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CHAPTER 8
LAND & SOILS

VOLUME II
ENVIRONMENTAL IMPACT ASSESSMENT REPORT

DECEMBER 2024

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8 Land & Soils

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8.1 Introduction

This chapter of the EIAR was prepared to assess the potential significant effects of the proposed development of a 14MW wind farm in the townlands of Cloonanny Glebe, Gorteenorna, Derrycharrow, Corragarrow, Co. Longford on land, soils and underlying geology during the construction, operation and decommissioning of the proposed development. It also identifies the characteristics, potential effects, mitigation measures and monitoring measures arising from the proposed development.

It should be read in conjunction with the following relevant chapters in the EIAR:

Chapter 1 – Introduction

Chapter 2 – Development Description

Chapter 7 – Material Assets

Chapter 9 – Water & Hydrology

The Construction Environmental Management Plan CEMP

8.2 Expertise & Qualifications

This chapter of the EIAR has been prepared by John Whiteford of Whiteford Geoservices Limited.

John Whiteford BSc (Hons) Geophys AMIOSH MEAGE FGS has more than 25 years of experience in the field of earth sciences, geotechnical engineering and management. His academic qualifications are a BSc with Honours in Geophysics from Edinburgh University, with memberships of The European Association of Geoscientists and Engineers and The Institute of Safety and Health.

John Whiteford has been engaged in full-time consultancy for the past 25 years and since 2000 trading as Whiteford Geoservices Limited. The company and its staff of professional and technical personnel has completed in excess 2000 contracts for clients within the Soils and Geology Assessment discipline, where they have built up a recognised level of specialist experience, particularly in the field of Wind Energy.

Working at home, in Europe and worldwide the company has been involved in more than 130 wind power projects of which the following are typical examples

- 29 Turbine 101MW Yellow River Wind Farm, Killnure, Co. Offaly
- 8 Turbine 16.8MW Sheskin Wind Farm, Bellacorrick, Co. Mayo
- 2 Turbine 4.6MW Templederry Wind Farm, Nenagh, Co. Tipperary
- 1 Turbine 0.9MW Clooncon East Single Turbine, Taum, Co. Galway
- 6 Turbine 14MW Tullynamoyle 2 Wind Farm, Co. Leitrim
- 5 Turbine 17MW Killala (Phase 1) Wind Farm, Killala, Co. Mayo

8.3 Proposed Development

A brief summary of the development is outlined below. A detailed description of the proposed development is contained within Chapter 2 of this EIAR and the Planning Statement that accompanies the application. The statutory notices should also be referred to.

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A 10-year permission is being sought by Natural Forces Renewable Energy 2 Limited for the development of a 14MW wind farm on lands measuring 17.28ha located at the L5046 and L50462 in the townlands of Cloonanny Glebe, Corragarrow, Derryharrow and Gorteenorna, Co. Longford.

The proposed development will consist of the following:

(i) Demolition of a single-storey derelict shed structure (c. 93 sqm GFA) to facilitate the turbine haul route

(ii) Construction of two E175 EP5 wind energy converters, each with an electrical rating of 7MW, an overall ground-to-blade tip height of 199.9 metres, a rotor blade diameter of 175 metres, hub height of 112.4 metres, associated foundations and hard-standing areas;

(iii) Construction of an 800m permanent internal site access road which will run from the L50462 to the wind energy converter hardstanding areas including a 9.1m clear span bridge crossing a local stream;

(iv) Construction of 1 No. meteorological mast with a height of 32 metres, associated foundation and hardstanding area;

(v) Construction of 1 No. 20kV substation compound comprising 2 No. Modular Buildings each measuring 13.5 sqm in area and 3.5m in height, a Battery Energy Storage System (BESS) comprising 3 storage modules with a height of 2.8 metres and associated electrical works, foundation and hardstanding area;

(vi) Temporary alterations to the L5046 and L50462 public roads and temporary access roads to facilitate the turbine component haul route, including temporary widening of sections of the L5046 and L50462.

(vii) Installation of underground collector circuit and communications cabling in underground cable trenches, from the proposed wind energy converter to the proposed on-site substation;

(viii) All associated and ancillary site development, excavation, construction, and reinstatement works, including the provision of a temporary construction compound, site drainage, spoil management, fencing, lighting, hedge and operational maintenance and tree trimming and cutting.

(ix) This application is seeking a 35- year operational life from the date of commissioning of the entire wind farm.

The grid connection from the proposed on-site substation to the national electricity grid does not form part of the subject planning application. However, as part of the planning application process, this EIAR addresses three potential grid connection options currently considered to ensure a comprehensive environmental assessment of all aspects of the Proposed Development. The grid connection will be via 1 of the 3 potential options outlined below:

- Option 1 Connect the proposed development via (8.03km) to Richmond 110kV Substation
- Option 2 Connect the proposed development via (3.96km) to Longford 38kV Substation
- Option 3 Connect the proposed development via (5.85km) to Glebe 38kV Substation

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It is anticipated that the grid connection from the Proposed Development will be by means of an underground cable connecting to one of the Substations identified above via the public road network. For bridge crossings, the cable will be located within the bridge deck, where there is insufficient depth and width available horizontal directional drilling (HDD) will be employed as an alternative.

Once the preferred route emerges it will be determined whether the grid connection falls within the category of exempted development under Class 26 of Schedule 2 in the Planning and Development Regulations 2001, as amended or requires planning permission, in which case an application will be made to the planning authority.

All elements of the proposed development as outlined above together with the turbine delivery route and grid connection options have been assessed as part of this EIAR.

8.3.1 Aspects Relevant to this Chapter

Aspects relevant to Soils and Geology pertaining to The Projects are as follows:

- The Proposed Development versus current land use.
- Excavation activities and their interaction with the existing soils and geology baseline.
- Vehicular movement, both along Turbine Delivery / Haul Route and new Site Tracks and their significance for compaction and subsidence.
- Slope Stability, in particular where this relates to peat landslide hazard, excavations in soils and spoil management.
- Potential for Soil and Groundwater contamination.
- Consideration of both sites of geological significance and protected sites and their potential to be impacted by interactions with the Soils and geology environment during the lifetime of The Project.
- Operation and Maintenance Phase activities.
- Decommissioning activities.

8.4 Methodology

8.4.1 Assessment Methodology

From the desk study, and field data acquired during the initial walkover survey, an assessment was carried out to screen for Peat Landslide Hazard and determine the presence and severity of other soils and geology related hazards.

The calculations, assessments and constraints contained in this report, follow on from these preliminary desktop and field-based assessments.

Regarding Soils and Geology, two main aspects have been reviewed; superficial soils and solid geology, and potential contamination of the landscape. The implications of these prevailing conditions were assessed at an early stage (Desk Study and Walkover Survey) and used to drive the rest of the study.

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8.4.1.1 Study Area

The study area is defined as the region within which changes to the soils and geology environment associated with the Proposed Development could reasonably impact sensitive receptors.

All potential effects of the Proposed Development have a limited zone of influence, and for these the study area has been limited to 1km from the Site boundary. However, there is also the potential for the zone of influence to be greatly extended, for instance soil contamination by watercourses. In such a case, effects can potentially impact receptors downstream in excess of 1km from the Site boundary. For this reason, sensitive receptors within 5km have been included in the study area.

8.4.1.2 Schedule of Works Undertaken

In April 2024 Whiteford Geoservices Ltd (WGS) personnel undertook a desk study of the available information pertaining to the proposed development of Cloonanny Wind Farm. This was then followed up by a site visit undertaken in May 2024, when preliminary scoping and a walkover assessment were carried out.

The predominate reason for undertaking the preliminary scoping and walkover survey was to determine the potential presence/or exclude the presence of geohazards, such as Peat Landslide Hazard, Karst Ground Instability, filled ground or other anthropogenic activities. This phase of the assessment was also used to categorise the relative sensitivity of receptors to soils and geology related impacts at the Site (e.g. from silt pollution of watercourses or mass movement of soils). This categorisation used a factor based probabilistic approach to provide a relativistic determination of sensitivity to potential soils and geology effects. Refer to **Table 8.19 Analysis of Other Sensitive Receptors Applicable to the Proposed Development** for details.

Following analysis, further investigation, laboratory testing and analysis was then carried out in May and June 2024, when a detailed assessment of topography, geology, drainage and ground stability conditions was also undertaken.

This detailed analysis of baseline conditions was finalised in July 2024.

A complete schedule of the investigative works undertaken at Cloonanny Wind Farm is listed in the table below.

Table 8.1 Schedule of Investigative Works by WGS, at Cloonanny Wind Farm Landholding

Key Dates	Activity	Infrastructure	Remarks
April 2024	Desk Study Analysis.	T1, T2 and Substation / BESS Compound	Undertaken by Whiteford Geoservices Ltd. Refer to this Report for findings
May 2024 (14th to 17th)	Preliminary Site Investigation consisting of in-situ testing of peat thickness, in-situ shear strength testing. Geophysical surveys.	T1, T2 and Substation / BESS Compound	
May and June 2024	Intrusive Site Investigation consisting of trial holes and laboratory testing of samples	T1, T2 and Substation / BESS Compound	
June and July 2024	Reporting	T1, T2 and Substation / BESS Compound	

8.4.1.3 Desk Study

Desk study information has been interpreted to establish the broad baseline conditions within the study area ahead of the site investigations and has been employed for both preliminary layout design and for design of the site investigation works.

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The desk study consisting of a review of all available datasets, information, and literature resources relevant to the Proposed Development has been completed and included the following sources:

- Geological Survey of Ireland – Geological Heritage site mapping (www.gsi.ie) – accessed 18/10/2024
- Geological Survey of Ireland – Groundwater, Landslides, Aggregate Potential and Geology (www.gsi.ie) – accessed 18/10/2024
- Environmental Protection Agency database (www.epa.ie) -– accessed 18/10/2024
- Study and assess the proposed locations of turbines with regard to available data on site topography and slope gradients (https://ireland.blueskymapshop.com/maps).
- Study and assess the proposed locations of turbines relative to aerial photographs (www.osi..ie) – accessed 24-10-2024
- Review Met Eireann meteorological records pertaining to the site (www.met.ie) – accessed 18/10/2024)
- Review of OPW Flood Mapping data to identify current potential for surface water and river flooding at the Site (www. https://www.floodinfo.ie/map/drainage_map) – accessed 14/10/2024
- Use desk-based information (including EPA Mapping) to identify preliminary list of potential receptors, either within the site boundary, immediately adjacent to it or in the wider vicinity, where these are at risk of being impacted from peat or soil movement caused by the proposed development.
- Use desk-based research to identify potential site "Preconditions" of slope instability or evidence of "Pre-failure Indicators" within the proposed development and vicinity.

8.4.2 Relevant Legislation & Guidance

This assessment complies with the EIA Directive as amended, which requires the assessment of likely significant effects on the environment for certain types of major development before development consent is granted. This assessment was undertaken in accordance with the following Irish legislation (transposition of the aforementioned directive):

- SI No. 296 of 2018: European Union (Planning and Development) (Environmental Impact Assessment) Regulations 2018.
- SI No. 30 of 2000: Planning and Development Act 2000 (as amended).
- SI No. 600 of 2001: Planning and Development Regulations 2001 (as amended).
- SI No. 4 of 1995: The Heritage Act 1995 (as amended).

- SI No. 33 of 2000: The Wildlife (Amendment) Act, 2000 (as amended).

The Roscommon County Development Plan (2022-2028) has also been considered as part of the EIA process.

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This assessment has been prepared in accordance with the following guidance documents, which take account of the aforementioned legislation:

- Department of Housing, Local Government and Heritage (2006) Wind Energy Development Guidelines.
- Department of Housing, Planning and Local Government (2019) Draft Revised Wind Energy Guidelines.
- Environmental Protection Agency (EPA) (2003) Advice Notes for Preparing Environmental Impact Statements.
- EPA (2022) Guidelines on the information to be contained in Environmental Impact Assessment Reports – May 2022 (Supersedes 1997, 2002 and 2017 versions).
- Institute of Geologists of Ireland (IGI) (2002) Geology in Environmental Effect Statements – A Guide.
- IGI (2013) Guidelines for the Preparation of Soils, Geology and Hydrogeology Chapters of Environmental Impact Statements.
- Irish Wind Energy Association (IWEA) (2012) Best Practice Guidelines for the Irish Wind Energy Industry.
- National Roads Authority (NRA) (2008) Guidelines on Procedures for the Assessment and Treatment of Geology, Hydrology and Hydrogeology for National Road Schemes.
- NRA (2008) Environmental Impact Assessment of National Road Schemes – A Practical Guide – Rev 1.
- CIRIA (2006) Control of Water Pollution from Linear Construction Projects – Technical Guidance.
- BSI (2015 + A1 2020) Code of Practice for Site Investigations – BS 5930.
- Peat Landslide Hazard and Risk Assessment: Prepared for Energy Consents Unit, Scottish Government Second Edition 2017, hereafter referred to as "the Scottish Guidance".
- NPWS (2015) National Peatlands Strategy.

8.4.3 Site Surveys/Investigations

Desk study information has been interpreted to establish the broad baseline conditions within the study area ahead of the site investigations and has been employed for both preliminary layout design and for design of the site investigation works.

The desk study assessment indicated the potential of peat soils at the main structures and the potential for "Karst" landforms within the soluble Visean Limestones that underlie the site. To this

end, the site investigation campaign was developed to screen for Peat Landslide Hazard and to physically appraise soil and geology conditions at the main wind farm infrastructure.

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This second phase of the soils and geology assessment (Site Investigation) allowed for a more detailed assessment of soils and geology, as follows:

- Detailed characterisation of the site's topographical and geological, geomorphological regime from the comparison of desk study data to actual site conditions.
- Exploratory trial pit investigation to visually and physically assess ground conditions at the main wind farm structures (Turbines and Substation) and their potential effect for foundations, compaction, subsidence, ground stability and land contamination issues.
- Use of this additional baseline data to update the preliminary desk study assessment of impacts on the soils, geology and hydrological aspects of the environment.
- Laboratory analysis of soil samples to determine specific soil and stability characteristics for the native soils and, if encountered, rock formations.
- Where impacts are identified, consider measures that would mitigate or reduce the identified impact.
- Consider that the development will be most at risk of peat movement during the construction phase and screen for its presence.
- Present and report these findings in a clear and logical format that complies with general EIAR reporting requirements.

8.4.4 Consultation

A pre-planning meeting and consultation was undertaken with Longford County Council on 25th April 2024. No comments pertaining to Soils and geology were received.

8.5 Difficulties Encountered

No Technical Difficulties arose out of the preparation of this assessment.

8.6 Baseline Environment

8.6.1 Site Description

The Proposed Development is located within the townlands of Corragarrow, Derryharrow and Cloonanny Glebe, and Gorteenorna approximately 3km northeast of Longford, Co. Longford.

Ground surface elevations vary between approximately 45m to 60m above Ordnance Datum (Malin Head).

The land usage across the number of land holdings which make up the development area, consists of agricultural grazing land for cattle and small areas of forestry.

The following additional aspects of the Proposed Development, external to the application area have also been included in this assessment.

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- **Turbine Delivery / Haul Route**: The Turbine Delivery Route from Belview Port, Waterford will be via motorways and the national, regional and local roads network to the windfarm entrance off the L50462. Refer to **Chapter 2, Section 2.3.10** for details. Both permanent and temporary works will be required at a number of locations along the Turbine Delivery Route. Refer to **Chapter 2, Section 2.3.5.2.**
- **Grid Connection:** The 20kV on site substation at Cloonanny will connect via underground circuits to one of three potential grid connection points, 1) the existing Richmond 110kV Substation, or 2) the existing Glebe 38kV Substation, from where it will connect by existing connection to the National Grid. For further details please refer to **Chapter 2, Section 2.3.11.**

8.6.2 Land Usage

8.6.2.1 Current

The land usage varies across the land holdings which make up the Cloonanny Wind Farm development with the predominant usage as mainly pastureland for livestock. In addition, there are areas of concentrated drainage at Turbines T01 and T02, where the lands within the river floodplain have been drained.

There are no residential dwellings within the site, however there is one uninhabited derelict agricultural building located within the red-line boundary. The closest habited buildings are more than 800m from the proposed turbines.

8.6.2.2 Historic

A review of historical mapping, courtesy of GSI, suggests that the site of Cloonanny Wind Farm has not changed significantly in land use from that recorded on the 1st Edition 6" TE Mapping. The same mapping indicates the original course of the Camlin River, along the southern boundary of the wind farm, has been straightened, although the overall course remains similar.

8.6.2.3 Services & Utilities

No overhead utilities were recorded within the proposed Wind Farm construction footprint, except for along the L5046 public road, where overhead telecom cables have been observed.

Underground services are present within the carriageway and verge adjacent to the site boundary and site entrance. Refer to **Chapter 7 - Material Assets Built Services** for further details.

8.6.3 Bedrock Geology

According to the GSI online database, the entirety of the Proposed Development is immediately underlain by the Visean Limestones Formation which consists of undifferentiated dark grey limestone rock.

Also present to the south of the Proposed Development, is the Argillaceous Limestones Formation which consists of dark limestone and shale.

One fault, trending along part of the Camlin River in an approximately southeast – northwest direction, separate the Visean Limestone Formation from the Argillaceous Limestones Formation. Fault zones are often associated with highly fractured and deeply weathered bedrock and / or the channelling of groundwater flow.

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8.6.3.1 Palaeo Karst Features

Karst topography is defined as "*An assemblage of topographic forms resulting from dissolution of the bedrock and consisting primarily of closely spaced sinkholes*." Karst topography can form in regions of exceptionally soluble rocks, including Limestone.

Soluble rocks generally mean those containing limestone, chalk or evaporite deposits such as gypsum that contain carbonates which are particular susceptible to dissolution under the action of rainfall.

The presence of such features has, in some cases, resulted in structural instability.

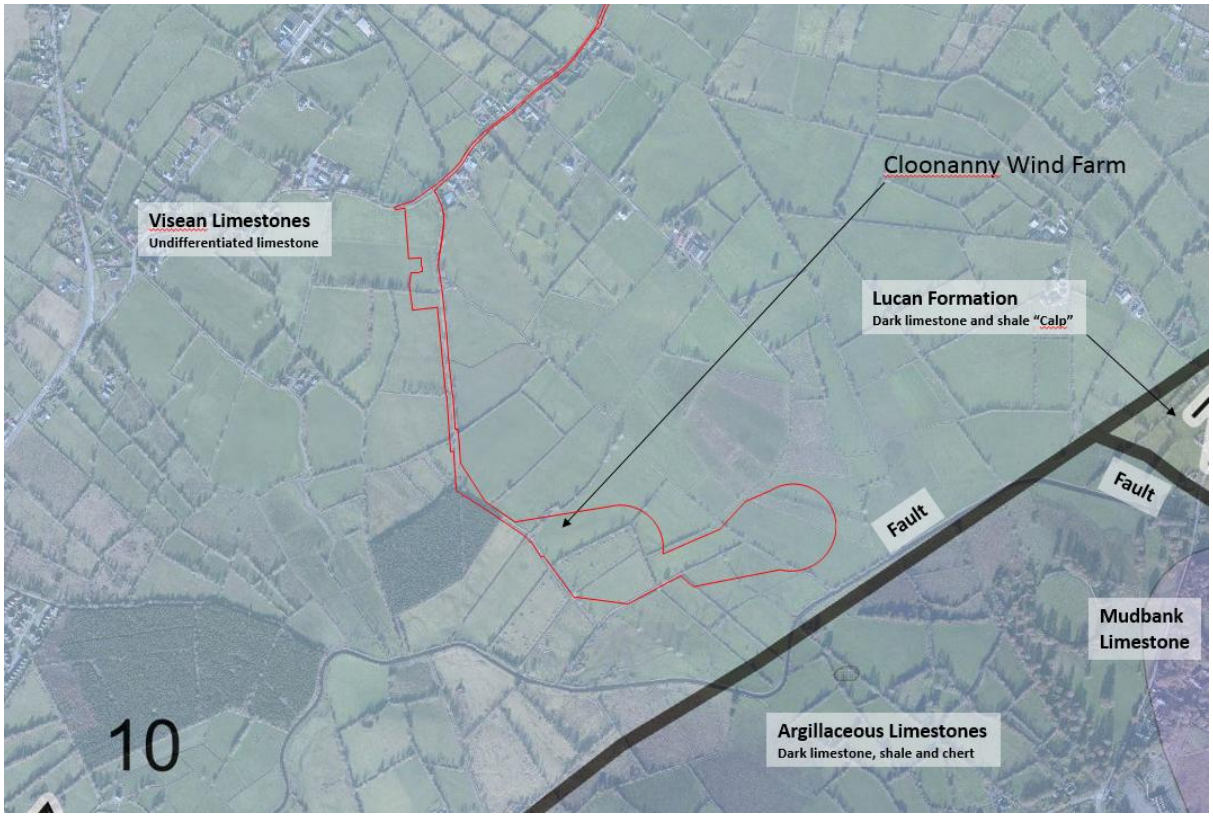


Figure 8.1 Bedrock Solid Geology (Reproduced courtesy of GSI Datasets Public Viewer)

The walkover survey did not identify any specific landforms / features consistent with a "karst" landscape at Cloonanny Wind Farm. Additionally, the ground investigations undertaken in 2024 did not record the presence of limestone, chalk or other obviously soluble rock. However, the underlying rock formation is known to contain soluble limestone and this particular rock formation is also known to be associated with "karst" features at other sites where it outcrops closer to the surface.

8.6.4 Soils and Subsoils

A desk-based study was made of available geological information. This study indicated that the following natural drift geology is present across the subject site.

- Topsoil
- Boulder Clay (Till / Mineral Soils)
- Alluvium

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Superficial soils present within the wind farm consist of thick till soils overlying often limestone rock at T01, T02 and the substation. The rock formation was not observed.

Alluvium and raised bog are also indicated by GSI within the site where it is associated with minor watercourses. Alluvial and peat soils would have the potential to impact construction at T02 and were investigated further during the site investigation campaign.

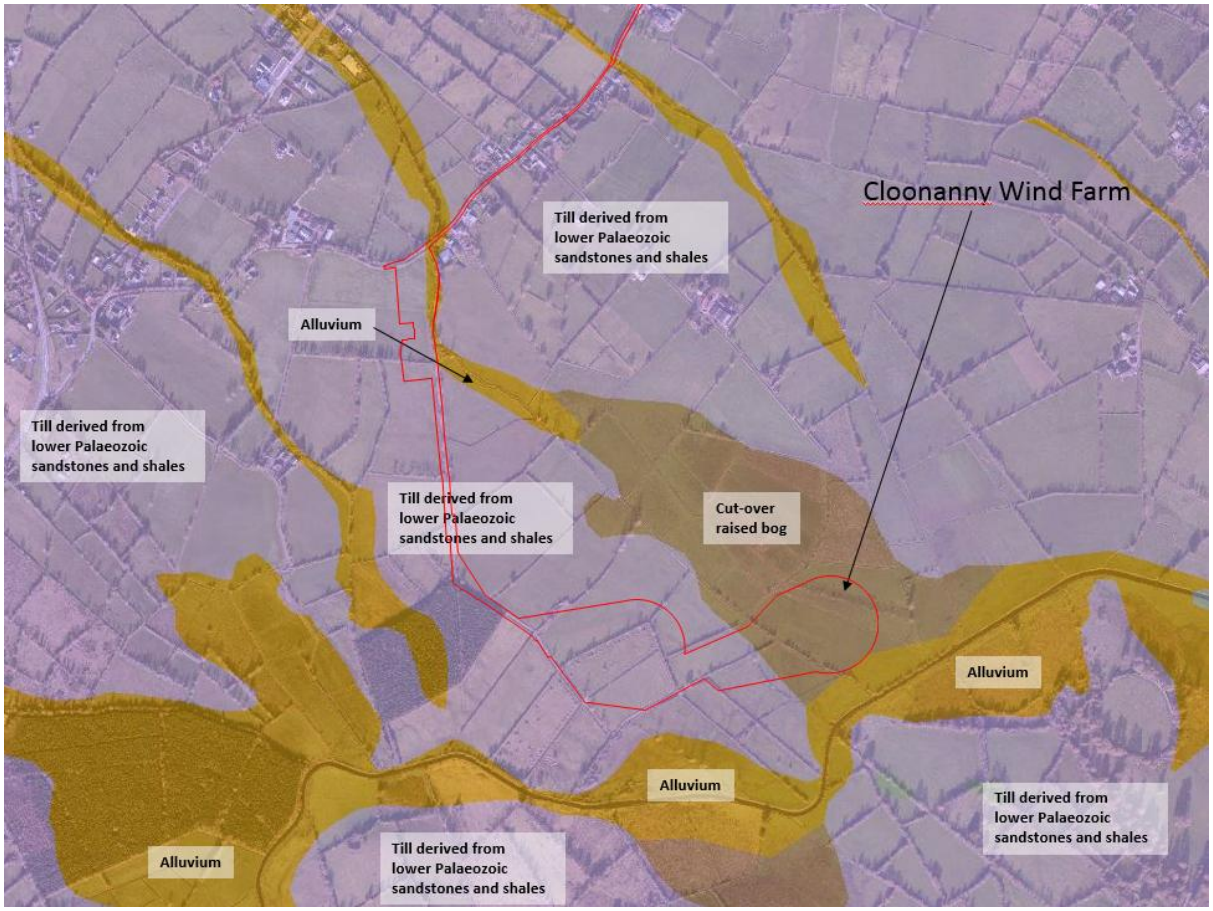


Figure 8.2 Superficial Geology. Reproduced courtesy of GSI Datasets Public Viewer

8.6.4.1 Peat Soils

Analysis of GSI online mapping and other records do not record any landslide events within 5km of the site boundary. Four landslide events; 2 no. relating to GSI_LS13-0002, Tomisky 2009, Longford, 1 no. relating to GSI_LS03-0007, Newtownforbes 1883, Longford and GSI_LS03-0033, Bog of Rhine Camlin River 1808, are recorded within a 5km radius. Three of the four events recorded "No apparent impact", whilst the event at Newtownfobes, 1883, records "land loss" / "covered turf and potatoes".

Peat depth screening undertaken at Turbines T01, T02 and the Substation / BESS Compound recorded an absence in PEAT soils within the Development footprint. Specific assessment for Peat Landslide Hazard is not required due to its absence. However, out of precaution, Peat Landslide Hazard

screening was undertaken at the main structures, within the redline boundary shown above. The results of these peat thickness measurements are given in **Table 8.2** below.

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Table 8.2 Peat Depth Distribution by Category

Peat Depth Category	Number of Survey Points
A – Rock/Very Shallow Peat/Topsoil (0.0-0.5m)	18
B - Shallow (0.5-1.5m)	0
C - Moderately Deep (1.5-2.5m)	0
D - Deep (2.5-4.0m)	0
E - Extremely Deep (>4m)	0
Total	**18**

No peat was recorded during these assessments and all organic soils encountered were classified as Topsoil. The potential for Peat Landslide has been screened out as a potential hazard.

8.6.4.2 Mineral Soils / Subsoils

Trial hole excavations undertaken during the site investigations were completed at the 2 no. proposed wind turbine locations and at the substation / BESS compound.

The results of these peat thickness measurements are given in **Table 8.3** below.

Table 8.3 Summary of Ground Conditions Encountered at the Main Wind Farm Infrastructure

Turbine / Infrastructure	Stratum Encountered	Depth to Stratum (m)	Remarks	Foundation Recommendation
T01	TOPSOIL	0.00		Gravity Base foundation in stiff SILT / CLAY at 3.50m depth
	Firm sandy gravelly CLAY/SILT	0.20		
	Stiff sandy gravelly CLAY/SILT with low cobble and boulder content	1.60 – 2.00	No rock encountered. Hole terminated at 3.50m in stiff CLAY/SILT	
T02	TOPSOIL	0.00		Gravity Base foundation in stiff SILT / CLAY at 5.00m depth
	Medium dense SAND	0.70 – 0.80		
	Stiff sandy gravelly CLAY/SILT	3.30 – 3.40	No rock encountered. Hole terminated at 3.70m in stiff CLAY/SILT	
Substation and BESS	TOPSOIL	0.00		Raft foundation within firm SILT/CLAY at 1.50m depth.
	Firm sandy gravelly CLAY/SILT	0.30	-	
	Stiff sandy gravelly CLAY/SILT with low cobble and boulder content	1.60 – 2.60	No rock encountered. Hole terminated at 3.50m in stiff CLAY/SILT	

These figures for soil thickness, obtained from the site investigation, have been employed for the purpose of calculating spoil quantities anticipated during excavation activities.

Table 8.4 Details of Estimated Soil Excavation at Turbine / Structural Locations

Element	Ave. topsoil depth (m)	Area of excavation for footprint at gravity base (m^2)	Area of hardstands/ temporary hardstands (m^2)	Vol. of topsoil spoil at bases (m^3)	Vol. of topsoil spoil at hardstand /set down (m^3)	Total Vol. of excavated topsoil (m^3)	Total Vol. excavated mineral soil (m^3)
Turbines, Hardstands and Temporary Hardstands	0.20 – 0.80	1414	12,235	706	5,489	6,195	**7,983**
Substation and BESS Compound	0.30	1,145				344	**484**
Track, turning heads and widening	0.43	17,404				7,542	**5,511**
Met Mast Foundation and Hardstand	0.30	425				128	**310**
Internal Cabling	0.43					211	**228**
Grid Connection	0.15					390	**1950**
Temporary Compound	0.30					630	**315**
Total est. Vols. Of Spoil Generated						**15,440**	**16,701**

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8.6.5 Ground Stability

A preliminary analysis of Blueskies topographic data was undertaken to identify the variation in gradient applicable to the existing slopes within the vicinity of the proposed wind farm development.

Ground stability is divided into two main types – Soil and Rock stability; the former being further sub-divided into Peat or Topsoils and Mineral Soils.

8.6.5.1 Ground Stability – Peat Soils

Both Evans and Warburton (2007) and Boylan *et al*. (2008) found from their analysis of recorded failures in blanket bog, that these were often recorded for slopes of typically 4 – 8 degrees to the horizontal. In such cases the mechanism of failure is by predominantly "bog burst" where the cause is a build-up of excessive hydrostatic pressure in the peat mass as a whole.

In their analysis, the peat failure was often internal and not due to a detaching of the peat soils from the underlying mineral substrate. This probably causes internal rupturing and detachment to occur below the failure point, coupled with lubrication of the basal plane by water. It is unlikely that the peat – mineral soil friction will have been exceeded in the case of "bog-burst".

Friction at the base of the peat is nonetheless important and thus it is important to consider the existing slope gradient as a potential trigger and a precondition for peat instability.

No significant thickness of peat was recorded within the Cloonanny Wind Farm site and therefore the potential stability hazard has not been considered further.

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8.6.5.2 Ground Stability – Subsoils / Mineral Soils

The Project will involve significant changes to the existing landscape, which will be altered during construction to accommodate the new structures, site tracks and infrastructure required. These construction works will necessitate excavation of the topsoil, subsoil and bedrock and the formation of both temporary and permanent changes to the local slope gradient.

Soils on steep slopes are less stable than soils on flat lands or low slopes. Similarly, rock is affected in a similar manner, particularly where vertical or sub vertical faces are concerned.

Construction works will create steep slopes that will be susceptible to stability issues. This will occur a) anywhere were excavation is undertaken, b) during the process of spoil management and stockpiling and c) where the existing topography is altered to construct site tracks and other infrastructure.

For this purpose, an assessment of ground stability has been undertaken as part of the soils and geology study.

In this report the term Mineral Soils relates to all other cohesive and granular natural soils. These soils are significantly more stable than peat / organic soils, with specific properties dependant on a combination of their relative density, particle distribution and shear strength properties.

Landslides within mineral soils are generally by rotational failure and greatly influenced by weather conditions, in particular how this affects the groundwater table and how the resulting surface water erodes the soil substrate.

In light of the reasons given above, this report advocates a banded factor-based approach to apportioning risk for peat and mineral soil failure. The following bands are used for this purpose (Table 8.5).

Table 8.5 Risk Factor Assignment – Existing Slope Gradient

Existing Slope Angle (Measured at Surface of Soils, Angle to Horizontal)	Relative Risk	Remarks
0 - ≤3	Negligible influence	Peat & organic soils only
3 - 5	Low	Peat & organic soils only
5 - ≤ 10	Medium (Peat) / Low (Mineral Soil)	Peat & organic soils only
10 - ≤ 22.5	High Peat) / Medium (Mineral Soil)	Potential for Unsupported granular soil failure
> 22.5	Very High (Peat) / High (Mineral Soil)	Unsupported granular soil failure. Potential failure in poor quality rock formations

8.6.5.3 Ground Stability – Rock Stability

Rock formations are normally significantly more stable than soil formations, where these repose at shallow angles. Where rock faces are present in the vicinity of wind farm infrastructure, particularly slope gradients in excess of 45 degrees to the horizontal, the risk of rock instability needs to be considered.

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In the case of the Proposed Development none of the construction activities are expected to be exposed to stability risk from rock faces. The underlying limestone rock formation is at such a depth that it is unlikely to be encountered during construction works, and if it is, only at the base of excavations.

Therefore, the potential hazard associated with rock faces has not been considered further.

8.6.5.4 Ground Stability – Analytical Assessment

The following assessment uses an analytical approach to determine factors of safety to quantify the risks of soil and rock movement and local rotational failure or engulfment of excavations occurring.

8.6.5.4.1 Soil Slopes

The application of Infinite Slope Stability Analysis will be employed to gauge the stability of mineral soils on slopes and for the determination of the relevant Factor of Safety (FoS). As an additional observation, the Stability of Excavations within mineral soils at the site of approved turbine excavations has also been considered. Refer to Appendix 8.1 B "Analytical Assessment" for detailed analysis in respect to the above. Results of these analysis are presented in the tables provided following.

Table 8.6 Analytical Assessment of Infinite Slope Stability of Soils

LOCATION	Max Slope (°)	z (m)	Undrained Condition		Dry Condition	
			Cu (kPa)	Factor of Safety Sliding	Cu (kPa)	Factor of Safety Sliding
T01	2.0	3.5	82	**29.21**	10	**3.56**
T02	1.0	3.5	67	**47.70**	10	**7.12**
Substation / BESS Compound	1.0	1.6	52	**80.98**	10	**15.57**

Table 8.7 Analytical assessment of Rotation Slope Stability of Soils

LOCATION	Cu (kPa)	Maximum Face Height Considered (m)	Factor of Safety Rotational Failure
T01	82	3.5	>1.10
T02	67	3.5	
Substation / BESS Compound	52	1.6	

8.6.5.4.2 Rock Slopes

Not required. Rock slope instability is not a significant hazard for the Proposed Development.

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8.6.5.5 Slope Stability at Main Structures

The table below details the calculation of hazard in relation to soil and soil slope stability at both the proposed wind turbines and the substation.

Table 8.8 Preliminary Hazard Ranking for each structure prior to implementation of Mitigation Measures

Turbine Location	Slope Stability (Soil / Rock) - Pre-Mitigation		
	Likelihood	Impact	HAZARD RANKING
T01	2	2 (Low)	**4**
T02	3	3 (Medium)	**9**
Substation	2	2 (Low)	**4**

Likelihood Rating	Likelihood
1	Highly Unlikely
2	Unlikely
3	Likely
4	Very likely
5	Frequent

Hazard Ranking	Category
1 to 6	Low
7 to 11	Medium
12 to 25	High

8.6.6 Assessment of Ground Conditions

The following is an appraisal of ground conditions at each of the locations where turbine bases and other infrastructure are being considered, for the Proposed Development.

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Table 8.9 Turbine T01

Nature of Assessment	Observations
Position (ITM)	615036, 777906
Peat / Topsoil Thickness	Peat 0m / Topsoil 0.20m
Superficial Soils	Firm, to stiff sandy, gravelly CLAY/SILT with a low cobble and boulder content
Solid Geology	>3.50m b.g.l. – Visean Limestones – not encountered
Presence of peat landforms, evidence of past ground movement, hydrological features, other watercourses or other features of note	None identified
Topography	Up to 2 degrees to horizontal.
Sensitive Receptors	< 300m from River Camlin; <200m from other designated watercourse. Within area of land drains
Utilities: Underground or overhead	None evident in vicinity
Any other observations	Extensive man-made drainage evident in the vicinity

Table 8.10 Turbine T02

Nature of Assessment	Observations
Position (ITM)	615470, 777952
Peat / Topsoil Thickness	Peat 0m / Topsoil 0.70m to 0.80m
Superficial Soils	Medium dense SAND overlying firm to stiff sandy, gravelly CLAY/SILT.
Solid Geology	>3.70m b.g.l. – Visean Limestones – not encountered
Presence of peat landforms, evidence of past ground movement, hydrological features, other watercourses or other features of note	None identified
Topography	Up to 1 degree to horizontal.
Sensitive Receptors	< 200m from River Camlin; coincident with other designated watercourse. Within area of land drains.
Utilities: Underground or overhead	None evident in vicinity
Any other observations	Extensive man-made drainage evident in the vicinity

Table 8.11 Substation and BESS

Nature of Assessment	Observations
Position (ITM)	614549, 778553
Peat / Topsoil Thickness	Peat 0m / Topsoil 0.30m
Superficial Soils	Firm, to stiff sandy, gravelly CLAY/SILT with a low cobble and boulder content
Solid Geology	>3.50m b.g.l. – Visean Limestones – not encountered
Presence of peat landforms, evidence of past ground movement, hydrological features, other watercourses or other features of note	None identified
Topography	Up to 1 degree to horizontal.
Sensitive Receptors	< 400m from River Camlin; <30m from other designated watercourse.
Utilities: Underground or overhead	None evident in vicinity
Any other observations	Extensive man-made drainage evident in the vicinity

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8.6.7 Existing Mining Activities and Potential Aggregate Resources

Review of the GSI online mapping data indicates that there is one active quarry / pit in close proximity of the proposed site.

Details for the closest active quarry are as follows:

1. Rhyne Quarries (Limestone): > 4km north west of Turbine T02 at Cloonanny Wind Farm

There are no historic quarry / pits located within the subject site. There are several other active aggregate extraction sites and historic mineral occurrences / workings within 10km radius of Proposed Development. None of these activities are considered to have more than a slight impact on the proposed development.

Mineral prospecting boreholes have been undertaken within the local area, but no active mineral extraction is recorded. No records of shafts or adits are recorded within 10km of the site.

According to GSI the subject site lies within an area predominantly classified as of Moderate Potential for Crushed Rock Aggregate, with very small pockets of high and very high potential along sections of the Camlin River where there is also Moderate Potential for Granular Aggregate. This same database also indicates that overburden, for the majority of the Site, is in excess of 10m thick with pockets of 5 – 10m thick overburden in the vicinity of turbine T02.

8.6.8 Existing Services / Utilities

The walkover survey did not yield any further information regarding the position of additional underground utilities within the site. Overhead telecom cables and potentially underground pipe and cable services are present at the site entrance, along the edge of the L5046.

8.6.9 Sites of Geological Heritage

The Geological Survey of Ireland (GSI) also maintains a database for known Geological Heritage Sites in Ireland. This database was accessed on 22nd October 2024 and review of its published contents has determined that 6 no audited Geological Heritage Sites are present in the vicinity of the subject site.

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Table 8.12 Audited Geological Site at Creeve Quarry

Site Code	LD007
Site Name	Creeve (3 km South East)
IGH Theme 1	IGH8
County	Longford
Description	A long disused quarry with adjacent wooded knoll of exposed rock
Designation	CGS
Geological	A good representative exposure of the Lower Carboniferous rocks in Longford
Coordinates (IG)	218353, 276290
Coordinates (ITM)	618300.245, 776307.746

Table 8.13 Audited Geological Site at Killoe Quarry

Site Code	LD011
Site Name	Killoe Quarry (4.5km North East)
IGH Theme 1	IGH8
County	Longford
Description	A large working quarry in the Lucan Formation, of Viséan (Lower Carboniferous) age
Designation	CGS
Geological	A good representative site for the Lower Carboniferous limestone rocks in Longford
Coordinates (IG)	219708, 279845
Coordinates (ITM)	619654.812, 779861.860

Table 8.14 Audited Geological Site at Glen Lodge Stream

Site Code	LD009
Site Name	Glen Lodge Stream (6.5km North West)
IGH Theme 1	IGH2, 4
County	Longford
Description	Streambank exposures in a deep glen or gorge
Designation	CGS. Recommended for NHA
Geological	Site is unique in Ireland as the sole exposure of late Silurian sedimentary rocks in Longford-Down
Coordinates (IG)	222845, 282972
Coordinates (ITM)	622791.478, 782988.731

Table 8.15 Audited Geological Site at Drumlish Quarry

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Site Code	LD008
Site Name	Drumlish Quarry (9.5km North East)
IGH Theme 1	IGH8
County	Longford
Description	An intermittently active quarry into greywacke of the Coronea Formation, of Ordovician age
Designation	CGS.
Geological	A good representative site for rocks not well exposed despite being relatively resistant to erosion within the Iapetus Suture zone
Coordinates (IG)	219420, 287244
Coordinates (ITM)	619366.926, 787259.292

Table 8.16 Audited Geological Site at Lough Rinn Drumlins

Site Code	LM022
Site Name	Lough Rinn Drumlins (11.5km North)
IGH Theme 1	IGH7
County	Leitrim
Description	This site forms part of a small, discrete field of drumlins, south and southeast of Mohill Village.
Designation	CGS.
Geological	Being set among an extensive field of drumlinised ribbed moraines, this small field of drumlins is unusual in that it comprises a small number of discrete, spindle-shaped drumlins, sitting on their own within the wider ribbed moraine landscape.
Coordinates (IG)	610750, 793103
Coordinates (ITM)	1009805.000, 1292885.000

Table 8.17 Audited Geological Site at Mid Roscommon Ribbed Moraines

Site Code	RO022
Site Name	Mid Roscommon Ribbed Moraines (17.5km North West)
IGH Theme 1	IGH7
County	Roscommon
Description	This field of ribbed moraine forms part of a small, discrete field northwest of Slieve Bawn
Designation	CGS.
Geological	This field of ribbed moraines form the perfect 'ribbed' topography
Coordinates (IG)	188269, 281685
Coordinates (ITM)	588222.859, 781701.684

8.6.10 Landslide Susceptibility

The GSI maintains a Landslide Susceptibility Map for Ireland. GSI landslide susceptibility mapping also indicates that the site has a low susceptibility with respect to landslide risk within the red-line boundary.

The Geological Survey of Ireland (GSI) records show that 4 no. landslides are recorded within 5km of the Site, with the closest landslide event being "Rhine1809", which occurred in 1808, approximately 2.5km to east of the Site.

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8.6.11 Peat Landslide Hazard Assessment

Although GSI mapping had indicated there to be an area of "cut-over" peat bog in the vicinity of turbine T02, no observations of peat soils, either at T02 or elsewhere within the red-line boundary were recorded during the site visit or SI stage.

Preliminary screening has determined that peat landslide hazard is negligible due to the Site's virtually flat topography and absence of significant peat within the construction zone.

8.6.12 Protected Sites of Designated Importance

When it comes to assessment of soils and geology related effects, it is important to determine the location of all sensitive receptors that could be detrimentally impacted by the Proposed Development. This includes consideration of SACs, where pathways such as watercourses or sloping topography link them to the potential adverse effects of the Proposed Development, such as siltation or landslide.

The following designated sites are sensitive environmental receptors which have been assessed for potential effects arising from the Proposed Development.

The following seven areas lie close to the Proposed Development are designated protected areas according to the Government of Ireland's EPA Map Viewer (accessed on 22nd October 2024):

- Carrickglass NHS (Ref 001822 – 850m South East)
- Royal Canal Proposed NHA (Ref 002103 – 3.4km South West)
- Section of the Camlin River designated as Nutrient Sensitive, according to the Urban Waste Water Directive (Ref 1994 – 3.6km South West)
- Lough Forbes Complex SAC / NHA (Ref IE0001818 – Habitats – 4.7km West)
- Ballykelly Fisherstown Bog SPA (Ref: IE0004101 – Birds – 4.7km West)
- Derrymore Bog Proposed NHA (Ref: 000447 – 4.9km South)
- Brown Bog Proposed SAC / NHA (Refs: IE0002346 & 00042) – 5km South West)

8.6.13 Soil Contamination

No soil or groundwater contamination was observed within the Proposed Development, nor on the potential grid connection routes. No evidence of soil contamination was noted during walkover surveys or the site investigation. As agricultural and forestry equipment is used across much of the Site it is possible that minor fuel spills and leaks have occurred locally in the past.

The EPA records the following four licenced industrial consents within 5km of the Site.

- P0855; Kiernan Structural Steel Limited, Killyreher, Carrigglas, Longford. (2km East)

  Active license no: P0855-01

  IPC, IPPC Facility & IPPC Boundary designations apply

- P0226; Barbour Threads, Templemichael Road, Longford. (2km South)

  Active license no: P0226-01

  IEL & IPPC Facility designations apply

- P0327; Glennon Brothers Timber Limited, The Sawmills, Kilnasavogue, Longford. (3km South East)

  Active license no: P0327-01

  IEL, IPPC Facility & IPPC Boundary designations apply

- P0351; Gem Manufacturing Company Limited, Catrongeeragh, Longford. (5km South West)

  Active license no: P0327-01

  IPC, & IPPC Facility designations apply

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8.6.14 Site Investigations – Summary of Findings

Table 8.18 presents a summary of the findings of the Soils and Geology Baseline together with preliminary design recommendations.

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Table 8.18 Summary of Site Investigation Findings and Recommendations

Element Ref:	Element Assessed at Site Investigation Stage	Summary Soil Description
1A	Typical Soil Overburden (Wind Farm)	A. Topsoil overlying firm to stiff, grey mottled orange, sandy, gravelly SILT / CLAY with a medium cobble and low boulder content (T01 & substation / BESS) B. Topsoil overlying medium dense, grey, very silty SAND and firm SILT (T02 only). Neither soil type is considered sensitive with respect to the application of either "driven" or "bored" piling to construct foundations.
1B	Typical Soil Overburden and Bedrock (Grid Connection)	MADE GROUND consisting of bituminous road surfacing and road base granular aggregate, overly mainly GLACIAL TILL mineral soils for all three route options. Isolated pockets of ALLUVIUM and PEAT are also present in the vicinity of the Camlin River affecting route options 2 and 3. The bedrock geology mapped along the Grid Connection route consists of solely Visean Limestones (Dark limestone, shale and chert) for route options 1 and 3. Along route option 2 bedrock geology consists of Visean Limestone, the Ballysteen Formation (dark muddy limestone and shale) and the Meath Formation (Limestone cand calcareous sandstone), Although the majority of the circuits will be laid within the superficial soils, some limited bedrock excavation is anticipated.
2	Typical Overburden Thickness (m)	T01 = >10m T02 = 8 to 10m SUBSTATION and BESS = > 10m
2	Rock Type (Wind Farm)	VISEAN LIMESTONES. Rock was not encountered within the trial holes excavated during the Site Investigation campaign. Geophysical Electrical Resistivity Imaging (ERT) surveys did identify rock at 8 – 10m depth at T02, but did not identify rock at T01. Geophysical data suggests that overburden is anticipated to be >10m thick at T01 and the Substation.
4	Rock Competence (Wind Farm)	Unconfirmed at this time. Further SI will be undertaken at construction stage to confirm this aspect. Geophysical data at T02 indicates that the rock will be WEAK to MEDIUM STRONG LIMESTONE (i.e. 5 - 50 MPa)

Element Ref:	Element Assessed at Site Investigation Stage	Summary Soil Description
5	Typical Depth to Non Rippable Rock	T01 = > 10m T02 = 8 - 10m SUBSTATION and BESS = > 10m
6	Recommended Foundation Type	T01 = Gravity Base within stiff MINERAL SOILS T02 = Ground Improvement and Gravity Base / Piled Foundation within stiff MINERAL SOILS SUBSTATION = Raft, strip or pad foundations within the stiff MINERAL SOILS
7	Slope Stability	T01 : FoS > 1.1 (Acceptable) T02 : FoS > 1.1 (Acceptable) SUBSTATION and BESS: FoS > 1.1 (Acceptable)
8	Karst Features	Although the underlying rock formation is soluble and therefore has potential to develop Karst dissolution features, no "karst" features such as sinkholes, caves, cavities, voids or subterranean watercourses were located during the site investigation campaign. GSI does not records any karst features within the Site. The potential impact to the Proposed Development is Significant, but will be mitigated by undertaking a detailed pre-construction ground investigation. This investigation will contain supplementary holes intended to map the competence of the rock formation over the footprint of the main infrastructure.
9	Groundwater Observations	**T01** – No groundwater recorded during SI. Soils are weakly permeable only. Location expected to be in hydraulic continuity with Camlin River and at this location subject to slow recharge. Mobile ground water table anticipated. **T02** – Weak flows of groundwater recorded at 2.80 – 3.30m depth during SI. Soils are moderately permeable. Location expected to be in hydraulic continuity with Camlin River and at this location subject to moderate rate of recharge. Mobile ground water table anticipated. **Substation / BESS** – No groundwater recorded during SI. Soils are weakly permeable only. Location expected to be in hydraulic continuity with Camlin River and at this location subject to slow recharge. Mobile ground water table anticipated.

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Element Ref:	Element Assessed at Site Investigation Stage	Summary Soil Description
10	Protected Geological Sites	The following sites of geological significance are present in the local vicinity: LD011: Killoe Quarry, IG8 LD007: Creeve Quarry, IG8 All other sites are sufficiently far enough (>5km) from the proposed development for any potential impact / effect caused by its construction and operation to be imperceptible.
11	Landslide Hazard	GSI mapping indicates landslide potential at the Site to be low. Preliminary SI indicates that peat soils are absent at the main infrastructure and the natural mineral soils are not considered sensitive. Maximum slope gradients at the site are less than 5 degrees to the horizontal. Risk is confirmed to be low.
12	Predicted Performance as a construction aggregate	**Marginal.** It is anticipated that negligible rock spoil will be generated during construction works. Spoil will consist of either SILT/CLAY or SAND/GRAVEL mineral soils. The former are likely to be variable in terms of their suitability and likely to be subject to degradation by wet weather conditions. The latter are anticipated to perform well as a construction fill material and less susceptible to weather conditions.
13	Predicted Performance as a construction aggregate	**It is not possible to predict with any certainty the quality of crushed rock aggregate that could be derived from the site**. Further SI is required to gain the necessary additional information to determine rock aggregate performance. The following is known and positive; a) this limestone rock formation generally produces an acceptable quality of crushed aggregate b) there are limestone rock quarries within 5km of the site. The following is known and negative; a) at this site b) GSI records indicate a moderate to high potential for crushed rock aggregate at this site.

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8.6.15 Other Potential Sensitive Receptors

Analysis of desk study resources and follow up walkover surveys have identified the following other sensitive receptors.

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Table 8.19 Analysis of Other Sensitive Receptors Applicable to the Proposed Development

Receptor	Minimum distance to Site	Exposure Factor Assigned (Using Factor Based Probabilistic Analysis)	Remarks
Peatlands / Bog	4.5km	1	Closest significant bog is located approx. 4.5km to the south west.
Agricultural Lands	0m (within site)	1	-
Minor Utilities	0m (within site)	2	Utilities near Substation and T2
Designated Minor Watercourses / Water Bodies	0m (IE_SH_26C010800 Waterbody is within site) <300m to Derryharrow Stream	2	Derryharrow Stream and IE_SH_26C010800 Waterbody
Designated Major Watercourses / Water Bodies	< 0.3km	3	Camlin 26 River
Undesignated Watercourses / Drainage	0m (within site)	1	e.g. ditches and man-made watercourses, around T01, T02 and close to Substation
Minor Public Roads	0m (adjacent to Site Entrance)	3	L1011, L5046 and L50462
Moderately to highly trafficked Public Road	< 1km	4	R198
Dwellings	c.70m from Site Boundary.	4	Closest dwelling to Site Boundary. Minimum distance to dwelling from a wind turbine is > 800m.
Commercial Property	0m (at Site Entrance)	3	Various. agricultural farm buildings, closest of which is adjacent to Site Entrance. Minimum distance from a wind turbine is > 650m.
Significant Utilities (Overhead) / Underground	>1km	3	
Population centre / Urban area	c. 3km to west	5	Longford town, population 10,592 (2022)

8.6.16 Potential Preconditions Identified local to the Proposed Development

Analysis of desk study resources and follow up walkover survey have identified the following static or inherited factors that could potentially act as preconditions to slope instability in peatlands.

Table 8.20 Risk Analysis of Preconditions Applicable to the Site

Precondition	Minimum distance to Development (m)	Remarks
Concentrated drainage network / presence of standing water / area of flush / springs, or rises	0m (drained lands adjacent to Camlin River at turbines T01 and T02.)	-
Significant slopes	N/A	-
Significant peat thickness	Not applicable – no peat at infrastructure	No peat encountered at Site
Very highly decomposed Peat	Not applicable – no peat at infrastructure	No peat encountered at Site
Very weak Peat or underlying mineral soils	Not applicable – no peat at infrastructure	No peat encountered at Site
Potential sonic vibration or ground accelerations	No sources of sonic energy (e.g. blasting etc.) within 3km of the site	Potential impact to site from existing quarry operations is imperceptible.

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8.6.17 Pre-Failure Indicators local to the Proposed Development

Pre-failure indicators are physical landforms that are "tell-tale" signs of stress within the peatland environment.

The following pre-failure indicators have been considered for the Proposed Development site:

- Historical evidence of previous movement
- Tension or compression features
- Soil creep
- Cracking / desiccation
- Other[1]

Table 8.21 shows pre-failure indicators are present within the immediate vicinity of the proposed development.

Table 8.21 Analysis of Pre-Failure Indicators Applicable to the Proposed Development

Pre-Failure Indicator	Minimum distance to Structures / Infrastructure (m)	Remarks
Historic peat cutting	0m	Large central portion of the Site has been "cut-over". No peat remains.
Evidence of cracking or movement within the rock formation	N/A	None evident
Evidence historical peat slide	c. 5km	GSI has identified 3no historical peat landslides within 5km of the proposed wind farm
Evidence of tension cracking or compression features	N/A	None

[1] The Scottish Guidance notes other potential pre failure indicators such as artificial drainage, concentrated drainage networks, seeps, springs, soft clays and iron pans. The author considers these to be preconditions and not pre failure indicators.

Pre-Failure Indicator	Minimum distance to Structures / Infrastructure (m)	Remarks
Evidence of soil creep	N/A	No soil creep observed within proposed construction zone
Cracking / desiccation	N/A	None evident within proposed construction zone

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8.7 The 'Do Nothing' Scenario

The "Do Nothing Effect" is the effect should the Proposed Development not be constructed. In this case, it is envisaged that the current land use would remain as it is now, with continued intensive grazing for cattle and other livestock.

Given the nature of the land, being generally pastureland, minor forestry and rough grazing, it is unlikely that any substantial changes in this use would occur in the near future.

8.8 Potential Significant Effects

8.8.1 Demolition Phase

No potential significant effects relating to Soils and Geology arise out of demolition of a single storey derelict shed structure to facilitate the turbine haul route.

8.8.2 Construction Phase

The Proposed Development is characterised by the construction of infrastructure necessary to complete the wind farm as described in **section 4 of the Construction and Environmental Management Plan.**

The EIA also assesses the Works required along the proposed Turbine Delivery Haul Route.

The direct and indirect effects of the construction activities, and their expected duration are assessed further in the following sections. The effect on use of land and on natural resources required to carry out the works which relate to soils and geology is also assessed.

The Construction Phase activities that will give rise to effects on soils and geology are listed below:

- Turbine Construction
- Substation and Battery Energy Storage Site (BESS) Construction
- Crane hard stand and temporary blade lay down hard stand construction
- Temporary construction compound
- Installation of internal cabling
- Installation of grid connection cabling
- Construction of Site Tracks
- Upgrade Turbine Delivery / Haul Route

These activities will have the following potential effects:

8.8.2.1 Land and Land use

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32,141m^3 of topsoil, subsoil and bedrock removal will occur during construction excavations and is an unavoidable consequence of the Proposed Development. This will result in an adverse effect to land capability for agriculture, causing a loss of moderately productive agricultural lands and a small area of forestry.

Removal of the soil (both organic topsoil and mineral soils) and bedrock is considered to be a permanent effect as it would not normally be reversed, although some reinstatement of the agricultural capability is possible after decommissioning.

Table 8.22 Effect Summary – Land and Land Use

Effect Description	Type	Quality	Significance	Extent	Context	Probability	Duration / Frequency
Loss / Change of Land Use	Direct	Negative	Slight	Site	Contrast to baseline	Likely	Permanent

8.8.2.2 Earthworks Activities

Subsoil and bedrock removal will occur during construction excavations and is an unavoidable consequence of the Proposed Development. The operation of removing soils and bedrock increases the potential for siltation to occur. Processes such as soil instability, poor spoil handling, compaction and subsidence brought about by earthworks activities, can cause a release of silt into the environment, which can adversely affect local sensitive receptors, such as watercourses and their associated flora and fauna.

8.8.2.2.1 Soil and Bedrock Excavations and Piling

Excavations will be required for most aspects of the Proposed Development including for turbines, turbine hardstand areas, substation and BESS, Site Access Tracks, Haul Route, compound, cable trenches, and grid connection route. Estimates of excavation volumes are presented in **Table 4-3 Excavation Volumes** in the **CEMP.** Piling may also be required to construct turbine foundations at T02.

The superficial soil material encountered at each turbine and infrastructure location during construction, is considered to be, in the main, a combination of Topsoil and Glacial Till (mineral soils). A portion of this material should also be suitable for re-use as construction fill for Site Access Track construction and as “ballast” placement above the turbine foundations.

Significant bedrock excavations are not anticipated. Bedrock was not encountered during the site investigations within the exploratory holes, but was located by the geophysical surveys at depths in excess of 5m below existing ground level.

Foundations for wind turbines will consist of either a) deep excavation to competent soils upon which a reinforced concrete “gravity base” foundation will be constructed, or b) the installation of bored piles, socketed into the underlying rock formation and construction of a shallow reinforced concrete platform, upon which the turbine will be constructed. Soil and rock conditions are not considered to be adversely sensitive to the vibration caused by the installation of piles. The potential effects from

piling operations are considered to be not significant, particularly with respect to the Soil and Bedrock Excavations.

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The use of heavy breakers or blasting will not be required to remove rock to facilitate the Proposed Development.

A permanent Site Access Track will be needed to accommodate the construction works and to provide access to the turbine locations for the whole life cycle of the wind farm. The track will be constructed using unbound crushed aggregates and incorporate drainage to maintain the performance of the pavement during wet weather. This road pavement will be constructed within the firm glacial till soils, following removal of the overlying topsoil, weak organic soils and soft glacial tills.

The potential effects here are considered to be of **moderate** significance, **permanent** and **negative**.

8.8.2.2.2 Haul Route

Haul Routes will use the existing public roads, between Belview Port, Waterford City and the Proposed Development Site, to facilitate the turbine haul route, but will require some temporary alterations. These alterations include temporary widening of sections to the L5046 and L50462 as well as temporary junction accommodation works to the site entrances on the L5046 and the L50462. Refer to **section 4.8** of the **CEMP** for details.

As part of the Proposed Development, it is proposed to upgrade and temporarily widen the L50462 from the location of the proposed substation and BESS compound for a distance of circa 750m to the main Site Entrance. Following Turbine delivery, the temporary widening will be grubbed up and the area will be reinstated.

Also, as part of the development it is proposed to construct a temporary Access Road to the west of the L50462 between the L5046 junction and the proposed substation and BESS compound for abnormal load deliveries. Except for abnormal loads, this road will not be used for construction traffic. A removable barrier will be constructed across the entrance points to the road to prevent unauthorised use.

Generally, the effects associated with this will be the same as for the permanent site access track construction (compaction and settlement where new road surface is laid), but on a very minor scale and reversible. The effects are considered to be **not significant**, **temporary** and **negative**.

8.8.2.2.3 Site Cable Trenches

Cable trenches throughout the Proposed Development Site will be 0.325m wide and excavated to a depth of 0.95m. Topsoil and glacial till soils will be stored separately during construction and any excess remaining after reinstatement will be stored permanently on site. Refer to **section 4.7.9** of the **CEMP** for further details.

Imported granular fill will be used to surround the cables, however, the majority of the excavated soils will be used for backfill with only minor amounts being removed and used elsewhere for berm landscaping. The effects associated with excavations for cable trenches are considered to be **not significant, permanent and negative.**

8.8.2.2.4 Grid Connection Cable

Grid connection trenches will be excavated along one of the potential grid connection routes; to Richmond 110kv substation, Longford 38kV substation or the Glebe 38kV substation from where it

will connect to the national grid. Refer to **section 4.9 and Appendix B – Grid Connection** of the **CEMP** for further details.

The trenches will be predominantly within roads and verges, of 0.325m in width and to a proposed depth of 0.95m, depending on confirmatory investigations. Excavation of road aggregates, topsoil, topsoil, glacial till and bedrock will be required.

These trenches will be backfilled using imported granular material. The excavated material will be disposed of offsite as inert landfill or recycled for use elsewhere. The effects associated with excavations for cable trenches are considered to be **not significant, permanent and negative**.

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8.8.2.2.5 Temporary Construction Compound

One temporary construction compound will be employed. The compound, located to the western side of the access track near the Proposed Development Site entrance, is to be the construction phase operations compound.

Construction works will involve topsoil stripping, levelling of the subsoils within compound footprint, and laying of road base materials for the siting of modular offices, stores, parking and material storage.

The potential effects here are considered to be **slight, temporary and negative.**

8.8.2.2.6 Storage and Stockpiles / Spoil Management

It is expected that the majority of spoil generated will be either topsoil, small amounts of organic soils, glacial till or rock. This spoil will be re-used, where possible as fill around infrastructure, and to construct stockpiles / bunds along the edge of site tracks, at the substation and around the edges of the construction compound. Surplus spoil will be disposed to permanent spoil storage separated for topsoil and glacial till / rock materials.

Removal of soil and rock during construction produces spoil that lacks the competence and stability it had before removal. Such spoil represents a hazard to the wider environment where it can be either a potential contaminant, causing siltation of watercourses, or a landslide hazard where earthworks are not managed appropriately.

The handling, management and re-use of excavated spoil material is important during the construction phase of the project.

Excavated spoil material will arise from all infrastructure elements of the windfarm (foundations, tracks, hardstands, cabling, grid connection etc.).

Estimated total volumes of material to be excavated are presented in **Table 4-3** of the **CEMP**.

Within the spoil management process there is potential for a moderate negative effect on soil due to erosion of inappropriately handled excavated materials. However, any effects from the handling of excavated materials will be managed through good site practice, as per NRA Guidelines. A robust sediment and erosion plan, greatly reduces the risk of erosion or sediment release to surface waters.

Organic matter loss can occur when wet peat or organic soils are excavated and allowed to dry in the open air. Such material is a major source of carbon and the loss of organic matter leads to an emission source of carbon dioxide (CO_2) and nitrogen dioxide (NO_2). A Carbon Calculation can be found in Chapter 14: Climate, which addresses the effect of loss of carbon to the atmosphere through the drying out of organic soils excavated as part of the Proposed Development.

Excavated soil and bedrock will be re-used for the construction of Site Access Tracks. No excavated soils will be taken offsite.

Any residual soils that cannot be re-used will be stored at the designated spoil repository. Refer to **Spoil Management Plan, CEMP.**

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Table 4-3, CEMP, also provides a breakdown for the amount of spoil retained in stockpiles, re-used and permanently stored.

This process of spoil management will have a **moderate, permanent and negative effect** on the geology and soils.

A summary of significance for all pre-mitigation effects, associated with excavation activities is presented in Table 8.23**.**

Table 8.23 Effect Summary – Excavation Activities

Effect Description	Type	Quality	Significance	Extent	Context	Probability	Duration / Frequency
Earthworks Activities – Soil Excavations & Piling	Direct	Negative	Moderate	Site	Contrast to baseline	Likely	Permanent
Earthworks Activities - Site Haul Route	Direct	Negative	Moderate	Site	Conforms to baseline	Likely	Temporary
Earthworks Activities – Site Cable Trenches	Direct	Negative	Not significant	Site	Contrast to baseline	Likely	Permanent
Earthworks Activities – Grid Connection Cable	Direct	Negative	Not significant	Regional	Conforms to baseline	Likely	Permanent
Earthworks Activities – Temporary Construction Compound	Direct	Negative	Slight	Site	Contrast to baseline	Likely	Temporary
Earthworks Activities – Storage and Stockpiles / Spoil Management	Direct	Negative	Moderate	Site	Contrast to baseline	Likely	Permanent

8.8.2.3 Vehicular Movement

8.8.2.3.1 Overview

Vehicle movement will occur primarily during the construction phase of the wind farm. Construction vehicles will include cranes, excavators, dumper trucks, concrete trucks, private cars (construction personnel). Please refer to **EMP6 Traffic Management, CEMP**, for details.

This process of vehicle movement will have a **significant, negative and permanent effect** on the geology and soils.

8.8.2.3.2 Compaction, Erosion and Degradation

Compaction, erosion and degradation of soils will occur during construction. In general any compacted soils will be excavated as part of the construction process, and access to soils outside the hardstands will be prevented. Ongoing compaction of soils will occur in areas of road construction on alluvial soils, where the effect, under adverse weather conditions, is potentially significant.

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Erosion and degradation of exposed soils will also occur during construction where subsoils are stripped of topsoil and exposed to the action of weathering. In general, this will be restricted to the construction footprint for the duration of the construction period only.

8.8.2.3.3 These compaction, erosion and degradation effects are also considered to be **significant, permanent and negative**.Haul Route and Site Tracks

There will be no material changes to the existing public roads with the exception of temporary widening between of a c. 750m long section of the L50462, where new load bearing surface will be laid alongside the existing public road. This will result in compaction of the underlying soils. Since most of these lands currently make up the road verge the effect of this local widening will be slight in significance.

Construction of new temporary Access Road for abnormal load deliveries will also result in compaction of currently uncompacted soils. This effect is considered to be **moderate, permanent** and **negative**.

The effects of compaction associated with heavy vehicle movements along the haul route is considered to be **moderate, temporary** and **negative**.

Vehicle movement along the Site Access Tracks will also result in a compaction of the underlying soils. The effects associated with vehicle movements on the geology and soils along the Site Access Tracks is considered to be **moderate, permanent** and **negative.**

A summary of the pre-mitigation effects associated with vehicle movement is given in Table 8.24**.**

Table 8.24 Effect Summary – Vehicular Movement

Effect Description	Type	Quality	Significance	Extent	Context	Probability	Duration / Frequency
Vehicle Movement - Compaction, erosion and degradation of soils arising from vehicular movement	Direct	Negative	Significant	Localised	Contrast to baseline	Likely	Long term / Permanent *(Temporary in the case of widened road grubbed out on completion of construction)*
Vehicle Movement - Subsidence and settlement of newly established and upgraded Site tracks	Direct	Negative	Moderate	Localised	Contrast to baseline.	Likely	Permanent *(Temporary in the case of widened road grubbed out on completion of construction)*

8.8.2.4 Peat Landslide Hazard, Ground Stability and Failure

Ground instability or failure refers to a significant mass movement of a body of soil or rock that would have an adverse effect on the Proposed Development and the surrounding environment.

Peat Landslide Hazard has been screened out as a potential impact on soils and geology as this was not recorded within the footprint of the windfarm infrastructure.

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A significant amount of Site Investigation data has been acquired across the Proposed Development Site and this data provides confidence on the depth of topsoil, subsoil and subsoil type. Subsoils are logged as mineral soil glacial till deposits comprising sandy, gravelly SILT/CLAY with cobbles and boulders and silty, SAND / sandy SILT.

These subsoils are generally not associated with ground instability or a risk of landslides where the ground slopes are low as they are at the Proposed Development. The overall landslide susceptibility is assessed to be low within the footprint of the Proposed Development.

Where the water level is high (e.g. within the flood zone surrounding T02), excavations within the granular soils will quickly become unstable if progressed below the water table. In such cases direct support will be required to maintain stability.

An iterative design involving multiple stages of ground investigations, followed by turbine and infrastructure re-design has been completed in order to avoid the worst of the existing ground conditions.

Site investigations did not record the presence of karst features, below the subsoils which can impact the stability of infrastructure. Given that the underlying rock formation Visean Limestones is known to be soluble, this hazard remains. Construction stage investigations will collect further geotechnical data to inform the appropriate design of foundations in this respect.

The subsurface conditions underlying the different Grid Connection route options have also been assessed. Local ground conditions along the route consist of made ground (bituminous macadam surfacing and granular aggregate road base) overlying glacial till deposits of varying consistency. A short section of the potential grid connection route between the Proposed Development and Richmond 110kV substation is underlain by peat and alluvial soils, where it crosses the Camlin River. The consequent effect this will have on stability has been considered.

Small amounts of hard strata excavation will be required to install the circuits at the scheduled for all potential grid connection routes.

The potential effects associated with ground stability are contained in Table 8.25.

Table 8.25 Effect Summary – Peat Landslide Hazard, Ground Stability and Failure

Effect Description	Type	Quality	Significance	Extent	Context	Probability	Duration / Frequency
Ground Stability and Failure - Stability issues and slope failure (Localised displacement)	Direct or Indirect / Secondary	Negative	Moderate	Localised / Potentially Regional	Contrast to baseline	Likely	Long term / Permanent
Ground Stability and Failure - Stability issues and slope failure (Landslide)	Indirect / Secondary	Negative	Significant	Localised / Potentially Regional	Contrast to baseline	Unlikely	Permanent

8.8.2.5 Soil and Groundwater Contamination

Four industrial processes with active pollution control licences are present within 5km of the Proposed Development. However, there are no records of contamination emanating from these facilities nor was any evidence of contamination observed during the Site Investigation campaign.

These sites also represent a cumulative risk with respect to the Proposed Development.

Accidental spillage of fuels and other chemicals during construction works is the main pollution risk.

The production of waste materials during construction will be minimised by good site practices and adherence to the waste management section of the CEMP. Refer to the **Construction Environmental Management Plan (CEMP), EMP4 – Fuel, Oil and Chemical Management & EMP15 – Waste Management Plan**.

The following sections present a breakdown of all the possible effects associated with the use of construction plant during the construction process.

8.8.2.5.1 Hydrocarbons

Wherever there are vehicles and plant in use, there is the potential for a direct hydrocarbon release which may contaminate the soil and subsoil. A spill also has the potential to indirectly pollute water, if the soil and subsoil act as a pathway from any source of pollution.

The accumulation of small amounts of fuels and lubricants during routine plant use can also be a significant pollution risk. Hydrocarbons have a high toxicity to humans, flora and fauna including fish and if released is persistent in the environment. Large spills or leaks have the potential to result in significant effects (i.e. contamination of soil, subsoils and pollution of underlying aquifers) on the geological and water environment.

Any spill of fuel or oil would potentially present a **significant, long-term, negative** effect on the soil and geological environment.

8.8.2.5.2 Wastewater and Sanitation

Wastewater / sewerage from the Temporary Construction Compound with be placed in a holding tank, which will be emptied periodically.

Chemicals will be used to reduce odours. The waste will likely be taken to a local wastewater sanitation plant for treatment. Wastewater or sewerage leakage may occur but will be small, localised and short-term.

The effects associated with wastewater and sewerage is considered to be **moderate, temporary** and **negative**.

Table 8.26 Effect Summary – Soil and Groundwater Contamination

Effect Description	Type	Quality	Significance	Extent	Context	Probability	Duration / Frequency
Soil and Groundwater Contamination - Hydrocarbons	Direct or Indirect / Secondary	Negative	Significant	Localised / Potentially Regional	Contrast to baseline	Unlikely	Long term / Permanent

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Effect Description	Type	Quality	Significance	Extent	Context	Probability	Duration / Frequency
Soil and Groundwater Contamination – Wastewater and Sanitation	Direct or Indirect / Secondary	Negative	Moderate	Localised / Potentially Regional	Conform to baseline	Unlikely	Temporary

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8.8.2.6 Sites of Geological Heritage

There are a number of geological heritage sites mapped proximal to the Proposed Development. These are located as follows: -

- LD007 Creeve Quarry (3 km South East)
- LD011 Killoe Quarry (4.5km North East)
- LD009 Glen Lodge Stream (6.5km North West)
- LD008 Drumlish Quarry (9.5km North East)
- LM022 Lough Rinn Drumlins (11.5km North)
- RO022 Mid Roscommon Ribbed Moraines (17.5km North West)

All of these geological heritage sites have been screened out for potential impacts on soils and geology, as they are located too distant from the Proposed Development for any direct or indirect impact on soils and geology to occur.

Table 8.27 Effect Summary – Sites of Geological Heritage

Effect Description	Type	Quality	Significance	Extent	Context	Probability	Duration / Frequency
Degradation of Quality of Sites of Geological Heritage caused by emissions / pollution from the Proposed Development	Direct / Indirect	Negative	Imperceptible	Regional	Contrast to baseline	Unlikely	Long term / Permanent

8.8.2.7 Protected Sites and Sites of Designated Importance

There are a number of sites of designated importance mapped proximal to the Proposed Development. These are located as follows: -

- Carrickglass NHA (Ref 001822 – 850m South East)
- Royal Canal Proposed NHA (Ref 002103 – 3.4km South West)
- Section of the Camlin River designated as Nutrient Sensitive, according to the Urban Waste Water Directive (Ref 1994 – 3.6km South West)
- Lough Forbes Complex SAC / NHA (Ref IE0001818 – Habitats – 4.7km West)
- Ballykelly Fisherstown Bog SPA (Ref: IE0004101 – Birds – 4.7km West)
- Derrymore Bog Proposed NHA (Ref: 000447 – 4.9km South)
- Brown Bog Proposed SAC / NHA (Refs: IE0002346 & 00042) – 5km South West)

All of these designated sites, with the exception of the Carrickglass NHA have been screened out for potential impacts on soils and geology, as they are located too distant from the Proposed Development for any direct or indirect impact on soils and geology to occur.

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Given its close proximity, there is potential for Carrickglass NHA to be impacted by pollution, originating from the Site, in the form of accidental contamination of soil indirectly transported by watercourses.

Table 8.28 details the Pre-Mitigation Potential Effects for the closest of these sites, Carrickglass NHA, where the potential effect is greatest.

Table 8.28 Effect Summary – Sites of Designated Significance

Effect Description	Type	Quality	Significance	Extent	Context	Probability	Duration / Frequency
Degradation of Quality of Sites of Sites of Designated Importance caused by emissions / pollution from the Proposed Development	Direct / Indirect	Negative	Significant	Local / Regional	Contrast to baseline	Unlikely	Long term / Permanent

8.8.2.8 Turbine Delivery Route / Haul Route

This section looks at effects caused to the existing soils and geology by increased traffic and axle loading on the route and relates to excessive compaction, settlement and subsidence.

The effects associated with soils and geology in respect to the turbine delivery route / haul route are given in Table 8.29.

Table 8.29 Effect Summary – Turbine Delivery Route

Effect Description	Type	Quality	Significance	Extent	Context	Probability	Duration / Frequency
Turbine Delivery Route	Direct	Negative	Moderate	Localised / Regional	Conforms to baseline	Likely	Long term / Permanent

8.8.2.9 Waste Materials

8.8.2.9.1 Construction Spoil

All construction materials will be stored in secure areas. Any hazardous materials will be correctly stored within properly bunded areas in accordance with good practice as described in the IWEA and Scottish Best Practice Guidelines and in accordance with the CEMP.

The effects associated with the use of construction materials are considered to be **moderate, permanent** and **negative**.

8.8.2.9.2 General Waste

All construction and operation waste materials will be correctly sorted, recycled or disposed of practice as described in the IWEA and Scottish Best Practice Guidelines and in accordance with the Waste Management Plan included in the CEMP. A policy of Reduce, Reuse and Recycle will apply.

The effects associated with waste materials is considered to be **moderate, permanent** and **negative**.

In summary, the Proposed Development has the potential to give rise to the following pre-mitigation soil contamination effects, shown in Table 8.30 below:

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Table 8.30 Effect Summary – Waste Materials

Effect Description	Type	Quality	Significance	Extent	Context	Probability	Duration / Frequency
Waste Materials – Construction Spoil	Direct	Negative	Moderate	Localised*	Contrast to baseline	Likely	Long term / Permanent
Waste Materials – General Waste	Direct	Negative	Slight	Localised*	Contrast to baseline	Unlikely	Temporary

8.8.2.10 Health Effects

Potential health effects arise mainly through the potential for soil, rock and groundwater contamination. The Proposed Development is not a recognised source of pollution and so the potential for effects during the operational phase are negligible.

Hydrocarbons will be used on site during construction; however, the volumes will be small in the context of the overall scale of the Proposed Development and will be handled in accordance with best practice mitigation measures.

The potential effect to human health associated with soil, hydrocarbon or groundwater contamination are **moderate, permanent** and **negative.**

Table 8.31 Effect Summary – Health Effects

Effect Description	Type	Quality	Significance	Extent	Context	Probability	Duration / Frequency
Health Effects in relation to: Soil, rock and groundwater contamination	Direct / Indirect	Negative	Moderate	Localised	Contrast to baseline	Unlikely	Long term/ Permanent

8.8.3 Operation and Maintenance Phase

The direct and indirect effects of the operational phase from the Proposed Development is assessed in the following sections.

8.8.3.1 Land Use

No further effect on land use is envisaged during the operational phase of the development

8.8.3.2 Earthworks Activities

Subsoils and bedrock removal during the operational phase can be further categorised as Excavations and laying / upgrading of Haul Route and Site Tracks.

8.8.3.2.1 Soil and Bedrock Excavations & Piling

No significant new excavations or piling works will be undertaken during the operational phase of the Proposed Development, although minor works will be undertaken. Any excavation works carried out during the operational phase, will be limited to that associated with maintenance of the infrastructure and will be both minor and constrained within the original construction footprint.

The effects are considered to be **not significant**, **temporary** and **negative**.

8.8.3.2.2 Haul Route and Site Tracks

The permanent Site Track will still be employed during the operational phase of the Proposed Development, but the Haul Route will be reinstated following construction. The use of Site Track usage will also be significantly less than during construction and on an ad hoc basis depending on maintenance or operational requirements.

The effects are considered to be **slight**, **permanent** and **negative**.

8.8.3.2.3 Storage and Stockpiles

Only minor spoil management works associated with ad hoc maintenance will be undertaken during the operational phase of the Proposed Development.

These effects are considered to be **not significant, long term and negative.**

8.8.3.3 Vehicular Movement

Only limited vehicle movement will occur during the operational phase of the Proposed Development albeit using a similar range of vehicle types.

As with during construction, compaction of soils will occur during the operational phase, but to a very limited extent. Compaction of soils will continue below the road base, as the sub soils continue to consolidate.

The effects associated with vehicular movement are considered to be **slight, long-term and negative.**

8.8.3.4 Peat Landslide Hazard, Ground Stability and Failure

No additional effect on land use is envisaged during the operational phase of the Proposed Development. The ongoing potential for ground instability or failure will be **slight, long-term and negative.**

8.8.3.5 Soil and Groundwater Contamination

Use of waste materials during the operational phase of the Proposed Development will be minimised by established site practices and waste management.

As for the construction phase, wherever there are vehicles and plant in use, there is the potential for a direct hydro-carbon release which may contaminate the soil and subsoil. A spill has the potential to indirectly pollute water, if the soil and subsoil act as a pathway from any source of pollution.

Any spill of fuel or oil would potentially present a **significant, long-term, negative** effect on the soil and geological environment.

During the operational phase wastewater/sewerage from the Substation with be placed in a holding tank, which will be emptied periodically. Chemicals will be used to reduce odours. The waste will be taken to a local wastewater sanitation plant for treatment. Wastewater or sewerage leakage may occur but will be small, localised and short-term.

The effects associated with wastewater and sewerage is considered to be **slight, temporary and negative**.

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8.8.3.6 Sites of Geological Heritage

No further effect on Geological Heritage is envisaged during the operational phase of the development.

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8.8.3.7 Protected Sites and Sites of Designated Importance

No further effect on Geological Heritage is envisaged during the operational phase of the development.

8.8.3.8 Waste Materials

8.8.3.8.1 Operational Waste

No materials will be stored on-site during the operational phase of the Project.

8.8.3.8.2 General Waste

All operational waste materials will be correctly sorted, recycled or disposed of, as described in the Waste Management Plan and in accordance with IWEA and Scottish Best Practice Guidelines and the Standard Operating Procedure. A policy of Reduce, Reuse and Recycle will apply. The effects associated with waste materials is considered to be **slight, long-term** and **negative**.

The Proposed Development has the potential to give rise to the following effects during the operational phase. Refer to Table 8.32 below:

Table 8.32 Effects Summary – Operational Phase

Effect Description	Type	Quality	Significance	Extent	Context	Probability	Duration / Frequency
Land and Land Use	Direct	Negative	Imperceptible	Localised	Contrast to baseline	Likely	Long term / Permanent
Earthworks Activities	Direct	Negative	Slight	Localised	Contrast to baseline	Likely	Long term / Permanent
Vehicle Movement	Direct	Negative	Slight	Localised	Contrast to baseline	Llikely	Long term / Permanent
Peat Landslide Hazard, Ground Stability and Failure	Direct	Negative	Slight	Localised	Contrast to baseline	Unlikely	Permanent
Soil and Groundwater Contamination	Direct	Negative	Significant	Localised / Potentially Regional	Contrast to baseline	Unlikely	Long term / Permanent
Operational Materials	Direct	Negative	Slight	Localised	Contrast to baseline	Likely	Long term / Permanent
General Waste	Direct	Negative	Slight	Localised	Contrast to baseline	Unlikely	Permanent

8.8.4 Decommissioning Phase

In general, the potential effects associated with decommissioning will be similar to those associated with construction, but of reduced magnitude, because extensive excavation and wet concrete handling will not be required. The potential environmental effect of soil storage/stockpiling and contamination by fuel leaks will remain during the decommissioning period.

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Refer to Table 8.33 for Decommissioning Phase Effects.

Table 8.33 Effects Summary –Decommissioning Phase

Effect Description	Type	Quality	Significance	Extent	Context	Probability	Duration / Frequency
Land and Land Use	Direct	Positive	Slight	Localised	Contrast to baseline	Likely	Long term / Permanent
Earthworks Activities	Direct	Negative	Moderate	Localised	Contrast to baseline	Likely	Long term / Permanent
Vehicle Movement	Direct	Negative	Moderate	Localised	Contrast to baseline	Likely	Long term / Permanent
Peat Landslide Hazard, Ground Stability and Failure	Direct	Negative	Moderate	Localised	Contrast to baseline	Unlikely	Permanent
Soil and Groundwater Contamination	Direct	Negative	Significant	Localised / Potentially Regional	Contrast to baseline	Unlikely	Long term / Permanent
Turbine Delivery Route	Direct	Negative	Moderate	Localised / Potentially Regional	Conforms to baseline	Likely	Temporary
Decommissioning Spoil	Direct	Positive	Moderate	Localised	Contrast to baseline	Likely	Long term / Permanent
General Waste	Direct	Negative	Slight	Localised	Contrast to baseline	Unlikely	Permanent

8.8.5 Cumulative Effects

Cumulative effects of the Proposed Development with other developments in the region, as discussed in **Appendix 1.2 Cumulative Assessment Project and Plans**, relate to the indirect effects that may arise due to the use of public roads as haul routes to bring construction materials to the Proposed Development and the cumulative effect on the use of natural resources.

The following activities are present within the local area and give rise to cumulative effects.

These activities are as follows:

<u>Planning Applications</u>

1. Solar Farm at Ballykenny, Co Longford, located c. 6km west of the proposed development (Planning Application - Permission Granted)
2. Solar Farm at Cleggil Co Longford, located c. 4.5km west of the proposed development (Planning Application - Permission Granted)

3. Bloomfield Park SHD at Bracklin Road, Edgeworthstown, Road Co Longford, located ca. 11km south east of the proposed residential development of 100 homes (Planning Application – Permission Granted)

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Operational Activities

1. Sliabh Bawn Wind Farm at Strokestown, Co Roscommon. 20nr 3.2MW turbines (Operational)
2. Quarry at Rhine, Killoe, Co Longford, located c. 4.5km northwest of the proposed development (Operational)

Rhine Quarry and Sliabh Bawn Wind Farm have been assessed to be potential cumulative effects to the Proposed Development with respect to Vehicle Movement on Soils. As such, there will be a **moderate, negative and temporary** cumulative effect, caused mainly by increased vehicle traffic, during the construction and decommissioning phases of the project. During the Operational phase there will be a **slight, negative and long-term** cumulative effect**.**

During the construction of the Proposed Development there will be the requirement for the importation of engineered fill from source quarries. Should these coincide with demand for imported aggregate for maintenance works at the existing Sliabh Bawn Wind Farm or construction of any of the projects currently in planning, there would a cumulative impact in terms of demands placed on local quarries for aggregate.

As such, it is considered there will be a **moderate, negative** and **temporary** cumulative effect, caused by this issue, during the construction and decommissioning phases of the project.

During the operational phase this effect will reduce to a **slight, negative** and **long-term** cumulative effect.

8.8.6 Summary

Table 8.34 summarises the identified likely significant effects during the construction phase of the Proposed Development before mitigation measures are applied.

Table 8.34 Summary of Construction Phase Likely Significant Effects in the absence of mitigation

Likely Significant Effect	Quality	Significance	Extent	Probability	Duration	Type
Earthworks Activities	Negative	Significant	Site	Likely	Permanent	Direct
Vehicle Movement - Compaction, erosion and degradation of soils arising from vehicular movement	Negative	Significant	Localised	Likely	Long term / Permanent *(Temporary in the case of widened road grubbed out on completion of construction)*	Direct
Ground Stability and Failure - Stability issues and slope failure arising from vehicular movement (Landslide)	Negative	Significant	Localised / Potentially Regional	Unlikely	Permanent	Direct

Likely Significant Effect	Quality	Significance	Extent	Probability	Duration	Type
Soil and Groundwater Contamination - Hydrocarbons	Negative	Significant	Localised / Potentially Regional	Unlikely	Long term / Permanent	Direct or Indirect / Secondary
Degradation of Quality of Sites of Sites of Designated Importance caused by emissions / pollution from the Proposed Development	Negative	Significant	Local / Regional	Unlikely	Long term / Permanent	Direct / Indirect

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Table 8.35 summarises the identified likely significant effects during the operational phase of the proposed development before mitigation measures are applied.

Table 8.35 Summary of Operational Phase Likely Significant Effects in the absence of mitigation

Likely Significant Effect	Quality	Significance	Extent	Probability	Duration	Type
Soil and Groundwater Contamination	Negative	Significant	Localised / Potentially Regional	Unlikely	Long term / Permanent	Direct

Table 8.36 summarises the identified likely significant effects during the decommissioning phase of the proposed development before mitigation measures are applied.

Table 8.36 Summary of Decommissioning Phase Likely Significant Effects in the absence of mitigation

Likely Significant Effect	Quality	Significance	Extent	Probability	Duration	Type
Soil and Groundwater Contamination	Negative	Significant	Localised / Potentially Regional	Unlikely	Long term / Permanent	Direct

8.9 Mitigation Measures

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8.9.1 Incorporated Design Mitigation

With regard to the Proposed Development, design and best practice has been and will be implemented as follows:

The primary mitigation measure employed has been the design of the wind farm in terms of locating the turbines, access roads, material storage areas and other site infrastructure on agricultural lands and minor forestry, where the soils are extensively worked and drained, so as to be remote from residential and sensitive commercial properties.

In order to reduce the impacts on soils and geology, infrastructure has also been positioned within areas where organic soils are absent and slope gradients are low. Infrastructure has also been moved away from designated watercourses and other sensitive features.

Extensive work has already been undertaken at the preliminary design stage to apply risk avoidance by design and include the following:

- Extensive peat probing to screen for the presence of peat or other organic soil deposits across the Proposed Development takes this into account for the purpose of placement of wind farm infrastructure. No significant wind farm infrastructure will be constructed within 100m of peat bog of thickness greater than 0.50m.
- Excavation of trial pits and undertaking of geophysical surveys to establish overburden and bedrock characteristics at the main structures.
- Relocation and micro-siting of turbines, hardstandings, access roads and other infrastructure based on the site assessments and geotechnical assessments in order to reduce ground risk associated with the proposed project.
- Works have been designed and checked by geotechnical engineers, who are suitably qualified and experienced in excavation and earthworks design and construction methodologies.

8.9.2 Demolition Phase Mitigation

No potential significant effects relating to Soils and Geology arise out of demolition of a single storey derelict shed structure to facilitate the turbine haul route.

These works are classified as Construction Activities and will follow mitigation general construction mitigation, as detailed in the **CEMP**.

8.9.3 Construction Phase Mitigation

The following sections outline appropriate mitigation measures to avoid or reduce the potential effect of the Proposed Development during the construction phase.

8.9.3.1 Construction and Environmental Management Plan

A **Construction Environmental Management Plan (CEMP)** has been prepared for the Proposed Development. This **CEMP** defines the work practices, environmental management procedures and management responsibilities relating to the construction phase of the proposed project.

The CEMP also sets out the key environmental management measures associated with the construction, operation and decommissioning of the Proposed Development to ensure that during these phases of development, the environment is protected, and any potential impacts are minimised.

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The final CEMP will be developed further at the construction stage, on the appointment of the main contractor to the project to address the requirements of any relevant planning conditions, including any additional mitigation measures that are conditioned and shall be submitted to the planning authority.

Reference to relevant sections of the CEMP with respect to the mitigation of potential effects to Soils and Geology from the proposed project are outlined in the following sections.

8.9.3.2 Land and Land Use

No mitigation is proposed.

8.9.3.3 Earthworks Activities & Piling

Implementation of the Proposed Development will result in the removal of soils in parts of the site to facilitate excavation for the construction of access roads and platforms for the wind turbines to a competent stratum or bedrock suitable for the emplacement of foundations.

Ground conditions vary across the site with varying depths of soil cover. At the proposed turbine bases, excavation required is anticipated to be up to 5.00m to a suitable bearing stratum for emplacement of "gravity base" turbine foundations. Use of piled foundations will require less excavation, up to 2.50m, but will employ the use of specialist plant to install "bored" piles that will be socketed into the underlying rock formation. Pile lengths are anticipated to be 12m.

No particular significant effects are anticipated for the piling aspect, that haven't been considered for earthworks activities.

The Proposed Development will be constructed in a phased manner in order to reduce the potential effects on the Soils and Geology. Phased construction reduces the amount of open, exposed excavations at any one time.

Any excavation, piling and construction related works will be subject to a design risk assessment at detailed design stage to determine risk levels for the construction, operation and maintenance and decommissioning of the works. Identified impacts will be minimised by the application of principles of avoidance, prevention and protection. Information on residual impacts will be recorded and relayed to appropriate parties

Detailed method statements for each element of the works will be prepared by the Contractor prior to any element of the work being carried out.

Given that the works comprise a significant proportion of excavation, earthworks and piling, suitably qualified and experienced geotechnical personnel will be required on site to supervise the works.

The Contractor will programme the works such that earthworks are not scheduled during severe weather conditions.

Details of the proposed methodology and mitigation measures are summarised below and are also outlined in the CEMP.

8.9.3.3.1 Earthworks Activities & Ground Stability – General Constraints and Anecdoctal Evidence

Analysis of the historic conditions following soil movement indicates that the following main factors generally trigger slope failures:

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1. Excessive quantities of spoil loaded onto sensitive topsoil, organic soils or sensitive mineral soils covered sloping ground (in such cases the gradient of the slope should be no more than an average of 5 degrees to the horizontal). Topsoils and organic soils should always be removed prior to such actions and retained for re-use as landscaping a material.

2. The angle of repose of the cut face of excavations is all too often found to be too high, sometimes 70 – 80 degrees to the horizontal. Battering back the sides of an excavation to approx. 60 degrees in clay soils and 30 degrees in granular soils helps to reduce the potential for slippage, which will significantly reduce the potential for soil movement.

3. Surface water flows will compromise most granular or cohesive soils at any slope angle and care should be taken to stop the development of such flows during construction.

The consequences of soil movements can be identified as Damage to Machinery, Damage or Loss of Access Track, Damage to Site Drainage, Site Works Damaged, Death or Injury to Personnel or Degradation to the Environment.

An emergency plan is to be prepared, and will be enacted should soil movement occur.

8.9.3.3.2 Earthworks & Ground Stability – Prevention of Landslide

Application of the following procedures will have the effect of reducing the Hazard Ranking associated with Soil Instability:

1. Excavated spoil will not be deposited on the down slope or up slope edges of the adjacent topsoil. This spoil will instead be deposited on the two flanks either side of the excavation (where gradient is least) and spread in such a way as to limit the surcharge pressure on sensitive topsoils.

2. The hardstanding areas surrounding the turbine bases will be designed in a manner such that crane loadings can be transferred directly onto the competent strata underlying any sensitive mineral soils. In order to facilitate these works it will be necessary to undertake limited excavations. To ensure effective sidewall support during these operations the contractor will adopt an approved engineering solution (such as sheet piling or other bracing method) to maintain sidewall stability at all times.

3. Movement can often occur during or following severe rainstorm events, particularly when following a prolonged dry spell. Extra vigilance will be maintained at such times, during construction.

4. All slopes are to be regularly checked for development of tension cracks indicative of slope movement.

5. Method statements will be followed at all times. Where modification is required this will be agreed by the supervising engineer.

6. Slopes will not be undercut or excavations left unsupported for periods in excess of 24 hours. Excavations are to be backfilled as soon as practicable. Excavation and filling operations shall be coordinated to minimise the time an excavation remains opened.

7. Pore water pressure within excavations should be kept low at all times by draining deliberate or intentional sumps at regular intervals. This is to prevent ponding of water within excavations which can in turn increase hydraulic heads locally and potentially lead to instability.

8. The potential for Soil Movement will be monitored regularly during the construction works, by means of regular site visits and assessments, by a suitably qualified and experienced professional.

9. Only experienced and competent contractors will be appointed to carry out the construction works.

10. Low ground bearing pressure machinery shall be used for transport of construction materials in sensitive areas, where ground conditions dictate its requirement.

11. Construction at less sensitive areas will be completed first to allow suitable construction practices to be established before works commence in the more difficult areas.

12. Site staff will also undergo induction training to learn about the risks associated with working on "upland environments" and procedures aimed at reducing soil movement.

13. Sufficient time should be allowed to carry out the works in a safe and timely manner.

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8.9.3.3.3 Earthworks Activities & Ground Stability – Spoil Disposal

Spoil will invariably be generated during excavations for foundations at turbines and along new access roads.

Minimisation of the production of this spoil will be treated as a high priority, but it is nevertheless expected that there will be in the region of **32,141m^3** of topsoils and till / rock spoil excavated during site works.

Analysis of topsoil thicknesses indicates a range of 0.0m to > 0.80m across the site, average topsoil thickness of 0.45m within the construction zone and an average peat thickness of 0m for the entire site.

Assuming average topsoil depth prevails across the construction footprint, the volume of topsoil (or semi-organic soils) extracted is estimated to be approximately **15,440m^3**.

Assuming an average depth to competent bearing stratum of 0.75m for access tracks, 0.30m to 1.00m for hardstandings and 5.00m for turbine foundations, the volume of mineral soil / till / rippable weathered rock to be extracted is estimated to be approximately **16,701m^3**.

Spoil types will be treated separately. Till soils and topsoils / organic soils will be separated during excavation and these two types of spoil will be disposed of generally as follows:

A *Till soils will be deposited directly on top of other mineral soils. This will require the removal of peat where present to facilitate the process.*

B *Topsoils / Organic Soils will be stored separately, protected from the environment to maintain their integrity and used to reinstate the minerals soil surfaces following completion of construction works. No topsoil will be disposed of as part of the Proposed Development.*

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1. Mineral soil spoil disposal will take place at various locations within the wind farmland holding where low surface gradients combine with minimal peat depth and sufficient distance from sensitive receptors. These proposed spoil deposition areas are detail in the Spoil Management planned, containing within the Construction and Environmental Management Plan.

2. It is intended that spoil movements will be minimised by disposing of the material within or immediately adjacent to the construction footprint of the structure from whence it was excavated.

3. Preparation of the Spoil Disposal site will involve the removal of the topsoil which will be transferred to a specific location to be stockpiled and maintained for re-use during restoration operations.

4. Spoil will be deposited, in layers of 0.50m and will not exceed a total thickness of 2.00m, unless contained by suitably designed berms.

5. Spoil will only be deposited on slopes of < 5 degrees to the horizontal and greater than 10m from the top of a cutting. The exact location of such areas will be determined in consultation with the construction phase geotechnical specialist.

6. Spoil Disposal Sites used will have a regular weekly assessment, made by the construction manager or other suitably qualified individual, to ensure that stability and good condition is maintained.

7. Once disposal is complete the disposal sites will be re-vegetated with the "Top Mat" removed at the commencement of disposal operations. Upon commencement of the restoration phase guidance from a suitably qualified ecologist will be sought to provide a suitable methodology and programme of maintenance for the restored areas.

8.9.3.3.4 Earthworks Activities & Ground Stability – Specific Risk Reduction Measures

Table 8.37 Earthworks Activates & Ground Stability – Specific Risk Reduction Measures

Risk Reduction Factor	Hazard
A	Limiting of construction during periods of heavy rainfall
B	Direct support of peat / mineral soil faces at excavation locations
C	Battering back of peat / mineral soil faces to 45 degrees within 100m of proposed works
D	Engineered drainage solution
E	Use of machinery with low ground bearing pressure for the transport of spoil and fill
F	Staff Induction and regular program of surveillance by external geotechnical engineer

The reduction in risk due to the above measures is discussed below, and the Hazard Rankings have been updated for each location for pre-mitigation Hazard Ranking.

8.9.3.3.5 Ground Stability – Post Mitigation Following Analytical Assessment

Implementation of the mitigation measures contained within the previous section (**Table 8.38** Hazard – Risk Reducing Factors) allows the optimal level of risk to be attained at each turbine of the proposed Cloonanny Wind Farm development site.

Table 8.38 Hazard Ranking for each turbine location following Mitigation Measures

Turbine Location	Slope Stability (Soil / Rock) Pre-Mitigation			Risk Reduction Factors						Slope Stability (Soil / Roc) Post-Mitigation		
	Likelihood	Impact	HAZARD RANKING	A (-0.25)	B (-0.25)	C (-0. 5)	D (-0.5)	E (-0.25)	F (-0.5)	Likelihood	Impact	HAZARD RANKING
T1	2	2	**4 (LOW)**	Y		Y			Y	0.75	2	**1.5 (LOW)**
T2	3	3	**9 (MEDIUM)**	Y		Y		Y	Y	1.5	3	**4.5 (LOW)**
Substation	2	2	**4 (LOW)**	Y		Y			Y	0.75	2	**1.5 (LOW)**

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Hazard Ranking	Category
1 to 6	Low
7 to 11	Medium
12 to 25	High

One of the primary mitigation measures employed at the preliminary design stage was the minimisation of volumes of excavated overburden deposits to be exported off site. All excavated overburden will be retained on-site.

This will include:

• Use of suitable site won material (selected overburden / granular and cohesive mineral soils) as general fill in the construction of access tracks, hardstands and in reinstatement around turbine foundations.

• Surplus overburden will be re-used on site in the form of landscaping, as ballast above turbine bases and for reinstatement purposes.

• Residual surplus overburden will also be stored at a permanent spoil repository. Refer to **the Spoil Management Plan** included in the CEMP for details.

Surplus overburden deposits excavated during the course of the works will be temporarily stored in designated areas adjacent to the construction phase excavations prior to reuse.

Some temporary stockpiles (not exceeding 2m in height) of material will be necessary adjacent to the excavation areas prior to reinstatement. No surplus/waste soil or rock will be removed from the proposed project site.

Temporary stockpiles will be shaped and sealed to prevent the ingress of water from rainfall.

To mitigate against the compaction of soil at the site, prior to the commencement of any earthworks, the work corridor will be demarcated, and machinery will stay within this corridor so that soils outside the work area are not damaged.

Excavations will then be carried out from access tracks as they are constructed in order to reduce the compaction of soft or otherwise sensitive ground.

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8.9.3.4 Vehicle Movements

Vehicular movements will be restricted to the footprint of the Proposed Development, particularly with respect to the newly constructed Site Access Tracks. This ensures that machinery must be kept on tracks and will not move onto areas that are not permitted.

Vehicular traffic will be minimised through the re-use of excavated material reducing the need to source material from external quarries.

As discussed previously, excavation volumes have been reduced during the design phase by avoiding areas of sensitive or soft soils and by avoiding excessive cut and fill during construction. This will result in reduced excavation volumes and therefore reduced traffic.

Best practice as described in the IWEA and Scottish Best Practice Guidelines will be applied during construction which will minimise double handling, again reducing the traffic.

All works will be managed and carried out in accordance with the Construction Environmental Management Plan, which will be updated by the civil engineering contractor and agreed prior to any works commencing.

8.9.3.5 Soil Contamination

Careful design of the wind farm has reduced the amount of traffic required by reducing access tracks lengths, excavation volumes and double handling. Similarly, good practice and a robust CEMP will also result in less traffic and a lower potential for fuel spills and leakages.

The CEMP (refer to **EMP1, EMP3, EMP4 and EMP5**) requires the checking of assets (plant, vehicles, fuel bowsers) on a regular basis during the construction phase of the Proposed Development. The purpose of this management control is to ensure that the measures in place are operating effectively, prevent accidental leakages, and identify potential breaches in the protective retention and attenuation network during earthworks operations.

Fuel management procedures (**EMP4 – Fuel, Oil and Chemical Management**) will include the following elements:

- Mobile bowsers, tanks and drums will be stored in secure, impermeable storage area, away from drains and open water;
- Fuel containers will be stored within a secondary containment system e.g. bund for static tanks or a drip tray for mobile stores;
- Ancillary equipment such as hoses, pipes will be contained within the bund;
- Taps, nozzles or valves will be fitted with a lock system;
- Fuel and oil stores including tanks and drums will be regularly inspected for leaks and signs of damage;
- Only designated trained operators will be authorised to use refuel plant.

The emergency response plan, as detailed in the **EMP 11 – Emergency Response Plan**, has been developed in order to deal with any emergency accidents or spills. In particular an emergency spill kit with oil boom and absorbers will be kept in the event of an accidental spill. All operatives will be trained in its use. In addition, all vehicles will also contain emergency spill kits.

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8.9.3.6 Ground Stability and Failure

As discussed previously, careful design of the wind farm has reduced the amount of construction required in areas of sensitive or soft soils, high slopes and other areas of potential ground instability.

With regard to slope stability issues, detailed design and construction phase best practice will be implemented as follows:

• The works will be supervised by a suitably qualified and experienced geotechnical engineer or engineering geologist, and hydrologist or drainage engineer.

• Drainage infrastructure will be put in place in advance of excavations. Drains will divert surface water and groundwater away from excavations into the existing and proposed surface drainage network. Uncontrolled, direct and concentrated discharges of water onto the ground surface will be avoided.

• Loading or stockpiling of materials on the surface of soft ground will be avoided. Loading or stockpiling on other deposits will not be undertaken without first establishing the adequacy of the ground to support loads by an appropriately qualified geotechnical engineer experienced in construction within upland conditions. No stockpiling of material shall take place on slopes greater than 5 degrees to the horizontal. The height of temporary stockpiles will not exceed 2m.

• Excavation will be carried out from access roads or hardstanding areas to avoid tracking of construction plant across areas of soft ground or other sensitive soils.

• An assessment of the stability at proposed infrastructure locations has been carried out as part of this EIAR based on worst case conditions. A further assessment will be undertaken at detailed design stage.

• Blasting of rock will not be permitted.

• Excavations which could have the potential to undermine the up-slope component of an existing slope will be sufficiently supported to resist lateral slippage and careful attention will be given to the existing drainage.

• Earthworks will not be commenced when heavy or sustained rainfall is forecast. A rainfall gauge will be installed on site to provide a record of rainfall intensity. An inspection of site stability and drainage by the Geotechnical Engineer will be carried out on site when a daily rainfall of over 25mm is recorded on site, works will only recommence after heavy rain with the prior approval of the Geotechnical Engineer following inspection.

The Construction Environmental Management Plan (**EMP 11 – Emergency Response Plan)** includes an emergency response to be applied in the unexpected event of a landslide or ground instability. In particular, catch fences and other physical barriers (i.e. concrete blocks) will be available in sufficient quantities to be used in the event of ground instability.

8.9.3.7 Material and Waste Management

All materials used and wastes generated will be reduced by good practice and attention to the CEMP (**EMP15 – Waste Management Plan)**. A policy of reduce, re-use and recycle will apply.

All waste will be segregated and re-used where possible or removed for recycling. Any waste which is not recyclable or compostable will be properly disposed to landfill.

Whenever possible, excavated spoil materials will be re-used close to the area of excavation. The careful design which has been achieved will result in minimal excess soil and rock.

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8.9.4 Operational Phase Mitigation

It is not envisaged that the operation of the Proposed Development will result in significant impacts on the Soils and Geology regime within the study area, as there will be no further disturbance of overburden postconstruction.

The main potential impact during the operation phase would be the risk to groundwater from contamination from spills. Storage tanks, used to store fuel for the various items of machinery, will be self-contained and double-walled. Refuelling of maintenance vehicles will be carried out from these tanks or from delivery vehicles at designated refuelling areas. Specific mitigation measures relating to the management of hydrocarbons are as follows:

• Fuels, lubricants and hydraulic fluids for equipment used will be carefully handled to avoid spillage.

• Any spillage of fuels, lubricants or hydraulic oils will be immediately contained, and the contaminated soil removed from the site and properly disposed of;

• Waste oils and hydraulic fluids will be collected in leak-proof containers and removed from the site for recycling and

• Appropriate spill control equipment, such as oil soakage pads, will be kept within the refuelling areas and in each item of plant to deal with any accidental spillage.

All wastes from the substation, battery storage and ancillary facilities will be removed by the appropriate contractor. The operational team will carry out maintenance works (to Site Access Tracks, Substation, Battery Energy Storage and Turbines) and will put in place control measures to mitigate the risk of hydrocarbon or oil spills during the operational phase of the windfarm. Any vehicles utilised during the operational phase will be maintained on a weekly basis and checked daily to ensure any damage or leakages are corrected.

Due to the reduced magnitude of the effects, no additional mitigation measures are required for the maintenance and operation of the wind farm, over and above those incorporated into the design of the substation transformers and batteries, which will be bunded to protect soils against accidental leakages of oils and battery fluids.

These potential effects are limited by the size of the fuel tank of vehicles used. Additional potential effects will occur in the event that a turbine needs replacement. The effects associated with this will be similar to those involved for vehicles movements during construction but much reduced.

There are no other effects relating to soils and geology during the operational phase of the Proposed Development.

8.9.5 Decommissioning Phase Mitigation

Following the permitted lifespan of the wind farm, decommissioning of the infrastructure will occur or repowering with more modern turbines, subject to a separate planning application. **Refer to Decommissioning and Reinstatement Plan, Appendix 2.3 for details.**

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Mitigation measures applied during decommissioning activities will be similar to those applied during construction where relevant.

8.9.5.1.1 Access Tracks

In terms of the access tracks, the stone imported to the site for use in their construction be removed from site and recycled for use as road base material in line with best environmental practices. The subsoil, if present, shall be aerated and a layer of topsoil material gained during the construction of the project will be spread over the excavated area and this will either be encouraged to regenerate from the seed-bank within the topsoil or reseeded with an appropriate seed mix of local native species and land use.

The area will be profiled to match the existing contours and to prevent ponding of rainwater. The developer will monitor the re-growth of vegetation and if necessary appropriate actions will be taken to ensure full re-growth.

An alternative option that may be explored with the consent of the Planning Authority at the time of decommissioning is to leave the roads on site if the land use at time of decommissioning would benefit from doing so. The option is commonly favourable among farmers as it gives access to areas that would not normally be accessible. This option reduces the amount of excavation works required and minimizes the disruption to the surrounding area during decommissioning.

8.9.5.1.2 Turbines and Hardstands

Following removal of the turbines, turbine bases, turbine piles and hardstand materials, the overburden shall be spread over the area of both the turbine foundation and hardstand. Any additional subsoil removed and stored during the construction of the bases shall be returned to the area and the original contours restored.

The alternative to complete removal of the turbine foundation is partial removal of the turbine foundation. The turbine foundation is made up of two sections/parts, the lower base and the upper base. With partial removal of the turbine foundation the upper base is removed to a depth of approximately 0.7 meters below ground level and the lower part of the base is left in place. The remaining foundation will be covered by soil and re-sodded with the same vegetation as exists in the surrounding area. This option reduces the amount of excavation works required and minimises the disruption to the surrounding area.

8.9.5.1.3 Substation and BESS

The internal cables will be pulled back through the ducting and wound onto cable reels and removed from site for re-use elsewhere or recycled as appropriate. The ducting will be left in situ.

The modular substations and BESS units will be dismantled and removed. The area will then be reinstated and revegetated.

All infrastructure will be removed with mitigation measures similar to those during construction being employed.

8.9.5.1.4 General

Areas of excess soil and rock will be reused in order to match the surrounding land as near as possible. Drainage and slopes will be restored as close to the original ground as possible.

Mitigation measures to avoid contamination by accidental fuel leakage and compaction of soil by on-site plant will be implemented as per the construction phase mitigation measures outlined above.

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8.10 Residual Impact Assessment

This section assesses potential significant environmental impacts which remain after mitigation measures are implemented.

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8.10.1 Demolition Phase

There will be no significant residual impact on Soils and Geology as a result of the Demolition Phase of the Proposed Development.

8.10.2 Construction Phase

The residual effects after implementation of all mitigation measures for the construction phase of the Proposed Development are presented in **Table 8.39**.

Table 8.39 Construction Phase Residual Effect Summary

Effect Description	Type	Quality	Significance	Extent	Context	Probability	Duration/ Frequency
Loss / Change of Land Use	Direct	Negative	Slight	Site	Contrast to baseline	Likely	Permanent
Earthworks Activities – Soil Excavations & Piling	Direct	Negative	Slight	Site	Contrast to baseline	Likely	Permanent
Earthworks Activities - Site Haul Route	Direct	Negative	Not significant	Site	Contrast to baseline	Likely	Temporary
Earthworks Activities – Site Cable Trenches	Direct	Negative	Not significant	Site	Contrast to baseline	Likely	Permanent
Earthworks Activities – Grid Connection Cable	Direct	Negative	Not significant	Regional	Contrast to baseline	Likely	Permanent
Earthworks Activities – Temporary Construction Compound	Direct	Negative	Slight	Site	Contrast to baseline	Likely	Temporary
Earthworks Activities – Storage and Stockpiles / Spoil Management	Direct	Negative	Slight	Site	Contrast to baseline	Likely	Permanent
Vehicle Movement - Compaction, erosion and degradation of soils arising from vehicular movement	Direct	Negative	Slight	Localised	Contrast to baseline	Likely	Long term / Permanent
Vehicle Movement - Subsidence and settlement of newly established and upgraded Site tracks	Direct	Negative	Slight	Localised	Contrast to baseline.	Likely	Permanent
Ground Stability and Failure - Stability issues and slope failure arising from vehicular movement (Localised displacement)	Direct or Indirect / Secondary	Negative	Slight	Localised / Potentially Regional	Contrast to baseline	Likely	Long term / Permanent
Ground Stability and Failure - Stability issues and slope failure arising from vehicular movement (Landslide)	Indirect / Secondary	Negative	Slight	Localised / Potentially Regional	Contrast to baseline	Unlikely	Permanent

Effect Description	Type	Quality	Significance	Extent	Context	Probability	Duration/ Frequency
Soil and Groundwater Contamination - Hydrocarbons	Direct or Indirect / Secondary	Negative	Slight	Localised / Potentially Regional	Contrast to baseline	Unlikely	Long term / Permanent
Soil and Groundwater Contamination – Wastewater and Sanitation	Direct or Indirect / Secondary	Negative	Slight	Localised / Potentially Regional	Contrast to baseline	Unlikely	Long term / Permanent
Degradation of Quality of Sites of Geological Heritage caused by emissions / pollution from the Proposed Development	Direct / Indirect	Negative	Imperceptible	Regional	Contrast to baseline	Unlikely	Long term / Permanent
Degradation of Quality of Sites of Sites of Designated Importance caused by emissions / pollution from the Proposed Development	Direct / Indirect	Negative	Not significant	Regional	Contrast to baseline	Unlikely	Long term / Permanent
Turbine Delivery Route	Direct	Negative	Not significant	Localised / Regional	Conforms to baseline	Likely	Long term / Permanent
Waste Materials – Construction Spoil	Direct	Negative	Slight	Localised*	Contrast to baseline	Likely	Long term / Permanent
Waste Materials – General Waste	Direct	Negative	Slight	Localised	Contrast to baseline	Unlikely	Temporary

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8.10.3 Operational Phase

The potential effects on the soil and geological environment during the operational phase of the work will be mitigated through good practice as described in the IWEA and Scottish Best Practice Guidelines; vehicular movements, hydrocarbon controls, sustainable use of natural resources, human health etc. as discussed previously.

Overall, the residual effects from these aspects will have a **not significant, permanent, negative** effect on the Site.

The residual effects after implementation of all mitigation measures for the operational phase of the Proposed Development are presented in Table 8.40.

Table 8.40 Operational Phase Residual Effect Summary

Effect Description	Type	Quality	Significance	Extent	Context	Probability	Duration / Frequency
Land and Land Use	Direct	Negative	Not Significant	Localised	Contrast to baseline	Likely	Long term / Permanent
Earthworks Activities	Direct	Negative	Not Significant	Localised	Contrast to baseline	Likely	Long term / Permanent
Vehicle Movement	Direct	Negative	Slight	Localised	Contrast to baseline	Unlikely	Long term / Permanent
Ground Stability and Failure	Direct	Negative	Slight	Localised	Contrast to baseline	Unlikely	Permanent
Soil and Groundwater Contamination	Direct	Negative	Not significant	Localised	Contrast to baseline	Likely	Long term / Permanent

Effect Description	Type	Quality	Significance	Extent	Context	Probability	Duration / Frequency
Turbine Delivery Route	Direct	Negative	Not significant	Localised / Potentially Regional	Conforms to baseline	Likely	Long Term
Operational Materials	Direct	Negative	Not significant	Localised	Contrast to baseline	Likely	Long term / Permanent
General Waste	Direct	Negative	Not significant	Localised	Contrast to baseline	Unlikely	Permanent

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8.10.4 Decommissioning Phase

The residual effects associated with decommissioning includes waste generation, hydrocarbon leakage and erosion of soil and rock. In general, effects will be similar to those at construction, but of a greatly reduced magnitude.

On completion of reinstatement works, it is expected that the wind farm will be returned as close to its present condition as possible. In particular, areas where local drainage has been altered will be reinstated.

Refer to Table 8.41 for Decommissioning Phase Residual Effects.

Table 8.41 Decommissioning Phase Residual Effect Summary

Effect Description	Type	Quality	Significance	Extent	Context	Probability	Duration / Frequency
Land and Land Use	Direct	Positive	Slight	Localised	Contrast to baseline	Likely	Long term / Permanent
Earthworks Activities	Direct	Neutral	Slight	Localised	Contrast to baseline	Likely	Long term / Permanent
Vehicle Movement	Direct	Negative	Slight	Localised	Contrast to baseline	Likely	Long term / Permanent
Peat Landslide Hazard, Ground Stability and Failure	Direct	Negative	Slight	Localised	Contrast to baseline	Unlikely	Permanent
Soil and Groundwater Contamination	Direct	Negative	Slight	Localised	Contrast to baseline	Unlikely	Long term / Permanent
Turbine Delivery Route	Direct	Negative	Slight	Localised / Potentially Regional	Conforms to baseline	Likely	Temporary
Decommissioning Spoil	Direct	Positive	Slight	Localised	Contrast to baseline	Likely	Long term / Permanent
General Waste	Direct	Positive	Slight	Localised	Contrast to baseline	Unlikely	Permanent

8.10.5 Summary of Post-mitigation Effects

Following the application of migration measures there will be no likely significant residual effects in relation to Soils and Geology, during the construction or decommissioning phases of the Proposed Development.

Following the application of migration measures there will be no likely significant residual effects, in relation to Soils and Geology, during the operational phase of the Proposed Development.

8.10.6 Cumulative Residual Effects

There will be no likely significant residual cumulative effects, in relation to Soils and Geology, caused by the Proposed Development.

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8.11 Risk of Major Accidents or Disasters

In relation to the Proposed Development, the potential major accidents / disasters that have a potential to occur during its lifetime are listed below: -

- A sudden release of contaminants; hydrocarbons or chemicals into a local watercourse, during either Construction, Operation or Decommissioning phases, that then transports this contamination downstream impacting site works, lands, flora, fauna and local Protected Sites.
- Sudden failure of soils, during Construction or Decommissioning phase earthworks activities, causing landslide that enters a local watercourse affecting site works, lands, flora and fauna and local Protected Sites.
- Sudden failure of soils, during Construction phase vehicle movements or other mechanism, causing localised instability affecting site works, vehicles and structures.
- Sudden failure of soils, during Operational phase vehicle movement or other mechanism, causing localised instability affecting site works, vehicles and structures.

8.12 Worst Case Scenario

A sudden release of contaminants; hydrocarbons or chemicals into a local watercourse, during either Construction, Operation or Decommissioning phases, that then transports this contamination downstream impacting site works, lands, flora, fauna and local Protected Sites.

8.13 Interactions

Interactions between the following disciplines must be considered in tandem with the effects relating to Soils and Geology and include:-

Material Assets: Built Services (**Chapter 7**). Utilities are sensitive receptors when it comes to potential soils and geology related effects. In particular both underground and overhead utilities can be susceptible to detrimental affects arising from soil failure and contamination.

Water and Hydrology (**Chapter 9**). Many potential soils and geology effects have the ability to directly affect local hydrology, such as watercourses and lakes. Soils entering water systems have the ability to extend the reach of these effects far from the site, affecting sensitive receptors well removed from the normal range of such actions. E.g. soil movement at the Site causing siltation of watercourses and indirect impacts on downstream environments.

Climate (**Chapter 14**). Climate change in the form of evolving weather conditions can alter the long-term condition of soils (e.g. drying out normally moist clay soils to form a more brittle substrate, prone to erosion). Climate change can also alter the frequency and severity of storm events that can make rare natural hazards, such as landslip/landside to become a more significant issue.

8.14 Monitoring

- All drainage systems will be properly maintained at regular intervals.
- Excavations, slopes, disposal sites and roads will be inspected and audited regularly for signs of soil or spoil movement and where possible, early warning systems will be established.
- Regular analysis of watercourses will be undertaken. Refer to Chapter 9, Water and Hydrology for further details.
- All activity on site, and at site boundaries, including plant and visitors, will be monitored and a register kept.
- Only authorised and suitably qualified personnel on-site – access will be strictly controlled at all times.

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8.15 Summary of Mitigation and Monitoring

The following Table summarises the Construction Phase mitigation and monitoring measures.

Table 8.42 Summary of Construction Phase Mitigation and Monitoring

Likely Significant Effect	Mitigation	Monitoring
Excavation Activities	Detailed guidance on soil handling. No unsupported excavations to remain open for periods in excess of 24 hours. Spoil will only be deposited or stockpiled on slopes of < 5 degrees to the horizontal. Till soils will only be deposited directly on top of other mineral soils. Porewater pressure within excavations to be kept to a minimum at all times, by use of adequate pumping arrangements. Low ground bearing plant will be used for transport of construction materials in sensitive areas. All site staff will undergo induction training to be cognisant of the specific risks associated with wind farm construction.	All slopes to be checked regularly for development of tension cracks. Potential for soil movement will be monitored regularly by a suitably qualified professional. All drainage systems will be monitored regularly avoid build-up of pore water pressures within sensitive lands.
Vehicle Movements	Vehicle movements will be restricted to the construction footprint only.	All activity on the Site will be closely monitored and a register kept.
Peat Landslide, Ground Stability and Failure	Limiting of construction during periods of heavy rainfall Direct support of topsoil / mineral soil faces at excavation locations Battering back of topsoil/ mineral soil faces to 45 degrees within 100m of proposed works Engineered drainage solution, if required Use of machinery with low ground bearing pressure for the transport of spoil and fill. Blasting of rock will not be permitted.	
Soil and Groundwater Contamination	The CEMP (EMP1, EMP3, EMP4, EMP5, EMP11 and EMP15) outline the following mitigation procedures aimed at minimising contamination hazard:-	Regular analysis of watercourses will be undertaken to monitor contamination emanating from the Site.

Likely Significant Effect	Mitigation	Monitoring
	1. Regular checking of assets (plant, vehicles, fuel bowsers) on a regular basis to prevent accidental leakages, and identify potential breaches in the protective retention and attenuation network during earthworks operations. 2. Adherence to Fuel, Oil and Chemical Management procedures. Development of an Emergency Response Plan.	
Degradation of Quality of Sites of Sites of Designated Importance caused by emissions / pollution from the Proposed Development	Refer to mitigation for soil and groundwater contamination	
Turbine Delivery Route	No mitigation deemed necessary	
Waste Materials	Adherence to the Waste Management Plan.	All imported material and all waste shipments off site will be documented.
Health Effects	Ditto both Soil and Groundwater Contamination, and Waste Materials	As for Soil and Groundwater Contamination

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The following Table summarises the Operational Phase mitigation and monitoring measures.

Table 8.43 Summary of Operational Phase Mitigation and Monitoring

Likely Significant Effect	Mitigation	Monitoring
Vehicle Movements	No mitigation deemed necessary	
Soil and Groundwater Contamination	1. Regular checking of assets (plant, vehicles, fuel bowsers) on a regular basis to prevent accidental leakages, and identify potential breaches in the protective retention and attenuation network during earthworks operations. 2. Adherence to Fuel, Oil and Chemical Management procedures. 3. Adherence to the Emergency Response Plan.	Regular analysis of watercourses will be undertaken to monitor contamination emanating from the Site.
Waste Materials	Adherence to the Waste Management Plan.	All imported material and all waste shipments off site will be documented.

The following Table summarises the Decommissioning Phase mitigation and monitoring measures.

Table 8.44 Summary of Decommissioning Phase Mitigation and Monitoring

Likely Significant Effect	Mitigation	Monitoring
Excavation Activities	Detailed guidance on soil handling. No unsupported excavations to remain open for periods in excess of 24 hours. Spoil will only be deposited or stockpiled on slopes of < 5 degrees to the horizontal. Till soils will only be deposited directly on top of other mineral soils. Porewater pressure within excavations to be kept to a minimum at all times, by use of adequate pumping arrangements. Low ground bearing plant will be used for transport of construction materials in sensitive areas. All site staff will undergo induction training to be cognisant of the specific risks associated with wind farm construction.	All slopes to be checked regularly for development of tension cracks. Potential for soil movement will be monitored regularly by a suitably qualified professional. All drainage systems will be monitored regularly avoid build up of pore water pressures within sensitive lands.
Vehicle Movements	Vehicle movements will be restricted to the construction footprint only. Vehicular traffic will be minimised through the re-use of excavated material reducing the need to source material from external quarries.	All activity on the Site will be closely monitored and a register kept.
Peat Landslide, Ground Stability and Failure	Limiting of construction during periods of heavy rainfall Direct support of topsoil / mineral soil faces at excavation locations Battering back of topsoil/ mineral soil faces to 45 degrees within 100m of proposed works Engineered drainage solution, if required Use of machinery with low ground bearing pressure for the transport of spoil and fill. Blasting of rock will not be permitted.	All slopes to be checked regularly for development of tension cracks. Potential for soil movement will be monitored regularly by a suitably qualified professional.
Soil and Groundwater Contamination	The CEMP (EMP1, EMP3, EMP4, EMP5, EMP11 and EMP15) outline the following mitigation procedures aimed at minimising contamination hazard:- 1. Regular checking of assets (plant, vehicles, fuel bowsers) on a regular basis to prevent accidental leakages, and identify potential breaches in the protective retention and attenuation network during earthworks operations. 2. Adherence to Fuel, Oil and Chemical Management procedures. 3. Development of an Emergency Response Plan.	Regular analysis of watercourses will be undertaken to monitor contamination emanating from the Site.
Degradation of Quality of Sites of Sites of Designated Importance caused by emissions / pollution from the Proposed Development	Refer to mitigation for soil and groundwater contamination	
Waste Materials	Adherence to the Waste Management Plan.	All imported material and all waste shipments off site will be documented.
Health Effects	Ditto both Soil and Groundwater Contamination, and Waste Materials	As for Soil and Groundwater Contamination

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8.16 Conclusion

The Proposed Development presents a low risk to soils and geology related aspects of the existing environment following successful adherence to the mitigation measures contained within this report. This will allow for the optimal level of risk to be attained during the construction and operation of Cloonanny Wind Farm, with respect to Soils and Geology.

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The hazard of peat landslide is avoided due to the minimal quantities of organic soils present.

Standard methods of excavation and construction, such as excavation of topsoil so that the site access road base can be founded directly onto the underlying mineral soils, remains the optimal approach. The need for "floated road" construction, for access tracks, is not envisaged for the Proposed Development. Construction of the wind farm infrastructure is considered to have significant, negative and permanent effect on the baseline before mitigation.

Related to excavation activities is the potential for significant effect on close by Protected Areas and Sites of Designated Importance. There is potential for contamination, in the form of hydrocarbons, chemicals or spoil to propagate via watercourses and detrimentally impact the Carrickglass NHA. Construction of the wind farm infrastructure is considered to have significant, negative and permanent effect on the baseline before mitigation.

Baseline surveys indicate that a portion of the wind farm infrastructure lies within the floodplain of the Camlin River. This means that the location around turbine T02, the associated access track and other wind farm infrastructure will be potentially subject to seasonal river flooding. Floodwater has the potential to cause high levels of up-thrust on, and to cause erosion to, foundations, road bases, hardstands, transformers, installed cable trenches etc. This action can disturb or destabilise structures unless designed to deal with such scenarios. Similarly, baseline surveys have also indicated that soluble rocks, typical of a "karst" environment, are potentially present below the site, although these soluble rocks do not outcrop within the site boundary. The presence of a "karst" environment elevates a risk to the ground stability of structures placed on it. Thus, the potential ground stability / failure related impact from both these scenarios, is considered to be significant, negative and permanent without mitigation.

In order to mitigate this risk, further detailed ground investigations will be undertaken prior to construction of the turbines, hardstands and other sensitive infrastructure. This is required to ensure that the competence of the underlying subsurface is more fully understood and that foundation design is appropriate. Similarly, supplementary ground investigation will be undertaken prior to construction to ensure the appropriate design solution is employed for all structures and other infrastructure affected.

Construction and operation of the wind farm will result in an elevated risk of contamination to the local environment resulting from silt from spoil generating activities entering watercourses, and / or contaminants such as oils and other chemicals used in the construction and operation entering the subsurface or water courses. The potential impact this will cause is considered to be significant, negative and long term without mitigation.

Baseline contamination is imperceptible with only limited exposure to contamination from agricultural land use. Construction of the wind farm infrastructure has the potential to introduce hydrocarbon and

other forms of contamination into the soils and as such this will potentially have a significant, negative and permanent effect on the baseline without mitigation.

All other potential effects, relating to soils and geology, are considered to be at most negative, slight and of at least long-term duration.

The application of the mitigation measures as recommended will ensure that the development will suffer **no significant impact** from; nor have **no significant negative effect** to; the soils, geology or surface water conditions in the vicinity of the Proposed Development.

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CHAPTER 9
WATER & HYDROLOGY

VOLUME II
ENVIRONMENTAL IMPACT ASSESSMENT REPORT

DECEMBER 2024

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9 Water & Hydrology

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9.1 Introduction

IE Consulting were engaged by Mable Consulting Engineers to carry out an assessment of the potential effects of the Proposed Development at Cloonanny, Co. Longford, on the water (hydrology and hydrogeology) environment.

The objectives of this chapter are:

- Present a baseline study of the existing hydrological and hydrogeological environments in the area of the Proposed Development Site;
- Determine the impacts, if any, on the hydrology and hydrogeology of the area arising from the Proposed Development;
- Propose measures to mitigate against impacts on the hydrology and hydrogeology, if required.
- Evaluate any significant residual effects; and,
- Examine the potential cumulative effects of the Proposed Development in conjunction with other local developments.

This chapter should be read in conjunction with Chapter 8 *Land and Soils*.

9.2 Expertise & Qualifications

IE Consulting are a specialist hydrological, hydrogeological and environmental consultancy based in Carlow. Established in 2000, IE Consulting provides services in areas of hydrogeology, hydrology, flood risk assessments, contaminated land, and drainage design.

We provide specialist consultancy services to a range of clients throughout Ireland, including government departmental bodies, local authorities, group water schemes, developers, local businesses and private individuals. Our area of specialisation lies in the areas of Hydrogeology, Hydrology, Flood Risk Assessment, Nature Based Solutions / SuDS, and Civil Engineering.

We routinely complete environmental impact assessments of geology, hydrology and hydrogeology for a large variety of projects including national road schemes, quarries, industrial, residential and agricultural developments.

This chapter was prepared by Joanne Mackey under the technical direction and supervision of Jerome Keohane.

Jerome Keohane (BSc, MSc, FCIWEM, C. Geol, MIEI, CIWEM), Technical Director IE Consulting is a Chartered Environmental Engineer with over 40 years' experience in catchment assessment, source protection, groundwater source development/evaluation/protection, water treatment, hydrogeology, nutrient modelling, water quality assessments, contaminated land and project

management. Jerome holds a warrant to advise An Bord Pleanála on matters relating to planning matters related to hydrogeology. Jerome conducted a final review of a draft of the report, signing off on it as Technical Director prior to submission to the client.

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Joanne Mackey (BSc, MSc) is a Project Geologist with over 5 years' consultancy experience both in the UK and Ireland. She has prepared the Land, Soils and Geology chapters and Water (Hydrology and Hydrogeology) chapters for several quarries and for the expansion of EPA licensed sites. She has experience in both water resource and water quality hydrogeology. Joanne completed all sections of the original draft of the report. The draft was then edited following review by Jerome Keohane.

9.3 Proposed Development

A brief summary of the development is outlined below. A detailed description of the proposed development is contained within Chapter 2 of this EIAR and the Planning Statement that accompanies the application. The statutory notices should also be referred to.

A 10-year permission is being sought by Natural Forces Renewable Energy 2 Limited for the development of a 14MW wind farm on lands measuring 17.28ha located at the L5046 and L50462 in the townlands of Cloonanny Glebe, Corragarrow, Derryharrow and Gorteenorna, Co. Longford.

The proposed development will consist of the following:

(i) Demolition of a single-storey derelict shed structure (c. 93 sqm GFA) to facilitate the turbine haul route

(ii) Construction of two E175 EP5 wind energy converters, each with an electrical rating of 7MW, an overall ground-to-blade tip height of 199.9 metres, a rotor blade diameter of 175 metres, hub height of 112.4 metres, associated foundations and hard-standing areas;

(iii) Construction of an 800m permanent internal site access road which will run from the L50462 to the wind energy converter hardstanding areas including a 9.1m clear span bridge crossing a local stream;

(iv) Construction of 1 No. meteorological mast with a height of 32 metres, associated foundation and hardstanding area;

(v) Construction of 1 No. 20kV substation compound comprising 2 No. Modular Buildings each measuring 13.5 sqm in area and 3.5m in height, a Battery Energy Storage System (BESS) comprising 3 storage modules with a height of 2.8 metres and associated electrical works, foundation and hardstanding area;

(vi) Temporary alterations to the L5046 and L50462 public roads and temporary access roads to facilitate the turbine component haul route, including temporary widening of sections of the L5046 and L50462.

(vii) Installation of underground collector circuit and communications cabling in underground cable trenches, from the proposed wind energy converter to the proposed on-site substation;

(viii) All associated and ancillary site development, excavation, construction, and reinstatement works, including the provision of a temporary construction compound, site drainage, spoil management, fencing, lighting, hedge and operational maintenance and tree trimming and cutting.

(ix) This application is seeking a 35- year operational life from the date of commissioning of the entire wind farm.

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The grid connection from the proposed on-site substation to the national electricity grid does not form part of the subject planning application. However, as part of the planning application process, this EIAR addresses three potential grid connection options currently considered to ensure a comprehensive environmental assessment of all aspects of the Proposed Development. The grid connection will be via 1 of the 3 potential options outlined below:

- Option 1 Connect the proposed development via (8.03km) to Richmond 110kV Substation
- Option 2 Connect the proposed development via (3.96km) to Longford 38kV Substation
- Option 3 Connect the proposed development via (5.85km) to Glebe 38kV Substation

It is anticipated that the grid connection from the Proposed Development will be by means of an underground cable connecting to one of the Substations identified above via the public road network. For bridge crossings, the cable will be located within the bridge deck, where there is insufficient depth and width available horizontal directional drilling (HDD) will be employed as an alternative.

Once the preferred route emerges it will be determined whether the grid connection falls within the category of exempted development under Class 26 of Schedule 2 in the Planning and Development Regulations 2001, as amended or requires planning permission, in which case an application will be made to the planning authority.

All elements of the proposed development as outlined above together with the turbine delivery route and grid connection options have been assessed as part of this EIAR.

9.3.1 Aspects Relevant to this Chapter

The following aspects of the Proposed Development are relevant to potentially affecting the water environment:

- **Construction of foundations and hard-standing areas:** the construction of foundations for the wind turbines and associated hard-standing areas will require significant excavation, potentially altering the existing local surface and subsurface drainage. The impermeable surfaces created by hard-standing areas will alter the natural infiltration rates, potentially increase surface runoff and affecting groundwater recharge.
- **Construction of internal site access road:** the proposed access road will alter surface water flow patterns and infiltration rates. Furthermore, building the road will likely involve grading and altering the landscape, which could impact local drainage patterns, surface runoff, and sediment transport.

- **Temporary alterations to haul routes and temporary access roads:** the creation of temporary access roads and junction accommodation works will impact surface water drainage patterns, cause soil compaction, and lead to increased surface runoff.
- **Installation of underground circuit and communications cabling:** trenching for underground cables will disturb the soil structure, alter the natural flow paths of groundwater, and potentially intercept shallow groundwater tables. If the cabling routes cross areas with sensitive hydrology or high groundwater tables, they could alter groundwater movement or drainage patterns. Additionally, if the cabling is selected along the Glebe 38kV Substation route (one of three options), this would result in the HDD (Horizontal Directional Drilling) under the River Camlin being proposed as part of one of the potential grid connection routes. A potential issue with HDD is the unintended release of drilling fluid into surface water, which, along with the risk of oil and fuel spills, can be toxic to aquatic ecosystems and negatively affect water quality.
- **Site Drainage:** the installation of new drainage systems can change how water is conveyed across the site. These changes could impact local hydrological regimes by concentrating flow, altering existing drainage paths, or potentially increasing sediment loads in nearby water bodies.
- **Associated site development, excavation, and reinstatement works:** general site development activities, including excavation, site drainage installation, spoil management, and tree cutting, can directly affect both surface and groundwater. These activities can change the local topography, alter natural drainage patterns, increase the potential for erosion and sedimentation in nearby watercourses, and modify groundwater recharge zones.
- **Provision of a Temporary Construction Compound:** the temporary construction compound may include facilities that impact local water quality or hydrology, such as storage of hazardous materials, fuel, and equipment. The impermeable surface of the compound could also affect infiltration rates and increase runoff.

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9.4 Methodology

9.4.1 Desk Study

A desk study of the Proposed Development Site and the surrounding area was completed prior to undertaking the site walkover assessment. The desk study involved collecting all relevant geological, hydrological, hydrogeological and meteorological data for the area. The data for the Water Baseline study was gathered from the following available online sources:

- Aerial Imagery from Google Maps and Bing Maps (https://www.google.com/maps and https://www.bing.com/maps);
- Department of Communications, Climate Action and Environment Website; Irish National Flood Hazard Mapping/Flood Info (Office of Public Works (OPW)) (https://www.floodinfo.ie/map);
- Environmental Protection Agency (EPA) (https://www.epa.ie/);
- EPA Catchments Website (https://www.catchments.ie/);
- Geohive Map Viewer (https://webapps.geohive.ie/mapviewer/index.html)

- Geological Survey of Ireland (GSI) (https://www.gsi.ie/);
- GSI Groundwater Body Descriptions (https://www.gsi.ie/en-ie/programmes-and-projects/groundwater/activities/understanding-ireland-groundwater/Pages/Groundwater-bodies.aspx);
- Historical and recent mapping from Ordnance Survey Ireland (OSI) through Irish Townland and Historical Map Viewer (https://osi.maps.arcgis.com/apps/webappviewer/index.html?id=bc56a1cf08844a2aa2609aa92e89497e)
- Met Eireann Meteorological Databases (https://www.met.ie/);
- My Plan Website (https://viewer.myplan.ie/);
- National Parks & Wildlife Service (NPWS) Map Viewer (https://www.npws.ie/);
- Teagasc Subsoil Mapping (https://www.teagasc.ie/environment/soil/soil-maps/).

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9.4.2 Baseline Monitoring and Site Investigations

A site walkover survey was undertaken by a geologist from IE Consulting on the 12th and 13th of August 2024. During the site visit, surface features that may influence the hydrology and hydrogeology because of the Proposed Development were identified and characterised.

Additionally, surface water samples and field hydrochemistry were taken at 3 no. locations on a watercourse at an upgradient, mid-gradient and downgradient location of the Proposed Development.

9.4.3 Impact Assessment Methodology

This chapter was prepared in accordance with the following national guidance documents on environmental impact assessment:

- *Guidelines on the Information to be Contained in Environmental Impact Statements* (Environmental Protection Agency, 2022);
- *Guidelines for the Preparation of Soils, Geology and Hydrogeology Chapters of Environmental Impact Statements* (Institute of Geologists of Ireland, 2013).

The IGI's and EPA's recommended methodology for assessing impacts was used. Each potential impact was described in terms of its Quality, Significance, Duration and Type. For the purposes of this assessment, the impacts of the Proposed Development on the surrounding environment, the wider study area includes a 2 km radius from the site. The extent of the wider study area is based on the IGI guidelines, which recommends a minimum distance of 2 km. Where necessary for continuity, the study was extended beyond the 2 km limit, following the precautionary principle.

In addition to the above methodology, the sensitivity of the water environment receptors was assessed using the criteria outlined in Table 9-1.

Table 9-1 Receptor Sensitivity Criteria (adapted from Scottish Environmental Protection Area (SEPA))

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Type	Receptor Sensitivity
Not Sensitive	Receptor is of low environmental importance. Heavily engineered or artificially modified watercourses which may run dry in the summer months. Fish are sporadically present or restricted. The environmental equilibrium is stable and resilient to changes which are considerably greater than natural fluctuations, without detriment to its present character. No abstractions for public or private water supplies. GSI groundwater vulnerability is of low – medium with a poor aquifer designation.
Sensitive	Receptor is of medium environmental importance or of regional value. Salmonoid species may be present and may be locally important fisheries. Private abstractions for water supply. Environmental equilibrium copes well with all natural fluctuations but cannot absorb some changes greater than this without altering part of its present character. GSI groundwater vulnerability is high with a locally important aquifer designation.
Very Sensitive	Receptor is of high environmental importance or of national or international value e.g., SAC or NHA. Salmonoid spawning grounds present. Abstractions for public drinking water supply. GSI groundwater vulnerability is extreme with a regionally important aquifer designation.

The hydrogeological environment type was classified in line with the IGI guidelines, which are outlined in Table 9-2.

Table 9-2 Hydrogeological Environment Classification (IGI, 2013)

Environment Type	Characteristics
Type A	Passive hydrogeological environment e.g., areas of thick low permeability subsoil, areas underlain by poor aquifers, historically stable geological environments.
Type B	Naturally dynamic hydrogeological environments e.g., groundwater discharge areas, areas underlain by regionally important aquifers, nearby spring rises, areas underlain by permeable subsoil.
Type C	Man-made dynamic hydrogeological environments e.g., nearby groundwater abstractions, nearby quarrying or mining activities below the water table, nearby wastewater discharges to ground, geothermal systems.
Type D	Sensitive hydrogeological environments e.g., potentially unstable geological environments, groundwater source protection zones, karst.
Type E	Groundwater dependent ecosystems e.g., wetlands, nearby rivers with a high groundwater component of base flow.

The sensitivity of water environment receptors was evaluated following the desk study and baseline study. The levels of sensitivity, as outlined in '*Guidelines on Procedures for Assessment and Treatment of Geology, Hydrology and Hydrogeology for National Road Schemes*.' National Roads Authority (NRA), 2008 was utilised to assess the potential effects of the Proposed Development on these receptors. Levels of sensitivity are defined in Table 9-3 for hydrology and Table 9-4 for hydrogeology.

Table 9-3 Criteria for Estimation of Importance of Hydrology (NRA, 2008)

Importance	Criteria	Typical Example
Extremely High	Attribute has a high quality or value on an international scale	River, wetland or surface water body ecosystem protected by EU legislation e.g. 'European sites' designated under the

Importance	Criteria	Typical Example
		Habitats Regulations or 'Salmonid waters' designated pursuant to the European Communities (Quality of Salmonid Waters) Regulations, 1988.
Very High	Attribute has a high quality or value on a regional or national scale	River, wetland or surface water body ecosystem protected by national legislation – NHA status. Regionally important potable water source supplying >2500 homes Quality Class A (Biotic Index Q4, Q5). Flood plain protecting more than 50 residential or commercial properties from flooding. Nationally important amenity site for wide range of leisure activities.
High	Attribute has a high quality or value on a local scale	Salmon fishery. Locally important potable water source supplying >1000 homes Quality Class B (Biotic Index Q3-4). Flood plain protecting between 5 and 50 residential or commercial properties from flooding. Locally important amenity site for wide range of leisure activities.
Medium	Attribute has a medium quality or value on a local scale	Coarse fishery. Local potable water source supplying >50 homes Quality Class C (Biotic Index Q3, Q2-3). Flood plain protecting between 1 and 5 residential or commercial properties from flooding.
Low	Attribute has a low quality or value on a local scale	Locally important amenity site for small range of leisure activities. Local potable water source supplying <50 homes. Quality Class D (Biotic Index Q2, Q1). Flood plain protecting 1 residential or commercial property from flooding. Amenity site used by small numbers of local people.

Table 9-4 Criteria for Estimation of Importance of Hydrogeology (NRA, 2008)

Importance	Criteria	Typical Example
Extremely High	Attribute has a high quality or value on an international scale	Groundwater supports river, wetland or surface water body ecosystem protected by EU legislation e.g. SAC or SPA status.
Very High	Attribute has a high quality or value on a regional or national scale	Regionally Important Aquifer with multiple wellfields. Groundwater supports river, wetland or surface water body ecosystem protected by national legislation – NHA status. Regionally important potable water source supplying >2500 homes. Inner source protection area for regionally important water source.

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Importance	Criteria	Typical Example
High	Attribute has a high quality or value on a local scale	Regionally Important Aquifer. Groundwater provides large proportion of baseflow to local rivers. Locally important potable water source supplying >1000 homes. Outer source protection area for regionally important water source. Inner source protection area for locally important water source.
Medium	Attribute has a medium quality or value on a local scale	Locally Important Aquifer. Potable water source supplying >50 homes. Outer source protection area for locally important water source.
Low	Attribute has a low quality or value on a local scale	Poor Bedrock Aquifer. Potable water source supplying <50 homes.

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9.4.4 Impact Assessment Process

The impact assessment process as outlined in the 2022 EPA *Guidelines on the Information to be Contained in Environmental Impact Assessment Reports (EIAR)* including the descriptors provided in the Glossary of Impacts, was used where potential effects are identified. This process involves several key steps to systematically evaluate the potential environmental impacts associated with the hydrology and/or hydrogeology on the Proposed Development. This process, commonly referred to as the Source-Pathway-Receptor approach, aims to assess and mitigate any significant negative effects the Proposed Development might have on the environment.

An overview of the impact assessment process in outlined in Table 9-5.

Table 9-5 Steps for Impact Assessment Process

Step No.:	Description	Explanation
1	**Identify the Source**	Identification of the activity or source that could lead to environmental impacts.
2	**Determine the Pathway**	The pathway / route through which the source can potentially affect the environment.
3	**Identify the Receptor**	The receptor is environmental feature or entity that could be impacted by the identified source through the pathway. Receptors can be water bodies, ecosystems, human populations, groundwater supplies, or air quality, among others.
4	**Pre-Mitigation Impact Assessment**	Assess the potential impact on the receptor without any mitigation or intervention. This provides a baseline

Step No.:	Description	Explanation
		understanding of the worst-case scenario for the environmental impacts. Consider the magnitude, duration, and significance of the impact. The assessment can be qualitative or quantitative, depending on the nature of the project and its potential effects.
5	**Identify Mitigation Measures**	Propose mitigation measures to prevent, reduce, or offset significant adverse effects. This can include changes in the project design, operational procedures, or additional protective measures to minimize impact.
6	**Residual Impact Assessment**	Reassess the impact on the receptor after the implementation of mitigation measures. This step aims to evaluate how effective the mitigation measures are in reducing the adverse effects. The residual impact should be significantly less than the pre-mitigation impact if the mitigation is effective.
7	**Significance of Effects**	Determine the significance of the residual impacts. The ultimate goal is to ensure that the project either has no significant impact or that any significant impacts are managed and reduced to acceptable levels.

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9.4.5 Relevant Legislation & Guidance

Water resource management in Ireland is dealt with in the following key pieces of legislation, which were considered as part of this EIAR:

a. European Union, 2006. Groundwater Directive (2006/188/EC);
b. European Union, 2018. Planning and Development (Environmental Impact Assessment) Regulations 2018 (S.I. No. 296/2018), with EIA Directive as amended by the directive 2014/52/EU aligning EU rules with Irish Law.
c. European Union, 2000. Water Framework Directive (WFD), 2000/60/EC;
d. European Union, 2007. The EU Floods Directive, 2007/60/EC.

e. Government of Ireland, 2018. European Communities (Water Policy) (Abstractions) Registration Regulations (S.I. No. 261/2018);
f. Government of Ireland, 2010. European Communities (Water Policy) Regulations (S.I. No. 350 of 2014);
g. Government of Ireland, 2010. European Communities Environmental Objectives (Groundwater) Regulations (S.I. No. 9 of 2010) as amended;
h. Government of Ireland, 2016. European Communities Environmental Objectives (Groundwater) Regulations (S.I. No. 366 of 2016);
i. Government of Ireland, 2009. European Communities Environmental Objectives (Surface Water) Regulations (S.I. No. 272 of 2009) as amended;
j. Government of Ireland, 2012. European Communities Environmental Objectives (Surface Water) Regulations (S.I. No. 327 of 2012);
k. Government of Ireland, 2015. European Communities Environmental Objectives (Surface Water) Regulations (S.I. No. 386 of 2015);
l. Government of Ireland, 2019. European Communities Environmental Objectives (Surface Water) Regulations (S.I. No. 77 of 2019);
m. Government of Ireland, 2014. European Communities (Drinking Water) Regulations (S.I. No. 122 of 2014);
n. Government of Ireland, 2023. European Union (Drinking Water) Regulations (S.I. No. 99/2023);
o. Government of Ireland, 1988. European Communities (Quality of Salmonid Waters) Regulations (S.I. No. 293 of 1988);

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9.4.6 Site Surveys/Investigations

On August 12th and 13th, 2024, a geologist from IE Consulting conducted a site walkover survey. Surface water samples and field hydrochemistry data were collected from three locations: upgradient, migration, and downgradient of the Proposed Development Site. Refer to Section 9.6.3 for full details.

9.4.7 Consultation

IE Consulting attended a pre-planning meeting for the Cloonanny Windfarm with Longford County Council (LCC) on April 25, 2024, in which flood risk was a key point of discussion. LCC (via Rita Connaughton) indicated no foreseen issues with the Flood Risk Assessment (FRA) provided the development does not increase flood risk elsewhere. It was outlined that the assessment must include sufficient evidence supporting this.

Additionally, there was a question about the turbines' ability to withstand flood events. The design was confirmed to account for flood risks, with turbine foundations being robust and not reliant on pile foundations, except where necessary from a geotechnical perspective. Key electrical components are placed in the nacelle, making them operational during flood events.

Concerns were outlined during the pre-planning meeting regarding the DMS 16.182 regulation, which restricts wind farms in Flood Zones A and B. It was confirmed that a Justification Test (JT) was completed as a part of this application and the design of the Proposed Development, the test addressed compliance with flood management guidelines and concluded that the Proposed

Development would be in compliance. Following discussion with LCC it was confirmed that the Proposed Development would not present a material contravention of the LCC development plan

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Additionally on-going coordination with the project ecologist, who is responsible for preparing the Appropriate Assessment (AA) screening and biodiversity chapter was made prior to the site visit with correspondence on the 30th of July 2024 to agree surface water sample locations and parameters for analysis. Following collection and analysis of samples, on the 11th of September the results of the surface water quality were shared with the project ecologist. These interactions were important to ensure a consistent approach in identifying and assessing potential impacts on water quality. The DRAFT water chapter was shared with the project ecologist for review on the 7th October 2024 to ensure alignment on findings related to designated sites, hydrological connectivity and other relevant factors.

9.5 Difficulties Encountered

IE Consulting's involvement began after the initial site investigations were underway, meaning that we were not present to observe the trial pits and collect data from these works firsthand. As a result, observations related to hydrology and hydrogeology, could not be captured during these investigations.

9.6 Baseline Environment

This section describes the existing baseline environment in terms of hydrology, flooding and hydrogeology in the area and surrounding environment of the Proposed Development.

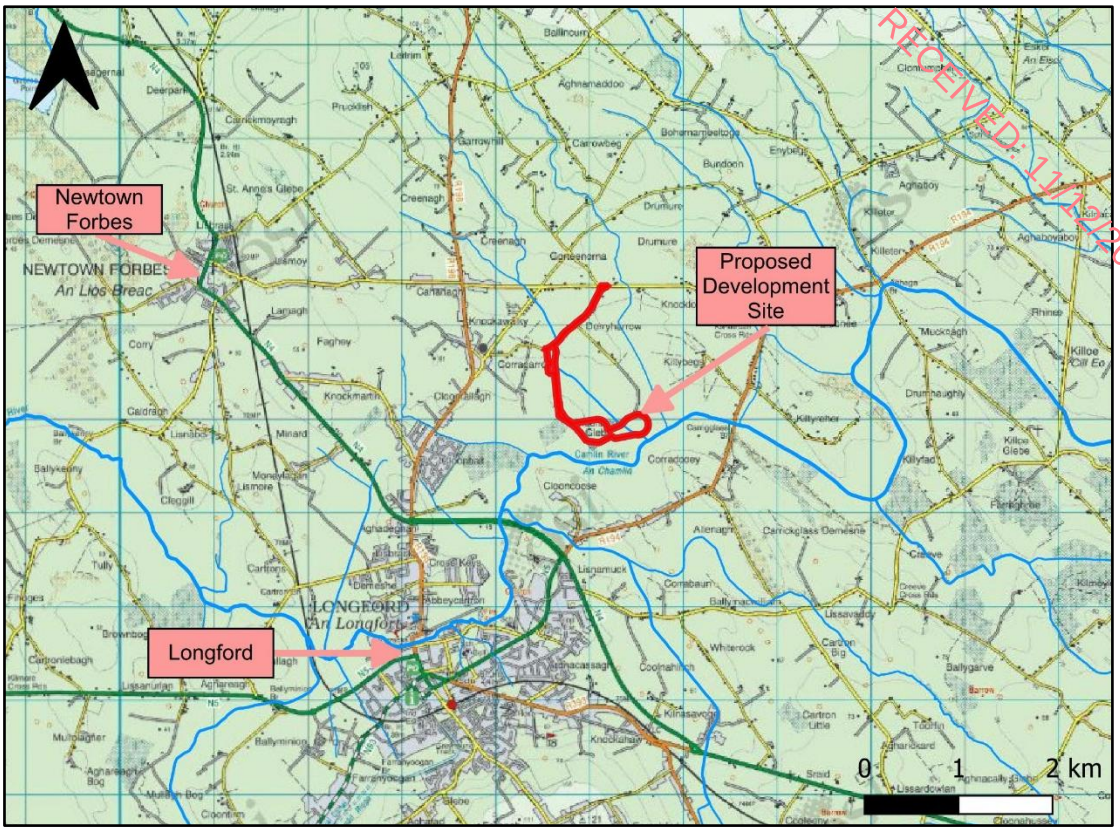
Based on this information, the potential impacts of the Proposed Development are identified, and the measures required to mitigate any identified negative impacts on the water environment.

9.6.1 Location

The Proposed Development is located c. 2.9 km north-north-east of Longford and 3.8 km east-south-east of Newtown Forbes. Refer to Figure 9-1 and Figure 9-2 for regional and local maps of the site.

The Proposed Development is accessed via the junction at the road L1011 in the direction of L5046, at the north of the site. The planning application site boundary has a total combined area of 17.28 Ha (area outlined in red in Figure 9-1 and Figure 9-2).

The lands surrounding the south of the site (south of the L5046) are largely agricultural in nature (grazing for cattle with some coniferous forestry). The area to the north along the L5046 has several one-off houses located along the roadway. There are a number of businesses and other amenities such as Melview National School within 500 m of the northern extent of the site, to the northwest.



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Figure 9-1 Proposed site on a Regional Context (OSI, 2024)

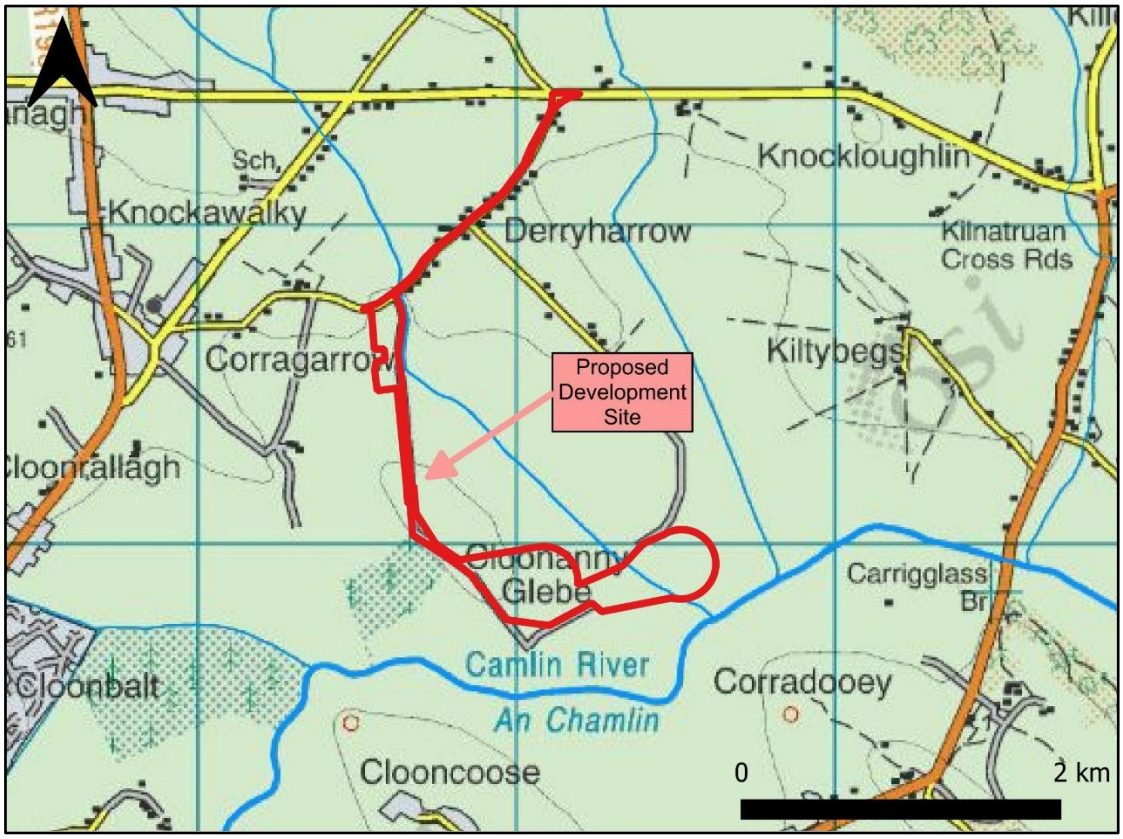


Figure 9-2 Proposed site on a Local Context (OSI, 2024)

9.6.2 Topography

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Locally, the site is relatively flat with a slight mound in the south-west corner of the site. Ordnance Survey Mapping shows the site is relatively flat at an elevation of approximately 50m OD.

Refer to Figure 9-3 for map showing the topographic setting surrounding the site.

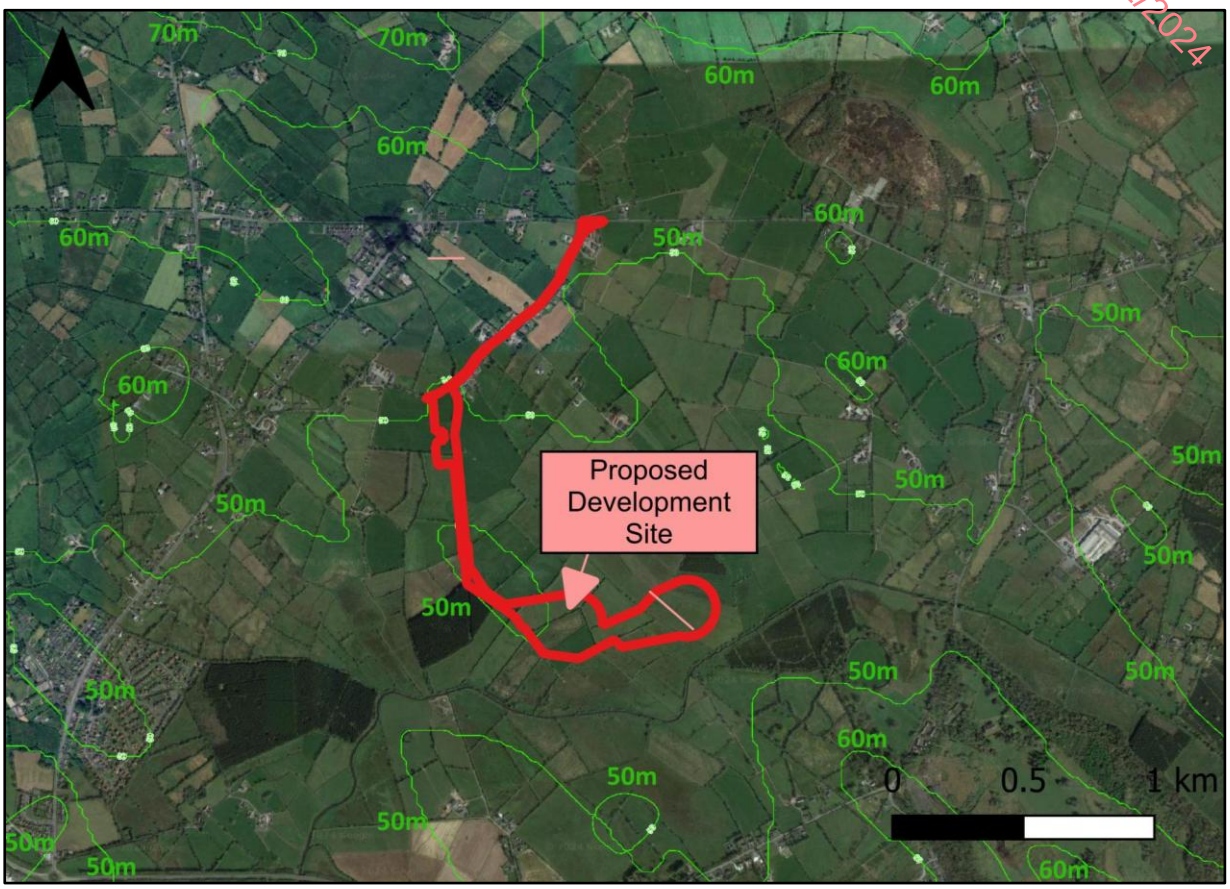


Figure 9-3 Topographical Setting

9.6.3 Hydrology

9.6.3.1 River Basin & Surface Water Features

Regionally, the landscape consists of the gently meandering Camlin River (termed by the EPA as Camlin 26) surrounded by relatively flat, lowland landscape topography. The Camlin River rises near Granard c. 17.6 km to the east of the Proposed Development and is a tributary of the River Shannon, c. 7.3km to the west of the site. Generally, the riverbanks are not steep, indicating a gradual slope of the land to the surrounding watercourses and their associated tributaries. The hydrological setting of the site is shown in Figure 9-4.

According to EPA Online Map Viewer the site lies within WFD Catchment area of Upper Shannon which is part of the Upper River Shannon river basin. The site lies within the WFD Sub-Catchment of Shannon[Upper]_SC_060. This Sub-Catchment includes parts of counties such as Longford,

Roscommon, and possibly other adjacent areas. The Sub-Catchment encompasses the Camlin River plus various smaller rivers, streams, and tributaries that feed into the Upper Shannon.

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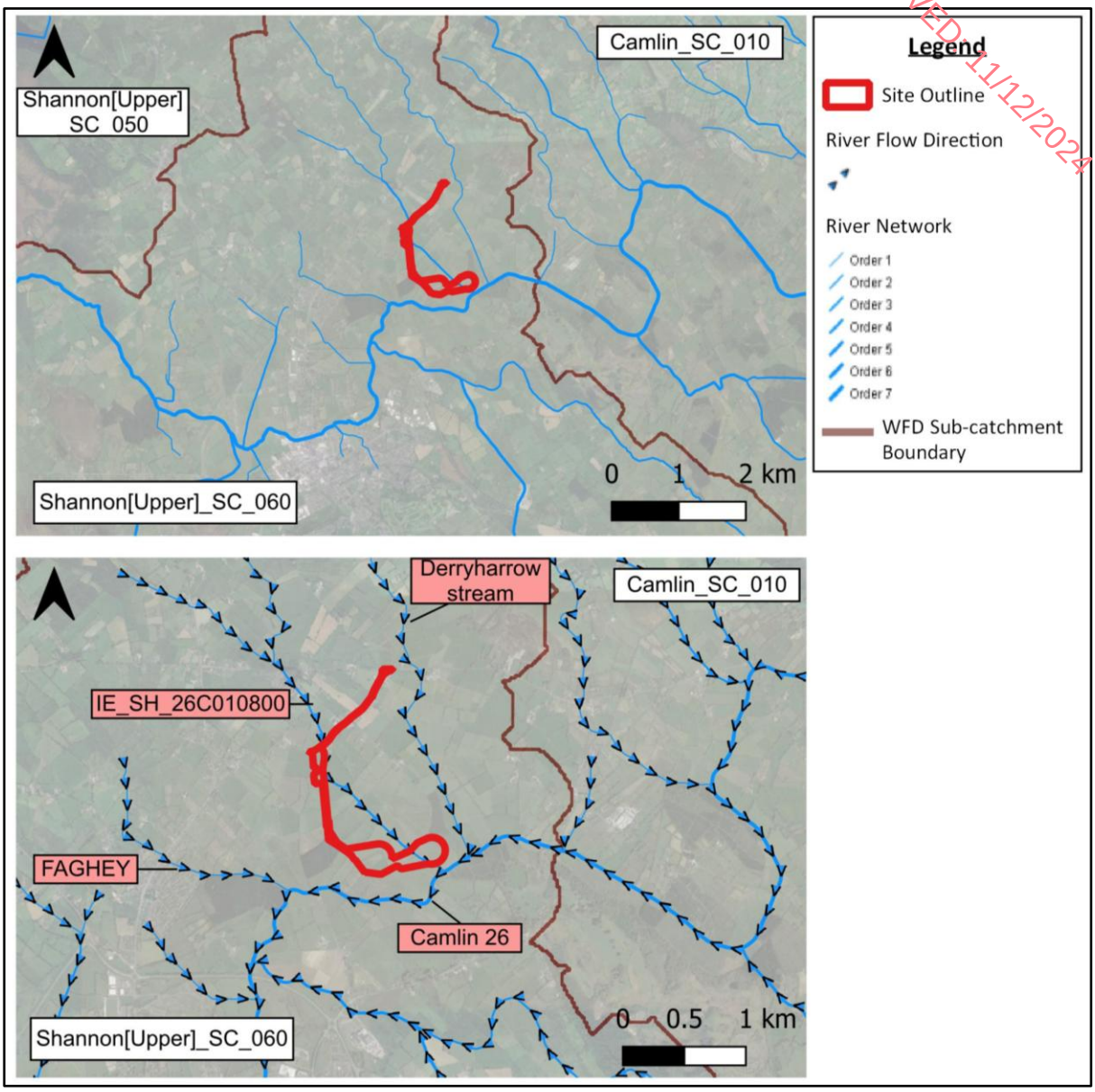


Figure 9-4 Hydrological Setting

9.6.3.2 Surface Waterbody Status, Pressure & Quality

The River Basin Management Plan (RBMP) 2018-2021 is a key policy document developed by Ireland's Environmental Protection Agency (EPA) to implement the goals of the EU Water Framework Directive (WFD). It outlines the strategy for protecting and improving water quality in Ireland's rivers, lakes, groundwater, estuaries, and coastal waters. The plan is part of Ireland's commitment to meeting WFD objectives, which aim to ensure the sustainable management and protection of water resources. The objectives are as follows:

- Achieve Good Ecological and Chemical Status on all waterbodies by 2027;
- Preventing any deterioration in the historic status of water bodies;

- Protecting hydromorphological health to support groundwater from pollution, over-abstraction, and contamination, which includes maintaining groundwater quality and quantity at sustainable levels;
- Promoting the sustainable use of water resources by encouraging water-efficient practices and managing water demand, particularly in sectors such as agriculture, industry, and public water supplies.

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In this context of the RBMP/WFD, surface waters should be afforded the same level of protection and mitigation measures to prevent any deterioration in their status.

The EPA Hydrological Mapping was reviewed for the surfaces water features within a 2 km radius of the Proposed Development. For the purposes of the Water Framework Directive (WFD) the water quality 'status' of the nearby surface water bodies has been categorised (2016-2021). The status and risk of the nearby surface water features are shown in Table 9-6.

In the vicinity of the site, the Shannon[Upper] _SC_060 achieved 'Good' status in the latest WFD cycle (2016-2021) and was deemed to be 'Not at Risk' of failing to meet its WFD objectives. Further downstream, the Moneylagan watercourse achieved 'Moderate' status and is 'At Risk' of failing to meet its WFD objective. The 2nd Cycle Catchment Upper Shannon Report states that the main pressures identified are urban run-off (diffuse sources run-off), urban waste water (combined sewer overflows), hydromorphology (Dams, barriers, locks, weirs) and agriculture (pasture).

The WFD Compliance Report for the Proposed Development is available in Appendix 9-1.

The biological Q-rating is a system developed by the EPA to assess the ecological health of rivers and streams based on their water quality. It is part of the WFD) monitoring program and provides an important indicator of the biological status of a water body. The Q-rating is based on the presence and diversity of aquatic macroinvertebrates (e.g., insects, crustaceans, worms) that are sensitive to pollution. The status categories range from 0-1 (Poor) to 5 (High).

Two EPA monitoring points along the Camlin 26 stream to were reviewed. The upstream monitoring point c. 700 m to the south east of the Proposed Development (Station No.: RS26C010700) achieved a Q-rating of 3-4, deemed 'Moderate' status in the latest WFD monitoring round (2020). The closest downstream monitoring point on the Camlin 26 (Station No.: RS26C010800), c. 4 Km to the Proposed Development achieved a Q-rating of 4, deemed 'Good' status in the latest WFD monitoring round (2020).

Table 9-7 presents the summary of the 2020 EPA water quality monitoring Q-rating values.

Surface water samples were collected from three locations: SW1, SW2 and SW3 on the 12th and 13th of August 2024. SW1 was collected from the unnamed stream (EPA Code: IE_SH_26C010800) at the existing bridge on the north side of the road L5046. This sample represents the upstream baseline conditions prior to the main construction activities. SW2 was collected from the unnamed stream (EPA Code: IE_SH_26C010800) further downstream that where the stream will from south of the turbine T2. SW3 was collected on the Camlin 26 at a location downstream of the construction activities.

The location of the sampling points is shown in Figure 9-5. Results are shown in Table 9-8 screened against the relevant Environmental Quality Standards (EQS) values for surface water. Laboratory reports are available in Appendix 9-2.

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Table 9-6 Hydrological Features and WFD Status (EPA, 2024)

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Water Feature	WFD Sub-Catchment	Waterbody Code (EPA)	Segment Code (EPA)	Distance From Site	WFD Status (2016-2021)	WFD Risk (Catchements.ie, Sep 2024)	Pressures
Unnamed	Shannon[Upper]_SC_060	IE_SH_26C010800	26_1267	Flows through eastern boundary of the site south of L5046 and through the south-eastern extent of the site	Good	Not at Risk	-
Camlin 26	Shannon[Upper]_SC_060	IE_SH_26C010800	26_4091	c. 100 m to the south-east of the site	Good	Not at Risk	-
Derryharrow stream	Shannon[Upper]_SC_060	IE_SH_26C010800	26_4060	c. 180 m to the east of the eastern most points of the site	Good	Not at Risk	-
FAGHEY	Shannon[Upper]_SC_060	IE_SH_26C010800	26_3606	c. 562 m to the south-west of the southwestern most boundary of the site	Good	Not at Risk	-
Unnamed	Camlin_SC_010	IE_SH_26C010700	26_2844	c. 1.00 Km to the east	Good	Not at Risk	-
Clooncoose (Stream)	Shannon[Upper]_SC_060	IE_SH_26C010800	26_1197	c. 1.01 Km to the south	Good	Not at Risk	-
Kilnasavoge stream	Shannon[Upper]_SC_060	IE_SH_26C010800	26_2332	c. 1.35 Km to the south	Good	Not at Risk	-
Unnamed	Shannon[Upper]_SC_060	IE_SH_26C010800	26_3576	c. 1.42 Km to the south-west	Good	Not at Risk	-
Killeenatruan Stream	Camlin_SC_010	IE_SH_26C010700	26_3718	c. 1.56 Km to the east	Good	Not at Risk	-
Kilnashee	Camlin_SC_010	IE_SH_26C010700	26_3633	c. 1.89 Km to the north-east	Good	Not at Risk	-
Moneylagan	Shannon[Upper]_SC_060	IE_SH_26C010900	26_1640	c. 1.98 Km to the south-west	Moderate	At Risk	Urban run-off, urban waste water, hydromorphology (Dams, barriers, locks, weirs) and agriculture

Table 9-7 Water Quality Monitoring Q-Rating Values (EPA, 2020)

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WFD Sub-Catchment	Station	Easting / Northing	EPA Q-Raing (Status)	Location in relation to Proposed Development
Camlin_SC_010	RS26C010700	216580 / 277937	3-4 (Moderate)	Upstream
Shannon[Upper]_SC_060	RS26C010800	213836.42 / 275827.13	4 (Good)	Downstream

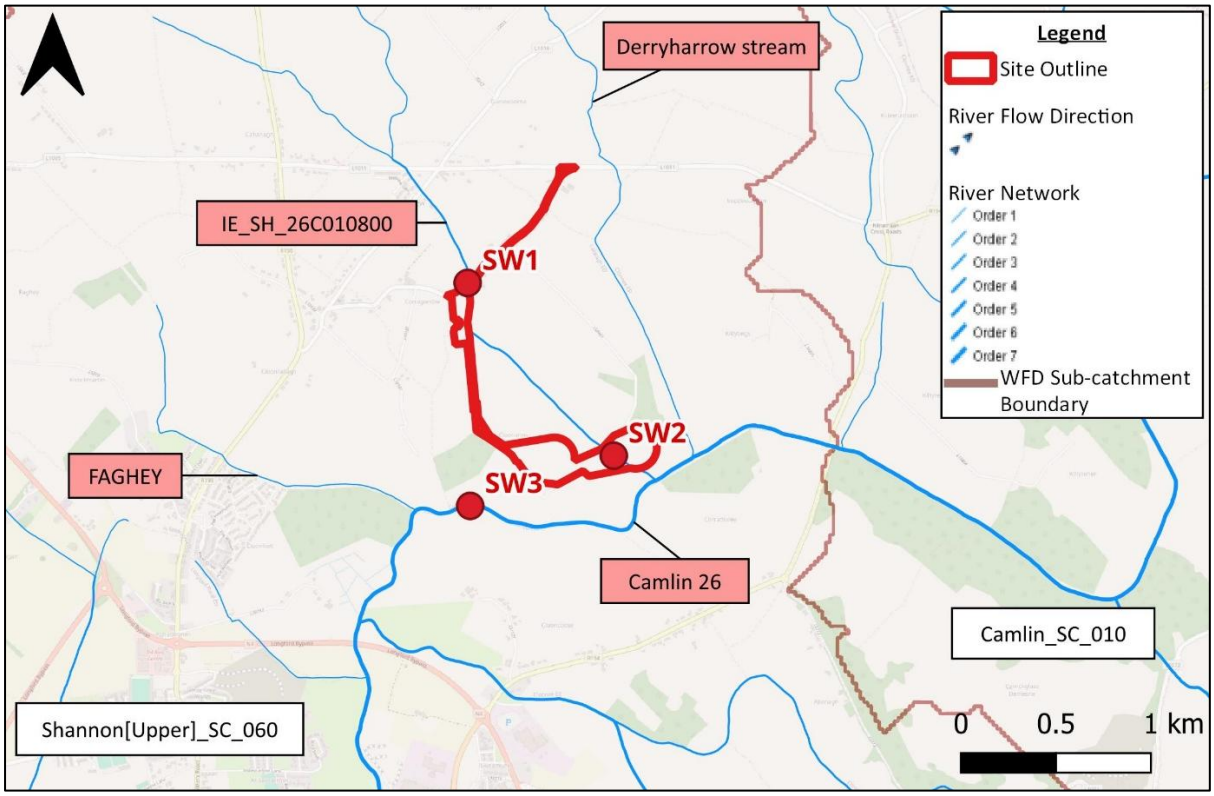


Figure 9-5 Surface Water Sample Locations

Table 9-8 Surface Water Quality Results (12/08/2024-13/08/2024)

Parameter	Units	EQS	SW1	SW2	SW3
Ammoniacal Nitrogen as NH4	mg/l N	High status ≤ 0.040 / Good status ≤ 0.065	0.18	0.08	0.08
BOD	mg/l #	High status ≤ 1.3 / Good Status ≤ 1.5 #	$<3_{AA}$	$<3_{AA}$	$<3_{AA}$

Parameter	Units	EQS	SW1	SW2	SW3
Chloride	mg/l	-	17.9	20.1	14.7
Electrical Conductivity	Us/cm	-	448	501	499
EPH >C8-C40	ug/l	-	<10	<10	<10
Nitrate as NO_3	mg/l	-	5.0	6.4	1.2
Orthophosphate as P	mg/l	High status ≤ 0.025 / Good status ≤ 0.035	0.17	0.15	<0.03
pH*	pH Units	<6.0 < 9.0	8.17	8.18	8.10
Sulphate as SO_4	mg/l	-	17.0	14.6	11.8
Total Alkalinity	mg/l CaCO3	-	202	228	210
Total Phosphorus	mg/l	High status: ≤ 0.025 Good status: ≤ 0.035	0.251	0.232	0.212
Total Suspended Solids	mg/l	>25	10	<10	66
Turbidity	NTU	-	6.8	6.3	32.3
Notes #BOD comparison to EQS values limited by laboratory limit of detection *pH range for Hard Water with Hardness > 100 mg/l CaCO3 AA - 2 x Dilution					

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Nitrate reported values ranging from 5.0 mg/l to 6.4 m/g at SW1 and SW2, while a value of 1.2 mg/l was reported in the downstream sample SW3 in the Camlin 26.

Chloride values range from 14.7 mg/l to 20.1 mg/l across the three locations.

Total suspended solids reported below the standard threshold of <25 mg/l per SI No. 293 of 1988 (for Salmonid waters, applied here for information purposes only) at SW1 and SW2. However, at SW3 a value of 66 mg/l exceeds the EQS.

Results for ammoniacal nitrogen and total phosphorus exceeded the good status threshold (≤ 0.065 mg/l and ≤ 0.035 mg/l respectively) of the Surface Water Regulations (SI No. 272 of 2009/ SI No. 77 of 2019) at all locations. Orthophosphate exceeded the good status threshold (≤ 0.035 mg/l) of the Surface Water Regulations (SI No. 272 of 2009/ SI No. 77 of 2019) at SW1 and SW2, while the downstream sample SW3 reported less than the laboratory limit of detection (LOD).

Biological Oxygen Demand (BOD) was reported <3 mg/l in all samples. The result is limited by the laboratory limit of detection (LOD) and is likely below the EQS, as reported <LOD after two dilutions.

Overall, results are reasonably consistent across the three sample locations. However, Ammoniacal Nitrogen, Orthophosphate and total Phosphorus show poorer quality relative to the "Good" status assigned to this sub-catchment in the WFD Shannon[Upper]_SC_060.

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9.6.3.3 Site Hydrology

The main surface water features potentially affected by the Proposed Development include the unnamed stream (EPA Code: IE_SH_26C010800) and the Derryharrow stream to the east, both of which drain into the Camlin 26 stream to the south of the site (refer to Section 9.6.3.2.). The unnamed stream (EPA Code: IE_SH_26C010800) flows through eastern boundary of the site, south of the road L5046 and through the most south-eastern extent of the site to the west and south of the proposed turbine termed T2.

Two surface water samples were collected from the unnamed stream (EPA Code: IE_SH_26C010800): SW1 and SW2. This stream flows south and is a small tributary feeding into the Camlin 26 stream. The third location SW3 was downstream of the site in the Camlin 26 stream. This was a wider stream c. 2 m from bank to bank. Physiochemical parameters including temperature, pH and electrical conductivity, were recorded in-situ for each of the locations.

The 3 No. surface water monitoring points were visually assessed. Physical observations were recorded as follows at the time of sampling:

- **SW1**: Clear, no odour, no sheen, no turbidity. Low, but constant flow in channel.
- **SW2**: Clear, no odour, no sheen, no turbidity. Low, but constant flow in channel.
- **SW3**: Clear, no odour, no sheen, very mild turbidity. Thick vegetation on the banks of the river channel. Low, but constant flow in channel.

The samples were sent to Element Materials Technology, a UKAS accredited laboratory for analysis. Following sampling, the samples were placed in clean, secure cooler box with ice packs and sent via overnight courier to the UK for analysis. A temperature blank was included for quality control.

Table 9-9 presents images of the sample locations along with the recorded physico-chemical data.

Table 9-9 Images of Surface Water Sample Locations

		
SW1 (Upstream) pH: 7.36	**SW2 (Midstream)** pH: 7.41	**SW3 (Downstream)** pH: 7.46

°C: 17.2 uS/cm: 519	°C: 16.4 uS/cm: 430	°C: 17.9 uS/cm: 401

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In addition, there are also numerous drainage ditches located within the Proposed Development Site and its surrounds. These channels facilitate the flow of surface water runoff into the streams within or downgradient of the Site boundary. The drainage network is largely influenced by the gradient of the land and topography in the area.

Mapping of the field drains was completed based on a combination of observation of the watercourses during the site walkover and windscreen study on the 12th and 13th of August 2024, in addition to satellite images from Google Maps (Figure 9-6). This map does not provide a precise representation of the full extent of the area, but it illustrates the extensive drainage network in the vicinity of turbines T1 and T2.

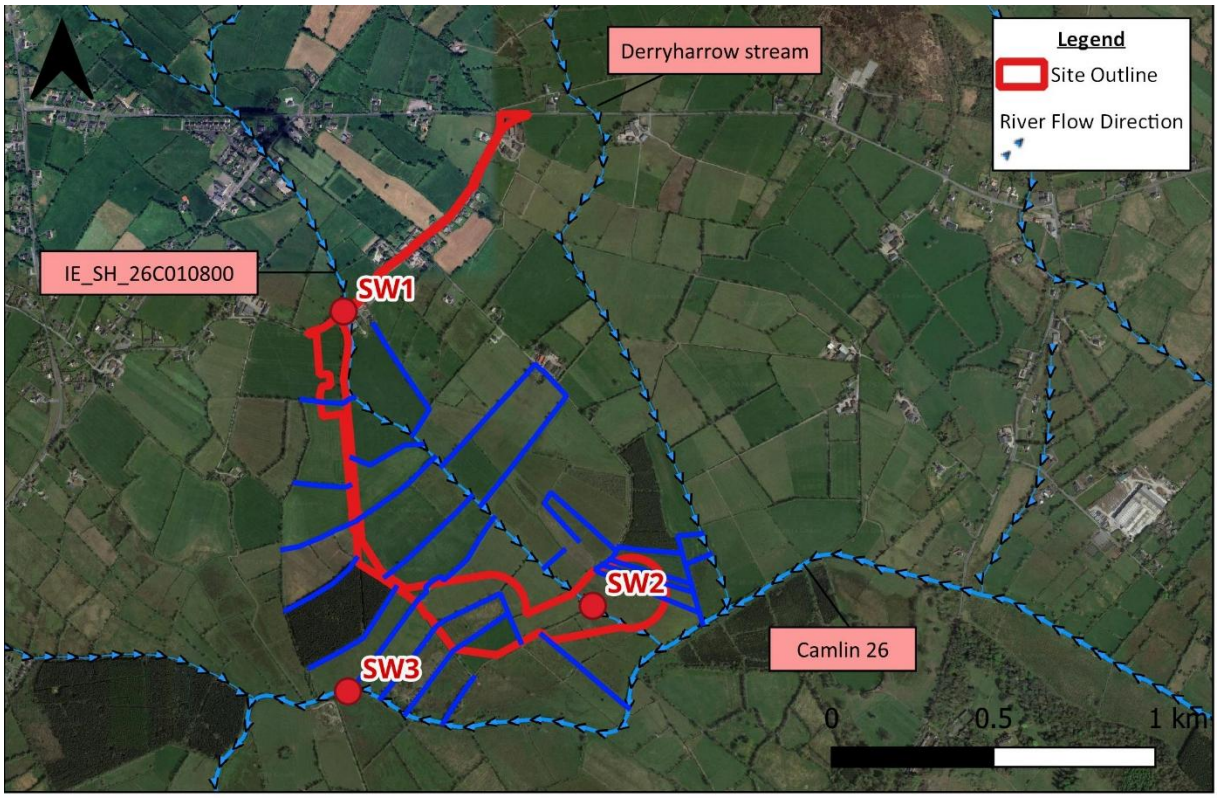


Figure 9-6 Field Drains Around the Proposed Site

9.6.3.4 Meteorology & Climatology data

Long-term rainfall and evaporation data were sourced from Met Éireann. The closest synoptic station to the Proposed Development with available 30-year annual average rainfall and temperature data is Casemont Aerodome Station, 100 Km to the south east. The long-term-average (LTA) reference period is 1991-2020. Potential Evapotranspiration (PE) data was not available at this station, so the average PE monthly values from Mount Dillon Station, located 16 Km to the north-west were used. PE data was only available from Mount Dillon Station for reference period 2011-2020.

The average monthly rainfall, temperature and PE values are outlined in Table 9-10.

Table 9-10 Monthly Rainfall Averages (mm), Temperature and PE Averages (1991-2020)

Parameter	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
Rainfall* (mm)	65	55.2	51.8	55.3	59.1	65.7	59.4	71.2	61.6	81.6	81.9	75.7	**783.5**
Mean Daily Maximum T* (°C)	8	8.5	10.3	12.4	15.4	18	19.8	19.4	17	13.7	10.3	8.3	**13.4**
Mean Daily Minimum T* (°C)	2.4	2.2	3.1	4.5	6.9	9.6	11.6	11.4	9.6	7.2	4.4	2.6	**6.3**
PE** (mm)	11.03	16.10	32.38	53.84	75.08	75.24	76.46	63.42	41.94	22.89	10.28	8.61	**487.27**

*Rainfall and temperature based on LTA reference period 1991-2020 for Casement Aerodrome Station.

**PE based on available data from reference period 2011-2020 for Mount Dillon Station (PE = Potential Evapotranspiration).

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According to the LTA values in Table 9-10, November is the wettest month and March is the driest month. February is the coolest month, while the warmest month is July.

The effective rainfall represents the water available for runoff and recharge to groundwater via infiltration to through the site.

On account of the bedrock and subsoil geology beneath the site the groundwater recharge coefficient mapped by the GSI varies slightly for a small area in the south-east of the site. All of the site is mapped as overlying a Visean limestones which consist of undifferentiated dark grey limestone rock. Therefore, the variation in recharge can be attributed to the overlying cut-over raised bog to the south-east of the site. This area corresponds to the location of the turbine T2. Most of the site is mapped as having a recharge coefficient of 22%. However, the area corresponding to the cut-over bog has a much lower recharge value of 4% applied. Therefore, this value and the higher value (22%) are both used in the simple water balance calculations for the site, below. In this calculation, the remainder of the effective rainfall becomes either surface water run-off or groundwater in the subsoil (over the bedrock).

Site Water Balance

Annual Average Rainfall (AAR) = 783.5 mm

Potential Evapotranspiration (PE) = 487.27 mm

Actual Evapotranspiration (AE) = 462.9 mm (taken as 95% of PE)

Effective rainfall = AAR – AE

Effective rainfall = 783.5 – 462.9

Effective rainfall = 320.6 mm

GSI Recharge Coefficient (Rc) = 4%

Groundwater recharge = EF x Rc

Groundwater recharge = 320.6 x 0.04

Groundwater recharge = 12.8 mm/yr

The remainder of the EF (307.8 mm/yr) becomes either surface runoff or groundwater in the subsoil.

GSI Recharge Coefficient (Rc) = 22%

Groundwater recharge = EF x Rc

Groundwater recharge = 320.6 x 0.22

Groundwater recharge = 70.5 mm/yr

The remainder of the EF (250.1 mm/yr) becomes either surface runoff or groundwater in the subsoil.

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The Rc is based on the anticipated recharge to bedrock, while the effective rainfall is what is available for runoff over the land surface or infiltration to the subsoil. A groundwater recharge rate of 12.8 mm/yr or 70.5 mm/yr applies to recharge to the bedrock. The remainder of the effective rainfall becomes either surface water run-off or groundwater within the subsoil and is estimated above.

During winter period (and periods of prolonged rainfall) when the soil and subsoil is more likely to be saturated due to limited permeability of the soil/sub-soil there is higher potential for overland flow or surface runoff. With regard to the Proposed Development Site, the drainage and in particular the hydraulic efficiency of the stream drain is therefore important for mitigating against surface waterlogging to a significant extent.

Note: *The calculation above is a simple water balance based on certain assumptions such as a certain degree of areal homogeneity of effective rainfall and groundwater recharge. Its purpose is to provide a broad, indication of the baseline hydrological characteristics of the area.*

9.6.3.5 Site Specific Flood Risk Assessment

To determine areas at risk of flooding, the OPW's indicative river flood map (www.floodmaps.ie), the Department of Environment, Community and Local Government's online planning map (www.myplan.ie), and historical maps (such as 6" and 25" base maps) were reviewed. Additionally, the National Indicative Flood Mapping (NIFM) extents were consulted to identify any potential flood zones near the Proposed Development.

There is no identifiable map text on locally available historical 6" or 25" mapping for the study area that identify lands that are "prone to flooding". However, in the south-eastern extent of the boundary, north of the River Camlin (i.e. Camlin 26) symbology denoting marshes, bogs, or wetlands implies these areas have a higher flood risk, as these are natural low-lying areas where water can accumulate.

There are no recurring flood incidents within the Proposed Development site boundary according to the OPW's flood mapping. The only areas within the site boundary mapped as 'Benefiting Lands'; is the south-eastern more location denoted as "Drainage Districts Benefiting Lands". 'Benefiting Lands' are defined as 'land that might benefit from the implementation of Arterial (Major) Drainage Schemes (under the Arterial Drainage Act 1945). Drainage Districts Benefiting Lands are areas improved by OPW-managed drainage schemes to reduce flooding and enhance land usability, particularly for

agriculture and development. The Past Flood Event Local Area Summary Report in available in Appendix 9-3.

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The OPW PFRA maps for the area, Map no. 301 (north of the site) and 285 (south of the site) were reviewed. Map no. 301 (north of the site) indicates that the Proposed Development falls within an indicative 100-year (Flood Zone A), while Map no. 285 (south of the site) indicates that the Proposed Development site falls within an indicative 100-year (Flood Zone A) and 1000-year (Flood Zone B) flood zone. Both maps show pluvial or groundwater flood zones are not mapped within the site boundary.

In addition, the NIFM (National Indicative Flood Mapping) fluvial flood extent map shows that the Proposed Developmentis not located within the present day and mid-range future scenario 100-year (Flood Zone A) and 1000-year (Flood Zone B) fluvial flood zones.

Overall, the potential flood risk to the proposed development site from an extreme fluvial flood event from the River Camlin is considered to be HIGH, however the Site Specific Flood Risk Assessment (SSFRA) has concluded that while part of the Proposed Development, particularly turbine no. 2, is located within Flood Zones A and B, the development is not expected to adversely impact the local hydrological regime or increase flood risk elsewhere (see Site Specific Flood Risk Assessment submitted with the application).

9.6.3.6 Receptor Sensitivity

Based on the criteria set out in Table 9-3, the Camlin River downstream of the site can be considered as being of High Importance due to its “Moderate (3-4)” Q-rating values and its vital role in drainage and flood management on a local scale.

The main risk of surface water contamination arises from increased concentrations of suspended solids due to increased surface runoff and sediment transport, plus potential hydrocarbon leaks and spills from equipment and machinery, which could enter nearby watercourses.

9.6.4 Hydrogeology

9.6.4.1 Regional Geology

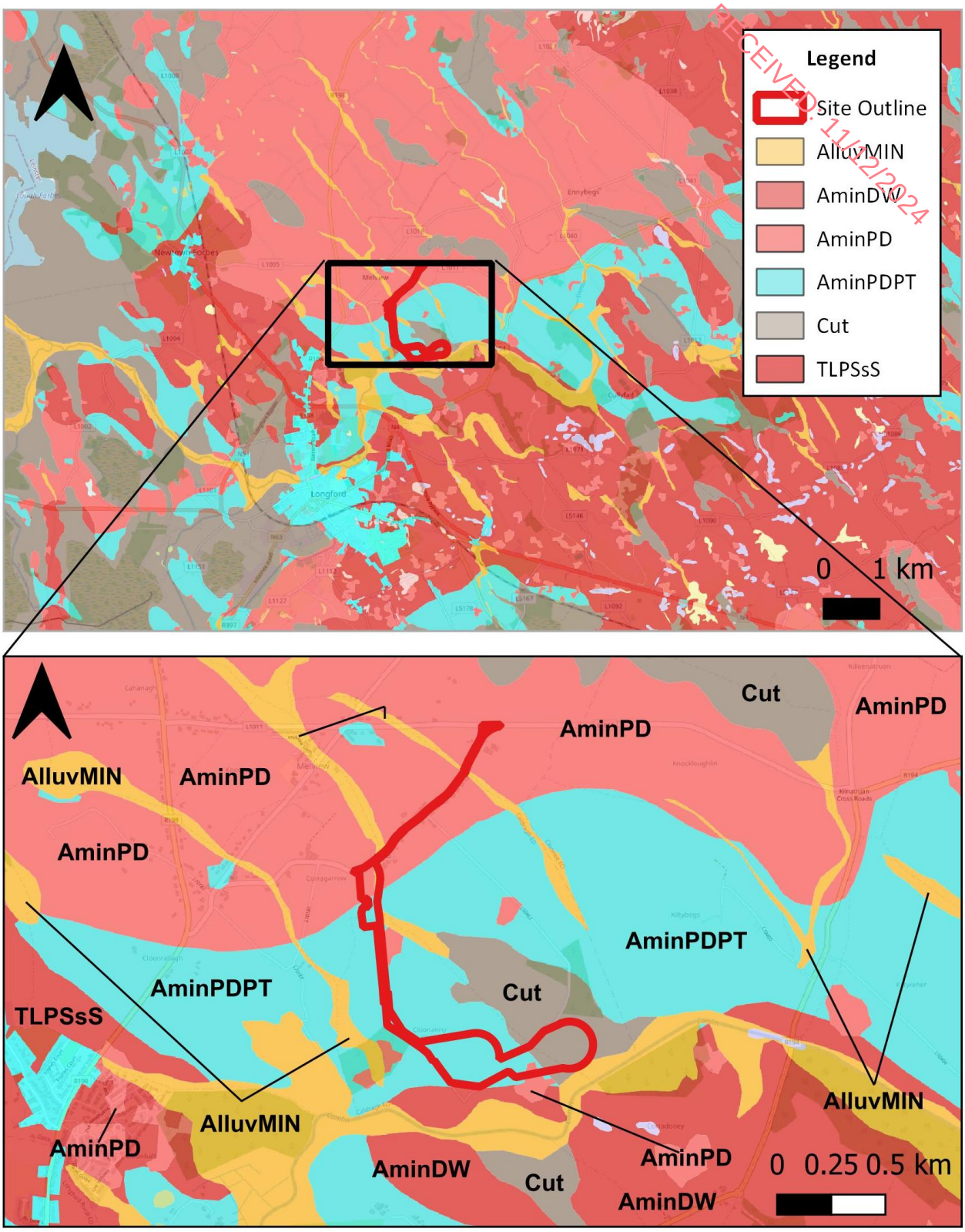
9.6.4.1.1 Regional Soils

There are a number of soils mapped across the site. To the north of the site there are Acid Deep Poorly Drained Mineral (AminPD) to the north-west and Mineral Alluvium (AlluvMIN) along the north-east boundary (GSI, 2024).

The majority of the remainder of the remainder of the site (except for the south-east corner) is characterised by Acid Poorly Drained Mineral Soils with Peaty Topsoil (AminPDPT) and two small areas of AminPD (GSI, 2024).

The south-east corner is mapped as Cutaway/cutover peat (Cut).

The soils were observed to be well drained, and of high agricultural value during the site walk over survey. The regional soil mapping is shown in Figure 9-7.



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Figure 9-7 Regional Soils (Tasgasc, 2024)

9.6.4.1.2 Regional Subsoils

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The majority of the site is characterised as Sandstone and shale till (Lower Paleozoic) (TLPSsS) with minor strips of Alluvium (EPA, 2024). The south-east corner is mapped as cutover peat (Cut).

The regional subsoil mapping is shown in Figure 9-8.

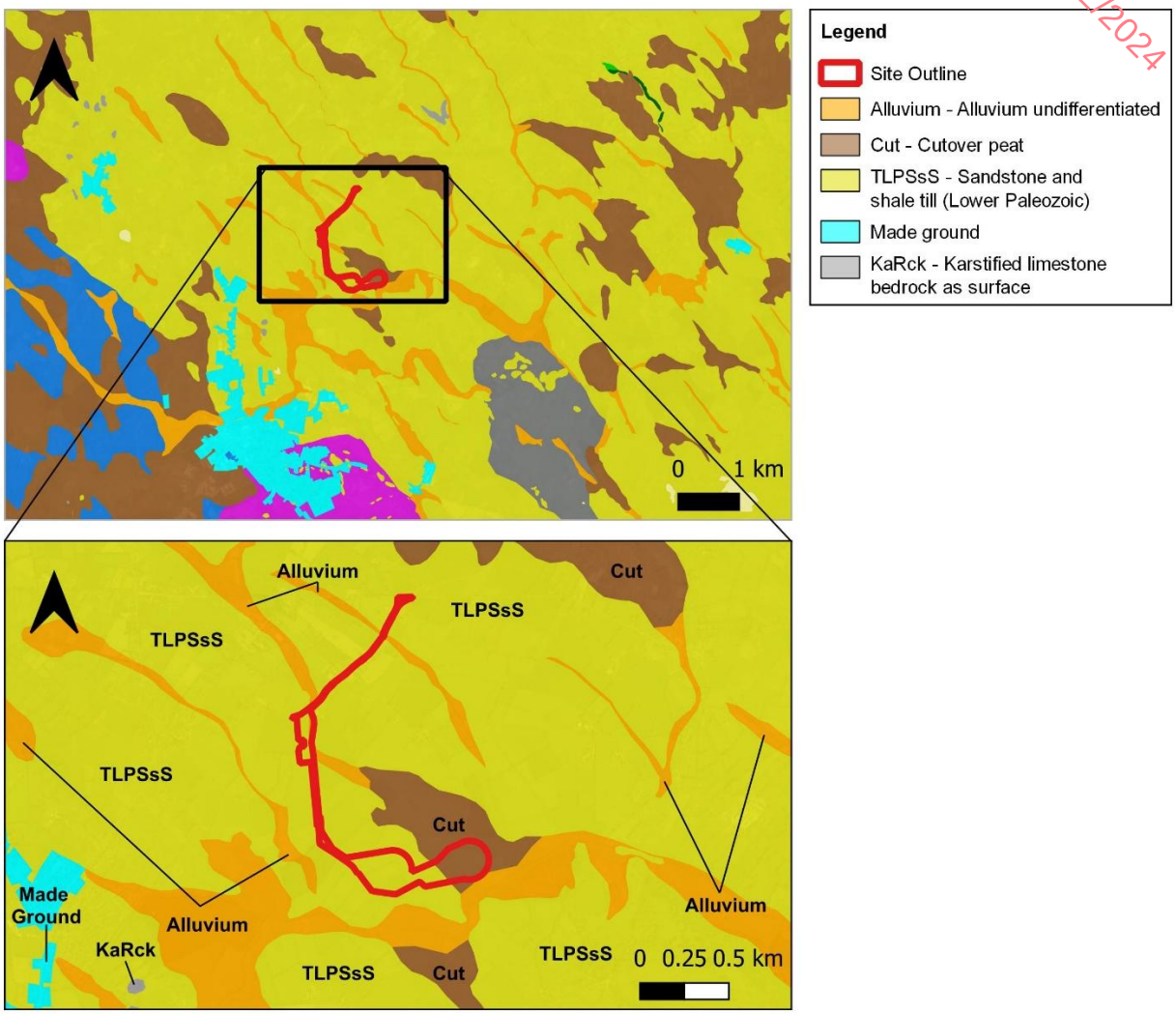


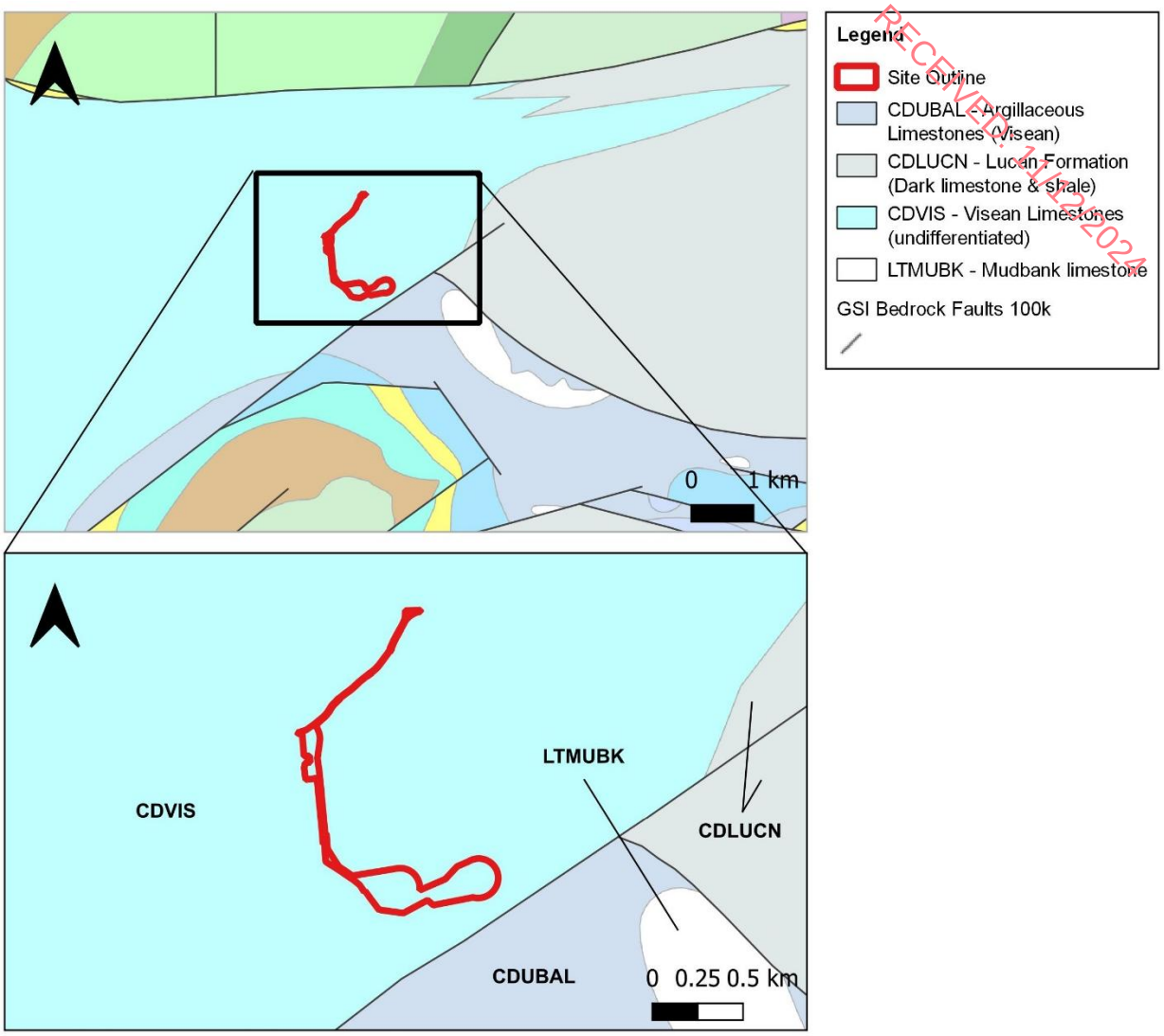
Figure 9-8 Regional Subsoils (EPA, 2024)

9.6.4.1.3 Regional Geology

The site is underlain by Visean Undifferentiated Limestone (CDVIS). These rocks are classified by the GSI as consisting of interbedded limestone with subordinate sandstone and argillaceous beds. This rock formation is known to contain soluble limestone and is also known to be associated with "karst" features at other sites where it outcrops closer to the surface; however, none are mapped at this location.

South of the Camlin River (outside of the site boundary), the bedrock is mapped as Argillaceous Limestones consisting of dark limestone, shale and chert (CDUBAL). The boundary between these two rock types, is marked by a south-west to north-east trending fault,

The regional geology map is presented in Figure 9-9.



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Figure 9-9 Regional Geology (GSI, 2024)

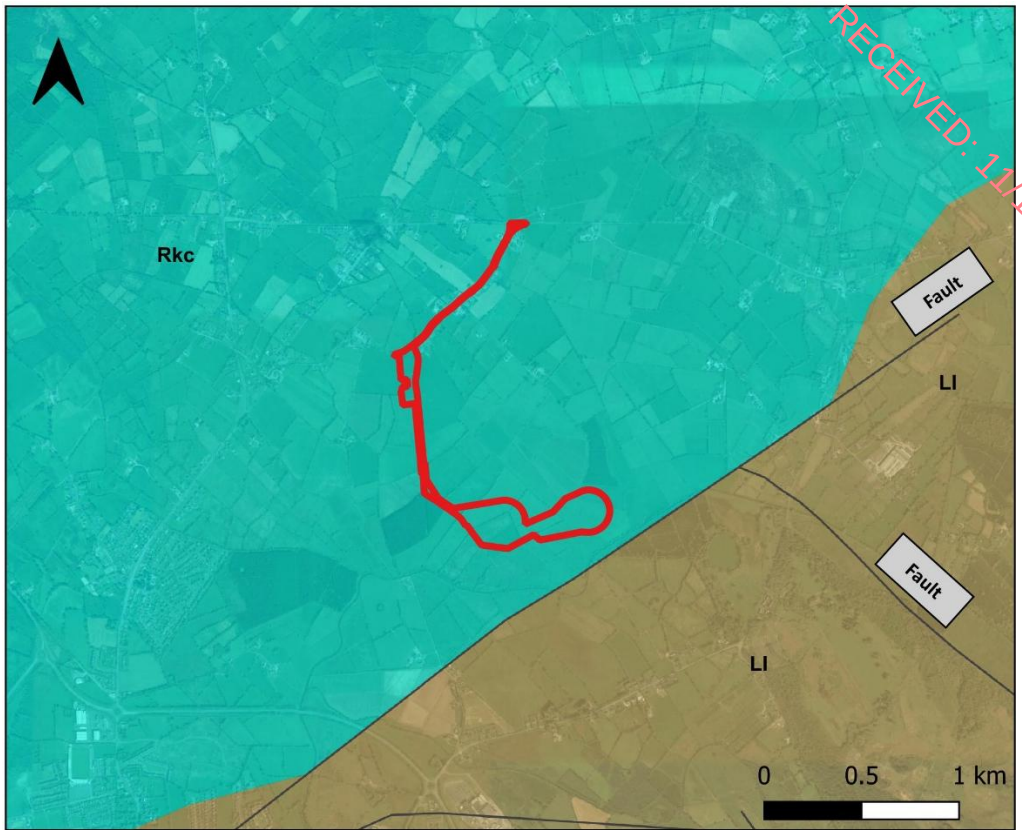
9.6.4.2 Regional Hydrogeology

The site is underlain by Visean Undifferentiated Limestone. These rocks are classified by the GSI as consisting of interbedded limestone with subordinate sandstone and argillaceous beds. The area corresponds with Regionally Important Aquifer– Karstified (conduit) (Rkc).

South of the Camlin River (outside of the site boundary), the bedrock is mapped as Argillaceous Limestones consisting of dark limestone, shale and chert. This are corresponding to Locally Important Aquifer – Bedrock which is Moderately Productive in Local Zones (Ll).

The boundary between these two rock types and aquifer types, marked by a south-west to north-east trending fault, suggests potential implications for connectivity.

A local bedrock aquifer map is shown in Figure 9-10.



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Figure 9-10 Local Bedrock Aquifer Map with site outlined in red (GSI, 2024)

9.6.4.3 Local Geology

9.6.4.3.1 Local Soils/Subsoils

Refer to Appendix 8.1 C, for SI Report containing 6 No. Trial Hole engineering logs detailing the ground conditions encountered at each exploratory hole location. A summary of the range of peat / topsoil thickness encountered within the area around each of the proposed main structures is shown in Table 9-11. Most distinctive is that the thickest layer of peat is at T2 where up to 0.80 m is recorded; in contrast to 0.20 m thickness at T1 and 0.30 m at the Substation location. Peat depth screening undertaken at the main infrastructure of the Proposed Development recorded an absence in PEAT soils within the Development footprint.

The subsoils consist of boulder clay tills / mineral soils. No bedrock was encountered in any of the trial holes.

Table 9-11 Site Investigation and Foundations Information

Turbine / Infrastructure	Stratum Encountered	Depth to Stratum (m)	Remarks	Turbine Foundation Information
T1	TOPSOIL	0.00	-	Gravity Base foundation in stiff SILT / CLAY at 3.50m depth
	Firm sandy gravelly CLAY/SILT	0.20	-	
	Stiff sandy gravelly CLAY/SILT with low cobble and boulder content	1.60 – 2.00	No rock encountered. Hole terminated at 3.50m	

T2	TOPSOIL	0.00	-	Deep foundation (Piled or other), where suitable rock formation is >3.50m b.g.l. and turbine lies within a flood zone.
	Medium dense SAND	0.70 – 0.80	-	
	Stiff sandy gravelly CLAY/SILT	3.30 – 3.40	No rock encountered. Hole terminated at 3.70m	
Substation	TOPSOIL	0.00	-	Raft foundation within firm SILT/CLAY at 1.50m depth.
	Firm sandy gravelly CLAY/SILT	0.30	-	
	Stiff sandy gravelly CLAY/SILT with low cobble and boulder content	1.60 – 2.60	No rock encountered. Hole terminated at 3.50m	

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9.6.4.3.2 Local Geology

The Visean Limestone Formation is characterised by dark grey undifferentiated Carboniferous limestone. This formation commonly associated with the presence of "karst" type features, such as deep weathering, sinkholes etc. During the site walkover study no evidence of karst features were observed.

9.6.4.4 Site Specific Hydrogeology

9.6.4.4.1 Groundwater Body

The site is underlain by the Newtown Forbes Groundwater Body (GWB), which covers an area of 80 km^2 and is characterised by a conduit flow regime. According to Draft 3 Newtown Forbes GWB Description issued 22nd December 2003, the Newtown Forbes GWB primarily features Visean Carboniferous Limestone, covered by thick deposits (>10 m) of glacial drift and peat deposits with little rock outcrop. The limestone is generally described as a high-yield aquifer due to its karstic nature, which means it has significant solution features and high permeability. The aquifer is classified as a Regionally Important Aquifer – Karstified (conduit) (Rkc). This means the aquifer has high permeability and productivity, largely due to the development of karst features such as caves and conduits.

Other characteristics of this GWB include:

- The area is influenced by a range of structural geological features, including faults and folds. The report indicates the presence of significant faults, which can affect groundwater flow and connectivity between different aquifer units.
- Diffuse recharge to the aquifer is primarily from rainfall, which infiltrates through the limestone and replenishes the groundwater. The karst features enhance recharge by providing direct pathways for water to enter the aquifer. However, percolation of recharge will be restricted in the west of the body due to the extensive covering of peat and the typically associated underlying lacustrine clay or clayey till.
- The aquifer exhibits high transmissivity and storage capacity due to its karstic nature. This means it can transmit and store large quantities of groundwater, making it a valuable water resource.
- Groundwater flow in this is expected to be concentrated in an upper weathered and epickarstic zone and an underlying zone of interconnected fissures generally extending to a

depth of 30 m. The flow of the groundwater will be towards the rivers crossing the body and west and northwest to the River Shannon. Groundwater may become partially confined in some areas in this GWB where there are extensive areas of peat and low permeability subsoil.

- The groundwater quality in the Newtown Forbes GWB is generally good, though local variations may occur. The karst nature of the aquifer can lead to higher vulnerability to contamination if surface pollutants are not managed properly.

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9.6.4.5 Groundwater Vulnerability

Vulnerability is a term used to represent the intrinsic geological and hydrogeological characteristics that determine the ease with which groundwater may be contaminated by human activities. Where the subsoil thickness is <3 m, the vulnerability is rated as Extreme (the highest risk situation). Where the subsoil thickness is >3 m, the vulnerability is rated as High, Moderate or Low (depending on the nature and thickness of the subsoil). The GSI's criteria for mapping vulnerability are shown in Table 9.12 below.

Table 9-12 Vulnerability Mapping Guidelines

Depth to Rock	Hydrogeological Requirements for Groundwater Vulnerability				
	Diffuse Recharge			Recharge Point	Unsaturated Zone
	High Permeability *(sand/gravel)*	**Moderate Permeability** *(sandy subsoil)*	**Low Permeability** *(clayey subsoil, clay, peat)*	***(swallow holes, loosing streams)***	***(sand & gravel aquifers only)***
0-3 m	Extreme	Extreme	Extreme	Extreme (30 m radius)	Extreme
3 – 5 m	High	High	High	N/A	High
5 – 10 m	High	High	Moderate	N/A	High
>10 m	High	Moderate	Low	N/A	High

N/A = not applicable.
Release point of contaminants is assumed to be 1 – 2 m below ground surface.
Permeability classifications relate to the engineering behaviour as described by BS5930.
Outcrop and shallow subsoil (i.e., generally <1.0 m) areas are shown as sub-category of extreme vulnerability.
(amended from Deakin and Daly (1999) and DELG/EPA/GSI (1999)

The GSI online webviewer indicates the vulnerability of groundwater beneath the site is predominately Moderate (M) with a small area of High (H) in the south-east extinct of the site which corresponds with the eastern portion of the infrastructure for turbine T2 (Figure 9-11).

Based on site investigation data the subsoils beneath the site were confirmed to be of low (at T1 and the Substation) to moderate (at T2) permeability. Based on the geophysical survey carried out, the thickness of soil/subsoil overburden is between 10 m to 20 m in the area around T1 and the Substation, and between 5 m to 10 m in the area around T2. All exploratory trial holes excavated, were terminated

between 3.50m (turbine T1 and Substation) to 3.70m (turbine T2) depth within predominantly stiff SILT/CLAY. Therefore, based on the GSI classification for groundwater vulnerability in Table 9-12, the area around T1 and the Substation can be classified as Low (L), and at T2 as Moderate (M).

The area where the proposed infrastructure for T2 is proposed is more vulnerable because the subsoils are not as thick. Therefore, a greater level of protection to the aquifer can be expected in areas where T1 and the Substation are proposed to be positioned.

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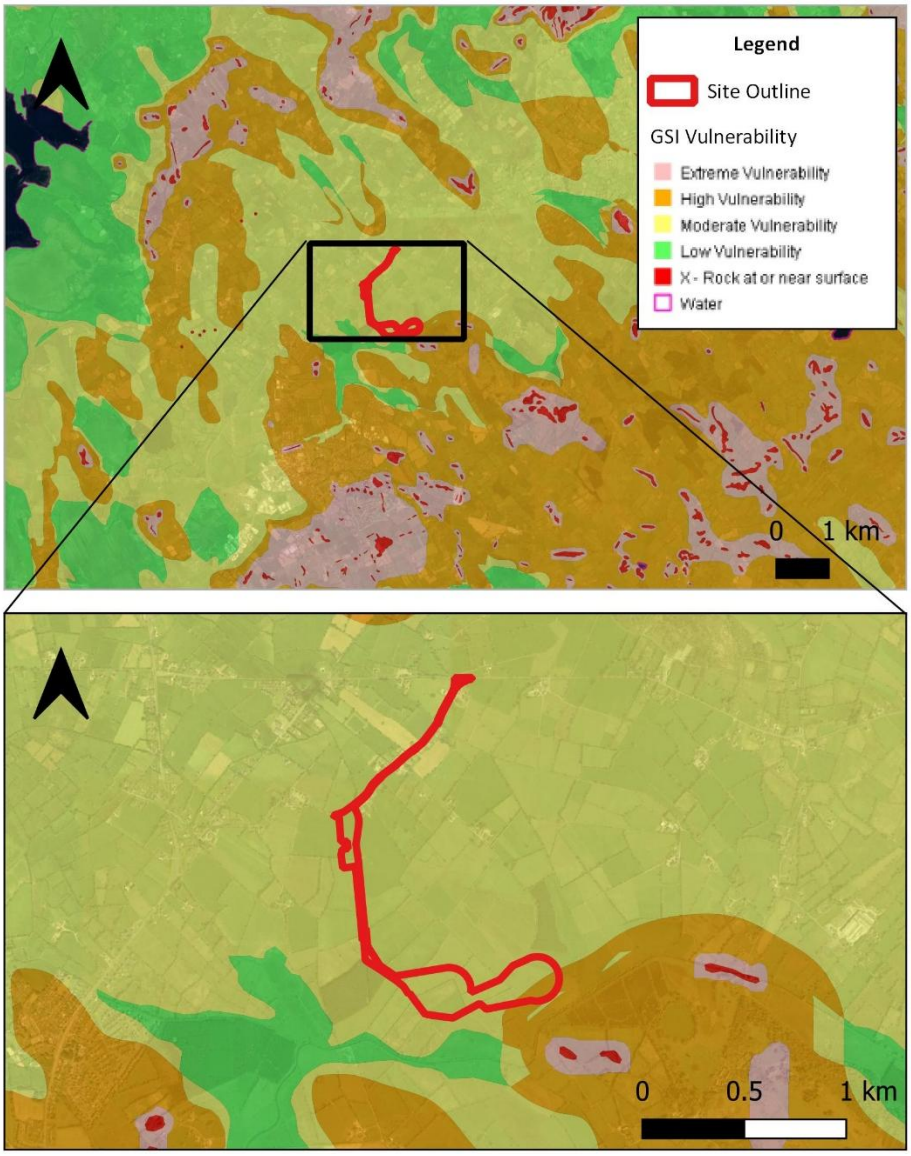


Figure 9-11 Groundwater Vulnerability

9.6.4.6 Groundwater Rechange

Based on GSI mapping, the majority of the site is mapped as having a recharge coefficient of 22%. However, the area corresponding to the cut-over bog (with greater topsoil thickness up to 0.80 m) has a much lower recharge value of 4% applied.

Based on the site specific data, groundwater recharge is greater (22%) in the areas where the top soil was found to be between 0.20 m and 0.30 m in most of the site and where T1 and the Substation are

positioned. In the south-east of the site topsoil was shown to be up to 0.80 m this results in a lower permeability resulting in a lower recharge value (i.e. 4%).

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9.6.4.7 Groundwater Levels and Flow Direction

Six trial pits were excavated as part of the site investigations: two no. in the area of the Substation; two no. in the area of T1; and two no. in the area of T2. Groundwater strikes with weak flow were encountered at 2.80 m below ground level (BGL) at TP-TP02-A and at 3.30 m below ground level (BGL) at TP-TP02-A both trial pits in the vicinity of the T2 infrastructure. See Section 9.6.4.3.1 for summary of trial pit findings. This supports the conclusion that permeability is low to moderate in the subsoils. Groundwater strikes were not encountered in any of the other four no. trial pits in the area of Substation or T1 works.

It is likely that the groundwater table across the entire site is dynamic, experiencing fluctuations over time due to seasonal variations in climatic conditions rainfall.

With respect to the south-eastern area of the site in the vicinity of the T2 infrastructure, the topographic gradient is towards the Camlin River. This likely causes surface and subsurface water to flow in that direction. However, due to the lower permeability of the "Stiff sandy gravelly CLAY/SILT" at T2 relative to the "Stiff sandy gravelly CLAY/SILT with low cobble and boulder content" at T1 and the Substation locations, it is likely that the water cannot drain as easily, leading to greater water retention and a higher water table in the area of T2.

9.6.4.8 Groundwater Hydrochemistry

Groundwater sampling has not been completed.

There are no EPA Groundwater Monitoring data available for this Newtown Forbes GWB. However, hydrochemical analysis carried out on samples trial wells just north of Longford Town in 1999 showed hardness ranging from 246-394 mg/l, alkalinity from 230-365 mg/l and EC from 445-680 mg/l. Iron and Manganese exceeded the E.U. Potable Water MAC (0.21-0.23 mg/l Fe and 0.22-0.73 mg/l Mn).

9.6.4.9 Karst Features

Karst forms in carbonate bedrock where rainwater that is slightly acidic dissolves the bedrock over time. The dissolution of the limestone bedrock results in unique features such as swallow holes, caves or enclosed depressions. The GSI Karst Database was consulted, and there is no karst features mapped within 2 Km of the site.

During the site visit on August 12th and 13th, 2024, no karst features or landforms were identified, and no rock outcrops were observed at the surface. However, according to GSI mapping, the underlying bedrock consists of limestone that is known to be soluble, which therefore has the potential to develop karst features.

Several karst features are mapped to the west and northwest of the site, with the nearest being two enclosed depressions located approximately 2.5 km to the northwest.

9.6.4.10 WFD Groundwater Body (GWB) Status

A summary of the WFD status and risk result for the GWBs within 2 Km of the site is shown in Table 9-13. The site is underlain by Newtown Forbes GWB which achieved 'Good' status in 3 no. WFD cycles and 'Not at Risk' status. No significant pressures have been identified to be impacting these GWBs.

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Table 9-13 Summary of WFD GWB Status

WFD GWB	2010-2015 Overall Status	2013-2018 Overall Status	2016-2021 Risk Status	2016-2021 Overall Status	Pressures
Newtown Forbes	Good	Good	Not at Risk	Good	-
Longford Ballinalee	Good	Good	Not at Risk	Good	-

9.6.4.11 Groundwater Resources

There are no Group Water Schemes (GWS) or Public Water Supply Schemes located within 2 Km of the site. The closest GWS is Clonmore GWS Protection Area c. 5 Km to the south west of the site.

A desk-based review of abstractions listed on the GSI Spatial Resources Viewer was conducted. A search for private well locations, with an accuracy range of 1-100 meters, was conducted using the GSI well database. The results indicate that the GSI national well database has no. records of private wells within 2 Km the immediate vicinity of the site. However, 4 no. wells with lesser accuracy located within 2 Km of the site are outlined in Table 9-14.

It can also be assumed that all houses within 2 Km to the north and east of site have private domestic wells. However, the properties to the west in Longford are likely supplied by public water scheme.

Table 9-14 GSI Wells within 2 Km of the Site

GSI Borehole Name	Proximity to Site	Drill Date	Accuracy to	Depth (m)	Yield (m^3/day)	Source Use
2027SWW110	c. 0.39 Km to the west	Jul, 1961	1 Km	24.3	87.3	Agri & domestic use
2027NEW001	c. 0.65 to the north-east	Mar, 1963	1 Km	38.7	Failure	-
2027NEW007	c. 1.60 to the north-east	Dec, 1899	2 Km	27.4	48	-
2027SWW115	c. 2 Km to the north-west	Oct, 1956	1 Km	25.6	78.5	Agri & domestic use

9.6.4.12 Designated Sites

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There are several types of designated sites in Ireland:

- Special Areas of Conservation (SACs) - areas designated under the EU Habitats Directive to protect habitats and species of European importance;
- Special Protection Areas (SPAs) - areas designated under the EU Birds Directive to protect bird species and their habitats;
- Natural Heritage Areas (NHAs) / Proposed Natural Heritage Areas (pNHAs) - sites designated or proposed designated sites by the Irish government for their natural heritage value, including unique habitats, species, or geological formations.

The main designated sites within the c. 5 Km of the site, that are within the same surface water catchment are listed in Table 9-15. A map of the designated sites is shown in Figure 9-12.

The main designated sites deemed to have hydrological and/or hydrogeological connectivity to the Proposed Development are the Ballykenny-Fisherstown Bog SPA/ Lough Forbes Complex pNHA and Brown Bog SAC.

Table 9-15 Designated Sites

Site Name	Type of Designated Site	Site Code	Proximity to Site	Hydrological / Hydrogeological Connection	Screen In / Screen Out
Carrickglass Demesne	pNHA	001822	0.93 Km to the south-east	N/A - known for its historical and cultural significance	Screen Out
Royal Canal	pNHA	002103	3.39 Km to the south-west	Downstream of the Camlin River but contributes to it via a separate, unconnected stream. Located in a different aquifer from the site, classified as a Locally Important Aquifer - Bedrock that is only moderately productive in specific local zones (Ll). Connectivity expected to be limited.	Screen Out
Ballykenny-Fisherstown Bog	SPA	004101	4.59 Km to the west	Direct connectivity, Camlin River flows through the south of the site. Within the same Regionally Important Aquifer – Karstified (conduit).	Screen In

Site Name	Type of Designated Site	Site Code	Proximity to Site	Hydrological / Hydrogeological Connection	Screen In / Screen Out
Lough Forbes Complex	pNHA	001818	4.59 Km to the west	Direct connectivity, Camlin River flows through the south of the site. Within the same Regionally Important Aquifer – Karstified (conduit).	Screen In
Brown Bog	SAC	002346	5.02 Km to the south-west	Upgradient of the Camlin River so no hydrological connectivity. Within the same Regionally Important Aquifer – Karstified (conduit).	Screen Out

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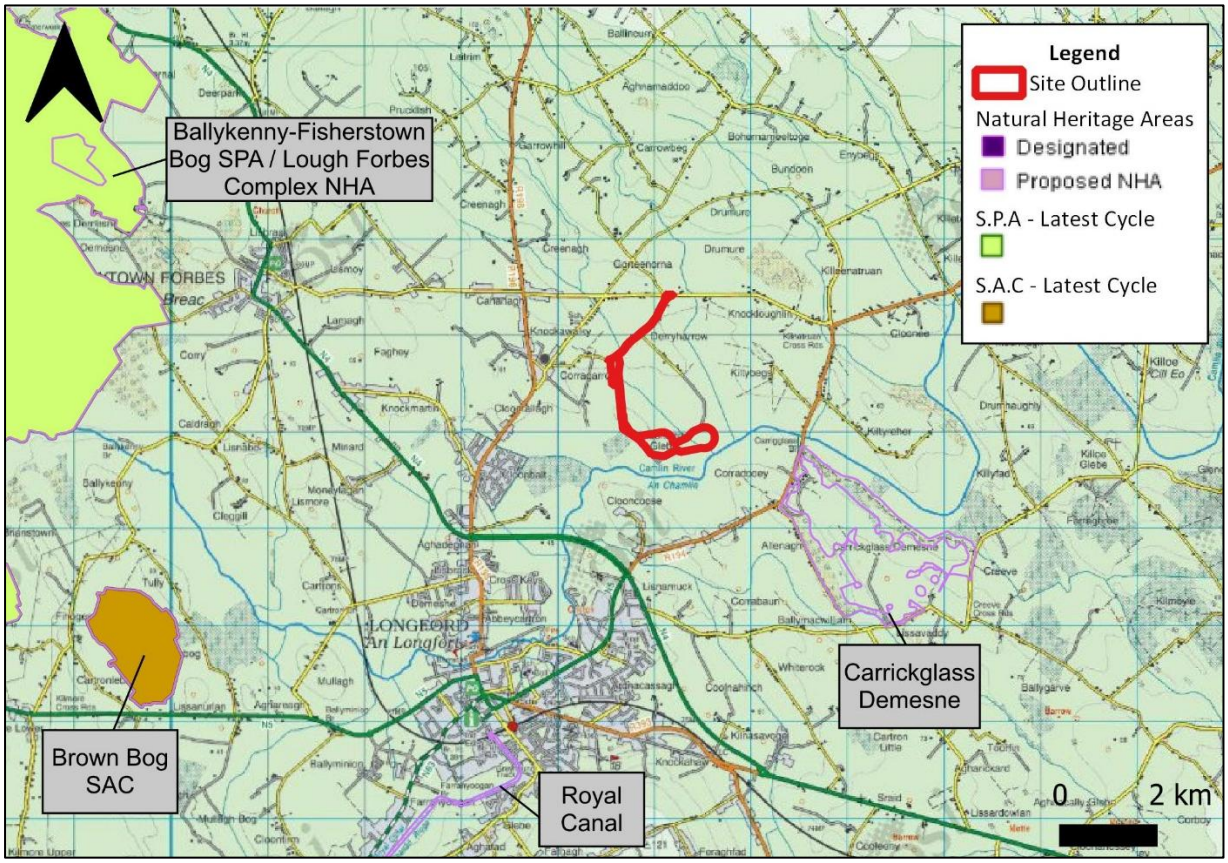


Figure 9-12 Designated Sites

9.6.4.13 Receptor Sensitivity

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According to the criteria in Table 9-4, the Regionally Important Aquifer – Karstified (conduit) beneath the site is classified as being of Very High Importance. The main hydrogeological risks are potential hydrocarbon spills and/or leaks from equipment during the construction and operation of the wind farm.

9.6.5 Hydrological and Hydrogeological Conceptual Model

A conceptual site model was developed, using data collected from the desk based study, site walk over, drawings and available site investigation information. The conceptual model is summarised below and is shown in Figure 9-13 in graphical format.

- The site is approximately 2.9 km north-north-east of Longford and 3.8 km east-south-east of Newtown Forbes, covering an area of 17.28 hectares.
- The Proposed Development consists of predominantly agricultural land (cattle grazing and coniferous forestry) to the south; several one-off houses and amenities, including Melview National School, within 500 m to the northwest.
- The site is relatively flat with a slight elevation of around 50 mOD, featuring a small mound in the south-west corner.
- Hydrology:
    - The site is within the Upper Shannon river basin (WFD Sub-Catchment of Shannon[Upper]_SC_060.), close to the Camlin River, which is a tributary of the River Shannon.
    - The unnamed stream (EPA Code: IE_SH_26C010800) and the Derryharrow stream are primary features impacted by the Proposed Development, both flowing into the Camlin 26 stream to the south.
    - The surface water bodies adjacent to the site generally have 'Good' ecological status, except the Moneylagan watercourse, which has 'Moderate' status and is 'At Risk' due to various pressures.
    - The proposed site features numerous drainage ditches that facilitate surface water runoff into local streams, largely influenced by the topography.
    - Three monitoring points (SW1, SW2, SW3) were established to assess baseline surface water quality. Surface water samples indicate elevated ammoniacal nitrogen, orthophosphate and total phosphorus, which exceeded good status thresholds at most locations. Biological Oxygen Demand (BOD) values were low across samples, which along with other parameters (e.g. electrical conductivity) suggesting generally good water quality.
    - Groundwater recharge rates were estimated between 12.8 mm/yr (area to the south-east of the site where T2 infrastructure is proposed) and 70.5 mm/yr (for the majority of the site including the Substation and T1). Recharge is largely depending on local soil/subsoil, which has implications for surface runoff.
    - Historical flood mapping indicated no recurring flood incidents within the site, though some low-lying areas near the River Camlin are at higher risk. Flood risk from fluvial events is considered high, particularly from the River Camlin.

- The Site Specific Flood Risk Assessment (SSFRA) has concluded that while part of the Proposed Development, particularly turbine no. 2, is located within Flood Zones A and B, the development is not expected to adversely impact the local hydrological regime or increase flood risk elsewhere.
- The hydrological environment is classified as High Importance due to the Camlin River's ecological health (Q-rating 3-4) and role in local flood management.
- The main surface water contamination risks include increased sediment runoff and potential hydrocarbon leaks from construction activities.

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- Hydrogeology:
  - The site is underlain by Visean Undifferentiated Limestone, classified as a Regionally Important Karstified Aquifer. A geological fault located south of the Camlin River separates this from Argillaceous Limestones, which form a Locally Important Aquifer that is moderately productive.
  - The site is underlain by the Newtown Forbes Groundwater Body (GWB) which covers 80 km², and primarily features karstic limestone with high permeability. Recharge is mainly diffuse from rainfall but limited in areas with extensive peat cover.
  - Newtown Forbes GWB consistently rated as 'Good' and 'Not at Risk' with no significant pressures reported.
  - The GSI apply a recharge coefficient of 22% generally; however, the south-east area of the site has a lower value of 4% corresponding to the cut-over bog soil/subsoil. Recharge likely greatest in the southeast with thinner subsoils.
  - Groundwater vulnerability is rated as Moderate in most areas; but High in southeast (where T2 infrastructure is proposed). Subsoil thickness influences vulnerability ratings (thinner soils = higher risk).
  - During the site investigations groundwater encountered at depths of 2.80 m and 3.30 m at the T2 location in the south east of the site. Groundwater was not encountered in the area of the proposed Substation or T1.
  - Groundwater flow direction generally towards the Camlin River, with lower drainage in the south east due to peat's permeability.
  - No karst features mapped within 2 km of the site; but the potential of their presence exists due to soluble limestone bedrock.
  - No Group Water Schemes or Public Water Supplies within 2 km; some private wells identified.
  - Several designated sites within 5 km, with notable hydrological connectivity to the Ballykenny-Fisherstown Bog SPA and Lough Forbes Complex pNHA.
  - The hydrogeological environment is classified as Very High Importance due to the karst aquifer;
  - The main risks include hydrocarbon spills during construction and operation.

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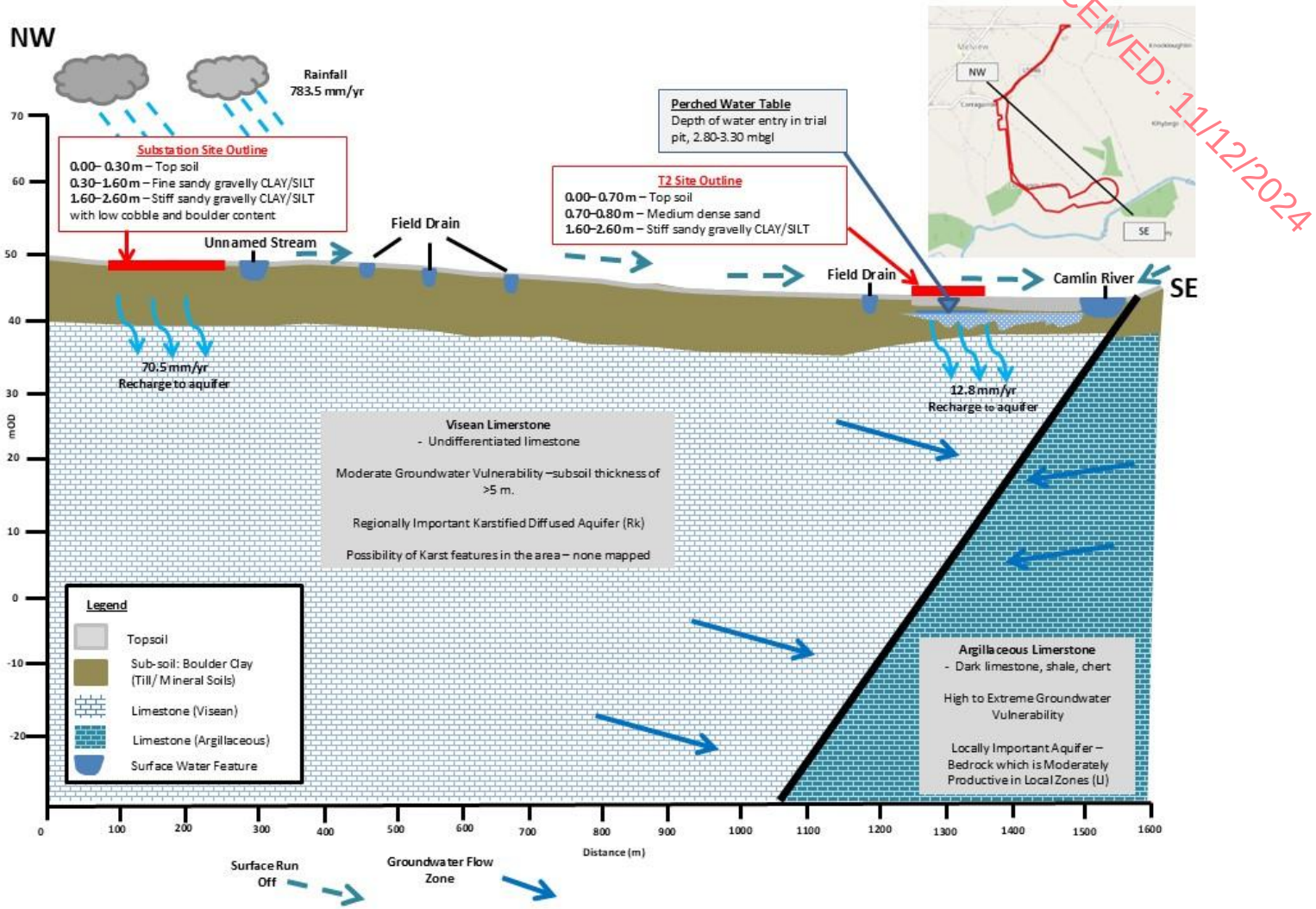


Figure 9-13 Hydrological and Hydrogeological Conceptual Model

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9.7 The 'Do Nothing' Scenario

If the Proposed Development were not to proceed, the site would remain as a greenfield site, continuing to be used for agriculture.

9.8 Potential Significant Effects

As outlined in Section 9.3.1, the relevant aspects of the Proposed Development that could potentially impact the water environment are identified. The following sections incorporate these elements with the developed conceptual model for the site's water environment per Section 9.6.5.

9.8.1 Construction Phase

The site is a greenfield site, therefore the construction phase will involve construction of site access roads (temporary and permanent), removal of vegetation and soil/subsoil to accommodate foundations for infrastructure including for the Substation, T1 and T2 turbines and temporary construction compound etc. The following are potential impacts of the proposed development on natural hydrological and hydrogeological processes and water quality during construction.

9.8.1.1 Possible Impacts on Groundwater Vulnerability

Based on the geophysical survey carried out as part of the site investigations the thickness of soil/subsoil overburden is between 10 m to 20 m in the area around T1 and the Substation infrastructure, and between 5 m to 10 m in the area around T2 infrastructure. The subsoils beneath the site were confirmed to be of low (at T1 and the Substation) to moderate (at T2) permeability. The area where the proposed infrastructure for T2 is proposed is more vulnerable because the subsoils are not as thick in this area of the site.

The Proposed Development will involve removal of low permeability cut-over bog soil/subsoil in the area of T2, currently used for agriculture which will increase the groundwater vulnerability and thus recharge to the underlying Regionally Important Karstified Aquifer which is regarded as being of Very High Importance. Top soil is mapped as having a thickness < 0.70 m in this area. The underlying medium dense sand and stiff sandy gravelly clay/silt would have a higher permeability.

Additionally, there is a possible perched water in the area of T2 (groundwater occurred at 2.80-3.30 mbgl in the trial pits). When foundations are excavated, especially in the areas of the perched water table it may disrupt this upper layer, causing the perched water to drain into deeper soil layers or subsoil. However, the foundations of the T2 turbine are 0.6 mbgl; well above the anticipated perched water table.

Pathway: Infiltration via Subsoil

Receptor: Regionally Important Karstified Aquifer.

Pre-Mitigation Potential Effect: Negative, Significant, Likely, Temporary and Indirect.

9.8.1.2 Surface and Groundwater Contamination from Oil/Fuel Spills and Leaks

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Heavy machinery used for earthworks, turbine foundation construction, and road building often requires oil and fuel for operation. Spills can occur from leaks, accidents, or improper handling of these materials. Additionally, excavation activities and earthworks involved in the proposed grid connection, particularly horizontal directional drilling (HDD) at river crossings—may result in the unintended release of drilling fluid into surface water. Oil and fuel spills can be toxic to aquatic ecosystems and negatively affecting water quality.

Wastewater/greywater will be generated from the temporary construction compound during the construction phase. Untreated or improperly managed wastewater may contain contaminants such as oils, greases, detergents, chemicals, and nutrients that can runoff into nearby water bodies, leading to water pollution. Inadequate wastewater management (e.g., from leaking) could result in contamination of groundwater resources, especially into the Regionally Important Aquifer underlying the site.

Pathway: Surface runoff, soil/subsoil infiltration

Receptor: Camlin river, Ballykenny-Fisherstown Bog SPA and Regionally Important Karstified Aquifer.

Pre-Mitigation Potential Effect: Negative, Slight, Likely, Long-term and Direct.

9.8.1.3 Earthworks Leading to the Mobilization of Suspended Solids into Surface Waterbodies

Construction phase activities, including the construction of access roads (both permanent and temporary), the two turbine bases and hardstanding areas including piling for the foundation at T2, temporary compound, meteorological mast, substation, internal cable routes etc., will involve excavation of earthworks including 5 m to 10 m of moderate permeability, predominantly stiff SILT/CLAY where the turbine lies within a flood zone (at T2) and mineral subsoil where present. Additionally, excavation activities and earthworks as part of the proposed potential grid connections, particularly horizontal directional drilling (HDD) at river crossings can lead to soil displacement and compaction and can create additional pathways for transport of contaminants, increasing the risk of erosion and sedimentation, particularly near riverbanks and sensitive areas and increasing the risk of groundwater contamination. This can degrade water quality. The excavated material presents a significant potential source of sediment-laden runoff. Additional sources of sediment include:

- Drainage and seepage from excavation areas;
- Stockpiled excavated material acting as point sources of exposed sediment;
- Erosion from newly constructed site drainage channels.

These activities will lead to the mobilization of suspended solids into surface waters, increasing sediment loads and turbidity, potentially affecting downstream water quality. Without the implementation of appropriate mitigation measures, the potential impacts on the downstream watercourses (i.e. Camlin River) could be significant.

Pathway: Surface runoff

Receptor: Camlin river

Pre-Mitigation Potential Effect: Negative, Significant, Likely, Temporary, and Direct.

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9.8.1.4 Potential Effects on Surface and Groundwater WFD Status

The Shannon[Upper] _SC_060 achieved 'Good' status in the latest WFD cycle (2016-2021) and was deemed to be 'Not at Risk' of failing to meet its WFD objectives. The EPA monitoring point c. 700 m upstream of the site achieved a Q-rating of 3-4, deemed 'Moderate' status in the latest WFD monitoring round (2020) and the closest downstream monitoring point on the Camlin 26 c. 4 Km to the Proposed Development achieved a Q-rating of 4, deemed 'Good' status in the latest WFD monitoring round (2020).

There is potential for the generation of suspended sediment in surface water runoff during the construction phase. Excavating for turbine foundations, and grading for access roads all expose soil that was previously protected by vegetation or topsoil. Once exposed, the soil becomes more susceptible to erosion, particularly during heavy rain. Loosening the soil, makes it easier for rainfall or surface water to pick up and carry fine particles away, leading to an increase in sediment entering surface water bodies which drain into the Camlin River.

The Q-rating of water bodies is linked to the biological quality of these ecosystems, and an increase in sediment could lower the Q-rating at downstream monitoring points. For instance, the downstream Camlin River monitoring point, which has "Good" status (Q4), could be pushed into moderate or worse conditions if it receives excessive sediment inputs.

Pathway: Surface runoff

Receptor: Camlin river

Pre-Mitigation Potential Effect: Negative, Imperceptible, Likely, Temporary, and Indirect.

9.8.1.5 Potential Effects on Natural Infiltration and Groundwater Recharge

The construction of foundations, hard-standing areas for the wind turbines and associated infrastructure will require significant excavation, potentially altering the existing local surface and subsurface drainage. The impermeable surfaces created by hard-standing areas will alter the natural infiltration rates, potentially increase surface runoff and affecting groundwater recharge outfalls of the drainage system) plus in the unnamed stream which will run through the T2 infrastructure and the Camlin River.

Pathway: Surface runoff

Receptor: Camlin river

Pre-Mitigation Potential Effect: Negative, Significant, Likely, Temporary, and Direct.

9.8.2 Operational Phase

9.8.2.1 Increased Storm Water Run-off

The impermeable surfaces created by hard-standing areas such as from the wind turbines and substation and associated infrastructure will alter the natural infiltration rates, potentially increasing

surface runoff and affecting groundwater recharge. However, the area where T2 is located to the south-east of the site is currently characterised by lower permeability till soil/subsoil so the impact surface water drainage pattern in this area is likely to be limited.

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Pathway: Surface runoff

Receptor: Camlin river

Pre-Mitigation Potential Effect: Negative, Significant, Likely, Long-term and Indirect.

9.8.2.2 Potential Impacts on Surface Water Quality

Routine maintenance of turbines and equipment may involve the use of lubricants or chemicals, in addition to small quantities of oil used for cooling of the transformers which can accidentally spill and contaminate water sources if not managed properly. Similarly, the need to maintain clear areas around the site when operation may involve use of herbicides or mechanical clearing, which could affect nearby waterways if not properly controlled. Waste generated during operation, including any hazardous materials, must be managed carefully to prevent leachate or runoff from contaminating surface water.

Pathway: Surface runoff

Receptor: Camlin river

Pre-Mitigation Potential Effect: Negative, Significant, Likely, Medium-term and Indirect.

9.8.2.3 Potential Impacts on Groundwater Quality

Hydrocarbons used for cooling of turbines or as fuel for machinery around the site may infiltrate the soil/subsoil through accidental spill age resulting in contamination of the aquifer if not managed properly.

Wastewater/greywater facilities will not be onsite therefore it is not envisaged that the operation period will involve significant impacts on groundwater quality as a result of this input.

Pathway: Surface runoff, soil/subsoil infiltration

Receptor: Camlin river, Ballykenny-Fisherstown Bog SPA and Regionally Important Karstified Aquifer.

Pre-Mitigation Potential Effect: Negative, Slight, Likely, Long-term and Indirect.

9.8.2.4 Potential Impacts on Designated Sites

The Ballykenny-Fisherstown Bog SPA is hydrologically connected to the site via the Camlin River. The site is also hydrogeologically connected to the SAC via the underlying Regionally Important Aquifer. The Proposed Development has the potential to adversely impact the water environment in the vicinity of the site, therefore can impact this SAC.

Pathway: Surface runoff, soil/subsoil infiltration

Receptor: Camlin river, Ballykenny-Fisherstown Bog SPA and Regionally Important Karstified Aquifer.

Pre-Mitigation Potential Effect: Negative, Slight, Likely, Long-term and Indirect.

9.8.2.5 Potential Impacts on WFD Status

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There is slight potential for the generation of suspended sediment in surface water runoff during the operation phase, perhaps if there was heavy rain fall or flooding events,

The Q-rating of water bodies is linked to the biological quality of these ecosystems, and an increase in sediment could lower the Q-rating at downstream monitoring points. For instance, the downstream Camlin River monitoring point, which has "Good" status (Q4), could be pushed into moderate or worse conditions if it receives excessive sediment inputs.

Pathway: Surface runoff

Receptor: Camlin river

Pre-Mitigation Potential Effect: Negative, Slight, Likely, Temporary and Indirect.

9.8.3 Decommissioning

The Pre-Mitigation Potential Effects and rating associated with decommissioning and reinstatement works are the same as those associated with the construction phase (refer to Section 9.8.1). The removal of wind turbines, above ground structures, and hardstands may disturb subsurface hydrological pathways, leading to alterations in groundwater recharge rates or flow directions. Improper reinstatement of drainage systems or soil compaction during decommissioning activities could result in increased surface runoff, ponding, or localized flooding, potentially impacting downstream waterbodies. Additionally, there is a risk of contamination to surface and groundwater from accidental spills of oil, fuel, or other hazardous substances used during decommissioning operations.

No additional potential impacts during decommissioning are likely to occur.

9.8.4 Cumulative Effects

IE Consulting has reviewed the interaction between the Proposed Development and other planned or permitted projects in the area on the water environment, as outlined in Appendix 1.2 "*Culmulative Impact Project and Plans Report*" as part of the assessment process. Several minor developments, mostly related to residential construction and extensions, were identified but were not expected to significantly contribute to cumulative impacts. Larger developments such as quarries, solar farms, and other wind farms within a broader area (up to 20 km away) were also assessed for their potential cumulative effects.

The "Zone of Influence" (ZoI), of the water environment is considered as confined to the WFD Catchment area of Upper Shannon which is part of the Upper River Shannon river basin, more specifically the WFD Sub-Catchment of Shannon[Upper]_SC_060 and the Regionally Important Aquifer– Karstified (conduit) (Rkc) which underlies the Proposed Development.

The other nearby developments (such as quarries and solar farms) are either too far distance or are unlikely to interact with the water systems in such a way that would cause significant cumulative effects.

The subject site falls within the jurisdiction of Longford County Council and is governed by the Longford County Development Plan 2021–2027 (LCDP). Longford County Council is currently developing a new 6-year Local Area Plan (LAP) for Longford Town for 2023–2029. Based on the Draft LAP published in September 2024 the Proposed Development is located outside the LAP boundary and, therefore, is not included in the cumulative effects assessment.

No significant hydrological and/or hydrogeological cumulative effects will occur.

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9.8.5 Summary

The following Table 9-16 summarises the identified likely significant effects during the construction phase of the Proposed Development before mitigation measures are applied.

Table 9-16 Summary of Construction Phase Likely Significant Effects in the absence of mitigation

Likely Significant Effect	Quality	Significance	Extent	Probability	Duration	Type
Possible Impacts on Groundwater Vulnerability	Negative	Significant	Regionally Important Karstified Aquifer and perched water table below T2	Likely	Temporary	Indirect
Surface and Groundwater Contamination from Oil/Fuel Spills and Leaks	Negative	Slight	Camlin river, Ballykenny-Fisherstown Bog SPA and Regionally Important Karstified Aquifer.	Likely	Long term	Indirect
Earthworks Leading to the Mobilization of Suspended Solids into surface Waterbodies	Negative	Significant	Camlin River	Likely	Temporary	Direct
Potential Effects on Surface and Groundwater WFD Status	Negative	Imperceptible	Camlin River	Likely	Temporary	Direct
Potential Effects on Natural Infiltration and Groundwater Recharge	Negative	Significant	Camlin River	Likely	Temporary	Direct

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Table 9-17 summarises the identified likely significant effects during the operational phase of the Proposed Development before mitigation measures are applied.

Table 9-17 Summary of Operational Phase Likely Significant Effects in the absence of mitigation

Likely Significant Effect	Quality	Significance	Extent	Probability	Duration	Type
Increased Storm Water Run-off	Negative	Significant	Camlin River	Likely	Long-term	Indirect
Potential Impacts on Surface Water Quality	Negative	Significant	Camlin River	Likely	Medium-term	Indirect
Potential Impacts on Groundwater Quality	Negative	Slight	Camlin river, Ballykenny-Fisherstown Bog SPA and Regionally Important Karstified Aquifer.	Likely	Long term	Indirect
Potential Impacts on Designated Sites	Negative	Slight	Camlin River	Likely	Long term	Indirect
Potential Impacts on WFD Status	Negative	Slight	Camlin River	Likely	Temporary	Indirect

The potential impacts associated with decommissioning are the same as those associated with the construction phase. No additional potential impacts during decommissioning are likely to occur.

9.9 Mitigation Measures

9.9.1 Incorporated Design Mitigation

The main mitigation strategy involves strategically designing the wind farm layout to minimize environmental impact. Turbines, access roads, material storage areas, and other infrastructure have been situated on agricultural lands and areas of minor forestry, where the soil has already been heavily utilized and drained. This approach keeps the development away from residential zones and sensitive commercial properties. Additionally, to lessen the effects on soil and geological conditions, the infrastructure has been placed in locations where there are no organic soils and where slopes are gentle. Furthermore, key infrastructure has been intentionally set back from designated watercourses and other sensitive natural features to prevent potential disturbances.

The incorporated design mitigation measures, specifically addressing the hydrological and hydrogeological environment, include a range of strategies around surface water and groundwater management, in additional to flood zone mitigation measures. These measures aim to control surface runoff, reduce sediment pollution, and protect both surface water and groundwater resources during the construction phase.

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Key mitigation measures outlined include the following:

9.9.1.1 Surface Water Management

Before construction begins, several erosion control measures will be put in place to minimize environmental impact during site preparation. These measures are designed to prevent soil erosion and the movement of loose sediment, which can be carried away by rainwater runoff. By implementing techniques such as silt fences, sediment barriers, and temporary drainage channels, the construction team can effectively control water flow and stabilize exposed soil areas. Additionally, vegetative cover or erosion control blankets may be used on vulnerable slopes to further reduce the risk of soil displacement. These steps are essential to prevent sediment-laden runoff from polluting nearby water bodies, protecting local ecosystems and maintaining water quality.

Interceptor drains will allow the separation of clean water (e.g., natural rainwater flow) from potentially contaminated water that has come into contact with construction activities. By directing clean water away from construction zones, these drains reduce the risk of mixing with polluted runoff. This separation is vital as it ensures that sediment-laden or chemically impacted water does not enter local watercourses, maintaining the quality of nearby streams, rivers, and groundwater.

Temporary settlement ponds allow water to sit temporarily, giving sediments time to settle at the bottom before the clearer water is discharged. This process significantly reduces the volumn of suspended solids that could otherwise enter and pollute nearby water bodies.

9.9.1.2 Groundwater Management

The establishment of buffer zones around water bodies provides an extra layer of protection against contamination. These buffer zones act as natural barriers, creating a safe distance between construction activities and nearby streams, rivers, or wetlands. Vegetative cover within these zones helps absorb runoff, filter out sediments, and reduce the flow of potentially polluted water. This approach not only protects aquatic habitats but also helps maintain the overall health and quality of the surrounding water environment.

9.9.1.3 Flood Zone Mitigation

To mitigate flooding risks during construction, a flood protection berm will be positioned outside the Turbin base of T2. The berm, which consist of raised barrier of compacted soil or rock, is constructed around the excavation area to divert stormwater away and prevent water from inundating the worksite. By channelling excess water away from vulnerable zones (Flood Zone “A” and Flood Zone “B”), the berm helps to safeguard both the construction site and the surrounding environment from flood-related damage.

Alongside the berm, temporary drainage systems are installed to effectively manage stormwater runoff, especially in flood-prone areas. These systems include features like drainage channels, culverts, and sediment traps that help control water flow and direct it safely away from critical infrastructure. The drainage setup minimizes the risk of water accumulation, reducing the potential for erosion and contamination of nearby water bodies.

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9.9.2 Construction Phase Mitigation

9.9.2.1 Possible Impacts on Groundwater Vulnerability

There is a very slight increase in groundwater vulnerability (but may not impact the overall rating) in the south-east of the site where soil is thinner and is mapped as Moderate (i.e. low permeability, soil/subsoil thickness between 5 m to 10 m). In the remainder of the site the groundwater vulnerability is deemed low with soil thickness more than 10 m.

The primary mitigation for groundwater vulnerability involves implementing best practices for oil use and machinery refuelling to prevent any contamination of groundwater.

All construction phase activities on-site will be carried out in strict accordance with a detailed Environmental Management Plan (EMP). The EMP will serve as a dynamic, working document, regularly updated to reflect current conditions and project needs. It will govern all operations on-site, ensuring that environmental protection measures are effectively implemented and maintained throughout the construction process. The plan will outline specific protocols for managing potential environmental impacts, including waste management, erosion control, pollution prevention, and spill response, while also ensuring compliance with all relevant environmental regulations and guidelines."

9.9.2.2 Surface and Groundwater Contamination from Oil/Fuel Spills and Leaks

Mitigation will include the following:

- All plant and machinery will be serviced before being granted access to the site;
- Designate specific areas for refuelling and maintenance in a controlled manned, located on impervious surfaces/bunded trays to prevent spills from spilling / seeping into the ground;
- Only trained personnel will handle refuelling and maintenance to reduce the likelihood of accidental spills;
- A comprehensive spill response plan and procedures will be in place, that can be actioned in the event of an accident or emergency;
- Refuelling and equipment maintenance will be prohibited near watercourses or drainage areas to minimise contamination risks;
- All drilling operations will be closely controlled, with continuous monitoring of fluid returns to ensure minimal impact and prompt response to any issues;
- All drilling fluid and lubricants shall be biodegradable and non-toxic;
- Silt fencing should be in place to prevent contaminated runoff from reaching surface water;
- 20 m buffer zones should be in place around all watercourses where possible;
- All activities will be completed in line with the EMP.

- Wastewater/greywater from the temporary construction compound will be transferred offsite by a suitably licensed wastewater facility for treatment and disposal.

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9.9.2.3 Earthworks Leading to the Mobilisation of Suspended Solids into Surface Waterbodies

The proposed construction phase is short term.

Silt fencing will be installed prior to commencement of works, around the perimeter of the work site and along watercourses boundaries (including field drains where there is connectivity to the streams adjacent to the site which drain into the Camlin River) to capture and retain sediment before it enters surface waters. These silt fences will be embedded into the local soil to ensure water is adequately captured and filtered reducing the likelihood of suspended sediment in surface water being transferred into the local watercourses and field drains.

Daily monitoring and inspections of runoff, plus surface water near construction sites will be completed to detect any increases in suspended solids and take immediate corrective actions.

Earthmoving activities will be ceased during heavy rainfall to reduce the likelihood of erosion and runoff. Construction activities will be planned where possible during dry periods of low rainfall to minimise the risk of erosion and sediment mobilisation caused by heavy rain.

Disturbed areas will be revegetated as quickly as possible once earthworks are completed to promote natural soil stabilisation and reduce sediment runoff.

All groundworks should be completed in line with the CEMP.

9.9.2.4 Potential Effects on Surface and Groundwater WFD Status

Strict mitigation measures regarding hydrocarbon use and the prevention of increased suspended solids during the construction phase will ensure the protection of the Surface and Groundwater Water Framework Directive (WFD) status. The Proposed Development will not result in any changes to the volume or chemical status of surface and groundwater, ensuring no alteration to their WFD status. Consequently, the development complies with the requirements of the WFD (2000/60/EC).

At construction stage, there will be no direct discharge to streams or rivers. All runoff from work areas will pass through an in-line water treatment system before being released via buffered outfalls to vegetated natural surfaces.

9.9.2.5 Mitigation Measures for Construction Activities in Flood-Prone Areas

The turbine T2 is located within a delinated Flood Z “A” and Flood Zone “B”; primarily attributable to an extreme fluvial flood event in the Camlin River to the south of the site. To address potential flood-related risks during construction, the following mitigation measures will be implemented:

- **Topsoil and Subsoil Management**: all topsoil and subsoil excavated during construction will be stored outside of the flood zone area to prevent loss or contamination during flooding events.
- **Flood Protection Berm**: a flood protection berm will be constructed around the excavation area for T2 to shield it from potential floodwaters.

- **Material Storage**: construction materials will either be stored within the protection berm or in areas outside the flood zone to ensure they remain dry and uncontaminated during flood events.
- **Temporary Drainage Systems**: temporary drainage infrastructure will be installed to effectively manage stormwater runoff, preventing water accumulation and mitigating localized flooding during periods of heavy rainfall.
- **Reinforcement Stability:** measures will be taken to secure all reinforcements, ensuring they are properly anchored and remain stable during **potential** flooding scenarios.
- **Seasonal Scheduling/ Weather Warnings:** concrete pouring and other critical construction activities will be scheduled for the drier summer months to minimize the risk of flooding-related disruptions and to improve construction efficiency. Additionally, All procedures outlined in Environmental Management Plan (EMP) 11 will be strictly followed when Met Éireann issues a weather warning, ensuring proactive response to extreme weather conditions.

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9.9.3 Operational Phase Mitigation

9.9.3.1 Increased Storm Water Run-off

The proposed infrastructure will attenuate storm water so that any increase in discharge volume during storm events are gradual and controlled, preventing an increase in the flood risk downstream. Drainage discharge points will be inspected and managed throughout the Operational stage of the project.

9.9.3.2 Potential Impacts on Surface Water Quality

The Proposed Development will incorporate a comprehensive water management system specifically designed to prevent surface water contamination from suspended solids, hydrocarbons, and other pollutants.

This system will include features such as sediment control measures, oil-water separators, and filtration mechanisms to ensure that runoff from operational activities is properly managed. By capturing and treating any potential contaminants before they enter nearby watercourses, the system will maintain water quality and protect aquatic ecosystems.

All maintenance activities on site will be completed in accordance with the EMP.

9.9.3.3 Potential Impacts on Groundwater Quality

Mitigation will include the following:

- All plant and machinery will be serviced before being granted access to the site;
- Designate specific areas for refuelling and maintenance in a controlled manned, located on impervious surfaces/bunded trays to prevent spills from spilling / seeping into the ground;
- Only trained personnel will handle refuelling and maintenance to reduce the likelihood of accidental spills;

- A comprehensive spill response plan and procedures will be in place, that can be actioned in the event of an accident or emergency;
- Refuelling and equipment maintenance will be prohibited near watercourses or drainage areas to minimise contamination risks;
- Silt fencing should be in place to prevent contaminated runoff from reaching surface water;
- 20 m buffer zones should be in place around all watercourses where possible;
- Avoid use of herbicides for vegetation control around turbines and access roads. Where herbicides are necessary, use environmentally friendly alternatives and apply them following strict guidelines to prevent infiltration into groundwater;
- Conduct baseline groundwater quality testing before the wind farm becomes operational to establish existing conditions;
- Implement a regular groundwater monitoring program to detect any potential contamination early and take immediate corrective action;
- All activities will be completed in line with the EMP.

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9.9.3.4 Potential Impacts on Designated Sites

Implementation of the mitigation measures for protection of surface and groundwater as outlined in Section 9.9.2.2 and Section 9.9.2.3 will ensure that Ballykenny-Fisherstown Bog SPA will not be affected by the Proposed Development.

9.9.3.5 Potential Impacts on WFD Status

Strict mitigation measures regarding hydrocarbon use and the prevention of increased suspended solids during the operation phase will ensure the protection of the Surface and Groundwater Water Framework Directive (WFD) status. The Proposed Development will not result in any changes to the volume or chemical status of surface and groundwater, ensuring no alteration to their WFD status. Consequently, the development complies with the requirements of the WFD (2000/60/EC).

At the operational stage, there will be no direct discharge to streams or rivers. All runoff from work areas will pass through an in-line water treatment system before being released via buffered outfalls to vegetated natural surfaces.

9.9.4 Decommissioning Phase Mitigation

Any impact that occurs during the decommissioning phase will be similar the construction phase. Thus, the mitigation measures outlined for the construction phase will also be implemented during the decommissioning phase.

9.10 Residual Impact Assessment

This section assesses potential significant environmental impacts which remain after mitigation measures are implemented.

9.10.1 Construction Phase

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9.10.1.1 Possible Impacts on Groundwater Vulnerability

The construction of foundations for turbines and access roads will cause localised changes to the natural groundwater flow patterns. Impacts will typically be minimal and localised, but there will be minor residual changes to the recharge rates to the groundwater aquifers beneath the site.

The residual effect is considered to be Negative, Not Significant, Likely, Temporary and Indirect.

9.10.1.2 Surface and Groundwater Contamination from Oil/Fuel Spills and Leaks

Despite implementing spill containment and response measures, there is always a slight residual risk of accidental spills of oil, fuel, or chemicals during construction activities. Small leaks or spills may still occur and, if not immediately contained, could infiltrate the ground and impact groundwater.

The residual effect will be Negative, Imperceptible, Unlikely, Short-term and Indirect.

9.10.1.3 Earthworks Leading to the Mobilization of Suspended Solids into Surface Waterbodies

Earthworks have the potential to result in elevated concentrations of suspended solids in surface water runoff. The measures outlined in Section 9.9.1.3 will mitigate the risk of suspended solids entering the watercourses.

The residual effect will be Neutral, Imperceptible, Unlikely, Short-term and Indirect.

9.10.1.4 Potential Effects on Surface and Groundwater WFD Status

Strict mitigation measures as outlined in Section 9.9, regarding hydrocarbon use and the prevention of increased suspended solids during the construction phase will ensure the protection of the Surface and Groundwater Water Framework Directive (WFD) status. The Proposed Development will not result in any changes to the volume or chemical status of surface and groundwater, ensuring no alteration to their WFD status. Consequently, the development complies with the requirements of the WFD (2000/60/EC).

At construction stage, there will be no direct discharge to streams or rivers. All runoff from work areas will pass through an in-line water treatment system before being released via buffered outfalls to vegetated natural surfaces.

The residual effect will be Neutral, Imperceptible, Unlikely, Short-term and Indirect.

9.10.2 Operational Phase

9.10.2.1 Increased Storm Water Run-off

With the implementation of mitigation measures outlined in Section 9.9, the residual impact is Negative, Imperceptible, Unlikely, Medium-term and Indirect.

9.10.2.2 Potential Impacts on Surface Water Quality

With the implementation of mitigation measures outlined in Section 9.9, the residual impact is Negative, Imperceptible, Unlikely, Medium-term and Indirect.

9.10.2.3 Potential Impacts on Groundwater Quality

With the implementation of mitigation measures outlined in Section 9.9, the residual impact is Negative, Imperceptible, Unlikely, Medium-term and Indirect.

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9.10.2.4 Potential Impacts on Designated Sites

With the implementation of mitigation measures outlined in Section 9.9, the residual impact is Negative, Imperceptible, Unlikely, Medium-term and Indirect.

9.10.2.5 Potential Impacts on WFD Status

With the implementation of mitigation measures outlined in Section 9.9, the residual impact is Negative, Imperceptible, Unlikely, Medium-term and Indirect.

9.10.3 Decommissioning Phase

Any residual impacts that occur during the decommissioning phase will be similar to the construction phase. Thus, the residual impacts outlined for the construction phase will also be applicable.

9.10.4 Summary of Post-mitigation Effects

The following Table 9-18 summarises the identified likely significant residual effects during the construction phase of the Proposed Development following the application of mitigation measures.

Table 9-18 Summary of Construction Phase Effects Post Mitigation

Likely Significant Effect	Quality	Significance	Extent	Probability	Duration	Type
Possible Impacts on Groundwater Vulnerability	Negative	Not Significant	Regionally Important Karstified Aquifer and perched water table below T2	Likely	Temporary	Indirect
Surface and Groundwater Contamination from Oil/Fuel Spills and Leaks	Negative	Imperceptible	Camlin river, Ballykenny-Fisherstown Bog SPA and Regionally Important Karstified Aquifer.	Unlikely	Short-term	Indirect
Earthworks Leading to the Mobilization of Suspended Solids into	Neutral	Imperceptible	Camlin River	Unlikely	Short-term	Indirect

Likely Significant Effect	Quality	Significance	Extent	Probability	Duration	Type
Surface Waterbodies						
Potential Effects on Surface and Groundwater WFD Status	Neutral	Imperceptible	Camlin River	Unlikely	Short-term	Indirect

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The following Table 9-19 summarises the identified likely residual significant effects during the operational phase of the Proposed Development post mitigation.

Table 9-19 Summary of Operational Phase Effects Post Mitigation

Likely Significant Effect	Quality	Significance	Extent	Probability	Duration	Type
Increased Storm Water Run-off	Negative	Imperceptible	Camlin River	Unlikely	Medium-term	Indirect
Potential Impacts on Surface Water Quality	Negative	Imperceptible	Camlin River	Unlikely	Medium-term	Indirect
Potential Impacts on Groundwater Quality	Negative	Imperceptible	Camlin river, Ballykenny-Fisherstown Bog SPA and Regionally Important Karstified Aquifer.	Unlikely	Medium-term	Indirect
Potential Impacts on Designated Sites	Negative	Imperceptible	Camlin River	Unlikely	Medium-term	Indirect
Potential Impacts on WFD Status	Negative	Imperceptible	Camlin River	Unlikely	Medium-term	Indirect

9.10.5 Cumulative Residual Effects

No significant hydrological and/or hydrogeological cumulative effects will occur.

There are no other Wind Farms in the immediate area of the site.

9.11 Risk of Major Accidents or Disasters

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No significant environmental risks from major accidents or disasters are anticipated during the development and operation of the wind farm. This conclusion is based on comprehensive risk assessments and the implementation of robust mitigation strategies. The project design incorporates best practices to prevent incidents, including proper handling and storage of hazardous materials, erosion control measures ensuring minimal disruption to local watercourses and strict adherence to environmental protection guidelines and regulations.

9.12 Worst Case Scenario

The 'Worst Case Scenario' for hydrological and hydrogeological effects are assessed to comprise the contamination of surface water features during the construction, operational and decommissioning phases, which in turn could affect the ecology and quality of the downstream surface water bodies. Also, it is assessed that localised groundwater contamination from oils, hydrocarbons, and elevated levels of suspended solids could occur should mitigation measures fail.

However, best practice construction methodologies and thorough mitigation measures will be put in place to prevent this 'Worst Case Scenario' from happening.

9.13 Interactions

The following interactions with the water environment during construction phase include:

- Biodiversity Chapter: proximity to sensitive sites such as the River Blackwater SAC – whereby changes in water quality or flow in this sensitive waterbody could affect aquatic ecosystems. More generally, increased surface runoff and potential soil erosion during construction can lead to sedimentation in nearby water bodies, impacting aquatic habitats and reducing water quality.
- Land, Soils and Geology: excavation activities for turbine foundations and access roads will disturb the soil and subsoil layers. In areas where the overburden is thinner (e.g., near T2 infrastructure), this increases groundwater vulnerability, particularly affecting the Regionally Important Karstified Aquifer. Earthworks and vegetation removal increase the potential for soil erosion. Mobilized suspended solids can enter nearby surface water bodies, affecting water quality. The exposed soils, particularly during periods of heavy rainfall, can contribute to sedimentation in the Camlin River, impacting aquatic habitats downstream.

The following interactions with the water environment during operation phase include:

- Biodiversity Chapter: operation of the development, particularly the hard-standing areas and access roads, can lead to permanent changes in surface water runoff patterns and groundwater recharge which can impact aquatic ecosystems.
- Land, Soils and Geology: the installation of impermeable surfaces (e.g., turbine foundations, access roads) reduces natural infiltration and alters groundwater recharge patterns. This can affect the flow dynamics of the Regionally Important Karstified Aquifer beneath the site. Over time, changes in groundwater flow could impact the hydrogeological balance and affect local

water-dependent ecosystems. Additionally increased stormwater runoff from impermeable surfaces can lead to changes in the hydrological regime. The water management infrastructure will include sediment control measures and filtration systems to ensure no adverse impacts on surface water quality.

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9.14 Monitoring

Monitoring is essential for reducing the risks associated with mitigation measures in a wind farm development project because it ensures that these measures are functioning as intended and can be adjusted if needed. Regular monitoring allows for the early identification of issues such as erosion control failure, water contamination, or structural damage, which could compromise mitigation efforts. By detecting problems early, corrective actions can be taken before they escalate into major accidents or environmental impacts.

9.14.1 Construction Phase

Surface water quality monitoring should be completed during the construction phase of the Proposed Development. Surface water quality monitoring will be completed at the discharge point (downstream of the buffered outfalls of the drainage system) plus in the unnamed stream which will run through the T2 infrastructure and the Camlin River. The monitoring will include the following:

- Visual inspection (colour, turbidity, odour, sheen)
- In-situ physio-chemical parameters including: Temperature, pH and Conductivity

9.14.2 Operational Phase

Surface water quality monitoring should be completed during the operational phase of the Proposed Development. Surface water quality monitoring will be completed at the discharge point (downstream of the buffered outfalls of the drainage system) plus in the unnamed stream which will run through the T2 infrastructure and the Camlin River. The monitoring will include the following:

- Visual inspection (colour, turbidity, odour, sheen)
- In-situ physio-chemical parameters including: Temperature, pH and Conductivity

9.14.3 Decommissioning Phase

Surface water quality monitoring should be completed during the decommissioning phase of the Proposed Development. Surface water quality monitoring will be completed at the discharge point (downstream of the buffered outfalls of the drainage system) plus in the unnamed stream which will run through the T2 infrastructure and the Camlin River. The monitoring will include the following:

- Visual inspection (colour, turbidity, odour, sheen)
- In-situ physio-chemical parameters including: Temperature, pH and Conductivity

9.15 Summary of Mitigation and Monitoring

The following Table 9-20 summarises the Construction Phase mitigation and monitoring measures.

Table 9-20 Summary of Construction Phase Mitigation and Monitoring

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Likely Significant Effect	Mitigation	Monitoring
Possible Impacts on Groundwater Vulnerability	-Implementing best practices for oil use and machinery refuelling to prevent any contamination of groundwater. -All construction phase activities on-site will be carried out in strict accordance with a detailed Environmental Management Plan	EMP Monitoring to ensure adherence to best practices.
Surface and Groundwater Contamination from Oil/Fuel Spills and Leaks	Mitigation will include the following: -All plant and machinery will be serviced before being granted access to the site; -Designate specific areas for refuelling and maintenance in a controlled manned, located on impervious surfaces/bunded trays to prevent spills from spilling / seeping into the ground; -Only trained personnel will handle refuelling and maintenance to reduce the likelihood of accidental spills; -A comprehensive spill response plan and procedures will be in place, that can be actioned in the event of an accident or emergency; -Refuelling and equipment maintenance will be prohibited near watercourses or drainage areas to minimise contamination risks; -All drilling operations will be closely controlled, with continuous monitoring of fluid returns to ensure minimal impact and prompt response to any issues; -All drilling fluid and lubricants shall be biodegradable and non-toxic; -Silt fencing should be in place to prevent contaminated runoff from reaching. surface water; -20 m buffer zones should be in place around all watercourses where possible; -All activities will be completed in line with the EMP.	Surface Water Monitoring as outlined in Section 9.14.1

Likely Significant Effect	Mitigation	Monitoring
	-Wastewater/greywater from the temporary construction compound will be transferred offsite by a suitably licensed wastewater facility for treatment and disposal.	
Earthworks Leading to the Mobilization of Suspended Solids into Surface Waterbodies	-Silt fencing will be installed prior to commencement of works, around the perimeter of the work site and along watercourses boundaries (including field drains where there is connectivity to the streams adjacent to the site which drain into the Camlin River) to capture and retain sediment before it enters surface waters. These silt fences will be embedded into the local soil to ensure water is adequately captured and filtered reducing the likelihood of suspended sediment in surface water being transferred into the local watercourses and field drains. -Earthmoving activities will be ceased during heavy rainfall to reduce the likelihood of erosion and runoff. Construction activities will be planned where possible during dry periods of low rainfall to minimise the risk of erosion and sediment mobilisation caused by heavy rain. - Disturbed areas will be revegetated as quickly as possible once earthworks are completed to promote natural soil stabilisation and reduce sediment runoff. All groundworks should be completed in line with the CEMP.	-Daily monitoring and inspections of runoff, plus surface water near construction sites will be completed to detect any increases in suspended solids and take immediate corrective actions.
Potential Effects on Surface and Groundwater WFD Status	No direct discharge to streams or rivers. All runoff from work areas will pass through an in-line water treatment system before being released via buffered outfalls to vegetated natural surfaces.	Surface Water Monitoring as outlined in Section 9.14.1
Mitigation Measures for Construction Activities in Flood-Prone Areas	-All topsoil and subsoil excavated during construction will be stored outside of the flood zone area to prevent loss or contamination during flooding events.	EMP Monitoring to ensure adherence to best practices.

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Likely Significant Effect	Mitigation	Monitoring
	•A flood protection berm will be constructed around the excavation area for T2 to shield it from potential floodwaters. •Construction materials will either be stored within the protection berm or in areas outside the flood zone to ensure they remain dry and uncontaminated during flood events. •Temporary drainage infrastructure will be installed to effectively manage stormwater runoff, preventing water accumulation and mitigating localized flooding during periods of heavy rainfall. •Measures will be taken to secure all reinforcements, ensuring they are properly anchored and remain stable during potential flooding scenarios. •Concrete pouring and other critical construction activities will be scheduled for the drier summer months to minimize the risk of flooding-related disruptions and to improve construction efficiency. -All procedures outlined in Environmental Management Plan (EMP) 11 will be strictly followed when Met Éireann issues a weather warning, ensuring proactive response to extreme weather conditions.	

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The following Table 9-21 summarises the Operational Phase mitigation and monitoring measures.

Table 9-21 Summary of Operational Phase Mitigation and Monitoring

Likely Significant Effect	Mitigation	Monitoring
Increased Storm Water Run-off	-Storm water attenuation so that any increase in discharge volume during storm events are gradual and controlled, preventing an increase in the flood risk downstream.	Drainage discharge points will be inspected and managed throughout the Operational stage of the project.
Potential Impacts on Surface Water Quality	Water management system specifically designed to prevent surface water contamination from suspended solids, hydrocarbons,	Surface Water Monitoring as outlined in Section 9.14.2.

Likely Significant Effect	Mitigation	Monitoring
	and other pollutants. This system will include features such as sediment control measures, oil-water separators, and filtration mechanisms to ensure that runoff from operational activities is properly managed. All maintenance activities on site will be completed in accordance with the EMP.	
Potential Impacts on Groundwater Quality	Mitigation will include the following: -All plant and machinery will be serviced before being granted access to the site; -Designate specific areas for refuelling and maintenance in a controlled manned, located on impervious surfaces/bunded trays to prevent spills from spilling / seeping into the ground; -Only trained personnel will handle refuelling and maintenance to reduce the likelihood of accidental spills; -A comprehensive spill response plan and procedures will be in place, that can be actioned in the event of an accident or emergency; -Refuelling and equipment maintenance will be prohibited near watercourses or drainage areas to minimise contamination risks; -Silt fencing should be in place to prevent contaminated runoff from reaching surface water; -20 m buffer zones should be in place around all watercourses where possible; -Avoid use of herbicides for vegetation control around turbines and access roads. Where herbicides are necessary, use environmentally friendly alternatives and apply them following strict guidelines to prevent infiltration into groundwater; -All activities will be completed in line with the EMP.	-Conduct baseline groundwater quality testing before the wind farm becomes operational to establish existing conditions; -Implement a regular groundwater monitoring program to detect any potential contamination early and take immediate corrective action;

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Likely Significant Effect	Mitigation	Monitoring
Potential Impacts on Designated Sites	Implementation of the mitigation measures for protection of surface and groundwater as outlined in Section 9.9.2.2 and Section 9.9.2.3 will ensure that Ballykenny-Fisherstown Bog SPA will not be affected by the Proposed Development.	Surface Water Monitoring as outlined in Section 9.14.2.
Potential Impacts on WFD Status	Strict mitigation measures regarding hydrocarbon use and the prevention of increased suspended solids during the operation phase will ensure the protection of the Surface and Groundwater Water Framework Directive (WFD) status. All runoff from work areas will pass through an in-line water treatment system before being released via buffered outfalls to vegetated natural surfaces.	Surface Water Monitoring as outlined in Section 9.14.2.

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9.16 Conclusion

The Proposed Development has been thoroughly assessed with respect to its potential impacts on surface water and groundwater environment. During the construction and operational phases, the primary risks identified include increased sedimentation, accidental oil/fuel spills, and potential alteration of natural water flows. These risks could affect both the Water Framework Directive (WFD) status of nearby waterbodies and groundwater quality, particularly in vulnerable areas.

During the construction phase, the primary concern is the potential for mobilisation of suspended solids and accidental chemical spills. Mitigations, such as proper site drainage, erosion control measures, and handling procedures for oils and fuels, are expected to significantly reduce the likelihood of any significant adverse impacts.

During the operational phase, the risk of groundwater contamination is minimal due to the design of the infrastructure and the inclusion of containment systems. Routine maintenance procedures and stormwater management measures are also in place to prevent any potential long-term contamination risks from spills or leaks.

After implementing all mitigation measures, the residual impacts on both surface water and groundwater quality are expected to be minor and localised. There will be no significant change in the volume or chemical status of surface water and groundwater, ensuring compliance with the requirements of the Water Framework Directive (2000/60/EC).

The water management systems proposed for the site, combined with ongoing monitoring, ensure that the development will not have a detrimental effect on the local water environment. The project

has been designed in line with best practice environmental standards, and no long-term significant adverse effects on water environment are anticipated.

In conclusion, with the implementation of the comprehensive mitigation strategies outlined in this report, the Proposed Development will have no significant residual impacts on surface or groundwater quality.

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CHAPTER 10
BIODIVERSITY

VOLUME II
ENVIRONMENTAL IMPACT ASSESSMENT REPORT

DECEMBER 2024

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10 Biodiversity

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10.1 Introduction

This chapter of the EIAR was prepared to assess the potential significant effects of the Proposed Development on biodiversity, examining impacts both individually and in combination with other projects. It outlines mitigation strategies designed to avoid, minimise, or offset any identified significant effects on ecological features. An assessment of residual biodiversity impacts follows, specifically focusing on species and habitats of conservation value. These include those protected under the Wildlife Acts (1976-2022) and the EU Habitats Directive (92/43/EEC). Impacts on bird species are addressed in Chapter 11 of this Environmental Impact Assessment Report (EIAR) and were appropriate within this chapter such as in relation to designated sites. A detailed description of the Proposed Development is available in Chapter 2.

This chapter should be read in conjunction with the Hydrology chapter (Chapter 9) and Ornithology chapter (Chapter 11) and appendices in this EIAR, as well as the Appropriate Assessment Screening Report.

10.2 Expertise & Qualifications

This chapter of the EIAR has been prepared by Ian Douglas of ID Environmental Consultants Ltd. with support from several specialist sub-consultants, including Paul Murphy of EirEco (Aquatics) and Blackstaff Ecology (Bats).

ID Environmental Consultants was founded by Ian Douglas (MSc, BSc, H Cert. Ag) in 2022. With over a decade of experience as an Ecologist and Environmental Consultant, Ian has developed expertise in Appropriate Assessments, Ecological Impact Assessments, habitat assessments, GIS and habitat creation and enhancement planning. Ian has experience with a wide range of projects, including major road developments and energy infrastructure, as well as residential and other infrastructure planning across Ireland. His work also includes the design and implementation of nature trails, constructed wetlands, and conservation grazing schemes. Prior to establishing ID Environmental Consultants, Ian worked in Ecology and Agriculture in England and Australia. He joined Flynn, Furney Environmental Consultants in 2018, where he currently holds the position of Associate Director.

Paul Murphy of EirEco carried out document review and desktop and field aquatic surveys in December 2023. Paul Murphy holds an MSc in Environmental Science. He is a Chartered Environmentalist (Society for the Environment), a Member of the Chartered Institute of Ecology and Environmental Management and a Member of the Institute of Fisheries Management. He has been operating as an environmental consultant for almost thirty years, providing technical and practical expertise in the areas of ecological survey and monitoring, nature conservation, and habitat management.

Ellen Irwin also contributed to the reports for this project. Ellen is a former UCD student who recently graduated with her Agri-Environmental Science (BAgrSc, Level 8) degree. Through this degree, Ellen has developed practical field and lab-based skills necessary for field/habitat surveying and soil sampling and has also gained knowledge of GIS software. Since finishing her degree in May 2023, Ellen has worked with ID Environmental Consultants and Flynn Furney Environmental Consultants. During this time, Ellen has gained ample experience in ecological surveying, including mammal, bat and bird

surveys and has contributed to reports, including Appropriate Assessments and Ecological Impact Assessments.

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Bird surveys that underpin the assessment process in relation to European Designated site was carried out by Daniel Maloney and Mark Davenport. Daniel Maloney is an experienced Ornithologist who has worked for Birdwatch Ireland and RSPB Northern Ireland and has provided expert input as a Breeding Wader Advisory Officer, as a Bird Specialist advisor for ACRES and on projects specifically focusing on Corn Crake and Curlew. Daniel works as a freelance Ecologist specialising in bird surveys for wind farm impact assessments and other construction works in the Republic of Ireland, Northern Ireland, and Scotland. Expert skills include site assessment, vantage point surveys, walkovers, broader raptor surveys, predevelopment breeding and nesting bird surveys on Proposed Developments, road construction, power line, and gas pipeline projects. Mark Davenport is a freelance ecologist specialising in ornithology with several years of experience on bird surveys for wind farm impact assessments and the conservation of red-listed waders for NPWS. Specialised skills include vantage point surveys, breeding raptor/wader surveys, walkovers and broader breeding bird surveys for proposed windfarm and substation projects.

The collision risk model referenced in this report and see in Appendix 11.3 was prepared by Patrick Manley, Senior Ornithologist of MKO, and reviewed by Susan Doyle, Senior Ornithologist. Both are suitably qualified ornithologists with experience in avifaunal assessment and collision risk modelling and competent experts for the purposes of the preparation of this report.

The static detector surveys were coordinated by Blackstaff Ecology, who collected and subsequently analysed the data, manually verifying it with Kaleidoscope Pro. The following members of the Blackstaff team contributed to this Report:

Catriona holds a Master's degree in Animal Behaviour and Welfare (Distinction) from Queen's University, Belfast. With several years of experience in nature conservation, she has volunteered extensively with organizations such as the UK Overseas Territories Conservation Forum, Ulster Wildlife, and the RSPB. Since joining Allen & Mellon Environmental in April 2021, Catriona has accumulated over three years of experience in ecological consultancy. She has contributed to projects across both Northern and Southern Ireland, gaining diverse experience in survey techniques and ecological reporting. To date, Catriona has conducted approximately thirty-five bat emergence/re-entry surveys, twenty bat roost assessments for buildings and trees, and has served as an Ecological Clerk of Works (ECoW) on two supervised demolitions. Additionally, she has completed over one hundred bat carcass searches for single wind turbines. Catriona is a Qualifying member of the Chartered Institute of Ecology and Environmental Management (CIEEM).

Cormac is a Chartered Environmentalist and a full member of the Chartered Institute of Ecology and Environmental Management (MCIEEM). He holds a Master's degree with Distinction in Environmental Management from the University of Ulster and possesses extensive experience in bat surveys. Cormac has conducted and coordinated comprehensive bat surveys and impact assessments for numerous infrastructure projects, ranging from large developments to smaller undertakings. He has held a Natural England Disturbance Licence (20121610) for all bat species across England and has completed various CPD (Continuing Professional Development) courses, including the Natural England-approved "Bat Licence Training Course" by Wildwood Ecology in Cardiff. Additionally, Cormac has attended the BCT (Bat Conservation Trust) "Bats and Trees" course and has participated in three Bat Conservation Ireland (BCI) biennial conferences (Kilkenny 2010, Sligo 2012, and Cork 2014). He also attended the Nathusius' Pipistrelle Workshop in Enniskillen (2009).

Philip has served as an Environmental Technician at Blackstaff Ecology Ltd for over six years. His responsibilities include maintaining and deploying a suite of 30 static detectors across various sites annually. Philip has gathered data from over 20 wind farms and 200 individual turbine installations. In addition, he has conducted carcass searches at two major wind farms for the past five years. Philip is currently pursuing a degree in Environmental Science.

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10.3 Proposed Development

A brief summary of the development is outlined below. A detailed description of the proposed development is contained within Chapter 2 of this EIAR and the Planning Statement that accompanies the application. The statutory notices should also be referred to.

A 10-year permission is being sought by Natural Forces Renewable Energy 2 Limited for the development of a 14MW wind farm on lands measuring 17.28ha located at the L5046 and L50462 in the townlands of Cloonanny Glebe, Corragarrow, Derryharrow and Gorteenorna, Co. Longford.

The proposed development will consist of the following:

(i) Demolition of a single-storey derelict shed structure (c. 93 sqm GFA) to facilitate the turbine haul route

(ii) Construction of two E175 EP5 wind energy converters, each with an electrical rating of 7MW, an overall ground-to-blade tip height of 199.9 metres, a rotor blade diameter of 175 metres, hub height of 112.4 metres, associated foundations and hard-standing areas;

(iii) Construction of an 800m permanent internal site access road which will run from the L50462 to the wind energy converter hardstanding areas including a 9.1m clear span bridge crossing a local stream;

(iv) Construction of 1 No. meteorological mast with a height of 32 metres, associated foundation and hardstanding area;

(v) Construction of 1 No. 20kV substation compound comprising 2 No. Modular Buildings each measuring 13.5 sqm in area and 3.5m in height, a Battery Energy Storage System (BESS) comprising 3 storage modules with a height of 2.8 metres and associated electrical works, foundation and hardstanding area;

(vi) Temporary alterations to the L5046 and L50462 public roads and temporary access roads to facilitate the turbine component haul route, including temporary widening of sections of the L5046 and L50462.

(vii) Installation of underground collector circuit and communications cabling in underground cable trenches, from the proposed wind energy converter to the proposed on-site substation;

(viii) All associated and ancillary site development, excavation, construction, and reinstatement works, including the provision of a temporary construction compound, site drainage, spoil management, fencing, lighting, hedge and operational maintenance and tree trimming and cutting.

(ix) This application is seeking a 35- year operational life from the date of commissioning of the entire wind farm.

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The grid connection from the proposed on-site substation to the national electricity grid does not form part of the subject planning application. However, as part of the planning application process, this EIAR addresses three potential grid connection options currently considered to ensure a comprehensive environmental assessment of all aspects of the Proposed Development. The grid connection will be via 1 of the 3 potential options outlined below:

- Option 1 Connect the proposed development via (8.03km) to Richmond 110kV Substation
- Option 2 Connect the proposed development via (3.96km) to Longford 38kV Substation
- Option 3 Connect the proposed development via (5.85km) to Glebe 38kV Substation

It is anticipated that the grid connection from the Proposed Development will be by means of an underground cable connecting to one of the Substations identified above via the public road network. For bridge crossings, the cable will be located within the bridge deck, where there is insufficient depth and width available horizontal directional drilling (HDD) will be employed as an alternative.

Once the preferred route emerges it will be determined whether the grid connection falls within the category of exempted development under Class 26 of Schedule 2 in the Planning and Development Regulations 2001, as amended or requires planning permission, in which case an application will be made to the planning authority.

All elements of the proposed development as outlined above together with the turbine delivery route and grid connection options have been assessed as part of this EIAR.

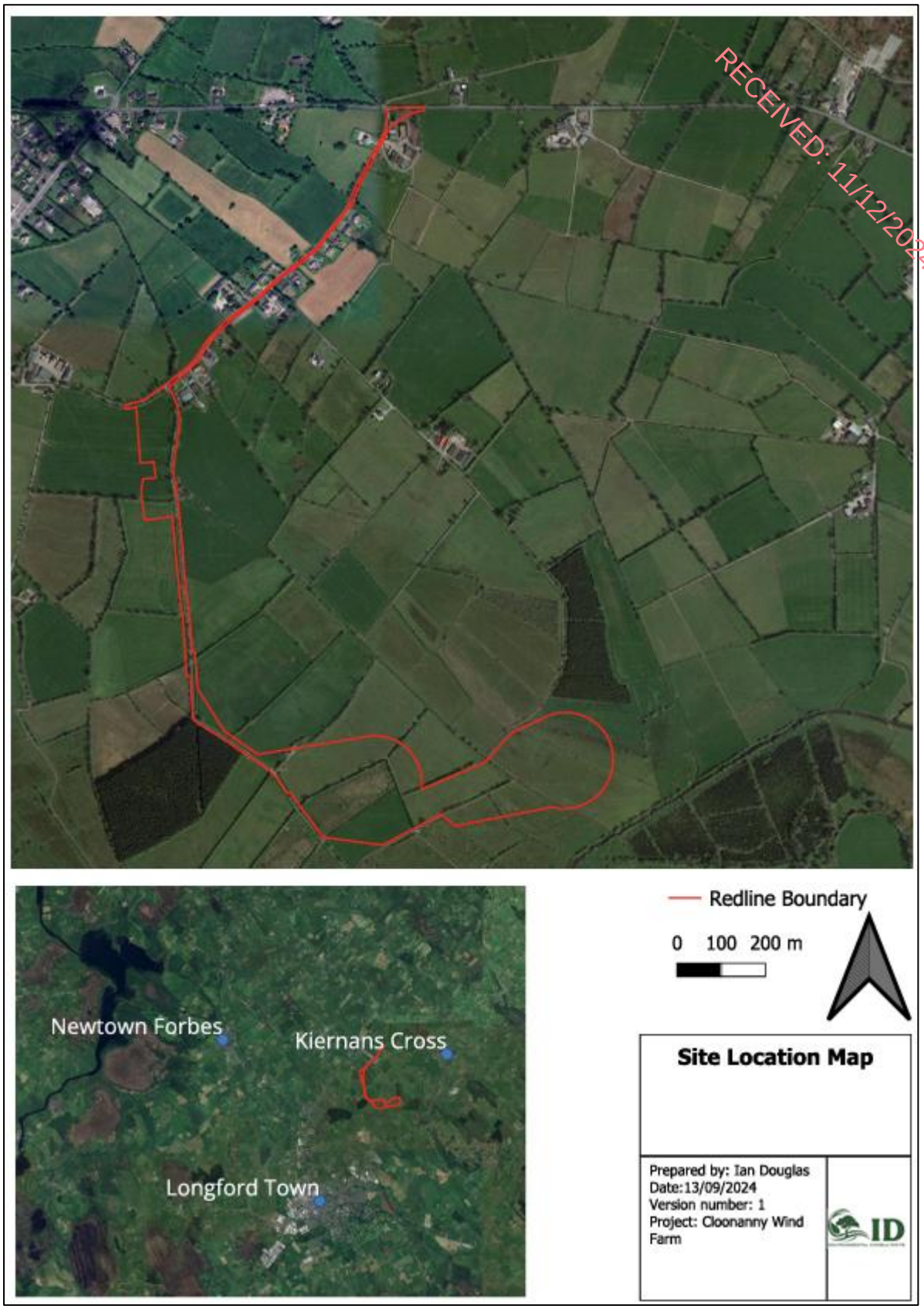


Figure 10-1: Site location map

10.3.1 Grid Connection Route Options Assessed

The proposed grid connection for the development does not form part of this planning application. Although the grid connection options are excluded from the red line boundary, they have been considered within the EIAR and supporting assessments, which consider the project as a whole.

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It is anticipated that the proposed grid connection from the development will be by means of an underground cable connecting to an existing Eirgrid or ESB Networks Substation via the public road network. The applicant has considered three grid routes, which can be seen in Figure 10-2 below and further described in detail within the CEMP accompanying this EIAR.

10.3.1.1 Option 1 - Connection to Existing Richmond 110kV Substation

This connection option consists of connecting the Proposed Development to the national electricity grid via approximately 8km of underground 20kV electrical cabling to Richmond 110kV Substation in the town of Ballykenny, County Longford. The majority of the grid connection will be constructed on public roads.

10.3.1.2 Option 2 – Connection to Existing Longford 38kV Substation

This connection option consists of connecting the Proposed Development to the national electricity grid via circa 4.1km of underground 20kV electrical cabling connecting to Longford 38kV Substation in the townland of Minard, County Longford. The majority of the grid connection will be constructed in public roads.

10.3.1.3 Option 3 – Connection to Existing Glebe 38kV Substation

This connection option consists of connecting the Proposed Development to the national electricity grid via circa 5.9km of underground 20kV electrical cabling connecting to Glebe 38kV Substation in the townland of Lisnamuck, County Longford. The majority of the grid connection will be constructed in public roads.

The grid in relation to the ecological study area can be seen in Figure 10-2.

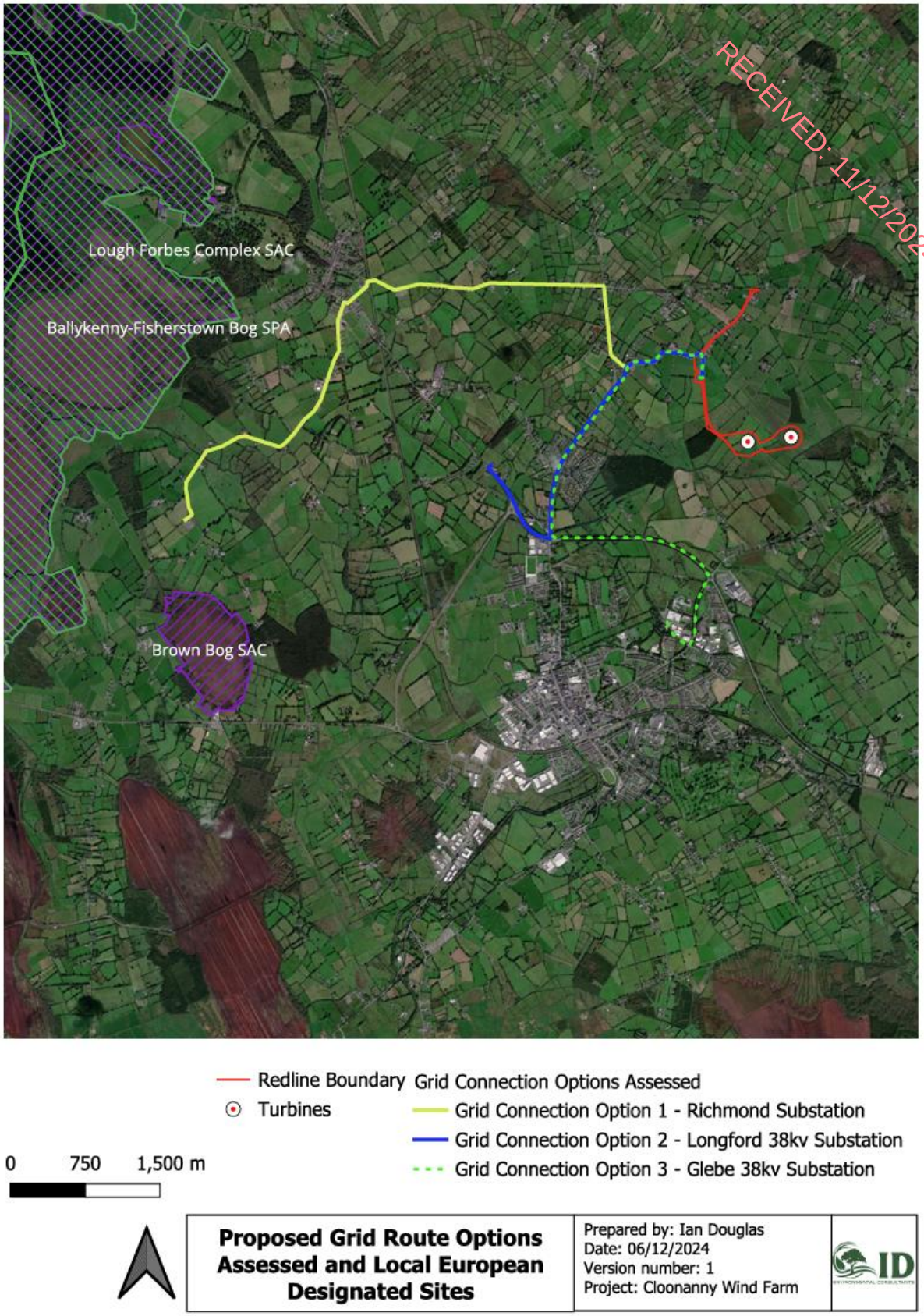


Figure 110-2 Grid Connection Option Assessments

10.3.1.4 Turbine Delivery Route

The components for the Wind Turbines will be delivered by cargo ships to the Port of Waterford, also known as Belview Port. The components for each Wind Turbine will be delivered in separate loads, some of which are abnormal in terms of their width and length. The components will be transported from Belview to the site along the motorway, national, regional, and local road network (Figure 10-3).

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A Turbine Delivery Route Assessment has been prepared for the project, forming part of the Preliminary Transport Management Plan (PTMP). The CEMP is to be read in conjunction with the PTMP.

The selected haulage route is detailed in the PTMP and is as summarised as follows:-

- Starting at Belview Port;
- N29 (Waterford City By-Pass) to the N25;
- N25 to N9;
- N9 National Road to M9 Motorway;
- M9 Motorway and Merge onto M7 Motorway;
- Continue on M7 Motorway to N7 National Road;
- N7 National Road and merge onto M50 Motorway;
- At junction 7 exit onto N4 National Road;
- N4 National Road to M4 Motorway;
- M4 Motorway to N4 National Road;
- Exit N4 National Road onto R194 Regional Road;
- Turn left at Kiernans cross junction onto the L1011;
- Turn left onto L5046;
- Turn left onto L50462;
- Continue to the Site Entrance.

Further details on the above are outlined in the PTMP, prepared by Mable Consulting Engineers which accompanies the subject application as a standalone document.

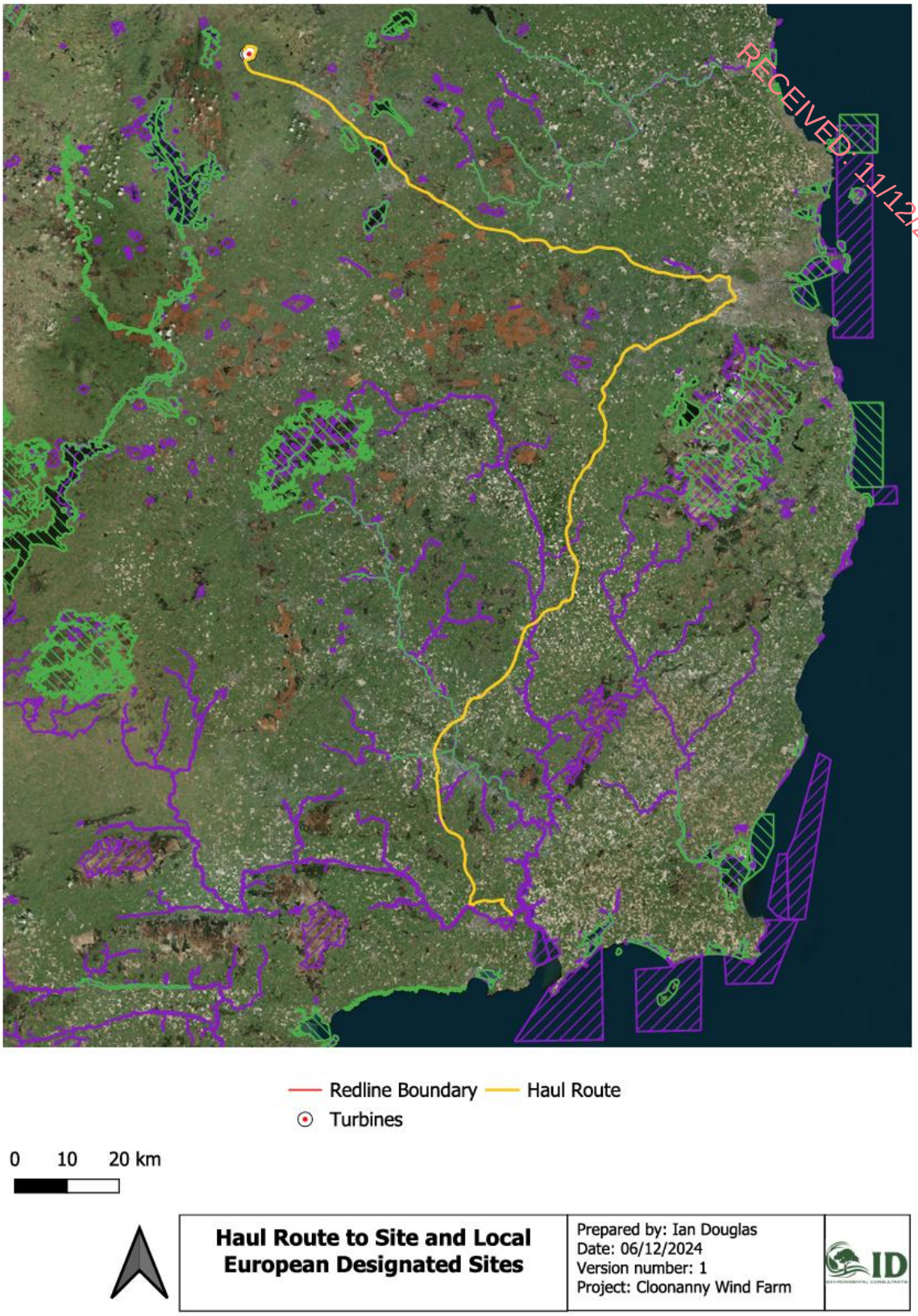


Figure 110-3: Turbine Delivery Route

10.4 Relevant Legislation & Guidance

10.4.1 Internation Policies and Treaties

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The UN Convention on Biological Diversity (CBD) is an international treaty aimed at conserving biodiversity, promoting sustainable use of natural resources, and ensuring the fair and equitable sharing of benefits derived from genetic resources. Adopted in 1992 at the Earth Summit in Rio de Janeiro, the CBD provides a global framework for addressing biodiversity loss and fostering cooperation among nations to protect ecosystems, species, and genetic diversity. The Ramsar Convention on Wetlands of International Importance.

Ramsar Convention on Wetlands of International Importance is a global treaty established in 1971 to protect and sustainably manage wetlands, especially those critical for waterfowl habitats.

10.4.2 European Legislation

The **Council Directive on the Conservation of Natural Habitats of Wild Fauna and Flora (92/43/EEC)**, known as the *Habitats Directive*, aims to promote biodiversity by conserving natural habitats and wild species listed in its annexes. Member States are required to take measures to maintain or restore biodiversity at a favourable conservation status while also considering economic, social, and cultural needs, as well as regional and local characteristics. The Directive enforces site and species protection through the establishment of the Natura 2000 network, designating European Sites, including Special Areas of Conservation (SAC) and Special Protection Areas (SPA). It mandates protection for specific non-avian species and habitats, giving priority to those in need of heightened protection. Additionally, the Directive requires an Appropriate Assessment for any plan or project likely to have significant effects on a European Site, either individually or in combination with other projects, even if the plan is not directly connected to the site's management.

Annex I of the Habitats Directive outlines specific habitat types that require designation as Special Areas of Conservation (SAC) to ensure their protection. Annex II identifies animal and plant species that also necessitate SAC designation for their conservation. Annex IV lists species requiring strict protection, including the lesser horseshoe bat and otter, while Annex V includes species whose capture in the wild and use may be regulated through management measures. In Ireland, Annex V species include the Irish hare, common frog, and pine marten. Some species appear in multiple annexes; for instance, both the otter and lesser horseshoe bat are listed in Annexes II and IV. Article 12 of the Habitats Directive addresses the prevention of deliberate disturbance to Annex IV species, particularly during sensitive periods such as breeding, rearing, hibernation, and migration, as well as the protection of their breeding and resting sites.

The **Council Directive on the Conservation of Wild Birds (2009/147/EC)**, known as the *Birds Directive*, provides a framework for the conservation and management of wild birds in Europe and addresses human interactions with these species. It seeks to maintain wild bird populations within their natural range and to conserve habitats for rare or vulnerable species listed in Annex I, as well as for migratory species, through the classification of SPAs. Additionally, the Directive provides protection for all wild birds across Europe.

The Directive identifies a subset of bird species in Annex I that require specific conservation measures for their habitats. These species are listed due to factors such as their risk of extinction, vulnerability to particular habitat changes, and/or their relatively small population size or limited distribution.

10.4.3 National Legislation and Policy

Wildlife Act 1976 (and amendments): Provides protection for wildlife and habitats in Ireland. It establishes the framework for the conservation of species and designated areas.

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Natural Heritage Areas (NHAs) and Proposed Natural Heritage Areas (pNHAs) are designated sites aimed at safeguarding flora, fauna, habitats, and geological features. Only NHAs are officially designated under the Wildlife (Amendment) Act 2020. **Proposed Natural Heritage Areas (pNHAs)** were initially published in 1995 on a non-statutory basis and have yet to be formally proposed or designated. Despite this, they hold ecological importance and may eventually become statutorily designated sites (NPWS, 2023).

The Flora (Protection) Order 2022 (S.I. No. 235 of 2022) outlines the species, hybrids, and flora subspecies protected under Section 21 of the Wildlife Acts. This order provides legal protection to a diverse range of plant species in Ireland, including vascular plants, mosses, liverworts, lichens, and stoneworts. Under this order, it is prohibited to cut, pick, collect, uproot, damage, injure, or destroy any listed species or their reproductive parts or to wilfully alter, destroy, or interfere with their habitats without a license.

Ireland's 4th National Biodiversity Action Plan (NBAP) 2023–2030 was published by the Department of Housing, Local Government and Heritage and outlines Ireland's biodiversity strategy for 2023–2030. It aims to foster significant changes in how biodiversity is valued and protected, reflecting a collective commitment from various sectors of society. Ireland's 4th National Biodiversity Action Plan (NBAP) sets the national biodiversity agenda for the period 2023-2030. It aims to deliver the transformative changes required to how we value and protect nature. The 4th NBAP has been developed with the support, advice and input of the interdepartmental Biodiversity Working Group and the independent Biodiversity Forum. Ireland's 2nd National Biodiversity Conference was held to gather insights and recommendations for developing the NBAP. A public consultation process provided further opportunities to engage with the NBAP.

The 4th NBAP strives for a "whole of government, whole of society" approach to the governance and conservation of biodiversity. The aim is to ensure that every citizen, community, business, local authority, semi-state and state agency has an awareness of biodiversity and its importance and of the implications of its loss while also understanding how they can act to address the biodiversity emergency as part of a renewed national effort to "act for nature".

Strategic Objectives: The plan builds on previous efforts and focuses on five strategic objectives:

- **Objective 1**: Promote an inclusive approach across all sectors for biodiversity governance.
- **Objective 2**: Address urgent conservation and restoration needs to protect ecosystems.
- **Objective 3**: Highlight and secure the benefits of nature for human well-being.
- **Objective 4**: Improve the evidence base to inform biodiversity actions and policies.
- **Objective 5**: Enhance Ireland's role in international biodiversity efforts.

The Longford County Development Plan 2021–2027 outlines a range of policies. The Policy Objective of the Council is to protect, promote and restore natural heritage across the county. Key Policy objectives include:

- **CPO 12.1:** Protect, conserve, and enhance the County's natural heritage and biodiversity. This includes wildlife (flora and fauna), habitats, landscapes, and/or landscape features of

importance to wildlife or that play a key role in the conservation and management of natural resources. Encourage and promote access to and understanding of the county's natural heritage.

- **CPO 12.3:** Protect important geological or geomorphological sites in the County, including any sites designated or proposed to be designated as Natural Heritage Areas (NHAs).
- **CPO 12.4:** Pursue in consultation with the National Parks and Wildlife Service, the preparation, establishment and implementation of Habitat mapping and a Wetland Survey for the County.

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County Longford Heritage Plan 2019-2024 also addresses actions to protect and enhance biodiversity across County Longford. Developed by the County Longford Heritage Office in partnership with local communities, environmental organisations, and stakeholders, the plan outlines actions to conserve natural heritage.

10.5 Methodologies and Guidelines

This section describes the methodologies used to establish the baseline ecological condition of the Proposed Development and Study Area. Assessing the impacts of any project and associated activities requires an understanding of the ecological baseline conditions prior to and during the project's proceeding. Ecological baseline conditions are those existing in the absence of proposed activities (CIEEM, 2018).

The assessment methodology follows the guidance outlined in Guidelines for Ecological Impact Assessment in the UK and Ireland: Terrestrial, Freshwater, Coastal, and Marine (CIEEM, 2018, updated 2022), along with the National Road Authority (NRA) Guidelines for Assessment of Ecological Impacts of National Road Schemes (2009). Additionally, the survey approach is informed by the NRA Guidelines on Ecological Surveying Techniques for Protected Flora and Fauna on National Road Schemes (NRA, 2009a).

This assessment has been carried out per the Environmental Impact Assessment guidance outlined in Chapter 1 of the EIAR. The following additional guidelines were followed in the preparation of this EIAR:

- Bats and onshore wind turbines: survey, Assessment and mitigation (NatureScot updated August 2021).
- WPS (2022) Bat Mitigation Guidelines for Ireland – v2.
- All Ireland Pollinator Plan 2021-2025.
- Guidelines on the information to be contained in Environmental Impact Assessment Reports (Environmental Protection Agency (EPA, 2022).
- Guidelines for Planning Authorities and An Bord Pleanála on Carrying out Environmental Impact Assessment. (Department of the Environment, Community and Local Government (DoEHLG), 2013).
- Guidelines for assessment of Ecological Impacts of National Road Schemes (TII, 2009).
- Environmental Impact Assessment of National Road Schemes: A Practical Guide (TII, 2008).
- In relation to invasive species: Regulation (EU) No 1143/2014: Regulation 49: Prohibition on introduction and dispersal of certain species: Regulation 50: Prohibition on dealing in and keeping certain species (however, regulation 50 is not yet in effect).

Additionally, the following legislation regarding habitats, wildlife, and water quality in Ireland has been taken into account in preparing this report:

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- The International Convention on Wetlands of International Importance, especially Waterfowl Habitat (Concluded at Ramsar, Iran on 2 February 1971) S.I. No. 272 of 2009: European Communities Environmental Objectives (Surface Waters) Regulations 2009 and
- S.I. No. 722 of 2003 European Communities (Water Policy) Regulations 2003, which further effect the EU Water Framework Directive (2000/60/EC).
- Planning and Development Acts 2000 (as amended).

10.5.1 Desk Study

Prior to and during the main fieldwork contributing to this assessment, a desktop survey of available information sources was carried out. Sources of information included:

- The NPWS Protected Species Database and Online Mapping.
- Data on waterbodies, available for download and interrogation from the Environmental Protection Agency (EPA)[1].
- Information on the location, nature and design of the Proposed Development supplied by the applicant's design team.
- Review of previous and current planning applications for the subject site and local area via the Longford Council Councils Planning portal[2], Myplan[3] and the An Bord Pleanála website[4].
- Desk research included a review of records available through the National Biodiversity Data Centre mapping system. These included rare and protected species. Records were requested for all species appearing within the study area or immediately surrounding the study area (2km)[5].
- Data on semi-natural Irish grasslands from the Irish Semi-Natural Grassland Surveys (ISGS) 2007 – 2012.
- Data contained in the National Survey of Native Woodland (NSNW) and Ancient Woodlands inventory (2011 – 2012).
- Data held on the NPWS Article 17 datasets for protected species[6].
- Review of relevant Plans, including Ireland's 4th National Biodiversity Action Plan 2023–2030, County Longford Heritage Plan 2019-2024[7] and the All-Ireland Pollinator Plan 2021-2025 and;
- Review of bat species and roost records from the Bat Conservation Ireland (BCI).

[1] https://gis.epa.ie/EPAMaps/

[2] https://www.longfordcoco.ie/

[3] https://www.myplan.ie/

[4] https://www.pleanala.ie/en-ie/map-search

[5] https://maps.biodiversityireland.ie/Map

[6] https://www.npws.ie/maps-and-data/habitat-and-species-data/article-17

[7] Longford County Council has integrated its Biodiversity Action Plan (BAP) within its broader Heritage Plan. The County Longford Heritage Plan 2019-2024

10.5.2 Consultation

ID Environmental Consultants consulted with several statutory bodies and agencies relevant to the conservation of biodiversity in Ireland. In addition to the main consultation with the competent authority, Longford County Council, further consultation took place, which is detailed in Table 10-1.

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Table 10.1: List of Consultees

Consultee	Date of Consultation	Response
National Parks and Wildlife Services	August 2024	The Department is not in a position to make specific comments on this particular referral at this time. No inference should be drawn from this that the Department is satisfied or otherwise with the proposed activity. The Department may submit observations/recommendations at a later stage in the process.
Inland Fisheries Ireland	June 2023 and August 2024	No Response
BirdWatch Ireland	June 2023	No Response
Longford County Council	June 2024	Biodiversity Officer- No Response
Bat Conservation Ireland	September 2023	Data request for known bat roosts within 1km of the site returned no records of any roost sites. Bat Conservation Ireland does not, provide opinions or comments on developments.

10.5.3 Field Surveys

Ecological surveys were carried out to provide sufficient data to support a robust assessment of all ecological constraints related to this project. Preliminary Ecological appraisal of the overall study area was initially conducted in November 2020 with a range of surveys carried out across the study area up to September 2024. The following sections fully describe the ecological surveys that have been undertaken and provide details of the methodologies, dates of survey and guidance followed. Multi-disciplinary walkover surveys were conducted and covered the lands within the application site boundary, the grid connection routes and the proposed access roads. Beginning in November 2020, surveys were carried out that included scoping and viewshed analysis for bird surveying (See Chapter 11). The findings of these initial surveys formed the basis for further detailed targeted surveys for habitats and species of ecological significance within the survey area. These surveys were carried out in accordance with NRA Guidelines on Ecological Surveying Techniques for Protected Flora and Fauna on National Road Schemes (NRA, 2009), and additional methodologies are described below.

10.5.3.1 Habitat and Botanical Surveys

Habitats were identified, mapped, and classified and dominant plant species were noted in accordance with the guidelines given by Fossitt (2010). Habitats were classified as per Fossitt (2000). Plant nomenclature follows the BSBI's List of Accepted Plant Names (BSBI, 2007). The survey timings fall within the recognised optimum period for vegetation surveys/habitat mapping, i.e. April to September (Smith *et al.,* 2011). Full details of all the botanical surveys and results are provided in the Appendix 10.4 and an assessment of Annex I habitats found within the study is provided in this Appendix 10.5.

The habitat assessment surveys described in this report have been undertaken with reference to the following guidelines and interpretation documents:

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- Fossitt, J.A. (2000) A Guide to Habitats in Ireland. The Heritage Council, Kilkenny.
- Smith, G.F., O'Donoghue, P., O'Hora, K. and Delaney, E., 2011. Best practice guidance for habitat survey and mapping. The Heritage Council: Ireland.
- JNCC. (2010). Handbook for Phase 1 habitat survey - A technique for environmental audit.
- Commission of the European Communities (2007) Interpretation manual of European Union habitats. Eur 27. European Commission DG Environment.
- NPWS (2013) The Status of EU Protected Habitats and Species in Ireland. Habitat Assessments Volume 2. Version 1.1. Unpublished Report, National Parks and Wildlife Services. Department of Arts, Heritage and the Gaeltacht, Dublin, Ireland.
- NPWS (2019).The Status of EU Protected Habitats and Species in Ireland. Volume 2: Habitat Assessments. Unpublished NPWS report. Edited by Deirdre Lynn and Fionnuala O'Neill.

Habitats considered to be of ecological significance, particularly those having the potential to correspond to those listed in Annex I of the EU Habitats Directive 92/43/EEC, were identified and classified as Key Ecological Receptors (KERs). Plant nomenclature for vascular plants follows 'New Flora of the British Isles' (Stace, 2010). On June 7, 2023, and 28th August, 2024, detailed botanical surveys were undertaken for turbine hardstands, road infrastructure, and other associated infrastructure. The June 2023 surveys also included an assessment of Molinia meadow (EU Habitats Directive code 6410) habitat within the study area outside the Proposed Development Site was carried out0 This can be seen in Appendix 10.5. A representative number of relevés were taken to describe the vegetation in greater detail and to understand the habitat condition. The results of these surveys can be seen in Appendix 10.4.

Invasive Species Surveys

These surveys were carried out as per published guidelines by Transport Infrastructure Ireland (TII, 2020), The Management of Invasive Alien Plant Species on National Roads–Technical Guidance and the Chartered Institute of Ecology and Environmental Management (CIEEM, 2019) Guidelines for Ecological Impact Assessment in the UK and Ireland: Terrestrial, Freshwater, Coastal and Marine.

10.5.3.2 Bats

Detailed static bat surveys were conducted by Blackstaff (2023) and results are provided in the Appendix 10.2 of this EIAR. This document provides a detailed description of survey methodologies undertaken at the site during static bat detection surveys during the summer of 2023. In addition, bat roosting potential surveys, transect surveys and emergence surveys were conducted by IDEC (2023) and are provided in Appendix 10.3.

These surveys and data assessments were conducted with reference to these guidelines:

- Bat Surveys for Professional Ecologists – Good Practice Guidelines (4th edn.) (Collins, 2024).
- Identification Guide to Ireland's Bats (Roche & Torsney, 2021).
- Bats and onshore wind turbines - survey, assessment and mitigation (NatureScot, 2021).
- Bat mitigation guidelines for Ireland v2. (Marnell, Kelleher & Mullen, 2022).

10.5.3.3 Terrestrial Fauna Surveys

Badger

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Dedicated badger surveys were conducted on the 16th of January 2023, the 2nd of February 2022 and the 3rd of March 2024. The badger surveys covered the development footprint and suitable habitats surrounding the Proposed Development. The badger surveys were conducted to determine the presence or absence of badger signs within and in close proximity to the Proposed Development. This involved a search for all potential badger signs, such as latrines, badger paths and setts. If encountered, setts would be classified as per the convention in NRA (2009) (i.e. main, annexe, subsidiary, outlier). The badger survey was conducted adhering to best practice guidance (NRA, 2009) and followed the 'Guidelines for the Treatment of Badger Prior to the Construction of National Roads Schemes' (NRA, 2006a) and CIEEM best practice competencies for species surveys (CIEEM, 2013).

Otter

Otter surveys were conducted adhering to best practice guidance (NRA, 2009) and followed Guidelines for the Treatment of Otter Prior to the Construction of National Roads Schemes (NRA, 2008). Surveys for otter were carried out on the 16th of January, 2023, and the 3rd of March, 2024. This involved a search for all otter signs, e.g. spraints, scat, prints, slides, trails, couches and holts. In addition to the width of the rivers/watercourses, a 10m riparian buffer (both banks) was considered to comprise part of the potential otter habitat (NPWS, 2009).

Other Terrestrial Mammals

Surveys were conducted adhering to best practice guidance (NRA, 2009) on the same dates as the Otter and Badger surveys noted above. These focused on the detection of field signs and the direct observation of mammal species pine marten (*Martes martes*) and red squirrel (*Sciurus vulgaris*).

10.5.3.4 Marsh Fritillary

A preliminary ecological appraisal of the Proposed Development was carried out in November 2020. It was determined that targeted larval web searches were required. Larval web searches were undertaken on September 8th, 2022, September 14th, 2023, and September 5th, 2024, across all suitable habitat areas within and surrounding the Proposed Development. The surveys were undertaken within the optimal period for marsh fritillary larval web surveys, i.e., August –September, on dry days with no rain and little wind. The survey methodology followed that described in the NRA (2009) best practice guidance document. This involved walked surveys to identify suitable areas of marsh fritillary habitat within or adjacent to the Proposed Development as it has the potential to impact on this species in areas where it overlaps with or is adjacent to suitable habitat for the species.

10.5.3.5 Fisheries and Aquatic Ecology Surveys

A surveys was undertaken aimed at establishing the type and distribution of aquatic habitats and ecological sensitivities in the vicinity of the Proposed Development. Prior to undertaking the field surveys, the surface water network was identified from the EPA Map viewer (https://gis.epa.ie/EPAMaps/Water). The habitats along the watercourses within the study area were examined on aerial photography (Bing and Google) to ascertain the distribution and boundaries of aquatic and marginal habitat types.

The surveys were undertaken on the 2nd August 2023. Surveys follow Transport Ireland Infrastructure guidance (TII, 2009) and aquatic habitats were classified using the Heritage Council classification (Fossitt, 2000).

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The surveys aimed to identify any rare or protected aquatic plant species listed under the Flora Protection Order (2022) and invasive species listed under the Third Schedule of the European Communities (Birds and Natural Habitats) Regulations 2011.

The surveys recorded the following key characteristics along the length of the study area:

- Channel width, depth and bank-side profile.
- Substrate type.
- Flow type (riffle, glide or pool).
- In-stream macrophyte and bryophyte cover.
- Riparian habitats and species composition.

The river channel morphology, substrate and flow regime were used to determine the suitability of the habitat for spawning or as a nursery habitat by salmonids and other species, including coarse fish and lamprey. Dip-netting was used in areas of soft sediment to check for lamprey ammocoete larvae and also to determine the presence of invasive species. The aquatic macrophyte vegetation was assessed by a combination of visual observation and sampling with a grapnel.

10.5.3.6 Birds

Over 2 years of ornithological surveys were carried out as part of this assessment using accepted methodologies, and by suitably qualified professionals. Ornithological methodologies, results and impact assessments are detailed separately in Chapter 11.

10.5.4 Assessment of Impacts and Effects

10.5.4.1 Key Ecological Receptors

In accordance with National Roads Authority guidelines (2009), an impact assessment is only undertaken of 'key ecological receptors' (KERS). KERS are within the zone of influence of the project and are "both of sufficient value to be material in decision making and likely to be affected significantly". To qualify as KERS, features must be of local ecological importance (higher value) or higher to qualify as KERS.

Features falling below this threshold are not assessed. Impacts are described as either significant or not significant. Broadly, significant effects encompass impacts on the structure and function of defined sites, habitats, or ecosystems and the conservation status of habitats and species (including extent, abundance, and distribution) (CIEEM, 2018).

10.5.4.2 Determining the Zone of Influence

Determining whether an KER has the potential to be affected by the Proposed Development relates to the concept of the Zone of Influence (ZoI). The ZoI relates to the nature of the development, its likely impacts and the presence of connections or pathways between ecological receptors and the development. Thus, ecological receptors that lack a connection to the development are considered

outside the ZoI, even if directly within the development site. Conversely, considerably removed receptors from the development can still be considered within the ZoI if a pathway for impacts exists.

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Table 10-4 identifies all connections (ecological, hydrological, and hydrogeological) that provide pathways for impacts between the Proposed Development and ecological receptor sites in the surrounding area.

For all receptors that are not designated nature conservation sites, the initial ZoI for the construction and decommissioning phase is as follows:

Direct effects: up to a 50m buffer surrounding permanent and temporary proposed site infrastructure for turbine hardstand, temporary access roads and the proposed substation and BESS, and up to a 5m buffer along the Grid Connection and haul road.

Indirect effects: dependent on the type of works and the published sensitivities of the ecological receptor or designated nature conservation sites, DoEHLG (2010) guidelines recommend using a 15 km study area as an initial approach to assess potential source-receptor connections between a project and European sites. However, this distance is considered flexible, as it may need to be adjusted—reduced or expanded—based on hydrological, hydrogeological, or ecological connectivity. This assessment used a 20 km study area to reflect the maximum distance typically travelled by SPA QI bird species (NatureScot, formerly SNH, 2016), extending slightly beyond the 15 km guideline.

10.5.4.3 Determining Ecological Importance

The basis of the assessment of ecological value and significance of the Proposed Development for habitats and species follows the Guidelines for Assessment of Ecological Impacts of National Road Schemes (National Roads Authority, 2009) and is consistent with the Guidelines for Ecological Impact Assessment in the UK and Ireland: Terrestrial, Freshwater and Coastal and Marine (CIEEM, 2018). These guidelines set out the context for the determination of value on a geographic basis with a hierarchy assigned in relation to the importance of any particular receptor. The guidelines provide a basis for the determination of whether any particular receptor is of importance on the following scale:

- International,
- National,
- County,
- Local Importance (Higher Value),
- Local Importance (Lower Value).

The 'ecological value' of an area or feature is therefore defined with reference to geographical context. That is, whether it is of value locally, regionally, nationally or internationally. For example, a SAC or SPA is considered internationally important, while a Natural Heritage Area (NHA) or pNHA is considered nationally important. When determining the conservation value of a species population, factors such as rarity, distribution, and conservation status must be considered, including trends informed by historical data where available. Published lists have been consulted as references for this purpose. Relevant examples include:

- Species of European conservation concern (e.g., those listed under Annex I of the Birds Directive or Annexes II and IV of the Habitats Directive).

- Species red-listed in Ireland, such as those identified in the Birds of Conservation Concern in Ireland (BoCCI) (Gilbert *et al*., 2021).
- Species protected under the Flora Protection Order 2022.

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10.5.4.4 Characterisation of Impacts and Effects

In alignment with CIEEM (2018) and EPA (2022) guidelines, impacts and effects have been described based on several key criteria set out in Table 10-2 below.

Table 10.2: Characterisation of Impacts and Effects

Criteria	Description
Quality	Positive / Neutral / Negative
Extent	Spatial area
Context	Conform / Contrast with baseline conditions
Magnitude	Size / Amount / Intensity / Volume
Probability	Likely / Unlikely
Duration	Temporary / Short-term / Medium-term / Long-term / Permanent
Frequency	Once / Rarely / Occasionally / Frequently / Constantly
Timing	Critical life-stage or season
Reversibility	Reversible / Irreversible

10.5.4.5 Determining Significant Effects

The ecological significance of effects from the Proposed Development is assessed using the precautionary principle, following the methodology described in Section 5 of the CIEEM (2018) guidelines. Within Ecological Impact Assessment (EcIA), a 'significant effect' is one that either contributes to or detracts from biodiversity conservation goals for key ecological features or biodiversity overall. Such effects can be evaluated on a scale from local to international significance (CIEEM, 2018). Both direct and indirect impacts are considered in determining significance:

Direct impacts are those directly caused by an action, such as the physical loss of habitat occupied by a Key Ecological Receptor (KER) species during construction.

Indirect impacts affect an ecological receptor indirectly through an intermediary process, ecosystem, or receptor.

The significance of an effect is determined by examining whether:

- Any key processes or characteristics of important ecological receptors are altered or eliminated.

- There are changes to the extent, structure, or function of important ecological features.
- The average population size and sustainability of important species are affected.
- The conservation status of critical habitats or species is impacted.

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The assessment also incorporates the EPA Guidelines for Environmental Impact Assessment Reports (2022) and the Guidelines for the Assessment of Ecological Impacts of National Road Schemes (NRA, 2009) to ensure compliance with established standards. Terminology follows the EPA Guidelines (2022) as referenced in Table 10-3, which suggests using the term 'integrity' to gauge whether an impact is likely to be significant (NRA, 2009). A 'significant effect' is therefore one that either supports or undermines the objectives for biodiversity conservation (CIEEM, 2018).

Table 10.3: Criteria for determining the significance of effects, based on (EPA 2017) guidelines

Effect	Magnitude
No change	No discernible change in the ecology of the affected feature.
Imperceptible effect	An effect capable of measurement but without noticeable consequences.
Not Significant	An effect which causes noticeable changes in the character of the environment but without significant consequences.
Slight effect	An effect which causes noticeable changes in the character of the environment without affecting its sensitivities.
Moderate effect	An effect that alters the character of the environment in line with existing and emerging trends.
Significant effect	An effect which, by its character, magnitude, duration, or intensity, alters a sensitive aspect of the environment.
Very Significant	An effect which, by its character, magnitude, duration, or intensity, significantly alters most of a sensitive aspect of the environment.

10.5.4.6 Cumulative Impacts and Effects

Cumulative effects can arise from individually insignificant impacts that, when combined, become significant due to their occurrence over time or concentration in a specific location. These impacts may be categorised as follows:

- **Additive/Incremental**: This occurs when multiple activities or projects, each with potentially insignificant individual effects, combine to create a significant effect due to their proximity in time and space. These effects can be either additive or synergistic.

- **Associated/Connected**: This refers to multiple activities that, while part of separate planning applications or consent processes, are interconnected as part of the same overall project.

When establishing cumulative effects, the following other plans and projects should be considered:

- Proposals for which consent has been applied but are awaiting determination.

- Projects that have been granted consent but have not yet commenced or those that are underway but not yet completed (i.e., under construction).
- Proposals that have been refused permission but are currently under appeal, with the appeal undetermined.
- Proposals to be implemented by a public body where no consent from a competent authority is required.
- Completed developments whose full environmental effects are not yet evident and therefore cannot be reflected in the baseline.
- Developments specifically referenced in a National Policy Statement, a National Plan, or a Local Plan.

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10.5.4.7 Mitigation Hierarchy and Residual Effects

Section 10.9 of this chapter assesses the potential effects of the Proposed Development to ensure that all effects on sensitive ecological receptors are adequately addressed. The implementation of mitigation measures follows a structured approach that prioritises avoiding impacts whenever feasible, followed by the introduction of mitigation measures to reduce any unavoidable impacts. The effects that remain after these measures are referred to as "residual effects." If these residual effects are still significant, compensation may be considered to address any remaining impacts.

- **Avoidance**: This term is applied when an impact is prevented, often through adjustments in the project design.
- **Mitigation**: This refers to actions aimed at reducing or remedying a specific negative impact on-site.
- **Compensation**: This involves measures taken to counterbalance residual effects when on-site mitigation is not feasible.
- **Enhancement** is the provision of new benefits for biodiversity that are additional to those provided as part of mitigation or compensation measures, although they can be complementary.

10.6 Difficulties Encountered

Seasonal influences on species distribution and behaviour were fully accounted for in conducting the surveys. An evaluation of the Proposed Development's capacity to support specific populations, particularly those of conservation significance that might not have been observed due to seasonal absence, nocturnal activity, or cryptic behaviours, was also completed. Specialist studies, analyses, and reports adhered to all relevant guidelines. The habitats and species at the site were easily identifiable, enabling thorough assessments during the fieldwork. No constraints related to the scope, scale, or context of the assessment were identified.

10.7 Baseline Environment

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10.7.1 Designated Sites

This section evaluates the potential ecological impact of the Proposed Development on sites designated for nature conservation. The potential for significant effects, particularly in relation to the ecological integrity of European Sites, has been assessed in the AA Screening Report accompanying this application, with a summary presented here for reference. The development site is neither located within or directly adjacent to any European Designated Sites. The closest European Sites to the Proposed Development are the Lough Forbes Complex SAC and Ballykenny-Fisherstown Bog SPA, situated approximately directly 4.6km west of the development area and potentially hydrological connected via the Camlin River. Additionally, Brown Bog SAC is located approximately 5km southwest of the Proposed Development, with no direct hydrological connection to the Proposed Development site. The Camlin River is approximately 200m south of the Proposed Development (Figure 10-15). A tributary of the Camlin, the Derryharrow Stream, is found about 190m north of the nearest turbine location. Numerous drains and modified streams within the Proposed Development discharge into the Camlin. The Camlin flows along the eastern boundary of Lough Forbes Complex SAC and Ballykenny-Fisherstown Bog SPA approximately 10km downstream from the Proposed Developemnt Site before crossing the southern portion of these designated areas 12km downstream, and eventually discharging into the Shannon 14km downstream. The Shannon then flows into Lough Ree, which forms part of both the Lough Ree SPA and SAC, located approximately 26km downstream from the Proposed Development.

Part of the Proposed Development, particularly turbine no. 2, is located within a flood zone. For this, a Site Specific Flood Risk Assessment (SSFRA) was carried out and concluded that the development is not expected to adversely impact the local hydrological regime or increase flood risk elsewhere. The is detailed within the Site Specific Flood Risk Assessment (SSFRA) that can be found accompanying this EIAR.

The Proposed Development has been Screened for Appropriate Assessment by ID Environmental Consultants (2024). It concluded the following:

'In view of the conservation objectives of the European sites reviewed during this screening process, and based on the gathered evidence, it is our professional opinion that the Proposed Development, either individually or in combination with other plans and projects (whether directly or indirectly), is not likely to have significant effects on any designated site. Accordingly, progression to Stage 2 Appropriate Assessment is not required.'

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Table 10.4:Designated sites in relation to the Proposed Development

Site Name Designation Site Code Distance	Qualifying Interests	Value	Rationale
Lough Forbes Complex SAC 001818 **~ 4.6km via Directly** **~ 10km via Camlin River**	• Natural eutrophic lakes with *Magnopotamion* or *Hydrocharition* - type vegetation [3150] • Active raised bogs [7110] • Degraded raised bogs still capable of natural regeneration [7120] • Depressions on peat substrates of the *Rhynchosporion* [7150] • Alluvial forests with *Alnus glutinosa* and *Fraxinus excelsior* (*Alno-Padion*, *Alnion incanae*, *Salicion albae*) [91E0]	International	There will be no direct effects as this European Site lies entirely outside of the development footprint. Hydrological connectivity exists between the Proposed Development Site and this SAC via the Camlin River. Active raised bogs [7110] associated habitats: Degraded raised bogs still capable of natural regeneration [7120] and Depressions on peat substrates of the *Rhynchosporion* [7150] are typically rainwater fed and so are not dependent on surface water or sensitive to impacts to surface water quality (as a result of pollution to watercourses). Additionally, Given the significant buffer distance of over 10km via the Camlin, no potential for significant effects was identified, either individually or in combination with other plans or projects to these bog habitat types. Lough Forbes has been designated for the conservation of Natural eutrophic lakes with *Magnopotamion* or *Hydrocharition* - type vegetation [3150]. Alluvial forests with *Alnus glutinosa* and *Fraxinus excelsior* (*Alno-Padion*, *Alnion incanae*, *Salicion albae*) [91E0] are also found along the shoreline of Lough Forbes (NPWS, 2016). Both are upstream of where the Camlin flows through this SAC and are, as such, outside the ZOI for hydrological impacts.
Brown Bog SAC 002346	• Active raised bogs [7110] • Degraded raised bogs still capable of natural regeneration [7120] • Depressions on peat substrates of the *Rhynchosporion* [7150]	International	There will be no direct effects as this European Site lies entirely outside of and >5km from the development footprint. The potential for indirect effects on the QIs of this SAC can be ruled out due to the intervening distance between the development site and the SAC and the absence of a source-pathway-receptor chain for likely significant effects.

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Site Name Designation Site Code Distance	Qualifying Interests	Value	Rationale
5km			
Mount Jessop Bog SAC 002202 7.5km	• Degraded raised bogs still capable of natural regeneration [7120] • Bog woodland [91D0]	International	There will be no direct effects as this European Site lies entirely outside of and >7.5km from the development footprint. The potential for indirect effects on the QIs of this SAC can be ruled out due to the intervening distance between the development site and the SAC and the absence of source-pathway-receptor chain for likely significant effects.
Clooneen Bog SAC 002348 8km	• Active raised bogs [7110] • Degraded raised bogs still capable of natural regeneration [7120] • Depressions on peat substrates of the *Rhynchosporion* [7150] • Bog woodland [91D0]	International	There will be no direct effects as this European Site lies entirely outside of and >8km from the development footprint. The potential for indirect effects on the QIs of this SAC can be ruled out due to the intervening distance between the development site and the SAC and the absence of source-pathway-receptor chain for likely significant effects.
Ardagullion Bog SAC 002341 15.5km	• Active raised bogs [7110] • Degraded raised bogs still capable of natural regeneration [7120] • Depressions on peat substrates of the *Rhynchosporion* [7150]	International	There will be no direct effects as this European Site lies entirely outside of and >15.5km from the development footprint. The potential for indirect effects on the QIs of this SAC can be ruled out due to the intervening distance between the development site and the SAC and the absence of source-pathway-receptor chain for likely significant effects.

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Site Name Designation Site Code Distance	Qualifying Interests	Value	Rationale
Lough Ree SAC 000440 ~17km directly ~26km via Camlin and Shannon	• Natural eutrophic lakes with *Magnopotamion* or *Hydrocharition* - type vegetation [3150] • Semi-natural dry grasslands and scrubland facies on calcareous substrates (*Festuco-Brometalia*) (* important orchid sites) [6210] • Active raised bogs [7110] • Degraded raised bogs still capable of natural regeneration [7120] • Alkaline fens [7230] • Limestone pavements [8240] • Bog woodland [91D0] • Alluvial forests with *Alnus glutinosa* and Fraxinus excelsior (*Alno-Padion, Alnion incanae, Salicion albae*) [91E0] • *Lutra lutra* (Otter) [1355]	International	There will be no direct effects as this European Site lies entirely outside of and >26km from the Proposed Development. Maintaining water quality is central to meeting the conservation objectives of several of the QI habitats and species of the Lough Ree SAC, namely Natural eutrophic lakes with *Magnopotamion* or *Hydrocharition* - type vegetation [3150], Alkaline fens [7230] and *Lutra lutra* (Otter) [1355]. The significant buffer distance of approximately 26km between the potential source and this receptor site, coupled with the natural processes of pollutant dissipation, dilution, and sedimentation along the River Camlin, make likely significant effects extremely unlikely. These mechanisms ensure that any pollutants potentially reaching the Camlin during the construction phase are unlikely to reach the SAC in concentrations that could compromise any of the site's conservation objectives. No pathway for likely significant effects exists for Semi-natural dry grasslands and scrubland facies on calcareous substrates (*Festuco-Brometalia*) (* important orchid sites) [6210], Active raised bogs [7110], Degraded raised bogs still capable of natural regeneration [7120], Limestone pavements [8240] or Bog woodland [91D0]. Potential impacts to Otters were assessed. In Ireland, the territory of female otters in mesotrophic rivers is approximately 7.5 +/- 1.5km in length (Ó Néill, L., 2008), whilst the territories of males otters in mesotrophic and oligotrophic rivers is approximately 13.2 +/- 5.3km in length, with a high degree of variability as territorial males respond quickly to social perturbation. Given a distance of over 26km from the Proposed Development to the SAC boundary it extremely unlikely that otter

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Site Name Designation Site Code Distance	Qualifying Interests	Value	Rationale
			populations associated with this SAC interact with those recorded in the Camlin adjacent to the site. No significant direct or indirect effects are predicted to otter.
Fortwilliam Turlough SAC 000448 19.6km	• Turloughs [3180]	International	There will be no direct effects as this European Site lies entirely outside of and >19.6km from the development footprint. The potential for indirect effects on the QIs of this SAC can be ruled out due to the intervening distance between the development site and the SAC and the absence of source-pathway-receptor chain for likely significant effects.
Ballykenny – Fisherstown Bog SPA 004101 **~ 4.6km via Directly**	• Greenland White-fronted Goose (*Anser albifrons flavirostris*) [A395]	International	There will be no direct effects as this European Site lies entirely outside of the development footprint. Greenland White-fronted goose has not been recorded on this site in over a decade (NPWS, 2012). Other species, including Merlin and Red Grouse, Cormorant (51), Whooper Swan (40), Wigeon (419), Teal (444), Tufted Duck (49) and Goldeneye (11), are known to occur within this SPA. Greenland White-fronted was not recorded during any surveys of the wind farm site. Cormorant, Wigeon, Teal, and Tufted Duck were all recorded during surveys of the wind farm site (See Appendix 11.1 and 11.2). None were recorded in numbers or at a frequency corresponding to county-level importance or above, with the exception of the whooper swan, which is discussed further below. No likely significant effects were predicted for any

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Site Name Designation Site Code Distance	Qualifying Interests	Value	Rationale
~ 10km via Camlin River			of these species alone or in combination with any other developments as a result of the Proposed Development. Whooper swan was the only SCI bird species recorded at a frequency indicating county-level importance during bird surveys of the Proposed Development site. Although not listed as a Special Conservation Interest (SCI) species for the site, it is an Annex I species under the EU Birds Directive. Comprehensive bird surveys (See Appendix 11.1 and 11.2) impact assessments (detailed in Chapter 11 of the EIAR), and a collision risk assessment model (refer to Appendix 11.3) concluded that the Proposed Development would not result in any significant adverse effects on this species via, displacement, disturbance, barrier effect or collision risk. No likely significant effects are anticipated for the whooper swan, either individually or in combination with other developments. Further discussion on the potential for LSE in this species is provided in Table 10-8, and it is discussed comprehensively in the Appropriate Assessment Screening Report that accompanies this EAR.
Glen Lough SPA 004045 16km	• Whooper Swan (*Cygnus cygnus*) [A038]	International	There will be no direct effects as this European Site lies entirely outside of and >16km from the development footprint. There is no hydrological connectivity between the Proposed Development and the SPA which is located in a different surface water catchment to the Proposed Development. Therefore, no potential for indirect effects on supporting wetland habitat for SCI bird species due to deterioration in water quality exists.

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Site Name Designation Site Code Distance	Qualifying Interests	Value	Rationale
			The core foraging range from the night roost for whooper swan is less than 5km (SNH, 2016), placing this SPA significantly outside of the ZOI for the Proposed Development. Whooper swan was the only bird species recorded at a frequency indicating county-level importance during bird surveys of the Proposed Development site. This Special Conservation Interest (SCI) species for this SPA is also an Annex I species under the EU Birds Directive .Comprehensive bird surveys (See Appendix 11.1 and 11.2) impact assessments (detailed in Chapter 11 of the EIAR), and a collision risk assessment model (refer to Appendix 11.3) concluded that the Proposed Development would not result in any significant adverse effects on this species via, displacement, disturbance, barrier effect or collision risk. No likely significant effects are anticipated for the whooper swan, either individually or in combination with other developments. Further discussion on the potential for LSE to this species is provided in Table 10-8.
Lough Ree SPA 004064 ~17km directly	• Little Grebe (*Tachybaptus ruficollis*) [A004] • Whooper Swan (*Cygnus cygnus*) [A038] • Wigeon (*Anas penelope*) [A050] • Teal (*Anas crecca*) [A052] • Mallard (*Anas platyrhynchos*) [A053] • Shoveler (*Anas clypeata*) [A056]	International	There will be no direct effects as this European Site lies entirely outside of and >20km from the development footprint. Maintaining water quality is central to maintaining and restoring the favourable conservation condition of the wetland habitat in Lough Ree SPA as a resource for the regularly-occurring migratory waterbirds that Utilise. The significant buffer distance of approximately 26km between the potential source and this receptor site, coupled with the natural processes of pollutant dissipation, dilution, and sedimentation along the River Camlin, make likely significant effects extremely unlikely. These mechanisms ensure that any pollutants potentially reaching the Camlin

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Site Name Designation Site Code Distance	Qualifying Interests	Value	Rationale
~26km via Camlin and Shannon	• Tufted Duck (*Aythya fuligula*) [A061] • Common Scoter (*Melanitta nigra*) [A065] • Goldeneye (*Bucephala clangula*) [A067] • Coot (*Fulica atra*) [A125] • Golden Plover (*Pluvialis apricaria*) [A140] • Lapwing (*Vanellus vanellus*) [A142] • Common Tern (*Sterna hirundo*) [A193] • Wetland and Waterbirds [A999]		during the construction phase are unlikely to reach the SPA in concentrations that could compromise the site's conservation objectives. Wigeon, Teal , Mallard, Golden Plover and Lapwing were all recorded during surveys of the wind farm site (See Appendix 11.1 and 11.2). No were recorded in numbers or at a frequency corresponding to county-level importance or above. No likely significant effects were predicted for any of these species alone or in combination with any other developments as a result of the Proposed Development. The core foraging range from the night roost for Whooper Swans is less than 5km (SNH, 2016), placing this SPA significantly outside of the ZOI for the Proposed Development. Whooper swan was the only bird species recorded at a frequency indicating county-level importance during bird surveys of the Proposed Development site. This Special Conservation Interest (SCI) species for this SPA is also an Annex I species under the EU Birds Directive. Comprehensive bird surveys (See Appendix 11.1 and 11.2) impact assessments (detailed in Chapter 11 of the EIAR), and a collision risk assessment model (refer to Appendix 11.3) concluded that the Proposed Development would not result in any significant adverse effects on this species via, displacement, disturbance, barrier effect or collision risk. No likely significant effects are anticipated for the whooper swan, either individually or in combination with other developments. Further discussion on the potential for LSE to this species is provided in Table 10-8.

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Site Name Designation Site Code Distance	Qualifying Interests	Value	Rationale
Lough Derravarragh SPA 004043 20km	• Whooper Swan (*Cygnus cygnus*) [A038] • Pochard (*Aythya ferina*) [A059] • Tufted Duck (*Aythya fuligula*) [A061] • Coot *(Fulica atra*) [A125] • Wetland and Waterbirds [A999]	International	There will be no direct effects as this European Site lies entirely outside of and >20km from the development footprint. There is no hydrological connectivity between the Proposed Development site and this SPA. Therefore, there is no potential for indirect effects on supporting wetland habitat for SCI bird species due to deterioration in water quality. The core foraging range from the night roost for Whooper Swans is less than 5km (SNH, 2016), placing this SPA significantly outside of the ZOI for the Proposed Development. Whooper swan was the only bird species recorded at a frequency indicating county-level importance during bird surveys of the Proposed Development site. This Special Conservation Interest (SCI) species for this SPA is also an Annex I species under the EU Birds Directive. Comprehensive bird surveys (See Appendix 11.1 and 11.2) impact assessments (detailed in Chapter 11 of the EIAR), and a collision risk assessment model (refer to Appendix 11.3) concluded that the Proposed Development would not result in any significant adverse effects on this species via, displacement, disturbance, barrier effect or collision risk. No likely significant effects are anticipated for the whooper swan, either individually or in combination with other developments. Further discussion on the potential for LSE to this species is provided in Table 10-8.
Lough Iron SPA	• Whooper Swan (*Cygnus cygnus*) [A038] • Wigeon (*Anas penelope*) [A050]	International	There will be no direct effects as this European Site lies entirely outside of and >23km from the development footprint.

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Site Name Designation Site Code Distance	Qualifying Interests	Value	Rationale
004046 23km	• Teal (*Anas crecca*) [A052] • Shoveler (*Anas clypeata*) [A056] • Coot (*Fulica atra*) [A125] • Golden Plover (*Pluvialis apricaria*) [A140] • Greenland White-fronted Goose (*Anser albifrons flavirostris*) [A395] • Wetland and Waterbirds [A999]		There is no hydrological connectivity between the Proposed Development site and this SPA. Therefore, there is no potential for indirect effects on supporting wetland habitat for SCI bird species due to deterioration in water quality. The core foraging range from the night roost for Whooper Swans is less than 5km (SNH, 2016), placing this SPA significantly outside of the ZOI for the Proposed Development. Whooper swan was the only bird species recorded at a frequency indicating county-level importance during bird surveys of the Proposed Development site. This Special Conservation Interest (SCI) species for this SPA is also an Annex I species under the EU Birds Directive. Comprehensive bird surveys (See Appendix 11.1 and 11.2) impact assessments (detailed in Chapter 11 of the EIAR), and a collision risk assessment model (refer to Appendix 11.3) concluded that the Proposed Development would not result in any significant adverse effects on this species via, displacement, disturbance, barrier effect or collision risk. No likely significant effects are anticipated for the whooper swan, either individually or in combination with other developments. Further discussion on the potential for LSE to this species is provided in Table 10-8.
Lough Oughter Complex SPA 004049	• Great Crested Grebe (*Podiceps cristatus*) [A005] • Whooper Swan (*Cygnus cygnus*) [A038] • Wigeon (*Anas penelope*) [A050] • Wetland and Waterbirds [A999]	International	There will be no direct effects as this European Site lies entirely outside of and >30km from the development footprint. There is no hydrological connectivity between the Proposed Development site and this SPA. Therefore, there is no potential for indirect effects on

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Site Name Designation Site Code Distance	Qualifying Interests	Value	Rationale
30km			supporting wetland habitat for SCI bird species due to deterioration in water quality. Wigeon were recorded during surveys of the wind farm site (See Appendix 11.1 and 11.2). None were recorded in numbers or at a frequency corresponding to county-level importance or above. No likely significant effects were predicted for this species alone or in combination with any other developments as a result of the Proposed Development. The core foraging range from the night roost for Whooper Swans is less than 5km (SNH, 2016), placing this SPA significantly outside of the ZOI for the Proposed Development. Whooper swan was the only bird species recorded at a frequency indicating county-level importance during bird surveys of the Proposed Development site. This Special Conservation Interest (SCI) species for this SPA is also an Annex I species under the EU Birds Directive. Comprehensive bird surveys (See Appendix 11.1 and 11.2) impact assessments (detailed in Chapter 11 of the EIAR), and a collision risk assessment model (refer to Appendix 11.3) concluded that the Proposed Development would not result in any significant adverse effects on this species via, displacement, disturbance, barrier effect or collision risk. No likely significant effects are anticipated for the whooper swan, either individually or in combination with other developments. Further discussion on the potential for LSE to this species is provided in Table 10-8.
River Suck Callows	• Whooper Swan (*Cygnus cygnus*) [A038] • Wigeon (*Anas penelope*) [A050]	International	There will be no direct effects as this European Site lies entirely outside of and >36km from the development footprint. There is no hydrological connectivity between the Proposed Development site and this SPA. Therefore, there is no potential for indirect effects on

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Site Name Designation Site Code Distance	Qualifying Interests	Value	Rationale
SPA 004097 36km	• Golden Plover (*Pluvialis* alpricaria) [A140] • Lapwing (*Vanellus vanellus*) [A142] • Greenland White-fronted Goose (*Anser albifrons flavirostris*) [A395] • Wetland and Waterbirds [A999]		supporting wetland habitat for SCI bird species due to deterioration in water quality. Wigeon, Golden Plover and Lapwing were recorded during surveys of the wind farm site (See Appendix). None were recorded in numbers or at a frequency corresponding to county-level importance or above. No likely significant effects were predicted for this species alone or in combination with any other developments as a result of the Proposed Development. The core foraging range from the night roost for whooper swans is less than 5km (SNH, 2016), placing this SPA significantly outside of the ZOI for the Proposed Development. Whooper swan was the only bird species recorded at a frequency indicating county-level importance during bird surveys of the Proposed Development site. This Special Conservation Interest (SCI) species for this SPA is also an Annex I species under the EU Birds Directive. Comprehensive bird surveys (See Appendix 11.1 and 11.2) impact assessments (detailed in Chapter 11 of the EIAR), and a collision risk assessment model (refer to Appendix 11.3) concluded that the Proposed Development would not result in any significant adverse effects on this species via, displacement, disturbance, barrier effect or collision risk. No likely significant effects are anticipated for the whooper swan, either individually or in combination with other developments. Further discussion on the potential for LSE to this species is provided in Table 10-8.

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Site Name Designation Site Code Distance	Qualifying Interests	Value	Rationale
Middle Shannon Callows SPA 004096 39km	• Whooper Swan (*Cygnus cygnus*) [A038] • Wigeon (*Anas penelope*) [A050] • Corncrake (*Crex crex*) [A122] • Golden Plover (*Pluvialis apricaria*) [A140] • Lapwing (*Vanellus vanellus*) [A142] • Black-tailed Godwit (*Limosa limosa*) [A156] • Black-headed Gull (*Chroicocephalus ridibundus*) [A179] • Wetland and Waterbirds [A999]	International	There will be no direct effects as this European Site lies entirely outside of and >39km from the development footprint. There is no hydrological connectivity between the Proposed Development site and this SPA. Therefore, there is no potential for indirect effects on supporting wetland habitat for SCI bird species due to deterioration in water quality. Wigeon, Black-headed Gull, Golden Plover and Lapwing were recorded during surveys of the wind farm site (See Appendix 11.1 and 11.2). None were recorded in numbers or at a frequency corresponding to county-level importance or above. No likely significant effects were predicted for this species alone or in combination with any other developments as a result of the Proposed Development. The core foraging range from the night roost for whooper swans is less than 5km (SNH, 2016), placing this SPA significantly outside of the ZOI for the Proposed Development. Whooper swan was the only bird species recorded at a frequency indicating county-level importance during bird surveys of the Proposed Development site. This Special Conservation Interest (SCI) species for this SPA is also an Annex I species under the EU Birds Directive. Comprehensive bird surveys (See Appendix 11.1 and 11.2) impact assessments (detailed in Chapter 11 of the EIAR), and a collision risk assessment model (refer to Appendix 11.3) concluded that the Proposed Development would not result in any significant adverse effects on this species via, displacement, disturbance, barrier effect or collision risk. No likely significant effects are anticipated for the whooper swan, either individually or in combination with other

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Site Name Designation Site Code Distance	Qualifying Interests	Value	Rationale
			developments. Further discussion on the potential for LSE to this species is provided in Table 10-8.
Lough Gara SPA 004048 45km	• Whooper Swan (*Cygnus cygnus*) [A038] • Greenland White-fronted Goose (*Anser albifrons flavirostris*) [A395]	International	There will be no direct effects as this European Site lies entirely outside of and >45km from the development footprint. There is no hydrological connectivity between the Proposed Development site and this SPA. Therefore, there is no potential for indirect effects on supporting wetland habitat for SCI bird species due to deterioration in water quality. The core foraging range from the night roost for whooper swans is less than 5km (SNH, 2016), placing this SPA significantly outside of the ZOI for the Proposed Development. Whooper swan was the only bird species recorded at a frequency indicating county-level importance during bird surveys of the Proposed Development site. This Special Conservation Interest (SCI) species for this SPA is also an Annex I species under the EU Birds Directive. Comprehensive bird surveys (See Appendix 11.1 and 11.2) impact assessments (detailed in Chapter 11 of the EIAR), and a collision risk assessment model (refer to Appendix 11.3) concluded that the Proposed Development would not result in any significant adverse effects on this species via, displacement, disturbance, barrier effect or collision risk. No likely significant effects are anticipated for the whooper swan, either individually or in combination with other developments. Further discussion on the potential for LSE to this species is provided in Table 10-8.

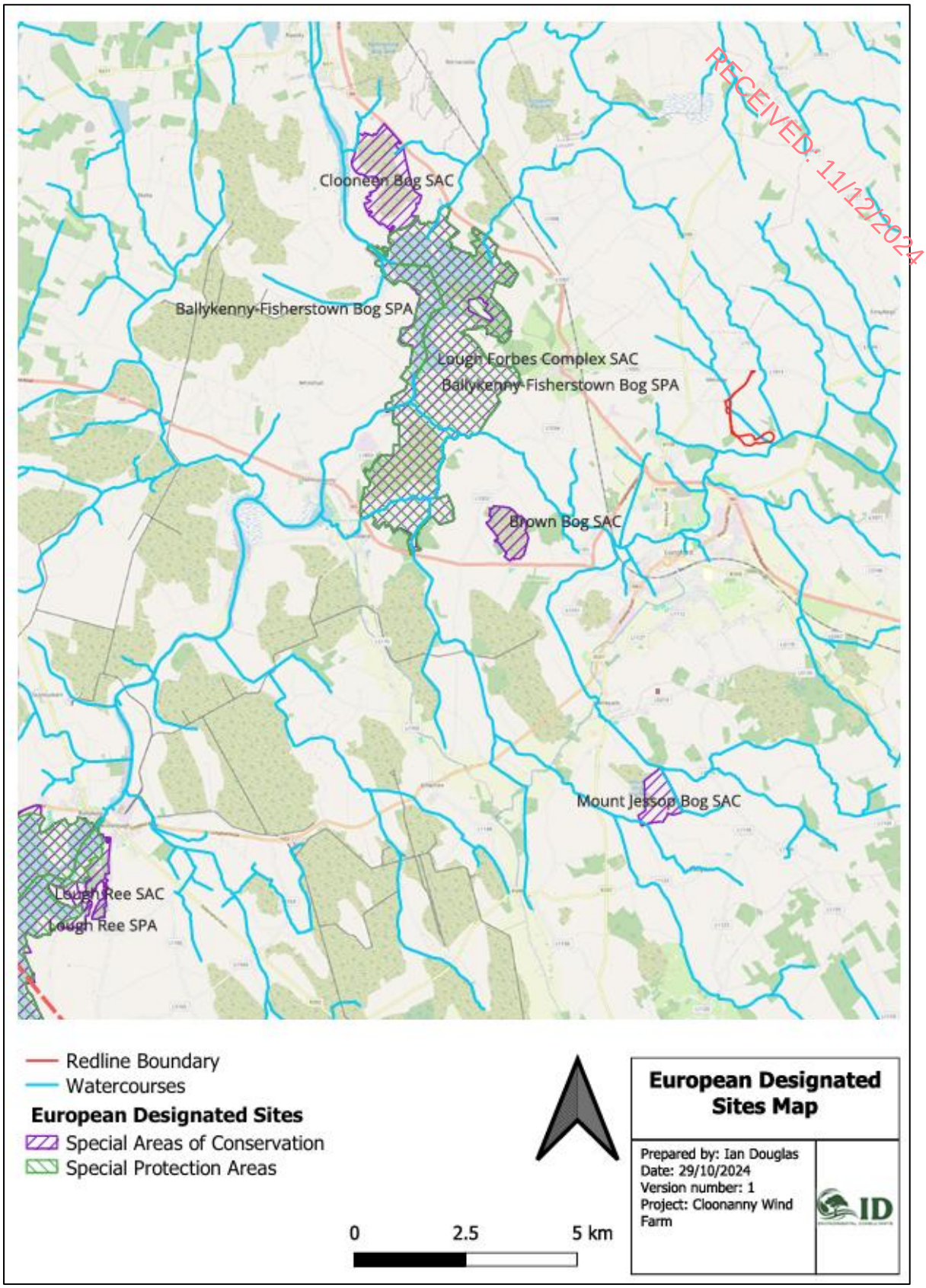
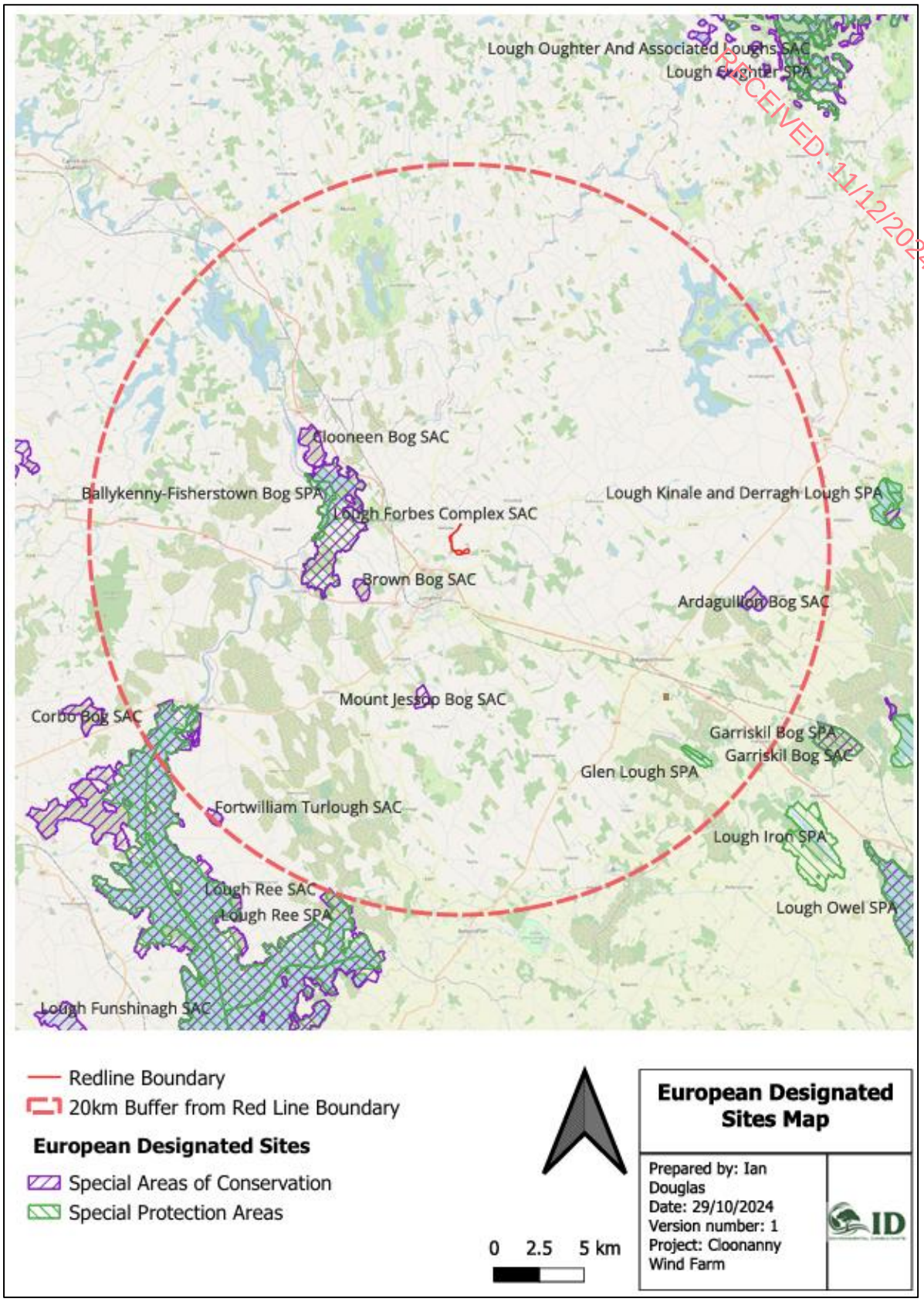


Figure 110.4: EU Designated Sites surrounding the Proposed Development



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Figure 110.5: European Designated Sites within 20km of the Proposed Development

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10.7.1.1 Other Designated Conservation Areas

Natural Heritage Areas (NHAs) are designated under Section 18 the Wildlife (Amendment) Act 2000; their management and protection is provided for by this legislation and planning policy. The potential for effects on these designated sites is fully considered in this EIAR. Proposed Natural Heritage Areas (pNHAs) were listed on a non-statutory basis in 1995, but have not since been statutorily proposed or designated. However, the potential for effects on these designated sites is fully considered in this chapter.

Table 10.5: Other designated conservation areas

Site Name & Designation Site Code Distance	Qualifying Interests	Value	Rationale
Carrickglass Demesne pNHA 001822 890m	Well-developed, semi-natural mixed broadleaved woodlands, its mainly mature nature and the lack of similar habitats in the north midlands	National	The proposed development is located outside the boundary of this pNHA and there is no potential for direct effects. The potential for indirect effects on this pNHA can be ruled out due to the intervening distance between the development site and the pNHA and the nature of the conservation site. No hydrological connectivity exists between the two sites.
Royal Canal pNHA 002103 3km	Diversity of species along linear habitats, otter and opposite-leaved pondweed (*Groenlandia densa*)	National	The proposed development is located outside the boundary of this pNHA and there is no potential for direct effects. The potential for indirect effects on this pNHA can be ruled out due to the intervening distance between the development site and the pNHA and the nature of the conservation site. No hydrological connectivity exists between the two sites.
Lough Forbes Complex pNHA 001818 4.5km	Overlaps with SAC of same name, no site synopsis available.	National	Considered under SAC of the same name The proposed development is located outside the boundary of this pNHA and there is no potential for direct effects. The potential for indirect effects on this pNHA can be ruled out due to the intervening distance between the development site and the pNHA and the nature of the conservation site.

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Site Name & Designation Site Code Distance	Qualifying Interests	Value	Rationale
Derrymore Bog pNHA 000447 4.7km	Lowland raised bog	National	The proposed development is located outside the boundary of this pNHA and there is no potential for direct effects. The potential for indirect effects on this pNHA can be ruled out due to the intervening distance between the development site and the pNHA and the lack of a source – receptor pathway between this site and the Proposed Development.
Brown Bog pNHA 000442 5km	Overlaps with SAC of same name, no site synopsis available	National	Considered under SAC of the same name The proposed development is located outside the boundary of this pNHA and there is no potential for direct effects. The potential for indirect effects on this pNHA can be ruled out due to the intervening distance between the development site and the pNHA and the lack of a source – receptor pathway between this site and the Proposed Development.
Clooneen Bog pNHA 000445 8km	Overlaps with SAC of the same name, no site synopsis available	National	Considered under SAC of the same name The proposed development is located outside the boundary of this pNHA and there is no potential for direct effects. The potential for indirect effects on this pNHA can be ruled out due to the intervening distance between the development site and the pNHA and the lack of a source – receptor pathway between this site and the Proposed Development.
Lough Rinn pNHA 01417 12km	Large linear lake, part of the larger River Shannon Catchment	National	The proposed development is located outside the boundary of this pNHA and there is no potential for direct effects. The potential for indirect effects on this pNHA can be ruled out due to the intervening distance between the development site and the pNHA and the lack of a source – receptor pathway between this site and the Proposed Development.
Clooncoe Wood and Lough pNHA 000424 12.5km	Forms part of the Lough Rinn group of lakes, situated in a long narrow inter drumlin hollow orientated approx. north-south	National	The proposed development is located outside the boundary of this pNHA and there is no potential for direct effects. The potential for indirect effects on this pNHA can be ruled out due to the intervening distance between the development site and the pNHA and the lack of a source – receptor pathway between this site and the Proposed Development.

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Site Name & Designation Site Code Distance	Qualifying Interests	Value	Rationale
Lough Boderg and Lough Bofin pNHA 001642 12.8km	Complex of connected Upper Shannon lakes	National	The proposed development is located outside the boundary of this pNHA and there is no potential for direct effects. The potential for indirect effects on this pNHA can be ruled out due to the intervening distance between the development site and the pNHA and the lack of a source – receptor pathway between this site and the Proposed Development.
Lough Bannow pNHA 000449 13.8km	Very little open water, the lake is dominated by a large reed-bed dominated by Common Reed (*Phragmites australis*).	National	The proposed development is located outside the boundary of this pNHA and there is no potential for direct effects. The potential for indirect effects on this pNHA can be ruled out due to the intervening distance between the development site and the pNHA and the lack of a source – receptor pathway between this site and the Proposed Development.
Lough Gowna pNHA 000992 14.2km	Medium sized lake divided into two sections. The substrate is Silurian grits and slates, and it is situated in a drumlin filled basin with many bays and inlets.	National	The proposed development is located outside the boundary of this pNHA and there is no potential for direct effects. The potential for indirect effects on this pNHA can be ruled out due to the intervening distance between the development site and the pNHA and the lack of a source – receptor pathway between this site and the Proposed Development.
Lough Bawn pNHA 001819 14.2km	Relatively small site composed of raised bog, fen, wet and dry woodland and freshwater marsh habitats. It is the area of fen that gives this site its primary scientific interest.	National	The proposed development is located outside the boundary of this pNHA and there is no potential for direct effects. The potential for indirect effects on this pNHA can be ruled out due to the intervening distance between the development site and the pNHA and the lack of a source – receptor pathway between this site and the Proposed Development..
Lough Errew pNHA 001807 14.8km	One of three linked lakes, Lough Errew is set in glacial drift deposit of high conductivity.	National	The proposed development is located outside the boundary of this pNHA and there is no potential for direct effects. The potential for indirect effects on this pNHA can be ruled out due to the intervening distance between the development site and the pNHA

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Site Name & Designation Site Code Distance	Qualifying Interests	Value	Rationale
			and the lack of a source – receptor pathway between this site and the Proposed Development.
Ardagullion Bog pNHA 002069 15.5km	Overlaps with SAC of the same name, no site synopsis available	National	Considered under SAC of the same name The proposed development is located outside the boundary of this pNHA and there is no potential for direct effects. The potential for indirect effects on this pNHA can be ruled out due to the intervening distance between the development site and the pNHA and the lack of a source – receptor pathway between this site and the Proposed Development.
Lough Sallagh pNHA 001808 15.6km	Smallest of three linked lakes, Lough Sallagh is set in glacial drift deposit of high conductivity.	National	The proposed development is located outside the boundary of this pNHA and there is no potential for direct effects. The potential for indirect effects on this pNHA can be ruled out due to the intervening distance between the development site and the pNHA and the lack of a source – receptor pathway between this site and the Proposed Development.
Glen Lough pNHA 001687 15.6km	Overlaps with SPA of the same name, no site synopsis available.	National	Considered under SAC of the same name The proposed development is located outside the boundary of this pNHA and there is no potential for direct effects. The potential for indirect effects on this pNHA can be ruled out due to the intervening distance between the development site and the pNHA and the lack of a source – receptor pathway between this site and the Proposed Development.
Lough Ree pNHA 000440 16km	Overlaps with SAC of the same name, no site synopsis available.	National	Considered under SAC of the same name The proposed development is located outside the boundary of this pNHA and there is no potential for direct effects. The potential for indirect effects on this pNHA can be ruled out due to the intervening distance between the development site and the pNHA and the lack of a source – receptor pathway between this site and the Proposed Development.

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Site Name & Designation Site Code Distance	Qualifying Interests	Value	Rationale
Kilglass And Grange Loughs pNHA 000608 17.2km	Characterised by extensive areas of reed-swamps narrowing the lakes.	National	The proposed development is located outside the boundary of this pNHA and there is no potential for direct effects. The potential for indirect effects on this pNHA can be ruled out due to the intervening distance between the development site and the pNHA and the lack of a source – receptor pathway between this site and the Proposed Development.
Lough Naback pNHA 001449 18km		National	The proposed development is located outside the boundary of this pNHA and there is no potential for direct effects. The potential for indirect effects on this pNHA can be ruled out due to the intervening distance between the development site and the pNHA and the lack of a source – receptor pathway between this site and the Proposed Development.
Derry Lough pNHA 001444 18.2km	A fen woodland resulting from succession in the future will be a relatively large area of wet semi-natral woodland in an area where such woodland is rare.	National	The proposed development is located outside the boundary of this pNHA and there is no potential for direct effects. The potential for indirect effects on this pNHA can be ruled out due to the intervening distance between the development site and the pNHA and the lack of a source – receptor pathway between this site and the Proposed Development.
Cordara Turlough pNHA 001821 18.4km	The main interest of the site lies in the large numbers of wildfowl and waters that the area can support when wet. It is also an example of a rare habitat type, turloughs, outside their main region of distribution of the limestone areas west of the Shannon.	National	The proposed development is located outside the boundary of this pNHA and there is no potential for direct effects. The potential for indirect effects on this pNHA can be ruled out due to the intervening distance between the development site and the pNHA and the lack of a source – receptor pathway between this site and the Proposed Development.
Fortwilliam Turlough pNHA 000448	Overlaps with SAC of the same name, no site synopsis available	National	Considered under SAC of the same name The proposed development is located outside the boundary of this pNHA and there is no potential for direct effects.

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Site Name & Designation Site Code Distance	Qualifying Interests	Value	Rationale
			The potential for indirect effects on this pNHA can be ruled out due to the intervening distance between the development site and the pNHA and the lack of a source – receptor pathway between this site and the Proposed Development.
Cloonageeher Bog NHA 001423 6.5km	Peatlands [4]	National	The proposed development is located outside the boundary of this NHA and there is no potential for direct effects. The potential for indirect effects on this pNHA can be ruled out due to the intervening distance between the development site and the NHA and the lack of a source – receptor -pathway between this site and the Proposed Development.
Rinn River NHA 000691 6.5km	Peatlands [4]	National	The proposed development is located outside the boundary of this NHA and there is no potential for direct effects. The potential for indirect effects on this pNHA can be ruled out due to the intervening distance between the development site and the NHA and the lack of a source – receptor -pathway between this site and the Proposed Development.
Mount Jessop Bog NHA 001450 7.4km	Peatlands [4]	National	The proposed development is located outside the boundary of this NHA and there is no potential for direct effects. The potential for indirect effects on this pNHA can be ruled out due to the intervening distance between the development site and the NHA and the lack of a source – receptor -pathway between this site and the Proposed Development.
Aghnamona Bog NHA 000422 9.8km	Peatlands [4]	National	The proposed development is located outside the boundary of this NHA and there is no potential for direct effects. The potential for indirect effects on this pNHA can be ruled out due to the intervening distance between the development site and the NHA and the lack of a source – receptor -pathway between this site and the Proposed Development.

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Site Name & Designation Site Code Distance	Qualifying Interests	Value	Rationale
Cashel Bog (Leitrim) NHA 001405 11.7km	Peatlands [4]	National	The proposed development is located outside the boundary of this NHA and there is no potential for direct effects. The potential for indirect effects on this pNHA can be ruled out due to the intervening distance between the development site and the NHA and the lack of a source – receptor -pathway between this site and the Proposed Development.
Corracramph Bog NHA 001420 12kmd	Peatlands [4]	National	The proposed development is located outside the boundary of this NHA and there is no potential for direct effects. The potential for indirect effects on this pNHA can be ruled out due to the intervening distance between the development site and the NHA and the lack of a source – receptor -pathway between this site and the Proposed Development.

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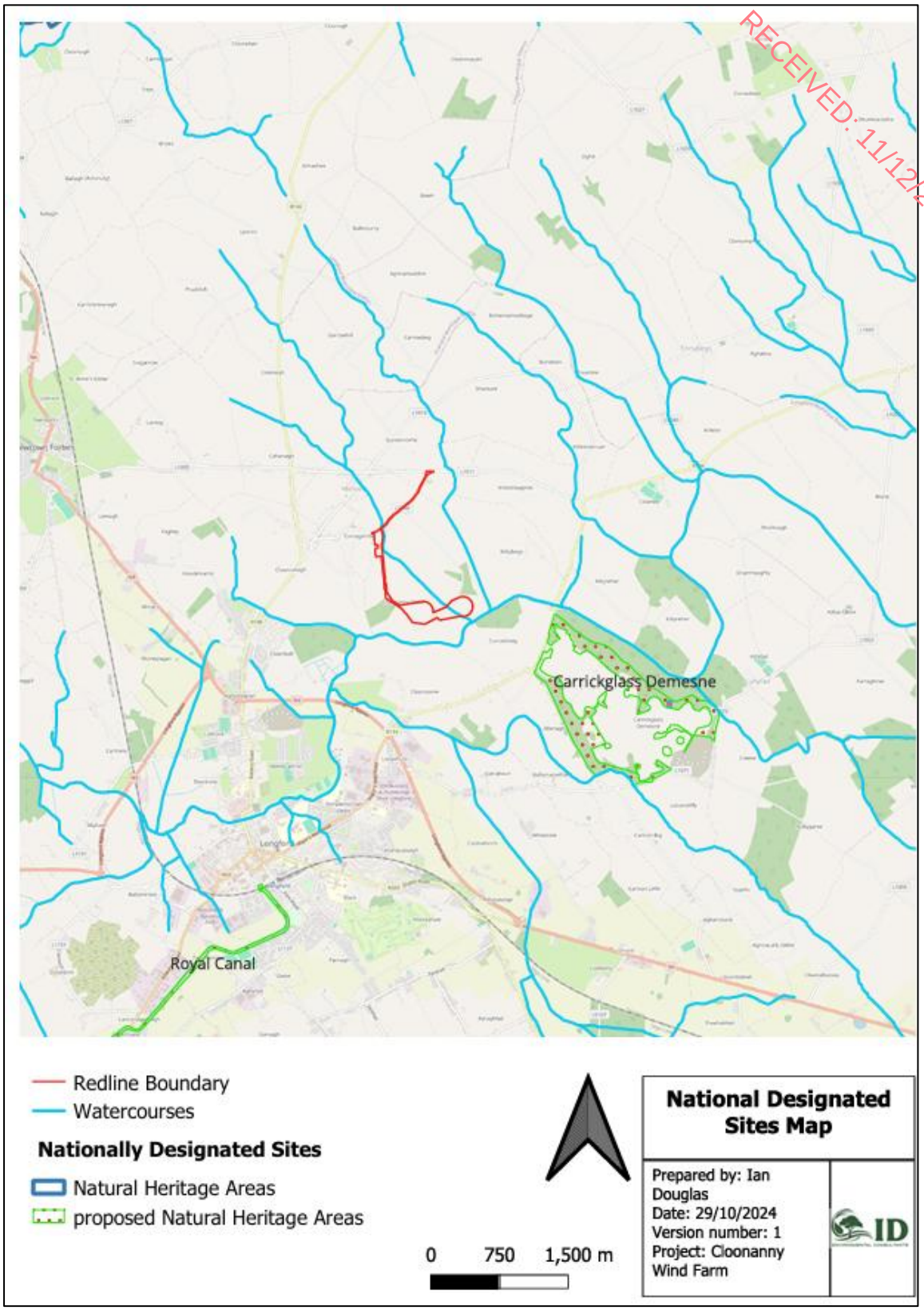
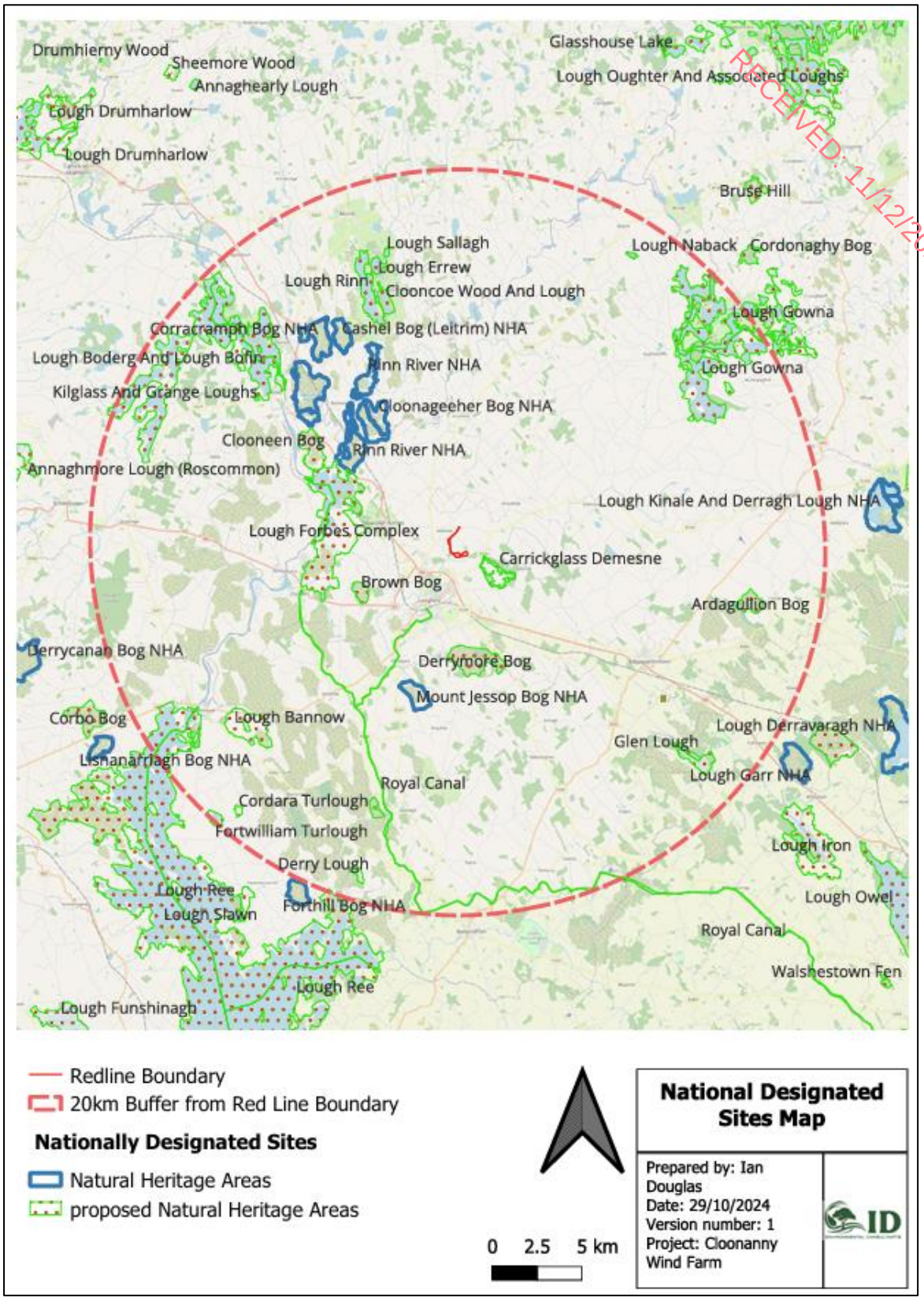


Figure 110-6: National Designated Sites Surrounding Proposed Development



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Figure 110-7: National Designated Sites Within 20km of the Subject Site

Several pNHA and NHA sites are found within 20km of the Proposed Development. Lough Forbes Complex and Lough Ree have hydrological connectivity to the Proposed Development via the Camlin River. Given the significant buffer distance between the potential source of pollution and these

receptor sites and the available distance over which potential pollutants have to become dissolved, diluted or settle out, no potential impacts are predicted alone or in conjunction with any other plans or projects.

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No connectivity is found with any other Nationally Designated site within or beyond 20km from the Proposed Development.

Carrickglass Demesne pNHA is found within 1km of the site's Redline boundary. This pNHA has been designated for areas of semi-natural woodland, which are listed as long-established woodlands on the Native Woodland (NSNW) and Ancient Woodlands inventory (2011 – 2012). No potential pathway for impacts exists between this pNHA and the Proposed Development during this development's construction or operation phase. Therefore, there are *no likely significant effects* on Nationally Designated Sites as a result of the construction phase of the Proposed Development.

10.7.1.2 NPWS Article 17 Reporting

The most recent National Parks and Wildlife Service (NPWS, 2019) data on the recorded distribution of EU Habitats Directive Annex I listed habitats was reviewed in relation to the Proposed Development. This data is available in the form of the NPWS (2019) Article 17 reporting and associated GIS data on 'The Status of EU Protected Habitats and Species in Ireland' (NPWS, 2019) and is shown in Figure 10-8 below. No terrestrial habitats are found within 6km of the site. The closest are those associated with the Lough Forbes Complex SAC.

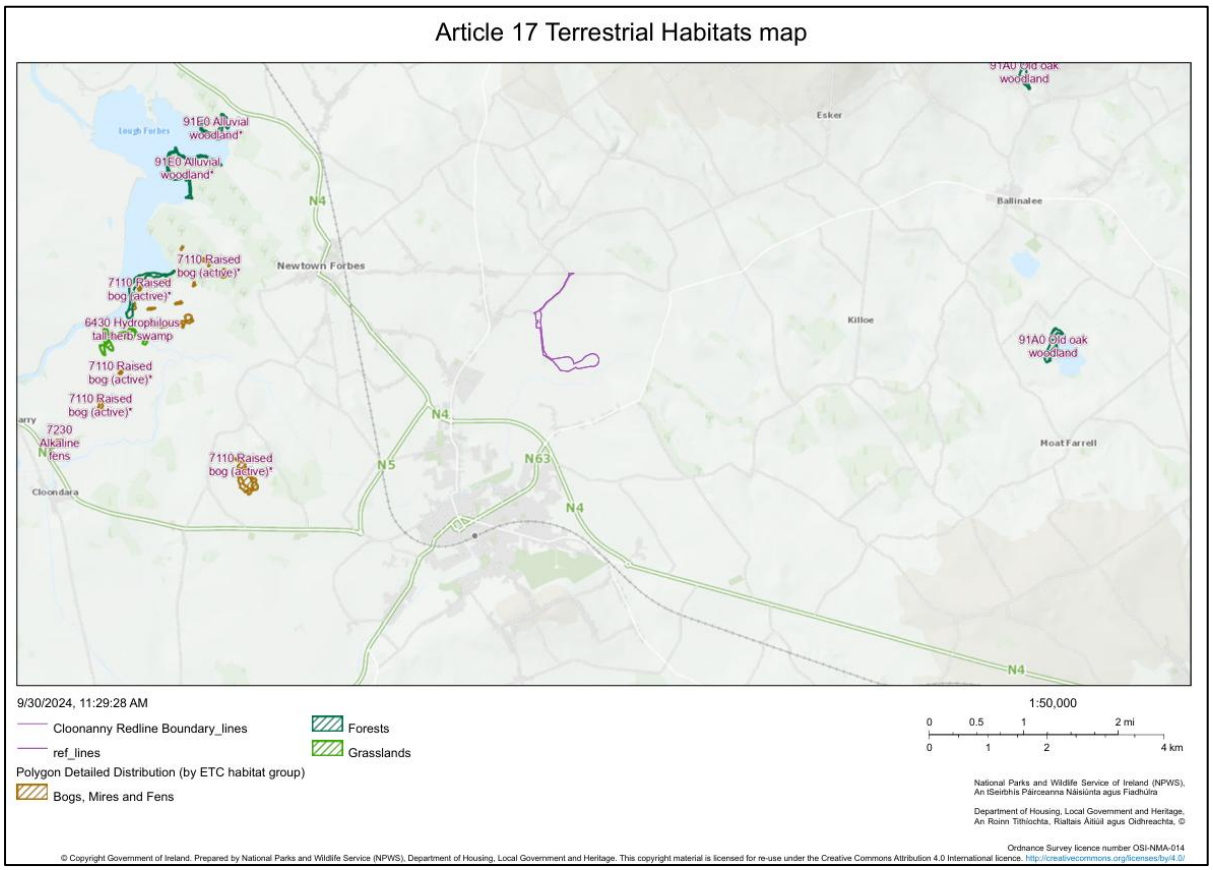


Figure 110-8: Article 17 Mapping for terrestrial habitats (NPWS, 2019)

10.7.2 Habitats and Flora

10.7.2.1 Desktop Survey - Habitats and Flora

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There are no previously mapped Annex I habitats present within the Proposed Development. The closest is associated with Lough Forbes Complex SAC and is over 6km west of the site, as shown in Figure 10-8 above. Habitats mapped as Long-established woodlands (LEW) are located within 930m from the Carrickglass Demesne and conform to Oak-ash-hazel woodland, Wet pedunculate oak-ash woodland and (Mixed) broadleaved woodland. A search on the National Biodiversity Data base within 2km of the Proposed Development did not identify any plants listed within the plant species listed under Annex II of the EU Habitats Directive, The Irish Red Data Book - 1 Vascular Plants (Curtis, 1988 and Wyse Jackson *et.al*., 2016) or the Flora (Protection) Order (1999, as amended 2022).

A search of the NPWS online data map for bryophytes (NPWS, 2020) was also undertaken to establish whether there are records for protected bryophytes within and in the vicinity of the Proposed Development. The mapper shows no records of protected bryophytes within or adjacent to the site.

10.7.2.2 Field Survey - Habitats and Flora

Between 2021 and 2024, ID Environmental ecologists visited the site to conduct habitat detailed habitat and botanical surveys. The habitat descriptions in this section are based on the walkover surveys and detailed vegetation surveys undertaken in 2023 and 2024. Detailed botanical quadrat data is provided in Appendix 10.4 of this EIAR. A habitat map with the construction footprint of the Proposed Development overlain is shown in Figure 10.9. All habitats described below have been classified in accordance with Fossitt (2000).

The proposed grid connection routes are located primarily within the existing road infrastructure classified as buildings and artificial surfaces (BL3). Small areas of hedgerow (WL1) and grassy verge (GS2) habitat, that will be removed along the grid connection route used.

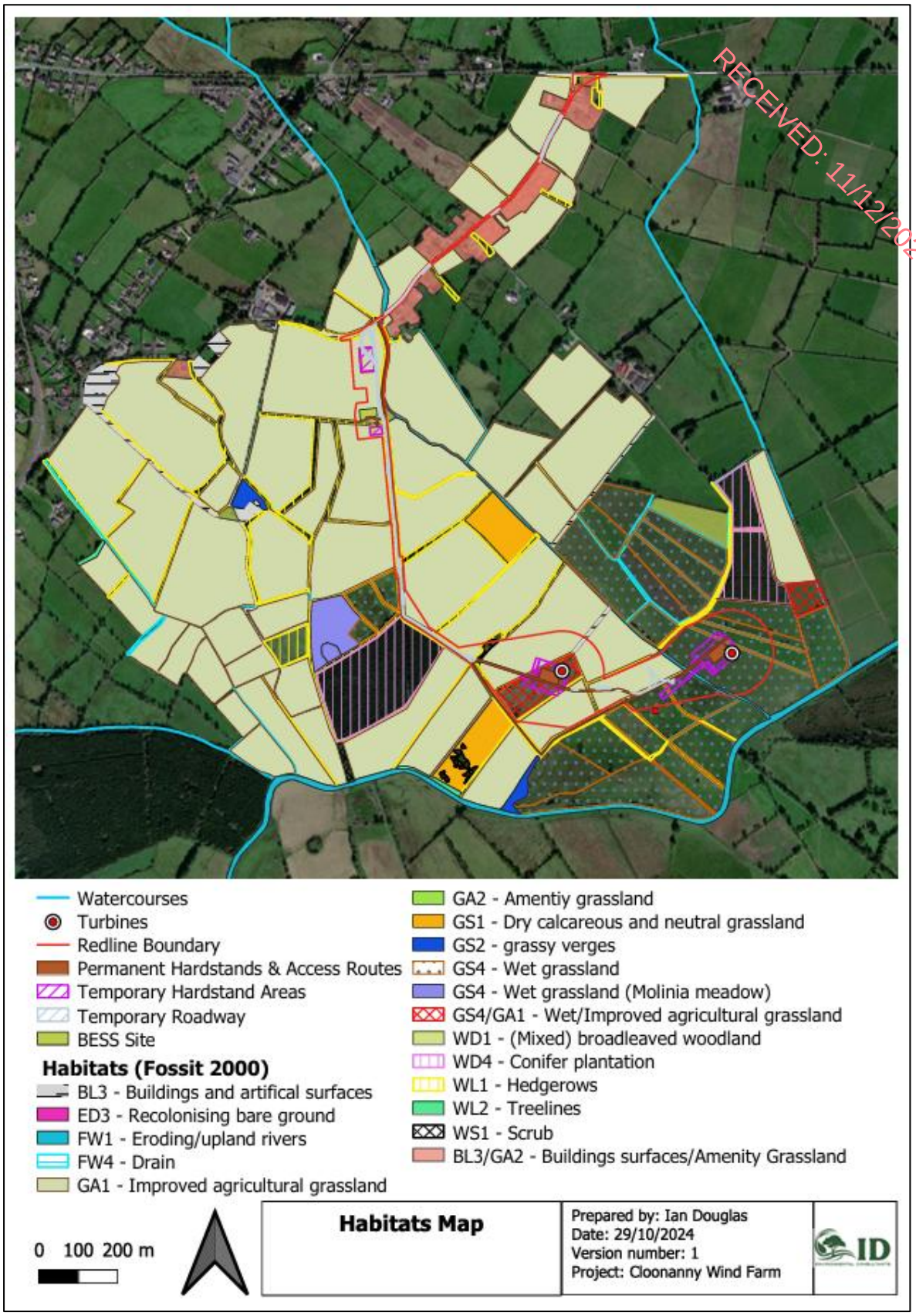


Figure 110-9: Habitat Map

10.7.2.2.1 Improved Agricultural Grassland (GA1)

Improved agricultural grassland is the dominant habitat type with the study area and surrounding landscape. Areas of GA1 habitat are also found within the Proposed Development. This habitat was characterised by reseeded fields dominated by perennial ryegrass (*Lolium perenne*) in addition to species including cocksfoot (*Dactylis glomerata*), yorkshire fog (*Holcus lanatus*), annual meadow-grass (*Poa annua*), creeping buttercup (*Ranunculus repens*) and broadleaved dock (*Rumex obtusifolius*) and dandelion (*Taraxacum officinale*).

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Figure 110-10:Improved Agricultural Grassland (GA1) within the Proposed Development, after being cut for silage

10.7.2.2.2 Hedgerows (WL1) and Treelines (WL2)

Hedgerows and treelines separated fields and access roads within and surrounding the Proposed Development . These were usually on a bank with a small drain at their base. Trees and shrubs were dominated by ash (*Fraxinus excelsior*), hawthorn (*Crataegus monogyna*), blackthorn (*Prunus spinosa*), dog-rose (*Rosa canina*) and bramble (*Rubus fruticosus agg*). The herb layer consisted of meadowsweet, willowherb, lady-fern (*Athyrium filix-femina*), soft shield fern (*Polystichum setiferum*) and hart's-tongue (*Asplenium scolopendrium*). Mosses were abundant throughout. Devil's-bit scabious (*Succisa pratensis*) and common spotted orchid (*Dactylorhiza fuchsii*) were noted occasionally. Hedgerows were found both as intensively managed box cut and overgrown undermanaged. The proportion of both within the works areas is shown in Appendix 10.1.

10.7.2.2.3 Conifer Plantation (WD4)

A small area of sitka spruce (*Picea sitchensis*) conifer plantation is found outside the Proposed Development. Along the site access road.

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10.7.2.2.4 Scrub (WS1)

Small patches of scrub were frequent within fields surrounding the Proposed Development, which were mainly composed of gorse (*Ulex europaeus*) and blackthorn. With bramble, ivy (*Hedera helix*), and honeysuckle (*Lonicera periclymenum*know).

10.7.2.2.5 Buildings and Artificial Surfaces (BL3)

There are some areas of buildings and artificial surfaces (BL3) within the Proposed Development, including the existing local roads, driveways and farm lanes. As shown in Figure.

10.7.2.2.6 Grassy Verge (GS2)

The haul road was bounded by a grassy verge habitat. This typically occurred as a linear strip of grassland separating the hedgerow and roadway. These habitats were typically overgrown and contained a high proportions of course grasses such as cock's-foot, bents (*Agrostis spp.*), false oat grass (*Arrhenatherum elatius*) and yorkshire-fog (*Holcus lanatus*). Herbs were dominated by tall growing and climbing species, including nettle, meadowsweet, willowherbs and bush vetch (*Vicia sepium*).



Figure 110-11:Managed verge and hedgerow habitats found along the site access road

10.7.2.2.7 Wet Grassland (GS4)

Wet grasslands of varying degrees of naturalness dominated the southern portion of the Proposed Development. Many of the fields of this habitat have been extensively drained, fertilised and reseeded but are still subject to occasional flooding. Other areas, particularly boarding the Camlin, have greater semi-natural species assemblages. Wet grassland was typically composed of hard rush, sharp-flowered rush (*Juncus acutiflorus*), marsh foxtail (*Alopecurus geniculatus*), purple moor-grass (*Molinia caerulea*), floating sweet-grass (*Glyceria fluitansrye*), yorkshire-fog and occtioanal rye grass. Broadleaved herb species included creeping buttercup (*Ranunculus repens*), marsh thistle (*Cirsium palustre*), silverweed (*Potentilla anserina*), meadowsweet (*Filipendula ulmaria*), cuckooflower (*Cardamine pratensis*) and marsh ragwort (*Jacobaea aquatica*).

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Figure 110-12:Wet grassland surrounding the Proposed Development

One field of wet grassland found within the study area outside the Proposed Development was found to correspond to the Annex I habitat 'Molinia meadows on calcareous, peaty or clayey-silt-laden soils (*Molinion caeruleae*) (6410). Sedge species recorded included hairy sedge (*Carex hirta*) and yellow sedge (*Carex viridula*), carnation sedge (*Carex panicea*) and star sedge (*Carex echinata*). Herb recorded included heath woodrush (*Luzula multiflora*), heath orchid (*Dactylorhiza maculata*), devil's, water mint (*Mentha aquatica*), ragged robin (*Lychnis flos-cuculi*), meadow thistle (*Cirsium dissectum*), and creeping buttercup (*Ranunculus repens*). Grasses recorded were sweet vernal grass (*Anthoxanthum odoratum*), Yorkshire fog (*Holcus lanatus*), and purple moor-grass (*Molinia caerulea*) highlights the meadow's structure and ecological diversity. This is described in detail in Appendix 10.5.



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Figure 110-13:Molinia meadow habitat dominated by devils bit scabious outside the works area.

10.7.2.2.8 Drainage Ditches

Fields within the Proposed Development are extensively drained with channels running through the study area and eventually discharge into the Camlin River or its tributaries. Drainage ditches were typically 1 -2m wide and less than 1m deep. The majority of the drainage channels on site were vegetated and contained nettle (*Urtica dioica*), meadowsweet (*Filipendula ulmaria*), common reed (*Phragmites australis*), Yellow Iris (*Iris pseudacorus*), valerian (*Valeriana officinalis*), gypsywort (*Lycopus europaeus*), marsh-bedstraw (*Galium palustre*), bulrush (*Typha latifolia*), horsetails (*Equisetum sp*.), willowherbs (*Epilobiums p*.), hard rush (*Juncus effusus*), and occasionally floating vegetation such as Pondweeds (*Potamogeton spp*). Substrates were predominantly silty.


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Figure 110-14:Typical overgrown drainage ditch on site

10.7.2.2.9 Lowland Depositing Rivers (FW2)

The Proposed Development is drained by several watercourses within and surrounding the site, including the Derryharrow and the Camlin, both of which are outside the development area. An unnamed steam is within the Proposed Development and is crossed to allow access to Turbine 1. This stream also runs adjacent to the haul road for approximately 250m. This small stream has been channelised at the crossing point and is overgrown with *Phragmites*. The watercourses above are described in the section 10.7.1 and more in depth in Chapter 9. A map showing the location of watercourses draining and surrounding the Proposed Development is shown in Figure 10-15.

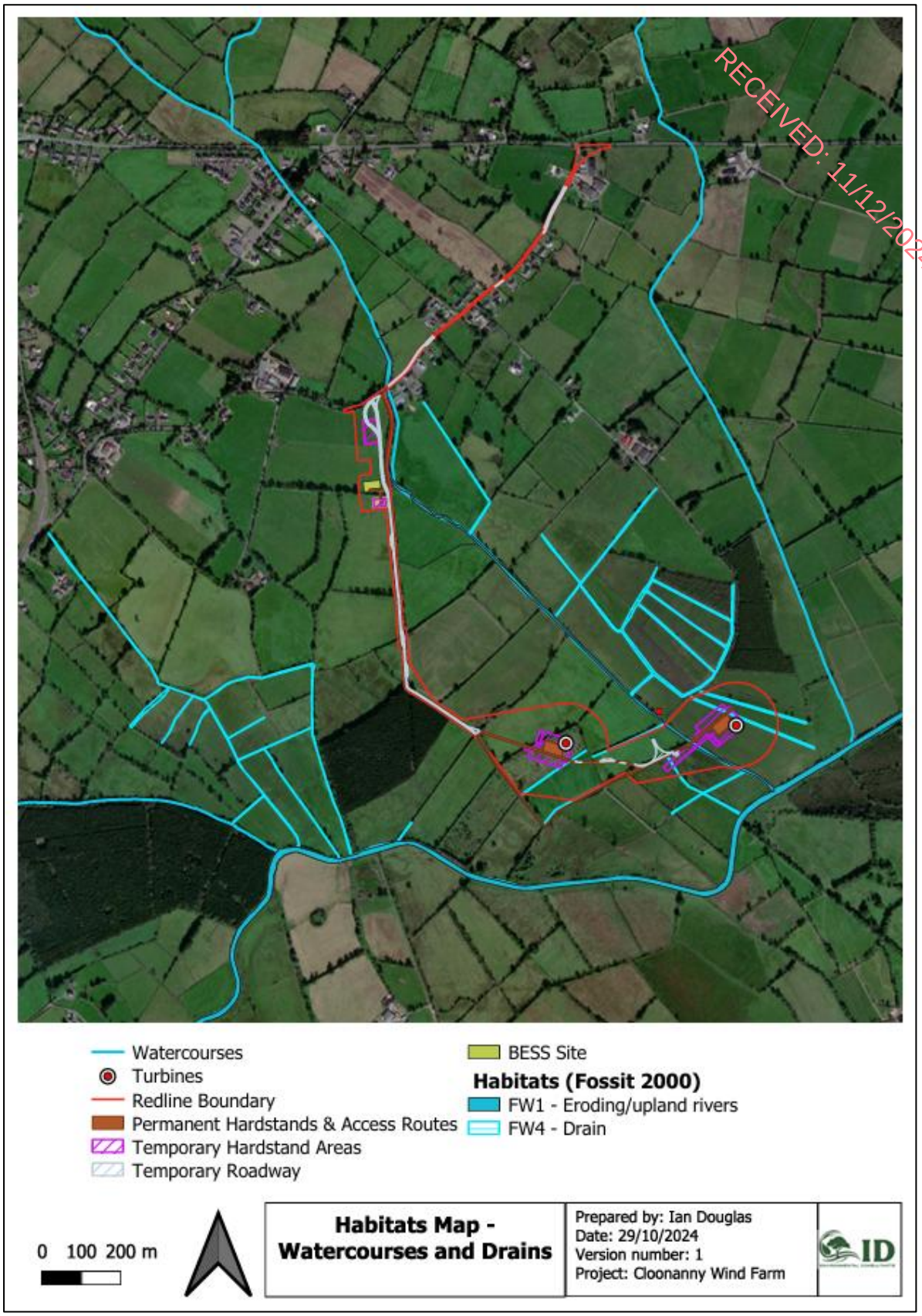


Figure 110-15: Watercourse and drainage ditches within and surrounding the Proposed Development

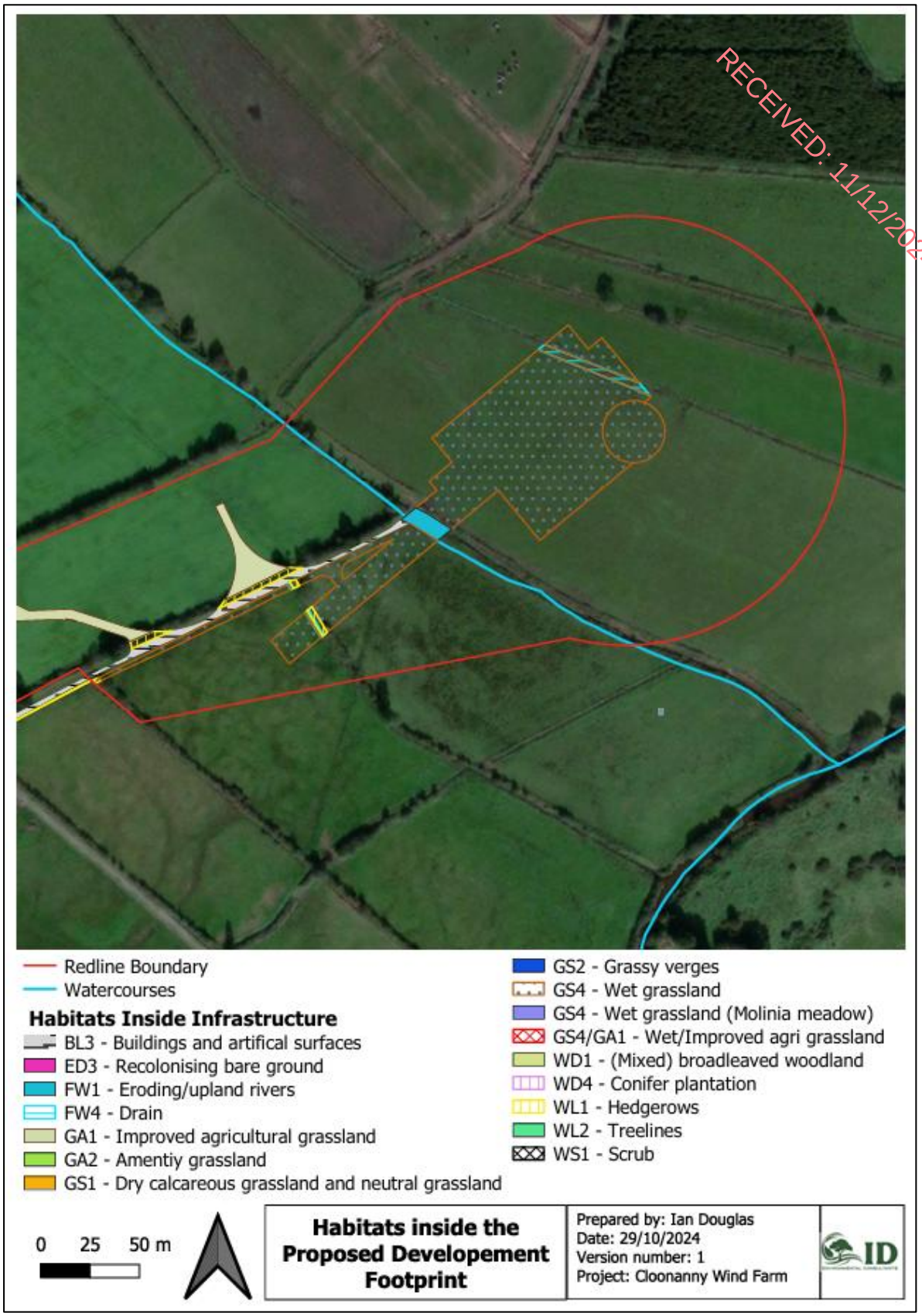


Figure 110-16:Habitats inside the Proposed Development Footprint -1

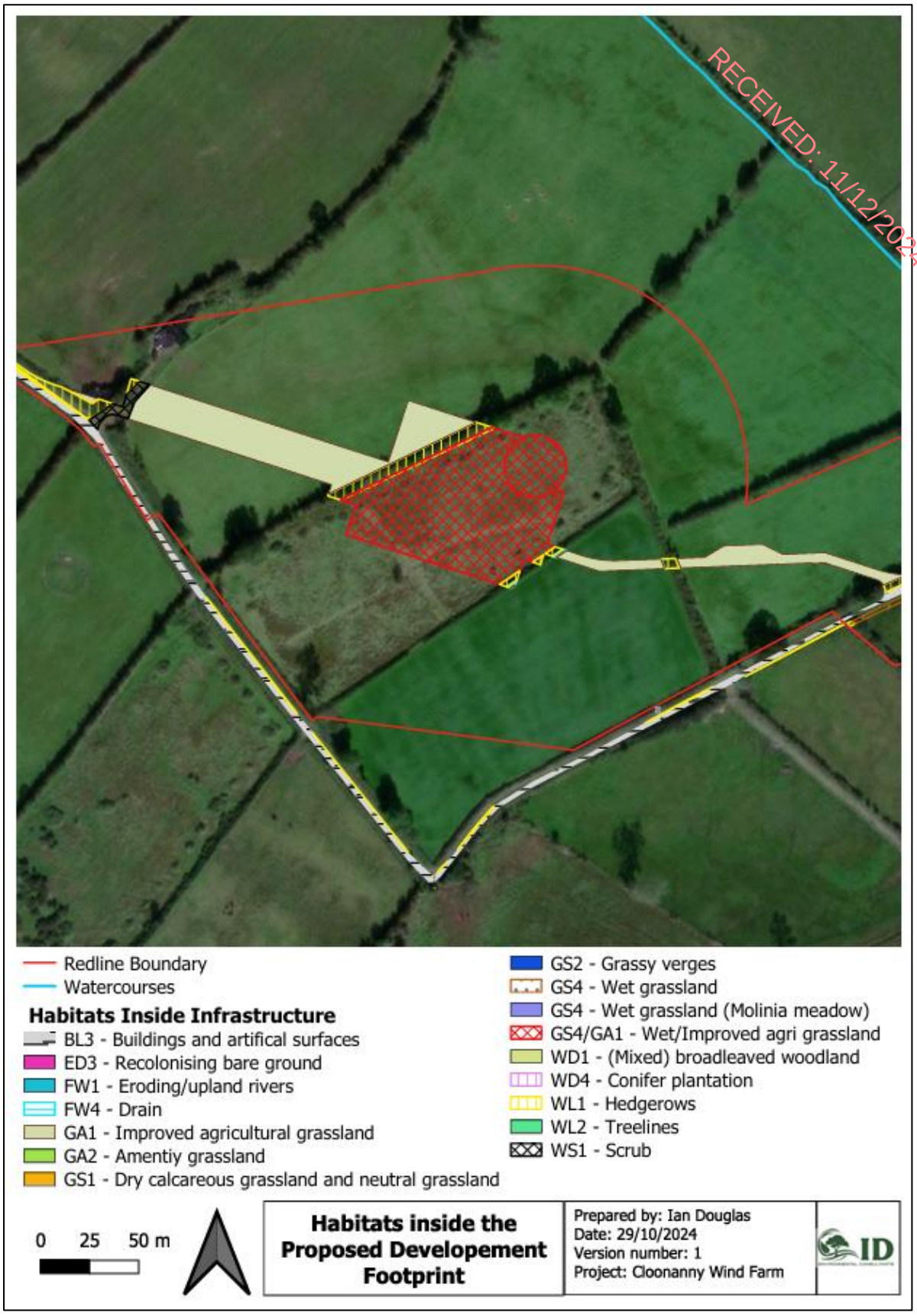


Figure 110-17:Habitats inside the Proposed Development Footprint -2

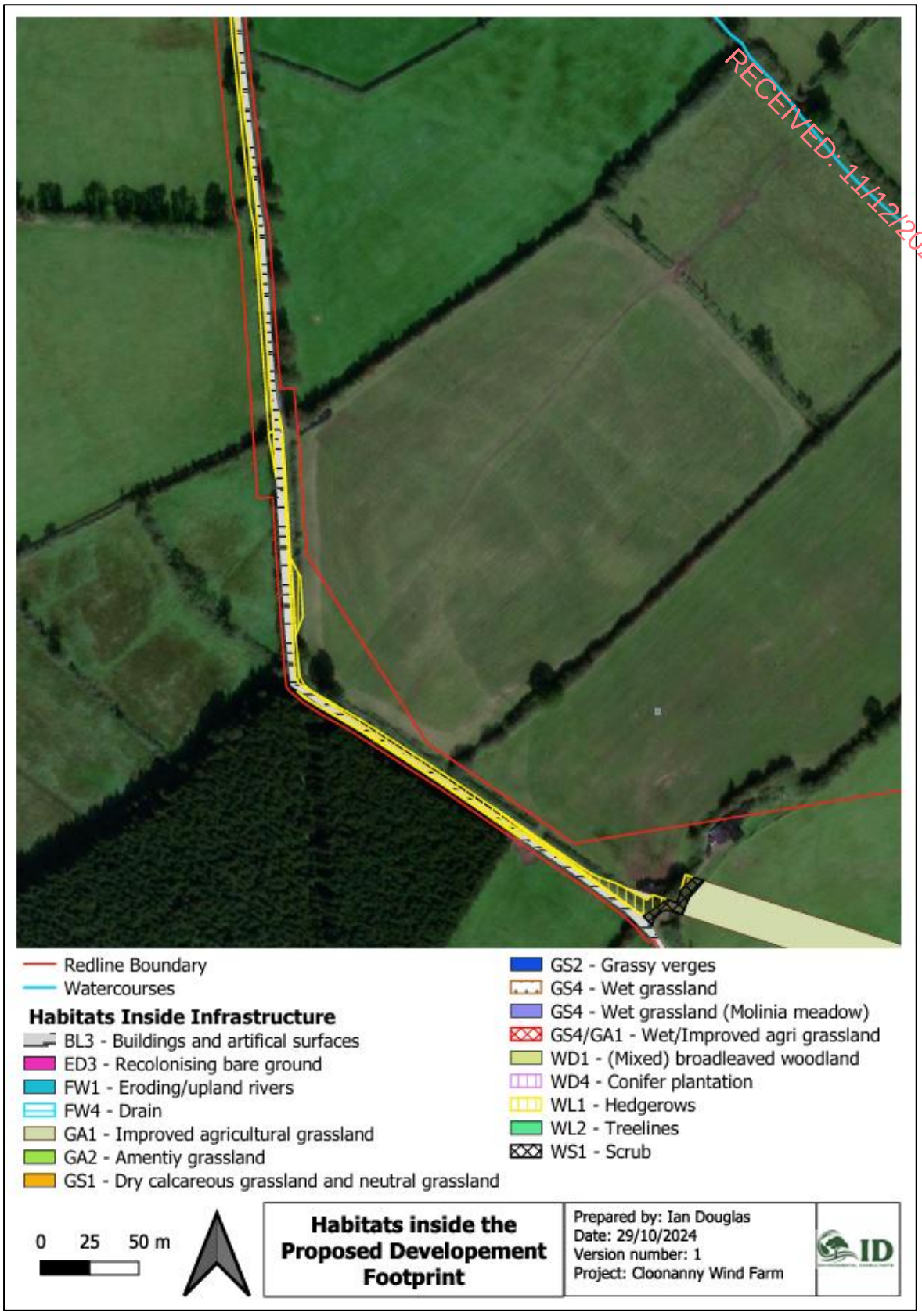


Figure 110-18:Habitats inside the Proposed Development Footprint -3

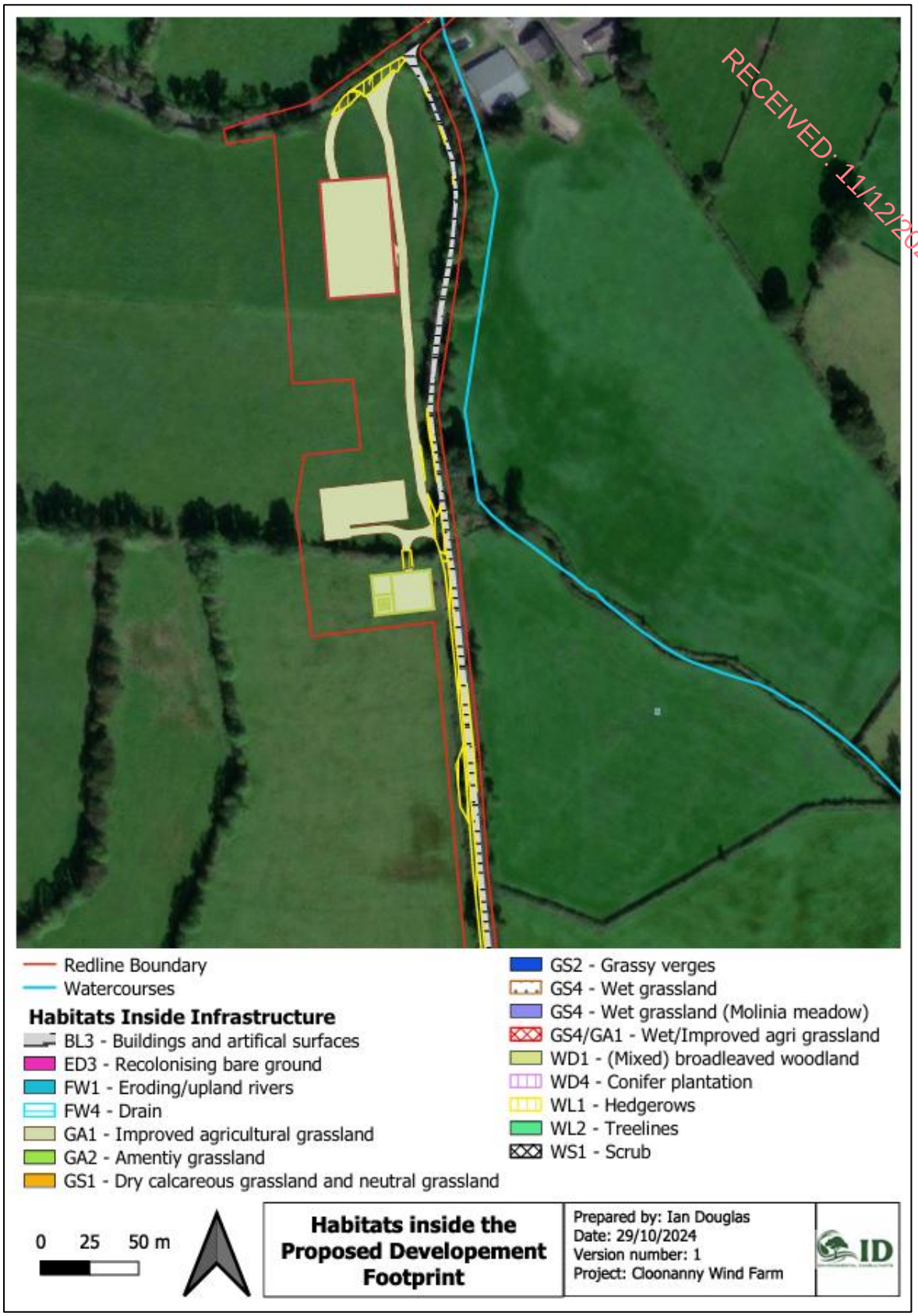


Figure 110-19:Habitats inside the Proposed Development Footprint -4

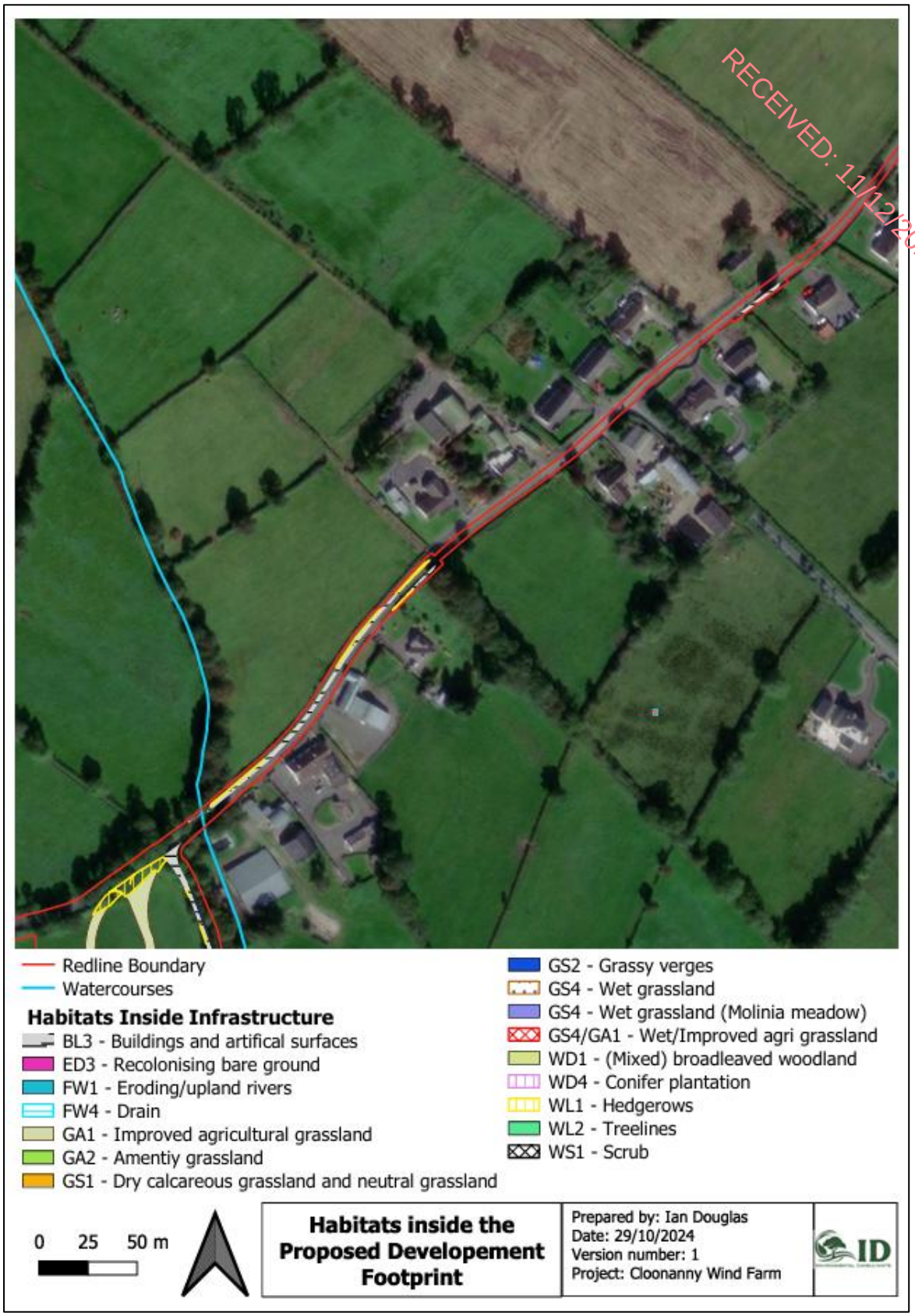


Figure 110-20:Habitats inside the Proposed Development Footprint -5

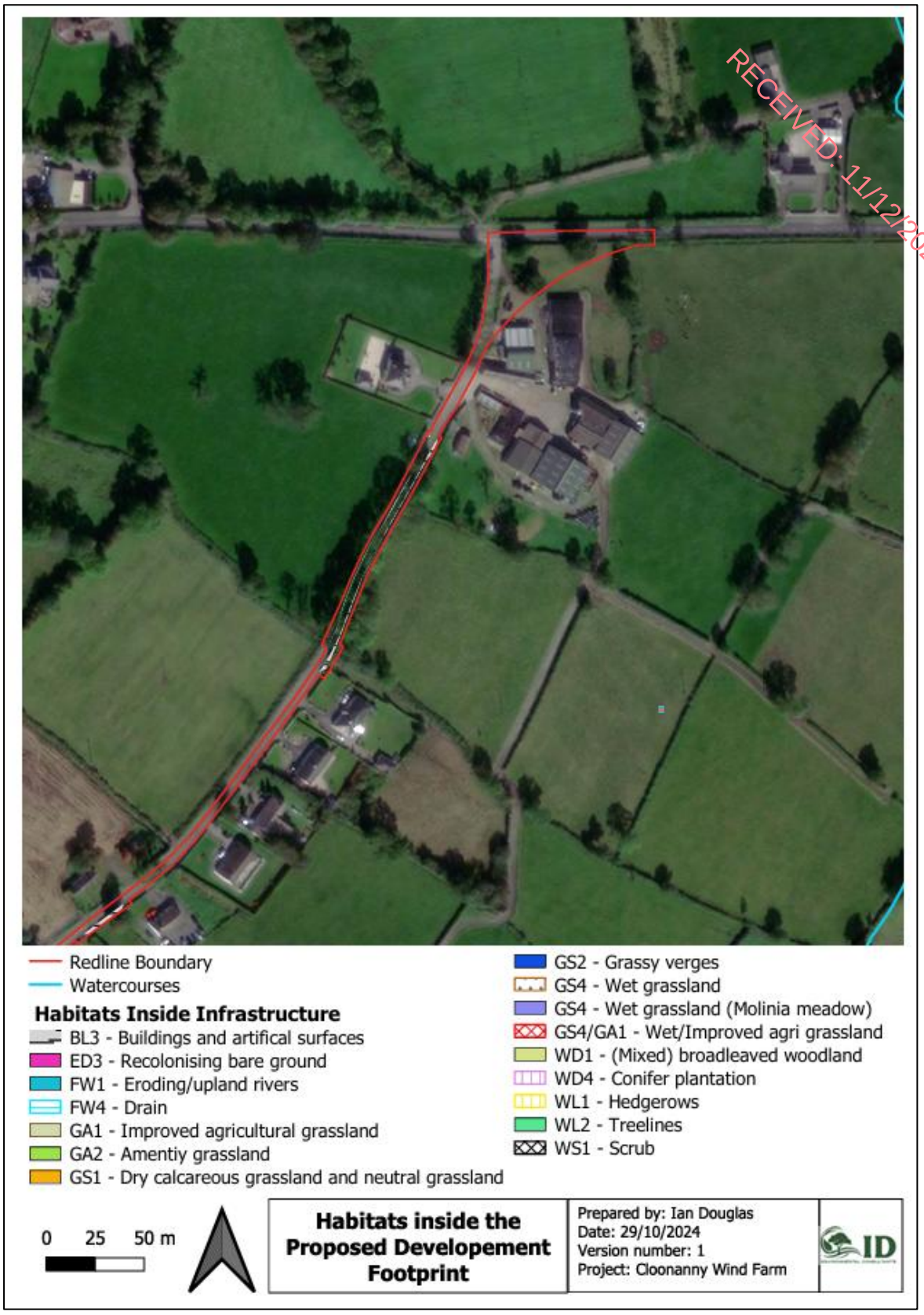


Figure 110-21:Habitats inside the Proposed Development Footprint -6

10.7.2.3 Invasive Species

During the multidisciplinary surveys, a search was conducted for Invasive Alien Species (IAS) listed under the Third Schedule of the European Communities Regulations 2011 (S.I. 477 of 2015).

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The European Union (EU) adopted Regulation (EU) No 1143/2014 on September 29, 2014, to address the introduction and spread of invasive alien species (IAS). This legally binding regulation for all EU member states came into effect on January 1, 2015. It establishes a framework to prevent, minimize, and mitigate the negative impacts of both intentional and unintentional IAS introduction and spread. These impacts encompass biodiversity loss, degradation of associated ecosystem services, and potential harm to human health and the economy.

In line with this regulation, Ireland launched its third National Biodiversity Action Plan (NBAP) in October 2017, covering the 2017-2021 period. This plan builds upon the previous NBAPs and outlines 119 targeted actions under seven strategic objectives. The goal is to achieve Ireland's national "Vision for Biodiversity" through collaborative efforts across government, civil society, and private sectors.

The European Communities (Birds and Natural Habitats) Regulations 2011 contain important new provisions to address the problem of invasive species. A black list of unwanted species is set out in the Regulations. It will be an offence without a licence to release or allow to disperse or escape, to breed, propagate, import, transport, sell or advertise such species. Two regulations that deal specifically with these scheduled lists of species are:

Regulation 49: Prohibition on introduction and dispersal of certain species

Regulation 50: Prohibition on dealing in and keeping certain species (however, regulation 50 is not yet in effect).

Table 10.6:NBDC records for invasive species within 2km of the Proposed Development

Common Name (Scientific Name)	Record Count	Date of last record	Dataset
Cherry Laurel (*Prunus laurocerasus*)	2	31/08/2004	Species Data from the National Vegetation Database
Eastern Grey Squirrel (*Sciurus carolinensis*)	2	31/12/2007	The Irish Squirrel Survey 2007
Indian Balsam (*Impatiens glandulifera*)	2	24/07/2008	National Invasive Species Database
Japanese Knotweed (*Fallopia japonica*)	2	29/04/2010	National Invasive Species Database
Rhododendron (*Rhododendron ponticum*)	3	21/05/2017	Irish Vascular Plant Data - Robert Northridge
Douglas Fir (*Pseudotsuga menziesii*)	1	30/08/2004	Species Data from the National Vegetation Database
Gammarus pulex	1	15/06/2011	A national macroinvertebrate dataset collected for the

			biomonitoring of Ireland's river network, 2007–2018 (EPA)
Sycamore (*Acer pseudoplatanus*)	3	31/08/2004	Species Data from the National Vegetation Database
Turkey Oak (*Quercus cerris*)	1	30/08/2004	Species Data from the National Vegetation Database
Jenkins' Spire Snail (*Potamopyrgus antipodarum*)	6	27/06/2017	A national macroinvertebrate dataset collected for the biomonitoring of Ireland's river network, 2007–2018 (EPA)
Spanish Bluebell (*Hyacinthoides hispanica*)	1	21/05/2017	Irish Vascular Plant Data - Robert Northridge

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Several invasive species were noted within 2km of the Proposed Development. Non-third schedule species found along the haul road and grid connection route included sycamore (*Acer pseudoplatanus*, snowberry (*Symphoricarpos albus*), cotoneaster (*Cotoneaster spp.*) and Cherry Laurel (*Prunus laurocerasus*), all of which were recorded in adjacent hedgerows and gardens.

10.7.3 Fauna

10.7.3.1 Bats

A detailed static bat surveys were conducted by Blackstaff (2023) and are provided in Appendix 10.2 of this EIAR. Bat roosting potential surveys, transect surveys and emergence surveys were conducted by IDEC (2023) and are provided in Appendix 10.3.

Data searches on the NBDC returned one record for common pipistrelle (*Pipistrellus pipistrellus*) dating from 2018. This was the only bat record within 2km of the Proposed Development. BCI data request did not identify any known roost sites within 2km of the Proposed Development.

The Irish National Bat Database, maintained by the Bat Conservation Ireland (BCI), holds records of bat sightings and observations made across the country. These records include findings from national monitoring programs, roost registrations, and casual observations. A recent search specifically examined bat presence and roosting locations within a 10-kilometer radius of a central point within the Proposed Development (Grid Reference: N 15123 78052) (BCI, 2012, NatureScot, 2021). Moreover, data from the National Biodiversity Data Centre (NBDC) was investigated to identify the bat species inhabiting the relevant 10-kilometer grid squares encompassing the Proposed Development. Additionally, information on the distribution range and habitat preferences of bat species, as described in the 2019 Article 17 Reports (NPWS, 2019), was analysed to assess the presence of any high-risk species at the periphery of their distribution range.

Records of nearby bat observations from the National Biodiversity Data Centre include several from 2004 at approximately 1km distance from the Proposed Development: brown long-eared bat, common pipistrelle, Leisler's, Nathusius' pipistrelle and natterer's bat and a common pipistrelle (*Pipistrellus pipistrellus*) recorded dating from 2018.

A search was made with The National Bat Database of Ireland for bat records within a 10km radius of the Proposed Development (N17). Seven bat species were recorded within a 10km radius of the site. The results of the database search are provided in Table 10-7.

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Table 10.7:NDBC Records within 10km of Proposed Site (N17 hectad).

Species name	Date of last record	Title of dataset	Designation
Brown Long-eared Bat (*Plecotus auritus*)	17/06/2014	National Bat Database of Ireland	EU Habitats Directive, Annex IV Wildlife Acts
Daubenton's Bat (*Myotis daubentonii*)	27/08/2013	National Bat Database of Ireland	EU Habitats Directive, Annex IV Wildlife Acts
Lesser Noctule (*Nyctalus leisleri*)	17/07/2004	National Bat Database of Ireland	EU Habitats Directive, Annex IV Wildlife Acts
Nathusius's Pipistrelle (*Pipistrellus nathusii*)	20/07/2004	National Bat Database of Ireland	EU Habitats Directive, Annex IV Wildlife Acts
Natterer's Bat (*Myotis nattereri*)	22/07/2004	National Bat Database of Ireland	EU Habitats Directive, Annex IV Wildlife Acts
Pipistrelle (*Pipistrellus pipistrellus sensu lato*)	11/08/2006	National Bat Database of Ireland	EU Habitats Directive, Annex IV Wildlife Acts
Soprano Pipistrelle (*Pipistrellus pygmaeus*)	18/09/2009	National Bat Database of Ireland	EU Habitats Directive, Annex IV Wildlife Acts

The National Biodiversity Data Centre (NBDC) map viewer provides “Bat Landscape” maps for individual species and combined species distribution. These maps categorise habitat suitability on a 5-point scale, from areas of highest suitability to areas of lowest suitability. While areas with lower scores may appear less favourable overall, they can still contain localised areas where bats are abundant.

The Proposed Development was assessed based on these habitat suitability indices. The NBDC’s Bat Landscape maps suggest the area supports high habitat suitability for brown long-eared bats, common pipistrelles, soprano pipistrelles, and Leisler’s bats. The mapped index for the site shows a suitability range of 28.1 to 36.4, indicating favourable habitat conditions for several bat species.

10.7.3.1.1 Roosting Potential and Emergence Surveys

No potential roosting sites were identified. No buildings or other structures are found within or surrounding the Proposed Development. Overall, the majority of trees within the site did not provide optimal habitat for roosting bats and were assessed as having Negligible –Low roosting potential

(Collins, 2023). Trees with low potential included several small ivy-covered ash trees located within the hedgerows to be removed along the main access road. One mature Oak was noted as having moderate roosting potential but has been avoided by the proposed works. Emergence surveys were carried out at this tree on the 16th of August and the 14th of September, 2023. No emergence was observed on either occasion.

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The proposed grid connection routes are located primarily within the existing road infrastructure classified as buildings and artificial surfaces (BL3). Small areas of improved agricultural grassland (GA1), in addition to hedgerow (WL1) and grassy verge (GS2) habitat, will be removed along the access road. With regard to commuting and foraging bats, features along the grid connection were assessed as having moderate suitability, i.e. Habitat that is connected to the broader landscape that could be used by bats for foraging, such as trees, scrub, grassland or water (Collins, 2023).

10.7.3.1.2 Bat Transect Surveys

Dusk activity transect surveys were conducted on August 16 and September 14, 2023, to assess bat foraging activity and species diversity at the Proposed Development. The transects covered the areas around the proposed turbine sites and surrounding landscape. Using an Echometer Touch 2 logger, surveyors recorded bat calls along the routes, treating each as a bat pass. Surveys began approximately 30 minutes post-sunset and lasted around 1.5 hours in optimal weather conditions, free from direct light pollution.

In total, 128 bat passes were logged across the two surveys, with common pipistrelle being the most frequently recorded species. Bats, including common and soprano pipistrelles and Leisler's bats, were observed throughout the Proposed Development, particularly along hedgerows, consistent with typical edge habitat preferences. Brown long-eared bats and *Nathusius's pipistrelle* were each recorded only once, in single locations.

10.7.3.1.3 Static Detector Surveys

Automated passive monitoring was undertaken between May – September 2023 for ten consecutive nights during spring, summer and autumn.

- Spring: Moderate to high activity levels were recorded across all monitoring locations, with near-constant activity in some areas, especially near proposed turbine locations.
- Summer: Consistent with spring, all locations recorded moderate to high bat activity. S3, in particular, recorded near-constant activity on one night.
- Autumn: Four out of five locations recorded moderate activity levels, though S4 did not surpass low levels in this season.

In total, 8,820 bat passes were recorded across all sites (including adjacent suitable habitat sampling sites) during the survey periods from Spring to Autumn. Common pipistrelle (n=3,068) occurred most frequently, followed by Soprano pipistrelle (n=1,746) and Leisler's bat (n=1,587). Instances of Myotis spp. (n=20), Brown long-eared bat (n=3) were significantly less frequent.

10.7.3.2 Badgers

The data search yielded no records of badgers within 2km of the Proposed Development.

Evidence of Badger activity was abundant throughout the entire development footprint and surrounding area. Recorded evidence included snuffing, paths, and latrines. One inactive, abandoned sett was found within 20m of the temporary access road. No evidence of recent activity was noted during the 2022 or 2023 surveys. Entrance holes were soft-blocked with sticks in January 2023. All sticks remained undisturbed in a subsequent visit in March 2024.

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One active sett was recorded 450m northwest of Turbine 1. This is outside the construction footprint and not close to any access and grid connection routes. This main sett had three entrances; evidence of recent activity, including fresh latrines and spoil heaps, were noted. The location of this site is to be kept confidential.

10.7.3.3 Otters

Dedicated otter surveys were undertaken on the 16th of January, 2023, and the 3rd of March, 2024. No evidence of Otter, including holts, slides or couches, was found during surveys of the Proposed Development site or any watercourse or drains within the Proposed Development, including a 10m riparian buffer (both banks). Sprints and prints were recorded along the banks of the Camlin over 250m from the Proposed Development. No evidence of any holting sites was identified during extensive searches of banks and riparian zones of the Camlin.

10.7.3.4 Reptiles and Amphibians

Common frog (*Rana temporaria*) was recorded on a number of occasions throughout the site. The species will likely breed in wetland areas within the Proposed Development. Smooth newt (*Lissotriton vulgaris*) was not recorded within the Proposed Development. However, the drainage ditches within the Proposed Development provide a suitable habitat for this species. While not recorded, common lizard (*Zootoca vivipara*) is likely to occur within the site and surrounds. It is considered that suitable habitat for these species is widespread in the Proposed Development and that the Proposed Development will not result in a significant loss of suitable habitat for these species.

10.7.3.5 Marsh Fritillary

A preliminary ecological appraisal of the Proposed Development was carried out in November 2020. It was determined that targeted larval web searches were required. Larval web searches were undertaken on September 8th, 2022, September 14th, 2023, and September 5th, 2024, across all suitable habitat areas within and surrounding the study area. The surveys were undertaken within the optimal period for marsh fritillary larval web surveys, i.e., August –September, on dry days with no rain and little wind. There are no NBDC records of the species within 2km of the subject site. There are also no records for the species on the NPWS Article 17 data (2019)[8].

[8] https://storymaps.arcgis.com/collections/1a721520030d404f899d658d5b6e159a?item=2

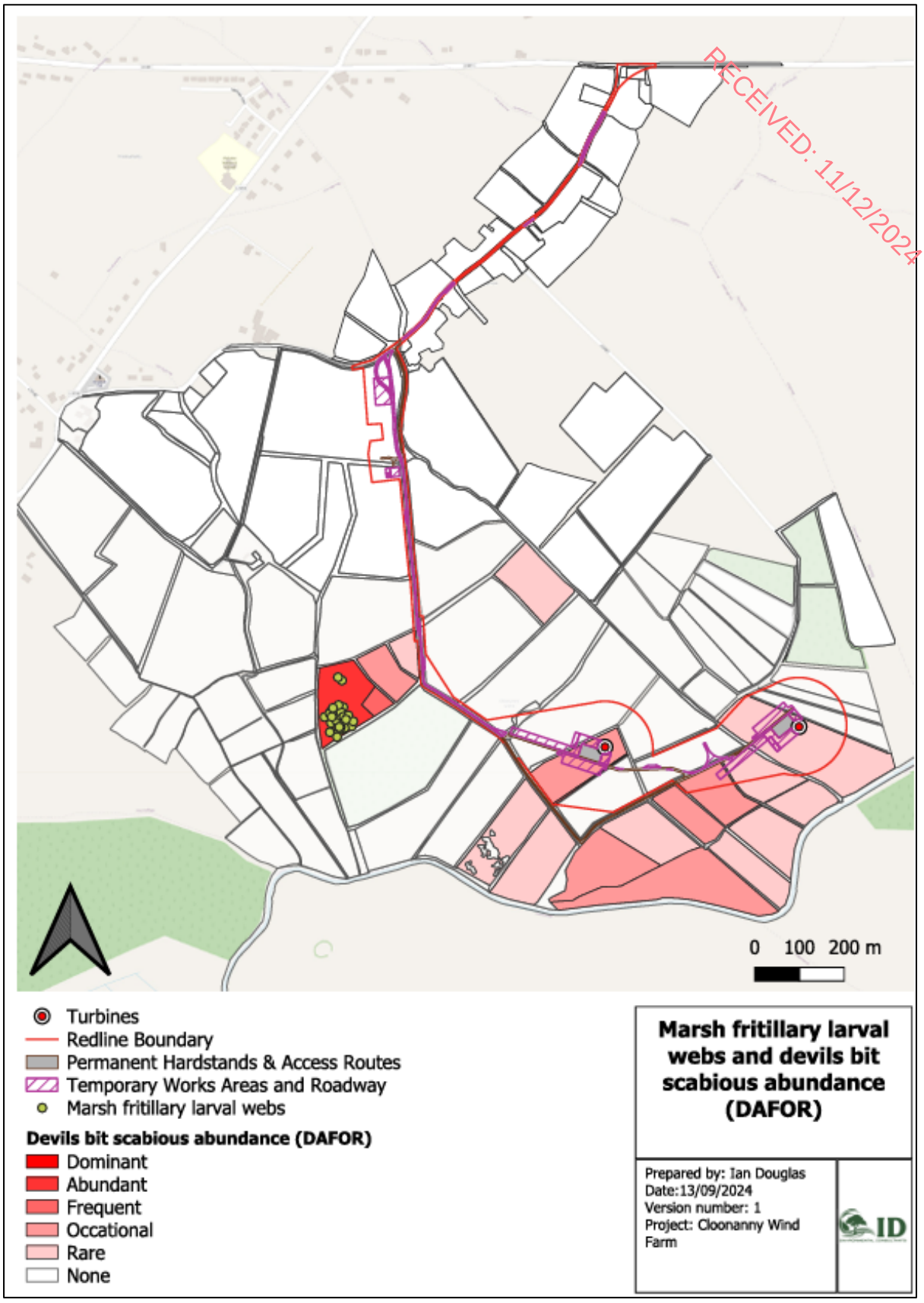


Figure 110-22:DAFOR abundance mapping of devil's bit scabious (Succisa pratensis) within the overall survey area and location of larval webs recorded

A total of 4 webs were recorded within the study area during targeted marsh fritillary surveys undertaken in 2022. Follow-up surveys were undertaken in 2023 and located a total of 25 websites within the study area. Surveys in 2024 recorded over 50 webs. The distribution of marsh fritillary colonies recorded within the study area was limited to one field, a portion of which conforms to the Annex I habitat Molinia meadow. Although additional smaller fragments of suitable marsh fritillary habitat were recorded in the study area, no larval webs were recorded during any surveys between 2022 and 2024. Adult marsh fritillary was also recorded within the same Molinia meadow during botanical surveys in June 2023. A map showing the extent of the marsh fritillary survey area and the location of all larval webs found can be seen in Figure 10-23 below.

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Figure 110-23:Marsh fritillary larval web recorded within the study area in 2023.

10.7.3.6 Other Fauna

The NBDC contained records for Irish stoat (*Mustela erminea subsp. hibernica*) and red fox (*Vulpes vulpes*) dating from 2023 and 2011, respectively.

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During the multi-disciplinary walkover surveys of the Proposed Development, signs of the following mammal species were recorded:

- Scat belonging to pine marten (*Martes martes*) was recorded in June 2023 near an area of conifer plantation outside the Proposed Development. No dens were recorded, and no works will take place in or near any areas of woodland that could support pine marten or red squirrel.
- Deer prints were recorded infrequently throughout the entire site.
- Hare (*Lepus timidus hibernicus*) was observed once in June 2023 with the study. The species is widespread throughout the habitats, and no dedicated survey was required.
- Evidence of fox (*Vulpes vulpes*) was recorded throughout the study area. As signs of fox were regularly recorded throughout the site, the distribution of the species has not been mapped.

In addition to the above mammal species (or signs thereof) that were recorded, it is likely that other species also occurred on or around the site but were not recorded during the site surveys that were undertaken. These include small mammal species such as wood mouse (*Apodemus sylvaticus*) but also larger mammals such as stoat (*Mustela ermina*) and mink (*Mustela vison*). No signs of any of these species were recorded during the walkover surveys and no requirement for dedicated surveys was identified.

Incidental records of invertebrates were recorded during all walkover surveys of the site. The following includes the species commonly recorded within the study area:

- Meadow brown butterfly (*Maniola jurtina*)
- Speckled wood butterfly (*Pararge aegeria*)
- Small Tortoiseshell (*Aglais urticae*)
- Peacock butterfly (*Inachis io*)
- Large White (*Pieris brassicae*)
- Cross Orbweaver (*Araneus diadematus*)
- Crab spider (*Misumena vatia*)

10.7.4 Fisheries and Aquatic Ecology

The Proposed Development is bounded to the south by the Camlin River. A number of streams and small drains flow in a generally southerly direction to the Camlin, the most significant one being the Derryharrow Stream, which is found about 190m north of the nearest turbine location. Another unnamed stream flows adjacent to the access road to the site off the L5046 road and will be crossed on the access to Turbine 1. Several field drains run through the site, which discharge into the Camlin River and the Derryharrow Stream. The drainage network with the indicative locations of the proposed turbines is shown in Figure 10-15. The Camlin River is within the Shannon River Basin District. It rises near Granard and flows in a westerly direction through Longford, reaching the River Shannon near Newtown Forbes. In the vicinity of the Proposed Development, the river is classified as a

Depositing Lowland River (FW2), approximately 12m in width with a depth of c1m. It has a gentle glide flow with steep banks that are lined with Willow-dominated scrub. The river has been subject to drainage in the past, and the channel is artificially straight with modified banks along its entire length adjacent to the Proposed Development and downstream, at least as far as the N4 bridge. The flow regime is unsuited for spawning by Brown trout, requiring riffle habitat. A narrow band of Tall Herb Swamp (FS2) reed-canary grass (*Phalaris arundinacea*) occurs along the base of the bank, with occasional water dock (*Rumex hydrolapathum*), bulrush (*Schoenoplectus lacustris*) and branched bur-reed (*Sparganium erectum*).

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Inland Fisheries Ireland (IFI) undertook an electro-fishing survey at eighteen sites along the length of the Camlin River in August 2011 (Gordon *et al*., 2021). A total of ten fish species were recorded during the survey. Three-spined stickle-back were the most common species, captured at 14 (78%) sites across the catchment, followed by brown trout, recorded at 12 (67%) sites. Four age classes (0+, 1+, 2+ and 3+) were present, with 0+ the most abundant age class recorded. Stone loach was recorded at four sites (n=19), pike at three sites (n=9), roach (n=119), gudgeon (n=17) and nine-spined stickleback (n=4) at two sites each and perch (n=6), lamprey (n=1) and minnow (n=1) at one site each. While the Lamprey species was undifferentiated, in view of the inland location, it is assumed to be Brook Lamprey (*Lampetra planeri*). In addition to the recorded species, European Eel (*Anguilla anguilla*) is expected to occur in the river.

Using the Water Framework Directive fish classification tool developed for Irish rivers (SNIFFER 2011), three sites achieved Good status, five achieved Moderate status, and ten were assigned Poor status. The reasons for the failures in fish ecological status were due to lower than expected abundance of type specific indicator species (e.g. brown trout), absence of certain age cohorts indicating recruitment failures and/or the presence of a relatively high abundance of tolerant fish species (e.g. three-spined stickleback). Failures and deteriorations in fish ecological status were likely caused by pressures such as nutrient enrichment, habitat modification and fish passage issues.

The Camlin River historically supported a population of the Annex II (EU Habitats Directive) White-clawed Crayfish (*Austropotamobius pallipes*). However, the most recent records on the National Biodiversity Data Centre website for the river date to 2014. Over the last decade, Crayfish Plague outbreaks have decimated crayfish populations in several Irish rivers and lakes, and the lack of more recent records (post 2014) suggests that the Camlin River may have been affected.

No evidence of Otter (*Lutra lutra*) activity was recorded along the river during the survey in August 2023. However, regular occurrence is expected due to the habitat's suitability and abundant fish stocks. No potentially suitable holt sites were recorded near the Proposed Development.

Kingfisher (*Alcedo athis*), a piscivorous species typically feeding on slow moving waters, are afforded protection on Annex I to the EU Birds Directive and are Amber listed under the Birds of Conservation Concern in Ireland (BoCCI) by BirdWatch Ireland. Their nesting requirements are quite specific, preferring a steep to overhanging bank of exposed clay or sand adjacent to water. No nest sites were noted on or in the immediate vicinity of the Proposed Development on any watercourses, though occurrence of Kingfisher is expected along the Camlin River and probably in the lower reaches of the Derryharrow Stream also.

Please see the Aquatic Ecology Report in Appendix 10.6 for further information.

10.7.4.1 Stream (IE_SH_26C010800)

An unnamed stream with the EPA River Waterbody Code (IE_SH_26C010800) rises in the townland of Leitrim, approximately 5km upstream from its confluence with the Camlin River. The stream flows adjacent to the access road to the Proposed Development from the L5046 road. It has a base width of approx—1 m with a shallow riffle flow over gravel and cobble. The stream runs adjacent to the access road from the L5046 road for approximately a distance. 200m, where it is flanked by scattered Ash (*Fraxinus excelsior*) and a low hedge of Hawthorn (*Crataegus monogyna*), Blackthorn (*Prunus spinosa*) and occasional young Sycamore (*Acer pseudoplatanus*), with abundant over-hanging ferns (*Dryopteris* spp.) and herbaceous vegetation along both banks. After it deviates from the access road, the flow regime reverts to a glide, and as it runs between the two proposed turbine locations, it is in a deep channel (approx. 1m) with very limited flow. Here, the channel, which has been dredged and straightened, has developed a dense marginal fringe of Tall herb swamp (FS2) dominated by reed canary-grass (*Phalaris arundinacea*), with nettle (*Urtica dioica*) and vetches (*Vicia* sp.) and occasional over-hanging willow.

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The habitat conditions in the stretch of stream adjacent to the access road provide potentially suitable spawning habitat for Brown Trout and Brook Lamprey. In view of the lack of suitable flow conditions within the main channel of the Camlin River, this stream and others like it may be critical for brown trout in this part of the catchment.

The unnamed stream does not appear to support White-clawed Crayfish, though extensive marginal vegetation provides suitable habitat for populations in its lower reaches. However, due to its connectivity with the main channel of the Camlin, it would be equally susceptible to the Crayfish Plague.

Several drainage ditches run through the Proposed Development, which are linked directly to the Camlin River or the unnamed stream. Due to the low-lying topography, many of these are continuously flooded and support a similar Tall herb swamp (FS2) community similar to the lower reaches of the unnamed stream In view of their connectivity to the larger watercourses, they are likely to support some fish, though they are likely confined to smaller, more tolerant species such as Stickleback, Minnow, and juvenile coarse fish.

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10.7.4.2 Identification of Key Ecological Receptors

Tables 10-8 list all identified ecological receptors and assign them ecological importance in accordance with the Guidelines for Assessment of Ecological Impacts of National Road Schemes (NRA, 2009). This table also provides the rationale for this determination and identifies the habitats and species that are Key Ecological Receptors (KERs). The potential impacts of the Proposed Development on these ecological receptors are considered in Section 10.9 of this report, and mitigation/ measures will be incorporated into the Proposed Development where required to avoid potential significant impacts on these receptors.

Table 10.8:Identification of Key Ecological Receptors

Feature Type	Ecological Feature	Value	Justification for Evaluation	KER
European Designated Sites	Ardagullion Bog SAC Lough Forbes Complex SAC Fortwilliam Turlough SAC Brown Bog SAC Clooneen Bog SAC Mount Jessop Bog SAC Lough Ree SAC Glen Lough SPA Lough Ree SPA Ballykenny-Fisherstown Bog SPA Lough Derravarragh NHA Lough Iron SPA Lough Oughter Complex SPA River Suck Callows SPA Middle Shannon Callows SPA Lough Gara SPA	International	An AA Screening Report accompanies the planning application and identifies the following Special Area of Conservation (SAC) and Special Protection Area (SPA) as being hydrologically connected to the Proposed Development: Lough Forbes Complex SAC Lough Ree SAC Lough Ree SPA Ballykenny-Fisherstown Bog SPA The nearest sites, Lough Forbes Complex SAC and Ballykenny-Fisherstown Bog SPA are over 4km from the Proposed Development. Lough Ree SPA and Lough Ree SAC are located over 26km from the site, connected via the Camlin River and the Shannon. Given this significant buffer distance, no potential for significant effects was identified, individually or in combination with other plans or projects. Further information is provided in the proceeding section. No significant impacts on avian species, including the Whooper Swan, are expected as a result of the proposed development, as concluded in Chapter 11 of this EIAR. This conclusion is supported by comprehensive bird surveys, impact assessments, and a collision risk model, all of which identified no adverse effects beyond low significance as per Percival's (2003) and EPA's (2017) criteria. As such, no significant effects will occur on any avian KERS as a result of the proposed development. Therefore, there cannot be any LSE to an SCI species as a result of direct or indirect impacts alone or cumulatively with other plans or projects.	No

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Feature Type	Ecological Feature	Value	Justification for Evaluation	KER
			No other ecological connectivity was identified between the Proposed Development and any other European Designated Site within or beyond a 20 km radius. Consequently, there is no potential for the proposed development to impact the conservation objectives of any Natura 2000 site. No impacts are anticipated that would hinder any Natura 2000 site from meeting its conservation objectives as a result of the Proposed Development.	
Nationally Designated Sites	Aghnamona Bog NHA Aghnamona Bog NHA Rinn River NHA Rinn River NHA Cashel Bog (Leitrim) NHA Corracramph Bog NHA Cloonageeher Bog NHA Cloonageeher Bog NHA Mount Jessop Bog NHA Clooncoe Wood And Lough pNHA Lough Ree pNHA Brown Bog pNHA Clooneen Bog pNHA Derrymore Bog pNHA Fortwilliam Turlough pNHA Lough Bannow pNHA Kilglass And Grange Loughs pNHA Lough Gowna pNHA Lough Rinn pNHA Derry Lough pNHA Lough Naback pNHA	National	Several pNHA and NHA sites are found within 20km of the Proposed Development. Of these, Lough Forbes Complex and Lough Ree both have hydrological connectivity to the Proposed Development via the Camlin River. Given the significant buffer distance between the potential source of pollution and these receptor sites and the available distance over which potential pollutants have to become dissolved, diluted or settle out, no potential impacts are predicted alone or in conjunction with any other plans or projects. No connectivity is found with any other Nationally Designated site within or beyond 20km from the Proposed Development. Carrickglass Demesne pNHA is found within 1km of the site's Redline boundary. This pNHA has been designated for semi-natural woodland areas listed as long-established woodlands on the Native Woodland (NSNW) and Ancient Woodlands inventory (2011 – 2012). No potential pathway for impacts exists between this pNHA and the Proposed Development.	No

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Feature Type	Ecological Feature	Value	Justification for Evaluation	KER
	Lough Boderg And Lough Bofin pNHA Glen Lough pNHA Lough Errew pNHA Lough Sallagh pNHA Lough Forbes Complex pNHA Lough Bawn pNHA Cordara Turlough pNHA Carrickglass Demesne pNHA Ardagullion Bog pNHA Royal Canal pNHA			
Habitats – Aquatic	Lowland Depositing Rivers (FW2)	Regional	The Camlin River is connected to the Proposed Development via several drainage ditches and highly modified streams. It is one of the most significant waterbodies within the region and is also a conduit to waterbodies with a high biodiversity value and international importance, including the Shannon and Lough Ree, which form part of European Sites. The potential for water quality impacts on this river exists. The smaller drains and rivers with the site have been assigned Local importance (higher value) in that, whilst many are highly modified, heavily silted, and of low fisheries value given historical channelisation and sedimentation, a small number of these provide some suitable, albeit sub-optimal habitat for aquatic fauna, including lamprey species, brown trout, salmon, European eel, and otter.	Yes
	Drainage ditches (FW4)	Local importance (Higher Value)		Yes
Habitats- Grasslands	Improved agricultural Grassland (GA1) Amenity Grassland (GA2)	Local importance (Low Value)	These habitats are predominantly associated with agricultural fields and amenity areas around neighbouring residential properties along the access track and grid route. They are assigned Local importance (lower value) as they do not contain natural habitats, are of negligible importance for local wildlife, and are common and widespread in the local and wider landscape.	No

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Feature Type	Ecological Feature	Value	Justification for Evaluation	KER
	Wet/Improved agricultural Grassland (GA1/GS1) Wet Grassland (GS4)	Local importance (Higher Value)	Wet grassland habitats are within the development footprint and are predominantly associated with agricultural fields, particularly those near the Camlin, that are subject to occasional flooding and are poorly drained. These habitats are assigned local importance (higher value), as some were noted to contain good species diversity within the sward. Other areas have been improved but still maintain semi-natural characteristics.	Yes
	Wet Grassland (GS4) - Molinia meadows (EU Habitats Directive code 6410)	Regional Importance	The area of Molinia meadows is outside the ZOI of potential impacts and is therefore not included as a KER.	No
	Grassy Verges (GS2)	National Importance	Areas of grassy verge were found along the site's access roads. Areas within the development footprint were noted as having low to moderate species diversity and occupying a small area.	No
Habitats – Woodlands, Scrub, Hedgerows and Treelines	Hedgerows (WL1) and Treelines (WL2)	Local importance (Higher Value)	The total length of the hedgerow that will be removed is 1,393m. Approximately 82%, or 1141m, are within temporary works areas and available for restoration and enhancement post-works. Meanwhile, 17%, or 251m, will be permanently lost.	Yes
	Scrub (WS1)		In total, 179m2 of scrub habitat is found within the ZOI, which has potential direct impacts. Given the small area and the value of Local importance (Lower Value), scrub has not been included as a KER.	No
	Mixed Broadleaved Woodland (WD1), Conifer Plantation (FW4)	Local importance (Higher Value)	All areas of woodland are outside the ZOI of potential impacts and are therefore not included as a KER.	No
Habitats – Other	Recolonising bare ground (ED3) & Buildings and artificial surfaces (BL3)	Local importance (Higher Value)	These habitats are common and widespread in the wider area. They have been assessed as of Local Importance (lower value) as they are highly modified and/or primarily associated with artificial site access tracks, roads, and driveways and have low biodiversity value.	No

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Feature Type	Ecological Feature	Value	Justification for Evaluation	KER
Terrestrial Mammals (Excluding Bats)	Badger	Local importance (Higher Value)	Evidence of a Badger has been identified within the study area, with an active sett known to occur over 450m from the Proposed Development. This is outside the ZOI of impacts. Taking a precautionary approach, there are potential effects associated with the construction phase of the Proposed Development for this species.	Yes
	Otter	International Importance	Evidence of an otter has been identified within the study area, along the banks of the Camlin River within 200m of the Proposed Development. Extensive searches of all drains within and surrounding the Proposed Development did not identify any evidence of otters. However, given the connectivity to areas where otters are known to occur and their highly mobile nature, the potential for impacts to this species exists as a result of the Proposed Development.	Yes
	Pine Marten	Local importance (Higher Value)	Evidence of this has been identified within the study area. No breeding sites were identified. No works will occur within this species' suitable key habitats (woodlands).	No
Lepidoptera	Marsh fritillary	County Importance	A significant breeding population of Marsh fritillary was identified within a single field that conforms to Annex I Molina meadows. The area of Molinia meadows is outside the ZOI of potential impacts and is, therefore, not included as a KER. The site Biodiversity Management Plan suggests efforts to conserve this field and enhance the suitable habitat for this species (See Appendix 10.1).	No
Bats	Bats	Local Importance (Higher Value)	Bat species have been assessed as of Local Importance (Higher Value) as they represent a resident or regularly occurring populations assessed to be important at the Local level and are listed in Annex IV of the EU Habitats Directive.	Yes
Reptiles and Amphibians	Common frog Smooth newt	Local Importance	The Proposed Development will not result in a significant loss of suitable habitat for reptiles or amphibians, and no evidence was found of amphibian populations of more than local significance. Given the legal protections for frogs and their spawn and their potential to be impacted by construction activities, they have been included as a Key	Yes

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Feature Type	Ecological Feature	Value	Justification for Evaluation	KER
	Lizard	(Higher Value)	Ecological Receptor (KER). Based on the limited amphibian records for the site and the habitat types present, amphibians and reptiles have been assessed as being of Local Importance (Higher Value) but are not designated as a primary KER.	
Aquatic and Fisheries Species	Atlantic salmon Brown trout Lamprey species European eel White-clawed crayfish Three-spined stickleback, stone loach and minnow	Local Importance (Higher Value)	The aquatic species associated with the smaller rivers and streams that drain the site are assigned Local Importance (Higher Value) in that they are likely to represent resident or regularly occurring populations of no more than local importance given the sub-optimal quality of the habitat (refer to Aquatic report in Appendix 10.6). These species include salmon, brown trout and lamprey (recorded in small numbers in a small number of streams) as well as three spined stickleback and European eel (not recorded but suboptimal habitat recorded). Taking a highly precautionary approach, there is potential for indirect effect on the above listed aquatic receptors in the form of water pollution during the construction phase of the Proposed Development. Therefore, aquatic species of Local importance (higher value) are included as a KER.	Yes
Birds			Potential Impacts on birds are discussed separately in Chapter 11 of this EIAR and summarised in the executive summary.	Yes

10.8 Do Nothing Scenario

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The Proposed Development comprises agricultural lands that are currently managed through a combination of high intensity and low intensity agricultural practices. If the Proposed Development does not proceed, the area will likely continue being used for agriculture. This means that it is likely that agricultural run-off will continue to be emitted to the watercourses in the surrounding area, and livestock will continue to put pressure on the hydraulic conditions via modification to riverbanks. The Grid Connection will continue to be used as a road, and the Proposed Substation and BESS sites field will continue to be used for agriculture. In the absence of the Proposed Development, faunal assemblages would likely be similar to those utilising the habitats within the site today. This includes assemblages of bird species typical of agricultural and riverine habitats in the midlands, typically composed of passerine bird species. Mammals, including badger and pine marten, would likely continue to use the fields, hedgerows and ditches to forage along streams and rivers within and surrounding the site for commuting and foraging otters. The scrub, hedgerow, and woodland habitats would likely continue to provide a linear foraging and commuting habitat for a range of bat species. The Molina Meadows (outside the development area ZOI) would continue to provide a suitable habitat for a range of invertebrates, including the Annex II species marsh fritillary, where abundant devil's bit scabious is present.

10.9 Likely Significant Effects

10.9.1 Construction Phase

10.9.1.1 Designated Sites

Potential hydrogeological connectivity exists at the Proposed Development site and Lough Forbes Complex SAC and Ballykenny-Fisherstown Bog SPA via the Camlin approximately 10km downstream. Further downstream via the Camlin and Shannon are Lough Ree SAC and Lough Ree SPA, approximately 26km from the Proposed Development site. Active raised bogs [7110] associated habitats: Degraded raised bogs still capable of natural regeneration [7120] and Depressions on peat substrates of the Rhynchosporion [7150] are typically rainwater fed and so are not dependent on surface water or sensitive to impacts to surface water quality (as a result of pollution to watercourses). S*ignificant direct or indirect effects* can, therefore, be excluded for these sites in terms of water quality impacts.

Lough Forbes has been designated for the conservation of Natural eutrophic lakes with *Magnopotamion* or *Hydrocharition* - type vegetation [3150]. Alluvial forests with *Alnus glutinosa* and Fraxinus excelsior (*Alno-Padion, Alnion incanae, Salicion albae*) [91E0] are also found along the shoreline of Lough Forbes (NPWS, 2016). Both are upstream of where the Camlin flows through this SAC and are, as such, outside the ZOI for hydrological impacts. Additionally, Given the significant buffer distance of over 10km via the Camlin, no potential for significant effects was identified, either individually or in combination with other plans or projects for these bog habitat types. S*ignificant direct or indirect effects* can, therefore, be excluded for these sites in terms of water quality impacts.

Maintaining water quality is central to meeting the conservation objectives of several of the QI habitats and species of the Lough Ree SAC, namely Natural eutrophic lakes with *Magnopotamion* or *Hydrocharition* - type vegetation [3150], Alkaline fens [7230] and *Lutra lutra* (Otter) [1355]. Maintaining water quality is also central to maintaining and restoring the favourable conservation

condition of the wetland habitat in Lough Ree SPA as a resource for the regularly occurring migratory waterbirds that utilise it. The significant buffer distance of approximately 20km between the potential source and this receptor site, coupled with the natural processes of pollutant dissipation, dilution, and sedimentation along the River Camlin, make likely significant effects extremely unlikely. These mechanisms ensure that any pollutants potentially reaching the Camlin during the construction phase are extremely unlikely to reach the Lough Ree SAC or Lough Ree SPA in concentrations that could compromise the site's conservation objectives. Therefore, significant direct or indirect effects can be excluded for these sites hydrologically connected in terms of water quality impacts.

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Potential effects on European sites, including SACs and SPAs, have been fully addressed in the accompanying Appropriate Assessment Screening Report submitted with this planning application. *No significant direct or indirect effects* were identified on the integrity of any SACs or SPAs. Therefore, in the EIA context, there are no anticipated impacts on these designated sites from the construction phase of the Proposed Development, whether directly or indirectly.

Potential impacts to Otters was assessed. Otters are a qualifying interest of the Lough Ree SAC. In Ireland, the territory of female otters in mesotrophic rivers is approximately 7.5 +/- 1.5km in length (Ó Néill, L., 2008), whilst the territories of males otters in mesotrophic and oligotrophic rivers is approximately 13.2 +/- 5.3km in length, with a high degree of variability as territorial males respond quickly to social perturbation. Given a distance of over 26km from the Proposed Development to the SAC boundary, it is extremely unlikely that otter populations associated with this SAC will interact with those recorded in the Camlin adjacent to the site. *No significant direct or indirect effects* are predicted for otter populations associated with this European Designated site.

Based on the number of occurrences during bird surveys between 2021 and 2024, the Whooper Swan was the only species recorded as a highly sensitive species. It is a Special Conservation Intertest Species for the following sites and an Annex I species.

- **Lough Ree SPA (004064)** – Approx. 16km from the site;
- **Glen Lough SPA (004045)** – Approx. 16km from the site;
- **Lough Derravarragh SPA (004043)** – Approx. 20km from the site;
- **Lough Iron SPA (004046)** – Approx. 23km from the site;
- **Lough Oughter Complex SPA (004049)** – Approx. 30km from the site;
- **River Suck Callows SPA** – Approx. 36km from the site;
- **Middle Shannon Callows SPA (004096)** – Approx. 39km from the site and;
- **Lough Gara SPA (004048)** – Approx. 45km from the site.

The Whooper Swan is listed as an Annex 1 species under the EU Birds Directive and is on the Amber list of Birds of Conservation Concern in Ireland. This species has been observed in all three winter surveys, flying over the Proposed Development and using areas within the survey area for foraging. No flocks of whooper swans qualifying as of national importance were observed at the Proposed Development. However, flocks of county importance were observed on 7 occasions during surveys between April 2021 and March 2024 within the footprint of the 500m site buffer. Potential impacts to this species are discussed in detail in Chapter 11. No significant impacts to any avian species, including the Whooper Swan, are expected as a result of the proposed development as concluded in Chapter 11 of this EIAR. This conclusion is supported by comprehensive bird surveys, impact assessments, and a collision risk model, all of which identified no adverse effects beyond low significance as per Percival (2003) and EPA (2017) criteria. Given that no areas of the Proposed Development form part of any key

habitat area, either within or ex-situ for any European Designated site, possible LSE upon the conservation objectives due to direct habitat loss, displacement, or disturbance cannot occur. Therefore, *no direct significant effects* are predicted on European Designated Sites due to the construction phase of the Proposed Development.

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Several pNHA and NHA sites are found within 20km of the Proposed Development. Lough Forbes Complex and Lough Ree have hydrological connectivity to the Proposed Development via the Camlin River. Given the significant buffer distance between the potential source of pollution and these receptor sites and the available distance over which potential pollutants have to become dissolved, diluted or settle out, *no indirect significant effects* are predicted alone or in conjunction with any other plans or projects.

No significant effects; No potential direct or indirect connectivity is found with any other Nationally Designated site within or beyond 20km from the Proposed Development.

Carrickglass Demesne pNHA is found within 1km of the site's Redline boundary. This pNHA has been designated for areas of semi-natural woodland, which are listed as long-established woodlands on the Native Woodland (NSNW) and Ancient Woodlands inventory (2011 – 2012). No potential pathway for impacts exists between this pNHA and the Proposed Development during this development's construction or operation phase. Therefore, there are potential direct or indirect *no significant effects* on Nationally Designated Sites are predicted as a result of the construction phase of the Proposed Development.

10.9.1.2 Habitats

The duration of any construction effects is not likely to exceed 18-24 months. There will be no habitat loss or degradation of any Annex I habitat. A single field corresponding to Annex I, Molinia meadows, was found. This was 500m from the nearest turbine and 200m from the nearest access round and is outside the ZOI. Therefore, there are no significant effects on any annex habitats as a result of the construction of the Proposed Development, either directly or indirectly.

Most of the terrestrial habitats projected to be lost either temporarily or permanently are of lower value and are common on the broader landscape. The construction phase will result in habitat loss/disturbance of approximately 2.9 ha of habitat in total to facilitate the construction of infrastructure and site access. By area, the largest habitat type loss as a result of the Proposed Development is improved agricultural grassland, which is approximately 1ha. This is a habitat type of Local Importance (Lower Value). These grasslands have been subject to improved drainage and reseeding and are typically subject to fertilisation. Of the areas of improved grassland, 73% are within temporary works areas, while 27% will be permanently converted into hard-standing areas. Wet grassland and improved /wet grassland comprise the second largest habitat type impacted, accounting for 1.5 ha combined. This habitat is classified as Local Importance (Higher Value). 75% of wet grassland and improved /wet grassland will be permanently converted into hardstanding areas. While 27% will be available to return to wet grassland post works. Wet grasslands of varying degrees of naturalness are found within the Proposed Development area. In the absence of mitigation, enhancement or compensation, the loss of Improved/Wet Grassland (GA1/GS4) and Wet Grassland (GS4) will only have a direct permanent slight negative effect at the local scale. Areas of built ground (BL3), grassy verge (GS2) and Scrub (WS1) have been excluded from this assessment as they have been classified as being of Local Importance (Lower Value) and occupy small areas.

Table 10.9:Figures for habitat areas permanently or temporarily lost as part of this development

Habitat types	Temporary Works Area	Permanent Works Areas	Total M2 Lost
GA1 - Improved agricultural grassland	7353.3	2672.0	10025.3
GS4 - Wet grassland	6279.4	3239.0	9518.4
GS4/GA1 - Wet grassland/Improved agricultural grassland	3314.7	2612.0	5926.7
FW4 - Drain	248.1	39.0	287.1
WS1 - Scrub	80.3	99.0	179.3
GS2 - Grassy verges		39.0	39.0
Total Figures (M2)	**20160.5**	**9300.0**	**29460.5**

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The removal of hedgerows will be required to allow access to the Proposed Development. The total length of the hedgerow, which will be removed, is approximately 1,393m. Approximately 82% or 1141m are within temporary works areas and available for restoration and enhancement after construction. Meanwhile, 17% or 251m will be permanently lost. A qualitative assessment of hedgerow habitat quality was carried out. This was based on the diversity of species, cultural significance (whether it is a townland boundary hedgerow) and management, and it was based on the hedgerow appraisal system (Foulkes *et al*., 2012). The majority of habitats within the Proposed Development occur as large, contiguous areas that are also part of the wider landscape. Therefore, the Proposed Development is not likely to significantly affect any habitats that could act as ecological stepping stones or corridors for mobile species, given their widespread abundance both inside and outside the development footprint. The exceptions are linear hedgerows, which act as ecological corridors. The loss of hedgerow habitat will have direct, *long-term, significant negative effects at the local scale* in the absence of mitigation, enhancement or compensation.

Table 10.10 Hedgerow Quality Assessment Scoring methodology and figures (based on (Foulkes et al., 2012) and aligning with (Collins, 2023).

Hedgerow Quality Assessment	Description	Meters of hedgerow for removal
Good Quality	Dense, continuous, species-rich, over 2m high and 2m wide.	254
Moderate Quality	Top heavy, mostly continuous, moderate species richness, mainly composed of 1 or 2 species, 2m high or 2m wide but not both.	124
Poor Quality	Low, box cut, discontinuous, low diversity or no opportunities for fruiting or flowering due to over-management.	1015

The construction layout for the Proposed Development has been designed to avoid sensitive habitats and minimise impacts on primary watercourses. The proposed turbine access roads will intersect one watercourse, which is highly modified at the crossing point and for over 200m up and downstream of the crossing point. While these artificial drains are not ecologically significant, they provide limited habitat for fish and aquatic wildlife and still connect to the larger water systems surrounding the site, namely the Camlin River. Habitats further upstream from the crossing point contain suitable riffle habitats that could provide spawning habitat for Salmonids. The crossing will use an existing bridge; however, the required road widening at this point will necessitate the installation of a bottomless or clear-span culvert. The existing bank will remain undisturbed, and no instream works will be needed. As a result, there will be no direct loss of potential fisheries habitat. Construction activities for the Proposed Development, such as building turbine hardstands and access tracks, have the potential to cause runoff and infiltration of pollutants—such as silt, nutrients, hydrocarbons, and cement-based materials—into drains and nearby watercourses within the development area. That all eventually discharges into the Camlin River. Additionally, lands around Turbine 2 are within a flood risk zone, and there is a potential for the site to become inundated during the construction phase of the development. This represents potential indirect effects on aquatic receptors in the form of habitat degradation as a result of water pollution. Potential indirect effects due to runoff and infiltration of pollutants on water quality of aquatic habitats are considered below under 'Fisheries and Aquatic Ecology'. In the absence of mitigation, this habitat type could have indirect, *temporary significant effects on the county/regional scale*. Further discussion on the potential impacts on water quality is described in Chapter 9, Hydrology of this EIAR, and in Appendix 10.6.

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10.9.1.3 Effects on Terrestrial Fauna (Excluding Bats)

The Proposed Development has been specifically designed to avoid identified suitable mammal habitats, including woodlands and known badger setts within the broader landscape. Direct effects on mammals during construction of the Proposed Development include impacts on dwellings (resting, hibernating or breeding sites), where the dwelling could be destroyed and/or both adults and juveniles could be killed or injured. Tree/vegetation removal could affect arboreal species (e.g. pine marten and red squirrel), and groundwork such as excavation or piling could affect ground-dwelling species (e.g. badger and hedgehog). No mammal dwellings were recorded within the vicinity of the footprint of the work, so there is unlikely to be disturbance during sensitive periods. The ZoI for significant effects is 50m for red squirrel dreys (NatureScot, 2020), 100m for pine marten dens (VWT, 2015) and 50m for active badger setts. Therefore, there are no likely direct effects for badgers, red squirrels or pine marten. Overall, *no significant direct effects* will occur.

Indirect effects on mammals during construction could result in the loss of potential foraging and commuting; however, given the abundance of similar habitats in the surrounding areas, it can be concluded that there will be *no significant indirect effects.*

As described above, in relation to aquatic habitats and species, the Proposed Development has been deliberately designed such that all major infrastructure avoids the main watercourses within the site. No otter resting or breeding sites were recorded within the Proposed Development or within the wider study area. There are no direct *significant effects* on otter resting or breeding sites.

Taking the precautionary approach, the Proposed Development has the potential to disturb otters due to the placement of minor infrastructure, such as access roads, near certain watercourses on-site. While the design has prioritised the avoidance of major watercourses, there remains a risk of indirect

impacts on otter habitats from water pollution caused by runoff of pollutants during construction activities. These activities could lead to an indirect, *slight negative effect at a local level.*

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There is no indication that the construction phase of the Proposed Development will significantly disturb otters. Being predominantly crepuscular, otters are most active during low-light periods around dawn and dusk, making them unlikely to be affected by the proposed works, which will be confined to daylight hours to minimise potential disturbances. The NPWS Threat Response Plan for otter reports limited evidence suggesting that recreational or construction-related disturbances significantly impact otters, highlighting that otters are known to travel considerable distances from water bodies in search of feeding areas or new territory. Findings from the *National Ot*ter Survey of Ireland 2004/2005 (Irish Wildlife Manual No. 23) revealed no significant correlation between human disturbance and otter occurrence, with otters present at both recreational and non-recreational sites. This survey also noted that sites with the lowest disturbance recorded the lowest otter occurrence. Similarly, Irish Wildlife Manual No. 76 (National Otter Survey of Ireland 2010/2012) reported that otter presence was unaffected by perceived levels of disturbance, with little evidence indicating a consistent link between otter activity and human disturbance (Mason & Macdonald 1986; Delibes *et al*. 1991; Bailey & Rochford 2006). Given the lack of evidence of otters within the works area, there are no indirect *significant effects* on otters due to disturbance from construction activities.

10.9.1.4 Effects on Bats

As per NatureScot (2021) Guidance, wind farms present four potential risks to bats:

- Collision mortality, barotrauma and other injuries
- Loss or damage to commuting and foraging habitat
- Loss of, or damage to, roosts and
- Displacement of individuals or populations.

No confirmed bat roosts were recorded within the Proposed Development within the footprint of the work access. So, *no direct effects* on bat roosts will occur. The grid route options surveyed will require minor pruning works of trees; all trees were checked for bat roosting potential, and no potential roost features were identified. *No direct effects* on potential bat roosts will occur.

In the absence of appropriate design, the loss or degradation of commuting/foraging habitat can reduce feeding opportunities and/or displace bat populations. Vegetation clearance will take place to facilitate turbine installation. Approximately 1,393m of existing hedgerow will be removed. The construction phase will, therefore, result in the removal of potential foraging and commuting habitat for bats. An assessment of hedgerow habitat quality and continuity is provided in the table. of the 1,393m of hedgerow removed, Only 378m of this was classified as moderate or good (Collins, 2023) bat foraging habitat with the remainder being classified as low quality (Collins, 2023). The loss of hedgerow habitat will have direct, *long-term, slight negative effects at the local scale* in the absence of mitigation, enhancement or compensation for local bat populations.

During the construction phase of the Proposed Development, there is potential for some disturbance of bat species due to increased activity and noise and the potential requirement for artificial lighting on the site. However, works will be confined to daylight hours and, given the nature of the habitats within the site, the small size of the construction footprint in relation to the overall size of the Proposed Development and the extent of suitable habitat within the Proposed Development boundary, *no significant indirect effects* from disturbance or displacement of bats is anticipated.

10.9.1.5 Effects on Fisheries and Aquatic Ecology

Potential indirect effects include the release of suspended solids, cement, concrete or hydrocarbons into the Camlin due to runoff or a flood event as described in section 10.9.1.2, which could enter the Camlin and lead to *short-term, slight negative effects on local populations* of aquatic species including Atlantic salmon, brook lamprey, European eel, white-clawed crayfish and otter. The same secondary effects, therefore, apply as described for the construction phase.

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10.9.2 Operational Phase

10.9.2.1 Designated Sites

No significant effects on the integrity of any SACs and SPAs were identified as a result of the operation phase of this development directly or indirectly. No potential water quality impacts are expected during the operational lifetime of this development; therefore, no sites hydrologically connected to the proposed site could be subject to LSE.

Impacts due to the barrier effect on whooper swan and all other avian KERS were explored based on over 2 years of survey data per Percival (2003) and EPA (2017) criteria in Chapter 11 of this EIAR. No evidence suggests that the Proposed Development lies on a migratory/regular commuting route for this species; therefore, no impacts from the barrier effect are anticipated. In addition, waterbird migration watches produced no records of whooper swans. This suggests that the Proposed Development site is not laying on any commuting corridor between SPAs or other wetland sites. Possible impacts due to collision risk were explored A "Random" collision risk analysis has been undertaken, and full details are provided in the Appendix 11.3. The collision risk has been calculated at a rate of 0.005 collisions per annum or one bird every 187 years for whooper swan. Other SCI species assessed for collision risk were also noted as being below the threshold for significant effects: Golden Plover (0.107 or one bird every 9 years), Peregrine (0.002 or one bird every 631 years), Cormorant (0.004 or one bird every 284 years), Lapwing (0.005 or one bird every 220 years) and Teal (0.001 or or one bird every 675 years). On this basis, the collision risk and barrier effect are considered negligible over the operational lifespan of the Proposed Development for all SCI and annex bird species. Therefore, it can be concluded that no LSE will occur, which would lead to any European Designated not meeting its conservation objectives. Therefore, there are *no significant effects* on European Designated Sites as a result of the Operation of the Proposed Development either directly or indirectly.

Nationally designated sites within the ZoI that have hydrologically connectivity to the Proposed Development includes Lough Forbes Complex and Lough Ree as stated above. However, no pathway for LSE exists as a result of the operational phase of this Proposed Development for these sites, as no potential water quality issues are expected to arise during the operational phase of this development. The Proposed Development does not fall within any NHA or pNHA boundaries or have connectivity to any other nationally designated sites; therefore, no direct or indirect effects are expected. Therefore, there are *no significant effects* on Nationally Designated Sites as a result of the Operation of the Proposed Development either directly or indirectly.

10.9.2.2 Habitats

The operation of the Proposed Development will not result in any additional land take or potential loss of silts or pollutants. As such, there is no potential for any significant effects in this regard. These habitats are not considered to be a KER in the context of the operation of the Proposed Development.

No significant effects are predicted either directly or indirectly. The Proposed Development does, however, have the potential to result in the enhancement of the surrounding habitats through habitat rehabilitation measures that will be undertaken throughout the operational phase of the Proposed Development. Details of the management that will be undertaken are provided in the Biodiversity Management and Enhancement Plan, see Appendix 10.1.

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10.9.2.3 Effects on Terrestrial Fauna (Excluding Bats)

The Proposed Development, once complete, will not pose any risk to Terrestrial Fauna in terms of direct mortality or indirect impacts to foraging. *No direct or indirect significant effects* will occur.

As described above otters are known to habitualise to anthropogenic disturbance. No water quality impacts are predicted during the operational phase. Therefore, *no direct or indirect significant effects* will occur to otter.

10.9.2.4 Effects on Bats

The risk of direct impacts to bat species from wind turbines is influenced by the likelihood of these species flying at Potential Collision Heights (PCHs) in open landscapes. Evidence from the USA and mainland Europe suggests that single wind turbines can impact bats, as dead bats have been found beneath some turbines. Such deaths may have been caused by direct collision with the turbine blades or by damage to the bat's lungs as they pass close to the rotating turbine blades. Such damage is called 'pulmonary barotrauma' and is thought to occur as bats fly into areas of low air pressure, which are created as the turbine blades are rotating; the resulting sudden change in air pressure is thought to cause the bat's lungs to expand at a rate which causes soft tissues within the lungs to rupture.

Various bat species are at varying degrees of risk from wind turbines as each species has a different flight style, foraging method and echolocation call. Using these parameters, it has been determined that four Irish bat species - common, soprano and *Nathusius' pipistrelles*, and Leisler's bat - are at a high level of risk from turbines with the latter two species also having a high population vulnerability. The remaining Irish bat species (Myotis spp., long-eared bats and horseshoe bats) were regarded as being at a low level of risk of collision with turbines and having low population vulnerability. The publication in 2016 of a large-scale study by researchers at Exeter University (Mathews *et al*., 2016), which was based on observations of bat activity and carcass searches at 46 operational wind farms throughout Britain (but excluding Ireland) provides useful data concerning bat fatalities and windfarms which may still be applicable to an Irish windfarm context. Therefore, all turbines may present a risk to foraging/commuting bats, particularly Pipistrelles and Leisler's bats. It is not possible to make a prediction about the number of bats that may be affected, but in a worst-case scenario, it is possible that there could be a *long-term, slight negative effect on local populations* of these species is predicted.

10.9.2.5 Effects on Fisheries and Aquatic Ecology

Proposed Development and all major infrastructure, such as turbine bases, are over 200 metres from major watercourses. There will be no instream activity during the operational phase of the Proposed Development and, therefore, no potential for habitat loss or disturbance during the operational phase. Flooding may occur during the operational phase and inundate the site. No material such as stockpile or other materials leading to potential silicification issues or other polluting materials such as cement, concrete or hydrocarbons will be on site that could lead to an impact on water quality and aquatic species. *No significant direct or indirect effects* are predicted.

10.9.3 Introduction and Spread of Invasive Species

No invasive species (listed under the Third Schedule of the European Communities (Birds and Natural Habitats) Regulations 2011 (S.I. No. 477 of 2011) were recorded within or adjacent to the Proposed Development footprint during the ecology surveys undertaken. Therefore, there is no potential for the spread of invasive species due to disturbance during the construction of the Proposed Development. *No significant effects* are predicted during either the construction or operational stages of this development, either directly or indirectly.

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10.9.4 Effects on Marsh Fritillary

Evidence of this species was recorded within 200m from the existing access road and over 500m from the nearest turbine. This species was noted utilising an area of Molinia meadows and is likely to represent a population of importance at the county level. No larval webs were recorded in suitable habitats outside the area of the Molinia meadow that was identified. It is not anticipated that the construction or operation of the Proposed Development will have any direct or indirect *significant effects* on marsh fritillary or habitat for the species, given its limited distribution to a single field outside the project ZOI.

10.9.5 Decommissioning Phase

The decommissioning phase for the Proposed Development, detailed in Chapter of the EIAR, anticipates a lifespan of approximately 35 years for the turbines. At the end of this period, the turbines may either be fully dismantled or replaced, subject to planning approval. Decommissioning will involve dismantling the turbines and meteorological masts, transporting all above-ground components off-site for recycling, and allowing foundations to remain underground, covered with soil to facilitate natural revegetation. Roads on the site are expected to stay in use as recreational paths and farm access roads unless deemed otherwise; in such cases, they may be removed as needed. Underground cables will also be removed, leaving ducting in place.

A decommissioning plan, to be approved by local authorities, will incorporate the same mitigation measures as those applied during construction. This includes best practices to protect water quality and minimise noise and disturbance to local wildlife, such as bats, birds, and mammals. Disturbance and displacement effects, like noise, lighting, and human presence, will resemble those of the construction phase but on a smaller scale. No additional habitat loss is anticipated, as foundations and other structures will remain.

10.9.6 Cumulative Impact

The cumulative impacts of the Proposed Development on the Key Ecological Receptors (KERs), including both European and nationally designated sites, were evaluated in conjunction with other local projects and plans. This assessment involved consulting online planning records, development plans, and various available resources to identify ongoing, past, and potential future activities in the area and their expected environmental impacts. The projects reviewed as part of this cumulative impact assessment are detailed in Appendix 1.2: Cumulative Assessment Cloonanny Wind Farm. This details the data sources and search time periods given there. The 25km radius search area exceeds the distance recommended by Irish Wind Energy Association (IWEA) (2012) guidelines.

A search of committed developments (i.e., ones that have received full or outline planning permission) proximate to the Proposed Development was also undertaken using and can be seen in Table 10-11.

- the An Bord Pleanála Online Planning search tool,
- the web map portal providing spatial information relevant to the planning process in Ireland (myplan.ie) and
- the Longford County Council Online Planning Register.

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The wind farm projects within a 25-kilometre radius of the Wind Farm Site are provided in Table 10-11 below. They are presented in terms of their proximity to the Wind Farm Site and whether the project is permitted/operational or pending/under appeal. Only one operational windfarm with 20 turbines lies within 25km of this Proposed Wind Farm.

Table 10.11:Wind Farms within 25km of the development site

Wind Farm	Status	No. Of Turbines	Separation Distance of Nearest Turbines
Derryadd Wind Farm Bord Pleanála Case reference: PA14.303592	Refused It is understood that the applicant is currently preparing a new application for this site.	22 (previous application)	12.6km
Sliabh Bawn Wind Farm, Roscommon Planning Application Number Roscommon County Council: 10507	Operational	20	18.6km
Lissanore, Co Longford Planning Application Number Longford County Council: 10507	Granted	1	14km
Total Existing		20	
Total Permitted		1	

The potential for the Application Site to result in significant cumulative or in combination effects when assessed alongside Derryadd Wind Farm, which is c. 12.6km from the nearest proposed turbine, was evaluated. While this application site was refused and the application was withdrawn, It is understood that the applicant is currently in the process of preparing a new application at this site; taking the precautionary approach, this site was assessed based on the existing information available in the Derryadd Wind Farm EIAR and NIS. The only possible pathway for cumulative impacts was via impacts to avian receptors. Derryadd Wind Farm shared the following key ornithological receptors with the Proposed Development: peregrine falcon, buzzard, kestrel, sparrowhawk, whooper swan, mute swan, mallard, golden plover, and snipe. The assessment of collision risk and displacement/barrier effect for the operational phase of this development was undertaken. The collision risk was assessed to be of low significance for the whooper swan, while sparrowhawk, golden plover, peregrine, mute swan, buzzard, snipe, and kestrel all were classed as very low significance (as per Percival, 2003). Other species that overlap with the Proposed Development, i.e., mallard, were not assessed in a collision risk assessment due to the low total number of flight lines for those species, thus negligible effects. Disturbance/displacement and barrier effects were assessed to be of low significance for peregrine

falcon, very low significance for mute swan, snipe, sparrowhawk, kestrel, buzzard and medium significance for golden plover, whooper swan and mallard.

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Taking the above information into account, as well as the location of Deryadd Wind Farm, the nature of the habitats, and the lack of significant residual impacts on bird species associated with the Proposed Development, significant cumulative or in-combination effects on avian KERs regarding direct habitat loss, displacement, or collision mortality are not anticipated.

The potential for the Application Site to result in significant cumulative or in combination effects when assessed alongside Sliabh Bawn Wind Farm, which is c. 18.6km from the nearest proposed turbine, was considered. Sliabh Bawn Wind Farm EIAR and NIS were reviewed as part of this process. The only possible pathway for cumulative impacts was via impacts to avian receptors. When taking the above information into account, as well as the location and separation distance and the lack of significant residual impacts on bird species associated with the Proposed Development, when considered on its own, It was concluded that there were no significant cumulative barrier effects given the distances between the two Wind Farms (18.6km) and based on preferential waterbird migration routes over natural water bodies rather than across mountainous/hilly landscapes. It was also concluded that there were no significant cumulative effects from direct habitat loss, displacement and disturbance, given the separation distances between the two wind farms.

Lissanore shared the following key ornithological receptors with the Proposed Development: peregrine falcon, buzzard, kestrel, sparrowhawk and snipe. None of these were noted as having residual impacts as a result of either the Proposed Cloonanny Development or the proposed Lissanore Development.

Considering the separation distances, the lack of hydrological connectivity between the sites reviewed, and the absence of significant residual impacts on bird species associated with the Proposed Development, no significant cumulative impacts—whether from direct habitat loss, displacement, disturbance, barrier effect or collision mortality—are predicted.

10.9.6.1.1 Other Local Projects

A desktop planning history search for permitted developments in the last five years and within 1.5km of the Proposed Development was undertaken. Planning applications older than five years have not been assessed as they have been deemed to either have expired or have been constructed (due to the standard five-year life of planning consents). Within the local area of 1.5km of the Proposed Development, only minor developments listed below (Table 10-12) were identified.

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Table 10.12:Other Local Projects

LCC Reg Ref	Brief Description	Cumulative or in combination impacts predicted
2413	Quarry Application Location: Approximately 4.5 km northwest of the Proposed Development. 10-year permission granted by Longford County Council on 17.06.2020 for: Continuation of aggregate extraction on 1.431 hectares. Processing and loading of aggregates on 0.233 hectares. Manufacture of ready-mix concrete in an existing plant (176 m²). Importation and storage of sand for concrete manufacturing on 0.008 hectares. Use of an existing weighbridge, wheel wash (154 m²), and site entrance (0.956 hectares). Conditions: 16 conditions were applied, and no appeals were lodged. Environmental Impact Screening: Concluded no significant environmental effects; EIA not required. Appropriate Assessment Screening: Determined no significant effect on any Natura 2000 site, Stage 2 NIS not required.	None No source- pathway receptor connectivity exists between this development and the Proposed Development. No cumulative or in combination impacts are predicted.
2023006	Quarry Application Location: Immediate vicinity of the 2017 quarry application site Blessington Stone & Concrete Plant Hire Application Proposed Development: 25-year permission for a 18.6-hectare development, including: Rock extraction by blasting on 14.2 hectares to a level of 20mOD. Erection of concrete batching plant, processing plant, block yard, and other facilities over 2.1 hectares. Landscaping with planted berms on 1.6 hectares. Entrance and access road on 0.7 hectares. Restoration of site upon completion. Environmental Impact Assessment (EIA): Accompanied by EIAR. Application deemed invalid due to insufficient information for environmental assessment.	None No source- pathway receptor connectivity exists between this development and the Proposed Development. No cumulative or in combination impacts are predicted.
19222	Location: Approximately 6 km west of the Proposed Development.	None

ABP Reg Ref 305969	Solar Farm at Ballykenny, Co. Longford. Granted for a 19-hectare solar farm with 9 MW capacity. Environmental Impact Screening: Not accompanied by EIAR; NIS was prepared and accepted by ABP, ensuring no adverse impact on nearby European sites.	No source- pathway receptor connectivity exists between this development and the Proposed Development. No cumulative or in combination impacts are predicted.
Ref 17/47, ABP Reg Ref 248470	Location: Approximately 4.5 km west of the Proposed Development. Solar Farm at Cleggil, Co. Longford. Location 10-year permission for a 19-hectare solar farm with 11.1 MW capacity. Environmental Impact Screening: Not accompanied by EIAR or NIS; ABP concluded no significant environmental effects, and a Stage 2 AA is not required.	None No source- pathway receptor connectivity exists between this development and the Proposed Development. No cumulative or in combination impacts are predicted.
16/81, ABP Reg Ref 246850	Location: Approximately 11.5 km southeast of the Proposed Development. Solar Farm at Lisnageeragh, Edgeworthstown, Ballinalee Road, Co. Longford. 10-year permission for a 14.5-hectare solar farm with 4.2 MVA capacity. Environmental Impact Screening: Not accompanied by EIAR or NIS; ABP determined no significant effect on nearby European sites.	None No source-pathway receptor connectivity exists between this development and the Proposed Development. No cumulative or in combination impacts are predicted.
ABP Reg Ref 313318	Location: Approximately 11 km southeast of the Proposed Development. Bloomfield Park Strategic Housing Development (SHD) at Bracklin Road, Edgeworthstown: Granted for 100 residential units (50 houses, 50 apartments) with associated works, within Edgeworthstown's urban boundary. Environmental Impact Screening: EIA and NIS not required; AA screening concluded no likely significant effects on any European sites.	None No source-pathway receptor connectivity exists between this development and the Proposed Development. No cumulative or in combination impacts are predicted.

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As seen in Tables 10-9 and 10-10, and discussed in this section, there are no operational, consented or proposed developments with hydrological connections to the Proposed Development. Longford County Development Plan (LCDP) (2021 -2027) provides a framework for land use developments and activities with potential for construction and operation source effects throughout the county. The LCDP was comprehensively reviewed, particularly concerning Policies and Objectives that relate to biodiversity, protected species and designated sites. Additionally, the County Longford Heritage Plan 2019-2024 was reviewed, which includes the Biodiversity Action Plan (BAP) for Longford for the same period. The proposed development is not expected to negatively affect biodiversity significantly. The Proposed Development has been carefully designed to avoid the most sensitive habitats within the site wherever possible. A comprehensive set of mitigation measures has been developed and implemented to ensure there are no significant negative impacts on habitats, species, protected sites, or water quality. Additionally, a Biodiversity Management and Enhancement Plan has been prepared, including provisions for enhancing the site post works. The Proposed Development is not considered to be contravention of the policies and objectives within these development plans. There is no potential for negative cumulative impacts when considered in combination with the current proposal were identified.

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The construction phase of the Proposed Development will lead to the disturbance and loss of around 2.9 hectares of habitat, mainly to create infrastructure and site access. The largest single affected habitat type is improved agricultural grassland (1 hectare), which is of Local Importance (Lower Value) and will be restored. About 73% of this grassland falls within temporary work zones and will be restored to productive agricultural use post works. While 27% will be permanently converted to hardstanding. The second most affected habitat is wet grassland and improved/wet grassland which cumulatively cover 1.5 hectares and are considered Local Importance (Higher Value). Of this, 75% will be permanently lost, with the remaining 27% being available for restoration to wet grassland post-construction. Without mitigation, the loss of these grasslands will result in a locally significant, permanent, slight negative effect. Additionally, approximately 1,393 meters of hedgerow will be removed to allow access to the site. Of this, 82% (1,141 meters) is within temporary work areas and restored post-construction, while 17% (251 meters) will be permanently lost. The Proposed Development includes mitigation in the form of habitat management and rehabilitation that will restore all available lands for biodiversity including hedgerows and low input wet grasslands. As such, there is no potential for the Proposed Development to contribute to any significant cumulative habitat loss in this regard when considered in combination with any other plans and projects.

No significant effects as a result of the Proposed Development in relation to disturbance, displacement or mortality of faunal species has been identified. Therefore, there is no potential for the Proposed Development to contribute to any cumulative effect in this regard.

Potential effects on European sites, including SACs and SPAs, have been fully addressed in the accompanying Appropriate Assessment Screening Report submitted with this planning application. No likely significant effects (LSE) on the integrity of any SACs or SPAs were identified. Therefore, in the EIA context, there are no anticipated impacts on these designated sites from the construction operation or decommissioning phases of the Proposed Development, whether directly or indirectly.

The potential for the Proposed Development to contribute to a cumulative effect on water quality in the Camlin catchment was considered in this chapter and also in Chapter 9 of this EIAR. Potential temporary significant effects on the county/regional scale in the absence of mitigation were identified. The Proposed Development includes a range of mitigation measures that are in place to minimise any

water pollution or hydrological effects outside the development footprint. The implementation of these measures ensures that there is no potential for significant cumulative effects on any downstream receptors, whether the Proposed Development is considered on its own or in combination with other plans or projects will not occur.

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The turbines, hardstands, access track, and Proposed Substation will not impact operations. The grid connection will be located underground within existing road networks, so underground cabling/ducting will not impact construction or operations.

A review of the projects found no links that could lead to additional or cumulative impacts, nor any potential for new impacts arising from the interaction of various projects and plans alongside the Proposed Development. Throughout its construction, operation, or decommissioning phases, the Proposed Development is not expected to cause any significant residual effects on biodiversity or contribute to cumulative effects when considered in combination with other plans and projects.

10.10 Mitigation Measures

10.10.1 Incorporated Design Mitigation

The Proposed Development has been meticulously designed to avoid, reduce, and minimise effects on avian Key Ecological Receptors (KERs) through a mitigation-by-design approach, guided by established literature, such as the Pearce-Higgins (2009) study. Alternative locations for the site can be seen in the Alternatives chapter (Chapter 3). An iterative design process was employed, involving ongoing consultation among the developer and the design team—comprising the Project Manager, Project Engineers, Project Ecologists, and Project Ornithologists—to optimise the layout of the wind farm. This collaborative effort ensured that construction activities were avoided at sensitive locations and habitat loss for KERs was minimised at the source. The design prioritised situating the development footprint in the least ecologically sensitive areas, thereby adopting an avoidance-by-design strategy to reduce potential adverse effects on bird species.

The Proposed Development design has included the following measures to reduce the potential for significant effects on avian receptors:

- Avoidance and minimising infrastructure placement on habitats of high local value or above (NRA, 2009). Turbines and wind farm infrastructure are located away from the better quality and natural foraging and nesting habitats for species);
- Hard-standing areas have been designed to the minimum size necessary to support the anticipated turbine model,
- Construction of access roads and areas of hard standing will be kept to a minimum to reduce habitat loss as much as possible, and
- Where possible, direct habitat loss will be minimised by upgrading existing access tracks.

10.10.2 Mitigation Measures During Construction Phase

10.10.2.1Mitigation for Watercourses and Aquatic Ecology

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The pathways that would allow potential impacts to occur due to deterioration of water quality were considered in the design of the Proposed Development. A Surface Water Management Plan (SWMP) has been prepared as part of the Construction Environmental Management Plan (CEMP) in conjunction with this EIAR, which will accompany the planning application for the Proposed Development. The SWMP (Mable, 2024) outlines the steps which will be taken during the construction phase of the project to ensure compliance with the relevant guidance, legislation and the detailed drainage design. The drainage strategy for the wind farm site will ensure minimal impact on the existing flow regime, water quality, and run-off quantity. All detailed design, construction and operation has been carried out in accordance with current best practice and guidance including CIRIA (2001), TII (2006), and IFI (2016).

Implementation of good practice measures as a matter of course during the construction of the Proposed Development are not considered to be mitigation measures but form an integral part of the design/construction process. The proposed surface water drainage measures are proposed and aim to control and treat water runoff to prevent sediment and contaminants from entering water bodies during construction. The main element of the SWMP to be implemented during construction are detailed here. For further information see full SWMP accompanying this EIAR. .

10.10.2.2Drainage Measures

Clean Water Cut-off Drains will be Installed in construction areas; these drains will divert clean water away from disturbed zones, reducing the risk of contamination. They will reroute water as sheet flow, minimising contact with construction surfaces. Check dams will also be placed within drains to slow down water flow and promote sedimentation.

Dirty Water Cut-off Drains will be positioned downgradient to capture sediment-laden water from construction areas and direct it to treatment facilities, such as settlement ponds. Check dams will be similarly used to control flow speed along the drain path, promoting sediment deposition. After construction, these drains will either be removed or integrated into the permanent drainage system, depending on their location.

Silt Fencing will be installed along watercourses and drainage paths, silt fencing will strategically be placed in single, double, or triple rows based on the sediment load and area risk. Regular inspections are conducted to ensure effectiveness.

Silt Busters are mobile silt management units used to filter suspended solids from pumped water on-site. The Siltbuster will be used to slows water flow, allowing silt to settle while clean water is released. Silt busters will be used during dewatering works and to control sediment laden runoff as required.

Silt Bags, which are geotextile bags designed for passive water filtration, will follow stilling ponds to trap finer sediments, further reducing suspended solids before water discharge. Once the bags reach capacity, they will be removed by a licensed waste contractor for proper disposal.

Swales are shallow drainage channels surrounding the construction zone that will capture and transport sediment-laden runoff to treatment areas like settlement ponds. Swales will carry water at controlled velocities, minimising erosion risks and ensuring safe runoff management.

Check Dams will be installed at regular intervals within swales and cut-off drains to further slow water flow and facilitate sediment deposition. They will be constructed from materials like straw bales or stone and will be designed to handle overflow during heavy rainfall events.

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Buffered Outfalls will be implemented to release treated water gently onto vegetated ground, minimising concentrated flows, erosion risks, and promoting natural dispersion.

Settlement Ponds with two-stage compartments (primary and secondary) will capture sediment-laden runoff from construction zones, providing settling time for particles. The ponds will be connected by rock aprons that regulate flow velocity, and final discharge will occur through stone dams. The pond sizes will be calculated based on peak storm flow requirements to maintain sufficient capacity.

Sedimats and Vegetation Filters: will be used to provide additional filtration after water passes through silt bags. Coir or jute sediment mats (Sedimats) and vegetation filters, placed on gentle slopes, will allow further infiltration and treatment of any remaining surface water before it percolates into the groundwater system.

10.10.2.3Surface Water Drainage Management

The construction stage drainage management plan outlines a comprehensive approach to ensure effective water management throughout the project. Key aspects include:

Project Hydrologist's Role: The Project Hydrologist will oversee the implementation of drainage controls as specified in the planning documents, ensuring that drainage systems are installed prior to or alongside related construction works.

Preparative Measures: Prior to the start of construction, essential materials (straw bales, geotextile, etc.) will be procured and kept on-site to facilitate immediate implementation of drainage designs as needed.

Pre-emptive Strategies: The construction schedule will adapt to weather forecasts, particularly concerning rainfall, with activities like excavation being scaled back or paused during heavy rain predictions to minimise runoff and erosion.

Reactive Management: Monitoring by the Environmental Manager will ensure the effectiveness of drainage measures. If siltation occurs in watercourses, all work in the affected areas will be halted until additional drainage measures are established.

Field Monitoring: Field chemistry measurements of unstable parameters, (pH, conductivity, temperature) will be taken at the surface water monitoring locations, as per water monitoring programme for the overall wind farm development and each primary watercourse along the route and at all installed sonde locations. These analyses will be carried out by either the ECoW or the Project Hydrologist. In-situ field monitoring will be completed on a weekly basis. In-situ field monitoring will also be completed after major rainfall events, i.e. after events of >25mm rainfall in any 24-hour period. The Project Hydrologist will monitor and advise on the readings collected by in-situ field monitoring.

10.10.2.4Habitats and Flora

The Proposed Development has been deliberately designed to avoid or minimise the loss of habitats of high local or higher ecological value. The grid route options are located almost entirely within existing roads. A Biodiversity Management and Enhancement Plan has been prepared for the

Proposed Development which provides for the ecological enhancement of all areas of grassland not returned to Improved agricultural grassland. Any hedgerows removed will be replaced in-situ or elsewhere in the Proposed Development at appropriate locations (i.e. designed to maximise ecological connectivity with the surrounding development). All hedgerows will be planted using native species and in a structural condition (on banks, over ditches, on walls) to mimic the original landscape diversity. To avoid widespread disturbance to habitats, access within the Proposed Development will be restricted to the footprint of the proposed works corridor and no access between different parts of the Proposed Development will be permitted, except via the proposed works corridor. An ECoW will be employed throughout the construction phase to ensure that construction activities do not encroach, unnecessarily, into any other habitats areas. To avoid damaging the roots of hedgerows and tree lines, root protection zones will be used. The roost protection zone area will be equivalent to a circle with a radius 12 times the diameter of the tree's trunk at 1.5 m above ground level.

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No invasives species were found during extensive surveys between 2021 and 2024. To ensure that no invasive species have entered the site prior to the commencement of construction an updated invasive species survey should be carried out of the entire Proposed Development Site, access road and grid route prior to project commencement.

10.10.2.5Mitigation for Terrestrial Mammals (Excluding Bats)

The Proposed Development has been specifically designed to avoid identified badger setts and other areas of suitable habitat for protected terrestrial mammals. Measures proposed in section 10.10.2.1 onwards will prevent deterioration of water quality and adverse effects on mammals relying on downstream habitats, such as otter. Habitat features important for mammals will be retained as much as possible (e.g. hedgerows, treelines and scrub).

A pre-construction walkover survey of the Proposed Development will be undertaken. This will search for mammal resting/breeding places, which could change over time. If any are identified, then appropriate exclusion zone(s) will be implemented and construction activities timed to avoid sensitive periods, such as the breeding season or hibernation, as relevant. Where licencing from NPWS is required, this will be sought.

The following will be implemented to reduce the possibility of direct and indirect effects on mammals:

- Limiting construction works to daylight hours,
- providing exit points for any excavations (e.g. escape planks or spoil runs) so mammals do not become trapped, and
- a suitably qualified ECoW will be employed for the duration of the construction period to make contractors aware of the mammalian sensitivities of the Proposed Development and to undertake surveys for breeding or resting mammals throughout the construction period. These are 50m for red squirrel, 100m for pine marten, 150m for otter and 50m for badger. If in the unlikely event that exclusion zones cannot be implemented, advice will be sought from NPWS, appropriate mitigation and compensation measures will be put in place, and an application will be made to NPWS for a derogation licence if required.

10.10.2.6Bats

No significant impacts on bats during the construction phase are anticipated the following standard best practice measures will be in place during the construction phase of the Proposed Development.

Noise restrictions

During the construction phase, plant machinery will be turned off when not in use and all plant and equipment for use will comply with the Construction Plant and Equipment Permissible Noise Levels Regulations (S.I. No. 632 of 2001).

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Lighting restrictions

Where lighting is required, directional lighting will be used to prevent overspill on to adjacent hedgerows. Exterior lighting, during construction and post construction, shall be designed to minimise light spillage, thus reducing the effect on areas outside the Proposed Development, and consequently on bats.

10.10.2.7Watercourses and Aquatic Ecology

The measures for control of runoff and sediment relate to the construction phase of the project when there is a high volume of site vehicles and delivery vehicles moving around the wind farm site. Following construction, the amount of on-site traffic will be negligible and there will be no particular risk of sediment runoff. Runoff from the roads, hardstands, and other works areas will continue to be directed to the settlement ponds, which will be left in place. Check dams within the drainage channels will remain in place. The retention of this part of the drainage infrastructure will ensure that runoff continues to be attenuated and dispersed across existing vegetation before recharge into the ground. In the operational phase of the wind farm, the reliance on the drainage system discussed above will become reduced as areas naturally revegetate. Once areas revegetate, this will result in a resumption of the natural drainage management that will have existed prior to any construction.

10.10.3 Mitigation Measures During Operation Phase

10.10.3.1Habitats and Flora

The operation of the Proposed Development will not lead to any additional land use or loss of habitats, meaning there is no potential for significant effects on habitats. Habitats are therefore not considered key ecological receptors (KER) in the context of the development's operation. The Proposed Development may have a positive effects on site habitat including grasslands and hedgerows through the implementation of the Biodiversity Management and Enhancement Plan as seen in Appendix 10.1. Summary points of the BMEP are outlined as follows:

- Restoration of improved grassland habitats for agricultural use.
- Restoration of hedgerows.
- Pollinator habitat creation and management.
- Protect the quality of Molinia meadows and enhance other fields for marsh fritillary.
- Monitoring by a suitably experienced ecologist.

10.10.3.2Mitigation for Terrestrial Mammals (Excluding Bats)

Once operational and with the implementation of the Biodiversity Management and Enhancement Plan, the foraging potential is expected to return to a similar level prior to the construction phase. No operational impacts are predicted.

10.10.3.3Bats

The 2023 bat survey at the Proposed Development documented bat activity levels that ranged from moderate to high across the area, including species identified as high-risk for turbine-associated mortality. In response, a Bat Monitoring and Mitigation Plan (BMMP) has been developed and is recommended for implementation for a minimum of three years following the windfarm's construction. This BMMP is designed to mitigate bat fatalities through a combination of monitoring and specific operational adjustments. The BMMP has been developed by Blackstaff Ecology and can be seen in full in Appendix 10.2.

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Feathering

Feathering is a primary mitigation measure that involves adjusting the turbine blades to a parallel position to the wind when the turbines are idling at low speeds. This reduces rotational speed below two revolutions per minute, decreasing the likelihood of bat fatalities by lowering the risk of barotrauma—a condition where bats experience internal injuries due to air pressure drops in the rotor's wake. Feathering will be applied to both turbines whenever wind speeds fall below the turbines' cut-in speed.

Curtailment

Curtailment involves raising the cut-in speed with associated loss of power generation in combination with reducing the blade rotation below the cut-in speed. Turbines can be programmed to feather the blades in response to real-time data using the manufacturer's bat protection programme (Enercon SCADA Bat Protection). This programme can be configured based on various factors, including time (e.g., sunset to sunrise), season (e.g., only during the bat active period), and specific environmental variables (e.g., wind speed and temperature). This bat protection programme requires the presence of sensors or data inputs to function. Data from these sensors is processed by the Enercon SCADA server and Edge Server, which convert it into 10-minute average values used to guide the bat protection settings. Recommended parameters are based on the SNH (2021) curtailment strategy, with conditions including wind speed below 5 m/s, temperature above 11.5°C, 30 minutes after sunset, and 40 minutes before sunrise, from 15 April to 15 October.

These parameters will be reviewed annually alongside findings from carcass searches; if a bat carcass is found, the parameters may be expanded. The curtailment regime can also be adapted using acoustic and meteorological data, ensuring it is only applied when necessary. For example, if acoustic data shows low bat activity during specific periods, curtailment may not be needed at those times. The Enercon SCADA Bat Protection programme records monthly control actions in a file accessible through Enercon SCADA Remote 3, allowing detailed logs of turbine operation versus curtailment. Only Enercon staff have permission to modify the configuration settings of the Bat Protection programme.

Automated Bat Detection

An optional bat detection system could be installed to automatically shut down the turbines in real-time if bat activity is detected. This would allow turbines to remain operational during favourable bat conditions unless bat activity is directly observed.

Integrated Automated Bat Detection Programme

The development may alternatively choose to employ a more specialised form of curtailment via an integrated automated bat detection programme. Such programmes have gained traction in the past decade and are useful tools for reducing turbine associated mortality by triggering turbine shut-down (and re-start) in real time in response to bat presence. If conditions fall outside environmental parameters considered suitable for bat activity but bats are detected, the programme will trigger shut down - if conditions are within these environmental parameters but bats are not detected, the turbine will remain operational. There are various programmes offering automatic stop and re-start triggers linked to bat activity and/or environmental parameters. The applicant is advised to discuss with their chosen turbine operator to choose an appropriate programme.

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Casualty Searches and Remedial Measures

Scottish Natural Heritage (SNH) reports that research shows about one-third of bat carcasses from wind turbine collisions are removed by scavengers within a few days, while another third remain for over a month, and the rest disappear at variable rates. Predators range from birds and mammals to insects like burying beetles, which can eliminate carcasses in just one or two days. Measuring carcass removal rates is essential to estimate bat fatalities accurately.

The Bat Monitoring and Mitigation Plan (BMMP) includes searcher efficiency and scavenger trials to achieve this. Carcasses similar to bats (e.g., lab mice) will be placed across different locations each season to prevent scavenger habituation. These carcasses will be deployed without human scent and left undisturbed for at least an hour before monitoring begins. Motion-activated cameras will track carcass removal over a three-week period, allowing for accurate data on scavenging rates. Various habitats will be tested to ensure a comprehensive understanding of removal patterns, with the use of cameras offering both time and species identification of scavengers.

Casualty searches will cover a grid area of 50m x 50m centred around each turbine. An initial "sweep" will be conducted, followed by alternate-day searches adjusted for weather conditions. Searches will begin within an hour post-sunrise to minimise potential removal of carcasses by scavengers. Efforts will focus on mornings following optimal bat conditions (warm temperatures, no rain), as bats are more active on these nights. A specialist ecologist will oversee these searches, adjusting schedules based on conditions such as livestock presence or weather. In cases where bat carcasses are found, NWPS will be informed, and search teams may be expanded to include specially trained dogs to increase carcass detection efficiency.

The number of observed bat carcasses recorded during the study (if any) will be corrected by taking into account the area searched, scavenger rates, and searcher efficiency results. Various researchers have proposed different approaches to data correction, including Korner-Nievergelt et al. (2011), Korner Nievergelt et al. (2013), Bispo et al. (2012), and Lintott et al. (2016). The most up to date formula for estimating the total number of carcasses present per turbine per season will be applied to the data collected at the end of the survey season.

The requirement for and design of additional remedial measures will depend upon the findings and conclusions of monitoring, and specific measures will be developed as appropriate to mitigate the significant impact predicted (those considered significant to bat populations at the local scale or above). Where significant impacts are predicted, potential remedial options may include, but are not limited to, expansion of curtailment parameters. The remedial measures will include a monitoring provision as part of the curtailment strategy for increasing the cut-in speed incrementally (i.e. by continuing to measure wind speed and bat fatalities) until bat fatalities are below an acceptable level.

10.10.4 Decommissioning Phase Mitigation

Mitigation measures for decommissioning will be similar to those for the construction phase, and will include pre-construction surveys of the site and the surrounding area, for the full range of flora and fauna. Mitigation will then be tailored to suit the baseline ecological condition found on the site at that time. However the magnitude required will be less, as track and turbine installation will not be required.

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10.10.5 Summary of Mitigation

Table 10.13:Summary of Construction Phase Mitigation

Ecological Feature	Action	Description
Watercourses and Aquatic Ecology	Create and Maintain Settlement Ponds and Check Dams within the drainage system	Provides long-term runoff management, allowing sediment control and gradual water dispersion through natural vegetation as the site stabilises.
	Allow Revegetation of Drainage Channels and Roadsides	Restores natural drainage as vegetation regrowth gradually replaces active drainage measures, reducing reliance on engineered systems.
Habitats and Flora	Implement Biodiversity Management and Enhancement Plan	Enhances on-site habitat quality, focusing on grassland and hedgerow recovery, contributing to improved biodiversity post-construction.
Bats	Use Noise and Lighting Control during construction	Limits disruption by turning off machinery when not in use and implementing directional lighting to prevent overspill onto sensitive areas.
	Consider Automated Bat Detection Systems	Allows turbines to automatically shut down in response to detected bat activity, preventing collisions in real time.
	Conduct Casualty Searches and Monitoring	This includes carcass searches and scavenger trials to assess the effectiveness of mitigation measures and adapting actions if needed.
Terrestrial Mammals (Excluding Bats)	Enforce Mammal Protection Zones as identified in pre-construction surveys	Establishes exclusion zones and restricts construction work to daylight hours to minimise impacts on mammal habitats.
	Provide escape routes from excavations.	Prevents mammals from being trapped by installing escape planks or other measures within excavation sites.
	Environmental Clerk of Works (ECoW) Monitoring	ECoW oversees construction to ensure compliance with mammalian sensitivity measures, maintaining ecological protection.

Table 10.14:Summary of Operational Phase Mitigation

Ecological Feature	Action	Description
Watercourses and Aquatic Ecology	Implement Surface Water Management Plan (SWMP), including clean and dirty water cut-off drains.	Minimises water contamination and manages sediment flow through settlement ponds, swales, silt fences, and other filtration measures.
	Monitoring by Project Hydrologist and Environmental Manager	Allows pre-emptive adjustments based on weather forecasts and field monitoring to reduce siltation risks in watercourses.
Habitats and Flora	Follow a Biodiversity Management and Enhancement Plan	Includes replacement of hedgerows with native species and restricted access zones to minimise damage to sensitive flora.
	Enforce Root Protection Zones	Protects the root systems of hedgerows and trees, supporting ecosystem stability and vegetation retention.
	Conduct Invasive Species Monitoring	Ensures no invasive species are introduced or overlooked, protecting native biodiversity and habitat integrity.
Bats	Execute Bat Monitoring and Mitigation Plan (BMMP)	Includes measures like feathering and curtailment of turbine blades during specific conditions to minimise bat mortality associated with turbines.
Terrestrial Mammals (Excluding Bats)	Support habitat recovery through Biodiversity Management and Enhancement Plan	Aims to restore mammal foraging and habitat potential to pre-construction levels, facilitating natural habitat use post-construction.

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10.11 Monitoring

10.11.1 General Pre-Construction Confirmation Surveys

To prevent accidental disturbance to resting places of mammals (badgers, red squirrel, pine marten, otter and hedgehog), an ecological walkover survey will be undertaken prior to any construction activities within the development footprint. Similarly, trees within the works corridor and grid route will be re-assessed for bat roosting potential, with any inspections or emergence surveys carried out as required. Checks for nesting birds will be required for construction undertaken during the bird breeding season. If nests are recorded, ongoing monitoring and appropriate exclusion zones will be implemented to determine when and where works can proceed. If exclusion zones cannot be implemented, NPWS will be contacted and based on their advice, additional mitigation and compensation will be implemented, with relevant licences applied for if required.

10.11.2 Water Quality (During and Post-Construction)

A construction-phase Surface Water Monitoring Plan (SWMP) has been developed and can be seen accompanying this EIAR.

This sets out specific parameters, inspection routines, and reporting protocols to manage water quality impacts during and after construction and assessed against pre and post construction conditions.

Monitoring at three designated surface water locations will measure key indicators, including Nitrogen as NH4, BOD, chlorides, nitrates, pH, phosphates, and total suspended solids.

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10.11.3 Construction Phase Monitoring

Daily Visual Inspections: Site drains and outfalls will be visually inspected daily to check for sediment build-up or obstructions, with extra attention following heavy rainfall. Any deviations in suspended solids compared to baseline levels will prompt further inspection and potential mitigation. Records, including photos, will document inspection results.

Water Monitoring: Water monitoring devices will track turbidity, flow rate, and water depth at specific site locations, supplemented by daily visual checks to ensure consistent oversight.

Monthly Laboratory Tests: Monthly lab analysis at baseline locations (SW1-SW3) will track construction impacts on water quality, with additional sampling points as needed.

Monthly Laboratory Tests: Weekly field measurements of pH, temperature, and conductivity, plus checks after rainfall, will complement laboratory results. Field assessments will help the Project Hydrologist advise on real-time water quality trends.

10.11.3.1Reporting and Post-Construction Monitoring

The Environmental Clerk of Works will compile visual inspection and lab results to evaluate drainage and pollution controls. Regular reporting at site meetings will summarise these findings, compare them to baseline data, and document any necessary corrective actions.

After construction, monthly sampling and analysis will continue until monitoring results indicate no adverse impacts on water quality, as verified by the Project Hydrologist. This comprehensive monitoring approach ensures that water quality remains protected throughout and beyond the project timeline.

10.11.3.2 Bats Post Construction

The Bat Monitoring and Mitigation Plan (BMMP) includes several measures which will be monitored and assessed to reduce bat collisions with wind turbines. Key strategies involve feathering (adjusting turbine blade angles), curtailment (limiting turbine operation under certain conditions), Enercon's SCADA Bat Protection, and casualty searches to monitor fatalities. If monitoring reveals a significant number of bat collisions, additional actions, such as increased feathering or further curtailment, may be implemented in coordination with the Planning Authority and the National Parks and Wildlife Service (NPWS).

Further mitigation steps will be implemented if monitoring records significant impacts on local bat populations. The monitoring process will assess the effectiveness of these adjustments in conjunction with consultation with NPWS and refine the strategy as needed.

Please refer to Appendix 10.2 for the full BMMP.

10.12 Interactions

Interactions of Biodiversity, Lands, Soils & Geology and Hydrology & Hydrogeology: There is potential for the biodiversity to overlap with the impact of construction works via the ecological and geological environment via excavation and subsequent accidental pollution. With the mitigation measures outlined in the CEMP as well as Chapter 8 and 9 will be implemented ensuring that no adverse interactions take place via protecting water bodies from pollution and sedimentation.

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Interactions of Biodiversity and Landscape and Visual: There will be no significant interaction between biodiversity and landscape and visual, as outlined within Chapter 3, the Proposed Development will have no significant visual impacts throughout construction, a slight impact through operation but still does not appear out of place in terms of its scale or function in this diverse landscape context, and none through the decommissioning phase therefore no adverse interactions will take place between biodiversity and landscape and visual.

Interactions of Biodiversity, Noise and Vibration and Traffic and Transport: There is potential for interaction between biodiversity, noise and vibration and traffic and transport during the construction phase of the development. As outlined within Chapter 12, the noise and vibration impacts during both the construction and operational phases (and the decommissioning phase) of the proposed development are predicted to be within the relevant guidance limits. Traffic using the site during the construction, operational and decommissioning phases of the development will be restricted to the use of the designated internal access roads. Mitigation measures outlined within Chapter 6 will be followed to ensure no adverse interactions will take place between biodiversity and traffic.

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10.13 Residual Impact Assessment

Table 10.15: Summary of Residual Effects

Ecological Feature	Project Phase	Potential Effect	Potential Cumulative Effect	Significance Pre-Mitigation Rationale Where No Effects are Predicted	Proposed Mitigation / Compensation / Enhancement	Significance of Residual Effect
European Sites	Construction Operation Decommissioning	Direct: None Indirect: None	No Likely Significant Effects Predicted	*No Likely Significant Effects* The only pathway for significant effects identified was via impacts to water quality impacts to connected downstream sites, including Lough Forbes Complex SAC, Ballykenny – Fisherstown Bog SPA, Lough Ree SAC, and Lough Ree SPA. In relation to Lough Forbes Complex SAC, Ballykenny – Fisherstown Bog SPA, the potential for LSE can be excluded due to the buffer distance of over 10km from the Proposed Development via the Camlin River, given this significant buffer distance and the nature of the conservation objectives of QIs potentially within the ZOI highly sensitive to water quality impacts. Lough Ree SPA and Lough Ree SAC are located over 26km from the site, connected via the Camlin River and the Shannon. Given the significant buffer distance between the potential source and receptor, any pollutants potentially reaching the Camlin would dissipate, dilute, or settle before reaching these sites. As such, no significant impacts are expected. No connectivity was found between these sites and any designated sites via avian receptors, as discussed in Chapter 11.	None required	Not significant

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Ecological Feature	Project Phase	Potential Effect	Potential Cumulative Effect	Significance Pre-Mitigation Rationale Where No Effects are Predicted	Proposed Mitigation / Compensation / Enhancement	Significance of Residual Effect
Nationally Designated sites	Construction Operation Decommissioning	Direct: None Indirect: None	No Likely Significant Effects Predicted	*No Likely Significant Effects* Several pNHA and NHA sites are found within 20km of the Proposed Development. Lough Forbes Complex and Lough Ree have hydrological connectivity to the Proposed Development via the Camlin River. Given the significant buffer distance between the potential source of pollution and these receptor sites and the available distance over which potential pollutants have to become dissolved, diluted or settle out, no indirect significant effects are predicted alone or in conjunction with any other plans or projects. Carrickglass Demesne pNHA is found within 1km of the site's redline boundary. This pNHA has been designated for areas of semi-natural woodland, which are listed as long-established woodlands on the Native Woodland (NSNW) and Ancient Woodlands inventory (2011 – 2012). No potential pathway for impacts exists between this pNHA and the Proposed Development.	None required	Not significant
Fisheries and Aquatic Ecology Water Quality	Construction Decommissioning	Direct: None Indirect: Yes	No Likely Significant Effects Predicted	*Direct Effects – Not Significant* Works have been specifically designed to avoid sensitive aquatic receptors. No direct impacts upon aquatic habitat or species are predicted. *Indirect Effects - Temporary significant effects on the county/regional scale* Potential indirect effects include the release of suspended solids, cement, concrete, or hydrocarbons into the Camlin due to runoff	See the section 10.10.2.7 of this chapter in addition to the Appendix 10.6 for a range of avoidance and mitigation measures that will be implemented during the construction phase to ensure no adverse impact on water quality with local aquatic receptors occurs.	Not Significant

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Ecological Feature	Project Phase	Potential Effect	Potential Cumulative Effect	Significance Pre-Mitigation Rationale Where No Effects are Predicted	Proposed Mitigation / Compensation / Enhancement	Significance of Residual Effect
				or a flood event, which could adversely affect aquatic habitats and species.		
Habitats						
Annex I habitats: 'Molinia meadows (6410).	Construction Operation Decommissioning	Direct: None Indirect: None	No Likely Significant Effects Predicted	*Not Significant* Molinia meadows recorded during surveys are entirely outside the project ZOI and will not be adversely impacted. The Biodiversity Management and Enhancement plans aim to better conserve this grassland through measures in adjacent fields to avoid poaching and overgrazing.	None required	Not significant
Improved/Wet Grassland (GA1/GS4) and Wet Grassland (GS4)	Construction Decommissioning	Direct: Yes Indirect: None	No Likely Significant Effects Predicted	*Direct Effects – Permanent slight negative effect at the local scale*	Habitat restoration and enhancement will occur post-works, including reinstatement and regeneration of suitable grassland habitats.	Not significant
Hedgerows (WL1)	Construction	Direct: Yes Indirect: None	No Likely Significant Effects Predicted	*Long-term, significant negative effects at the local scale*	Habitat restoration and enhancement will occur post-works, which include the reinstatement of hedgerows with suitable native locally appropriate species.	Not significant
Other habitats	Construction Phase	Direct: None	No Likely Significant	*Not Significant*	Grassy verge habitats will be restored and allowed to regenerate as part of	Not significant

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Ecological Feature	Project Phase	Potential Effect	Potential Cumulative Effect	Significance Pre-Mitigation Rationale Where No Effects are Predicted	Proposed Mitigation / Compensation / Enhancement	Significance of Residual Effect
Scrub (WS1) Buildings and Artificial Surfaces (BL3) Grassy Verge (GS2) Improved Grassland (GA1) Drain (FW4)		Indirect: None	Effects Predicted	These habitats have been excluded from this assessment as they have been classified as being of Local Importance (Lower Value) and occupy small areas.	hedgerow restoration works naturally.	
Invasive species	Construction Operation	Direct: None Indirect: None	No Likely Significant Effects Predicted	*Not Significant* No Third Schedule or high impact invasive species were recorded.	Preconstruction surveys for invasive species are proposed as part of best practice.	Not significant
Fauna						
Badgers	Construction Decommissioning	Direct: None Indirect: None	No Likely Significant Effects Predicted	*Direct Effects - Not Significant* No active refugia badgers are found within 200m of the Proposed Development, Access route or grid connection route options. *Direct Effects - Not Significant* Indirect effects on mammals during construction could result in the loss of potential foraging and commuting; however, given the	Precautionary mitigation has been proposed to avoid works during badgers' active periods and to implement measures to prevent entrapment.	Not significant

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Ecological Feature	Project Phase	Potential Effect	Potential Cumulative Effect	Significance Pre-Mitigation Rationale Where No Effects are Predicted	Proposed Mitigation / Compensation / Enhancement	Significance of Residual Effect
				abundance of similar habitats in the surrounding areas, the effects are extremely unlikely to occur.	Preconstruction surveys are required to assess for refugia for protected mammals.	
Otters	Construction Decommissioning	Direct: None Indirect: Yes	No Likely Significant Effects Predicted	*Direct Effects - Not Significant* The Proposed Development has been deliberately designed so that all major infrastructure avoids the main watercourses within it. No otter resting or breeding sites were recorded within the Proposed Development or within the wider study area. *Indirect Effects – slight negative effect at a local level* While the design has prioritised the avoidance of major watercourses, there remains a risk of indirect impacts on otter habitats from water pollution caused by runoff of pollutants during construction activities.	Section 10.10.2.1 outlines a range of water quality protection measures, including measures to control the loss of polluting material and suspended soils throughout the construction phase. The avoidance of water quality impact will protect against adverse effects on otters. Preconstruction surveys are required to assess for refugia for protected mammals.	Not significant
Pine Marten Red Squirrel Other Fauna: Amphibians (common frog	Construction Operation Decommissioning	Direct: None Indirect: None	No Likely Significant Effects Predicted	Direct Effects - Not Significant No active refugia for any protected mammal species was found within 200m of the Proposed Development, Access Route or Cable Corridor. Direct Effects - Not Significant	Preconstruction surveys are required to assess for refugia for protected mammals. Construction and pre-construction checks and the translocation of spawning/mating frogs will	Not significant

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Ecological Feature	Project Phase	Potential Effect	Potential Cumulative Effect	Significance Pre-Mitigation Rationale Where No Effects are Predicted	Proposed Mitigation / Compensation / Enhancement	Significance of Residual Effect
and smooth newt)				Indirect effects on mammals during construction could result in the loss of potential foraging and commuting; however, given the abundance of similar habitats in the surrounding areas effects are extremely unlikely to occur.	be undertaken under an NPWS licence if they are present in the Proposed Development footprint.	
Marsh Fritillary	Construction Operation Decommissioning	Direct: None Indirect: None	No Likely Significant Effects Predicted	Direct Effects - Not Significant No works will occur within any habitat or supporting habitat for this species. Direct Effects - Not Significant No significant indirect effects on key foraging habitats will occur (the majority of habitat loss will be of low-value agricultural grassland, which does not offer important foraging opportunities to adult butterflies).	None Mitigation Required The Biodiversity Management and Enhancement Plan proposes conserving and enhancing key breeding habitats. The Habitat Restoration plan also includes measures to increase the availability of pollinating and food plants for adult butterflies.	Not significant
Bats	Construction Decommissioning	Direct: None Indirect: Yes	No Likely Significant Effects Predicted	Direct Effects - Not Significant No confirmed bat roosts were recorded within the Proposed Development Indirect Effects - *Long-term, slight negative effect at the local scale* The fragmentation, loss or degradation of commuting/foraging habitat has the potential to reduce feeding opportunities and/or displace bat populations.	The Biodiversity Managment and Enhancement plan will involve the restoration of hedgerow habitat throughout the site to mitigate for the loss and degradation of commuting/foraging habitat	Not significant

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Ecological Feature	Project Phase	Potential Effect	Potential Cumulative Effect	Significance Pre-Mitigation Rationale Where No Effects are Predicted	Proposed Mitigation / Compensation / Enhancement	Significance of Residual Effect
	Operation	Direct: Yes Indirect: None	No Likely Significant Effects Predicted	Direct Effects - Long-term, slight negative effect on local populations Potential direct collision with turbines or barotrauma Indirect Effects - Not Significant The operational phase will not lead to further habitat fragmentation, and there is no risk of displacement due to lighting or noise during it.	A Bat Monitoring and Mitigation Plan (BMMP) has been developed and can be seen in the Appendix 10.2. This contains a range of mitigation and monitoring measures, including Feathering, Curtailment, and Casualty Searches. If monitoring shows potentially significant levels of collisions with turbines, mitigation measures will be implemented in conjunction with the Planning Authority and NPWS, which may include further turbine feathering and/or curtailment.	Not significant

10.14 Conclusion

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This evaluation concludes that, following the implementation of avoidance and mitigation measures, the Proposed Development will not result in significant ecological impacts on any identified key ecological receptors (KERs), including those at international, national, or county levels of importance. The Appropriate Assessment Screening Report for this project assessed potential effects on European Designated Sites, finding that, based on scientific data, the Proposed Development—alone or in combination with other projects—will not have likely significant effects on any designated sites.

For nationally designated sites, no significant effects are expected. With adherence to design, best practices, and the mitigation measures outlined in the application, no major ecological effects are anticipated at any assessed scale.

The detailed mitigation planning has been developed for all potential ecological receptors and will apply to all project phases and, if fully implemented, significant individual or cumulative effects on ecology are not anticipated upon any key ecological features.

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CHAPTER 11
ORNITHOLOGY

VOLUME II
ENVIRONMENTAL IMPACT ASSESSMENT REPORT

DECEMBER 2024

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11 Ornithology

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11.1 Introduction

This chapter assesses the potential significant effects that the Cloonanny Wind Farm Development (the 'Proposed Development') may have on avian receptors. Particular attention has been paid to species of ornithological importance. These include species with national and international protection under the Wildlife Acts 1979-2012 as amended and the EU Birds Directive 2009/147/EC, among other relevant legislation. This chapter details the methods used to establish the bird species and populations present, together with the process used to determine their Nature Conservation Importance. How birds might be affected (directly or indirectly) by the construction, operation and decommissioning of the Proposed Deveopment is evaluated, and an assessment is made regarding the significance of these effects. Where potential impacts are identified, mitigation measures have been developed to avoid or reduce residual significant effects.

This chapter is supported by Appendices 11.1 to 11.4, which contain data from the surveys undertaken, including full details of the survey times, weather conditions, and other relevant information, together with the bird records themselves. Appendix 11.3 contains the Collision Risk Assessment (CRA) (MKO, 2024), which illustrates how the Collision Risk Modelling was undertaken for the Proposed Development. Appendix 11.4 includes the bird monitoring programme. The Proposed Development and survey radii are provided in Figures 11.1 to 11.3.

The following list defines the meaning of the technical terms used in this chapter:

- " avian Key Ecological Receptor" (KER) is defined as a species occurring within the zone of influence of the development upon which likely significant effects are anticipated and assessed.
- "Zones of Influence" (ZOI) for individual ornithological receptors refers to the zone within which potential effects are anticipated. ZOIs were assigned following the best available guidance (SNH 2016 and McGuinness *et al*., 2015).

Areas designated for nature conservation within the European context have been considered in a standalone Appropriate Assessment Screening Report (IDEC, 2024) prepared to deal specifically with potential likely significant effects upon European sites.

Article 3(1) of the EIA Directive requires the EIA to identify, describe and assess the direct and indirect significant effects of a project on biodiversity, with particular attention to species and habitats protected under Directive 92/43/EEC and Directive 2009/147/EC. This chapter meets these criteria through the identification, description, and assessment of the significant direct and indirect effects of the proposed development on avifauna, as required under these directives. In this chapter, attention to species and habitats protected under these directives have been subject to the same level of scrutiny, noting that the European sites have been assessed in detail through Appropriate Assessment Screening Report (AASR).

11.1.1 Project Team

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The chapter has been prepared by Ian Douglas of ID Environmental Consultants (IDEC) Ltd, with support from Ellen Irwin from IDEC and freelance Ornithologist Louis Peacock. Ornithologists Daniel Maloney and Mark Davenport carried out the baseline ornithology surveys between 2021 and 2024. ID Environmental Consultants Ltd carried out the site's baseline surveys between January 2021 and March 2024.

ID Environmental Consultants was founded by Ian Douglas (MSc, BSc, H Cert. Ag) in 2022. With over a decade of experience as an Ecologist and Environmental Consultant, Ian has developed expertise in Appropriate Assessments, Ecological Impact Assessments, habitat assessments, GIS and habitat creation and ornithological surveys. Ian has experience with a wide range of projects, including major road developments and energy infrastructure, as well as residential and other infrastructure planning across Ireland. Ian has worked on several wind farm projects including projects Roscommon, Donegal and Cork. Prior to establishing ID Environmental Consultants, Ian worked in Ecology and Agriculture in England and Australia. He joined Flynn, Furney Environmental Consultants in 2018, where he currently holds the position of Associate Director.

Ellen Irwin contributed to the reports for this project. Ellen is a former UCD student who recently graduated with her Agri-Environmental Science (BAgrSc, Level 8) degree. Through this degree, Ellen has developed practical field and lab-based skills necessary for field/habitat surveying and soil sampling and has also gained knowledge of GIS software. Since finishing her degree in May 2023, Ellen has worked with ID Environmental Consultants and Flynn Furney Environmental Consultants. During this time, Ellen has gained ample experience in ecological surveying, including mammal, bat and bird surveys and has contributed to reports, including Appropriate Assessments and Ecological Impact Assessments.

Daniel Maloney is an experienced Ornithologist who has worked for Birdwatch Ireland and RSPB Northern Ireland and has provided expert input as a Breeding Wader Advisory Officer, as a Bird Specialist advisor for ACRES and on projects specifically focusing on Corn Crake and Curlew. Daniel works as a freelance Ecologist specialising in bird surveys for wind farm impact assessments and other construction works in the Republic of Ireland, Northern Ireland, and Scotland. Expert skills include site assessment, vantage point surveys, walkovers, broader raptor surveys, predevelopment breeding and nesting bird surveys on Proposed Developments, road construction, power line, and gas pipeline projects.

Mark Davenport is a freelance ecologist specialising in ornithology with several years of experience on bird surveys for wind farm impact assessments and the conservation of red-listed waders for NPWS. Specialised skills include vantage point surveys, breeding raptor/wader surveys, walkovers and broader breeding bird surveys for proposed windfarm and substation projects.

Louis is an Ecologist/Ornithologist with over three years experience in ecological consultancy and holds a 2nd class honours degree in Wildlife Biology from Munster Technological University, Tralee Campus. Louis has carried out multiple field surveys for both protected species and habitats for various project types ranging from large infrastructural, renewable energy and biodiversity enhancement projects. He has also completed AA screenings and Natura Impact Statements on various small and

large infrastructure projects. He has carried out various bird surveys, from general transects to targeted species surveys.

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The collision risk model and report was prepared by Patrick Manley, Senior Ornithologist of MKO, and reviewed by Susan Doyle, Senior Ornithologist. Both are suitably qualified ornithologists with experience in avifaunal assessment and collision risk modelling and competent experts for the purposes of the preparation of this report.

11.1.2 Proposed Development

A brief summary of the development is outlined below. A detailed description of the proposed development is contained within Chapter 2 of this EIAR and the Planning Statement that accompanies the application. The statutory notices should also be referred to.

A 10-year permission is being sought by Natural Forces Renewable Energy 2 Limited for the development of a 14MW wind farm on lands measuring 17.28ha located at the L5046 and L50462 in the townlands of Cloonanny Glebe, Corragarrow, Derryharrow and Gorteenorna, Co. Longford.

The proposed development will consist of the following:

(i) Demolition of a single-storey derelict shed structure (c. 93 sqm GFA) to facilitate the turbine haul route

(ii) Construction of two E175 EP5 wind energy converters, each with an electrical rating of 7MW, an overall ground-to-blade tip height of 199.9 metres, a rotor blade diameter of 175 metres, hub height of 112.4 metres, associated foundations and hard-standing areas;

(iii) Construction of an 800m permanent internal site access road which will run from the L50462 to the wind energy converter hardstanding areas including a 9.1m clear span bridge crossing a local stream;

(iv) Construction of 1 No. meteorological mast with a height of 32 metres, associated foundation and hardstanding area;

(v) Construction of 1 No. 20kV substation compound comprising 2 No. Modular Buildings each measuring 13.5 sqm in area and 3.5m in height, a Battery Energy Storage System (BESS) comprising 3 storage modules with a height of 2.8 metres and associated electrical works, foundation and hardstanding area;

(vi) Temporary alterations to the L5046 and L50462 public roads and temporary access roads to facilitate the turbine component haul route, including temporary widening of sections of the L5046 and L50462.

(vii) Installation of underground collector circuit and communications cabling in underground cable trenches, from the proposed wind energy converter to the proposed on-site substation;

(viii) All associated and ancillary site development, excavation, construction, and reinstatement works, including the provision of a temporary construction compound, site drainage, spoil management, fencing, lighting, hedge and operational maintenance and tree trimming and cutting.

(ix) This application is seeking a 35- year operational life from the date of commissioning of the entire wind farm.

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The grid connection from the proposed on-site substation to the national electricity grid does not form part of the subject planning application. However, as part of the planning application process, this EIAR addresses three potential grid connection options currently considered to ensure a comprehensive environmental assessment of all aspects of the Proposed Development. The grid connection will be via 1 of the 3 potential options outlined below:

- Option 1 Connect the proposed development via (8.03km) to Richmond 110kV Substation
- Option 2 Connect the proposed development via (3.96km) to Longford 38kV Substation
- Option 3 Connect the proposed development via (5.85km) to Glebe 38kV Substation

It is anticipated that the grid connection from the Proposed Development will be by means of an underground cable connecting to one of the Substations identified above via the public road network. For bridge crossings, the cable will be located within the bridge deck, where there is insufficient depth and width available horizontal directional drilling (HDD) will be employed as an alternative.

Once the preferred route emerges it will be determined whether the grid connection falls within the category of exempted development under Class 26 of Schedule 2 in the Planning and Development Regulations 2001, as amended or requires planning permission, in which case an application will be made to the planning authority.

All elements of the proposed development as outlined above together with the turbine delivery route and grid connection options have been assessed as part of this EIAR.

11.2 Legislation, Guidance and Policy Context

This EIAR is prepared in accordance with the requirements of the EU EIA Directive (2014/52/EU). The following key legislative provisions apply to habitats and fauna in Ireland:

- Irish Wildlife Acts 1976 to 2012 as amended.
- The European Communities (Birds and Natural Habitats) Regulations 2011, as amended (S.I. no. 477 of 2011). These regulations transpose the EU Birds Directive into Irish law.
- The International Convention on Wetlands of International Importance (the Ramsar Convention), 1971.

The Wildlife Act of 1976 is the principal national legislation providing for the protection of wildlife and the control of some activities that may adversely affect wildlife. The Wildlife Act of 1976 aims to

protect and conserve wild fauna and flora, conserve a representative sample of essential ecosystems, develop and protect game resources and regulate their exploitation, and provide the services necessary to accomplish such aims.

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The EU Directive on the Conservation of Habitats, Flora and Fauna (92/43/EEC), commonly known as "the Habitats Directive", was adopted in 1992, came into force in 1994 and was transposed into Irish law in 1997. In addition, certain other obligations of the Habitat Directive have been transposed by the European Communities (Birds and Natural Habitats) Regulations 2011 and Part XAB of the Planning and Development Act 2000, as amended.

The Convention on Wetlands of International Importance, especially as waterfowl habitat, more commonly known as the Ramsar Convention, was ratified by Ireland in 1984 and came into force for Ireland on 15 March 1985. Ireland presently has 45 sites designated as Wetlands of International Importance.

In the absence of specific national ornithological survey guidance for Ireland, the following guidance documents published by NatureScot have been followed to inform this assessment:

- SNH (2000). Wind farms and birds: calculating a theoretical collision risk assuming no avoidance action. Scottish Natural Heritage, Inverness, Scotland. SNH (2009). Monitoring the impact of onshore wind farms on birds. Scottish Natural Heritage, Inverness, Scotland.
- SNH (2016). Assessing connectivity with Special Protection Areas (SPAs). Scottish Natural Heritage, Inverness, Scotland.
- SNH (2017). Recommended bird survey methods to inform impact assessment of onshore wind farms. Scottish Natural Heritage, Inverness, Scotland.
- SNH (2018b). Assessing the cumulative impacts of onshore wind farms on birds. Scottish Natural Heritage, Inverness, Scotland.
- SNH (2018c). Assessing the significance of impacts from onshore wind farms outwith designated areas. Scottish Natural Heritage, Inverness, Scotland.
- Bibby, C. J., Burgess, N. D., Hill, D. A., & Mustoe, S. (2000). *Bird Census Techniques* (2nd ed.). Academic Press.
- Hardey, J., Crick, H., Wernham, C., Riley, H., Etheridge, B. and Thompson, D., 2013. Raptors, a field guide for surveys and monitoring.
- Goodship, N.M. and Furness, R.W. (2022). NatureScot Research report 1283 – Disturbance Distances Review: An updated literature review of disturbance distances of selected bird species.

The following Irish guidance documents were also consulted:

- Percival, S.M. (2003). Birds and wind farms in Ireland: A review of potential issues and impact assessment. Ecology Consulting, Durham, UK.
- McGuinness, D., Muldoon, C., Tierney, N., Cummins, S., Murray, A., Egan, S. and Crowe, O. (2015). Bird Sensitivity Mapping for Wind Energy Developments and Associated Infrastructure in the Republic of Ireland. Birdwatch Ireland, Wicklow, Ireland.

- Gilbert, G., Stanbury, A. and Lewis, A. (2021). Birds of Conservation Concern in Ireland 4: 2020-2026. Irish Birds, 43:1-22.

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11.3 Methodology

11.3.1 Desktop Study

A comprehensive review of available information pertaining to the Study Area was conducted. The Study Area encompasses not only the lands directly impacted by the proposed development—where its components are located—but also distant habitats that may experience indirect ecological effects arising from the development's construction and operation (Figure 11.1). The assessment included a thorough review of the available ecological and ornithological data, including:

- The NPWS Protected Species Database and Online Mapping (Updated November 2023).
- Data on waterbodies, available for download and interrogation from the Environmental Protection Agency (EPA) web map service (Environmental Protection Agency, 2018).
- Information on the location, nature and design of the proposed development supplied by the applicant's design team.
- Review of Bird Atlases: (Sharrock, 1976; Lack, 1986; Gibbons *et al*., 1993; Balmer *et al*., 2013).
- Review of Birds of Conservation Concern (BoCCI) in Ireland 2020 – 2026 (Gilbert *et al*., 2021).
- Environmental Impact Statements from relevant developments in the region, including windfarms
- Bird Sensitivity Mapping for Wind Energy Developments and Associated Infrastructure in the Republic of Ireland. Guidance Document (McGuinness *et al*., 2015).
- Review of previous and current planning applications for the subject site and local area via the Longford Council Councils Planning portal[1], Myplan[2] and the An Bord Pleanála[3].
- Desk research included a review of records available through the National Biodiversity Data Centre mapping system. These included rare and protected species. Records were requested for all species appearing within the Study Area or immediately surrounding the Study Area (2km)[4].
- Data held on the NPWS Article 17 datasets for protected species[5].

[1] https://eplanning.ie/eplan/searchtypes?localAuthorityId=18

[2] https://www.myplan.ie/

[3] https://www.pleanala.ie/en-ie/map-search

[4] https://maps.biodiversityireland.ie/Map

[5] https://www.npws.ie/maps-and-data/habitat-and-species-data/article-17

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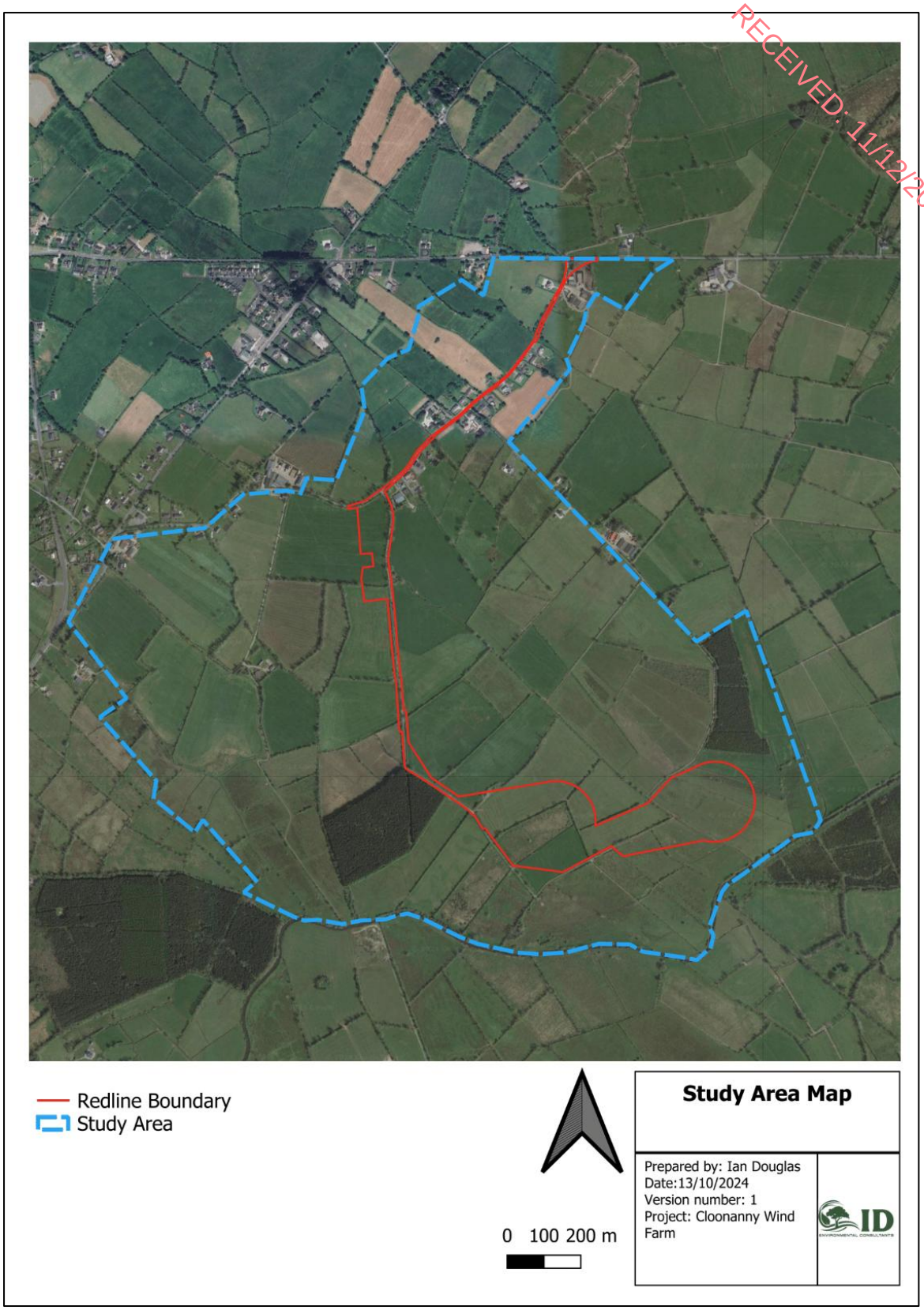


Figure 11-1 Study Area

11.3.2 Consultation

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Consultation was undertaken with the relevant statutory and non-statutory organisations as part of the EIAR scoping to inform the current assessment. Table 11-1 lists the organisations consulted about Ornithology during the scoping process and notes where scoping responses were received. The recommendations of the consultees have informed the EIAR preparation process and the contents of this chapter.

Table 11.1 Summary of Consultation carried out and Responses

Consultee	Date of Consultation	Response
National Parks and Wildlife Services	August 2024	The Department is not in a position to make specific comment on this particular referral at this time. No inference should be drawn from this that the Department is satisfied or otherwise with the proposed activity. The Department may submit observations/recommendations at a later stage in the process.
BirdWatch Ireland	June 2023	No Response
Longford County Council	April 2024 June 2024	Pre Planning Meeting, no specific ecology related response Longford Biodiversity Officer- No Response

11.3.3 Identification of Target Species and avian Key Ecological Receptors (KERs)

Avian KERs are "target species" and are the typical species likely to occur in the zone of influence of the Proposed Development Site. Specifically, species that are afforded a higher level of legislative protection or are considered more sensitive to potential impacts from wind farm developments by virtue of their behaviour (SNH, 2017). The observation/survey work carried out on the site was specifically designed to survey these identified target species in accordance with SNH guidance (2017). The target species was drawn from:

- Species listed in Annex I of the EU Birds Directive.
- Special Conservation Interests (SCI) of Special Protection Areas (SPA) within the zone of likely significant effects.
- Species protected under the fourth schedule of the Wildlife Acts 1976-2012 (buzzards, eagles, falcons, harriers, hawks, kites, osprey, owls).
- Red-listed birds of Conservation Concern.
- Bird species that are susceptible to impacts from this type of development (i.e. raptors).

Therefore, only red-listed species have been included as target species unless the species meets one of the other target species selection criteria, e.g. Annex I, outlined above. However, to ensure that

other species that may be sensitive to wind farms were not missed during surveys, all other species of gull, wader, duck, goose, swan, cormorant, and heron were included as secondary target species. According to SNH (2017), it is generally considered that windfarms do not significantly impact passerine species.

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11.3.4 Field Surveys

The survey work undertaken between November 2021 and March 2024 forms the core dataset for assessing effects on ornithology. These field surveys complied with SNH guidance (SNH, 2017). Field survey methodologies were devised to survey the composition and assemblages of bird species that occur within the Proposed Development Site and its surroundings.

11.3.4.1 Vantage Point Surveys

Vantage point (VP) surveys were undertaken by SNH guidance (SNH, 2017) from November 2021 to March 2024. Surveys were conducted monthly throughout this survey period from 3 fixed vantage points to allow as comprehensive coverage of the 500m survey radius surrounding the proposed turbines as possible. The vantage point locations were selected by undertaking a viewshed analysis, as described below and via on-site scoping exercises in October 2021 by Daniel Moloney. Table 11-2 shows the vantage point locations used between November 2021 and March 2024 and the viewshed as determined as part of the MKO (2024) Collision Risk Assessment Modelling exercise. Maps of the vantage can be seen in Figure 11-2.

Table 11.2 Vantage point locations

Vantage Point	X(ITM)	Y(ITM)
VP1	615176	778605
VP2	614257	778295
VP3	614857	777843

The main purposes of vantage point survey watches are to collect data on target species that will enable estimates to be made of:

1. The time spent flying over the defined survey area;
2. The relative use of different parts of the defined survey area; and
3. The proportion of flying time spent within the upper and lower height limits as determined by the rotor diameter and hub height.

11.3.4.2 Viewshed Analysis

Vantage point viewsheds were calculated using the Visibility Analysis plugin (Version 1.8) over a raster digital elevation model (DEM) in QGIS (Version 3.28) using a notional layer suspended at 25m. The vantage point locations were tested for visibility coverage from a point 1.75m in height (to represent the height of the surveyor) on a map using 10m contours terrain data. The relative height of any

surrounding landscape features (e.g. trees) and their effects on visibility were also accounted for in the analysis. The software produced a 360° viewshed 25m from ground level up to a 2km radius around the vantage point. This viewshed was then cropped to a 180° arc, representing the area visible to the surveyor.

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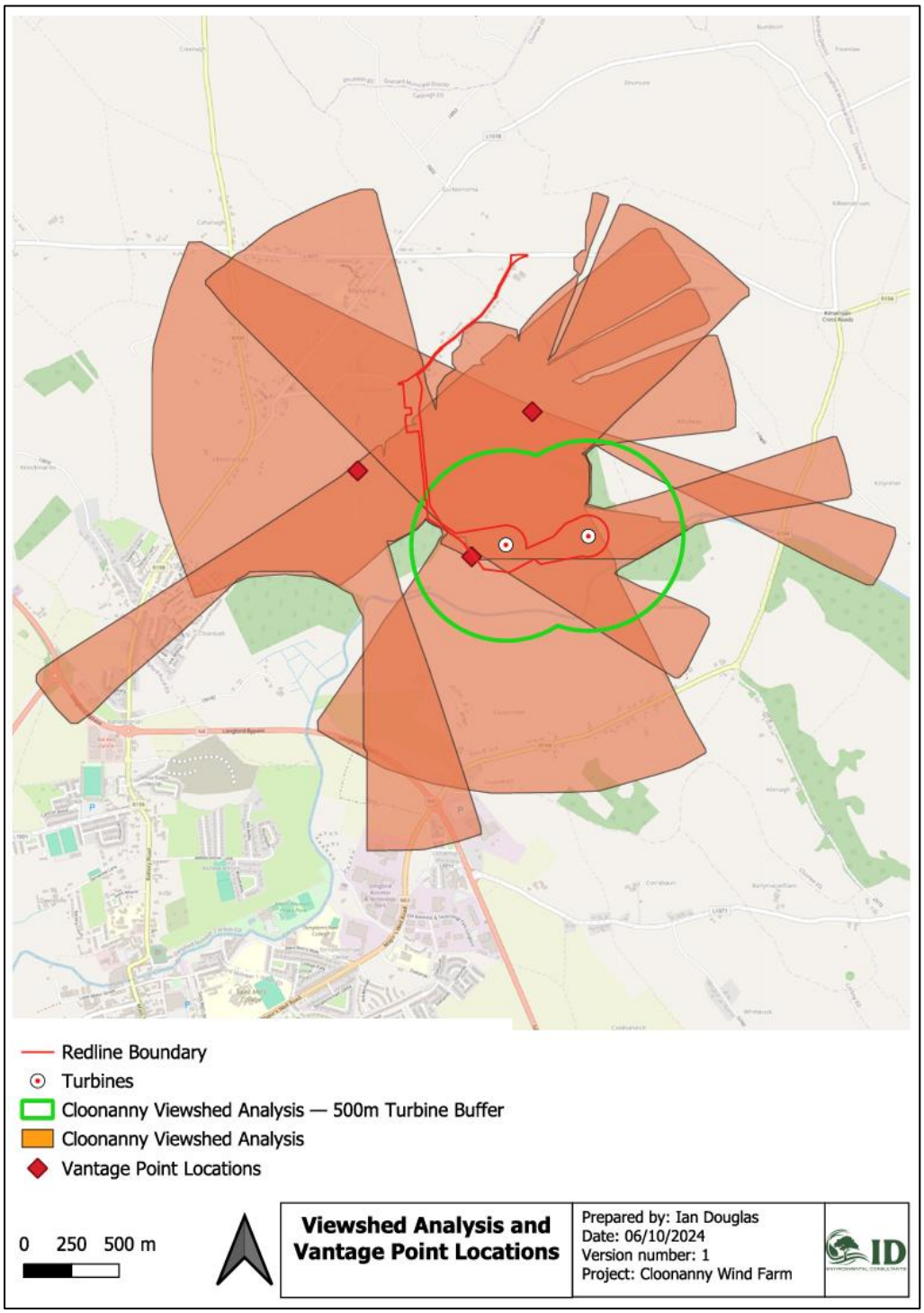


Figure 11-2: Vantage Points, Turbine Locations and Redline Boundary and Viewshed Analysis

11.3.4.3 Winter Walkover Surveys

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Winter walkover surveys were undertaken to investigate the presence of bird species of high conservation concern within areas of potentially suitable habitat in the Study Area. The methodology was based on methods described in Bibby *et al.,*(2000) and adapted by Brown and Shepherd (SNH, 2017). The walkover route was designed to give full coverage of the extended site and the 500m buffer area. In order to record maximum bird registrations and to record the diversity of species, all important habitats and aspects of the site were covered. Habitats that may hold target species were incorporated into the walkover route. These transects were undertaken between November 2021 to March 2022, October 2022 to March 2023 and October 2023 to March 2024.

11.3.4.4 Breeding Walkover Surveys

Breeding walkover surveys were undertaken during daylight hours during April 2022 to July 2022 and April 2023 to July 2023 to evaluate the use of the site by breeding bird species. The walkover route was designed to give full coverage of the extended site and the 500m buffer area. In order to record maximum bird registrations and to record the diversity of species, all important habitats and aspects of the site were covered. Habitats that may hold target species were incorporated into the walkover route. The survey methodology followed Brown and Shepherd (SNH, 2017) and Calladine *et al*. (2009). The field maps were analysed following all survey visits to determine the number and location of breeding territories. All non-breeding individuals and species encountered were also recorded. All habitats within the land take areas were recorded and identified according to the Heritage Council's 'Guide to Habitats in Ireland' (Fossitt, 2000). The walkover surveys were designed to detect any protected habitats or species, including any suitable habitat for protected species, that may occur in the vicinity of the Proposed Development. Incidental sightings/ observations of birds and additional fauna were noted during the site visit.

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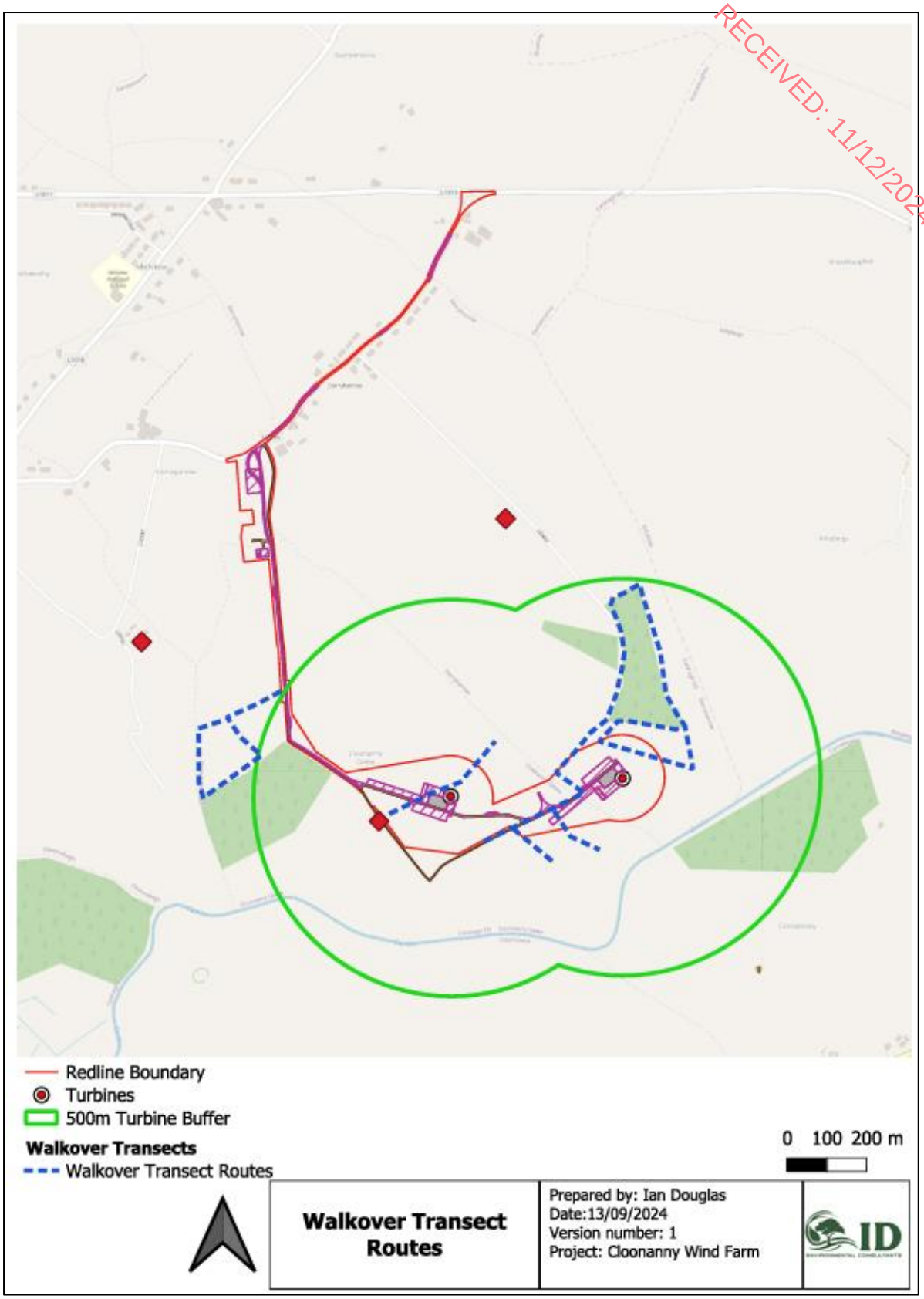


Figure 11-3: Walkover transect surveys used

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11.3.4.5 Breeding Raptor Surveys

Breeding raptor surveys (i.e. birds of prey and owls) were conducted within the Study Area and its immediate surroundings. The survey area extended 2km beyond the site boundary. The aim of these surveys was to identify attempted or successful breeding attempts by raptor pairs and ascertain their territories within the Study Area. The methodology followed Hardey *et al.,* (2013). Raptor surveys, in the form of 3-hour VPs, were conducted within the Study Area and lands up to 2km outside the Study Area boundary on a monthly basis during the core breeding season (April, May, June and July) in 2023.

11.3.4.6 Wintering and Migratory Waterfowl Surveys

These surveys comprise surveying loughs/waterbodies within a 5km buffer of the Site. These surveys were designed to record waterfowl species wintering within the vicinity of the Proposed Development Site. Migration Watch VP surveys for migratory wildfowl were conducted from September to November (autumn migration) 2022 and March to mid-May (spring migration) 2023. Winter waterbird surveys were carried out during daylight hours and with an effort to survey at dawn or dusk as this may assist in identifying roost sites. The survey methodology follows Gilbert *et al*., (1998) and the Irish Wetland Bird Survey core count methodology[6].

11.3.4.7 Breeding Snipe Surveys

Breeding season surveys were conducted per Gilbert *et al*., (1998). The survey area extended 500m outside the site boundary. Visits were conducted in areas of suitable habitat between May and June 2022. Surveys commenced shortly after sunrise.

11.3.4.8 Survey Effort

Table 11.3 Survey effort for Proposed Development Site

Months	Days	Surveys
2021		
October	25th - 26th	2 Vantage Point (VP) surveys (2x3hr) and 1 Walkover
November	5th – 7th	2 Vantage Point (VP) surveys (2x3hr) and 1 Walkover
December	2nd – 4th	2 Vantage Point (VP) surveys (2x3hr) and 1 Walkover
2022		
January	4th – 6th	2 Vantage Point (VP) surveys (2x3hr) and 1 Walkover
February	17th, 19th, 20th	2 Vantage Point (VP) surveys (2x3hr) and 1 Walkover
March	10th – 12th	2 Vantage Point (VP) surveys (2x3hr) and 1 Walkover

[6] https://irishwetlandbirdsurvey.ie/

April	17th- 20th	2 Vantage Point (VP) surveys (2x3hr), 2 Migration watches, 1 BRVP survey and 1 Walkover
May	1st – 6th, 9th	3 Vantage Point (VP) surveys (2x3hr), Snipe survey, Woodcock survey, 1 BRVP survey, 2 Migration watches and 1 Walkover
June	25th- 27th	3 Vantage Point (VP) surveys (2x3hr)
July	27th – 30th	3 Vantage Point (VP) surveys (2x3hr), 1 BRVP survey and 1 Walkover
August	15th – 17th	3 Vantage Point (VP) surveys (2x3hr)
September	21st – 23rd, 29th 30th	3 Vantage Point (VP) surveys (2x3hr), 2 Migration watches
October	7th – 8th	2 Migration watches
November	21st – 22nd	2 Migration watches
2023		
January	9th – 13th	3 Vantage Point (VP) surveys (2x3hr), 1 WBD survey and 1 Walkover
February	8th – 12th, 24th	3 Vantage Point (VP) surveys (2x3hr), 2 WBD survey and 1 Walkover
March	10th, 27th - 30th	3 Vantage Point (VP) surveys (2x3hr), 2 WBD survey and 1 Walkover
April	13th – 16th	3 Vantage Point (VP) surveys (2x3hr), 1 BRVP and 1 Walkover
May	3rd – 5th, 18th	3 Vantage Point (VP) surveys (2x3hr), 1 BRVP and 1 Walkover
June	22nd – 25th	3 Vantage Point (VP) surveys (2x3hr), 1 BRVP and 1 Walkover
July	7th – 10th	3 Vantage Point (VP) surveys (2x3hr), 1 BRVP and 1 Walkover
August	20th – 23rd	3 Vantage Point (VP) surveys (2x3hr) and 1 Walkover
September	25th – 28th	3 Vantage Point (VP) surveys (2x3hr) and 1 Walkover
October	5th, 17th – 21st	3 Vantage Point (VP) surveys (2x3hr), 2 WBD survey and 1 Walkover
November	1st-3rd, 17th, 18th, 30th	3 Vantage Point (VP) surveys (2x3hr), 2 WBD survey and 1 Walkover
December	8th - 12th, 22nd	3 Vantage Point (VP) surveys (2x3hr), 2 WBD survey and 1 Walkover
2024		
January	3rd, 4td, 16th	3 Vantage Point (VP) surveys (2x3hr)
February	12th – 14th	3 Vantage Point (VP) surveys (2x3hr)

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March	2nd, 3rd, 4th	3 Vantage Point (VP) surveys (2x3hr)

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11.3.4.9 Incidental Recording

During all other surveys including habitats, mammals and botanical surveys walkover surveys all significant bird sightings were recorded.

11.3.5 Turbine Delivery Route and Grid Connection

Multidisciplinary walkover surveys of the land take areas along the proposed turbine delivery route and grid connection route options were undertaken between January 2022 and March 2024. The surveys were undertaken in accordance with NRA Guidelines on Ecological Surveying Techniques for Protected Flora and Fauna on National Road Schemes (NRA, 2009).

11.3.5.1 Grid Connection Route Options Assessed

The proposed grid connection for the development does not form part of this planning application. Although the grid connection options are excluded from the red line boundary, they have been considered within the EIAR and supporting assessments which consider the project as a whole.

It is anticipated that the proposed grid connection from the development will be by means of an underground cable connecting to an existing Eirgrid or ESB Networks Substation via the public road network. Three grid routes have been considered by the applicant, these can be seen in Figure 11-4 below and with further in detail within the CEMP accompanying this EIAR application.

11.3.5.2 Option 1 - Connection to Existing Richmond 110kV Substation

This connection option consists of connecting the Proposed Development to the national electricity grid via circa 8km of underground 20kV electrical cabling connecting to Richmond 110kV Substation in the townland of Ballykenny, County Longford. The majority of the grid connection will be constructed in public roads.

11.3.5.3 Option 2 – Connection to Existing Longford 38kV Substation

This connection option consists of connecting the Proposed Development to the national electricity grid via circa 4.1km of underground 20kV electrical cabling connecting to Longford 38kV Substation in the townland of Minard, County Longford. The majority of the grid connection will be constructed in public roads.

11.3.5.4 Option 3 – Connection to Existing Glebe 38kV Substation

This connection option consists of connecting the Proposed Development to the national electricity grid via circa 5.9km of underground 20kV electrical cabling connecting to Glebe 38kV Substation in the townland of Lisnamuck, County Longford. The majority of the grid connection will be constructed in public roads. The grid in relation to the ecological Study Area can be seen in figure 11.4.

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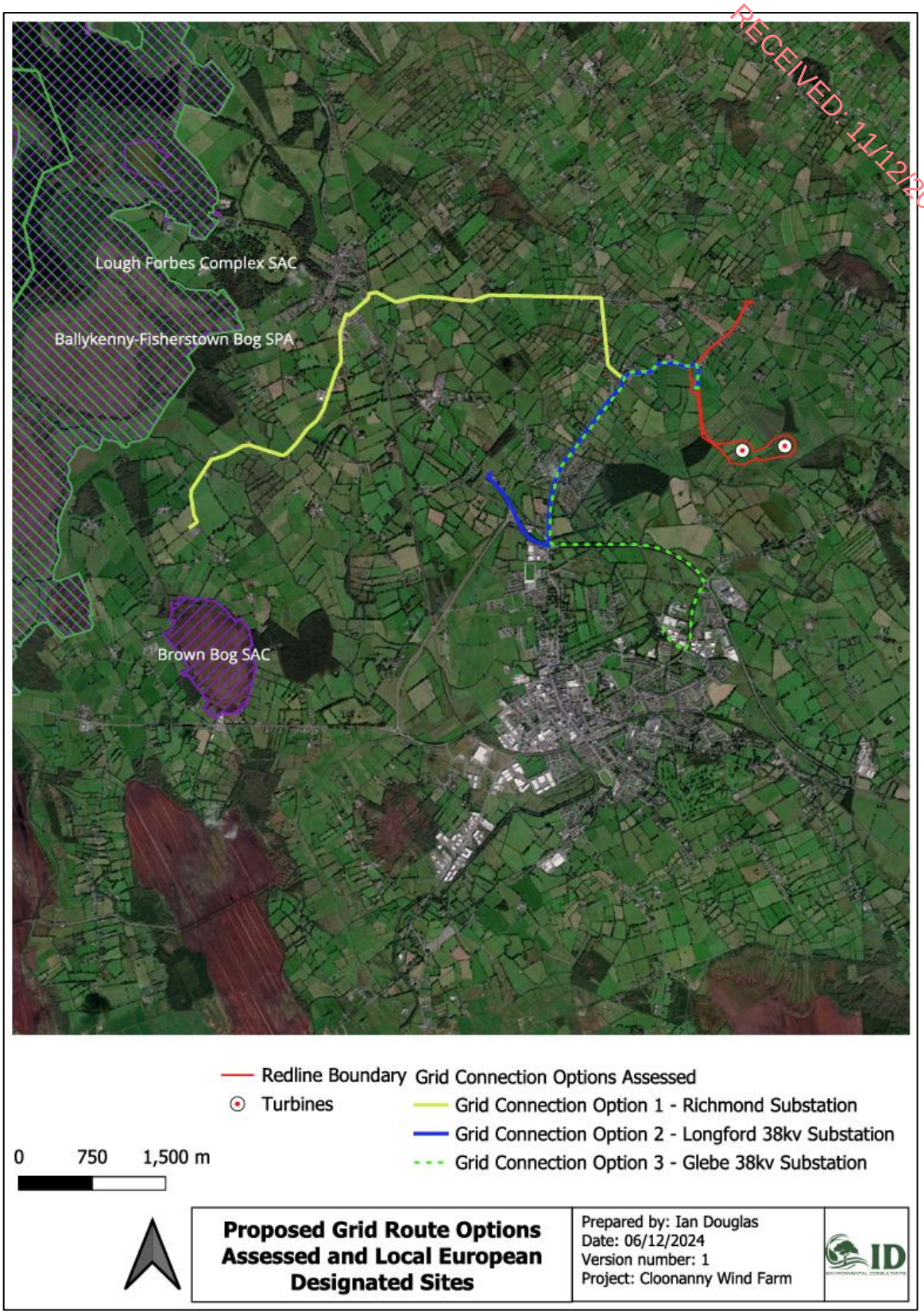


Figure 11-4 Grid connections options consulted in assessment.

No habitat features were found within or surrounding these areas that could act as key habitat area for any bird species. The proposed grid connection routes are located primarily within the existing road infrastructure classified as buildings and artificial surfaces (BL3). Small areas of improved agricultural grassland (GA1), in addition to hedgerow (WL1) and grassy verge (GS2) habitat, will be removed along the access road.

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11.3.5.5 Turbine Delivery Route and Grid Connection Routes Surveys

The components for the Wind Turbines will be delivered by cargo ships to the Port of Waterford, which is also known as Belview Port. The components for each Wind Turbine will be delivered in separate loads, some of which are abnormal in terms of their width and length. The components will be transported from Belview to the site along the motorway, national, regional and local road network (Figure 11-3).

A Turbine Delivery Route Assessment has been prepared for the project and forms part of the Preliminary Transport Management Plan (PTMP). The CEMP is to be read in conjunction with the PTMP.

The selected haulage route is detailed in the PTMP and is as summarised as follows:-

- Starting at Belview Port;
- N29 (Waterford City By-Pass) to the N25;
- N25 to N9;
- N9 National Road to M9 Motorway;
- M9 Motorway and Merge onto M7 Motorway;
- Continue on M7 Motorway to N7 National Road;
- N7 National Road and merge onto M50 Motorway;
- At junction 7 exit onto N4 National Road;
- N4 National Road to M4 Motorway;
- M4 Motorway to N4 National Road;
- Exit N4 National Road onto R194 Regional Road;
- Turn left at Kiernans cross junction onto the L1011;
- Turn left onto L5046;
- Turn left onto L50462;

Continue to Site Entrance.

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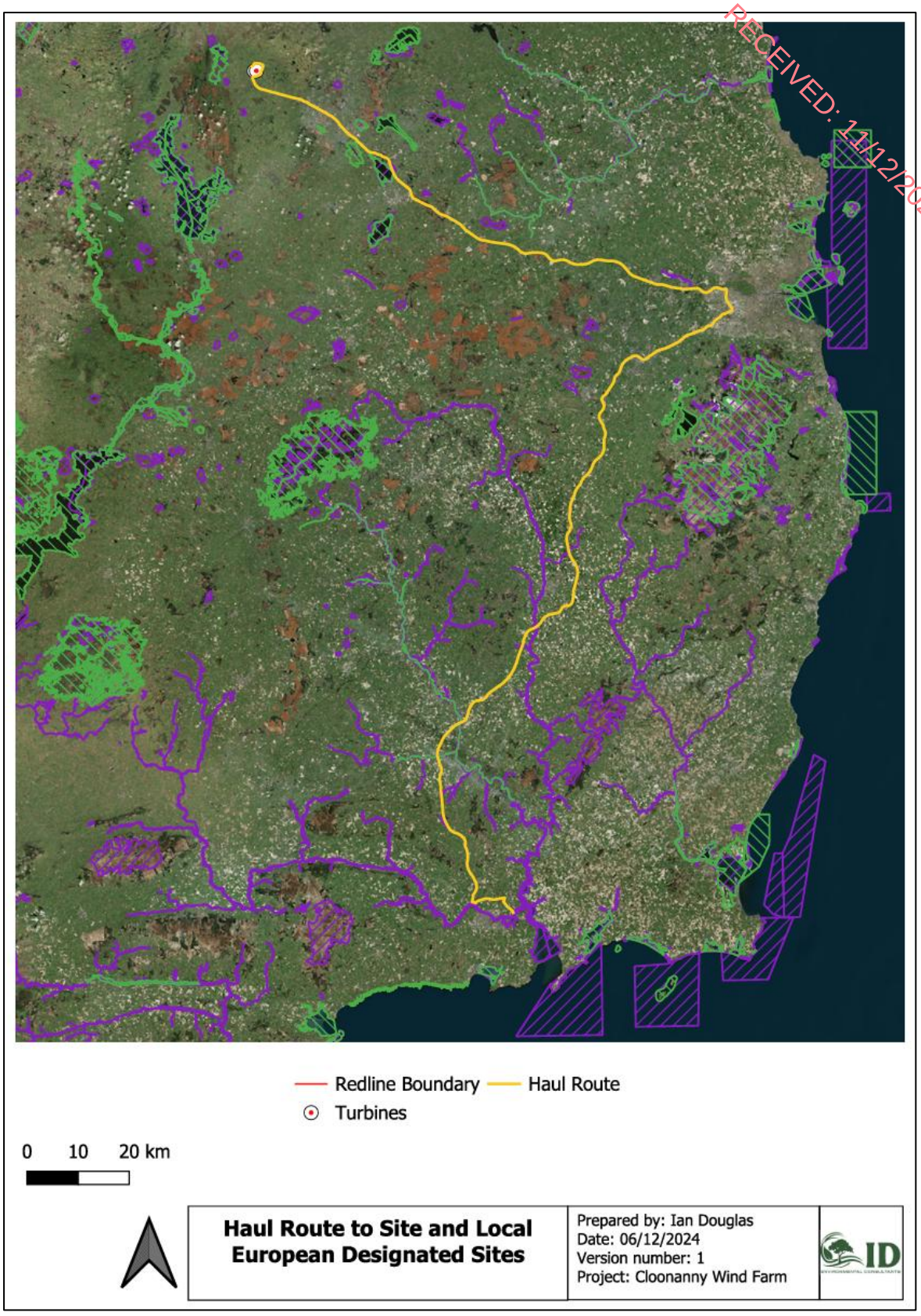


Figure 11-5: Turbine Delivery Route

11.3.6 Impact Assessment Methodology and Ornithological Evaluation Criteria

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This section concerns the criteria for ecological assessments/evaluations and impact assessments, referring to relevant legislation and guidelines where available.

As per SNH Guidance, wind farms present three potential risks to birds.

- Direct habitat loss through the construction of wind farm infrastructure;
- Disturbance and Displacement (sometimes called indirect habitat loss) if birds avoid the wind farm and its surrounding area due to turbine construction and operation. Displacement may also include barrier effects: This effect is of concern because of the possibility of increased energy expenditure when birds have to fly further as a result of avoiding a large array of turbines and the potential disruption of linkages between distant feeding, roosting, moulting and breeding areas otherwise unaffected by the wind farm. The effect depends on species, type of bird movement, flight height, distance to turbines, the layout and operational status of turbines, time of day and wind force and direction, and can be highly variable, ranging from a slight 'check' in flight direction in which birds are deterred from using normal routes to feeding or roosting grounds; height or speed, through to significant diversions which may reduce the numbers of birds using areas beyond the wind farm.
- Death through collision or interaction with turbine blades and other infrastructure.

For each of these three risks, detailed knowledge of bird distribution and flight activity within and surrounding the site has been utilised to predict the potential effects of the Proposed Development on birds. Effects are assessed for the construction, operational, and decommissioning phases. They are also evaluated cumulatively with other projects.

The impact assessment and ecological evaluation approach used in this report is based on "Guidelines on the information to be contained in Environmental Impact Assessment Reports" (EPA, 2022) and "Guidelines for Ecological Impact Assessment in the UK and Ireland"(CIEEM, 2018).

The basis of the assessment of ecological value and significance of the Proposed Development follows the Guidelines for Assessment of Ecological Impacts of National Road Schemes (NRA, 2009) and is consistent with the Guidelines for Ecological Impact Assessment in the UK and Ireland: Terrestrial, Freshwater and Coastal and Marine (CIEEM, 2018). These guidelines set out the context for the determination of value on a geographic basis with a hierarchy assigned in relation to the importance of any particular receptor. The guidelines provide a basis for the determination of whether any particular receptor is of importance on the following scale:

- International,
- National,
- County,
- Local Importance (Higher Value),
- Local Importance (Lower Value).

The 'ecological value' is therefore defined with reference to geographical context. That is, whether it is of value locally, regionally, nationally or internationally. For example, a SAC or SPA is considered internationally important, while a Natural Heritage Area (NHA) or pNHA is considered nationally important. When determining the conservation value of a species population, factors such as rarity, distribution, and conservation status must be considered, including trends informed by historical data where available.

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11.3.7 Receptor Evaluation and Impact Assessment (Percival 2003)

Percival's (2003) methodology for assessing the effects of wind farms on birds has been applied to assess the sensitivity of a species to the development type, the magnitude of the effect and the significance of the potential impact. The following tables (Table 11-4 – 11-6) detail the assessment criteria for each stage.

Table 11.4 Evaluation of Sensitivity for Birds (Percival, 2003)

Sensitivity	Determining Factor
Very High	• Species that form the cited interest of SPA's and other statutorily protected nature conservation areas. Cited means mentioned in the citation text for the site as a species for which the site is designated.
High	• Species that contribute to the integrity of an SPA but which are not cited as a species for which the site is designated. • Ecologically sensitive species including the following: divers, common scoter, hen harrier, golden eagle, red-necked phalarope, roseate tern and chough. • Species present in nationally important numbers (>1% Irish population)
Medium	• Species on Annex 1 of the EU Birds Directive. • Species present in regionally important numbers (>1% regional (county) population). • Other species on BirdWatch Ireland's red list of Birds of Conservation Concern
Low	• Any other species of conservation interest, including species on BirdWatch Ireland's amber list of Birds of Conservation Concern not covered above.

This methodology has been used to assess the sensitivity of a species to the development type, the magnitude of the effect, and the significance of the potential impact. Several factors are used to determine this sensitivity:

- Whether the species is on Annex I of the EC Birds Directive;
- Whether the species is particularly ecologically sensitive – this includes large birds of prey and rare breeding birds;
- Whether the site contains species at nationally important numbers (>1% of the Irish population);
- Whether the site contains species at regionally important numbers (>1% of the regional population, with the region usually taken as the county) and

- Whether the species is subject to special conservation measures, such as red or amber species on BirdWatch Ireland's (Gilbert *et al.,* 2021) list of Birds of Conservation Concern (BoCCI).

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Table 11.5 Determination of Magnitude of Effects (Percival, 2003)

Sensitivity	Description
Very High	Total loss or very major alteration to key elements/ features of the baseline conditions such that the post development character/ composition/ attributes will be fundamentally changed and may be lost from the site altogether. Guide: < 20% of population / habitat remains
High	Major loss or major alteration to key elements/ features of the baseline (predevelopment) conditions such that post development character/ composition/ attributes will be fundamentally changed. Guide: 20-80% of population/ habitat lost
Medium	Loss or alteration to one or more key elements/features of the baseline conditions such that post development character/composition/attributes of baseline will be partially changed. Guide: 5-20% of population/ habitat lost
Low	Minor shift away from baseline conditions. Change arising from the loss/alteration will be discernible but underlying character/composition/attributes of baseline condition will be similar to pre-development circumstances/patterns. Guide: 1-5% of population/ habitat lost
Negligible	Very slight change from baseline condition. Change barely distinguishable, approximating to the "no change" situation. Guide: < 1% population/ habitat lost

The significance of the effects is determined based on the species' sensitivity and the magnitude of the effects, as presented in Table 11-5. The methodology allows this by cross-tabulating the species' sensitivity and the magnitude of the effects to predict the significance of each potential impact.

Table 11.6 Significance matrix: combining magnitude and sensitivity to assess significance (Percival, 2003)

Significance		Sensitivity			
		Very High	High	Medium	Low
Magnitude	Very High	Very High	Very High	High	Medium
	High	Very High	Very High	Medium	Low
	Medium	Very High	High	Low	Very Low

Significance		Sensitivity			
		Very High	High	Medium	Low
	Low	Medium	Low	Low	Very Low
	Negligible	Low	Very Low	Very Low	Very Low

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11.3.8 Impact Assessment – EPA Criteria (2022)

Effects identified as per the Percival 2003 criteria have been equated with EPA impact assessment criteria are described below and detailed in Table 11-7.

The terms impact and effect are defined by CIEEM (2018) as:

- Impact –Actions resulting in changes to an ecological feature. For example, the construction activities of a development removing a hedgerow (CIEEM, 2018).
- Effect –Outcome to an ecological feature from an impact. For example, the effects on a dormouse population from loss of a hedgerow (CIEEM, 2018).

CIEEM (2018) guidelines state that when describing ecological impacts and effects, the following characteristics should be referenced as required: positive or negative, extent, magnitude, duration, frequency and timing, and reversibility. As shown in Table # below.

Table 11.7 Characterisation of Impacts and Effects

Criteria	Description
Quality	Positive / Neutral / Negative
Extent	Spatial area
Context	Conform / Contrast with baseline conditions
Magnitude	Size / Amount / Intensity / Volume
Probability	Likely / Unlikely
Duration	Temporary / Short-term / Medium-term / Long-term / Permanent
Frequency	Once / Rarely / Occasionally / Frequently / Constantly
Timing	Critical life-stage or season
Reversibility	Reversible / Irreversible

The following terms were utilised when quantifying the duration and frequency of effects:

- Momentary – effects lasting from seconds to minutes.
- Brief – effects lasting less than a day.
- Temporary – effects lasting less than a year.
- Short-term – effects lasting 1 to 7 years.
- Medium term – effects lasting 7 to 15 years.

- Long term – effects lasting 15 to 60 years.
- Permanent – effects lasting over 60 years.
- Reversible – effects that can be undone, for example, through remediation or restoration.
- Frequency – How often the effect will occur (once, rarely, occasionally, frequently, constantly – or hourly, daily, weekly, monthly, annually).

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11.3.8.1 Determining Significant Effects

The ecological significance of the effects of the Proposed Development is assessed using the precautionary principle, following the methodology described in Section 5 of the CIEEM (2018) guidelines. Within Ecological Impact Assessment (EcIA), a 'significant effect' is one that either contributes to or detracts from biodiversity conservation goals for key ecological features or biodiversity overall. Such effects can be evaluated on a scale from local to international significance (CIEEM, 2018). Both direct and indirect impacts are considered in determining significance:

- Direct impacts are those directly caused by an action, such as the physical loss of habitat occupied by a Key Ecological Receptor (KER) species during construction.
- Indirect impacts affect an ecological receptor indirectly through an intermediary process, ecosystem, or receptor.

The significance of an effect is determined by examining whether:

- Any key processes or characteristics of important ecological receptors are altered or eliminated.
- There are changes to the extent, structure, or function of important ecological features.
- The average population size and sustainability of important species are affected.
- The conservation status of critical habitats or species is impacted.

The assessment also incorporates the EPA Guidelines for Environmental Impact Assessment Reports (2022) and the Guidelines for the Assessment of Ecological Impacts of National Road Schemes (NRA, 2009) to ensure compliance with established standards. Terminology follows the EPA Guidelines (2022) as referenced in Table 11-7, which suggests using the term 'integrity' to gauge whether a site impact is likely to be significant (NRA, 2009). A 'significant effect' is therefore one that either supports or undermines the objectives for biodiversity conservation (CIEEM, 2018).

Table 11.8 Criteria for determining the significance of effects, based on (EPA 2017) guidelines

Effect	Magnitude
No change	No discernible change in the ecology of the affected feature.
Imperceptible effect	An effect capable of measurement but without noticeable consequences.
Not Significant	An effect which causes noticeable changes in the character of the environment but without significant consequences.
Slight effect	An effect which causes noticeable changes in the character of the environment without affecting its sensitivities.
Moderate effect	An effect that alters the character of the environment in line with existing and emerging trends.

Significant effect	An effect which, by its character, magnitude, duration, or intensity, alters a sensitive aspect of the environment.
Very Significant	An effect which, by its character, magnitude, duration, or intensity, significantly alters most of a sensitive aspect of the environment.

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11.3.8.2 Sensitivity of Receptors

In line with the recommendations of CIEEM guidelines, only ornithological receptors that are considered to be important and potentially affected by the project were subject to detailed assessment. It is not necessary to carry out a detailed assessment of receptors that are sufficiently widespread, unthreatened and resilient to project impacts and would remain viable and sustainable.

11.3.9 Collision Risk Assessment

Collision risk assessment (CRA) was undertaken by MKO (2024) and can be seen in Appendix 11.3. Collision risk is calculated using a mathematical model to predict the number of birds that may be killed by collision with moving wind turbine rotor blades. The modelling method used in this collision risk calculation is known as the Band Model (Band *et al*., 2007) and has been used in a number of studies on bird collision with wind turbines (e.g., Chamberlain *et al*., 2006; Drewitt and Langston, 2006; Fernley *et al*., 2006; Madders and Whitfield, 2006). Note that these are theoretical predictions; therefore, the results must be interpreted with a degree of caution.

Two stages are involved in the Band Model. First, the number of birds transits through the air space swept by the rotor blades of the wind turbines per year is estimated. Then, the collision risk for a bird passing through the rotor blades is calculated using a mathematical formula. The product of these provides a theoretical annual collision mortality rate. Finally, a bird avoidance rate is applied to the collision mortality rate to account for birds attempting to avoid collision. This final collision mortality rate informs the assessment of the impacts of the wind turbine on birds. Further information on the methodology used can be seen in CRA in Appendix 11.3.

11.3.10 Mitigation

11.3.11 Assessment of Limitations

This Environmental Impact Assessment Report (EIAR) chapter comprehensively details the baseline environment at the Proposed Development site, along with accurate predictions of potential impacts arising from the Proposed Development. Necessary mitigation measures are prescribed, and the anticipated residual impacts are described. All specialist studies, analyses, and reports adhere to relevant guidelines.

No significant challenges (e.g., technical limitations or knowledge gaps) were encountered during information gathering. Moreover, no major limitations in the assessment's scope, scale, or context were identified. However, one minor, non-significant limitation exists: vantage point surveys for the winter season were not conducted between October and December 2022. To address this gap, six additional hours of surveys were undertaken per month between December 2023 and March 2024.

Since the overall survey period spans 2 years and 3 months, exceeding the recommended two-year duration (SNH, 2017), this missed period doesn't constitute a significant limitation on the Proposed Development's survey scope.

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11.4 Baseline Conditions and Receptor Evaluation

11.4.1 Identification of Designated Sites within the Likely Zone of Influence of the Proposed Development

An Appropriate Assessment Screening Report (AASR) has been submitted alongside this Environmental Impact Assessment Report (EIAR) to provide the competent authority with the necessary information to carry out an Appropriate Assessment Screening for the Proposed Development, in compliance with Article 6(3) of the EU Habitats Directive (92/43/EEC).

This summarises the key findings of the screening assessment related to Special Protection Areas (SPAs). A separate summary of findings regarding Special Areas of Conservation (SACs) is also provided within Chapter 10 (Biodiversity) of this EIAR.

The assessment adhered to the DoEHLG (2009) recommendation of adopting a 15 km ZoI but also incorporated a case-by-case evaluation to account for potential source-receptor pathways. The guidance provided by SNH (2016) was used to assess the ecological connectivity with special protection areas (SPAs), particularly in relation to species' dispersal and foraging ranges. A 40 km buffer has been applied as a precautionary baseline to evaluate potential impacts on Irish Special Conservation Interest (SCI) bird species in particular whooper Swan.

Following the Irish Wind Energy Association (IWEA, 2012) guidelines and the Office of the Planning Regulator's Practice Note PN01 all European Sites within 20 km of the Proposed Development were considered for source-receptor connectivity. Hydrological connectivity beyond 20km was also evaluated using GIS to identify downstream European Sites linked via watercourses. This approach defined the Zone of Influence (ZoI) as typically 20km but allowed for adjustments where specific ecological or hydrological pathways extended further were required. such as birds as discussed above

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Table 11.9 Designated Sites

Site Name Code Designation Distance	Qualifying Interests	Conservation objectives in summary	Rationale (where European site is excluded)
Ballykenny-Fisherstown Bog **SPA** **004101** **~ 4.6km via Directly** **~ 10km via Camlin River**	Greenland White-fronted Goose (*Anser albifrons flavirostris*) [A395]	To restore the favourable conservation condition of the sites' qualifying interests.	There will be no direct effects as this European Site lies entirely outside of the development footprint. Hydrological connectivity exists between the Proposed Development Site and this SAC via the Camlin River. Greenland White-fronted goose has not been recorded on this site in over a decade (NPWS, 2012). Other species, including Merlin and Red Grouse, Cormorant (51), Whooper Swan (40), Wigeon (419), Teal (444), Tufted Duck (49) and Goldeneye (11), are known to occur within this SPA. Greenland White-fronted was not recorded during any surveys of the Proposed Development Site. Cormorant, Wigeon, Teal, and Tufted Duck were all recorded during surveys of the Proposed Development (See Appendix 11.1). None were recorded in numbers or at a frequency corresponding to county-level importance or above, with the exception of the whooper swan, which is discussed further below. No likely significant effects were predicted for any of these species alone or in combination with any other developments as a result of the Proposed Development. Further discussion on the potential for LSE to these species is provided in Table 11.7.3. Whooper swan was the only Special Conservation Interest (SCI) or annex I bird species recorded at a frequency indicating county-level importance during bird surveys of the Proposed Development. Although not listed as a Special Conservation Interest (SCI) species for the site, it is an Annex I species under the EU Birds Directive. Comprehensive bird surveys (See Appendix 11.1 and 11.2) detailed in this chapter and a collision risk assessment model (refer to

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Site Name Code Designation Distance	Qualifying Interests	Conservation objectives in summary	Rationale (where European site is excluded)
			Appendix 11.3) concluded that the Proposed Development would not result in any significant adverse effects on this species via, displacement, disturbance, barrier effect or collision risk. No likely significant effects are anticipated for the whooper swan, either individually or in combination with other developments. Further discussion on the potential for LSE to this species is provided in Table 11.7.3.
Glen Lough **SPA** **004045** **~16km directly**	Whooper Swan (Cygnus cygnus) [A038]	To maintain or restore the favourable conservation condition of the bird species listed as Special Conservation Interests for this SPA.	There will be no direct effects as this European Site lies entirely outside of and >16km from the development footprint. There is no hydrological connectivity between the Proposed Development and the SPA which is located in a different surface water catchment to the Proposed Development. Therefore, no potential for indirect effects on supporting wetland habitat for SCI bird species due to deterioration in water quality exists. The core foraging range from the night roost for whooper swan is less than 5km (SNH, 2016), placing this SPA significantly outside of the ZOI for the Proposed Development. Whooper swan was the only bird species recorded at a frequency indicating county-level importance during bird surveys of the Proposed Development. This Special Conservation Interest (SCI) species for this SPA is also an Annex I species under the EU Birds Directive. Comprehensive bird surveys (See Appendix 11.1 and 11.2) impact assessment detailed in this chapter and a collision risk assessment model (refer to Appendix 11.3) concluded that the Proposed Development would not result in any significant adverse effects on this species via, displacement, disturbance, barrier effect or collision risk. No

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Site Name Code Designation Distance	Qualifying Interests	Conservation objectives in summary	Rationale (where European site is excluded)
			likely significant effects are anticipated for the whooper swan, either individually or in combination with other developments. Further discussion on the potential for LSE to these species is provided in Table 11.7.3
Lough Ree **SPA** **004064** **~17km directly** **~26km via Camlin and Shannon**	Little Grebe (Tachybaptus ruficollis) [A004] Whooper Swan (Cygnus cygnus) [A038] Wigeon (Anas penelope) [A050] Teal (Anas crecca) [A052] Mallard (Anas platyrhynchos) [A053] Shoveler (Anas clypeata) [A056] Tufted Duck (Aythya fuligula) [A061] Common Scoter (Melanitta nigra) [A065] Goldeneye (Bucephala clangula) [A067] Coot (Falika atra) [A125]	To maintain or restore the favourable conservation condition of the wetland habitat at Lough Ree SPA as a resource for the regularly-occurring migratory waterbirds that utilise it.	There will be no direct effects as this European Site lies entirely outside of and >20km from the development footprint. Maintaining water quality is central to maintaining and restoring the favourable conservation condition of the wetland habitat in Lough Ree SPA as a resource for the regularly-occurring migratory waterbirds that utilise it. The significant buffer distance of approximately 26km between the potential source and this receptor site, coupled with the natural processes of pollutant dissipation, dilution, and sedimentation along the River Camlin, make likely significant effects extremely unlikely. These mechanisms ensure that any pollutants potentially reaching the Camlin during the construction phase are unlikely to reach the SPA in concentrations that could compromise the site's conservation objectives. Wigeon, Teal, Golden Plover and Lapwing were all recorded during surveys of the Proposed Development site (See Appendix 11.1). No were recorded in numbers or at a frequency corresponding to county-level importance or above. No likely significant effects were predicted for any of these species alone or in combination with any other developments as a result of the Proposed Development. Further discussion on the potential for LSE to these species is provided in Table 11.7.3

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Site Name Code Designation Distance	Qualifying Interests	Conservation objectives in summary	Rationale (where European site is excluded)
	Golden Plover (Pluvialis apricaria) [A140] Lapwing (Vanellus vanellus) [A142] Common Tern (Sterna hirundo) [A193] Wetland and Waterbirds [A999]		The core foraging range from the night roost for Whooper Swans is less than 5km (SNH, 2016), placing this SPA significantly outside of the ZOI for the Proposed Development. Whooper swan was the only bird species recorded at a frequency indicating county-level importance during bird surveys of the Proposed Development. This Special Conservation Interest (SCI) species for this SPA is also an Annex I species under the EU Birds Directive. Comprehensive bird surveys (See Appendix 11.1 and 11.2) impact assessment detailed in this chapter and a collision risk assessment model (refer to Appendix 11.3) concluded that the Proposed Development would not result in any significant adverse effects on this species via, displacement, disturbance, barrier effect or collision risk. No likely significant effects are anticipated for the whooper swan, either individually or in combination with other developments. Further discussion on the potential for LSE to this species is provided in Table 11.7.3 BirdWatch Ireland in support of the department of forestry have issued a guide to bird foraging distances from core areas (namely SPA's)[7]. For mallard the core coring area from an SPA is 1.5km. This aligns with studies from Sweden that note a typical distance of 1km to a typical maximum of 5km (Bengtsson et al, 2014). This places this SPA significantly outside of the ZOI for the Proposed Development for Mallard. Further discussion on the potential for LSE to this species is provided in Table 11.7.3.

[7] https://assets.gov.ie/96741/2601fdba-420a-45da-948a-ac2b5b0babe3.docx

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Site Name Code Designation Distance	Qualifying Interests	Conservation objectives in summary	Rationale (where European site is excluded)
			Migration watches recorded mallard travelling along the Camlin River generally in a south easterly direction which would not align with travelling to or from this SPA. It is extremely unlikely that mallard recorded during this survey are associated with those from the population of this SPA.
Lough Derravaragh **SPA** **004043** **~20km directly**	Whooper Swan (Cygnus cygnus) [A038] Pochard (Aythya ferina) [A059] Tufted Duck (Aythya fuligula) [A061] Coot (Fulica atra) [A125] Wetland and Waterbirds [A999]	To restore the Favourable conservation condition of Whooper Swan, Pochard, Tufted Duck and Coot in Lough Derravaragh SPA. To maintain the Favourable conservation condition of Wetland habitats in Lough Derravaragh SPA as a resource for the regularly-occurring migratory waterbirds that utilise these areas.	There will be no direct effects as this European Site lies entirely outside of and >20km from the development footprint. There is no hydrological connectivity between the Proposed Development site and this SPA. Therefore, there is no potential for indirect effects on supporting wetland habitat for SCI bird species due to deterioration in water quality. The core foraging range from the night roost for Whooper Swans is less than 5km (SNH, 2016), placing this SPA significantly outside of the ZOI for the Proposed Development. Whooper swan was the only bird species recorded at a frequency indicating county-level importance during bird surveys of the Proposed Development. This Special Conservation Interest (SCI) species for this SPA is also an Annex I species under the EU Birds Directive. Comprehensive bird surveys (See Appendix 11.1 and 11.2) impact assessment detailed in this chapter and a collision risk assessment model (refer to Appendix 11.3) concluded that the Proposed Development would not result in any significant adverse effects on this species via, displacement, disturbance, barrier effect or collision risk. No likely significant effects are anticipated for the whooper swan, either individually or in combination with other developments. Further discussion on the potential for LSE to this species is provided in Table 11.7.3

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Site Name Code Designation Distance	Qualifying Interests	Conservation objectives in summary	Rationale (where European site is excluded)
Lough Iron **SPA** **004046** **~23km directly**	Whooper Swan (Cygnus cygnus) [A038] Wigeon (Anas penelope) [A050] Teal (Anas crecca) [A052] Shoveler (Anas clypeata) [A056] Coot (Fulica atra) [A125] Golden Plover (Pluvialis apricaria) [A140] Greenland White-fronted Goose (Anser albifrons flavirostris) [A395] Wetland and Waterbirds [A999]	To restore the Favourable conservation condition of Teal, Shoveler, Coot, Golden Plover and Greenland White-fronted Goose Whooper Swan in Lough Iron SPA. To maintain the Favourable conservation condition of Wetland habitats in Lough Iron SPA as a resource for the regularly-occurring migratory waterbirds that utilise these areas.	There will be no direct effects as this European Site lies entirely outside of and >23km from the development footprint. There is no hydrological connectivity between the Proposed Development and this SPA. Therefore, there is no potential for indirect effects on supporting wetland habitat for SCI bird species due to deterioration in water quality. Wigeon, Teal and Golden Plover were all recorded during surveys of the Proposed Development site (See Appendix 11.1 and 11.2). None were recorded in numbers or at a frequency corresponding to county-level importance or above. No likely significant effects were predicted for any of these species alone or in combination with any other developments as a result of the Proposed Development. Further discussion on the potential for LSE to these species is provided in Table 11.7.3. The core foraging range from the night roost for Whooper Swans is less than 5km (SNH, 2016), placing this SPA significantly outside of the ZOI for the Proposed Development. Whooper swan was the only bird species recorded at a frequency indicating county-level importance during bird surveys of the Proposed Development. This Special Conservation Interest (SCI) species for this SPA is also an Annex I species under the EU Birds Directive. Comprehensive bird surveys (See Appendix 11.1 and 11.2) impact assessment detailed in this chapter and a collision risk assessment model (refer to Appendix 11.3) concluded that the Proposed Development would not result in any significant adverse effects on this species via, displacement, disturbance, barrier effect or collision risk. No likely significant effects are anticipated for the whooper swan, either

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Site Name Code Designation Distance	Qualifying Interests	Conservation objectives in summary	Rationale (where European site is excluded)
			individually or in combination with other developments. Further discussion on the potential for LSE to this species is provided in Table 11.7.3 No source-pathway-receptor links and no risk of likely significant effects were identified, either alone or in combination with other plans or projects.
Lough Oughter Complex **SPA** **004049** **~30km directly**	Great Crested Grebe (Podiceps cristatus) [A005] Whooper Swan (Cygnus cygnus) [A038] Wigeon (Anas penelope) [A050] Wetland and Waterbirds [A999]	To maintain or restore the favourable conservation condition of the bird species listed as Special Conservation Interests for this SPA. To maintain or restore the favourable conservation condition of the wetland habitat at Lough Oughter Complex SPA as a resource for the regularly-occurring migratory waterbirds that utilise it.	There will be no direct effects as this European Site lies entirely outside of and >30km from the development footprint. There is no hydrological connectivity between the Proposed Development site and this SPA. Therefore, there is no potential for indirect effects on supporting wetland habitat for SCI bird species due to deterioration in water quality. Wigeon were recorded during surveys of the wind farm site (See Appendix 11.1 and 11.2). None were recorded in numbers or at a frequency corresponding to county-level importance or above. No likely significant effects were predicted for this species alone or in combination with any other developments as a result of the Proposed Development. Further discussion on the potential for LSE to this species is provided in Table 11.7.3. The core foraging range from the night roost for Whooper Swans is less than 5km (SNH, 2016), placing this SPA significantly outside of the ZOI for the Proposed Development. Whooper swan was the only bird species recorded at a frequency indicating county-level importance during bird surveys of the Proposed Development. This Special Conservation Interest (SCI) species for this SPA is also an Annex I species under the EU Birds Directive. Comprehensive bird surveys (See

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Site Name Code Designation Distance	Qualifying Interests	Conservation objectives in summary	Rationale (where European site is excluded)
			Appendix 11.1 and 11.2) impact assessment detailed in this chapter and a collision risk assessment model (refer to Appendix 11.3) concluded that the Proposed Development would not result in any significant adverse effects on this species via, displacement, disturbance, barrier effect or collision risk. No likely significant effects are anticipated for the whooper swan, either individually or in combination with other developments. Further discussion on the potential for LSE to this species is provided in Table 11.7.3
River Suck Callows **SPA** **004097** **~36km directly**	Whooper Swan (Cygnus cygnus) [A038] Wigeon (Anas penelope) [A050] Golden Plover (Pluvialis apricaria) [A140] Lapwing (Vanellus vanellus) [A142] Greenland White-fronted Goose (Anser albifrons flavirostris) [A395] Wetland and Waterbirds [A999]	To maintain the favourable conservation condition of Whooper Swan. To restore the favourable conservation condition of Wigeon, Golden Plover, Lapwing and Greenland White-fronted Goose. To maintain the wetland habitats at River Suck Callows SPA as a resource for the regularly-occurring migratory waterbirds that utilise these areas.	There will be no direct effects as this European Site lies entirely outside of and >36km from the development footprint. There is no hydrological connectivity between the Proposed Development site and this SPA. Therefore, there is no potential for indirect effects on supporting wetland habitat for SCI bird species due to deterioration in water quality. Wigeon, Golden Plover and Lapwing were recorded during surveys of the Proposed Development site (See Appendix 11.1). None were recorded in numbers or at a frequency corresponding to county-level importance or above. No likely significant effects were predicted for this species alone or in combination with any other developments as a result of the Proposed Development. Further discussion on the potential for LSE to these species is provided in Table 11.7.3. The core foraging range from the night roost for whooper swans is less than 5km (SNH, 2016), placing this SPA significantly outside of the ZOI for the Proposed Development.

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Site Name Code Designation Distance	Qualifying Interests	Conservation objectives in summary	Rationale (where European site is excluded)
			Whooper swan was the only bird species recorded at a frequency indicating county-level importance during bird surveys of the Proposed Development. This Special Conservation Interest (SCI) species for this SPA is also an Annex I species under the EU Birds Directive. Comprehensive bird surveys (See Appendix 11.1 and 11.2) impact assessment detailed in this chapter and a collision risk assessment model (refer to Appendix 11.3) concluded that the Proposed Development would not result in any significant adverse effects on this species via, displacement, disturbance, barrier effect or collision risk. No likely significant effects are anticipated for the whooper swan, either individually or in combination with other developments. Further discussion on the potential for LSE to this species is provided in Table 11.7.3.
Middle Shannon Callows **SPA** **004096** **~39km directly**	Whooper Swan (Cygnus cygnus) [A038] Wigeon (Anas penelope) [A050] Corncrake (Crex crex) [A122] Golden Plover (Pluvialis apricaria) [A140] Lapwing (Vanellus vanellus) [A142] Black-tailed Godwit (Limosa limosa) [A156]	To maintain the favourable conservation condition of Whooper Swan, Golden Plover To restore the favourable conservation condition of Wigeon, Black-tailed Godwit, Lapwing, Black-headed Gull and Lapwing. To maintain the wetland habitats of the Middle Shannon Callows SPA as a resource for the regularly-occurring migratory waterbirds that utilise these areas.	There will be no direct effects as this European Site lies entirely outside of and >39km from the development footprint. There is no hydrological connectivity between the Proposed Development site and this SPA. Therefore, there is no potential for indirect effects on supporting wetland habitat for SCI bird species due to deterioration in water quality. Wigeon, Black-headed Gull, Golden Plover and Lapwing were recorded during surveys of the Proposed Development site (See Appendix 11.1). None were recorded in numbers or at a frequency corresponding to county-level importance or above. No likely significant effects were predicted for this species alone or in combination with any other developments as a result of the Proposed Development. Further discussion on the potential for LSE to these species is provided in Table 11.7.3.

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Site Name Code Designation Distance	Qualifying Interests	Conservation objectives in summary	Rationale (where European site is excluded)
	Black-headed Gull (Chroicocephalus ridibundus) [A179] Wetland and Waterbirds [A999]		The core foraging range from the night roost for whooper swans is less than 5km (SNH, 2016), placing this SPA significantly outside of the ZOI for the Proposed Development. Whooper swan was the only bird species recorded at a frequency indicating county-level importance during bird surveys of the Proposed Development. This Special Conservation Interest (SCI) species for this SPA is also an Annex I species under the EU Birds Directive. Comprehensive bird surveys (See Appendix 11.1 and 11.2) impact assessment detailed in this chapter and a collision risk assessment model (refer to Appendix 11.3) concluded that the Proposed Development would not result in any significant adverse effects on this species via, displacement, disturbance, barrier effect or collision risk. No likely significant effects are anticipated for the whooper swan, either individually or in combination with other developments. Further discussion on the potential for LSE to this species is provided in Table 11.7.3
Lough Gara **SPA** **004048** **~45km directly**	Whooper Swan (Cygnus cygnus) [A038] Greenland White-fronted Goose (Anser albifrons flavirostris) [A395]	To maintain or restore the favourable conservation condition of the bird species listed as Special Conservation Interests for this SPA.	There will be no direct effects as this European Site lies entirely outside of and >45km from the development footprint. There is no hydrological connectivity between the Proposed Development site and this SPA. Therefore, there is no potential for indirect effects on supporting wetland habitat for SCI bird species due to deterioration in water quality. The core foraging range from the night roost for whooper swans is less than 5km (SNH, 2016), placing this SPA significantly outside of the ZOI for the Proposed Development.

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Site Name Code Designation Distance	Qualifying Interests	Conservation objectives in summary	Rationale (where European site is excluded)
			Whooper swan was the only bird species recorded at a frequency indicating county-level importance during bird surveys of the Proposed Development. This Special Conservation Interest (SCI) species for this SPA is also an Annex I species under the EU Birds Directive. Comprehensive bird surveys (See Appendix 11.1 and 11.2) impact assessment detailed in this chapter and a collision risk assessment model (refer to Appendix 11.3) concluded that the Proposed Development would not result in any significant adverse effects on this species via, displacement, disturbance, barrier effect or collision risk. No likely significant effects are anticipated for the whooper swan, either individually or in combination with other developments. Further discussion on the potential for LSE to this species is provided in Table 11.7.3

11.4.2 Breeding and Wintering Bird Atlas Records

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Bird Atlas 2007-11: The breeding and wintering birds of Britain and Ireland' (Balmer *et al*., 2013) is the most recent comprehensive work on wintering and breeding birds in Ireland.

Previous Bird Atlases have been the primary source of information on the distribution and abundance of British and Irish birds prior to Bird Atlas 2007–11. The three previously published atlases were:

- Sharrock, J.T.R. (1976) The atlas of breeding birds in Britain and Ireland.
- Lack, P.C. (1986) The atlas of wintering birds in Britain and Ireland.
- Gibbons, D.W., Reid, J.B. & Chapman, R.A. (1993) The new atlas of breeding birds in Britain and Ireland: 1988-1991.

The Proposed Development lies within hectad[8] N17. Table 11-10 presents a list of species of conservation interest recorded from the relevant hectad during the 2007-2011 Atlas:

Table 11.10 Breeding Bird Atlas Data (Hectad N17)

Species Name	Breeding Atlas 07-11 Hectad N17	Conservation Status
Golden Plover (*Pluvialis apricaria*)	-	RL
Wigeon (*Anas penelope*)	-	AL
Whooper Swan (*Cygnus cygnus*)	-	BD
Kestrel (*Falco tinnunculus*)	Poss	RL
Peregrine (*Falco peregrinus*)	-	BD
Mallard (*Anas platyrhynchos*)	Conf	AL
Sparrowhawk (*Accipiter nisus*)	Poss	GL
Black-headed gull (*Larus ridibundus*)	-	AL
Teal (*Anas crecca*)	-	AL
Long-eared Owl (*Asio otus*)	Conf	GL
Buzzard (*Buteo buteo*)	Poss	GL
Mute swan (*Cygnus olor*)	-	AL
Lapwing (*Vanellus vanellus*)	Conf	RL

[8] A hectad is a term used in describing a geographical location and is of an area 10km by 10km square.

Species Name	Breeding Atlas 07-11 Hectad N17	Conservation Status
Grey Heron (*Ardea cinerea*)	-	GL
Redwing (*Turdus iliacus*)	Conf	-
Greenfinch (*Carduelis chloris*)	Conf	RL
Yellowhammer (*Emberiza citrinella*)	Conf	RL
Meadow Pipit (*Anthus pratensis*)	Conf	RL

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Poss = possible breeding; Conf = confirmed breeding; - = not-recorded. Conservation Status: BD = Annex I of the Birds Directive, BoCCI RL = Red Listed, AL= Amber listed & GL= Green listed.

Table 11.11 Winter Bird Atlas Data (Hectad N17)

Species Name	Breeding Atlas 07-11 Hectad N17	Conservation Status
Golden Plover (*Pluvialis apricaria*)	-	RL
Wigeon (*Anas penelope*)	-	AL
Whooper Swan (*Cygnus cygnus*)	Pres	BD
Kestrel (*Falco tinnunculus*)	Pres	RL
Peregrine (*Falco peregrinus*)	Pres	BD
Mallard (*Anas platyrhynchos*)	Pres	AL
Sparrowhawk (*Accipiter nisus*)	Pres	GL
Black-headed gull (*Larus ridibundus*)	Pres	AL
Teal (*Anas crecca*)	Pres	AL
Long-eared Owl (*Asio otus*)	-	GL
Buzzard (*Buteo buteo*)	Pres	GL
Mute swan (*Cygnus olor*)	Pres	AL
Lapwing (*Vanellus vanellus*)	Pres	RL

Species Name	Breeding Atlas 07-11 Hectad N17	Conservation Status
Grey Heron (*Ardea cinerea*)	Pres	GL
Redwing (*Turdus iliacus*)	Pres	RL
Greenfinch (*Carduelis chloris*)	Pres	RL
Yellowhammer (*Emberiza citrinella*)	-	RL
Meadow Pipit (*Anthus pratensis*)	Pres	RL

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11.4.3 Bird Sensitivity Mapping Tool

BirdWatch Ireland created the Bird Sensitivity Mapping Tool for wind energy developments. This tool provides spatial data on where protected birds might be impacted by wind energy projects[9]. A detailed guide by McGuiness *et al*., (2015) accompanies the tool and explains how sensitivity zones (low, medium, high, and highest) were estimated for different species based on their known behaviour, ecology and distribution.

The site does not overlap with or is within 5km of any bird sensitivity zone.

11.4.4 Irish Wetland Bird Survey (I-WeBS) Records

No I-WeBS sites cover the Proposed Development, and the nearest site is located approximately 4km west of the Proposed Development at Lough Forbes. Data from I-WeBS sites in County Longford have been used to estimate county populations of wintering waterbirds. The limitations of using this data to estimate a county population are acknowledged; as all the counts in a given year were undertaken on the same day, typically, there is the potential for under or over-estimates. I-WeBS Sites within Longford, Westmeath and Roscommon within 30km of the Proposed Development include:

- River Shannon (Termonbarry-Lanesborough) – 9.2km from the Proposed Development
- Lough Forbes – 4km from the Proposed Development
- Gorteen Lake - 8.3km from the Proposed Development
- Currygrane Lough – 7.3km from the Proposed Development
- Lough Gowna - 17.8km from the Proposed Development
- Annagh Lough – 12.9km from the Proposed Development
- Lough Kinale and Derragh Lough - 24.4km from the Proposed Development
- Lough Ree - 18.8km from the Proposed Development
- Doogarry Lough 17.3km from the Proposed Development

[9] This tool was accessed via the National Biodiversity Data Centre website (https://maps.biodiversityireland.ie/).

The following Iwebs sites have been used as they provide the most consistent data sets for the species identified during the bird survey for the Proposed Development. While this data is not perfect, it reflects the best available data for assessing these species populations at a county level. Datasets for the following sites were downloaded from www.birdwatchireland.ie and reviewed:

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- Gorteen Lake
- Lough Gowna
- Lough Kinale & Derragh Lough
- Lough Ree
- Doogarry Lough

11.4.5 Field Survey Results

A comprehensive list of all target and non-target bird species recorded during surveys is provided in Appendix 11.1 and 11.2. The target species listed below in Table were recorded within the zone of influence of the Proposed Development during the core ornithological surveys (November 2021 to March 2024).

Table 11.12 Target species recorded between November 2021 to March 2024

Species	2021	2022	2023	2024
Black-headed Gull				
Breeding			X	
Non-breeding			X	
Common Buzzard				
Breeding		X	X	
Non-breeding	X	X	X	X
Cormorant				
Non-breeding			X	X
Golden Plover				
Breeding			X	
Non-breeding			X	X
Great Black Backed Gull				
Breeding		X		
Herring Gull				

Species	2021	2022	2023	2024
Breeding		X		
Non-breeding			X	
Kestrel				
Breeding		X	X	
Non-breeding	X		X	X
Lapwing				
Non-breeding				X
Lesser Black Backed Gull				
Breeding			X	
Mallard				
Breeding		X	X	
Non-breeding	X	X	X	
Meadow Pipit				
Breeding		X	X	
Non-breeding	X	X	X	
Mute Swan				
Breeding			X	
Non-breeding	X		X	X
Peregrine Falcon				
Non-breeding		X	X	
Snipe				
Breeding		X	X	
Non-breeding	X	X	X	X
Sparrowhawk				

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Species	2021	2022	2023	2024
Breeding		X	X	
Non-breeding	X	X	X	X
Teal				
Breeding		X		
Non-breeding			X	X
Tufted Duck				
Non-breeding		X		
Whooper Swan				
Non-breeding	X	X	X	X
Wigeon				
Breeding		X		
Non-breeding	X	X	X	

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11.4.6 Evaluation of Ornithological Receptors

Several common birds recorded on the Proposed Development site were categorised as having a Low Nature Conservation Importance, these include fieldfare, linnet, meadow pipit, redwing and skylark. According to SNH (2017), it is generally considered that windfarms do not significantly impact passerine species. These species occur and breed widely throughout Ireland and are not expected to be affected by the Proposed Development.

However, several species that carry a higher value of nature conservation importance were also encountered during surveys at the site, species that have been included on the Red and Amber list of BoCCI, EU Birds Directive Annex I, and Section 22 of the Wildlife Act.

Target species were recorded several times on site and will be discussed in Table 11-13 below.

Table 11.13 Key Ornithological Receptors recorded

Species	Notes of species recorded
Whooper Swan	The Whooper Swan is listed as an Annex 1 species under the EU Birds Directive and is on the Amber list of Birds of Conservation Concern in Ireland. This species has been observed in all three winter surveys, flying over the site and using areas within the survey area for foraging.

Species	Notes of species recorded
Mute Swan	Mute Swans are an Amber listed species on the Birds of Conservation Concern in Ireland. This species was recorded once in December 2021 and again in the 2023 summer season. In the 2023 winter surveys (Nov & Dec), three individuals were recorded flying between 33-38m in height. In March 2024, 4 adults and 2 Juveniles were recorded flying through the site between 44-55m in height.
Buzzard	Buzzard is listed in the section 22 list of the Wildlife Act 1976 and Wildlife (Amendment) Act 2000 and on the green list of Birds of Conservation Concern in Ireland. Due to their slow flight, Buzzards are susceptible to turbine strikes. Strong winter association with the site as buzzards have been recorded within each month, except for January. In addition, observations of foraging/hunting were recorded. There is a strong association in the summer with the numerous activities recorded, in addition to an individual carrying nest material being recorded. Later in the season, a juvenile was recorded in September 2023.
Sparrowhawk	Sparrowhawk is listed in section 22 of the Wildlife Act 1976 and Wildlife (Amendment) Act 2000. Strong winter association with the site as sparrowhawks have been recorded within each month in addition to observations of foraging/hunting being recorded. Strong summer association with the site as sparrowhawks have been recorded within each month, in addition to observations of foraging/hunting being recorded. In July, sparrowhawks were observed carrying prey within the site boundary.
Kestrel	Kestrel is listed as Red on the Birds of Conservation Concern in Ireland and listed in section 22 of the Wildlife Act 1976 and Wildlife (Amendment) Act 2000. It is not listed in Annex I of the Birds Directive. Kestrel has been recorded frequently in both years. It has been observed hunting, therefore, may use the site as a foraging ground.
Peregrine Falcon	Peregrine is listed as Annex 1 on the EU Birds Directive. Peregrine was recorded once in the winter period 2021/22 in March 2022, travelling through the site. The species was also recorded hunting in the 2022 winter period during November 2022 and again in the 2023 winter period during December.
Mallard, Wigeon, Teal & Tufted duck	Mallard, wigeon, teal, and tufted duck are all listed as Amber on the Birds of Conservation Concern in Ireland. Flooded fields and the Camlin River provide suitable habitats for these species within and surrounding the Proposed Development Site. An incidental recording of a flock of over 100 mallards was made during botanical surveys of the site in July 2023 during a period of flooding. Teal, tufted duck and wigeon were recorded travelling through the site in March 2023 in low numbers
Snipe	Snipe are Red listed on the Birds of Conservation Concern in Ireland for both breeding and wintering populations. During the winter period, snipes were flushed every month with a maximum of 4 individuals. Targeted snipe surveys were undertaken in the breeding season. A Snipe was recorded chirping, which indicates signs of breeding territory within the site boundary.
Golden Plover	Golden plover is listed as an Annex 1 species under the EU Birds Directive species due to their long terms decline in the breeding population and are on the red list of the Birds of Conservation Concern in Ireland. Golden plover were not observed in the first winter season but were observed travelling over the site (n=24) in April of the 2023 summer season and again, a small group (n=15) travelling over the site in December 2023. Between January and March 2024, a flock of 50 were noted traveling by the site.

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Species	Notes of species recorded
Gull Species	Species of gulls, such as the greater black-back gull and herring gull, were both recorded. Both species are listed as Amber on the Birds of Conservation Concern in Ireland. There was no breeding activity of any gull species within the site. Gull species were recorded using the site for foraging. The surrounding area is dominated by GA habitat that could be utilised by gull species.
Passerines (Red Listed and Amber Listed)	The BoCCI Red listed species grey wagtail, meadow pipit, redwing, swift and yellowhammer were recorded during the surveys between October 2021 and March 2024. Grey wagtail were observed on 16 occasions, with up to two birds being recorded. Meadow pipit were observed on 763 occasions, with up to 230 birds being recorded. Redwing were observed on 110 occasions, with up to 200 birds being recorded. Stock dove were observed on six occasions, with up to two birds being recorded. Swift were observed on 74 occasions, with up to 14 birds being recorded. Yellowhammer were observed on 37 occasions, with up to 4 birds being recorded.

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11.5 Receptor Evaluation

11.5.1 Determination of Population Importance

A determination of the population importance of birds within the likely zone of influence is provided below following criteria described in Section 11.4. Estimates of National population sizes were obtained from the NPWS Article 12 Reporting (2013-2018), which details the status and trends of Ireland's bird species. The Proposed Development Site is found entirely with Co. Longford. Where relevant, estimates for mean county populations have been derived following a review of I-WeBS sites in Co. Longford. The Irish Wetland Bird Survey (I-WeBS) is a national monitoring scheme coordinated by BirdWatch Ireland (BWI) in conjunction with NPWS.

11.5.2 Whooper Swan

11.5.2.1 Wintering

As per the latest national wintering estimates provided by Burke *et al.,* (2021), the national wintering population of whooper swans in the ROI is 14,467. Using these latest Whooper Swan Census figures, 1% of the National population of whooper swan is 145. Therefore, as per NRA 2009, a regularly occurring population of 145 Whooper Swans is required for classification as Nationally Important.

The Swan Census 2020 (Burke *et al*., 2021) was consulted regarding the population data for whooper swans in Longford. Based on the 2020 Swan Census data the Longford population was 394 individuals. Therefore, a regularly occurring population of 4 or more birds is required to be classified as County Importance. No flocks of whooper swans qualifying as of national importance were observed at the Proposed Development. However, there were flocks of county importance observed on 7 occasions during surveys between April 2021 and March 2024 within a 500m buffer of the Proposed Development Site.

The flocks recorded at the Proposed Development were assigned **County Importance.**

11.5.2.2 Breeding

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Whooper swan is generally a wintering species in Ireland. Breeding is known to occur along the northern coast of Ireland. Longford and Roscommon have been recorded as a possible county for breeding by the Irish Rare Breeding Birds Panel[10]. However, no Whooper Swans were recorded outside the wintering season during any surveys. The Proposed Development is of **No Ecological Importance** for this species during the breeding season.

11.5.3 Mute Swan

11.5.3.1 Wintering

As per the latest national wintering estimates provided by Burke *et al*., (2018), the national wintering population of mute swans in the ROI is 7,032. Therefore, as per NRA 2009, a regularly occurring population of 70 Mute Swans is required for classification as Nationally Important. In total, 17 mute swans were recorded on 11 different occasions during VP, walkover, and waterbird distribution surveys for the Proposed Development and surrounds. The population recorded at the Proposed Development was therefore assigned **High Local Importance** based on the resident/regularly occurring wintering population.

To estimate the county population, a review of all Longford I-WeBS sites was conducted. The following mean count values have been recorded for I-WeBS sites over the most recent 5-season period, i.e. for the period 2016/17 – 2020/21 (note that sites with a mean of zero birds were excluded from this list).

Longford I-WeBS Sites

- Gorteen Lake (mean = 5),
- Lough Gowna (mean = 93),
- Lough Kinale & Derragh Lough (mean = 423),
- Lough Ree (mean = 195),
- Doogarry Lough (mean=1).

Based on the above, the mean wintering population calculated from Longford Iwebs sites is 144 individuals. Therefore, to be considered of county-level importance, 1 regularly occurring individual would be required. There have been 101 mute swans recorded during winter surveys; the population recorded at the Proposed Development was, therefore, eligible for **County Level Importance** based on a resident/regularly occurring wintering population.

The wintering records from the Proposed Development were assigned to **County level of importance**

11.5.3.2 Breeding

As reported (2013-2018) under Article 12 of the Birds Directive (Directive 2009/147/EC), the national breeding population estimates of mute swan in the Republic of Ireland is 3516 pairs. Using these latest

[10] https://irbbp.org/species-list/species-profiles/whooper-swan/

figures, 1% of the National population of mute swan is 35 pairs. Therefore, as per NRA 2009, a population of 35 pairs is required to be of national importance.

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There are no published figures for populations of breeding mute swan in Longford. Assuming an even distribution of mute swan across the 26 counties of the Republic of Ireland the population of mute swan is estimated to be 35 birds each (national population divided by 26 counties). Therefore, a regularly occurring population of 1 pair is required for classification of County Importance.

This species was only observed on 3 occasions during the breeding season. These observations were in April, May, and July, with two pairs recorded in April and July, with one pair being recorded in a drainage ditch and a single bird recorded in April in improved grassland. Therefore, there is at least one identified breeding territory within the 500m buffer of the Proposed Development; therefore, the breeding population of the Proposed Development was assigned **County Importance**.

11.5.4 Buzzard

Buzzard is not listed in Annex I of the Birds Directive. The species is Green listed in Ireland (BoCCI). The population recorded across the seasons was assigned **Local Importance (Higher Value**) based on a resident/regularly occurring population assessed to be important at the local level.

11.5.5 Sparrowhawk

Sparrowhawk is not listed in Annex I of the Birds Directive. The species is Green listed in Ireland (BoCCI). The population recorded was assigned **Local Importance (Higher Value)** based on a resident/regularly occurring population assessed to be important at the local level.

11.5.6 Kestrel

As reported (2008-2012) under Article 12 of the Birds Directive (Directive 2009/147/EC), the national breeding population estimate of kestrel in the ROI is 13,500 birds. Using these latest figures, 1% of the National population of kestrel is 135 birds. Therefore, as per NRA 2009, a regularly occurring population of 135 birds is required for classification as **Nationally Important**.

There are no published figures for populations of kestrel in Longford. Assuming an even distribution of kestrel across the 26 counties of the Republic of Ireland[11], the population of kestrels is estimated to be 519 birds (national population divided by 26 counties). Therefore, a regularly occurring population of 5 birds is required for the classification of **County Importance**.

Kestrels were on 14 occasions during the baseline surveys, and breeding is expected to occur in the local area. The species uses the survey area at least for hunting purposes.

There was a maximum of 1 unconfirmed breeding territory identified outside the Proposed Development Area and within 500m buffer. No resident population of adult birds was recorded within the Proposed Development. The population recorded at the Proposed Development was therefore

[11] While acknowledging the unfavourable conservation status of this species with an identified population decline, this remains a species with a widespread distribution in Ireland (BOCCI, 2020-2026). [23] https://app.bto.org/birdfacts/results/bob3040.htm

assigned **Local importance (higher value)** based on a lack of resident/regularly occurring wintering population assessed to be important on a local level only.

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11.5.7 Peregrine Falcon

As per the latest NPWS Article 12 reporting document, the estimated population of peregrine is 425 pairs. Therefore, as per NRA 2009, a regularly occurring population of four pairs of peregrines is required for a classification of Nationally Importance. There are no published figures for the Longford populations of peregrine. Assuming an even distribution of peregrine across the 26 counties of the Republic of Ireland (ROI), the population of peregrine in both counties is estimated to be 32 birds each (national population divided by 26 counties). Taking a precautionary approach and using the above as a guide, a regularly occurring population of a single bird is required for classification of County Importance. Breeding peregrine is a green-listed species and thus of least conservation concern.

Peregrine falcon was observed on 4 occasions within 500m of the Proposed Development. Of these 4 observations, birds were observed commuting, hunting and in a perched state. No breeding evidence for this species was recorded.

Taking a precautionary approach, the population recorded was assigned **County Importance.**

11.5.8 Mallard

11.5.8.1 Wintering

As per the latest national wintering estimates provided by Burke *et al*., (2018), the national wintering population of mallards in the ROI is 18,810. Therefore, as per NRA 2009, a regularly occurring population of 188 mallard is required for classification as Nationally Important. In total 95 mallard were recorded during 28 occasions throughout the winter season during vantage point, waterbird distribution, migration watches and walkover surveys. The population recorded at the Proposed Development does not meet the threshold and is, therefore, categorised as **Not Nationally Important.**

Longford I-WeBS Sites:

- Gorteen Lake (mean = 23),
- Lough Gowna (mean = 114),
- Lough Kinale & Derragh Lough (mean = 52),
- Lough Ree (mean = 302),
- Doogarry Lough (mean =2),.

Based on the above, the mean wintering population calculated from Longford IWebs sites is 99 individuals. Therefore, to be considered of county-level importance, 1 regularly occurring individual would be required. Due to the total number and frequency of mallard observations, the wintering population recorded at the windfarm site was categorised as of **County Importance**.

11.5.8.2 Breeding

Mallard breed and winter in ROI. This species was recorded on the Proposed Development during both the breeding and non-breeding seasons.

As reported (2013-2018) under Article 12 of the Birds Directive (Directive 2009/147/EC), the national breeding population estimates of mallard in the Republic of Ireland is 15,400 pairs. Using these latest figures, 1% of the National population of mallard is 154 pairs. Therefore, as per NRA 2009, a population of 154 pairs is required to be of national importance.

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There are no published figures for populations of breeding mallard in Longford. Assuming an even distribution of mallard across the 26 counties of the Republic of Ireland, the population of mallard is estimated to be 592 birds each (national population divided by 26 counties). Therefore, a regularly occurring population of 3 pairs is required for the classification of **County Importance.**

This species was observed on 5 separate occasions during the breeding season surveys, with a total of 6 birds recorded during walkover surveys. These observations were in July (2022 and 2023) and September 2023. A pair was observed in both July 2022 and 2023, and an additional individual was recorded in July 2023 separately from the pair mentioned above. Both observations in 2023 were from wet grassland suitable for breeding mallard in some conditions. Additionally, a flock of over 100 mallard were observed in July 2023 foraging within flood grassland within the site boundary. Therefore, there is at least one identified breeding territory with the potential for another territory within the 500m buffer of the Proposed Development and usage of the site during flood conditions during the breeding season. Therefore, the breeding population at the Proposed Development was assigned **Local Importance (higher value),** taking the precautionary approach.

11.5.9 Wigeon[12]

11.5.9.1 Wintering

As per the latest national wintering estimates provided by Burke et al. (2018), the national wintering population of wigeon in the ROI is 50,452. Therefore, as per NRA 2009, a regularly occurring population of 505 wigeon is required for classification as Nationally Important. In total, 75 wigeon were recorded on 5 occasions, with 4 occurring during winter walkovers and vantage point surveys (within 500m of the Proposed Development). One observation occurred during migration watches (up to 2km). The population recorded at the Proposed Development was therefore, categorised as **Not Nationally Important** population**.**

Longford I-WeBS Sites:

- Gorteen Lake (mean = 100),
- Lough Gowna (mean = 181),
- Lough Kinale & Derragh Lough (mean = 39),
- Lough Ree (mean = 270).

[12]These estimates must be treated as conservative on the basis that they are widely distributed in a variety of wetland and non-wetland habitats that are under sampled during I-WeBS, WeBS and the special surveys, such as on large, small, and ephemeral wetlands, or considerable distances offshore and not detected during counts from land-based vantage points.

Based on the above, the mean wintering population[13] The number of individuals from Longford IWebs sites is 148. Therefore, to be considered county-level importance, 1 regularly occurring individual would be required.

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Since wigeon was only recorded on four occasions within, or partially within 500m of the Proposed Development despite undertaking a comprehensive suite of surveys over two years and 3 months. it can be acknowledged that while the total number of individuals meets the criteria for county-level importance, the population is not regularly occurring, and therefore, the Proposed Development Site is of **No Ecological Importance** for this species during the winter season.

11.5.9.2 Breeding

Wigeon are a wintering species in Ireland. The Proposed Development is of **No Ecological Importance** for this species during the breeding season.

11.5.10 Teal

11.5.10.1Wintering

As per the latest national wintering estimates provided in Burke *et al.,* (2018), the national wintering population of teal in the ROI is 27,644. Therefore, as per NRA 2009, a regularly occurring population of 277 is required for classification as Nationally Important. In total, 9 teal were recorded on three occasions during vantage point surveys, migration watches, and waterbird distribution surveys. During the winter vantage point survey, only one observation was made of teal within 500m of the site. The population recorded at the Proposed Development was, therefore, categorised as not nationally Important.

Longford I-WeBS Sites:

- Gorteen Lake (mean = 35)
- Lough Gowna (mean = 37)
- Lough Kinale & Derragh Lough (mean = 22)
- Lough Ree (mean = 155)

Based on the above, the mean wintering population calculated from Longford IWebs sites is 62 individuals. Therefore, to be considered county-level importance, 1 regularly occurring individual would be required.

Teal was only recorded on three occasions within, or partially within, 500m of the Proposed Development. It can be acknowledged that while the total number of individuals meets the criteria for county-level importance, the population is not regularly occurring, and therefore, the Proposed Development is of **No Ecological Importance** for this species during the winter season.

[13 & 15] Please note that these figures are estimates based on the best available information but should be interpreted with a degree of caution.

11.5.10.2Breeding

Teal both breed and winter in Ireland. This species was only recorded once during the breeding, with 6 individuals travelling by the site. The Proposed Development is of **No Ecological Importance** for this species during the breeding season.

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11.5.11 Tufted Duck

11.5.11.1Wintering

As per the latest national wintering estimates provided in Burke *et al.,* (2018), the national wintering population of tufted duck in the ROI is 16,927. Therefore, as per NRA 2009, a regularly occurring population of 170 tufted duck is required for classification as Nationally Important population. In total 6 tufted duck were recorded on one occasion during walkover surveys within 500m of the Proposed Development . The population recorded at the Proposed Development was, therefore, categorised as **Not Nationally Important**.

To estimate the county population, a review of all Longford I-WeBS sites was conducted. The following mean count values have been recorded for I-WeBS sites over the most recent 5-season period, i.e. for the period 2016/17 – 2020/21 (note that sites with a mean of zero birds were excluded from this list).

Longford I-WeBS Sites:

- Gorteen Lake (mean = 43)
- Lough Gowna (mean = 81)
- Lough Kinale & Derragh Lough (mean = 262)
- Lough Ree (mean = 708)

Based on the above, the mean wintering population calculated from Longford IWebs sites is 274 individuals. Therefore, to be considered of county level importance 3 regularly occurring individuals would be required.

Since tufted duck was only recorded on one occasion within, or partially within 500m of the Proposed Development despite undertaking a comprehensive suite of surveys over two years and 3 months. While the total number of individuals meets the criteria for county level importance, the population is not regularly occurring and therefore, the Proposed Development is of **No Ecological Importance** for this species during the winter season.

11.5.11.2Breeding

The tufted duck is a breeding species within the Republic of Ireland; however, no breeding season observations were made of this species at this Proposed Development, and the habitat is not suitable for breeding tufted duck. Tufted duck require large open lakes for breeding where they build nests in waterside vegetation. Therefore, the Proposed Development is of **No Ecological Importance** for this species during the breeding season.

11.5.12 Snipe

Snipe have a secretive nature and no population estimates exist for this species(Burke *et al*., 2018). Snipe are red-listed in Ireland during both the breeding and winter seasons (BoCCI). The population recorded within the Proposed Development was assigned **Local Importance (Higher Value)** on the basis of resident/regularly occurring populations both in winter and summer assessed to be important at the local level.

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11.5.13 Golden Plover

11.5.13.1Wintering

Burke *et al*., (2018) gave the All-Ireland wintering population at 92,060 birds for the period 2011-12 to 2015/16, which is a 43.6% decline since the 1994/95-1988/99 period. The current estimated national wintering population of golden plover in ROI is 80,707 birds (Burke *et al*., 2018). 1% of the National wintering population of golden plover is 807 birds. As per NRA 2009, a regularly occurring population of 807 golden plover is required for classification as **Nationally Important**. The maximum number of birds recorded within 500m of the Proposed Development from the winter seasons surveyed was 30 birds. There were no nationally important numbers of golden plover recorded at the Proposed Development.

To estimate the county population, a review of all Longford I-WeBS sites was conducted. It should be noted that the population estimate based on I-WeBS figures alone is likely to be an underestimate of the county population.[14]This is due to the foraging ecology of wintering golden plovers, which will utilise agricultural grasslands and other terrestrial habitats not typically surveyed during I-WeBS counts, as this is a survey of wetland habitats.

The following mean count values have been recorded for I-WeBS sites over the most recent 5-season period, i.e. for the period 2016/17 – 2020/21 (note that sites with a mean of zero birds were excluded from this list) and the mean peak count for the 2021/2022, 2022/2023 and 2023/2024 winter seasons at the Proposed Development where birds' surveys have been conducted:

Longford I-WeBS Sites [15]

- Gorteen Lake (mean = 263),
- Lough Gowna (mean = 122),
- Lough Kinale & Derragh Lough (mean = 5),
- Lough Ree (mean = 1413).

Cloonanny Terrestrial Survey Data:

- The Proposed Development (mean = 24).

[14] As per Burke et al (2018) in relation to the golden plover count, "these estimates must be treated as conservative on the basis that they are widely disturbed in a variety of wetland and non-wetland habitats that are under-sampled during I-WeBS."

[15] Of the 13 IWebs sites for Co Longford, only 5 sites have consistent data while the remaining 7 of no data recorded.

Based on the above, the mean wintering population from Longford IWebs sites is 360. However, as previously stated, this likely remains underestimated.

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The largest single flock of golden plover recorded was 30 birds, was recorded during winter surveys in January and March 2024 of the Proposed Development. While the numbers of golden plovers meet the numerical criteria for county-level importance in Longford, these flocks were not regularly occurring with no evidence of foraging on site identified. Therefore, taking a precautionary approach Proposed Development is of **Local Importance (Higher Value)** to this species during winter period.

11.5.13.2Breeding

This species was only observed on 1 occasion during the breeding season. This observation occurred in April 2022 and consisted of one flock of 24 birds. These observations are believed to be birds on passage given the breeding range of the species[16], flock size, time of year and no further observations during the breeding season months of May to August inclusive. In addition, golden plover is only known to use upland areas and nest within blanket bog, heather dominated areas, and marginal grasslands (Suddaby & O'Brien, 2020).

The Proposed Development is of **No Ecological Importance** to this species during the breeding season.

11.5.14 Herring Gull

11.5.14.1Wintering

As per the latest national wintering estimates provided by Burke *et al*., (2018), the national wintering population of herring gull in the ROI is 11,524. Therefore, as per NRA 2009, a regularly occurring population of 115 herring gulls is required for classification as a Nationally Important population. In total 44 birds have been observed during winter surveys for the Proposed Development and therefore, the population recorded at the Proposed Development was categorised as **Not Nationally Important**.

To estimate the county population, a review of all Longford I-WeBS sites was conducted; however, only one I-webs site had herring gull records. This is due to poor Iwebs coverage in Co Longford where of 13 sites, 7 have no collated data available and, due to coverage of gull species by the I-WeBS methodology, the counting of gull species is optional (Birdwatch Ireland, un-dated). Therefore, county population was determined by the assumption of an even distribution of winter herring gull across the 26 counties of Republic of Ireland, the population of herring gull is therefore estimated to be 443 birds each (national population divided by 26 counties). Therefore, a regularly occurring winter population of 4 birds is required for the classification of County Importance.

As there have been a total of 44 birds recorded on 11 separate occasions over the winter surveys, the herring gull population has been categorised as **County Importance**.

[16] The breeding range is largely restricted to western and northern coastal counties.

11.5.14.2 Breeding

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Herring gull is a breeding species within the ROI and is known to nest communally in gull colonies on offshore coastal islands and has recently adapted to nesting on anthropogenic structures in built-up environments (cities) with limited number of inland sites (Cummins *et al.*, 2020). There are no known breeding sites for this species within Co Longford (Cummins *et al*., 2020), and therefore, the calculation of the breeding population across the 26 counties was not conducted as the assumption of an even spread is not applicable to the breeding ecology or spatial distribution of this species.

However, there were three breeding season observations of this species during walkover surveys, two separate flocks of 16 individuals were recorded in April and May 2022, and a group of 6 birds was recorded in June 2022. The site's habitat is unsuitable for breeding gulls, and the observations are likely of non-breeding birds using the site and surrounding area for short-term foraging or roosting while commuting. The lack of data across all other surveys also indicates this theory. Therefore, the Proposed Development is of **No Ecological Importance** for this species during the breeding season.

11.5.15 Great Black-backed Gull

11.5.15.1Wintering

No winter observations were recorded throughout the full suite of ornithological surveys over the two and a half years at this site. Therefore, the Proposed Development is of **No Ecological Importance** for this species during the winter season.

11.5.15.2Breeding

Great black-backed gull is a breeding species within the ROI and is known to nest communally in gull colonies on offshore coastal islands with one known inland site at Lough Ree where between 1-10 pairs were observed during 2015-2018 breeding seasons (Cummins *et al.*, 2020). There are no other known breeding sites for this species within Co Longford (Cummins *et al.*, 2020). Therefore, the calculation of breeding population across the 26 counties was not conducted as the assumption of an even spread is not applicable to the breeding ecology or spatial distribution of this species. Using the estimated 1-10 pairs, a single regularly occurring pair would be deemed of County Importance.

There were two observations of this species during walkover surveys in April and May 2022, with flock sizes being 12 and 9, respectively. There is potential that the separate groups of birds were travelling to Lough Ree to their known breeding site, taking the time of year into account and the site's proximity to Lough Ree. The site's habitat is unsuitable for breeding gulls, and the observations of birds using the site and surrounding area for short-term foraging or roosting while commuting. The lack of data across all other surveys also supports this. Therefore, the Proposed Development is of **No Ecological Importance** for this species during the breeding season.

11.5.16 Lesser Black-backed Gull

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11.5.16.1Wintering

No winter observations were recorded throughout the full suite of ornithological surveys over the two and a half years at this site. Therefore, the Proposed Development is of **No Ecological Importance** for this species during the winter season.

11.5.16.2Breeding

Lesser black-back gull is a breeding species in ROI and can breed on offshore coastal and lake islands, often in mixed gull colonies. Lough Ree is a traditional breeding site for this species and is managed and monitored by NPWS and Birdwatch Ireland. The population estimates for Lough Ree for this species are between 1001 and 5000 pairs; these figures were calculated from the 2015-2018 breeding season (Cummins *et al*., 2020).

Due to the spatial breeding distribution of lesser black-back gulls, the calculation of the breeding population across the 26 counties was not conducted, as the assumption of an even spread is not applicable to the breeding ecology or spatial distribution of this species. Combining the lowest estimated pairs (1001 pairs) from the 1 known nest site, 10 regularly breeding pairs would be required to be categorised as County Importance.

In total 14 lesser black-back gulls were recorded during the walkover surveys (breeding season) of the site between April-September 2023. A separate group of 3 and 4 individuals were observed within 500m of the Proposed Development on the 16th of April 2023, and a pair were recorded on the 28th of September 2023; all other records were single individual observations. There is potential that the separate groups of 3 and 4 birds were travelling to Lough Ree to their known breeding site when taking the time of year into account and the proximity of the Proposed Development to Lough Ree. While there were 14 observations of this species across the breeding season at the site, the habitat is not suitable for breeding gulls, and the observations are likely of birds using the site and surrounding area for short-term foraging or roosting while commuting. The evidence from surveys suggests that this is not a regularly occurring population. Therefore, the Proposed Development is of **No Ecological Importance** for this species during the breeding season.

11.5.17 Black-headed Gull

11.5.17.1Wintering

A total for 5 observations were recorded the wintering surveys totally 14 individuals during water bird distribution surveys and walkover surveys . Therefore, the Proposed Development is of **No Ecological Importance** for this species during the winter season.

11.5.17.2 Breeding

Black-headed Gull has the most inland bias with regard to its breeding distribution (Balmer et al.2013). Hutchinson (1989) describes the nesting preferences of Black-headed Gull in Ireland to include islands on the coast, along the edges of brackish lagoons, around boggy lakes, on marshes and on the midland bogs(Cummins *et al*., 2020).

Due to the spatial breeding distribution of Black-headed Gull, the calculation of the breeding population across the 26 counties was not conducted, as the assumption of an even spread is not applicable to the breeding ecology or spatial distribution of this species. Combining the lowest estimated pairs (4000 pairs) therefore a 40 regularly occurring breeding pairs would be required to be categorised as County Importance. Only 6 individuals were recorded during breeding season surveys. Therefore, the Proposed Development is of **No Ecological Importance** for this species during the breeding season.

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11.5.18 Cormorant

11.5.18.1Wintering

As per the latest national wintering estimates provided in Burke *et al.,* (2018), the national wintering population of cormorant in the ROI is 7967. Therefore, as per NRA 2009, a regularly occurring population of 79 cormorant is required for classification as Nationally Important. In total, only four observations of a single cormorant occurred during all winter surveys. Therefore, the population has been categorised as **Not Nationally Important**.

Longford I-WeBS Sites

- Gorteen Lake (mean = 1),
- Lough Gowna (mean = 33),
- Lough Kinale & Derragh Lough (mean = 18),
- Lough Ree (mean = 33).

Based on the above, the mean wintering population calculated from Longford I-WeBS sites is 85 individuals. Therefore, to be considered of county level importance 1 regularly occurring individuals would be required.

Since cormorant was only recorded on four occasions during winter surveys for the Proposed Development despite undertaking a comprehensive suite of surveys over two years and 3 months. It can be acknowledged that while the total number of individuals meets the criteria for county level importance, the population is not regularly occurring and therefore, the Proposed Development is of **No Ecological Importance** for this species during the winter season.

11.5.18.2Breeding

Cormorant both breed and winter in Ireland. This species was only recorded on surveys during the non-breeding season. The Proposed Development is of **No Ecological Importance** for this species during the breeding season.

11.5.19 Lapwing

11.5.19.1Wintering

As per the latest national wintering estimates provided in Burke et al (2018), the national wintering population of lapwing in the ROI is 69823. Therefore, as per NRA 2009, a regularly occurring population of 698 lapwing is required for classification as Nationally Important. In total only one flock of 7 Lapwing

occurred during all winter surveys. Therefore, the population has not been categorised as not nationally important.

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Longford I-WeBS Sites

- Gorteen Lake (mean = 120),
- Lough Gowna (mean = 83),
- Lough Kinale & Derragh Lough (mean = 120),
- Lough Ree (mean = 1277).

Based on the above, the mean wintering population calculated from Longford IWebs sites is 400 individuals. Therefore, to be considered of county level importance, 4 regularly occurring individuals would be required.

Since lapwing was only recorded on one occasion during winter surveys for the Proposed Development despite undertaking a comprehensive suite of surveys over two and half years, it can be acknowledged that while the total number of individuals meets the criteria for county level importance, the population is not regularly occurring. Therefore, the Proposed Development is of **No Ecological Importance** for this species during the winter season.

11.5.19.2Breeding

Lapwing both breed and winter in Ireland. This species was only recorded on surveys during the non-breeding season. The Proposed Development is of **No Ecological Importance** for this species during the breeding season.

11.5.20 Passerines (Red Listed and Amber Listed)

Grey wagtail, meadow pipit, redwing and greenfinch are red listed in ROI. Populations recorded at the Proposed Development were deemed to be of no greater than **Local Importance (Lower Higher Value).**

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11.6 Identification of Key Ornithological Receptors

Table 11.14 Identification of Key Ornithological Receptors

Species	Conservation Status	NRA Evaluation (NRA, 2009)	KER (Yes/No)	Rational for Inclusion/Exclusion/Criteria
Whooper Swan	Annex I, EU Birds Directive; BoCCI Amber List & Irish Wildlife Act	Winter Flocks of County Importance recorded Breeding No population of ecological	Yes	**Direct Habitat Loss** This species was occasionally recorded foraging within or surrounding the Proposed Development during the winter season. **Displacement** Birds were recorded flying over the Proposed Development and within 500m of the proposed turbine layout. **Collision Risk** Observed flying at the collision risk height during the survey period.
Mute Swan	Amber List & Irish Wildlife Act	Winter Flocks National Importance Recorded Breeding Flocks County Importance Recorded Potential breeding territory within 500m	Yes	**Direct Habitat Loss** This species was occasionally recorded foraging within or surrounding the Proposed Development during the winter season. **Displacement** Birds were recorded flying over the Proposed Development and within 500m of the proposed turbine layout. Species recorded during the breeding season within 500m of the proposed turbine layout **Collision Risk** Observed flying at the collision risk height during the survey period.
Buzzard	BoCCI Green list Wildlife Act	High Local Importance (All seasons)	Yes	**Direct Habitat Loss**

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Species	Conservation Status	NRA Evaluation (NRA, 2009)	KER (Yes/No)	Rational for Inclusion/Exclusion/Criteria
				This species was recorded frequently foraging within or surrounding the Proposed Development during all seasons. **Displacement** This species was recorded frequently foraging within or surrounding the Proposed Development during all seasons. **Collision Risk** Observed flying at the collision risk height during the survey period.
Sparrowhawk	BoCCI Green list & Irish Wildlife Act.	High Local Importance (All seasons)	Yes	**Direct Habitat Loss** This species was recorded frequently foraging within or surrounding the Proposed Development during all seasons. **Displacement** This species was recorded frequently foraging within or surrounding the Proposed Development during all seasons. **Collision Risk** Observed flying at the collision risk height during the survey period.
Kestrel	BoCCI Red List & Irish Wildlife Act.	High Local Importance (All seasons)	Yes	**Direct Habitat Loss** This species was recorded frequently foraging within or surrounding the Proposed Development during all seasons. **Displacement** This species was recorded frequently foraging within or surrounding the Proposed Development during all seasons. **Collision Risk** Observed flying at the collision risk height during the survey period.

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Species	Conservation Status	NRA Evaluation (NRA, 2009)	KER (Yes/No)	Rational for Inclusion/Exclusion/Criteria
Peregrine Falcon	Annex I, EU Birds Directive; BoCCI Green List & Irish Wildlife Act	High Local Importance (All seasons)	Yes	**Direct Habitat Loss** This species was recorded foraging within or surrounding the Proposed Development during the non-breeding season. **Displacement** This species was recorded foraging within or surrounding the Proposed Development during the non-breeding season. **Collision Risk** Observed flying at the collision risk height during the survey period.
Mallard	BoCCI Amber list & Irish Wildlife Act.	High Local Importance (All seasons)	Yes	**Direct Habitat Loss** This species was recorded foraging within or surrounding the Proposed Development on flooded grasslands along the Camlin River, and within drainage ditches within 500m of the Proposed Development site. **Displacement** This species was recorded flying over and foraging within or surrounding the Proposed Development on flooded grasslands along the Camlin River and within drainage ditches within 500m of the Proposed Development site. **Collision Risk** This species was not observed flying at the collision risk height during the survey period.
Wigeon	BoCCI Amber list & Irish Wildlife Act.	All Seasons No population of ecological importance recorded	No	Wigeon was only observed within the site or 500m of the Proposed Development on 4 occasions. There is no evidence to suggest that the Proposed Development is of significance to this species.
Teal	BoCCI Amber list & Irish Wildlife Act.	All Seasons	No	Teal was only recorded on 1 occasion during the winter season during the flight activity survey (within 500m). There is no evidence to suggest that the Proposed Development is of significance to this species.

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Species	Conservation Status	NRA Evaluation (NRA, 2009)	KER (Yes/No)	Rational for Inclusion/Exclusion/Criteria
		No population of ecological importance recorded		
Tufted Duck	BoCCI Amber list & Irish Wildlife Act	<u>All Seasons</u> No population of ecological importance recorded	No	Tufted duck was only recorded on one occasion throughout all surveys, and this was in the winter season. No breeding observations from all survey types occurred for this species. There is no evidence to suggest that the Proposed Development is of significance to this species.
Cormorant	BoCCI Amber list & Irish Wildlife Act	<u>All Seasons</u> No population of ecological importance recorded	No	Cormorant was only recorded on 1 occasion during the winter season during Waterbird Distribution Surveys. There is no evidence to suggest that the Proposed Development is of significance to this species.
Snipe	BoCCI Red Listed (Breeding & Wintering Populations) & Irish Wildlife Act.	<u>Winter</u> County Importance	Yes	**Direct Habitat Loss** This species was frequently recorded utilising habitats on, or within 500m of, the Proposed Development during winter months. **Displacement** The species was recorded within the Proposed Development. **Collision Risk** Observed flying at the collision risk height during the survey period.
		<u>Breeding</u> County Importance	Yes	**Direct Habitat Loss** This species was frequently recorded utilising habitats on, or within 500m of, the Proposed Development during winter months. **Displacement**

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Species	Conservation Status	NRA Evaluation (NRA, 2009)	KER (Yes/No)	Rational for Inclusion/Exclusion/Criteria
				Between 1 and 3 breeding territories were identified on or within 500m of the Proposed Development. **Collision Risk** Observed flying at the collision risk height during the survey period.
Golden Plover	Annex I, EU Birds Directive; SCI species of nearby SPAs; BoCCI Red List & Irish Wildlife Act.	Wintering Of flocks High Local Importance Recorded	Yes	**Direct Habitat Loss** This species was not recorded utilising habitats on, or within 500m of, the Proposed Development during winter months. **Displacement** This species was not recorded utilising habitats on, or within 500m of, the Proposed Development during winter months. **Collision Risk** Observed flying at the collision risk height during the survey period.
Herring Gull	BoCCI Amber list & Irish Wildlife Act.	Winter Population of County importance Breeding No population of ecological Importance	Yes	**Direct Habitat Loss** This species was recorded utilising habitats on, or within 500m of, the Proposed Development during winter months. **Displacement** The species was recorded within the Proposed Development. **Collision Risk** This species was not observed flying at the collision risk zone during the survey period.

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Species	Conservation Status	NRA Evaluation (NRA, 2009)	KER (Yes/No)	Rational for Inclusion/Exclusion/Criteria
Great Black-Back Gull	BoCCI Green List & Irish Wildlife Act.	All Seasons No population of ecological importance recorded	No	**Direct Habitat Loss** This species was only recorded on 2 occasions during the breeding season, taking the flock types (9 & 12 individuals) and the habitat present at the Proposed Development. No evidence of breeding or roosting activity was recorded within the Study Area. **Displacement** The species was recorded in low numbers sporadically recorded within the Proposed Development. **Collision Risk** This species was not observed flying at the collision risk zone during the survey period
Black-headed Gull	BoCCI Red Listed (Breeding Populations) & Irish Wildlife Act.	All Seasons No population of ecological importance recorded	No	**Direct Habitat Loss** This species was only recorded on six occasions in total; 5 of these were in the winter season and 1 within a breeding season. No evidence of breeding or roosting activity was recorded within the Study Area. **Displacement** The species was recorded in low numbers sporadically recorded within the Proposed Development. **Collision Risk** This species was not observed flying at the collision risk zone during the survey period.
Lesser Black-backed gull	BoCCI Red List BoCCI Red List Wildlife Act	All Seasons No population of ecological importance recorded	No	**Direct Habitat Loss** This species was only recorded on 8 occasions during the breeding season and travelling through the site. No foraging was recorded on site. **Displacement** The species was recorded in low numbers sporadically recorded within the Proposed Development.

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Species	Conservation Status	NRA Evaluation (NRA, 2009)	KER (Yes/No)	Rational for Inclusion/Exclusion/Criteria
				Collision Risk This species was not observed flying at the collision risk zone during the survey period.
Lapwing	BoCCI Red list & Irish Wildlife Act	<u>All Seasons</u> No population of ecological importance recorded	No	Lapwing was only recorded on 1 occasion during the winter season flightline activity surveys where a flock of 7 birds were observed. There is no evidence to suggest that the Proposed Development is of significance to this species.

11.6.1 Determining the Importance of Avian Key Ecological Receptors

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This evaluation follows the guidance for assessing birds outlined in Percival (2003). The criteria are outlined in Section 11.6 above. As per Percival, the sensitivity of avian KERs is listed below, with the rationale for their respective sensitivity classification included in brackets.

Species of High Sensitivity

- Whooper Swan (A flock of county importance was recorded, Annex I; EU Birds Directive Species, SCI bird species of a number of local European Sites).

Species of Medium Sensitivity

- Peregrine (Annex I; EU Birds Directive),
- Herring Gull (A flock of county importance was recorded, SCI bird species),
- Mute Swan (Flock of county importance recorded, SCI bird species).
- Mallard (Flocks of county importance recorded, SCI bird species)

Species of Low Sensitivity (Species recorded in low numbers or sporadically)

- Buzzard,
- Sparrowhawk,
- Kestrel,
- Snipe,
- Golden Plover,
- Great Black-Back Gull,
- Black-headed Gull,
- Lesser Black-backed gull, and
- Passerines, including meadow pipit, and grey wagtail.

11.7 Potential Effects

This section of the assessment of effects is structured as follows:

- Assessment of 'Do nothing' Effect (Please also refer to Chapter 3).
- Assessment of effects in relation to avian KERs.
- Assessment of effects in relation to sites designated for nature conservation.
- Summary of potential effects associated with the Proposed Development.

The construction phase impacts associated with the Proposed Development (including site preparation works, upgrades to existing roads and tracks, construction of hardstands and the erection of the turbines) and operation of the Proposed Development are outlined below. The construction impacts relate to habitat loss, disturbance/displacement during construction and barrier effect. The operation impacts relate to disturbance/displacement, barrier effect and bird collisions with moving turbine rotors. To assess the significance of potential impacts on the avian KERs, an appraisal of the magnitude of impacts on these species is necessary. Percival (2003) details an assessment

methodology to determine the significance of an impact based on the product of the sensitivity of the receptor and the magnitude of the effect. The significance of any one impact is a product of the sensitivity of the receptor, the magnitude of the impact and the probability of that impact occurring. The assessment in the following subsections follows this evaluation methodology outlined in Percival (2003). It must be noted that identifying a risk does not represent a prediction either that it will occur or create or cause a significant impact.

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11.7.1 Do-Nothing Scenario

The Proposed Development comprises agricultural lands that are currently managed through a combination of high intensity and low intensity agricultural practices. If the Proposed Development does not proceed, the area is likely to continue to be used for agricultural purposes. This means that it is likely that agricultural run-off will continue to be emitted to the watercourses in the surrounding area and livestock will continue to put pressure on the hydraulic conditions via modification to riverbanks. The Grid Connection will continue to be used as a road, and the Proposed Substation and BESS sites field will continue to be used for agriculture. In the absence of the Proposed Development, it is likely that faunal assemblages would be similar to those utilising the habitats within the site today. This includes assemblages of bird species typical of agricultural and riverine habitats in the midlands typically composed of passerine bird species.

11.7.2 Designated Sites

Potential effects on European sites, have been fully addressed in the accompanying Appropriate Assessment Screening Report submitted with this planning application. This report provides the necessary information to enable the competent authority to undertake a screening for Appropriate Assessment (AA). Based on a comprehensive examination, analysis, and evaluation of all relevant data, and in accordance with best scientific knowledge and the precautionary principle, it is concluded that the Proposed Development will not result in any likely significant effects on the following European Designated Sites: Lough Forbes Complex SAC, Ballykenny-Fisherstown Bog SPA, Brown Bog SAC, Clooneen Bog SAC, Ardagullion Bog SAC, Fortwilliam Turlough SAC, Lough Ree SAC, Lough Ree SPA, Lough Derravaragh SPA, Lough Iron SPA, Lough Oughter Complex SPA, River Suck Callows SPA, Middle Shannon Callows SPA, Lough Gara SPA, or any other European Designated Site.

This conclusion is based on thoroughly considering the nature of the project, its potential interactions with all European sites within its zone of influence, and the conservation objectives of these sites. Accordingly, it can be determined that progression to Stage 2 Appropriate Assessment is not required.

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11.7.3 Effects on avian KERs during Construction and Operation:

Table 11.15 Effects on avian KERs during Construction and Operation: Whooper Swan

Whooper Swan (Wintering)			
	Potential Effects During Construction and Operation	**Significance of potential effect (EPA 2022)**	**Significance Matrix (Percival, 2003)** **Magnitude and Potential Significance of Effect**
Construction Phase			
Direct Habitat Loss	There were no observations of whooper swan roosting within the Proposed Development, but they were, however, recorded foraging directly on the boundary of the footprint and within the 500m buffer of the Proposed Development. Records were obtained during winter walkover and waterbird distribution surveys. During waterbird distribution surveys within or directly adjacent to the Proposed Development, observations occurred of two groups in January (8) and March (2) 2023. In addition, 4 separate flocks ranging between 4-11 were recorded within 500m of the Proposed Development in 2021 (Oct), 2022 (Jan) and 2023 (Jan & Oct). While there may be some loss of foraging habitat which is occasionally utilised by whooper swan, the actual total area size of the footprint of the Proposed Development isn't deemed to be of significance, when taking the volume of suitable foraging areas within the immediate and surrounding locality. There are no significant effects predicted.	Short-term **Slight** Negative Effect	The magnitude of the effect is assessed as **Low**. **High** sensitivity species + **Low** Impact corresponds to a **Low** effect significance.
Displacement	Whooper swans were recorded flying over the Proposed Development on 2 occasions over the full survey period of April 2021 to March 2024 with an additional flightline within 500m buffer. There were 6 separate records of whooper swan flocks between 2-11 individuals utilising habitats within the footprint, directly adjacent to the Proposed Development and within 500m buffer however, no roost sites were identified. From research conducted on construction noise impacts on birds, it was recommended that whooper swan require a disturbance free zone of 200-600m (Goodship & Furness, 2022). Therefore, there is some potential for disturbance to whooper swan foraging within the Proposed Development and its surrounding area. However, when taking the numbers and frequency of this recorded species it's unlikely that they are ecologically dependent on the Proposed Development	Short-term **Slight** Negative Effect	The magnitude of the effect is assessed as **Low**. **High** sensitivity species + **Low** Impact corresponds to a **Low** effect significance.

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Whooper Swan (Wintering)			
	Potential Effects During Construction and Operation	**Significance of potential effect (EPA 2022)**	**Significance Matrix (Percival, 2003)** **Magnitude and Potential Significance of Effect**
	site or surroundings. In addition, there is a volume of suitable alternative foraging habitat within the locality, with both agricultural grassland and wet grassland being abundant. Therefore, based on the survey data, there is a low potential for significant displacement effects.		
	Operational Phase		
Direct Habitat Loss	Direct effects are not anticipated as no additional infrastructure is proposed upon completion of the construction phase.	**No** Effect	**No** Effect
Displacement & Barrier Effect	There was whooper swan recorded utilising habitats in the form of foraging within the boundary of the Proposed Development. There were 6 observations of whooper swan within 500m of the Proposed Development and 3 flightlines recorded within 500m. No regular or distinct patterns could be identified from the flightlines due to the low sample size (3 flightlines over 2.5 years), and the flightlines were likely on a random basis. No evidence suggests that the Proposed Development lies on a migratory/regular commuting route for this species; therefore, no impacts from the barrier effect are anticipated. In addition, waterbird migration watches produced no records of whooper swans, suggesting no commuting corridor between SPAs or other wetland sites. Research on wind energy projects and birds found that whooper swans are susceptible to displacement from habitats up to 150m from wind energy infrastructure at the operational stage (Hötker et al. 2006). Therefore, habitats up to 150m may be avoided around the Proposed Development where small numbers of whooper were recorded. However, given the homogenous nature of the surrounding localities' habitats, it's likely there is an abundance alternative suitable foraging location within the immediate area.	Long-term **Slight** Negative Effect	The magnitude of the effect is assessed as **Low**. **High** sensitivity species + **Low** Impact corresponds to a **Low** effect significance.

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Whooper Swan (Wintering)			
	Potential Effects During Construction and Operation	**Significance of potential effect (EPA 2022)**	**Significance Matrix (Percival, 2003)** **Magnitude and Potential Significance of Effect**
	Therefore, based on the survey data, there is a low potential for significant displacement and barrier effects only on foraging area for this species.		
Collision Mortality	This species was recorded flying within the potential collision risk zone during vantage point surveys. A "Random" collision risk analysis has been undertaken and full details are provided in Appendix 11.3. The collision risk has been calculated at a rate of 0.005 collisions per annum or one bird every 187 years. On this basis, the collision risk is considered insignificant/negligible over the operational lifespan of the Proposed Development.	Long-term **Imperceptible** Negative Effect	The magnitude of the effect is assessed as **Negligible**. **High** sensitivity species + **Negligible** Impact corresponds to a **Very Low** effect significance.

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Table 11.16: Effects on avian KERs during Construction and Operation: Mute Swan

Mute Swan (All Seasons)			
	Potential Effects During Construction and Operation	**Significance of potential effect (EPA 2022)**	**Significance Matrix (Percival, 2003) Magnitude and Potential Significance of Effect**
	Construction Phase		
Direct Habitat Loss	Mute swans weren't recorded utilising the habitats within the footprint of the Proposed Development. However, they were recorded within the 500m buffer during both wintering and breeding seasons. All other records of this species consisted of birds travelling via flightlines. Therefore, no impacts relating to direct habitat loss via land take for the construction of the Proposed Development are anticipated. No significant effects are predicted.	Short-term **Imperceptible Negative** Effect.	The magnitude of the effect is assessed as **Negligible**. **Low** sensitivity species + **Negligible** Impact corresponds to a **Very Low** effect significance.
Displacement	Mute swans were recorded flying within 500m of the Proposed Development on three occasions over the full survey period of April 2021 to March 2024. These flightlines consisted of three separate records of mute swans (1- 2 individuals). No mute swans were recorded utilising habitats within the footprint of the Proposed Development but were recorded within a 500m buffer. However, no roost sites were identified. Mute swans are known to be tolerable of human-associated noise and interaction and are often found in areas of high levels of human disturbance. In addition, there is suitable alternative breeding and wintering habitat with the immediate and surrounding locality. Therefore, based on the survey data there is limited potential for significant disturbance effects given the nature of this species and the volume, location and type of observations recorded. No significant effects are predicted.	Short-term **Imperceptible Negative** Effect	The magnitude of the effect is assessed as **Low.** **Low** sensitivity species + **Negligible** Impact corresponds to a **Very Low** effect significance

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Mute Swan (All Seasons)			
	Potential Effects During Construction and Operation	**Significance of potential effect (EPA 2022)**	**Significance Matrix (Percival, 2003) Magnitude and Potential Significance of Effect**
	Operational Phase		
Direct Habitat Loss	Direct effects are not anticipated as no additional infrastructure is proposed upon completion of the construction phase.	**No** Effect	**No** Effect
Displacement & Barrier Effect	Mute swans were recorded utilising habitats in the form of foraging and breeding within the 500m buffer of the Proposed Development. There were 7 observations of mute swan within 500m of the Proposed Development and 3 flightlines recorded within 500m, with 1 flightline between proposed turbine layouts. No regular or distinct patterns could be identified from the flightlines due to low sample size (3 flightlines over 2.5 years), and the flightlines were likely on a random basis. No evidence suggests that the Proposed Development lies on a regular commuting route for this species; therefore, no impacts from the barrier effect are anticipated. In addition, waterbird migration watches produced no records of mute swan, suggesting no commuting corridor between alternative wetlands. No research currently exists on the impacts of wind energy during the operational phase on mute swan; however, as previously mentioned, mute swan is a tolerable species and often inhabits areas of high disturbance and anthropogenic noise. However, there may be some avoidance of habitats around the Proposed Development where small numbers of mute swan were recorded. Given the homogenous nature of the surrounding localities habitats, its likely there is an alternative suitable foraging location within the immediate area. Therefore, based on the survey data, no significant displacement and barrier effects are anticipated.	Long-term **Slight** Negative Effect	The magnitude of the effect is assessed as **Low.** **Medium** sensitivity species + **Negligible** Impact corresponds to a **Very Low** effect significance.

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Mute Swan (All Seasons)			
	Potential Effects During Construction and Operation	**Significance of potential effect (EPA 2022)**	**Significance Matrix (Percival, 2003)** **Magnitude and Potential Significance of Effect**
Collision Mortality	This species was recorded flying within the potential collision risk zone during vantage point surveys. A "Random" collision risk analysis has been undertaken and full details are provided in Appendix 11.3. The collision risk has been calculated at a rate of 0.001 collisions per annum, or one bird every 1138 years. On this basis, the collision risk is considered negligible over the Proposed Development's operational lifespan.	Long-term **Imperceptible Negative** Effect	The magnitude of the effect is assessed as **Negligible.** **Medium** sensitivity species + **Negligible** Impact corresponds to a **Very Low** effect significance.

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Table 11.17: Effects on avian KERs during Construction and Operation: Buzzard

Buzzard (All Seasons)			
	Potential Effects During Construction and Operation	**Significance of potential effect (EPA 2022)**	**Significance Matrix (Percival, 2003)** **Magnitude and Potential Significance of Effect**
Construction Phase			
Direct Habitat Loss	This species was recorded regularly during both wintering and breeding seasons between survey period of April 2021 to March 2024. Due to the overall small footprint of the proposed development, there will not be a significant loss of foraging habitats. In addition to this, the habitat within the footprint of the windfarm is not scarce in the immediate and the wider locality. There were no confirmed nests within the windfarm site in 2022, but one probable breeding territory was within the 500m boundary of the windfarm site. Considering the nature of the habitats within the Proposed Development, a significant loss of breeding habitat is not predicted. There will be a direct loss of foraging habitat within the footprint of the Proposed Development. However, this is negligible. Significant impacts are not predicted.	Short-term **Slight** Negative Effect	The magnitude of the effect is assessed as **Low.** **Medium** sensitivity species + **Negligible** Impact corresponds to a **Very Low** effect significance.
Displacement	Only one probable breeding pair were observed from April 2021 to March 2024, which was outside of the Proposed Development boundary. In addition, regular non-breeding buzzard behaviour was recorded at the site during both winter and breeding seasons. The volume of available foraging habitat will be lost within the footprint. However, this area is minimal, and the habitats are not unique to this location; there is a suitable alternate habitat within the immediate and surrounding area of the Proposed Development. Significant displacement effects aren't predicted at any geographical impact scale.	Short-term **Slight** Negative Effect	The magnitude of the effect is assessed as **Low.** **Medium** sensitivity species + **Negligible** Impact corresponds

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Buzzard (All Seasons)			
	Potential Effects During Construction and Operation	**Significance of potential effect (EPA 2022)**	**Significance Matrix (Percival, 2003)** **Magnitude and Potential Significance of Effect**
			to a **Very Low** effect significance.
	Operational Phase		
Direct Habitat Loss	Direct effects are not anticipated as no additional infrastructure is proposed upon completion of the construction phase.	**No** Effect	**No** Effect
Displacement & Barrier Effect	Buzzard was regularly recorded within the Proposed Development footprint during breeding and wintering seasons. Only one territory was identified during surveys between April 2021 and March 2024. Research studies based on breeding bird densities around wind farms indicate that buzzards have been shown to have a significant turbine avoidance extending to a minimum of 500m (Pearce-Higgins et al., 2009). As previously mentioned, one breeding territory was identified within 500m of the site's footprint in April 2022. However, potential breeding and foraging habitats at the site are not scarce locally, and there is ample suitable habitat in the immediate and wider locality. In addition to breeding records, buzzards were recorded regularly within the footprint and the 500m buffer. The Proposed Development will cause some reduction in the frequency of foraging and commuting buzzards within 500m of the proposed turbine layout; however, taking the number of turbines, the Proposed Development is unlikely to create a significant landscape barrier. In addition, there is a volume of suitable alternative habitats within the immediate area. Significant displacement effects aren't predicted at any geographical impact scale.	Long-term **Slight** Negative Effect	The magnitude of the effect is assessed as **Low.** **Low** sensitivity species + **Negligible** Impact corresponds to a **Very Low** effect significance.

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Buzzard (All Seasons)			
	Potential Effects During Construction and Operation	**Significance of potential effect (EPA 2022)**	**Significance Matrix (Percival, 2003)** **Magnitude and Potential Significance of Effect**
Collision Mortality	This species was recorded flying the potential collision risk zone during vantage point surveys in both winter and breeding seasons. A "Random" collision risk analysis has been undertaken for both seasons separately and for a combined year. Full details are provided in Appendix 11.3. The breakdown in seasonal calculations was carried out due to the notable increase in buzzard activity during the breeding season. The favourable conservation status of this species (Green-listed BoCCI) limits the potential for ecologically significant effects to result. Collision risk for the breeding season was calculated at 0.306 birds per annum, or one bird every 3 years; for the winter season, it was calculated at 0.036 per annum, or one bird every 28 years; and the combined collision risk was calculated to be 0.296 per annum, or one bird every 3 years. On a precautionary basis, taking the larger figure of the breeding season collision rates, 0.306 per annum correlates to 1 bird death from the local population per 3 operational years at the Proposed Development. This number of collisions of a Green-listed (BoCCI) species is considered of low significance.	Long-term **No Significant** Negative Effect	The magnitude of the effect is assessed as **Low.** **Low** sensitivity species + **Low** Impact corresponds to a **Very Low** effect significance.

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Table 11.18: Effects on avian KERs during Construction and Operation: Sparrowhawk

Sparrowhawk (All Seasons)			
	Potential Effects During Construction and Operation	**Significance of potential effect (EPA 2022)**	**Significance Matrix (Percival, 2003) Magnitude and Potential Significance of Effect**
Construction Phase			
Direct Habitat Loss	This species was recorded regularly during both wintering and breeding seasons between survey period of April 2021 to March 2024. Due to the overall small footprint of the proposed development, there will not be a significant loss of foraging habitats. In addition, the habitat within the footprint of the windfarm is not scarce locally and there is ample suitable habitat in the immediate and wider locality. There was no confirmed nest for this species from the breeding raptor surveys; however, sparrowhawks were recorded 10 times during VP surveys throughout the surveyed breeding season, which indicates probable territory. There is potential for loss of nesting habitat from within the Proposed Development boundary, but the habitats present within the boundary aren't considered unique to the site and are common in the immediate area and locality. Significant displacement effects aren't predicted at any geographical impact scale.	Short-term **Slight** Negative Effect	The magnitude of the effect is assessed as **Low.** **Low** sensitivity species + **Negligible** Impact corresponds to a **Very Low** effect significance.
Displacement	There was a probable breeding territory within the Proposed Development and or 500m buffer. Construction related disturbance during the breeding season could disrupt or disturb foraging or breeding sparrowhawk and, thus, lower the density of breeding sparrowhawk at the Proposed Development. However, the habitats present are not unique to the locality, and suitable alternative breeding and foraging habitats are likely to exist.	Short-term **Slight** Negative Effect	The magnitude of the effect is assessed as **Low.** **Low** sensitivity species + **Negligible** Impact corresponds to a **Very Low** effect significance.

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Sparrowhawk (All Seasons)			
	Potential Effects During Construction and Operation	**Significance of potential effect (EPA 2022)**	**Significance Matrix (Percival, 2003)** **Magnitude and Potential Significance of Effect**
Operational Phase			
Direct Habitat Loss	Direct effects are not anticipated as no additional infrastructure is proposed upon completion of the construction phase.	**No** Effect	**No** Effect
Displacement & Barrier Effect	As previously stated, sparrowhawks use the Proposed Development for foraging, and there is probable breeding territory in the vicinity due to this species being recorded 10 times during the breeding season. No displacement research exists for the sparrowhawk; however, taking a precautionary approach, it is assumed to be like other raptors at 500m (Pearce-Higgins et al., 2009). The Proposed Development will reduce the frequency of foraging and commuting sparrowhawks within 500m of the proposed turbine layout. However, increasing the number of turbines on the Proposed Development is unlikely to create a significant landscape barrier. In addition, there is a volume of suitable alternative habitats within the immediate area, with a mix of grasslands, forestry, and hedgerows (outside of the 500m buffer). Significant displacement effects aren't predicted at any geographical impact scale.	Long-term **Slight** Negative Effect	The magnitude of the effect is assessed as **Low.** **Low** sensitivity species + **Negligible** Impact corresponds to a **Very Low** effect significance.
Collision Mortality	During vantage point surveys, this species was recorded flying the potential collision risk zone. A "Random" collision risk analysis has been undertaken; full details are provided in Appendix 11.3. The favourable conservation status of this species (Green-listed BoCCI) limits the potential for ecologically significant effects to result.	Long-term **Imperceptible** Negative Effect	The magnitude of the effect is assessed as **Negligible.** **Low** sensitivity species + **Negligible** Impact corresponds to a **Very Low** effect significance.

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Sparrowhawk (All Seasons)			
	Potential Effects During Construction and Operation	**Significance of potential effect (EPA 2022)**	**Significance Matrix (Percival, 2003)** **Magnitude and Potential Significance of Effect**
	Collision risk for the breeding season was calculated at 0.013 birds per annum or one bird every 75 years; for the winter season, it was calculated at 0.011 per annum or one bird every 95 years, and the combined collision risk was calculated to be 0.024 per annum or one bird every 42 years. Taking the larger value of these results (0.024 collisions/annum), the Green-listed status of the sparrowhawk, and the lifespan of the Wind Farm as precautionary measures, the impacts on this species are considered negligible.		

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Table 11.19: Effects on avian KERs during Construction and Operation: Kestrel

Kestrel (All Seasons)			
	Potential Effects During Construction and Operation	**Significance of potential effect (EPA 2022)**	**Significance Matrix (Percival, 2003) Magnitude and Potential Significance of Effect**
Construction Phase			
Direct Habitat Loss	There was 1 un-confirmed kestrel breeding territory was identified during surveys between April 2021 and March 2024. All the 14 kestrel observations took place during the winter season, but there is potential for these records to be of birds that could hold a local territory during the breeding season. Direct loss of foraging habitat, relative to its availability onsite, will be minimal. The land lost to the development footprint is small and there is a volume of suitable alternative habitats foraging in the immediate and wider area. No significant effects are predicted.	Short-term **Slight** Negative Effect	The magnitude of the effect is assessed as **Low.** **Low** sensitivity species + **Negligible** Impact corresponds to a **Very Low** effect significance.
Displacement	The Proposed Development does not contain habitats unique to the local area or surroundings. Therefore, if disturbance were to occur, it would not result in the loss of a scarce resource for the local kestrel population. As previously stated, 1 unconfirmed breeding kestrel territory was identified outside the site boundary within 500m. Significant effects are not anticipated, given that extensive areas of suitable foraging habitat remain in the surrounding area. Significant disturbance effects are not predicted.	Short-term **Slight** Negative Effect	The magnitude of the effect is assessed as **Low.** **Low** sensitivity species + **Negligible** Impact corresponds to a **Very Low** effect significance.

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Kestrel (All Seasons)			
	Potential Effects During Construction and Operation	**Significance of potential effect (EPA 2022)**	**Significance Matrix (Percival, 2003)** **Magnitude and Potential Significance of Effect**
Operational Phase			
Direct Habitat Loss	Direct effects are not anticipated as no additional infrastructure is proposed upon completion of the construction phase.	**No** Effect	**No** Effect
Displacement & Barrier Effect	Research studies on windfarms and raptors generally indicate that some species are more tolerant of turbines and avoidance is lower; this is the case for kestrel, which are known to continue foraging activity in windfarms and near turbines themselves. The habitats present at the site are not considered unique to the Proposed Development and are well represented in the immediate and wider locality.	Long-term **Slight** Negative Effect	The magnitude of the effect is assessed as **Low.** **Low** sensitivity species + **Negligible** Impact corresponds to a **Very Low** effect significance.
Collision Mortality	During VP surveys, The species were recorded flying within the potential collision risk zone. A "Random" collision risk analysis has been undertaken; full details are provided in Appendix 11.3. The collision risk has been calculated at a rate of 0.031 per annum or at least 1 death over the Proposed Development's operational lifespan. Despite the Kestrel being a Red-listed bird (BoCCI) in Ireland, the predicted collision risk is considered insignificant based on the predicted mortality rate across the Proposed Development's lifespan.	Long-term **Imperceptible** Negative Effect	The magnitude of the effect is assessed as **Negligible**. **Low** sensitivity species and **Negligible** Impact correspond to a **Very Low** effect significance.

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Table 11.20: Effects on avian KERs during Construction and Operation: Peregrine Falcon

Peregrine Falcon (All Seasons)			
	Potential Effects During Construction and Operation	**Significance of potential effect (EPA 2022)**	**Significance Matrix (Percival, 2003)** **Magnitude and Potential Significance of Effect**
Construction Phase			
Direct Habitat Loss	Peregrine falcon was recorded on 4 occasions during the surveys between April 2021 to March 2024. Of these 3 observations, individuals were recorded commuting, hunting, and perched within the Proposed Development. No evidence of breeding was recorded. This species is unlikely to depend on the onsite habitats, given the wide-ranging nature of the species and the availability of similar suitable habitats in the surroundings (e.g. bog/ grassland/ coniferous plantation). Significant effects are not predicted.	Long-term **Slight Negative** Effect	The magnitude of the effect is assessed as **Low**. **Medium** sensitivity species + **Low** Impact corresponds to a **Low** effect significance
Displacement	There was no evidence of breeding activity, and no individuals were recorded during the breeding season. Disturbance during construction is unlikely to discourage flight activity or foraging in the vicinity of the Proposed Development, particularly given that peregrine has been documented to become accustomed to various sources of human disturbance[17]. Significant disturbance effects are not anticipated.	Long-term **Slight Negative** Effect	The magnitude of the effect is assessed as **Low**. **Medium** sensitivity species + **Low** Impact corresponds to a **Low** effect significance.

[17] https://raptormonitoring.org/wp-content/uploads/2015/05/Raptors-2014-Peregrine.pd

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Operational Phase			
Direct Habitat Loss	Direct effects are not anticipated as no additional infrastructure is proposed upon completion of the construction phase.	**No** Effect	**No** Effect
Displacement & Barrier Effect	No evidence of breeding was recorded. This species was recorded on 4 occasions within 500m of the proposed turbine layout between April 2021 and March 2024. The availability of alternative suitable habitat limits the potential for significant displacement effects. Furthermore, peregrine has been documented to become accustomed to various sources of human disturbance (Ruddock et. al 2007). It is, therefore, reasonable to conclude that following a period of habituation, the population will adjust to the conditions.	Long-term **Slight Negative** Effect	The magnitude of the effect is assessed as **Low**. **Medium** sensitivity species + **Low** Impact corresponds to a **Low** effect significance.
Collision Mortality	The species was recorded flying within the potential collision risk zone during VP surveys. A "Random" collision risk analysis has been undertaken; full details are provided in Appendix 11.3. The collision risk has been calculated at a rate of 0.002 per annum or 0.06 birds for the Proposed Development's operational lifespan. Considering this result and the peregrine falcon's Green-list status (BoCCI), the collision risk is negligible.	Long-term **Imperceptible** Negative Effect	The magnitude of the effect is assessed as **Negligible**. **Low** sensitivity species and **Negligible** Impact correspond to a **Very Low** effect significance.

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Table 11.21: Effects on avian KERs during Construction and Operation: Mallard (Wintering)

Mallard (Wintering)			
	Potential Effects During Construction and Operation	**Significance of potential effect (EPA 2022)**	**Significance Matrix (Percival, 2003)** **Magnitude and Potential Significance of Effect**
Construction Phase			
Direct Habitat Loss	Mallard was recorded utilising habitats within the boundary of and directly adjacent to the Proposed Development and within the 500m buffer. Mallard was recorded 20 times within a 500m buffer; of these, 5 records were observed directly within the footprint of the Proposed Development. Therefore, there is a potential loss of utilised habitat; however, when taking the actual land take size for this development into account, the area of the Proposed Development is mostly grassland, which is not a key habitat for this species. No significant effects are predicted.	Long-term **Slight Negative** Effect	The magnitude of the effect is assessed as **Low**. **Medium** sensitivity species + **Low** Impact corresponds to a **Low** effect significance.
Displacement	Mallard was recorded on 5 instances within the footprint of the Proposed Development during waterbird distribution and walkover surveys. An additional 15 observations were recorded of wintering mallard within the 500m buffer. Flock sizes ranged between 4-10 individuals and records were regular throughout the winter surveys between 2021- 2023. The recommended disturbance buffer zone for non-breeding mallard is ≥100m (Goodship & Furness 2022). Some areas utilised by mallard fall within this recommended exclusion zone. Therefore there is some potential for construction related disturbance. However, there is an abundant volume of suitable alternative habitats within the immediate and surrounding locality, i.e. wet and improved agricultural grassland. No significant effects are predicted.	Long-term **Slight Negative** Effect	The magnitude of the effect is assessed as **Low**. **Medium** sensitivity species + **Low** Impact corresponds to a **Low** effect significance.

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Operational Phase			
Direct Habitat Loss	Direct effects are not anticipated as no additional infrastructure is proposed upon completion of the construction phase.	**No** Effect	**No** Effect
Displacement & Barrier Effect	Mallard was recorded on 5 occasions within the Proposed Development footprint during waterbird distribution and walkover surveys. An additional 15 observations were recorded of wintering mallard within the 500m buffer. Flock sizes ranged between 4-10 individuals, and records were regular throughout the winter surveys between 2021- 2023. One large flock of over 100 was recorded incidentally during a flooding period in July 2023. Only 1 mallard flightline was recorded throughout winter season vantage point surveys which was not within the collision risk zone. However, in addition to this 6 flightlines were recorded during Migration Watches within the risk zone with flocks between 3-7 individuals observed, with some of these flightlines occurring directly through and over the proposed turbine locations. From these, there is a slight pattern of flightlines heading towards the Camlin SE river of the proposed development. However, the total number of flightlines is low, and ample, suitable alternative habitat exists within the immediate and surrounding locality. No significant displacement effects are predicted.	Long-term **Slight Negative** Effect	The magnitude of the effect is assessed as **Low**. **Medium** sensitivity species + **Low** Impact corresponds to a **Low** effect significance.
Collision Mortality	The species was not recorded flying within the potential collision risk zone during VP surveys and therefore, not included in the collision risk assessment.	**No** Effect	**No** Effect

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Table 11.22: Effects on avian KERs during Construction and Operation: Mallard (Breeding)

Mallard (Breeding)			
	Potential Effects During Construction and Operation	**Significance of potential effect (EPA 2022)**	**Significance Matrix (Percival, 2003)** **Magnitude and Potential Significance of Effect**
Construction Phase			
Direct Habitat Loss	No mallard breeding was recorded within the boundary of the Proposed Development. All breeding records were within 500m buffer, as such no potential impacts relating to direct habitat loss within the Proposed Development. No significant effects are predicted.	Long-term **Slight Negative** Effect	The magnitude of the effect is assessed as **Low**. **Medium** sensitivity species + **Low** Impact corresponds to a **Low** effect significance

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Displacement	Mallard was recorded utilising habitats within 500m of the Proposed Development during both breeding seasons of 2022 and 2023. Mallard pairs were recorded during both breeding seasons, indicating breeding within 500m of the Proposed Development. A flock of over 100 mallard were recorded foraging on flooded grasslands within the Proposed Development in July 2023. A distance buffer of 50-100m is recommended for mallard during the breeding season (Goodship & Furness 2022). There is potential for disturbance to breeding mallard from the associated construction works. However, there is a volume of suitable alternative habitats within the immediate and surrounding locality. Additionally the majority of habitats within the Study Area where mallard are found are outside this buffer zone. No significant displacement effects are predicted.	Short-term **Slight Negative** Effect	The magnitude of the effect is assessed as **Low**. **Medium** sensitivity species + **Medium** Impact corresponds to a **Low** effect significance.
Operational Phase			
Direct Habitat Loss	Direct effects are not anticipated as no additional infrastructure is proposed upon completion of the construction phase.	**No** Effect	**No** Effect
Displacement & Barrier Effect	Mallard was recorded utilising habitats within 500m of the Proposed Development during both breeding seasons of 2022 and 2023. Mallard pairs were recorded during both breeding seasons, indicating breeding within 500m of the Proposed Development. There is potential for operational disturbance to mallard; however, taking the volume of suitable alternative breeding habitat within the immediate and surrounding locality. Flooding within fields utilised by mallard will be maintained post the construction phase. Therefore, no displacement of utilised habitat will occur. No significant displacement effects are predicted. No breeding season flightlines were recorded for mallard, indicating that the Proposed Development doesn't form an important commuting corridor to alternative habitat. No significant effects are predicted.	Long-term **Slight Negative** Effect	The magnitude of the effect is assessed as **Low**. **Low** sensitivity species + **Low** Impact corresponds to a **Very Low** effect significance.
Collision Mortality	This species was not recorded within the collision risk zone, therefore, has not been assessed in the Collison risk model.	**No** Effect	**No** Effect

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Table 11.23: Effects on avian KERs during Construction and Operation: Snipe

Snipe (All Seasons)			
	Potential Effects During Construction and Operation	**Significance of potential effect (EPA 2022)**	**Significance Matrix (Percival, 2003) Magnitude and Potential Significance of Effect**
Construction Phase			
Direct Habitat Loss	Snipe were frequently recorded during bird surveys between April 2021 and March 2024, with records of chipping snipe during the breeding season in 2022. Up to three snipe territories were potentially within 500m and one within the boundary of the Proposed Development. Snipe were also recorded utilising the footprint and within the 500m buffer of the Proposed Development. The loss of breeding and wintering habitat is minimal when considering the overall size of the Proposed Development. The habitats within the footprint of the site are not rare or unique, and there is a large number of suitable habitats within the immediate locality. No significant disturbance effects are predicted.	Short-term **Slight Negative** Effect	The magnitude of the effect is assessed as **Low**. **Low** sensitivity species + **Low** Impact corresponds to a **Very Low** effect significance.
Displacement	Research on the displacement of breeding snipe from wind energy projects suggests that snipe showed significant avoidance of turbines extending to 400m and that there is also evidence of avoidance of access tracks (Pearce-Higgins et al., 2009). In 2020, up to 3 snipe territories were identified within the site's footprint. In addition, snipes were recorded regularly during the winter season surveys, and the habitats present are suitable for wintering snipes. Construction associated disturbance will reduce the density of breeding and wintering snipe within the boundary of and around the margins of the Proposed Development.	Short-term **Slight** negative Effect	The magnitude of the effects is assessed as **Medium**. **Low** sensitivity species + **Medium** impact corresponds to a **Very Low** significance.

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Snipe (All Seasons)			
	Potential Effects During Construction and Operation	**Significance of potential effect (EPA 2022)**	**Significance Matrix (Percival, 2003)** **Magnitude and Potential Significance of Effect**
	Despite the disturbance, the site's habitat composition is not unique or rare within the area, and there is suitable alternative wintering and breeding habitat within the immediate and surrounding locality. No significant disturbance effects are predicted.		
	Operational Phase		
Direct Habitat Loss	Direct effects are not anticipated as no additional infrastructure is proposed upon completion of the construction phase.	**No** Effect	**No** Effect
Displacement & Barrier Effect	As mentioned previously, snipe have a 400m avoidance area around wind turbines during breeding season and have also, given evidence to suggest they avoid access tracks during the same period. In addition, it can reduce snipe breeding density by 50% within 400m of turbine (Pearce-Higgins et al, 2009). Taking this into account, there will be an acknowledgeable reduction in breeding snipe density within the footprint and the margins of the Proposed Development. It is not fully known the effects of an operational windfarm on wintering snipe however, upon completion, it's likely the surrounding habitat would remain suitable for winter utilisation. Despite, the disturbance the habitat composition within the site is not unique or rare within the area and there is suitable alternative wintering and breeding habitat within the immediate and surrounding locality post-construction.	Long-term **Slight** negative Effect	The magnitude of the effects is assessed as **Medium**. **Low** sensitivity species + **Medium** impact corresponds to a **Very Low** significance.

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Snipe (All Seasons)			
	Potential Effects During Construction and Operation	**Significance of potential effect (EPA 2022)**	**Significance Matrix (Percival, 2003)** **Magnitude and Potential Significance of Effect**
Collision Mortality	This species was recorded flying within the potential collision risk zone during VP surveys. A "Random" collision risk analysis has been undertaken and full details are provided in Appendix 11.3. It should be noted that the predicted number of transits and, thus, the predicted rate of collision for snipe may be underestimated; the flight movement of snipe is largely crepuscular in nature, and the VP surveys are mainly diurnal (SNH,2017). The collision risk has been calculated at a rate of 0.003 collisions per year or 0.1 birds throughout the lifespan of the Proposed Development. No definitive county population is available for Longford to cross-reference the total % loss from the Proposed Development. However, the figure <1 individual bird over the full lifespan of the Wind Farm and therefore, the collision risk impacts are negligible for this species.	Long-term **Imperceptible** Negative Effect	The magnitude of the effect is assessed as **Negligible**. The cross tablature of a **Low** sensitivity species and Negligible Impact corresponds to a **Very Low** effect significance.

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Table 11.24: Effects on avian KERs during Construction and Operation: Golden Plover (Wintering)

Golden Plover (Wintering)			
	Potential Effects During Construction and Operation	**Significance of potential effect (EPA 2022)**	**Significance Matrix (Percival, 2003) Magnitude and Potential Significance of Effect**
Construction Phase			
Direct Habitat Loss	No records of golden plover directly utilising the habitats within the boundary of the Wind Farm Project or within the 500m buffer in the full survey period of over 2.5 years. All golden plover records were that of flightlines in form of travelling. As such, there is no potential for impacts relating to habitat loss at the Proposed Development. No significant effects are predicted.	Short-term **Imperceptible Negative** Effect	The magnitude of the effects is assessed as **Negligible**. **Low** sensitivity species + **Negligible** Impact corresponds to a **Very Low** effect significance.
Displacement	No records of golden plover directly utilising the habitats for foraging or roosting within the boundary of the Wind Farm Project or within the 500m buffer in the full survey period of over 2.5 years. In addition, there is a volume of suitable alternative habitat within the immediate and surrounding locality i.e. wet and improved agricultural grassland, which limits the potential for significant displacement effects if they were to occur within proximity to the Proposed Development. Significant effects are not predicted.	Short-term **Imperceptible Negative** Effect	The magnitude of the effects is assessed as **Negligible**. **Low** sensitivity species + **Negligible** Impact corresponds to a **Very Low** effect significance.

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Golden Plover (Wintering)			
	Potential Effects During Construction and Operation	**Significance of potential effect (EPA 2022)**	**Significance Matrix (Percival, 2003)** **Magnitude and Potential Significance of Effect**
	Current research on the effects of disturbance on golden plover is limited in the fact that it largely is based upon pedestrian impacts however, its recommended that a buffer of 200-500m is required during non-breeding season (Goodship & Furness, 2022).		
	Operational Phase		
Direct Habitat Loss	Direct effects are not anticipated as no additional infrastructure is proposed upon completion of the construction phase.	**No** Effect	**No** Effect
Displacement & Barrier Effect	No records of golden plover directly utilising the habitats for foraging or roosting within the boundary of the Wind Farm Project or within the 500m buffer in the full survey period of over 2.5 years. All records of this species were birds travelling during vantage point surveys, 4 flightlines of this species were recorded with flocks of 15-35 existing. No patterns were identified from these flightlines and there is no indication of the Proposed Development being a corridor to alternative SPAs or wetland sites. In addition, there is a volume of suitable alternative habitats within the immediate and surrounding locality, i.e. wet and improved agricultural grassland, which limits the potential for significant displacement effects if they were to occur within proximity to the Proposed Development. Significant effects are not predicted.	Long-term **Imperceptible Negative** Effect	The magnitude of the effects is assessed as **Negligible**. **Low** sensitivity species + **Negligible** Impact corresponds to a **Very Low** effect significance.
Collision Mortality	The species was recorded flying within the potential collision risk zone during VP surveys. A "Random" collision risk analysis has been undertaken and full details are provided in Appendix 11.3. The collision risk assessment has followed a precautionary approach and utilises flight observations recorded across the winter season and the autumn and spring migration period (i.e. September to April inclusive).	Long-term **Imperceptible** Negative Effect	The magnitude of the effect is assessed as **Negligible**.

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Golden Plover (Wintering)			
	Potential Effects During Construction and Operation	**Significance of potential effect (EPA 2022)**	**Significance Matrix (Percival, 2003)** **Magnitude and Potential Significance of Effect**
	The collision risk has been calculated at a rate of 0.107 per annum. Research on annual mortality in adult golden plover shows that the estimated mortality per annum is 27% (Sandercock, 2003). If 0.107 collisions were to occur per year, it would cause an increase of 0.28% in mortality (based on c.390 county population) during the operational lifespan of the Proposed Development.		**Low** sensitivity species + **Negligible** Impact corresponds to a **Very Low** effect significance.

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Table 11.25: Effects on avian KERs during Construction and Operation: Herring Gull (Wintering)

Herring Gull (Wintering)			
	Potential Effects During Construction and Operation	**Significance of potential effect (EPA 2022)**	**Significance Matrix (Percival, 2003) Magnitude and Potential Significance of Effect**
Construction Phase			
Direct Habitat Loss	Herring gulls were not recorded utilising habitats within the direct footprint of the Proposed Development. As such, there is no potential for impacts relating to direct habitat loss within the proposed Development, and no significant effects are predicted.	Long-term **Imperceptible Negative** Effect	The magnitude of the effects is assessed as **Negligible**. **Low** sensitivity species + **Negligible** Impact corresponds to a **Very Low** effect significance.
Displacement	Observations of herring were recorded within and outside of the 500m buffer at the Proposed Development. Only one record of 14 birds was recorded during waterbird distribution surveys, which exhibited loafing/circling behaviour. All other records were birds flying/travelling only with no loafing behaviour; therefore, these flights are unlikely to be impacted by construction related noise. Furthermore, there is an alternative, suitable wintering habitat within the immediate and surrounding locality i.e. wet and improved agricultural grassland, which limits the potential for significant effects. Significant disturbance effects are not anticipated.	Short-term **Slight Negative** Effect	The magnitude of the effects is assessed as **Negligible**. **Low** sensitivity species + **Negligible** Impact corresponds to a **Very Low** effect significance.

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Herring Gull (Wintering)			
	Potential Effects During Construction and Operation	**Significance of potential effect (EPA 2022)**	**Significance Matrix (Percival, 2003)** **Magnitude and Potential Significance of Effect**
Operational Phase			
Direct Habitat Loss	Direct effects are not anticipated as no additional infrastructure is proposed upon completion of the construction phase.	**No** Effect	**No** Effect
Displacement & Barrier Effect	Herring gull was not recorded directly within the footprint of the Proposed Development. All records of this species occurred within or outside the 500m buffer and were travelling/flying apart from one record of 14 birds, which exhibited a loafing/circling behaviour in improved grassland. All other records consisted of 1-9 individuals during the winter season. No flight lines were recorded of this species throughout the 2.5 years of vantage points. Thus, no patterns were identifiable, and no corridors between other sites were recorded. Furthermore, there is an alternative, suitable wintering habitat within the immediate and surrounding locality, i.e. wet and improved agricultural grassland, which limits the potential for significant effects. Significant disturbance effects are not anticipated.	Long-term **Slight Negative** Effect	The magnitude of the effects is assessed as **Negligible**. **Low** sensitivity species + **Negligible** Impact corresponds to a **Very Low** effect significance.
Collision Mortality	No flightlines were recorded throughout the 2.5 years of vantage point surveys and therefore, no collision risk assessment was carried out for this species.	**No** Effect	**No** Effect

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11.7.4 Effects on avian KERs during Decommissioning

Table 11.26: Effects on avian KERs during Decommissioning: Herring Gull (Wintering)

Potential effects during the decommissioning phase of the Proposed Development		Significance of potential effect (EPA 2022)	Significance Matrix (Percival, 2003) Magnitude and Potential Significance of Effect
Decommissioning Phase			
Direct Habitat Loss	Direct effects are not anticipated as no additional infrastructure would be constructed.	**No** Effect	**No** Effect
Disturbance	As mentioned above, each species' construction phase as listed for each potential KER.	As above, for construction phase for each potential KER.	As above, for construction phase for each potential KER.

11.7.5 Effects Associated with the Turbine Delivery Route and Grid Connection Route

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To facilitate the delivery of large turbine components and other abnormal loads during the construction of the Proposed Development, this application includes the construction and alteration of existing local roads within the vicinity of the Proposed Development. Additionally, with grid connection route works will be required within the existing road network.

Most habitats along the turbine delivery route and grid connection routes consist of features of low ecological value (e.g., existing roads/tracks, agricultural land) and are unlikely to support species of conservation concern. As a precautionary measure, temporary displacement might occur during construction. However, the extensive availability of suitable habitat in the surrounding landscape suggests improbable significant displacement effects. The route is not anticipated to cause any substantial habitat loss or displacement of avian KERs. Following Percival (2003), the **Negligible** impact on avian KER translates to a **Low Effect** significance. The cross tablature of a **High** sensitivity species (e.g. whooper swan) and **Negligible** impact corresponds to a **Low Effect** significance. Whooper swan was used as an example as it is the highest sensitivity species identified as an avian KER at this site. The significance of the potential impact is classed as a **Short-term Slight Negative** effect following EPA criteria (2022).

11.8 Cumulative Impacts

11.8.1 Other Wind Farm Developments

The wind farm projects within a 25-kilometre radius of the Proposed Development are provided in Table 27 below and are presented in terms of their proximity to the Proposed Development and whether the project is permitted/operational or pending/under appeal. Only one permitted Wind Farm with 22 turbines and one operational windfarm with 20 turbines lie within 25km of the Proposed Development.

Table 11.27 Wind Farms within 25km of the development site Proposed Development

Wind Farm	Status	No. Of Turbines	Separation Distance of Nearest Turbines
Derryadd Wind Farm Bord Pleanála Case reference: PA14.303592	Refused It is understood that the applicant is currently preparing a new application for this site.	22 (previous application)	12.6km
Sliabh Bawn Wind Farm, Roscommon Planning Application Number Roscommon County Council: 10507	Operational	20	18.6km
Lissanore, Co Longford	Granted	1	14km

Planning Application Number Longford County Council: 10507			
Total Existing		20	
Total Permitted		1	

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The potential for the Proposed Development to result in significant cumulative or in combination effects when assessed alongside Derryadd Wind Farm, which is c. 12.6km from the nearest proposed turbine, was evaluated. While this application site was refused it is understood that the applicant is currently in the process of preparing a new application at this site; taking the precautionary approach, this site was assessed based on the existing information available in the EIAR and NIS prepared for the previous Derryadd Wind Farm application. The only possible pathway for cumulative impacts was via impacts to avian receptors. Derryadd Wind Farm shared the following key ornithological receptors with the Proposed Development: peregrine falcon, buzzard, kestrel, sparrowhawk, whooper swan, mute swan, mallard, golden plover, and snipe. The assessment of collision risk and displacement/barrier effect for the operational phase of this development was undertaken. The collision risk was assessed to be of low significance for the whooper swan, while sparrowhawk, golden plover, peregrine, mute swan, buzzard, snipe, and kestrel all were classed as very low significance (as per Percival, 2003). Other species that overlap with the Proposed Development, i.e., mallard, were not assessed in a collision risk assessment due to the low total number of flight lines for those species, thus negligible effects. Disturbance/displacement and barrier effects were assessed to be of low significance for peregrine falcon, very low significance for mute swan, snipe, sparrowhawk, kestrel, buzzard and medium significance for golden plover, whooper swan and mallard.

When taking the above information into account, as well as the location of Derryadd Wind Farm, the nature of the habitats, and the lack of significant residual impacts on bird species associated with the Proposed Development, when considered on its own, significant cumulative or in-combination effects on avian KERs regarding direct habitat loss, displacement or collision mortality are not anticipated.

The potential for the Proposed Development to result in significant cumulative or in combination effects when assessed alongside Sliabh Bawn Wind Farm, which is c. 18.6km from the nearest proposed turbine, was considered. Sliabh Bawn Wind Farm EIAR and NIS were reviewed as part of this process. When taking the above information into account, as well as the location and separation distance and the lack of significant residual impacts on bird species associated with the Proposed Development, when considered on its own, It was concluded that there were no significant cumulative barrier effects given the distances between the two Wind Farms (18.6km) and based on preferential waterbird migration routes over natural water bodies rather than across mountainous/hilly landscapes. It was also concluded that there were no significant cumulative effects from direct habitat loss, displacement and disturbance, given the separation distances between the two wind farms.

Lissanore shared the following avian KERs with the Proposed Development: peregrine falcon, buzzard, kestrel, sparrowhawk and snipe. None of these were noted as having residual impacts due to either the Proposed Development or the proposed Lissanore development.

Considering the separation distances, the lack of hydrological connectivity between the sites reviewed, and the absence of significant residual impacts on bird species associated with the Proposed Development, no significant cumulative impacts—whether from direct habitat loss, displacement, disturbance, barrier effect or collision mortality—are predicted.

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11.8.2 Other Local Projects Reviewed

A desktop planning history search was undertaken for permitted developments in the last five years and within 1.5 km of the Proposed Development. Planning applications older than five years have not been assessed as they have been deemed to either have expired or have been constructed (due to the standard five-year life of planning consent). Only minor developments listed below were identified within the local area of 1.5km of the Proposed Development.

Table 11.28 Other developments within 1.5km

LCC Reg Ref	Brief Description	Cumulative or in combination impacts predicted
2413	Quarry Application Location: Approximately 4.5 km northwest of the Proposed Development. 10-year permission granted by Longford County Council on 17.06.2020 for: • Continuation of aggregate extraction on 1.431 hectares. • Processing and loading of aggregates on 0.233 hectares. • Manufacture of ready-mix concrete in an existing plant (176 m²). • Importation and storage of sand for concrete manufacturing on 0.008 hectares. • Use of an existing weighbridge, wheel wash (154 m²), and site entrance (0.956 hectares). • Conditions: 16 conditions were applied, and no appeals were lodged. Environmental Impact Screening: Concluded no significant environmental effects; EIA not required. Appropriate Assessment Screening: Determined no significant effect on any Natura 2000 site, Stage 2 NIS not required.	None No source- pathway receptor connectivity exists between this development and the Proposed Development. No cumulative or in combination impacts are predicted.
2023006	Quarry Application Location: Immediate vicinity of the 2017 quarry application site.	None No source- pathway receptor connectivity exists between this development and the

	Blessington Stone & Concrete Plant Hire Application Proposed Development: 25-year permission for an 18.6-hectare development, including: • Rock extraction by blasting on 14.2 hectares to a level of 20mOD. • Erection of concrete batching plant, processing plant, block yard, and other facilities over 2.1 hectares. • Landscaping with planted berms on 1.6 hectares. • Entrance and access road on 0.7 hectares. • Restoration of site upon completion. Environmental Impact Assessment (EIA): Accompanied by EIAR. Application deemed invalid due to insufficient information for environmental assessment.	Proposed Development. No cumulative or in combination impacts are predicted.
19222 ABP Reg Ref 305969	Location: Approximately 6 km west of the Proposed Development. Solar Farm at Ballykenny, Co. Longford. Granted for a 19-hectare solar farm with 9 MW capacity. Environmental Impact Screening: Not accompanied by EIAR; NIS was prepared and accepted by ABP, ensuring no adverse impact on nearby European sites.	None No source- pathway receptor connectivity exists between this development and the Proposed Development. No cumulative or in combination impacts are predicted.
Ref 17/47, ABP Reg Ref 248470	Solar Farm Location: Approximately 4.5 km west of the Proposed Development. Solar Farm at Cleggil, Co. Longford. Location 10-year permission for a 19-hectare solar farm with 11.1 MW capacity. Environmental Impact Screening: Not accompanied by EIAR or NIS; ABP concluded no significant environmental effects, and a Stage 2 AA is not required.	None No source- pathway receptor connectivity exists between this development and the Proposed Development. No cumulative or in combination impacts are predicted.
16/81, ABP Reg Ref 246850	Solar Farm Location: Approximately 11.5 km southeast of the Proposed Development. Solar Farm at Lisnageeragh, Edgeworthstown, Ballinalee Road, Co. Longford. 10-year permission for a 14.5-hectare solar farm with 4.2 MVA capacity.	None No source-pathway receptor connectivity exists between this development and the Proposed Development. No cumulative or in combination impacts are predicted.

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	Environmental Impact Screening: Not accompanied by EIAR or NIS; ABP determined no significant effect on nearby European sites.	
ABP Reg Ref 313318	Strategic Housing Development Location: Approximately 11 km southeast of the Proposed Development. Bloomfield Park Strategic Housing Development (SHD) at Bracklin Road, Edgeworthstown: Granted for 100 residential units (50 houses, 50 apartments) with associated works, within Edgeworthstown's urban boundary. Environmental Impact Screening: EIA and NIS not required; AA screening concluded no likely significant effects on any European sites.	None No source-pathway receptor connectivity exists between this development and the Proposed Development. No cumulative or in combination impacts are predicted.

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11.9 Mitigation

This section describes the measures that are in place to mitigate adverse negative effects associated with the Proposed Development on avian receptors. Effects on avian receptors have been addressed in two ways:

- Design of the Proposed Development.
- Management of the development phases.

The relationship between wind energy developments and birds is variable and complex and depends on several factors, including the extent and type of development, associated topography, habitat type, bird species present, and their distribution and abundance in the area. As such, the location selected for wind energy projects and the siting of infrastructure with those project sites is important to minimise impacts on birds. Most potential impacts can be minimised or reduced by avoiding areas with sensitive habitats and key populations of vulnerable species.

11.9.1 Mitigation by Design

The Proposed Development has been meticulously designed to avoid, reduce, and minimise effects on avian Key Ecological Receptors (KERs) through a mitigation-by-design approach, guided by established literature, such as the Pearce-Higgins (2009) study. An iterative design process was employed, involving ongoing consultation among the developer and the design team—comprising the Project Manager, Project Engineers, Project Ecologists, and Project Ornithologists—to optimise the layout of the wind farm. This collaborative effort ensured that construction activities were avoided at sensitive locations and habitat loss for avian KERs was minimised at the source. The design prioritised situating the development footprint in the least ecologically sensitive areas, thereby adopting an avoidance-by-design strategy to reduce potential adverse effects on bird species.

The Proposed Development design has included the following measures to reduce the potential for significant effects on avian receptors:

- Avoidance and minimising infrastructure placement on habitats of high local value or above (NRA, 2009). Turbines and wind farm infrastructure are located away from the better quality and natural foraging and nesting habitats for species);
- Hard-standing areas have been designed to the minimum size necessary to support the anticipated turbine model,
- Construction of access roads and areas of hard standing will be kept to a minimum to reduce habitat loss as much as possible, and
- Where possible, direct habitat loss will be minimised by upgrading existing access tracks.

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11.9.2 Mitigation During Construction

The following section describes the mitigation and best practice measures to be implemented during each phase of the Proposed Development.

The general construction mitigation measures below will be followed:

- Displacement and/or disturbance impacts, and habitat degradation will be limited by controlling the movement of vehicles; vehicles will not encroach onto habitats beyond the Proposed Development footprint.
- Any vegetation clearance required, including the cutback and any clearance of hedgerows and scrub, will take place outside the breeding season (March to August, inclusive) unless permission is obtained from NPWS outside of these times.
- Where possible, construction will take place outside the breeding season to minimise disturbance and or displacement to breeding birds, but where works are necessary, there will be a commitment to undertake relevant pre-work checks by the ECoW/ornithologist;
- All plant and equipment will conform with the Construction Plant and Equipment Permissible Noise Levels Regulations 1996 (SI 359/1996) and other relevant legislation.
- Plant and equipment will be turned off when not in use, with no unnecessary revving.

11.9.2.1 Construction Environment Management Plan (CEMP)

A Construction and Environmental Management Plan (CEMP) has been prepared. The CEMP will be in place before the start of the construction phase and will address the requirements of any relevant planning conditions, including any additional mitigation measures conditioned by the competent authority. An Ecological Clerk of Works (ECoW) will be appointed for the project's construction phase. Duties will include:

- Deliver Tool Box Talks, informing on-site personnel of the ornithological and ecological sensitivities within the proposed development site;
- Liaise with Project Ornithologist/ECoW), discussing issues that may arise;
- Provide guidance to contractors to ensure the site is compliant with legislation and
- Liaising with NPWS, Local Authorities, other consenting authorities and other relevant bodies with regular updates concerning construction progress.

11.9.3 Operational Phase Mitigation

Once operational, the availability of suitable habitats in the area will not significantly decrease. Given the buffer distance from the Camlin and adjacent grasslands and the final turbine layout, no significant disturbance or displacement of avian species is anticipated. Collision Risk Assessment modelling indicated no greater than low impacts for any avian receptors, and no evidence of a barrier effect caused by the Proposed Development was identified. Therefore, no mitigation measures are required for the operational phase. However, monitoring in accordance with best practices is proposed; please see 11.10.1 below in addition to Appendix 11.4.

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11.9.4 Decommissioning Phase Mitigation

During the decommissioning phase, disturbance limitation measures will follow the construction phase described in section 11.9.2. In addition, if winter roosting or breeding activity of birds of high conservation concern is identified within monitoring activities, as described in section 11.10., no works shall be undertaken within a species-specific buffer (as per Goodship, N.M. and Furness, R.W. 2022), in line with industry best practice. No works shall be permitted within the buffer until it can be demonstrated that the roost/nest is no longer occupied.

11.10 Avian Monitoring

11.10.1 Pre-construction Monitoring

To minimise disturbance during the avian breeding season, construction activities will commence outside this period, which falls between 1st March and 31st August (inclusive).

Before commencing any work at the Study Area, a qualified ornithologist will undertake confirmatory bird surveys within one month of the start date. These surveys aim to identify any sensitive sites, such as roosting locations, within a 500-meter radius of the development footprint and all work areas where access permits.

If construction works extend into subsequent breeding or winter seasons following commencement, pre-construction surveys will be repeated to identify any new sensitive sites (e.g., nests). Additionally, breeding season surveys (where applicable) will be conducted once per month from April to July inclusive.

The ornithologist will conduct a thorough walkover survey of the development area. If winter roosts or nests of high conservation concern bird species are identified, the location will be earmarked for continued monitoring throughout the construction works.

Toolbox talks will inform all site personnel and subcontractors of any restrictions. A clear map demarcating the "no-work zone" will be provided to construction staff. The restricted area will also be physically marked on-site to alert personnel to the work suspension within that specific area.

11.10.2 Operational Phase Avian Monitoring

Bird surveys will continue during the operational phase at the VP locations used pre-construction, taking note of any bird behaviour indicative of avoidance or change of activity from baseline studies.

The timing and extent of bird surveys will be agreed with NPWS. If there are detectable changes in bird behaviour or collisions are greater than those predicted, then additional mitigation, such as curtailing operation times, may be required. A detailed Operational Avian Monitoring Programme has been prepared for the project's operational phase and can be seen in Appendix 11.4. The monitoring programme includes:

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- Breeding bird surveys
- Winter bird surveys; and
- Targeted bird collision surveys (corpse searches).

The monitoring programme was not proposed in response to any identified significant effect but rather as a best practice measure (SNH, 2009). The monitoring is comprehensive and considered entirely adequate in this regard.

11.10.3 Decommissioning Phase Avian Monitoring

Taking a precautionary approach, it is proposed that work commence outside the bird nesting season (1st of March to 31st of August inclusive). Decommissioning monitoring surveys will be undertaken prior to works associated with decommissioning at the Proposed Development. The surveys will include a thorough walkover survey of a 500m radius of the development footprint and all work areas. Any requirement for decommissioning works to run into the subsequent breeding season following commencement will be subject to a repeat of the decommissioning bird surveys to confirm the absence of breeding birds of conservation concern. If winter roosting or breeding activity of birds of high conservation concern is identified, the roost or nest site will be located and earmarked for monitoring at the beginning of the first winter or breeding season of the decommissioning phase. This will help inform the mitigation approach, as outlined in section 11.9.4.

11.10.4 Avian Monitoring Reporting

At the conclusion of each designated monitoring period, a report summarising the findings of bird and collision monitoring surveys will be submitted to the Planning Authority and the National Parks and Wildlife Service. This report will present the survey results, evaluate potential impacts on birds, with a particular focus on Avian KERs and offer recommendations that may guide additional mitigation measures during the operational phase of the Proposed Development.

11.11 Interactions

All of the potential significant effects of the Proposed Development and the measures proposed to mitigate them have been outlined above. However, for any development with the potential for significant environmental effects there is also the potential for interaction between these potential significant effects.

Ornithology and Water: Site activities during the construction phase have the potential to give rise to some water pollution, and consequential indirect effects on birds and their prey species (such as disturbance and deterioration of habitat quality due to impacts to water quality). The site activities during the construction phase would without mitigation likely to give rise to potential water quality

issues. Given the implementation of the measures set out in the surface water management plan (SWMP) and the CEMP. No adverse interactions are expected between water and Ornithology

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Ornithology and Air Quality and Climate During the operational phase, the proposed development will help offset carbon emissions from fossil fuel based electricity generation plants, which will help contribute to a slower increase in the rate of global warming and, consequently, could in combination with other renewable energy projects, contribute to preventing the loss of bird species from Ireland as a result of climate change.

Ornithology and Noise and Vibration Site activity during the construction phase could give rise to noise that could cause disturbance to birds that use the site, therefore, causing a temporary, slight, negative effect on ornithology. Best practice mitigation measures are included in Chapter 12 and Chapter 11 to minimise the potential negative effect of noise generated during the construction phase on ornithology.

Interactions of Ornithology and Landscape and Visual There will be no significant interaction between Ornithology and Landscape and Visual Impacts during the construction phase of the development, with the exception of site lighting during those portions of the construction period spanning winter months. This is a short-term, temporary impact and is addressed in the CEMP. There is no potential for interaction between Ornithology, in terms of Landscape Character, and Landscape and Visual during the operational phase of the development. There will be no significant light-spill from the site during the operational phase as the vast majority of site activity will occur during daylight hours and there will be little requirement for external lighting of the operations facilities.

11.12 Residual Effects

Significant residual impacts are impacts that remain once mitigation has been implemented or impacts that cannot be mitigated. As per Percival's 2003 criteria, an effect significance of greater than **Low** was not identified for any avian KER. As per EPA 2022 criteria, effect significance of greater than **Slight** was not identified for any avian KERs.

With the avoidance measures (design phase) and full implementation of mitigation measures throughout the project, significant negative residual effects on avian KERs are not expected.

11.13 Conclusion

This chapter thoroughly evaluates all potential scenarios that could impact avian Key Ecological Receptors (KERs) during the construction, operation, and decommissioning phases of the Proposed Development. The assessment considers both local effects and impacts on populations associated with designated areas, such as Special Protection Areas (SPAs) and important wetland sites. After accounting for residual effects following mitigation measures, it is concluded that the Proposed Development is unlikely to cause any significant adverse effects on the identified avian KERs. If the Proposed Development is carried out in line with the proposed design, best practices, and outlined mitigation measures, significant individual or cumulative impacts on any key avian receptors at the international, national, or county levels or on the identified avian KERs will not occur.

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CHAPTER 12
NOISE & VIBRATION

VOLUME II
ENVIRONMENTAL IMPACT ASSESSMENT REPORT

DECEMBER 2024

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12 Noise & Vibration

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12.1 Introduction

This chapter of the EIAR was prepared to assess the potential significant effects of the proposed development on environmental noise and vibration.

It should be read in conjunction with the Development Description chapter and the Traffic and Transport Chapter.

A glossary of acoustic terms is provided in Appendix 12.1

12.2 Expertise & Qualifications

This chapter of the EIAR has been prepared by Mike Simms of AWN Consulting.

Mike Simms (Principal Acoustic Consultant) holds a BE and MEngSc in Mechanical Engineering, and is a member of the Institute of Acoustics (MIOA) and of the Institution of Engineering and Technology (MIET). Mike has worked in the field of acoustics for over 20 years. He has extensive experience in all aspects of environmental surveying, noise modelling and impact assessment for various sectors including, wind energy, industrial, commercial and residential.

Mike Simms has carried out the noise and vibration assessment and been involved in the preparation of EIARs for the following projects:

- Brackyn Wind Farm, Co Westmeath. Baseline noise survey management, preparation of the noise and vibration chapter of the EIAR;
- Cahermurphy Wind Farm, Co Clare. Baseline noise survey management, preparation of the noise and vibration chapter of the EIAR and response to RFIs and Third-Party Submissions;
- Drumlins Park Wind Farm, Co Monaghan. Baseline noise survey management, preparation of the noise and vibration chapter of the EIAR.

12.3 Proposed Development

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A brief summary of the development is outlined below. A detailed description of the proposed development is contained within Chapter 2 of this EIAR and the Planning Statement that accompanies the application. The statutory notices should also be referred to.

A 10-year permission is being sought by Natural Forces Renewable Energy 2 Limited for the development of a 14MW wind farm on lands measuring 17.28ha located at the L5046 and L50462 in the townlands of Cloonanny Glebe, Corragarrow, Derryharrow and Gorteenorna, Co. Longford.

The proposed development will consist of the following:

(i) Demolition of a single-storey derelict shed structure (c. 93 sqm GFA) to facilitate the turbine haul route

(ii) Construction of two E175 EP5 wind energy converters, each with an electrical rating of 7MW, an overall ground-to-blade tip height of 199.9 metres, a rotor blade diameter of 175 metres, hub height of 112.4 metres, associated foundations and hard-standing areas;

(iii) Construction of an 800m permanent internal site access road which will run from the L50462 to the wind energy converter hardstanding areas including a 9.1m clear span bridge crossing a local stream;

(iv) Construction of 1 No. meteorological mast with a height of 32 metres, associated foundation and hardstanding area;

(v) Construction of 1 No. 20kV substation compound comprising 2 No. Modular Buildings each measuring 13.5 sqm in area and 3.5m in height, a Battery Energy Storage System (BESS) comprising 3 storage modules with a height of 2.8 metres and associated electrical works, foundation and hardstanding area;

(vi) Temporary alterations to the L5046 and L50462 public roads and temporary access roads to facilitate the turbine component haul route, including temporary widening of sections of the L5046 and L50462.

(vii) Installation of underground collector circuit and communications cabling in underground cable trenches, from the proposed wind energy converter to the proposed on-site substation;

(viii) All associated and ancillary site development, excavation, construction, and reinstatement works, including the provision of a temporary construction compound, site drainage, spoil management, fencing, lighting, hedge and operational maintenance and tree trimming and cutting.

(ix) This application is seeking a 35- year operational life from the date of commissioning of the entire wind farm.

The grid connection from the proposed on-site substation to the national electricity grid does not form part of the subject planning application. However, as part of the planning application process, this EIAR addresses three potential grid connection options currently considered to ensure a

comprehensive environmental assessment of all aspects of the Proposed Development. The grid connection will be via 1 of the 3 potential options outlined below:

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- Option 1 Connect the proposed development via (8.03km) to Richmond 110kV Substation
- Option 2 Connect the proposed development via (3.96km) to Longford 38kV Substation
- Option 3 Connect the proposed development via (5.85km) to Glebe 38kV Substation

It is anticipated that the grid connection from the Proposed Development will be by means of an underground cable connecting to one of the Substations identified above via the public road network. For bridge crossings, the cable will be located within the bridge deck, where there is insufficient depth and width available horizontal directional drilling (HDD) will be employed as an alternative.

Once the preferred route emerges it will be determined whether the grid connection falls within the category of exempted development under Class 26 of Schedule 2 in the Planning and Development Regulations 2001, as amended or requires planning permission, in which case an application will be made to the planning authority.

All elements of the proposed development as outlined above together with the turbine delivery route and grid connection options have been assessed as part of this EIAR.

12.3.1 Aspects Relevant to this Assessment

The potential impacts of the proposed development are considered in the following aspects:

- The short-term construction phase;
- The long-term operational phase of the wind turbines; and
- The long-term operational phase of the substation and Battery Energy Storage System (BESS).

12.4 Methodology

12.4.1 Relevant Legislation & Guidance

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

12.4.1.1 Construction Phase Noise

12.4.1.1.1 General Construction Works

There is no published statutory Irish guidance relating to the maximum permissible noise level that may be generated during the construction phase of a project. Local authorities normally control construction activities by imposing limits on the hours of operation and may consider noise limits at their discretion.

In the absence of specific noise limits, appropriate criteria relating to permissible construction noise levels for a development of this scale may be found in the BS5528-1 (BSI 2014a).

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

applied to each category. Exceedances (construction noise only) of the threshold value, at the facade of a noise-sensitive location (NSL) during construction, indicates a potential significant noise impact associated with the construction activities. The threshold values recommended by BS5228-1 (BSI 2014a) are depicted in Table 12.1.

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

Table 12.1 Example Threshold Potential Significant Effect at Dwellings

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

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

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

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

For 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 would indicate that the categories detailed in Table 12.2 are appropriate in terms of the nearest noise sensitive locations being considered in this instance. This assessment method is valid for residential properties but is not considered appropriate for setting construction noise threshold for commercial receptors.

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 12.2 Baseline Noise Categories and associated Construction Noise Thresholds

Based on the above the construction noise criterion of 65 dB $L_{Aeq,1hr}$ is proposed for the site, for weekdays between 07:00 hrs and 19:00 hrs and Saturdays between 07:00 hrs and 13:00 hrs.

12.4.1.1.2 Linear Construction Works

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

In relation to an appropriate fixed noise limit value, BS 5228-1 paragraph E.2 states:

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

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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".*

This construction noise criterion is similar to that in the Transport Infrastructure Ireland (TII) (formerly National Roads Authority (NRA)) document Guidelines for the Treatment of Noise and Vibration in National Road Schemes (TII, 2014) construction noise limits of 70 dB $L_{Aeq,1hr}$. for weekday periods (Monday to Friday 0700 – 1900 hrs) and 65 dB $L_{Aeq,1hr}$. on Saturdays (08:00 to 16:30hrs).

In this assessment, a Construction Noise Threshold of 70 dB $L_{Aeq,T}$ is adopted for the Proposed Grid Connection underground cabling works and the Temporary Widening Works.

12.4.1.1.3 Interpretation of the CNT

In order to assist with interpretation of Construction Noise Thresholds (CNTs), Table 12.3 includes guidance as to the likely magnitude of impact associated with construction activities and the corresponding Construction Noise Level (CNL), relative to the CNT. This guidance is derived from Table 3.16 of DMRB: Noise and Vibration and adapted to include the relevant significance effects from the EPA Guidelines (EPA 2022).

Construction Noise Level	Magnitude of Impact (DMRB)	EPA Significance of Effect	Determination
Below or equal Baseline Noise Level	Negligible	Not Significant	Depending on range of CNL and baseline noise level
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 12.3 Description of the magnitude of impacts. Adapted from DMRB Table 3.16

12.4.1.1.4 Additional Vehicular Activity on Public Roads Construction Phase

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

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

Table 12.4, taken from DMRB offers guidance as to the likely short term impact associated with any change in traffic noise level.

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Change in Sound Level (dB L_{A10})	Magnitude of Impact
0	No change
0.1 – 0.9	Negligible
1 – 2.9	Minor
3 – 4.9	Moderate
5+	Major

Table 12.4 Likely Impacts Associated with Change in Traffic Noise Level (Source DMRB, 2020).

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

12.4.1.1.5 Potential Significant Impacts – consideration of duration

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.

This consideration of the duration of the works is especially relevant for linear construction works.

12.4.1.1.6 Construction Phase Vibration

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

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

- BS 7385 – Evaluation and measurement for vibration in buildings – Part 2: Guide to damage levels from groundborne vibration (BSI, 1993) (BS7385).
- BS 5228-2:2009+A1:2014 – Code of practice for noise and vibration control on construction and open sites – Part 2: Vibration (BSI, 2014) (BS5228-2).

BS7385 states that there should typically be no cosmetic damage if transient vibration does not exceed 15 mm/s at low frequencies rising to 20 mm/s at 15 Hz and 50 mm/s at 40 Hz and above. These guidelines relate to relatively modern buildings and should be reduced to 50% or less for more critical buildings.

BS5228-2 recommends that, for a soundly constructed residential properties and similar structures that are generally in good repair, a threshold for minor or cosmetic (i.e., non-structural) damage should be taken as a peak particle velocity of 15 mm/s for transient vibration at frequencies below 15 Hz and 20 mm/s at frequencies above than 15 Hz. Below these vibration magnitudes minor damage is unlikely, although the standard notes that where there is existing damage these limits may be reduced

by up to 50%. In addition, where continuous vibration is such that resonances are excited within structures the limits discussed above may need to be reduced by 50%.

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The Transport Infrastructure Ireland (TII) (formerly National Roads Authority (NRA) publication Guidelines for the Treatment of Noise and Vibration in National Road Schemes (NRA, 2004) also contains information on the permissible construction vibration levels during the construction phase as shown in Table 12.5.

Allowable vibration (in terms of peak particle velocity) at the closest part of sensitive property to the source of vibration, at a frequency of		
Less than 10Hz	**10 to 50Hz**	**50 to 100Hz (and above)**
8 mm/s	12.5 mm/s	20 mm/s

Table 12.5 Allowable Vibration at Sensitive Properties (NRA, 2004)

Following review of the guidance documents set out above, the values in Table 12.5 are considered appropriate for this assessment as they provide more stringent vibration criteria.

12.4.1.2 Operational Phase Noise

The noise assessment documented in this chapter is based on guidance in relation to acceptable levels of noise from wind farms as contained in the document *Wind Energy Development Guidelines* for Planning Authorities published by the Department of the Environment, Heritage and Local Government in 2006. These guidelines are in turn based on detailed recommendations set out in the Department of Trade and Industry (UK) Energy Technology Support Unit (ETSU) publication *The Assessment and Rating of Noise from Wind Farms* (1996). The ETSU document has been used to supplement the guidance contained within the *Wind Energy Development Guidelines* publication where necessary.

12.4.1.2.1 The Assessment and Rating of Noise from Wind Farms – ETSU-R-97

As stated previously the core of the noise guidance contained within the Wind Energy Development Guidelines is based on the 1996 ETSU publication The Assessment and Rating of Noise from Wind Farms (ETSU-R-97).

ETSU-R-97 calls for the control of wind turbine noise by the application of noise limits at the nearest noise sensitive properties. ETSU-R-97 considers that absolute noise limits applied at all wind speeds are not suited to wind turbine developments and recommends that noise limits should be set relative to the existing background noise levels at noise sensitive locations. A critical aspect of the noise assessment of wind turbines relates to the identification of background noise levels through on-site noise surveys.

ETSU-R-97 states on page 58, "*…absolute noise limits and margins above background should relate to the cumulative effect of all wind turbines in the area which contribute to the noise received at the properties in question…*". Therefore, the noise contribution from all wind turbine development in the area should be included in the assessment.

The ETSU-R-97 guidance allows for a higher level of turbine noise operation at properties that have an involvement in the development, both as a higher fixed level of 45 dB L_{A90} and/or a higher level above the prevailing background noise level.

12.4.1.2.2 Wind Energy Development Guidelines for Planning Authorities

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Section 5.6 of the Wind Energy Development Guidelines for Planning Authorities published by the Department of the Environment, Heritage and Local Government (2006) addresses noise and outlines the appropriate noise criteria in relation to wind farm developments.

The following extracts from this document should be considered:

> *"An appropriate balance must be achieved between power generation and noise impact."*

While this comment is noted it should be stated that the Guidelines give no specific advice in relation to what constitutes an 'appropriate balance'. In the absence of this, guidance will be taken from alternative and appropriate publications.

> *"In the case of wind energy development, a noise sensitive location includes any occupied house, hostel, health building or place of worship and may include areas of particular scenic quality or special recreational importance. Noise limits should apply only to those areas frequently used for relaxation of activities for which a quiet environment is highly desirable. Noise limits should be applied to external locations and should reflect the variation in both turbine source noise and background noise with wind speed."*

As can be seen from the calculations presented later in this chapter the various issues identified in this extract have been incorporated into our assessment.

> *"In general, a lower fixed limit of 45dB(A) or a maximum increase of 5dB(A) above background noise at nearby noise sensitive locations is considered appropriate to provide protection to wind energy development neighbours."*

This represents the commonly adopted daytime noise criterion curve in relation to wind farm developments. However, an important caveat should be noted as detailed in the following extract.

> *"However, in very quiet areas, the use of a margin of 5dB(A) above background noise at nearby noise sensitive properties is not necessary to offer a reasonable degree of protection and may unduly restrict wind energy developments which should be recognised as having wider national and global benefits. Instead, in low noise environments where background noise is less than 30dB(A), it is recommended that the daytime level of the LA90, 10min of the wind energy development be limited to an absolute level within the range of 35 – 40dB(A)."*

In relation to night time periods the following guidance is given:

> *"A fixed limit of 43dB(A) will protect sleep inside properties during the night."*

This limit is defined in terms of the $L_{A90,10}$min parameter. This represents the commonly adopted night-time noise criterion curve in relation to wind farm developments.

In summary, the Wind Energy Development Guidelines outlines the following guidance to identify appropriate wind turbine noise criteria curves at noise sensitive locations:

- An appropriate absolute limit level in the range of 35 – 40 dB L_{A90} for quiet daytime environments with background noise levels of less than 30 dB $L_{A90,10min}$;

- 45 dB $L_{A90,10min}$ or a maximum increase of 5 dB above background noise (whichever is higher), for daytime environments with background noise levels of not less than 30 dB $L_{A90,10min}$ and;
- 43 dB $L_{A90,10min}$ for night time periods.

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While the caveat of an increase of 5dB(A) above background for night-time operation is not explicit within the current guidance it is commonly applied in noise assessments prepared and is detailed in numerous examples of planning conditions issued by local authorities and An Bord Pleanála.

12.4.1.2.3 Institute of Acoustics Good Practice Guide

The original ETSU-R-97 concepts underwent a thorough standardisation and modernisation in 2013 with the Institute of Acoustics publication of A Good Practice Guide to the Application of ETSU-R-97 for the Assessment and Rating of Wind Turbine Noise (IOA GPG) including 6 Supplementary Guidance Notes. These documents bring together the combined experience of acoustic consultants in the UK and Ireland in the application of the assessment methods. Numerous improvements in the accuracy and robustness are described the treatment of wind shear and the general adaptation to larger wind turbines. The guidance contained within IOA GPG, and its Supplementary Guidance Notes are considered to represent best practice and have been adopted for this assessment.

The IOA GPG states, that at a minimum continuous baseline noise monitoring should be carried out at the nearest noise sensitive locations for typically a two-week period and should capture a representative sample of wind speeds in the area (i.e., cut in speeds to wind speed of rated sound power of the proposed turbine). Background noise measurements (i.e., $L_{A90,10min}$) should be related to wind speed measurements that are collated at the site of the wind turbine development. Regression analysis is then conducted on the data sets to derive background noise levels at various wind speeds to establish the appropriate day and night time noise criterion curves.

Noise emissions associated with the wind turbines can be predicted in accordance with ISO 9613: Acoustics – Attenuation of sound outdoors, Part 2: General method of calculation (2024). This is a noise prediction standard that considers noise attenuation offered, amongst others, by distance, ground absorption, directivity, and atmospheric absorption. Noise predictions and contours are typically prepared for various wind speeds and the predicted levels are compared against the relevant noise criterion curve to demonstrate compliance with the appropriate noise criteria.

Where noise predictions indicate that reductions in noise emissions are required to satisfy any adopted criteria, consideration can be given to detailed downwind analysis and operating turbines in low noise mode, which is typically offered by modern wind turbine units.

For guidance on the methodology for the background noise survey and operation impact assessment for wind turbine noise the IOA GPG has been adopted.

The IOA GPG states that cumulative noise exceedances should be avoided and where existing or permitted development is at the noise limit, any new turbine noise sources should be designed to be 10 dB below the limit value.

Section 5.1 of the relevant IOA GPG states the following:

> *"5.1.1 ETSU-R-97 states at page 58, "…absolute noise limits and margins above background should relate to the cumulative effect of all wind*

turbines in the area which contribute to the noise received at the properties in question…"

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5.1.2 *The HMP Report states that "If an existing wind farm has permission to generate noise levels up to ETSU-R-97 limits, planning permission noise limits set at any future neighbouring wind farm would have to be at least 10 dB lower than the limits set for the existing wind farm to ensure there is no potential for cumulative noise impacts to breach ETSU-R-97 limits (except in such cases where a higher fixed limit could be justified)". Such an approach could prevent any further wind farm development in the locality, and a more detailed analysis can be undertaken on a case by case basis.*

5.1.3 *As with the assessment of noise for all wind farm developments, sequential steps need to be taken, but such steps require more detailed attention due to the added complexity of cumulative noise impacts. The advice of the EHO could be invaluable to this part of the assessment.*

Cumulative impact assessment necessary

5.1.4 *During scoping of a new wind farm development consideration should be given to cumulative noise impacts from any other wind farms in the locality. If the proposed wind farm produces noise levels within 10 dB of any existing wind farm/s at the same receptor location, then a cumulative noise impact assessment is necessary.*

5.1.5 *Equally, in such cases where noise from the proposed wind farm is predicted to be 10 dB greater than that from the existing wind farm (but compliant with ETSU-R-97 in its own right), then a cumulative noise impact assessment would not be necessary."*

12.4.1.2.4 Future Potential Guidance Changes

The 2006 Wind Energy Development Guidelines were issued by the Minister pursuant to section 28 of the 2000 Act which, so far as relevant, provides: "(*1) The Minister may, at any time, issue guidelines to planning authorities regarding any of their functions under this Act and planning authorities shall have regard to those guidelines in the performance of their functions ... (2) Where applicable, the Board shall have regard to any guidelines issued to planning authorities under subsection (1) in the performance of its functions.*"

Section 143 of the 2000 Act provides that: –

"(1) The Board shall, in performing its functions, have regard to – (a) the policies and objectives for the time being of the Government, a State authority, the Minister, planning authorities and any other body which is a public authority whose functions have, or may have, a bearing on the proper planning sustainable development of cities, towns or other areas, whether urban or rural."

The 2006 Guidelines are accordingly the guidelines that must be considered, and not any drafts. As per the High Court decision in Element Power Ireland Ltd v An Bord Pleanála (2017) nothing in the planning legislation, authorises the planning authorities to take into account drafts, or the prospect of new or modified government or local authority policy or objectives. Without prejudice to that

background, in December 2019, the Draft Revised Wind Energy Development Guidelines December 2019 (DRWEDG19) were published for consultation and have yet to be finalised. It is important to note that as part of the public consultation several concerns in relation to the proposed approach have been expressed by various parties and it is the opinion of the authors of this assessment that the DRWEDG19 document does not outline a best practice approach in terms of the assessment of wind turbine noise. Specific concerns expressed by a cross-party group of interested professionals can be reviewed at:

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> *https://www.ioa.org.uk/wind-energy-development-guidelines-wedg-consultation-irish-department-housing-planning-community-and*
>
> *https://tneigroup-com.stackstaging.com/wp-content/uploads/2022/05/WEDG-consultation-joint-response-R0.pdf*

The following statement is of note from the above submission:

> *"a number of acousticians working in the field have raised serious concerns over the significant amount of technical errors, ambiguities and inconsistencies in the content of the draft WEDG and these were highlighted during the consultation process by a group of acousticians"*

Therefore, in line with best practice, which includes ESTU and IOA methodologies as described above the assessment presented in the EIAR is based on the current best practice guidance outlined in Section 5.6 of the Wind Energy Development Guidelines for Planning Authorities, 2006 (WEDG06).

If updated Wind Energy Guidelines are published during the application process for the Proposed Development it is anticipated that any relevant changes affecting the noise will be addressed through an appropriate planning condition, or where a supplementary assessment is necessary, through provision of additional information.

12.4.1.2.5 Noise criteria for Substation and BESS

British Standard Institute (BSI) BS 8233: 2014: Guidance on Sound Insulation and Noise Reduction for Buildings (BSI, 2014), provides guideline values for internal noise levels within residential dwellings. The standard provides recommendations for indoor ambient noise levels as presented in Table 12.6:

Activity	Location	Daytime (07:00 to 23:00hrs)	Night-time (23:00 to 07:00hrs)
Resting	Living room	35 dB $L_{Aeq, 16hour}$	-
Dining	Dining room/area	40 dB $L_{Aeq, 16hour}$	-
Sleeping (daytime resting)	Bedroom	35 dB $L_{Aeq, 16hour}$	30 dB $L_{Aeq, 8hour}$

Table 12.6 BS 8233 Indoor Noise Levels

The BS 8233:2014 values are broadly in line with the values as presented in the WHO Guidelines for Community Noise 1995, which are also presented below in Table 12.7:

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Specific Environment	Critical Health Effect(s)	dB LAeq,T
Dwelling indoors	Speech intelligibility and moderate annoyance, daytime and evening	35 dB $L_{Aeq, 16hour}$
Inside bedrooms	Sleep disturbance, night-time	30 dB $L_{Aeq, 8hour}$

Table 12.7 WHO Indoor Noise Levels

It is appropriate to derive external noise limits based on the internal criteria noted above. This is carried out by factoring in the degree of noise reduction afforded by a partially open window. Annex G in BS 8233:2014 comments that, if partially open windows were relied upon for background ventilation, the noise insulation would be reduced to approximately 15 dB.

It is also acknowledged that the level difference through a window partially open for ventilation can vary depending on the window type and this is nominally deemed to fall in the range of 10 to 15 dB. Therefore, an inside-to-outside level difference in the range of between 10 to 15 dB is appropriate to define maximum external operational criteria.

12.4.1.2.5.1 Recommended Criteria

Following the evaluation of relevant guidance, the following noise criteria are proposed at the façades of residential properties in the vicinity of the proposed development:-

- Daytime (07:00 to 23:00 hours): 45-50 dB $L_{Aeq, 16hr}$; and
- Night time (23:00 to 07:00 hours): 40-45 dB $L_{Aeq, 8hr}$.

It should be noted that equipment and plant noise emissions will be selected such that they are no tonal and do not have impulsive characteristics at noise sensitive locations.

12.4.2 Site Surveys/Investigations

An environmental noise survey was undertaken to determine typical background noise levels at representative NSLs surrounding the development site. The background noise survey was conducted through the installation of unattended sound level meters at three representative locations in the surrounding area.

All measurement data collected during the background noise surveys has been carried out in accordance with the Institute to Acoustic's Good Practice Guide to the Application of ETSU-R-97 for the Assessment and Rating of Wind Turbine Noise (IoA GPG, 2013) and accompanying Supplementary Guidance Note 1: Data Collection (2014) discussed in the following Sections.

The NSLs are spread over a large area and the noise monitoring locations were selected to obtain background noise levels representative of the noise environments at noise sensitive locations surrounding the site.

12.4.2.1 Choice of Measurement Locations

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The noise monitoring locations were identified by preparing a preliminary noise model contour at an early stage of the assessment. Locations were selected generally on proximity to the proposed wind turbines. The selection of the noise monitoring locations was informed by a site visit and supplemented by reviewing aerial images of the study area and other online sources of information (e.g., Google Earth and OSI Maps).

The co-ordinates for selected locations for the noise monitoring are outlined in Table 12.8 and depicted on the map in Figure 12.1.

Name	Easting	Northing
A	615039	778704
B	616120	777245
C	614640	777159

Table 12.8 Noise Measurement Co-ordinates (ITM)

Site visits by survey personnel were carried out during the morning and afternoon time; during these visits, primary noise sources contributing to noise build-up were noted. In respect of night-time periods, when noise due to traffic on local roads, agricultural activities and other sources tend to reduce, there was no indication of any significant local night-time sources of noise at any location.

No significant sources of vibration were noted at any of the survey locations.

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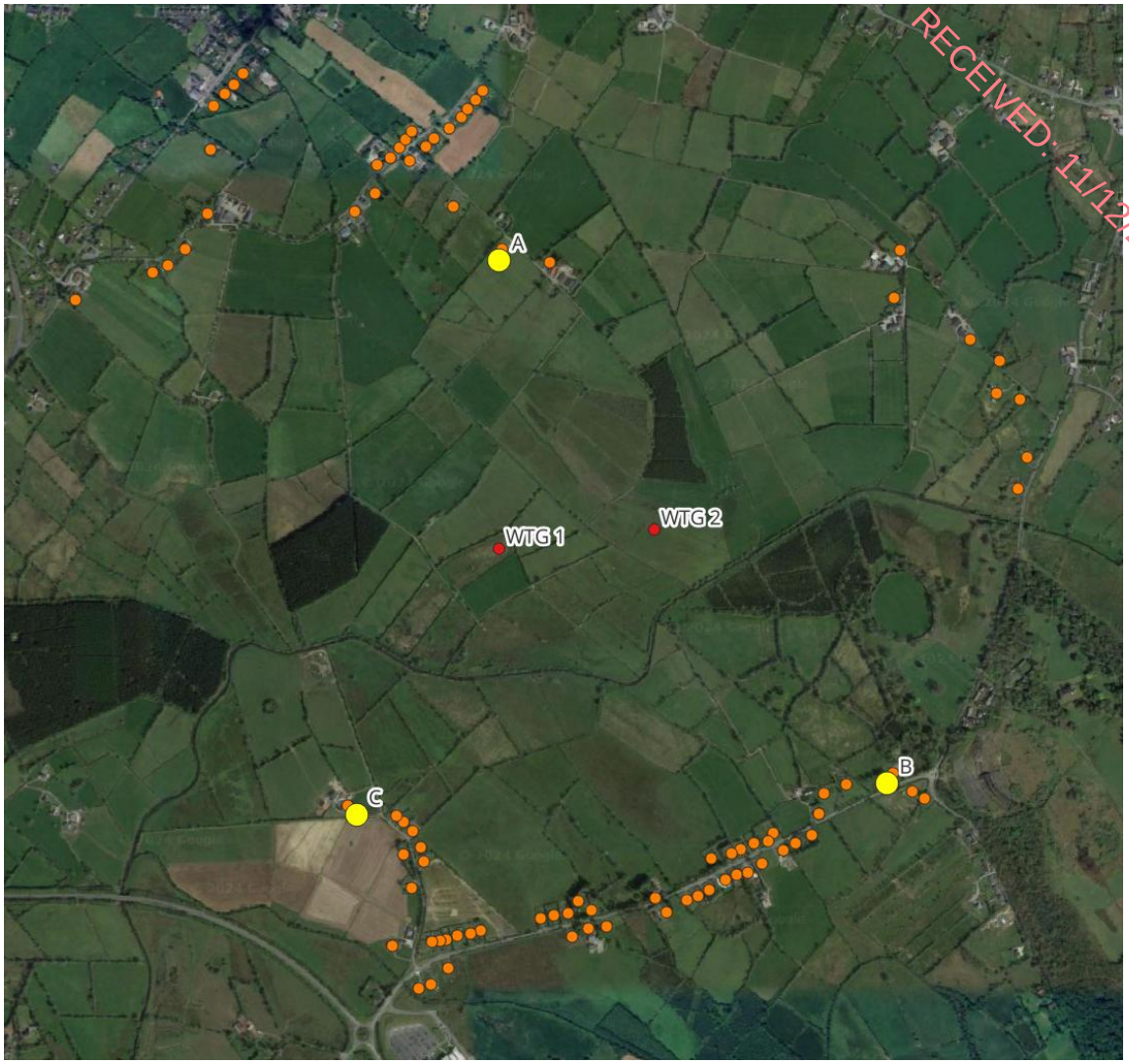


Figure 12.1 Noise Survey Locations

Figures 12.2 to 12.4 illustrate the installed noise monitoring kits at each location. Distances in the following descriptions of the locations are approximate.

12.4.2.1.1 Location A (H026)

At Location A, the noise monitor was positioned 25 m to the north of the house at location H010, and 60 m from the local road. Audible noise sources were birdsong, wind-generated noise in foliage and occasional vehicle movements.


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Figure 12.2 Noise Monitoring Installation – Location A

12.4.2.1.2 Location B (H004)

At Location B, the noise monitor was positioned 25 m to the southwest of the house at location H004, and 15 m from the local road. Audible noise sources were birdsong, wind-generated noise in foliage.



Figure 12.3 Noise Monitoring Installation – Location B

12.4.2.1.3 Location C (H068)

At Location C, the noise monitor was positioned 32 m to the southeast of farm buildings, at the end of a lane leading to the dwelling. The main source of noise was low-level wind generated noise in the surrounding foliage.


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Figure 12.4 Noise Monitoring Installation – Location C

12.4.2.2 Measurement Periods

The survey duration was typically 4 weeks, or until such time that enough data points were captured at each survey locations. Section 2.9.1 of the IOA GPG states:

> *"The duration of a background noise survey is determined only by the need to acquire sufficient valid data over the range of wind speeds (and directions, if relevant). It is unlikely that this requirement can be met in less than 2 weeks."*

AWN conducted an ongoing review of the survey data at regular intervals to establish when adequate data had been captured.

Noise measurements were conducted at relevant monitoring locations over the following periods:

Name	Start Time	End Time
A	11:40 on 26 April 2024	03:40 on 28 May 2024
B	12:20 on 26 April 2024	11:20 on 6 June 2024
C	13:00 on 26 April 2024	22:50 on 26 June 2024

Table 12.9 Noise Measurement Periods

A variety of wind speed and weather conditions were encountered over the survey periods in question. As an indication to this, Figure 12.5 shows the distribution of wind speed and direction recorded for all periods of day and night for the period between 26 April to 26 June 2024. The wind speed data presented below relates to a turbine hub height of 112.4 m which is the proposed turbine hub height.

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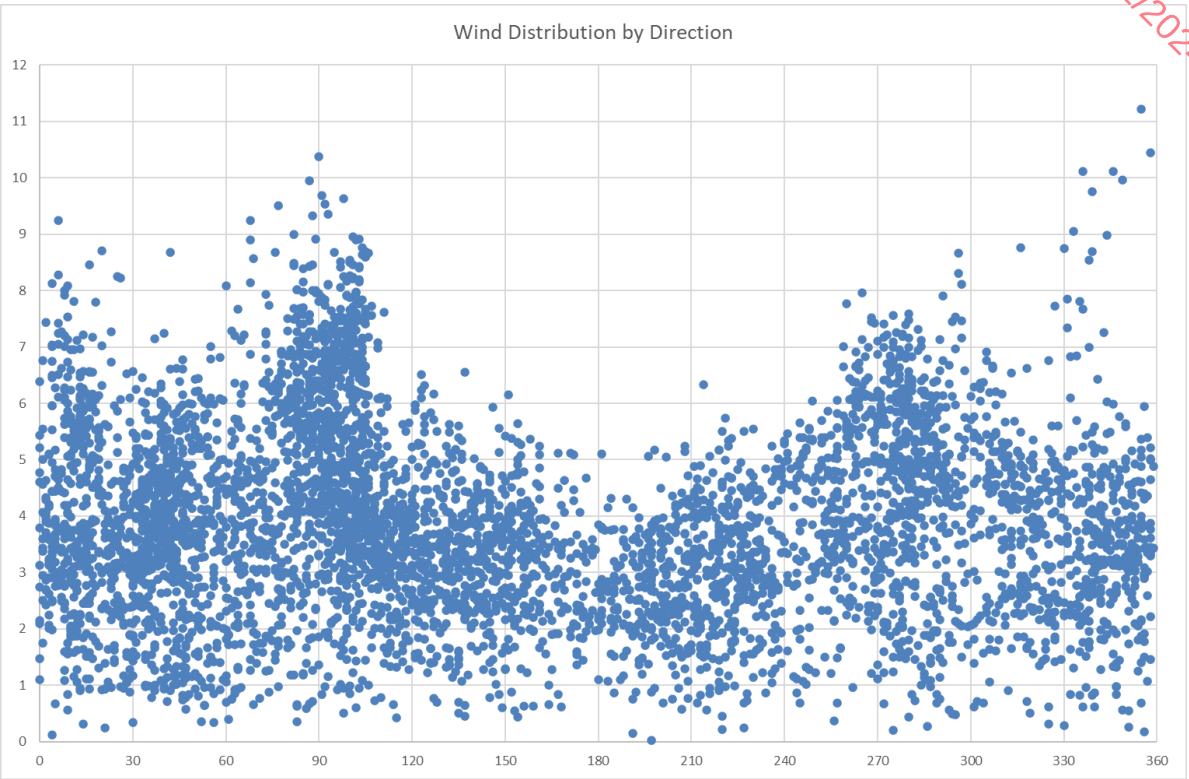


Figure 12.5 Distribution of Wind Speeds and Direction

12.4.2.3 Personnel and Instructions

AWN Consulting installed and removed the noise monitors at all locations. Battery checks and meter calibrations were carried out part-way through the survey periods. The following instrumentation was used at the various locations:

Location	Equipment	Serial Number	Calibration Date
A	Rion NL-52	998409	February 2024
B	Rion NL-52	998411	February 2024
C	Rion NL-52	998410	February 2024

Table 12.10 Instrumentation Details

Before and after the survey the measurement apparatus was check calibrated using a sound level calibrator where appropriate. Instruments were calibrated on each interim visit and any drift noted. Relevant calibration certificates are presented in Appendix 12.2.

Rainfall was monitored and logged using two Texas Instruments TR-525 console and a data logger that were installed at Locations A and B for the duration of the surveys. This allows for the identification of periods of rain fall to allow for the removal sample periods affected by rainfall from the noise monitoring data sets in line with best practice when calculating the prevailing background noise levels.

Wind data was measured at an on-site met mast. The ITM coordinates of the wind measurement were Easting 614909, Northing 778254. Wind data was supplied to AWN for data analysis.

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12.4.2.4 Procedure

Measurements were conducted at the three locations over the survey periods outlined in Table 12.9. Data samples for all measurements (noise, rainfall and wind) were logged continuously at 10-minute interval periods for the duration of the survey.

12.4.2.5 Analysis of Background Noise Data

The data sets have been filtered to remove issues such as the dawn chorus and the influence of other atypical noise sources. An example of atypical sources would be short, isolated periods of raised noise levels attributable to local sources, agricultural activity, boiler flues, operation of gardening equipment etc. In addition, sample periods affected by rainfall or when rainfall resulted in prolonged periods of atypical noise levels have also been screened from the data sets. The assessment methods outlined above are in line with the guidance contained in the IoA GPG.

The results presented in the following sections refer to the noise data collated during 'quiet periods' of the day and night as defined in the IoA GPG. These periods are defined as follows:

Daytime Amenity hours are:

- all evenings from 18:00 to 23:00hrs;
- Saturday afternoons from 13:00 to 18:00hrs;
- all day Sunday from 07:00 to 18:00hrs; and
- Night-time hours are 23:00 to 07:00hrs.

12.4.2.6 Consideration of Wind Shear

Wind shear is defined as the increase of wind speed with height above ground. As part of a robust wind farm noise assessment due consideration should be given to the issue of wind shear. The issue of wind shear has been considered in this assessment and followed relevant guidance as outlined in the IoA GPG. It is standard procedure to reference noise data to standardised 10 metre height wind speed.

Wind speed measurements at 80 m and 60 m heights have been corrected to a height of 112.4 m (the hub height adopted for the noise assessment) in accordance with Method B of Section 2.6 of the IOA GPG. The calculated hub height wind speeds were then corrected to standardised 10 metre height wind speed.

The IoA GPG presents the following equations in relation to the derivation of a standardised wind speed at 10 m above ground level:

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Shear Exponent Profile: $U = U_{ref} [(H / H_{ref})]^m$

Where:

U	Calculated wind speed
U_{ref}	Measured HH wind speed.
H	Height at which the wind speed will be calculated.
H_{ref}	Height at which the wind speed was measured.
m	shear exponent = $\log(U/U_{ref})/\log(H/H_{ref})$

The Calculated hub height wind speeds have been standardised to 10 m height using the following equation:

Roughness Length Shear Profile: $U_1 = U_2 \times [(\ln(H_1/z))/ (\ln(H_2/z))]$

Where:

H_1	The height of the wind speed to be calculated (10m)
H_2	The height of the measured or calculated HH wind speed.
U_1	The wind speed to be calculated.
U_2	The measured or calculated HH wind speed.
z	The roughness length.

Note: A roughness length of 0.05m is used to standardise hub height wind speeds to 10 m height in the IEC 61400-11:2003 standard, regardless of what the actual roughness length seen on a site may have been. This 'normalisation' procedure was adopted for comparability between test results for different turbines.

Any reference to wind speed in this chapter should be understood to be the standardised 10 m height wind speed reference unless otherwise stated.

12.4.3 Turbine Noise Calculations

A series of computer-based prediction models have been prepared to quantify the noise level associated with the operation of the Proposed Development. This section discusses the methodology for the noise modelling process.

12.4.3.1 Noise Modelling Software

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Proprietary noise calculation software was used for the purposes of this impact assessment. The selected software, DGMR iNoise Enterprise, calculates noise levels in accordance with ISO 9613: Acoustics – Attenuation of sound outdoors, Part 2: General method of calculation, (ISO, 2024).

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

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

12.4.3.2 Input Data and Assumptions

The calculation settings, input data and any assumptions made in the assessment are described in the following sections. Additional information relating to the noise model inputs and calculation settings is provided in Appendix 12.3.

12.4.3.3 Turbine Details

Table 12.11 details the co-ordinates of the 2 No. proposed turbines that are considered in this assessment.

Turbine Ref	Easting	Northing
T1	615036	777906
T2	615470	777952

Table 12.11 Noise Measurement Co-ordinates (ITM)

In terms of predicting noise levels at noise-sensitive locations however, the turbine technology is described by two parameters:

- The hub height, and
- The sound power level.

The turbine type assessed is the Enercon E175 7MW. The turbine is a pitch regulated upwind turbine with a three-blade rotor with a hub height of 112.4 m and a rotor diameter of 175 m. Each wind turbine is secured to a circular-shaped reinforced concrete foundation, including piling at T2. The sound power levels for the turbine are referenced to windspeeds at standardised 10 m height and are presented in Table 12.12.

Wind Speed (m/s)	Sound Power Level, dB(A) at Octave Band Centre Frequency (Hz)								dB L_{WA}
	63	125	250	500	1000	2000	4000	8000	
3	70.7	78.6	85.4	86.9	90.0	86.9	75.4	55.4	93.9
4	75.9	83.1	88.8	91.2	93.4	90.1	80.0	61.6	97.5
5	82.5	89.1	94.0	97.0	98.8	95.4	86.4	68.6	103.0
6	86.8	92.8	96.7	100.1	102.1	98.6	90.1	73.0	106.2
7	87.4	93.3	96.9	100.3	102.4	98.8	90.4	73.3	106.5
8	87.9	93.6	96.9	100.2	102.4	98.8	90.5	73.5	106.5
≥9	88.7	93.9	96.5	99.7	102.5	99.2	91.4	74.0	106.5

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Table 12.12 Sound Power Levels for the Enercon E175 turbine for 112.4 m hub height (Proposed Development)

An appraisal of the wider study area around the site identified no other wind farms in the area with the potential to affect a cumulative noise assessment. Further details are presented in Section 12.8.4.

12.4.4 Consultation

Not applicable.

12.5 Difficulties Encountered

No difficulty was encountered during the preparation of this chapter

12.6 Baseline Environment

12.6.1 Baseline Survey

The following sections present the results of the noise monitoring data obtained from the background noise survey in accordance with the methodology discussed in Section 12.4.2.

12.6.1.1 Location A - H026

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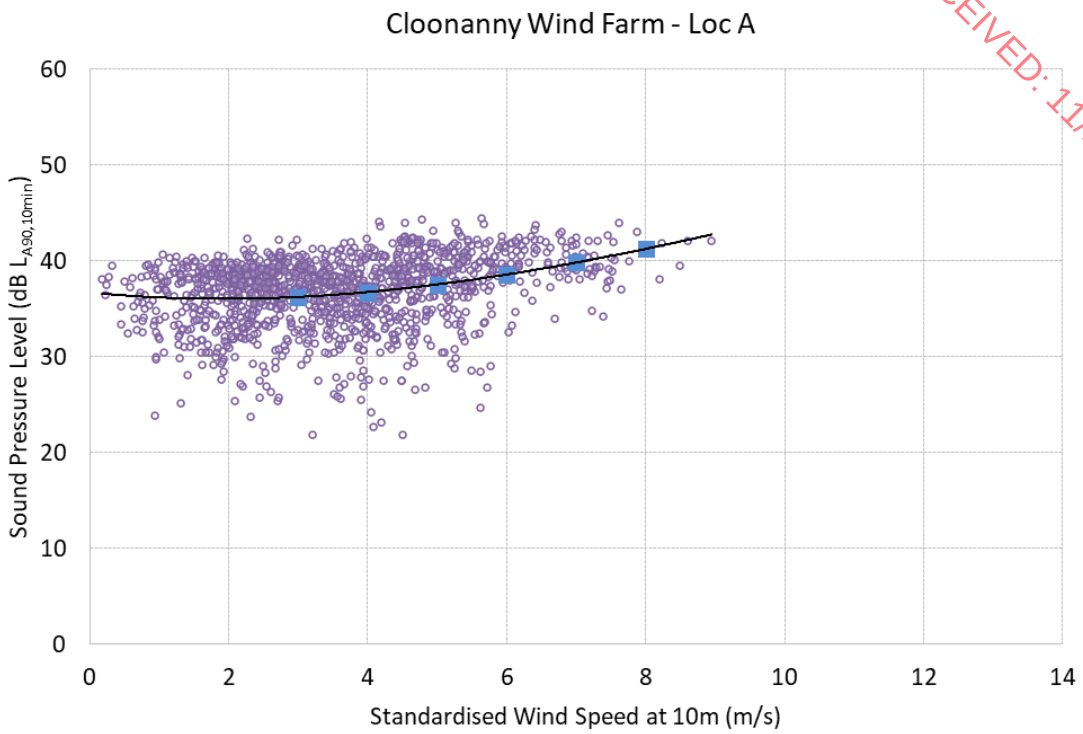


Figure 12.6 Background Noise Levels at Loc A - H026 - Daytime

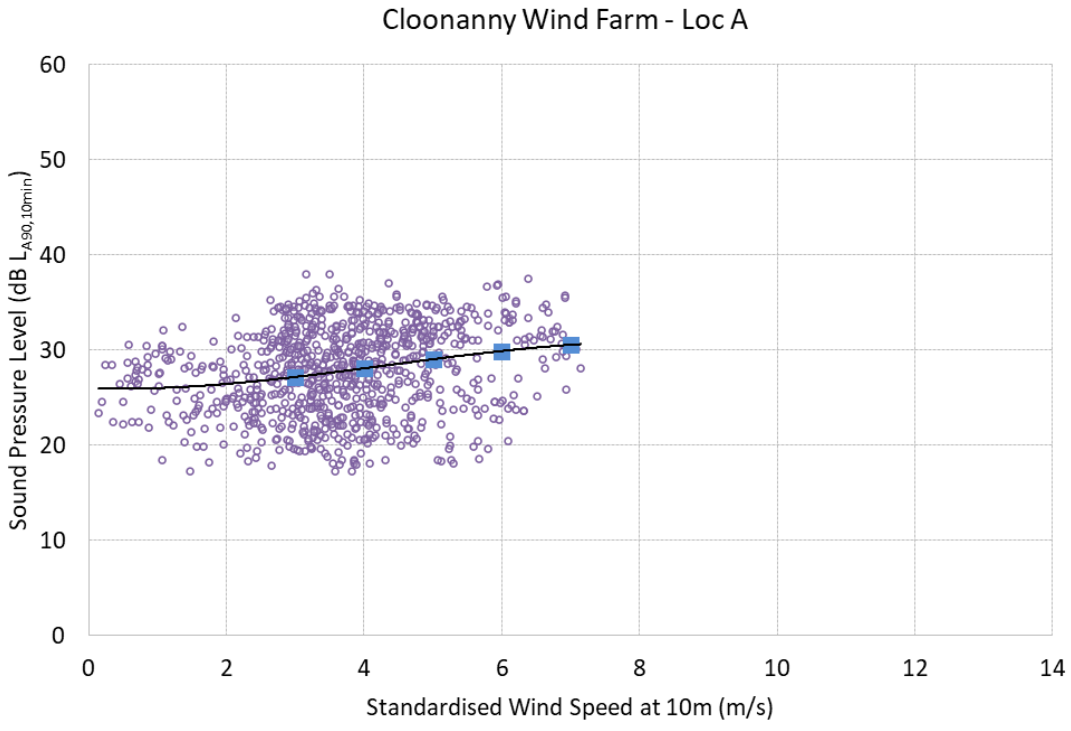


Figure 12.7 Background Noise Levels at Loc A - H026 – Night-time

12.6.1.2 Location B - H004

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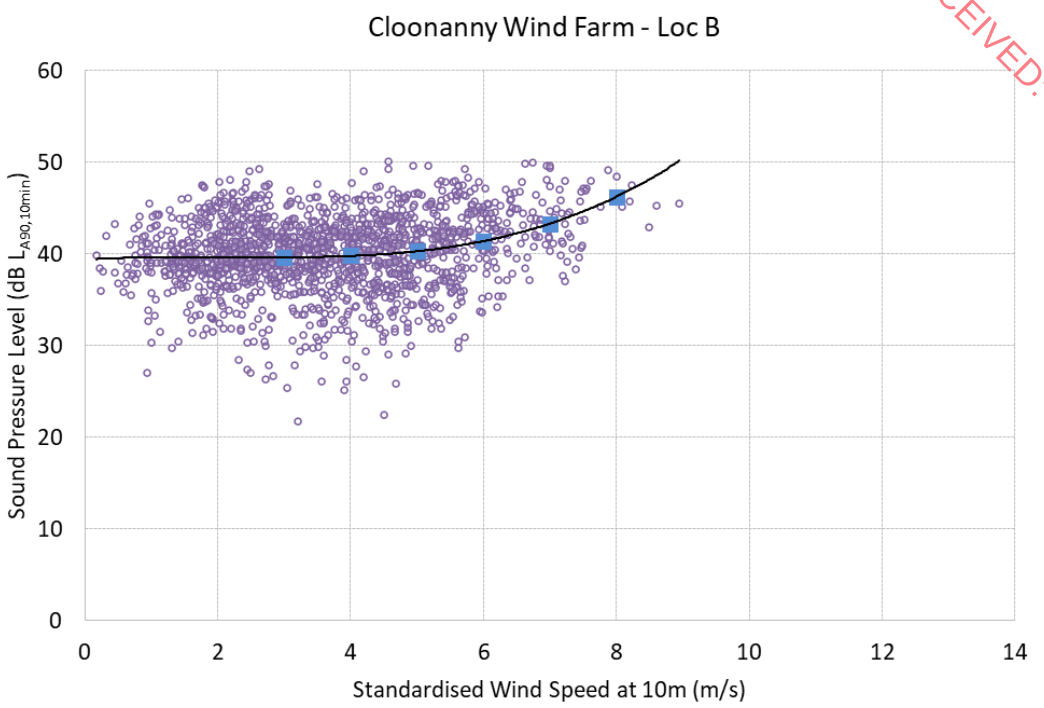


Figure 12.8 Background Noise Levels at Location B - H004 - Daytime

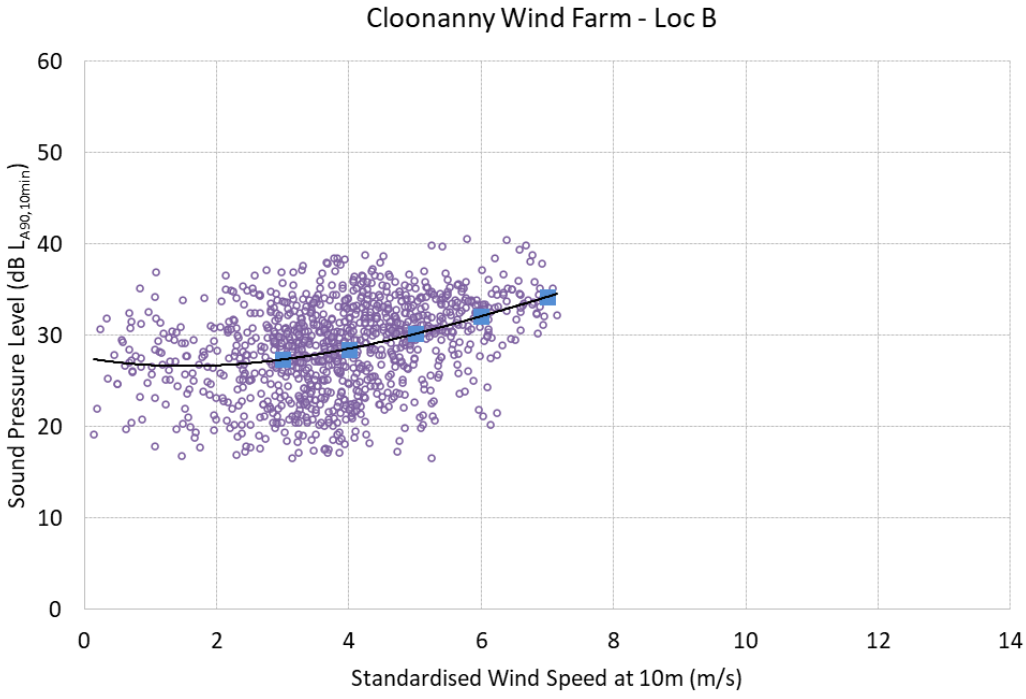


Figure 12.9 Background Noise Levels at Location B - H004– Night-time

12.6.1.3 Location C - H068

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In the case of H068, the analysis excluded west, northwest, north and north east wind direction sectors as noise levels were higher in those wind directions.

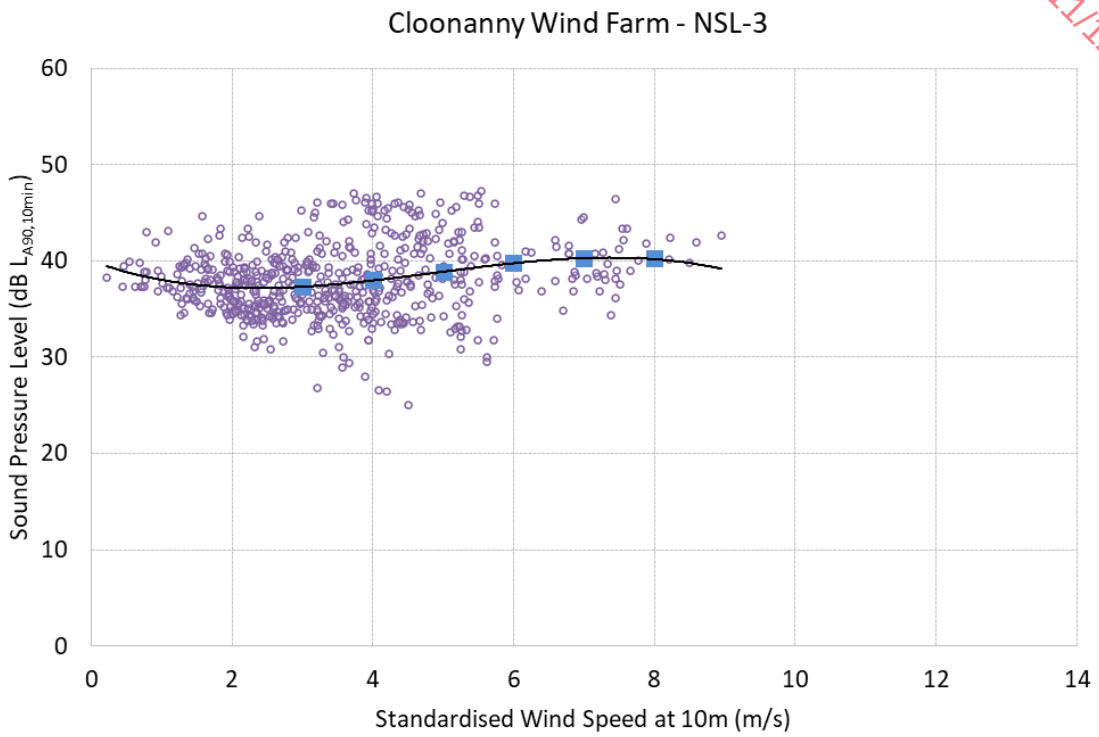


Figure 12.10 Background Noise Levels at H068 - Daytime

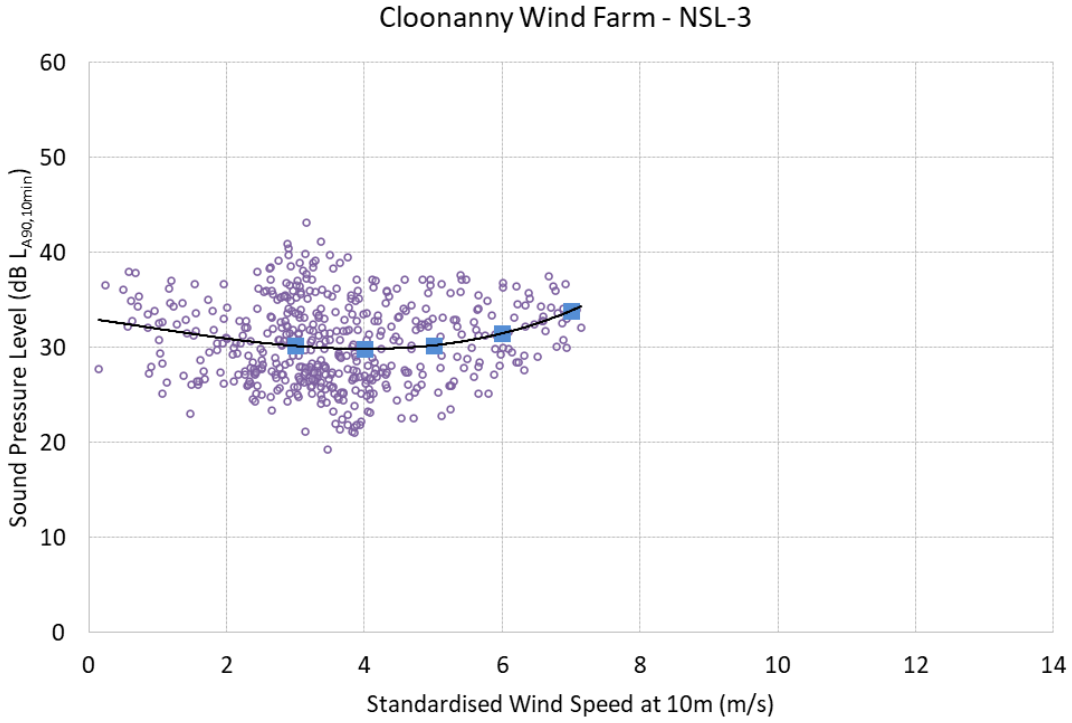


Figure 12.11 Background Noise Levels at H068 – Night-time

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12.6.1.4 Summary

Table 12.13 presents the various derived $L_{A90,10min}$ noise levels for each of the monitoring locations for daytime quiet periods and night-time periods. These levels have been derived using regression analysis carried out on the data sets in line with best practice guidance contained the IOA GPG and its SGN No. 2 Data Collection.

House	Period	Derived L_{A90}, 10-min Levels (dB) at Various Standardised 10m Height Wind Speeds					
		3	4	5	6	7	8
H010	Day	36.2	36.7	37.5	38.6	39.8	41.3
	Night	27.2	28.1	29.0	29.9	30.6	30.6
H018	Day	39.6	39.8	40.3	41.4	43.3	46.2
	Night	27.4	28.5	30.2	32.1	34.2	34.2
H028	Day	37.3	38.0	38.9	39.8	40.3	40.3
	Night	30.2	29.9	30.2	31.5	33.9	33.9
Envelope	Day	36.2	36.7	37.5	38.6	39.8	41.3
	Night	27.2	28.1	29.0	29.9	30.6	30.6

Table 12.13 Derived Levels of $L_{A90,10-min}$ for Various Wind Speeds

It is acknowledged that the coverage of wind speeds encountered during the survey is limited at the upper wind speed bins but it is sufficient for the environmental noise assessment of the proposed development for the following reasons:

The IOAGPG in section 2.9.6 states the following:

> *"The survey duration is determined entirely by the requirement to collect sufficient valid data over an adequate range of wind speeds. For pitch-regulated turbines, data should cover the range of wind speeds between cut-in and the speed at which maximum sound power level is achieved."*

In this instance, as shown in Table 12.12 maximum sound power levels are reached at 7 m/s standardised wind speed, thus this requirement is met.

12.6.2 Wind Turbine Noise Criteria

With respect to the relevant guidance documents outlined in Section 12.4.1.2, noise criteria curves have been identified for the proposed development. The criteria curves have been derived following a detailed review of the background noise data conducted at the nearest NSLs.

This set of criteria has been derived in line with the intent of the relevant Irish guidance and best practice guidance (as described in Section 12.4.1.2) it is comparable to noise planning conditions applied to similar sites previously granted planning permission by An Bord Pleanála and local planning authorities in Ireland. For the Proposed Development, it is considered that a lower daytime threshold of 40 dB $L_{A90,10-min}$ for low noise environments where the background noise is less than 30 dB(A) would be appropriate in respect of the following points:

- The EPA document 'Guidance Note for Noise: Licence Applications, Surveys and Assessments in Relation to Scheduled Activities (NG4)' proposes a daytime noise criterion of 45 dB(A) in

'areas of low background noise'. Accounting for the difference in the noise parameters, the proposed lower threshold here, this is more than 3 dB more stringent than this level.

- It is reiterated that the 2006 Wind Energy Development Guidelines states that "An appropriate balance must be achieved between power generation and noise impact." Based on a review of other national guidance (i.e. EPA NG4) in relation to acceptable noise levels in areas of low background noise it is considered that the criteria adopted as part of this assessment are robust.

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In summary, the operational noise limits proposed for the development are:

- 40 dB $L_{A90,10min}$ for daytime in quiet environments with typical background noise of less than 30 dB $L_{A90,10min}$.
- 45 dB $L_{A90,10min}$ for daytime in environments with typical background noise greater than or equal to 30 dB $L_{A90,10min}$ or a maximum increase of 5 dB(A) above background noise (whichever is the higher); and
- 43 dB $L_{A90,10min}$ for night-time periods or a maximum increase of 5 dB(A) above background noise (whichever is the higher).

Day and night time noise criteria curves have been determined and are presented in Table 12.14. These are the operational noise criteria that are applicable to this assessment.

House	Period	Derived L_{A90}, 10-min Levels (dB) at Various Standardised 10m Height Wind Speeds					
		3	4	5	6	7	8
H026	Day	45	45	45	45	45	46.3
	Night	43	43	43	43	43	43
H004	Day	45	45	45.3	46.4	48.3	51.2
	Night	43	43	43	43	43	43
H068	Day	45	45	45	45	45.3	45.3
	Night	43	43	43	43	43	43
Envelope	Day	45	45	45	45	45	46.3
	Night	43	43	43	43	43	43

Table 12.14 Proposed Noise Criteria Curves

The background noise data is used to derive appropriate noise limits for each of the noise sensitive locations. At all remaining locations, the worst-case envelope based on the lowest average levels across the various locations at each wind speed is used, considered separately for daytime and night-time.

12.6.3 Vibration

No sources of vibration were observed during the installation, collection or site visits.

12.7 The 'Do Nothing' Scenario

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

12.8 Potential Significant Effects

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12.8.1 Construction Phase

Construction noise prediction calculations have been conducted using the methodology outlined in Section 12.4.1.1. The noise levels referred to in this section are indicative only and are intended to demonstrate that it will be possible for the contractor to comply with current best practice guidance. The predicted "worst case" levels are expected to occur for only short periods of time at a very limited number of properties. Construction noise levels will be lower than these levels for most of the time at most properties in the vicinity of the proposed development.

There are several stages and elements associated with the construction phase of the Proposed Development which will include the following:

- Construction of turbines and hardstand areas;
- Construction of substation and BESS facility;
- Cabling and grid connections;
- Construction of internal roads; and
- Work to Turbine Delivery Route.

Detailed information is included in Chapter 2: Description of the Proposed Development.

In general, the distances between the construction activities associated with the Proposed Development and the nearest NSLs are such that there will be no significant noise and vibration impacts at NSLs. The following sections present an assessment of the main stages of the construction phase that have the potential for associated noise and vibration impacts, all other stages and elements are considered not to have significant noise and vibration impacts at NSLs.

Construction activities will be carried out during normal daytime working hours (i.e., weekdays 0700 – 1900hrs and Saturdays 0700 – 1400hrs). However, to ensure that optimal use is made of good weather periods or at critical periods within the programme (e.g., concrete pours) or to accommodate delivery of large turbine component along public routes it could be necessary on occasion to work outside of these hours. Any such out of hours working will be agreed in advance with the local authority.

12.8.1.1 Turbines, Temporary Hardstands and Permanent Hardstands

12.8.1.1.1 Noise

Several noise sources that would be expected on a construction site of this nature have been identified and predictions of the potential noise emissions calculated at the closest sensitive receptor. In this instance the closest noise-sensitive receptor is Location H007, which is situated approximately 735 m from the proposed hardstanding at turbine WTG2. (Note that this is the distance to the edge of the hardstanding, rather than that to the turbine base, which is 800m.)

Table 12.15 outlines the typical construction noise levels associated with the proposed works for this element of the construction. Calculations in this and the following construction noise tables have assumed an on-time of 66% for each item of plant i.e., that the item is operational for 8 hours over a 12-hour assessment period.

Item (BS 5228-1 Ref.)	Activity/Notes	Plant Noise level at 10m Distance (dB $L_{Aeq,1hr}$)	Predicted Noise Level (dB $L_{Aeq,1hr}$) at distance (m)
			735 m
HGV Movement (C.2.30)	Removing spoil and transporting fill and other materials.	79	33
Tracked Excavator (C.4.64)	Removing soil and rubble in preparation for foundation.	77	31
Excavator Mounted Rock Breaker (C9.12)	Rock Breaking.	85	39
Piling Operations (C.12.14)	Piling Foundations	89	43
General Construction (Various)	All general activities plus deliveries of materials and plant	84	38
Dumper Truck (C.4.4)	Moving fill	76	30
Mobile Telescopic Crane (C.4.39)	Turbine construction	77	31
Dewatering Pumps (D.7.70)	If required.	80	34
JCB (D.8.13)	For services, drainage and landscaping.	82	36
Vibrating Rollers (D.8.29)	Road surfacing.	77	31
Total			47

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Table 12.15 Typical Wind Farm Turbine Construction Noise Emission Levels

At 735 m from the works the predicted noise levels from construction activities are in the range of 31 to 43 dB $L_{Aeq,1hr}$ with a total worst-case cumulative construction level of the order of 47 dB $L_{Aeq,1hr}$. In all instances the predicted noise levels at the nearest NSLs are below the appropriate criteria outlined in Table 12.1 (Category A - 65 dB $L_{Aeq,1hr}$ during daytime periods). This assessment is considered representative of worst-case construction noise levels at NSLs.

There is no item of plant that would be expected to give rise to noise levels that would be considered out of the ordinary or in exceedance of the levels outlined in Table 12.1 and this finding is valid should all items of plant operate simultaneously.

12.8.1.1.2 Vibration

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

12.8.1.1.3 Description of Effects

With respect to the EPA's criteria for description of effects, the potential worst-case effects at the nearest noise sensitive locations associated with construction of turbines and hardstanding areas are described as negative, not significant and short-term.

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

12.8.1.2 Permanent Access Routes

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12.8.1.2.1 Noise

It is proposed to construct a permanent internal site access road which will run from the L50462 to the wind energy converter hardstanding areas including a 9.1m clear span bridge crossing a local stream.

A review of the road layout has identified that the closest NSLs is H079 (along the L5046 road) at a distance of 65 m from the site entrance.

Table 12.16 presents outline noise calculations, considering the plant anticipated for methods of construction, at varying distances from the construction works. Calculations have assumed a conservative on time of 66% for each item of plant.

Item (BS 5228-1 Ref.)	Activity/Notes	Plant Noise level at 10m Distance (dB $L_{Aeq,1hr}$)	Predicted Noise Level (dB $L_{Aeq,1hr}$) at distance (m)
			65 m
HGV Movement (C.2.30)	Removing spoil and transporting fill and other materials.	79	58
Tracked Excavator (C.4.64)	Removing soil and rubble in preparation for foundation.	77	56
Dumper Truck (C.4.4)	Moving fill	76	55
Vibrating Rollers (D.8.29)	Road surfacing.	77	56
Total			62

Table 12.16 Typical Construction Noise Emission Associated with Permanent Access routes

The predicted noise level of 62 dB $L_{Aeq,1hr}$ in Table 12.16 is within the construction noise criterion of 65 dB $L_{Aeq,1hr}$ set out in Section 12.4.1.1.1. On this basis noise control mitigation measures will not be required for this element of the works.

12.8.1.2.2 Vibration

Due to the nature of the of the proposed works for the permanent access route and the distance to noise-sensitive locations, significant vibration effects are not expected.

12.8.1.2.3 Description of Effects

With respect to the EPA's criteria for description of effects, the potential worst-case effects at the nearest noise sensitive locations associated with construction of permanent access routes are described as negative, not significant and short-term.

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

12.8.1.3 Temporary Road Widening Works

12.8.1.3.1 Noise

The proposed development includes temporary alterations to the L5046 and L50462 public roads to facilitate the turbine haul route, including temporary widening of sections of the L5046 and L50462 and temporary junction accommodation works to the site entrances on the L5046 and the L50462.

A review of the road layout has identified that the closest NSLs are those along the L5046 at distances of 10 to 20m from the works.

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Table 12.17 presents outline noise calculations, considering the plant anticipated for methods of construction, at varying distances from the construction works. Calculations have assumed a conservative on time of 66% for each item of plant.

Item (BS 5228-1 Ref.)	Activity/Notes	Plant Noise level at 10m Distance (dB $L_{Aeq,1hr}$)	Predicted Noise Level (dB $L_{Aeq,1hr}$) at distance (m)				
			10 m	15 m	20 m	25 m	30 m
HGV Movement (C.2.30)	Removing spoil and transporting fill and other materials.	79	77	73	71	67	65
Tracked Excavator (C.4.64)	Removing soil and rubble in preparation for foundation.	77	75	71	69	65	63
Dumper Truck (C.4.4)	Moving fill	76	74	70	68	64	62
Vibrating Rollers (D.8.29)	Road surfacing.	77	75	71	69	65	63
Total			81	77	75	71	69

Table 12.17 Typical Construction Noise Emission Associated with Temporary Widening Works

The predicted noise levels in Table 12.17 from works have the potential to exceed the construction noise criterion of 70 dB $L_{Aeq,1hr}$ for linear works set out in Section 12.4.1.1.2 However, as discussed in Section 12.4.1.1.3, on this basis that the duration of the noise effect is likely to be less than 10 days, the noise effect is not significant and therefore mitigation measures are not required in respect of noise from the Temporary Widening Works.

12.8.1.3.2 Vibration

Due to the nature of the of the proposed temporary widening works, and their short duration. significant vibration effects are not expected at noise-sensitive locations.

12.8.1.3.3 Description of Effects

With respect to the EPA's criteria for description of effects, the potential worst-case effects at the nearest noise sensitive locations associated with the temporary widening works are described as negative, not significant and short-term.

12.8.1.4 Substation and BESS Construction

12.8.1.4.1 Noise

The area containing the Substation and BESS is to be located at coordinates 614557, 778517. The nearest NSLs to the proposed substation are the NSL at a distance of 272 m from the substation. As a worst-case example assuming the same construction activities as outlined in Table 12.15, it is predicted that the potential noise levels from construction activities associated with the substation will be in the order of 58 dB $L_{Aeq,1hr}$ at the NSL. This level of noise is within the construction noise criterion set out in Section 12.4.1.1.1.

12.8.1.4.2 Vibration

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

12.8.1.4.3 Description of Effects

With respect to the EPA's criteria for description of effects, the potential worst-case associated effects at the nearest noise sensitive locations associated with construction of the substation and BESS area are negative, not significant and short-term.

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12.8.1.5 Met Mast and Temporary Concrete Washout Area

12.8.1.5.1 Noise

To the south of the Substation and BESS area, it is proposed to construct a meteorological mast, with and associated foundation and hardstanding area. On the basis that this element of the works is further from noise-sensitive locations than the Substation and BESS area, construction noise levels will be within the construction noise criterion set out in Section 12.4.1.1.1.

12.8.1.5.2 Vibration

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

12.8.1.5.3 Description of Effects

With respect to the EPA's criteria for description of effects, the potential worst-case associated effects at the nearest noise sensitive locations associated with construction of the met mast and temporary concrete washout area are negative, not significant and short-term.

12.8.1.6 Grid Connection

The grid connection does not form part of this planning application, however the potential noise effects are considered here.

The grid connection consists of underground cabling along one of three potential routes: to the Richmond 110kV substation, Longford 38kV substation or the Glebe 38kV substation, to connect to the national grid. For details please refer to Chapter 2 of this EIAR.

12.8.1.6.1 Noise

The predicted noise levels presented above for Temporary Road Widening Works are also considered applicable to the works for the laying of underground cables. it is important to note that the works for the construction of the underground electrical cabling will vary and will not be continuous in nature. The associated construction works will occur for short durations (at varying distances from NSLs. Works will therefore be in proximity to the closest NSLs for limited amount of time.

The predicted noise levels at the closest NSLs at closer distances to the works have the potential to exceed the construction noise criterion of 70 dB $L_{Aeq,1hr}$ set out in Section 12.4.1.1.2, if the works generate high noise level in proximity to the NSLs. However, on this basis that the duration of the noise effect is of short duration, mitigation measures are not required.

12.8.1.6.2 Vibration

Due to the nature of the of the proposed temporary widening works, and their short duration. significant vibration effects are not expected and noise-sensitive locations.

12.8.1.6.3 Description of Effects

With respect to the EPA's criteria for description of effects, the potential worst-case associated effects at the nearest noise sensitive locations associated with construction of the grid connection are negative, not significant and temporary.

12.8.1.7 Construction Traffic

12.8.1.7.1 Noise

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This section has been prepared to review potential noise impacts associated with construction traffic on the local road network. The information presented in the Traffic and Transport Assessment (TTA) prepared by Stephen Reid Consulting (document reference 20240926 -TTA_Rev1) has been used to inform the assessment here.

Changes in the traffic noise levels associated with the additional traffic for each of the construction stages listed above have been calculated based on traffic flow information presented in Table 6.1 in the TTA. Table 12.18 presents the changes in noise level due to the additional traffic flow during the construction of the proposed development.

Road Link	Change in Traffic Noise Level dB(A)	Significance of effect
N4 Longford Bypass (east of R194	+0.1	Imperceptible
R194 between N4 and L1011	+0.5	Imperceptible
L1011 west of R194	+1.2	Not Significant
L1011 east of R198/west of L1018	0.0	Imperceptible
R198 north of N4	+0.0	Imperceptible

Table 12.18 Calculated Changes in Traffic Noise Levels

12.8.1.7.2 Vibration

No significant vibration effects at noise-sensitive locations are expected in respect of construction traffic.

12.8.1.7.3 Description of Effects

With respect to the EPA criteria for description of effects, the potential effects at the NSL associated with the additional traffic generated during the construction phase are described as negative, not significant and short term. This effect should be considered in terms that the effect is variable, and that this assessment considers the locations of the greatest potential impact.

12.8.2 Operational Phase

12.8.2.1 Wind Turbines

The noise levels generated by the operation of the wind turbines have been calculated for all 87 NSLs identified within the study area, that is, the 35 dB L_{A90} contour of the proposed development. The predicted levels have been compared against the adopted noise criteria curves as detailed in Table 12.13. Table 12.19 below presents the predicted noise levels at the locations with ten highest noise levels at 9m/s standardised wind speed. It is noted that all predicted noise levels are within the criteria and that at all wind speeds, are below 40 dB L_{A90}. Predicted noise levels for all locations are presented in Appendix 12.4 and the noise contour at 9 m/s is presented in Appendix 12.5

1219Location	Parameter	Predicted Noise Level, dB LA90 at standardised 10 m windspeed, m/s						
		3	4	5	6	7	8	9
H0001	Predicted	24.0	27.8	33.3	36.5	36.8	36.8	36.7

1219Location	Parameter	Predicted Noise Level, dB LA90 at standardised 10 m windspeed, m/s						
		3	4	5	6	7	8	9
	Daytime Criterion	45	45	45	45	45	45.3	45.3
	Daytime Excess	--	--	--	--	--	--	--
	Night-time Criterion	43	43	43	43	43	43	43
	Night-time Excess	--	--	--	--	--	--	--
H0007	Predicted	26.2	29.9	35.5	38.6	39.0	39.0	38.9
	Daytime Criterion	45	45	45	45	45	45.3	45.3
	Daytime Excess	--	--	--	--	--	--	--
	Night-time Criterion	43	43	43	43	43	43	43
	Night-time Excess	--	--	--	--	--	--	--
H0011	Predicted	23.9	27.6	33.2	36.4	36.7	36.7	36.6
	Daytime Criterion	45	45	45	45	45	45.3	45.3
	Daytime Excess	--	--	--	--	--	--	--
	Night-time Criterion	43	43	43	43	43	43	43
	Night-time Excess	--	--	--	--	--	--	--
H0014	Predicted	23.9	27.6	33.2	36.3	36.6	36.6	36.6
	Daytime Criterion	45	45	45	45	45	45.3	45.3
	Daytime Excess	--	--	--	--	--	--	--
	Night-time Criterion	43	43	43	43	43	43	43
	Night-time Excess	--	--	--	--	--	--	--
H0020	Predicted	23.9	27.7	33.2	36.4	36.7	36.7	36.6
	Daytime Criterion	45	45	45	45	45	45.3	45.3
	Daytime Excess	--	--	--	--	--	--	--
	Night-time Criterion	43	43	43	43	43	43	43
	Night-time Excess	--	--	--	--	--	--	--

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1219Location	Parameter	Predicted Noise Level, dB LA90 at standardised 10 m windspeed, m/s						
		3	4	5	6	7	8	9
H0026	Predicted	25.5	29.2	34.8	37.9	38.2	38.2	38.2
	Daytime Criterion	45	45	45	45	45	45.3	45.3
	Daytime Excess	--	--	--	--	--	--	--
	Night-time Criterion	43	43	43	43	43	43	43
	Night-time Excess	--	--	--	--	--	--	--
H0048	Predicted	24.8	28.5	34.1	37.2	37.6	37.6	37.5
	Daytime Criterion	45	45	45	45	45	45.3	45.3
	Daytime Excess	--	--	--	--	--	--	--
	Night-time Criterion	43	43	43	43	43	43	43
	Night-time Excess	--	--	--	--	--	--	--
H0050	Predicted	24.6	28.4	33.9	37.1	37.4	37.4	37.3
	Daytime Criterion	45	45	45	45	45	45.3	45.3
	Daytime Excess	--	--	--	--	--	--	--
	Night-time Criterion	43	43	43	43	43	43	43
	Night-time Excess	--	--	--	--	--	--	--
H0052	Predicted	24.9	28.6	34.1	37.3	37.6	37.6	37.5
	Daytime Criterion	45	45	45	45	45	45.3	45.3
	Daytime Excess	--	--	--	--	--	--	--
	Night-time Criterion	43	43	43	43	43	43	43
	Night-time Excess	--	--	--	--	--	--	--
H0054	Predicted	24.2	28.0	33.5	36.7	37.0	37.0	36.9
	Daytime Criterion	45	45	45	45	45	45.3	45.3
	Daytime Excess	--	--	--	--	--	--	--
	Night-time Criterion	43	43	43	43	43	43	43

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1219Location	Parameter	Predicted Noise Level, dB LA90 at standardised 10 m windspeed, m/s						
		3	4	5	6	7	8	9
	Night-time Excess	--	--	--	--	--	--	--
H0068	Predicted	24.3	28.0	33.6	36.8	37.1	37.1	37.0
	Daytime Criterion	45	45	45	45	45	45.3	45.3
	Daytime Excess	--	--	--	--	--	--	--
	Night-time Criterion	43	43	43	43	43	43	43
	Night-time Excess	--	--	--	--	--	--	--

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Table 12.19 Predicted wind turbine noise levels at NSLs compared to criteria

12.8.2.2 Substation and BESS

Details of the proposed 20 kV substation are described in Chapter 2 of the EIAR. The substation will typically be operational 24/7, and the noise impact at the nearest NSL has been assessed to identify the potential greatest impact associated with the operation of the substation at the nearest NSL.

As part of the Proposed Project, the substation will be operational on a continuous basis. The noise emission level associated with a typical substation that would support a development of this nature is the order of 92 dB(A) L_w.

The BESS area of the substation includes the following items of electrical plant:

Item	Quantity	Sound Power Level, dB(A) re 10^{-12} W
Battery Energy Storage System (BESS)	3	90
Inverter	3	76
Transformer	3	70

Table 12.2020 Sound Power Levels of BESS electrical plant

Noise prediction calculations for the operation of these items a have been undertaken in accordance with ISO 9613: Acoustics – Attenuation of sound outdoors, Part 2: General method of calculation (2024). The predicted noise level from the operation of the substation area at the nearest NSL, H079, at approximately 272 m from substation boundary, is 37 dB $L_{Aeq,T}$. This level of noise is within the criteria presented in Section 12.4.1.2.5. At the detailed design stage plant will be selected to ensure that there are no tonal or impulsive characteristics form the plant audible at any noise sensitive location during night-time periods.

Table 12.21 below presents the predicted noise levels at the locations with ten highest noise levels due to the operation of the substation area.

NSL Reference	Predicted Noise Level, dB $L_{Aeq,1hr}$
H079	37
H076	35
H143	34
H142	34
H092	33
H147	33
H041	33
H087	33
H077	32
H150	32

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Table 12.21 Predicted noise levels due to Electrical Plant

As the predicted noise level is below the adopted criterion in all cases, it is unlikely to result in any adverse impacts at nearby NSLs.

12.8.2.3 Operational Phase Traffic Movements

There is no significant traffic volume expected during the operational phase, with 1-2 visits to site by a light goods vehicle (LGV) per week. Therefore, there are no significant noise effects assessed as likely during the operational phase.

12.8.3 Decommissioning Phase

In relation to the decommissioning phase, similar overall noise levels as those calculated for the construction phase would be expected, as similar plant, machinery and equipment will be used.

In all instances, the total predicted decommissioning noise levels are anticipated to be below the appropriate Category A value (i.e. 65 dB $L_{Aeq,1hr}$) and therefore a significant effect is not predicted in relation to the nearest NSLs in terms of decommissioning noise.

12.8.4 Cumulative Effects

The following wind energy developments were examined for any potential requirement for inclusion in a cumulative noise assessment:

- Sliabh Bawn Wind Farm at Strokestown, Co Roscommon: ABP PL 20.239743 and RCC Ref 10/507: This wind farm development is operational but is some 23 km from the subject site;
- Lissanore, Co Longford LCC Reg Ref 2360010, ABP Reg Ref 317459, permission granted in June 2024: This wind farm development is some 13 km from the subject site;
- Derryadd Windfarm: ABP Reg Ref 318974, permission refused though new application expected: This wind farm development is some 16 km from the subject site.

Based on the distances above, there is no potential for a cumulative noise or vibration impact at the NSLs at the proposed Cloonanny wind farm.

12.8.5 Summary

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The following table summarises the identified likely significant effects during the construction phase of the proposed development before mitigation measures are applied.

1222Likely Significant Effect	Quality	Significance	Extent	Probability	Duration	Type
Turbines, Temporary Hardstands and Permanent Hardstands	Negative	Not Significant	Local	Likely	Short term	Direct
Permanent Access Routes	Negative	Not Significant	Local	Likely	Short term	Direct
Temporary Widening Works	Negative	Not Significant	Local	Likely	Short term	Direct
Substation and BESS area	Negative	Not Significant	Local	Likely	Short term	Direct
Met Mast and Temporary Concrete Washout area	Negative	Not Significant	Local	Likely	Short term	Direct
Construction Traffic	Negative	Not Significant	Local	Likely	Short term	Direct

Table 12.23 Summary of Construction Phase Likely Significant Effects in the absence of mitigation

The following Table summarises the identified likely significant effects during the operational phase of the proposed development before mitigation measures are applied.

1224Likely Significant Effect	Quality	Significance	Extent	Probability	Duration	Type
Wind Turbine Operation	Negative	Not Significant	Local	Likely	Long term	Direct
Substation and BESS Operation	Negative	Not Significant	Local	Likely	Long term	Direct

Table 12.25 Summary of Operational Phase Likely Significant Effects in the absence of mitigation

The following Table summarises the identified likely significant effects during the decommissioning phase of the proposed development before mitigation measures are applied.

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Table 12.26 Summary of Decommissioning Phase Likely Significant Effects in the absence of mitigation

Likely Significant Effect	Quality	Significance	Extent	Probability	Duration	Type
Wind Turbine Decommissioning	Negative	Not Significant	Local	Likely	Short term	Direct
Substation and BESS Decommissioning	Negative	Not Significant	Local	Likely	Short term	Direct
Met Mast Decommissioning	Negative	Not Significant	Local	Likely	Short term	Direct

12.9 Mitigation Measures

12.9.1 Construction Phase Mitigation

Regarding construction activities, reference shall be made to BS5228-1 (BSI 2014a), which offers detailed guidance on the control of noise and vibration from construction activities. It is proposed that various practices be adopted during construction as required, including the following:

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

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

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

12.9.1.1 Noise

The contract documents shall specify that the Contractor undertaking the construction of the works will be obliged to take specific noise abatement measures when deemed necessary to comply with

the recommendations of BS5228-1 (BSI 2014a). The following list of measures will be considered, where necessary, to ensure compliance with the relevant construction noise criteria:

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- No plant used on site will be permitted to cause an on-going public nuisance due to noise.
- The best means practicable, including proper maintenance of plant, will be employed to minimise the noise produced by on site operations.
- All vehicles and mechanical plant will be fitted with effective exhaust silencers and maintained in good working order for the duration of the contract.
- Compressors will be attenuated models, fitted with properly lined and sealed acoustic covers which will be kept closed whenever the machines are in use and all ancillary pneumatic tools shall be fitted with suitable silencers.
- Machinery that is used intermittently will be shut down or throttled back to a minimum during periods when not in use.
- Any plant, such as generators or pumps, which is required to operate before 07:00hrs or after 19:00hrs will be surrounded by an acoustic enclosure or portable screen.
- During the construction programme, supervision of the works will include ensuring compliance that significant noise effects are avoided.
- The hours of construction activity will be limited to avoid unsociable hours where possible. Construction operations shall generally be restricted to between 7:00hrs and 19:00hrs Mondays to Fridays and to between 7:00hrs and 14:00hrs on Saturdays. However, to ensure that optimal use is made of good weather period or at critical periods within the programme (i.e., concrete pours) or to accommodate delivery of large turbine component along public routes it could be necessary on occasion to work outside of these hours.

12.9.1.2 Vibration

It is recommended that vibration from construction activities be limited to the values set out in Table 12.4. It should be noted that these limits are not absolute but provide guidance as to magnitudes of vibration that are very unlikely to cause cosmetic damage. Magnitudes of vibration slightly greater than those in the table are normally unlikely to cause cosmetic damage, but construction work creating such magnitudes should proceed with caution. Where there is existing damage these limits may need to be reduced by up to 50%.

Based on the large distances between locations where piling may take place (T2) and the nearest NSLs, no significant impact will be experienced. Therefore, no mitigation measures are proposed.

12.9.2 Operational Phase Mitigation

An assessment of the operational noise levels has been undertaken in accordance with best practice guidelines and procedures as outlined in Section 12.4.1.2 of this Chapter.

The findings of the assessment confirmed that the predicted operational noise levels from the Proposed Development will be within the relevant best practice noise criteria. Therefore, no specific mitigation measures are required.

12.9.2.1 Amplitude Modulation

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In the event that a complaint which indicates potential amplitude modulation (AM) associated with turbine operation, the operator will employ an independent acoustic consultant to assess the level of AM in accordance with the methods outlined in the Institute of Acoustics (IOA) Noise working Group (Wind Turbine Noise) Amplitude Modulation Working Group (AMWG) namely, Institute of Acoustics IOA Noise Working Group (Wind Turbine Noise) Amplitude Modulation Working Group Final Report: A Method for Rating Amplitude Modulation in Wind Turbine Noise (9 August 2016) or subsequent revisions.

The measurement method outlined in the IOA AMWG document, known as the 'Reference Method', will provide a robust and reliable indicator of AM and yield important information on the frequency and duration of occurrence, which can be used to evaluate mitigation requirements.

These mitigation measures, if required, will consist of the implementation of operational controls for the relevant turbine type, which will include turbine curtailment and/or stopping turbines under specific operational conditions.

12.9.3 Decommissioning Phase Mitigation

The decommissioning will entail similar activities to the construction phase. The mitigation measures described in Section 12.9.1 above will also be applied to the decommissioning phase in order to ensure noise levels remain within criteria.

12.10 Residual Impact Assessment

This section assesses potential significant environmental impacts which remain after mitigation measures are implemented.

12.10.1 Construction Phase

During the construction phase of the Proposed development there will be some short-term effect on nearby noise sensitive locations due to noise emissions from site traffic and other construction activities. However, given the distances between the main construction works and nearby noise sensitive locations, and the fact that the various infrastructure elements of the construction phase are temporary to short term in nature, the combination of the various noise sources will not be excessively intrusive at any single noise-sensitive location. Furthermore, the application of binding noise limits and hours of operation, along with implementation of appropriate noise and vibration control measures, will ensure that noise and vibration effect is kept within the guidance limits.

12.10.1.1 Noise

With respect to the EPA's criteria for description of effects, in terms of these construction activities, the potential associated effects at the nearest NSL's associated with the various elements of the construction phase are described below. All other elements of the construction phase are considered to have negative, imperceptible and short term effects.

12.10.1.1.1 Turbines, Temporary Hardstands and Permanent Hardstands

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The construction noise assessment presented in Section 12.8.1.1 confirmed that the predicted noise levels will be within the construction noise criteria and therefore no specific mitigation measures are necessary. With respect to the EPA's criteria for description of effects, the potential worst-case effects at the nearest noise sensitive locations associated with the construction of the Turbines, Temporary Hardstands and Permanent Hardstands remain as described in in Section 12.8.5.

12.10.1.1.2 Permanent Access Routes

The construction noise assessment presented in Section 12.8.1.2 confirmed that the predicted noise levels will be within the construction noise criteria and therefore no specific mitigation measures are necessary. With respect to the EPA's criteria for description of effects, the potential worst-case effects at the nearest noise sensitive locations associated with the construction of the Permanent Access Routes remain as described in in Section 12.8.5.

12.10.1.1.3 Temporary Road Widening Works

The construction noise assessment presented in Section 12.8.1.3 confirmed that the predicted noise levels will be within the construction noise criteria and therefore no specific mitigation measures are necessary. With respect to the EPA's criteria for description of effects, the potential worst-case effects at the nearest noise sensitive locations associated with construction of the Temporary Road Widening works remain as described in in Section 12.8.5.

12.10.1.1.4 Substation and BESS Construction

The construction noise assessment presented in Section 12.8.1.4 confirmed that the predicted noise levels will be within the construction noise criteria and therefore no specific mitigation measures are necessary. With respect to the EPA's criteria for description of effects, the potential worst-case effects at the nearest noise sensitive locations associated with construction of the Substation and BESS Construction remain as described in Section 12.8.5.

12.10.1.1.5 Met Mast and Temporary Concrete Washout Area

The construction noise assessment presented in Section 12.8.1.5 confirmed that the predicted noise levels will be within the construction noise criteria and therefore no specific mitigation measures are necessary. With respect to the EPA's criteria for description of effects, the potential worst-case effects at the nearest noise sensitive locations associated with construction of the Met Mast and Temporary Concrete Washout Area remain as described in Section 12.8.5.

12.10.1.1.6 Grid Connection

The construction noise assessment presented in Section 12.8.1.5 confirmed that the predicted noise levels will be within the construction noise criteria and therefore no specific mitigation measures are necessary. With respect to the EPA's criteria for description of effects, the potential worst-case effects at the nearest noise sensitive locations associated with construction of the Grid Connection remain as described in Section 12.8.5.

12.10.1.1.7 Construction Traffic

The construction traffic noise assessment presented in Section 12.8.1.7 confirmed that the predicted noise changes in traffic noise levels will not be significant and therefore no specific mitigation

measures are necessary. With respect to the EPA's criteria for description of effects, the potential worst-case effects at the nearest noise sensitive locations associated with construction traffic remain as described in Section 12.8.5.

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12.10.1.2 Vibration

The construction assessments presented in Section 12.8.1. confirmed that due to the distance of the proposed works from sensitive locations significant vibration effects are not expected. With respect to the EPA's criteria for description of effects, the potential worst-case residual effects at the nearest sensitive locations associated with construction vibration is negative, not significant and short term.

12.10.2 Operational Phase

With respect to the EPA's criteria for description of effects, the potential associated effects at the nearest noise-sensitive locations associated with the various elements of the operational phase are described below. All other elements of the Proposed development are considered to have a neutral, imperceptible, and long term effects.

12.10.2.1 Noise

12.10.2.1.1 Wind Turbine Operation

The predicted noise levels associated with the proposed 'Wind Turbine Operation' will be within best practice noise criteria curves recommended in the 2006 WEDGs, and that specific mitigation measures were not required.

It is not considered that a significant effect is associated with the Proposed development however it is noted that a new source of noise will be introduced to the receiving environment. While ambient noise levels will increase by varying degrees, depending on receptor location, and turbine operating conditions typically dictated by wind speed, the predicted noise levels are within the noise criteria.

With respect to the EPA's criteria for description of effects, the potential worst-case residual effects at the nearest noise sensitive locations associated with Wind Turbine Operation remain as described in Section 12.8.5.

The description of the effect considers that the effect is variable, and that this assessment takes into account the locations of the greatest potential impact.

12.10.2.1.2 Substation and BESS Operation

The predicted noise levels associated with the proposed 'Substation and BESS Operation' will be within the recommended noise criteria and no specific mitigation measured are required.

With respect to the EPA's criteria for description of effects, the potential worst-case effects at the nearest noise sensitive locations associated with Substation and BESS Operation remain as described in Section 12.8.5.

The description of the effect considers that the effect is variable, and that this assessment takes into account the locations of the greatest potential impact.

12.10.3 Decommissioning Phase

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12.10.3.1 Noise

With respect to the EPA's criteria for description of effects, the potential worst-case residual effects at the nearest noise sensitive locations associated with the decommissioning phase remain as described in Section 12.8.5.

12.10.3.2 Vibration

The assessments presented in Section 12.8.1 confirmed that the due to the distance of the proposed works from sensitive locations significant vibration effects are not expected. With respect to the EPA's criteria for description of effects, the potential worst-case residual effects at the nearest sensitive locations associated with construction vibration is negative, not significant and short term.

12.10.4 Summary of Post-mitigation Effects

The following Table summarises the identified likely significant residual effects during the construction phase of the proposed development following the application of mitigation measures.

1227Likely Significant Effect	Quality	Significance	Extent	Probability	Duration	Type
Turbines, Temporary Hardstands and Permanent Hardstands	Negative	Not Significant	Local	Likely	Short term	Direct
Permanent Access Routes	Negative	Not Significant	Local	Likely	Short term	Direct
Temporary Widening Works	Negative	Not Significant	Local	Likely	Short term	Direct
Substation and BESS area	Negative	Not Significant	Local	Likely	Short term	Direct
Met Mast and Temporary Concrete Washout area	Negative	Not Significant	Local	Likely	Short term	Direct
Grid Connection	Negative	Not Significant	Local	Likely	Short term	Direct
Construction Traffic	Negative	Not Significant	Local	Likely	Short term	Direct

Table 12.28 Summary of Construction Phase Effects Post Mitigation

The following Table summarises the identified likely residual significant effects during the operational phase of the proposed development post mitigation.

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1229Likely Significant Effect	Quality	Significance	Extent	Probability	Duration	Type
Wind Turbine Operation	Negative	Not Significant	Local	Likely	Long term	Direct
Substation and BESS Operation	Negative	Not Significant	Local	Likely	Long term	Direct

Table 12.30 Summary of Operational Phase Effects Post Mitigation

The following Table summarises the identified likely residual significant effects during the decommissioning phase of the proposed development post mitigation.

1231Likely Significant Effect	Quality	Significance	Extent	Probability	Duration	Type
Wind Turbine Decommissioning	Negative	Not Significant	Local	Likely	Short term	Direct
Substation and BESS Decommissioning	Negative	Not Significant	Local	Likely	Short term	Direct

Table 12.32 Summary of Decommissioning Phase Effects Post Mitigation

12.10.5 Cumulative Residual Effects

12.10.5.1 Construction and Decommissioning Phase

The predicted noise emissions for the construction and decommissioning phases are not of enough magnitude to cause an increase in the cumulative construction noise emissions exceeding the threshold for significant impacts at any NSL.

For construction activities occurring in close proximity to NSL's, considering the distance to any other projects and the noise emissions associated with these activities, cumulative construction noise or vibration effects are unlikely.

With respect to the EPA criteria for description of effects, the anticipated associated effects at the nearest noise sensitive locations associated with cumulative impacts during the construction and decommissioning phases are described as Negative, Not Significant and Short-term.

12.10.5.2 Operational Phase

12.10.5.2.1 Wind Turbine Noise

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Existing permitted and proposed wind farm developments with the potential for cumulative impacts have been considered as part of the turbine noise impact assessment. A review of existing, proposed and permitted wind turbine developments in the wider study has been undertaken in accordance with the guidance contained in the IOA GPG. Due to the distance between the turbines of the Proposed development and the other wind energy developments considered, there are no cumulative effects anticipated.

With respect to the EPA criteria for description of effects, the anticipated associated effects at the nearest noise sensitive locations associated with cumulative impacts from the Proposed development are described as Neutral, Imperceptible and Long-term.

12.10.5.2.2 Substation and BESS

It is not considered that any significant cumulative operational noise or vibration effects are likely from the operation of the proposed Substation and BESS area. The distance between the proposed development to any other developments will ensure that any contribution to cumulative noise will not be significant.

With respect to the EPA criteria for description of effects, the anticipated associated residual effects at the nearest noise sensitive locations associated with cumulative impacts from the proposed Substation and BESS area are described as Negative, Not Significant and Long Term.

12.11 Risk of Major Accidents or Disasters

There are no likely risks of major accidents and disasters in relation to noise and vibration associated with the proposed development due to the nature and scale of the development.

12.12 Worst Case Scenario

The assessment as presented above can be considered a reasonable worst-case scenario therefore this scenario would be as described in the Residual Impact Assessment, Section 12.10.

12.13 Interactions

There are interactions between the noise and vibration assessment and traffic assessment. With additional traffic movements during the construction phase, the noise level increases during this phase. In this assessment, the effect of the interactions between traffic and noise are considered to be imperceptible to not significant due to the low level changes in traffic flows associated with the construction of the proposed development.

12.14 Monitoring

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Commissioning noise surveys will be undertaken to ensure compliance with any noise conditions applied to the development. In the unlikely instance that an exceedance of these noise criteria is identified, the assessment guidance outlined in the IOA GPG and Supplementary Guidance Note 5: Post Completion Measurements (July 2014) should be followed, and relevant corrective actions will be taken. For example, implementation of noise operational modes resulting in curtailment of turbine operation can be implemented for specific turbines in specific wind conditions to ensure predicted noise levels are within the relevant noise criterion curves/planning conditions. Such curtailment can be applied using the wind farm SCADA system without undue effect on the wind turbine performance.

12.15 Summary of Mitigation and Monitoring

The following Table summarises the Construction Phase mitigation and monitoring measures.

12-33Likely Significant Effect	Mitigation	Monitoring
Construction Noise	Compliance with BS5228-1 (BSI 2014a), Implementation of best practice control measures	N/A
Construction Vibration	Vibration from construction activities to be limited to the values set out in Table 12.4	N/A

Table 12.34 Summary of Construction Phase Mitigation and Monitoring

The following Table summarises the Operational Phase mitigation and monitoring measures.

12-35Likely Significant Effect	Mitigation	Monitoring
Wind Turbine Operation	N/A	Commissioning noise surveys

Table 12.36 Summary of Operational Phase Mitigation and Monitoring

The following Table summarises the Decommissioning Phase mitigation and monitoring measures.

Table 12.37 Summary of Decommissioning Phase Mitigation and Monitoring

Likely Significant Effect	Mitigation	Monitoring
Decommissioning Noise	Compliance with BS5228-1 (BSI 2014a), Implementation of best practice control measures	N/A
Decommissioning Vibration	Vibration from decommissioning activities to be limited to the values set out in Table 12.4	N/A

12.16 Conclusion

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

The assessment of construction noise and vibration and has been conducted in accordance best practice guidance contained in BS 5228-1:2009+A1:2014 Code of practice for noise and vibration control on construction and open sites – Noise and BS 5228-2:2009+A1:2014 Code of practice for noise and vibration control on construction and open sites – Vibration.

Considering the distance between the construction activities and the nearest NSLs, residual noise associated with the construction and decommission phase is not expected to exceed the proposed threshold values. The associated noise and vibration levels are not expected to cause any likely significant effects at any NSL.

Based on detailed information on the site layout, and the proposed turbine specifications, turbine noise levels have been predicted at NSLs for a range of operational wind speeds. The predicted noise levels associated with the proposed development will be within best practice noise limits recommended in WEDGs regardless of which turbine is constructed within the turbine range, therefore it is not considered that the effects of the proposed development will not be significant.

Noise from the proposed substation including the BESS area has also been assessed and found to be within the proposed noise criteria.

No significant vibration effects are associated with the operation of the proposed development.

12.17 References and Sources

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- 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);
- Department of the Environment, Heritage, and Local Government (DEHLG) Wind Energy Development Guidelines (hereafter referred to as WEDG (DEHLG, 2006);
- Department of Trade, and Industry (UK) Energy Technology Support Unit (ETSU) ETSU-R-97 The Assessment and Rating of Noise from Wind Farms (hereafter referred to as ETSU-R-97) (ETSU, 1996);
- Institute of Acoustics (IOA) A Good Practice Guide to the Application of ETSU-R-97 for the Assessment and Rating of Wind Turbine Noise (hereafter referred to as IOA GPG) (IOA, 2013);
- Transport Infrastructure Ireland (TII) (previously National Roads Authority (NRA)) Good Practice Guidance for the Treatment of Noise during the Planning of National Road Schemes (hereafter referred to as the TII Noise Guidelines 2014) (NRA 2014);
- 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);
- ISO 1996: 2017: Acoustics – Description, measurement, and assessment of environmental noise.
- International Organization for Standardization (ISO) 9613-2:2024 Acoustics – Attenuation of sound during propagation outdoors - Part 2: General method of calculation (hereafter referred to as ISO 9613–2) (ISO 2024);
- Community Noise (Stockholm University for the World Health Organisation, 1995)

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CHAPTER 13
AIR QUALITY

VOLUME II
ENVIRONMENTAL IMPACT ASSESSMENT REPORT

DECEMBER 2024

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13 Air Quality

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13.1 Introduction

This chapter of the EIAR was prepared to assess the potential significant effects of the proposed development on air quality. This report provides a baseline assessment of the setting of the proposed development in terms of air quality and discusses the likely and significant effects that the construction, operation and decommissioning of the proposed development will have. Where required, appropriate mitigation measures to limit any identified likely significant adverse impacts to climate are recommended.

A full description of the proposed development is presented in Chapter 2. It should be read in conjunction with Chapter 6 Material Assets - Transportation and the standalone Traffic and Transportation Assessment submitted as part of the planning application.

13.2 Expertise & Qualifications

This chapter was prepared by Aisling Cashell, an Environmental Consultant in the air quality section of AWN Consulting Ltd. She holds a BA and an MAI in Civil, Structural and Environmental Engineering from Trinity College Dublin. She is a member of Engineers Ireland. She has been specialising in the area of air quality, climate and sustainability for 1 year and has prepared air quality and climate assessments for inclusion within EIARs for residential and commercial developments such as Twenties Lane (Planning Application Ref: 22713), Cherrywood T13 (Planning Application Ref: DZ23A/0028), Corballis Donabate LRD (Planning Application Ref: LRD0017/S3), The Paddocks (Planning Application Ref: 2360349), and Dublin Airport Authority.

This chapter was also prepared and reviewed by Dr. Avril Challoner. Avril is a Principal 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. She is a Chartered Environmentalist (CEnv), Chartered Scientist (CSci), Member of the Institute of Environmental Management and Assessment, Member of the Institute of Air Quality Management and specialises in the fields of air quality, EIA and air dispersion modelling.

13.3 Proposed Development

A brief summary of the development is outlined below. A detailed description of the proposed development is contained within Chapter 2 of this EIAR and the Planning Statement that accompanies the application. The statutory notices should also be referred to.

A 10-year permission is being sought by Natural Forces Renewable Energy 2 Limited for the development of a 14MW wind farm on lands measuring 17.28ha located at the L5046 and L50462 in the townlands of Cloonanny Glebe, Corragarrow, Derryharrow and Gorteenorna, Co. Longford.

The proposed development will consist of the following:

(i) Demolition of a single-storey derelict shed structure (c. 93 sqm GFA) to facilitate the turbine haul route

(ii) Construction of two E175 EP5 wind energy converters, each with an electrical rating of 7MW, an overall ground-to-blade tip height of 199.9 metres, a rotor blade diameter of 175 metres, hub height of 112.4 metres, associated foundations and hard-standing areas;

(iii) Construction of an 800m permanent internal site access road which will run from the L50462 to the wind energy converter hardstanding areas including a 9.1m clear span bridge crossing a local stream;

(iv) Construction of 1 No. meteorological mast with a height of 32 metres, associated foundation and hardstanding area;

(v) Construction of 1 No. 20kV substation compound comprising 2 No. Modular Buildings each measuring 13.5 sqm in area and 3.5m in height, a Battery Energy Storage System (BESS) comprising 3 storage modules with a height of 2.8 metres and associated electrical works, foundation and hardstanding area;

(vi) Temporary alterations to the L5046 and L50462 public roads and temporary access roads to facilitate the turbine component haul route, including temporary widening of sections of the L5046 and L50462.

(vii) Installation of underground collector circuit and communications cabling in underground cable trenches, from the proposed wind energy converter to the proposed on-site substation;

(viii) All associated and ancillary site development, excavation, construction, and reinstatement works, including the provision of a temporary construction compound, site drainage, spoil management, fencing, lighting, hedge and operational maintenance and tree trimming and cutting.

(ix) This application is seeking a 35- year operational life from the date of commissioning of the entire wind farm.

The grid connection from the proposed on-site substation to the national electricity grid does not form part of the subject planning application. However, as part of the planning application process, this EIAR addresses three potential grid connection options currently considered to ensure a comprehensive environmental assessment of all aspects of the Proposed Development. The grid connection will be via 1 of the 3 potential options outlined below:

- Option 1 Connect the proposed development via (8.03km) to Richmond 110kV Substation
- Option 2 Connect the proposed development via (3.96km) to Longford 38kV Substation
- Option 3 Connect the proposed development via (5.85km) to Glebe 38kV Substation

It is anticipated that the grid connection from the Proposed Development will be by means of an underground cable connecting to one of the Substations identified above via the public road network.

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For bridge crossings, the cable will be located within the bridge deck, where there is insufficient depth and width available horizontal directional drilling (HDD) will be employed as an alternative.

Once the preferred route emerges it will be determined whether the grid connection falls within the category of exempted development under Class 26 of Schedule 2 in the Planning and Development Regulations 2001, as amended or requires planning permission, in which case an application will be made to the planning authority.

All elements of the proposed development as outlined above together with the turbine delivery route and grid connection options have been assessed as part of this EIAR.

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13.3.1 Aspects Relevant to this Assessment

During the construction phase construction related dust emissions will occur as a result of site preparation works, earthworks and the movement of trucks on site and exiting the site. There is also the potential for engine emissions from site vehicles and machinery to affect air quality. Construction phase impacts will be short-term in duration.

Engine emissions from vehicles accessing the site have the potential to affect air quality during the operational phase of the development through the release of NO_2, PM_{10} and $PM_{2.5}$. However, the majority of operational phase impacts will be beneficial. The generation of renewable power will assist in reducing NO_2 emissions associated with electricity generation from fossil fuels. Operational phase effects will be long-term in duration.

13.4 Methodology

13.4.1 Relevant Legislation & Guidance

The principal guidance and best practice documents used to inform the assessment of potential impacts on air quality is summarised below.

- Guidelines for Planning Authorities and An Bord Pleanála on carrying out Environmental Impact Assessment (Department of Housing, Planning & Local Government, 2018);
- Environmental Impact Assessment of Projects: Guidance on the preparation of the Environmental Impact Assessment Report (European Commission, 2017);
- Guidelines on the Information to be Contained in Environmental Impact Assessment Reports (EPA, 2022);
- Guidance on the Assessment of Dust from Demolition and Construction Version 2.2 (Institute of Air Quality Management (IAQM), 2024);
- Air Quality Assessment of Specified Infrastructure Projects – PE-ENV-01106 (TII, 2022) and TII Road Emissions Model (REM) online calculator tool (TII, 2024).

13.4.1.1 Ambient Air Quality Standards

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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. These limit values or "Air Quality Standards" are health or environmental-based levels for which additional factors may be considered. For example, natural background levels, environmental conditions and socio-economic factors may all play a part in the limit value which is set.

Air quality significance criteria are assessed on the basis of compliance with the appropriate standards or limit values. The applicable standards in Ireland are set out in Directive 2024/2881/EC *of the European Parliament and of the Council of* (date to be confirmed) *on ambient air quality and cleaner air for Europe*. The EU formally adopted this directive on 14 October 2024. This directive supersedes EU Directive 2008/50/EC *of the European Parliament and of the Council of 21 May 2008 on ambient air quality and cleaner air for Europe* and sets out new air quality standards for pollutants to be reached by 2030 which are more closely aligned with the World Health Organisation (WHO) air quality guidelines.

The Air Quality Standards Regulations 2022 (S.I. 739 of 2022) transposed EU Directive 2008/50/EC. With the adoption of Directive (EU) 2024/2881, Ireland must transpose this directive into national law (i.e. update the Air Quality Standards Regulations) before October 2026.

The ambient air quality standards applicable for nitrogen dioxide (NO_2) and particulate matter (as PM_{10} and $PM_{2.5}$) are outlined in Table 13.1. The limit values set out in Directive 2024/2881/EC will need to be achieved by 2030, with the limit values set out in the Air Quality Standards Regulations 2022 (and future updated regulations) applicable until 2030.

Table 13.1 Ambient Air Quality Standards & TA Luft

Pollutant	2008/50/EC Limit Type	2008/50/EC Limit Value (applicable until 2030)	2024/xx/EC Limit Type	2024/xx/EC Limit Value (to be attained by 2030)
Nitrogen Dioxide (NO_2)	Hourly limit for protection of human health - not to be exceeded more than 18 times/year	200 µg/m³	Hourly limit for protection of human health - not to be exceeded more than 3 times/year	200 µg/m³
	n/a	n/a	24-hour limit for protection of human health - not to be exceeded more than 18 times/year	50 µg/m³
	Annual limit for protection of human health	40 µg/m³	Annual limit for protection of human health	20 µg/m³
NO_X	Annual limit for protection of vegetation	30 µg/m³	Annual limit for protection of vegetation	30 µg/m³
	24-hour limit for protection of human health - not to be	50 µg/m³	24-hour limit for protection of human health - not to be	45 µg/m³

Particulate Matter (as PM_{10})	exceeded more than 35 times/year		exceeded more than 18 times/year	
	Annual limit for protection of human health	40 µg/m^3	Annual limit for protection of human health	20 µg/m^3
Particulate Matter (as $PM_{2.5}$)	n/a	n/a	24-hour limit for protection of human health - not to be exceeded more than 18 times/year	25 µg/m^3
	Annual limit for protection of human health	25 µg/m^3	Annual limit for protection of human health	10 µg/m^3

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In April 2023, the Government of Ireland published the Clean Air Strategy for Ireland (Government of Ireland 2023), which provides a high-level strategic policy framework needed to reduce air pollution. The strategy commits Ireland to achieving the 2021 WHO Air Quality Guidelines Interim Target 3 (IT3) by 2026 (shown in **Error! Reference source not found.**), the IT4 targets by 2030 and the final targets by 2040 (shown in **Error! Reference source not found.**). The strategy notes that a significant number of EPA monitoring stations observed air pollution levels in 2021 above the WHO targets; 80% of these stations would fail to meet the final $PM_{2.5}$ target of 5 µg/m^3. The strategy also acknowledges that "*meeting the WHO targets will be challenging and will require legislative and societal change, especially with regard to both $PM_{2.5}$ and NO_2*".

Annex II of Directive 2024/2881/EC gives assessment thresholds which align with the clean air strategy final 2040 WHO targets. Directive (EU) 2024/2881 states that *"Member States shall endeavour to achieve and preserve the best ambient air quality and a high level of protection of human health and the environment, with the aim of achieving a zero-pollution objective as referred to in Article 1(1), in line with WHO recommendations, and below the assessment thresholds laid down in Annex II."*

These assessment thresholds relate to monitoring of ambient air quality by Member States, where *"exceedances of the assessment thresholds specified in Annex II shall be determined on the basis of concentrations during the previous 5 years where sufficient data are available. An assessment threshold shall be deemed to have been exceeded if it has been exceeded during at least 3 separate years out of those previous 5 years*."

The applicable air quality limit values for the purposes of this assessment are those set out in Table 13.1. The limit values stipulated under Directive 2008/50/EC and the Air Quality Standards Regulations 2022 are applicable prior to 2030. The limit values stipulated by Directive (EU) 2024/2881 are applicable for assessments after 2030.

Table 13.2 WHO Air Quality Guidelines

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Pollutant	Regulation	Limit Type	IT3 (2026)	IT4 (2030)	Final Target (2040)
NO_2	WHO Air Quality Guidelines	24-hour limit for protection of human health	50 µg/m³	50 µg/m³	25 µg/m³
		Annual limit for protection of human health	30 µg/m³	20 µg/m³	10 µg/m³
PM (as PM_{10})		24-hour limit for protection of human health	75 µg/m³	50 µg/m³	45 µg/m³
		Annual limit for protection of human health	30 µg/m³	20 µg/m³	15 µg/m³
PM (as $PM_{2.5}$)		24-hour limit for protection of human health	37.5 µg/m³	25 µg/m³	15 µg/m³
		Annual limit for protection of human health	15 µg/m³	10 µg/m³	5 µg/m³

13.4.1.2 Dust Deposition Guidelines

The concern from a health perspective is focused on particles of dust which are less than 10 microns and the EU ambient air quality standards outlined in Section 13.4.1 have set ambient air quality limit values for PM_{10} and $PM_{2.5}$.

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.

However, guidelines for dust deposition, the German TA-Luft standard for dust deposition (non-hazardous dust) (German VDI, 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. The TA-Luft standard has been applied for the purpose of this assessment based on recommendations from the EPA in Ireland in the document titled *Environmental Management Guidelines - Environmental Management in the Extractive Industry (Non-Scheduled Minerals)* (EPA, 2006). The document recommends that the Bergerhoff limit of 350 mg/m^2/day be applied to the site boundary of quarries. This limit value can be implemented with regard to dust impacts from construction of the proposed development.

13.4.1.3 National Air Emissions Targets

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

National Emission Ceiling Directive) until 2020. National emission reduction commitments which are applicable from 2020 and 2030 for SO_2, NO_X, non-methane volatile organic compounds (NMVOC), ammonia (NH_3), $PM_{2.5}$ and methane (CH_4) was also established. In relation to Ireland, the 2020 to 2029 emission targets are 25.5kt (kilotonnes) for SO_2 (65% reduction on 2005 levels), 68.4kt for NO_X (49% reduction on 2005 levels), 57.8kt for NMVOCs (25% reduction on 2005 levels), 118.9kt for NH_3 (1% reduction on 2005 levels) and 15.3 kt for $PM_{2.5}$ (18% reduction on 2005 levels) as shown in Table 13.3. In relation to 2030, Ireland's emission targets are 85% below 2005 levels for SO_2, 69% reduction for NO_X, 32% reduction for VOCs, 5% reduction for NH_3 and 41% reduction for $PM_{2.5}$, also shown in Table 13.3.

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Table 13.3 National Air Emission Targets (Ireland's Air Pollutant Emissions 2020 to 2030)

Pollutant	2005 Emission Level	2020-2029 Reduction Commitments		2030 Reduction Commitments	
		kt	% Reduction Compared to 2005 Levels	kt	% Reduction Compared to 2005 Levels
SO_2	72.813	25.5	-65%	10.9	-85%
NO_X	134.144	68.4	-49%	41.6	-69%
NMVOC	77.100	57.8	-25%	52.4	-32%
NH_3	120.148	118.9	-1%	114.1	-5%
$PM_{2.5}$	18.715	15.3	-18%	11.0	-41%

13.4.2 Site Surveys/Investigations

No site surveys were required for the air quality assessment. The baseline air quality environment was established using available long-term EPA monitoring data for representative locations (see Section 13.5.2).

13.4.3 Construction Phase

13.4.3.1 Construction Dust Assessment

The Institute of Air Quality Management in the UK (IAQM) guidance document '*Guidance on the Assessment of Dust from Demolition and Construction*' (2024) outlines an assessment method for predicting the impact of dust emissions from construction activities based on the scale and nature of the works and the sensitivity of the area to dust impacts. The IAQM methodology has been applied to the construction phase of this development to predict the likely risk of dust impacts in the absence of mitigation measures and to determine the level of site-specific mitigation required. The use of UK guidance is recommended by Transport Infrastructure Ireland in their guidance document *'Air Quality Assessment of Specified Infrastructure Projects – PE-ENV-01106'* (TII, 2022a).

The major dust generating activities are divided into four types within the IAQM guidance (IAQM, 2024) to reflect their different potential impacts. These are:

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- Demolition;
- Earthworks;
- Construction; and
- Trackout (transport of dust and dirt from the construction site onto the public road network).

The magnitude of each of the four categories is divided into large, medium or small scale depending on the nature of the activities involved. The magnitude of each activity is combined with the overall sensitivity of the area to determine the risk of dust impacts from site activities. This allows the level of site-specific mitigation to be determined.

13.4.3.2 Construction Phase Traffic Assessment

Construction phase traffic can also impact air quality. The TII guidance *'Air Quality Assessment of Specified Infrastructure Projects – PE-ENV-01106'* (TII, 2022a), states that road links meeting one or more of the following criteria can be defined as being *'affected'* by a proposed development and should be included in the local air quality assessment.

- Annual average daily traffic (AADT) changes by 1,000 or more;
- Heavy duty vehicle (HDV) AADT changes by 200 or more;
- Daily average speed change by 10 kph or more;
- Peak hour speed change by 20 kph or more;
- A change in road alignment by 5 m or greater.

While the guidance is specific to infrastructure projects the approach can be applied to any development that causes a change in traffic.

As advised by the project traffic team, the construction stage traffic will not increase by 1,000 AADT or 200 HDV AADT. Therefore, it does not meet the above scoping criteria. In addition, there are no proposed changes to the traffic speeds or road alignment. As a result, a detailed air assessment of construction stage traffic emissions has been scoped out from any further assessment as there is no potential for significant impacts to air quality.

13.4.4 Operational Phase Methodology

13.4.4.1 Operational Phase Traffic Assessment

Operational phase traffic has the potential to impact air quality. The TII scoping criteria (TII, 2022a) outlined in Section 13.4.3.2 was used to determine if any road links required a detailed modelling assessment. The operational phase of the development will involve only very occasional inspection and maintenance vehicles. By definition of the criteria in Section 13.4.3.2, there are no road links impacted as a result of the proposed development. Therefore, a detailed air assessment of operational stage traffic emissions has been scoped out from any further assessment as there is no potential for significant impacts to air quality as a result of vehicle emissions.

13.4.4.2 Operational Energy Production

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The assessment of baseline air quality in the region is conducted to review and ensure that the current levels of key pollutants are significantly lower than their limit values. The indirect impacts to air quality from savings in nitrogen oxides (NO_X) emissions arising from the production of electricity using renewable sources were calculated and compared against those produced using non-renewable sources. The calculations were carried out using SEAI published emission rates from non-renewable energy sources.

The most recent report by the SEAI entitled "*Energy in Ireland 2023 Report*" (SEAI, 2023) estimates that a total of 33.6TWh of electricity was generated nationally in 2022. Renewable energy accounted for 38.9% of the electricity generated in 2022.

The EPA state that a total of 92.84 kt NO_X was emitted in 2021 in their report entitled "*Ireland's Air Pollutant Emissions 1990 – 2030*" (EPA, 2023). These are the most recently published figures for NO_X emissions. Power generation accounted for 8.1% of the total emissions produced in 2021.

The above figures from the SEAI and EPA were used in the current assessment to quantify the NO_X emissions savings from the windfarm development both annually and over the assumed 35 year lifespan of the proposed development and the results were compared against the 2030 National Air Emissions Target of 40.6kt (see Table 13.3).

13.5 Baseline Environment

13.5.1 Meteorological Data

A key factor in assessing temporal and spatial variations in air quality are the prevailing meteorological conditions. Depending on wind speed and direction, individual receptors may experience very significant variations in pollutant levels under the same source strength (i.e. traffic levels) (WHO, 2006). Wind is of key importance in dispersing air pollutants and for ground level sources, such as traffic emissions, pollutant concentrations are generally inversely related to wind speed. Thus, concentrations of pollutants derived from traffic sources will generally be greatest under very calm conditions and low wind speeds when the movement of air is restricted. In relation to PM_{10}, the situation is more complex due to the range of sources of this pollutant. Smaller particles (less than $PM_{2.5}$) from traffic sources will be dispersed more rapidly at higher wind speeds. However, fugitive emissions of coarse particles ($PM_{2.5}$ - PM_{10}) will actually increase at higher wind speeds. Thus, measured levels of PM_{10} will be a non-linear function of wind speed.

The nearest representative weather station collating detailed long-term weather records is Knock Airport meteorological station, which is located approximately 75 km east of the site. Knock Airport meteorological station data has been examined to identify the prevailing wind direction and average wind speeds over a five-year period. The mean wind speed over the period 1996 – 2024 is approximately 4.8 m/s. Wind frequency is important as dust can only be dispersed by winds, and deposition of dust is a simple function of particle size, wind speed and distance. The closer the source of dust is to a receptor the higher the potential risk of impact of dust blow. The prevailing winds in the

area are westerly to south-westerly in direction, thereby predominantly dispersing any potential dust emissions to the east and north-east of the site (see Figure 13.1).

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Dust emissions are dramatically reduced where rainfall has occurred due to the cohesion created between dust particles and water and the removal of suspended dust from the air. It is typical to assume no dust is generated under "wet day" conditions where rainfall greater than 0.2 mm has fallen. Information regarding rainfall collected from Knock Airport meteorological station, identified that typically 235 days per annum are "wet" (Met Eireann 2024, 30-year averages). Thus, over 64% of the time no significant dust generation will be likely due to natural meteorological conditions.

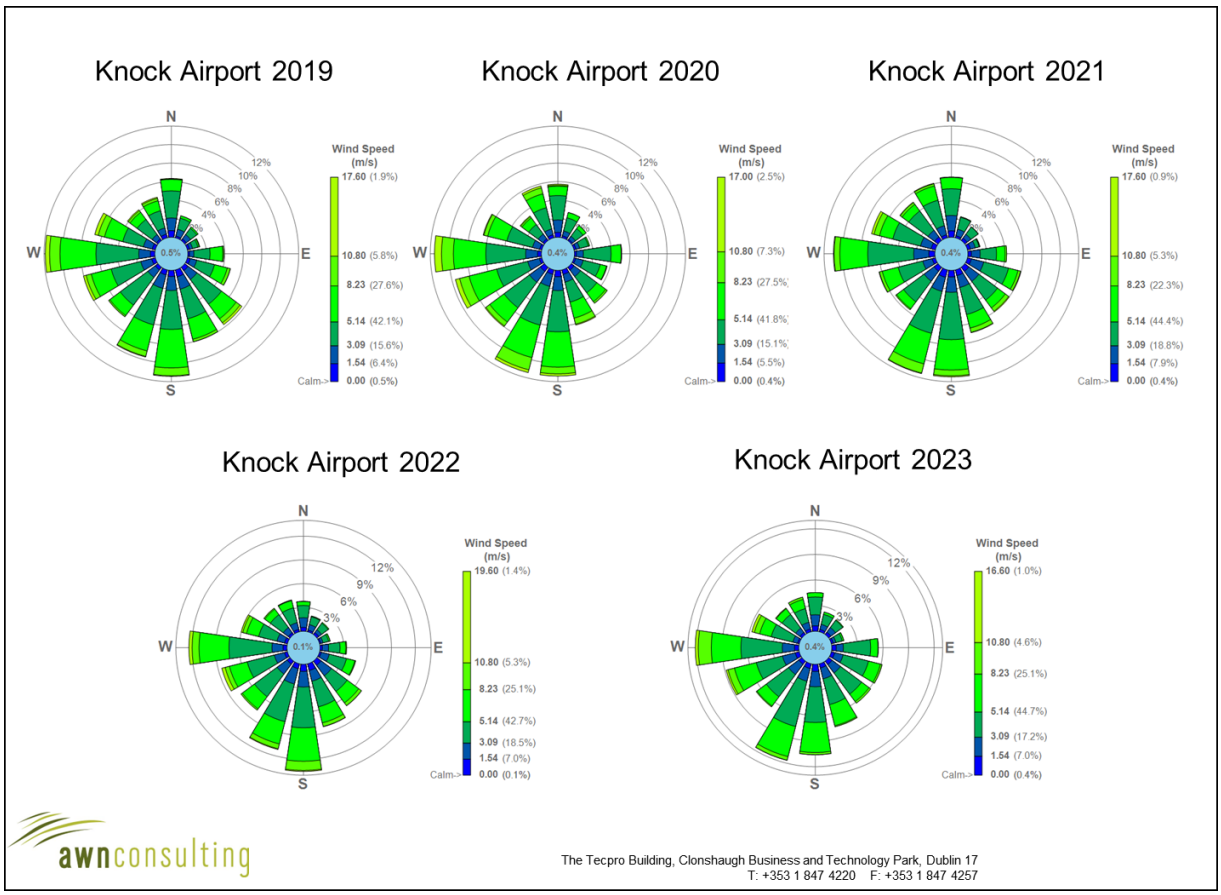


Figure 13.1 Knock Airport Windroses 2019 – 2023

13.5.2 Baseline Air Quality

Air quality monitoring programs have been undertaken in recent years by the EPA. The most recent annual report on air quality in Ireland is *"Air Quality In Ireland 2022"* (EPA, 2023). The EPA website details the range and scope of monitoring undertaken throughout Ireland and provides both monitoring data and the results of previous air quality assessments (EPA, 2024).

As part of the implementation of the Framework Directive on Air Quality (1996/62/EC), four air quality zones have been defined in Ireland for air quality management and assessment purposes as outlined within the EPA document titled *Air Quality in Ireland 2022* (EPA 2023). Dublin is defined as Zone A and Cork as Zone B. Zone C is composed of 23 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.

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In terms of air monitoring, the area of the proposed development is categorised as Zone D (EPA, 2024). The long-term monitoring data has been used to determine background concentrations for the key pollutants in the region of the proposed development. The background concentration accounts for all non-traffic derived emissions (e.g. natural sources, industry, home heating etc.).

13.5.2.1 Nitrogen Dioxide (NO_2)

Long-term NO_2 monitoring was carried out at the Zone D suburban background location of Castlebar and the rural background locations of Kilkitt and Emo Court which are considered representative of the area of the proposed development for the period 2018 – 2022 (EPA, 2023).

The NO_2 annual average in 2022 for the suburban background location of Castlebar, and rural background locations of Kilkitt and Emo Court, was 8 µg/m^3, 2 µg/m^3 and 3 µg/m^3 respectively. Therefore, long-term average concentrations measured at all locations were significantly lower than the current annual average limit value of 40 µg/m^3. Sufficient data is available at all three locations to observe the long-term trend over the period 2018 – 2022, with annual average results ranging from 3 – 7 µg/m^3 (Table 13.4). An estimate of the background NO_2 concentration, for the region of the proposed development is therefore 4 µg/m^3, as derived from these long-term trends.

Table 13.4 Trends in Zone D Air Quality – NO_2

Station	Averaging Period Notes 1	Year				
		2018	2019	2020	2021	2022
Castlebar	Annual Mean NO_2 (µg/m^3)	8	8	6	6	8
Kilkitt	Annual Mean NO_2 (µg/m^3)	3	5	2	2	2
Emo Court	Annual Mean NO_2 (µg/m^3)	3	4	3	4	3

Note 1 Annual average limit value - 40 µg/m^3 (EU Council Directive 2008/50/EC & S.I. No. 739 of 2022). 1-hour limit value - 200 µg/m^3 (EU Council Directive 2008/50/EC & S.I. No. 739 of 2022).

13.5.2.2 Particulate Matter (PM_{10})

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Long-term PM_{10} monitoring was carried out at the suburban background Zone D locations of Castlebar Co. Mayo, and Enniscorthy Co. Wexford and at the rural background locations of Kilkitt Co. Monaghan and Claremorris Co. Mayo over the period 2018 – 2022 (EPA, 2023). Annual mean concentrations range from 10 – 18 µg/m^3 for the urban sites and 7 – 12 µg/m^3 for the rural sites (Table 13.5). Hence, long-term average PM_{10} concentrations measured at these locations were significantly lower than the current annual average limit value of 40 µg/m^3. The 90.4th percentile of 24-hour values was well below the current limit value of 50 µg/m^3 reaching at most 25 µg/m^3 in Enniscorthy in 2020. Data for the rural site at Kilkitt, which is the most representative site to the proposed development location, suggests an upper average annual mean of no more than 9 µg/m^3 as a background value. Based on the above data a conservative estimate of the current background PM_{10} concentration in the region of the proposed development is 11 µg/m^3.

Table 13.5 Trends in Zone D Air Quality – PM_{10}

Station	Averaging Period Notes 1, 2	Year				
		2018	2019	2020	2021	2022
Castlebar	Annual Mean PM_{10} (µg/m^3)	11	16	14	10	11
	90th %ile 24-hr PM_{10} (µg/m^3)	20	24	22	22	19
Kilkitt	Annual Mean PM_{10} (µg/m^3)	9	7	8	8	9
	90th %ile 24-hr PM_{10} (µg/m^3)	15	13	14	13	14
Claremorris	Annual Mean PM_{10} (µg/m^3)	12	11	10	8	8
	90th %ile 24-hr PM_{10} (µg/m^3)	20	20	16	13	13
Enniscorthy	Annual Mean PM_{10} (µg/m^3)	-	18	15	14	-
	90th %ile 24-hr PM_{10} (µg/m^3)	-	-	25	23	-

Note 1 Annual average limit value - 40 µg/m^3 EU Council Directive 2008/50/EC & S.I. No. 739 of 2022). Daily limit value - 50 µg/m^3 (EU Council Directive 2008/50/EC & S.I. No. 739 of 2022).

13.5.2.3 Particulate Matter ($PM_{2.5}$)

The results of $PM_{2.5}$ monitoring at Longford Town, Claremorris and Enniscorthy over the period 2018 – 2022 ranged from 4 – 14 µg/m^3 (EPA, 2023). Long-term average $PM_{2.5}$ concentrations measured at this location were significantly lower than the current annual average limit value of 25 µg/m^3. Based on this information, a background $PM_{2.5}$ concentration of 9 µg/m^3 has been used in the assessment.

Table 13.6 Trends in Zone D Air Quality – $PM_{2.5}$

Station	Averaging Period Notes 1, 2	Year				
		2018	2019	2020	2021	2022
Longford Town	Annual Mean $PM_{2.5}$ (µg/m^3)	9	9	7	7	8
Claremorris	Annual Mean $PM_{2.5}$ (µg/m^3)	6	4	5	8	6
Enniscorthy	Annual Mean $PM_{2.5}$ (µg/m^3)	13	14	12	10	10

Note 1 Annual average limit value - 25 µg/m^3 (EU Council Directive 2008/50/EC & S.I. No. 739 of 2022).

13.5.2.4 Dust Deposition

Dust is present naturally in the air from a number of sources including weathering of minerals, pick-up across open land and dust generated from fires. Monitoring of dust deposition is not undertaken in the area and therefore background levels for the immediate vicinity of the site are not available.

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However, a study by the UK ODPM (UK ODPM, 2002) gives estimates of likely dust deposition levels in specific types of environments. In open country a level of 39 mg/m^2/day is typical, rising to 59 mg/m^2/day on the outskirts of towns, and peaking at 127 mg/m^2/day for a purely industrial area. A level of 39 mg/m^2/day can be estimated as the background dust deposition level for the region of the proposed Cloonanny Wind Farm due to its rural location.

13.5.2.5 Summary

Based on the above information the air quality in the area of the proposed development is generally good, with concentrations of the key pollutants generally well below the relevant current limit values. However, in general terms, the EPA have indicated that road transport emissions are contributing to increased levels of NO_2. There is the potential for breaches in the annual NO_2 limit value in future years at locations within urban centres and roadside locations. In addition, burning of solid fuels for home heating is contributing to increased levels of particulate matter (PM_{10} and $PM_{2.5}$). The EPA predict that exceedances in the particulate matter limit values are likely in future years if burning of solid fuels for residential heating continues (EPA, 2023).

13.5.3 Sensitivity of the Receiving Environment

13.5.3.1 Construction Phase

In line with the UK Institute of Air Quality Management (IAQM) guidance document *'Guidance on the Assessment of Dust from Demolition and Construction'* (2024) prior to assessing the impact of dust from a proposed development the sensitivity of the area must first be assessed as outlined below. Both receptor sensitivity and proximity to proposed works areas are taken into consideration. For the purposes of this assessment, high sensitivity receptors are regarded as residential properties (where people are likely to spend the majority of their time), schools and hospitals. Commercial premises and places of work are regarded as medium sensitivity and places where people are present for short periods, or do not expect a high level of amenity, are regarded as low sensitivity.

The sensitivity of the area to dust soiling effects and dust-related human health effects are first considered. The IAQM guidance (2024) states that where there are no sensitive human receptors present within 250 m of the site, then no assessment of dust impacts is required.

In terms of receptor sensitivity to dust soiling, there between 10 and 100 no. high sensitivity residential properties within 100m of the site boundary, which may be impacted by construction dust emissions or due dust spread on vehicles travelling along this road after exiting the site (see Figure 13.2). Of these receptors and using a conservative approach, between 1 and 10 no. properties are within 20m of the site boundary. The majority of the receptors are in proximity to road widening works to facilitate turbine haul routes. Therefore, the area is considered of medium sensitivity to dust soiling impacts based on the IAQM criteria outlined in Table 13.7.

Table 13.7 Sensitivity of the Area to Dust Soiling Effects

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Receptor Sensitivity	Number Of Receptors	Distance from source (m)			
		<20	<50	<100	<250
High	>100	High	High	Medium	Low
	10-100	High	Medium	Low	Low
	1-10	**Medium**	Low	Low	Low
Medium	>1	Medium	Low	Low	Low
Low	>1	Low	Low	Low	Low

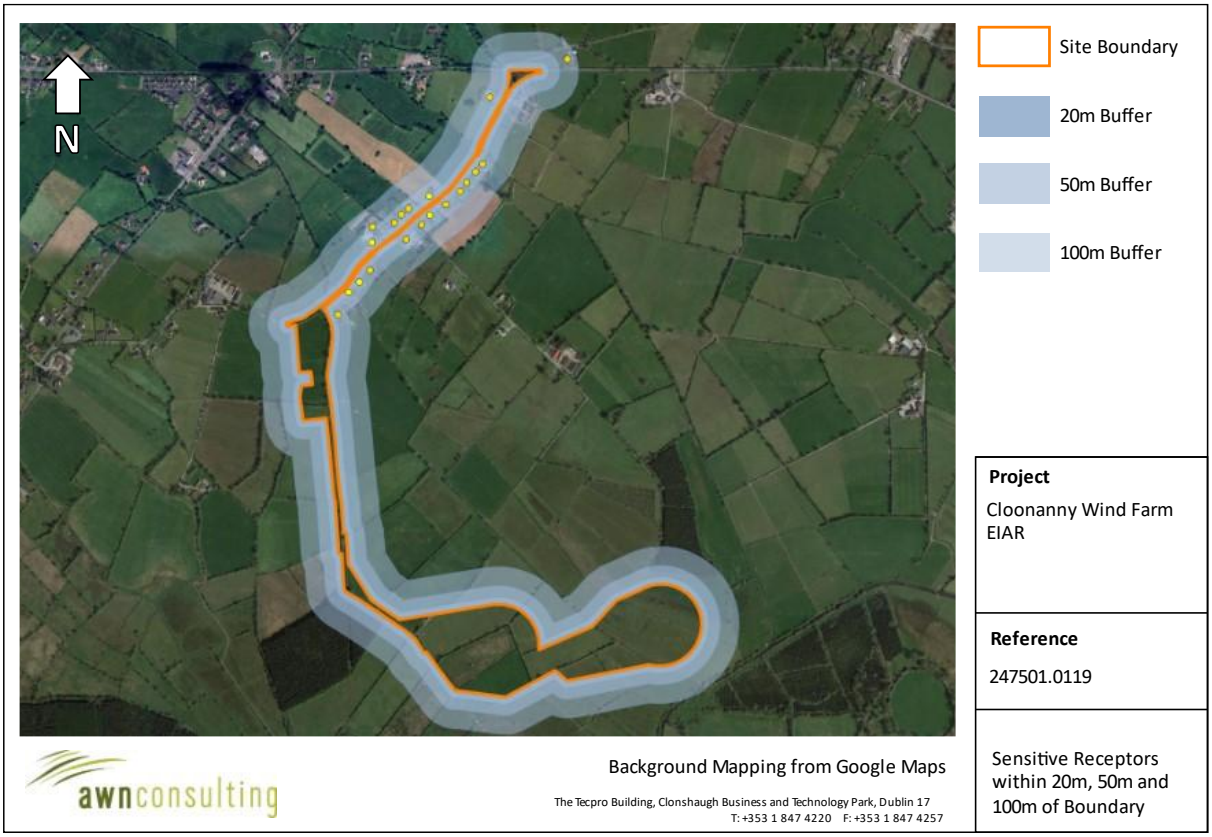


Figure 13.2 Sensitive Receptors within 20m, 50m and 100m of Site Boundary

In addition to sensitivity to dust soiling, the IAQM guidelines also outline the assessment criteria for determining the sensitivity of the area to human health impacts. The criteria take into consideration the current annual mean PM_{10} concentration, receptor sensitivity based on type (residential receptors are classified as high sensitivity) and the number of receptors affected within various distance bands from the construction works. A conservative estimate of the current annual mean PM_{10} concentration in the vicinity of the proposed development is 11 µg/m^3. As noted above, there are between 1 and 10 no. properties within 20m of the boundary which have the potential to be impacted by dust emissions from vehicles travelling along the road (see Figure 13.2). Therefore, the area is considered of low sensitivity to dust-related human health impacts based on the IAQM criteria outlined in Table 13.8.

Table 13.8 Sensitivity of the Area to Dust Related Human Health Effects

Receptor Sensitivity	Annual Mean PM_{10} Concentration	Number of Receptors	Distance from Source (m)			
			<20	<50	<100	<250
High	< 24 µg/m³	>100	Medium	Low	Low	Low
		10-100	Low	Low	Low	Low
		1-10	**Low**	Low	Low	Low
Medium	< 24 µg/m³	>10	Low	Low	Low	Low
		1-10	Low	Low	Low	Low
Low	< 24 µg/m³	>1	Low	Low	Low	Low

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The IAQM guidelines also outline the assessment criteria for determining the sensitivity of the area to dust-related ecological impacts. Dust emissions can coat vegetation leading to a reduction in the photosynthesising ability of the plant as well as other effects. The guidance states that dust impacts to vegetation can occur up to 50 m from the site, and 50 m from site access roads, up to 250 m for the site entrance. The sensitivity of the area is determined based on the distance to the source, the designation of the site, (European, National or local designation) and the potential dust sensitivity of the ecologically important species present.

Carrickglass Demesne pNHA is approximately 1km to the east of the site boundary (see Figure 13.3). High sensitivity ecological receptors are sites with European or National designation with particularly dust sensitive species present. The designated sites are all more than 50m away from the proposed development which is the area of potential impact as per IAQM guidelines (IAQM, 2024). Therefore, due to the distance from the works the designated areas will not be significantly affected by dust emissions. As this is a minor junction upgrade, construction work will be limited to shorter period. An ecological sensitivity assessment has therefore been scoped out.

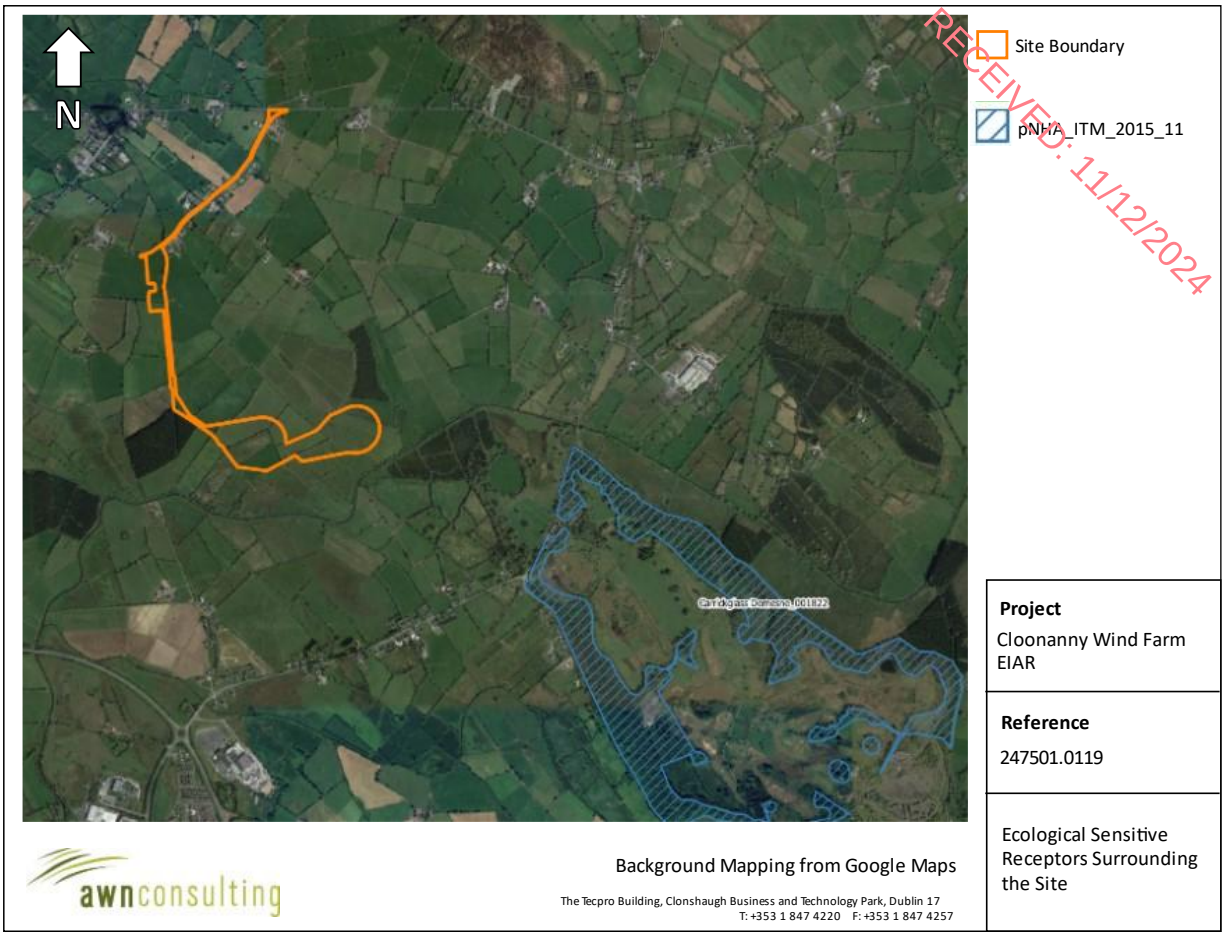


Figure 13.3 Ecological Sensitive Receptors Surrounding the Site

13.5.3.2 Operational Phase

The impact to air quality as a result of changes in traffic is typically assessed at sensitive receptors in the vicinity of affected roads. The TII guidance (TII, 2022) states a proportionate number of representative receptors which are located in areas which will experience the highest concentrations or greatest improvements as a result of the proposed development, are to be included in the modelling. The TII criteria states that receptors within 200 m of affected road links should be assessed; roads which are greater than 200 m from receptors will not affect pollutant concentrations at that receptor. The TII guidance (TII, 2022) defines sensitive receptor locations for the purposes of modelling annual mean pollutant concentrations as: residential housing, schools, hospitals, care homes and short term-accommodation such as hotels, i.e. locations where members of the public are likely to be regularly present for 24 hours.

A detailed air quality assessment of traffic emissions was scoped out in Section 13.4.3.2 due to the low-level changes in traffic as a result of the proposed development. The traffic would be associated with maintenance vehicles associated with the windfarm and its associated infrastructure. Therefore, no detailed review of operational phase receptors due to traffic impacts are required.

13.6 The 'Do Nothing' Scenario

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In the 'Do Nothing' scenario, the proposed development will not be constructed. No construction works associated with the proposed development will take place and the previously identified effects of fugitive dust and particulate matter emissions and emissions from equipment and machinery will not occur. The Do-Nothing scenario associated with the operational phase of the development is assessed within Section 13.7.2. In terms of the traffic assessment, the scenario was found to be ***long-term, localised, direct, imperceptible*** and ***negative***. In terms of the renewable electricity assessment, the scenario was found to be ***national, long-term, indirect, slight*** and ***positive***.

13.7 Potential Significant Effects

13.7.1 Construction Phase

13.7.1.1 Construction Dust Assessment

The greatest potential impact on air quality during the construction phase of the proposed development is from construction dust emissions and the potential for nuisance dust. While construction dust tends to be deposited within 250m of a construction site, the majority of the deposition occurs within the first 50m (IAQM, 2024). 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. A review of long-term meteorological data from Knock Airport meteorological station in Section 13.5.1 has indicated that dust generation will be reduced due to natural meteorological conditions for a large portion of the year. The key works included in this development with the potential for dust emissions include earthworks and excavation activities, creation of borrow pits, construction of hardstanding areas and movement of vehicles on and off site.

In order to determine the level of dust mitigation required during the proposed works, the potential dust emission magnitude for each dust generating activity needs to be taken into account, in conjunction with the previously established sensitivity of the area (see Section 13.5.3). The major dust generating activities are divided into four types within the IAQM guidance (2024) to reflect their different potential impacts.

These are:

- Demolition;
- Earthworks;
- Construction; and
- Trackout (movement of heavy vehicles).

13.7.1.1.1 Demolition

The demolition of 1 no derelict structure along the haul route is required. The demolition is associated with the turbine delivery to site; there is no other demolition activities associated with the proposed development. Demolition will primarily involve the removal of buildings or structures in a potentially

dusty manner. This may also involve dust generation at heights. Dust emission magnitude from demolition can be classified as small, medium and large and are described below:

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- **Large** Total building volume > 75,000m^3, potentially dusty construction material (e.g. concrete), on-site crushing and screening, demolition activities >12m above ground level;
- **Medium** Total building volume 12,000m^3 – 75,000m^3, potentially dusty construction material, demolition activities 6 – 12m above ground level;
- **Small** Total building volume less than 12,000m^3, construction material with low potential for dust release (e.g. metal cladding or timber), demolition activities <6m above ground, demolition during wetter months.

The dust emission magnitude for the proposed demolition activities can be classified as small as the total building volume will be less than 12,000 m^2.

The sensitivity of the area, as determined in Section 13.5.3, is combined with the dust emission magnitude for each dust generating activity to define the risk of dust impacts in the absence of mitigation. As the area is of medium sensitivity to dust soiling effects there is a low risk of dust soiling using the criteria in Table 13.11. The surrounding area is of low sensitivity to dust-related human health effects and therefore there is a negligible risk of human health effects from the proposed demolition activities. The risk of dust impacts from the proposed demolition activities is summarised in Table 13.12 for each category.

Table 13.9 Criteria for Rating Risk of Dust Impacts

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

Table 13.10 Risk of Dust Impacts – Demolition (IAQM, 2024)

Receptor	Receptor Sensitivity	Dust Emission Magnitude – Earthworks	Risk of Dust-Related Impacts
Dust Soiling	Medium	Small	Low Risk
Human Health	Low		Negligible

13.7.1.1.2 Earthworks

Earthworks primarily involve excavating material, loading and unloading of materials, tipping and stockpiling activities. Activities such as levelling the site and landscaping works are also considered under this category. The dust emission magnitude from earthworks can be classified as small, medium or large based on the definitions from the IAQM guidance as transcribed below:

- **Large** Total site area > 110,000m^2, potentially dusty soil type (e.g. clay which will be prone to suspension when dry due to small particle size), >10 heavy earth moving vehicles active at any one time, formation of bunds > 6m in height;
- **Medium** Total site area 18,000m^2 – 110,000m^2, moderately dusty soil type (e.g. silt), 5 - 10 heavy earth moving vehicles active at any one time, formation of bunds 3 – 6m in height;

- **Small** Total site area < 18,000m^2, soil type with large grain size (e.g. sand), < 5 heavy earth moving vehicles active at any one time, formation of bunds < 3 m in height.

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The dust emission magnitude for the proposed earthwork activities can be classified as medium as the total site area will be between 18,000 m^2 and 110,000 m^2.

The sensitivity of the area, as determined in Section 13.5.3, is combined with the dust emission magnitude for each dust generating activity to define the risk of dust impacts in the absence of mitigation. However, as noted in Section 13.5.3 there are between 1 and 10 no. sensitive receptors within 20m of the boundary of the proposed development. As the area is of medium sensitivity to dust soiling effects there is a medium risk of dust soiling using the criteria in Table 13.11. The surrounding area is of low sensitivity to dust-related human health effects and therefore there is an overall low risk of human health effects from the proposed earthwork activities. The risk of dust impacts from the proposed earthworks activities is summarised in Table 13.12 for each category.

Table 13.11 Criteria for Rating Risk of Dust Impacts

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

Table 13.12 Risk of Dust Impacts – Earthworks (IAQM, 2024)

Receptor	Receptor Sensitivity	Dust Emission Magnitude – Earthworks	Risk of Dust-Related Impacts
Dust Soiling	Medium	Medium	Medium Risk
Human Health	Low		Low Risk

13.7.1.1.3 Construction

Dust emission magnitude from construction can be classified as small, medium or large based on the definitions from the IAQM guidance as transcribed below:

- **Large** Total building volume > 75,000 m^3, on-site concrete batching, sandblasting;
- **Medium** Total building volume 12,000 m^3 – 75,000 m^3, potentially dusty construction material (e.g. concrete), on-site concrete batching;
- **Small** Total building volume < 12,000 m^3, construction material with low potential for dust release (e.g. metal cladding or timber).

The dust emission magnitude for the proposed construction activities can be classified as small when the full suite of works istaken into consideration. The construction works occur over multiple relatively small areas and there is some prefabrication involved. Using the criteria in Table 13.13 and the previously established sensitivity of the area from Section 13.5.3; there is a low risk of dust soiling and a negligible risk of dust-related human health effects. The risk of dust impacts from the proposed construction activities is summarised in Table 13.14 for each category.

Table 13.13 Criteria for Rating Risk of Dust Impacts – Construction (IAQM, 2024)

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

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Table 13.14 Risk of Dust Impacts – Construction

Receptor	Receptor Sensitivity	Dust Emission Magnitude – Construction	Risk of Dust-Related Impacts
Dust Soiling	Medium	Small	Low Risk
Human Health	Low		Negligible

13.7.1.1.4 Trackout

Factors which determine the dust emission magnitude are vehicle size, vehicle speed, number of vehicles, road surface material and duration of movement. Dust emission magnitude from trackout can be classified as small, medium or large based on the definitions from the IAQM guidance as transcribed below:

- **Large** > 50 HGV (> 3.5 t) outward movements in any one day, potentially dusty surface material (e.g. high clay content), unpaved road length > 100 m;
- **Medium** 20 - 50 HGV (> 3.5 t) outward movements in any one day, moderately dusty surface material (e.g. high clay content), unpaved road length 50 - 100 m;
- **Small** < 20 HGV (> 3.5 t) outward movements in any one day, surface material with low potential for dust release, unpaved road length < 50 m.

The dust emission magnitude for the proposed trackout activities can be conservatively classified as large, as there are long lengths of unconstructed road. Using the criteria in Table 13.15 and the previously established sensitivity of the area from Section 13.5.3; there is a medium risk of dust soiling and a low risk of dust-related human health effects. The risk of dust impacts from the proposed construction activities is summarised in Table 13.16 for each category.

Table 13.15 Criteria for Rating Risk of Dust Impacts – Trackout (IAQM, 2024)

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

Table 13.16 Risk of Dust Impacts – Trackout

Receptor	Receptor Sensitivity	Dust Emission Magnitude – Trackout	Risk of Dust-Related Impacts
Dust Soiling	Medium	Large	Medium Risk
Human Health	Low		Low Risk

13.7.1.1.5 Summary of Dust Emission Risk

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The risk of dust impacts as a result of the proposed development are summarised in Table 13.17 for each activity. The magnitude of risk determined is used to prescribe the level of site-specific mitigation required for each activity in order to prevent significant impacts occurring.

There is at most a medium risk of dust soiling effects and a low risk of dust-related human health effects associated with the proposed works. Therefore, best practice dust mitigation measures appropriate for medium risk sites will be implemented during the proposed earthworks activities to ensure there are no impacts at nearby sensitive receptors. During the construction works and trackout activities dust mitigation measures appropriate for medium risk site will be required. When the dust mitigation measures detailed in the mitigation section (Section13.8) are implemented, fugitive emissions of dust from the site will be insignificant and pose no nuisance at nearby receptors. In the absence of mitigation there is the potential for ***short-term, localised, direct, negative*** and ***slight*** impacts to air quality from dust emissions.

Table 13.17 Summary of Dust Impact Risk used to Define Site

Potential Impact	Dust Emission Magnitude			
	Demolition	Earthworks	Construction	Trackout
Dust Emission Magnitude	Small	Medium	Small	Large
Dust Soiling Risk	Low Risk	Medium Risk	Low Risk	Medium Risk
Human Health Risk	Negligible Risk	Low Risk	Negligible Risk	Low Risk
Ecology	N/A	N/A	N/A	N/A

13.7.1.2 Construction Phase Traffic Assessment

There is also the potential for traffic emissions to impact air quality in the short-term over the construction phase, particularly due to the increase in HGVs accessing the site. The construction stage traffic has been reviewed and a detailed air quality assessment has been scoped out. None of the road links impacted by the proposed development satisfy the TII scoping assessment criteria in Section 13.4.3.2. It can, therefore, be determined that the construction stage traffic will have a ***short-term, direct, negative*** and ***imperceptible*** effect on air quality.

13.7.2 Operational Phase

13.7.2.1 Operational Phase Traffic Assessment

There is the potential for traffic emissions to impact air quality during the operational phase, due to increased vehicle numbers accessing the site. The operational stage traffic has been reviewed and a detailed air quality assessment has been scoped out. None of the road links impacted by the proposed development satisfy the TII scoping criteria in Section 13.4.3.2. The only operational phase traffic will be associated with maintenance vehicles for the windfarm and its associated infrastructure. The impact of the proposed development on ambient air quality in the operational stage, using the EPA

EIA terminology (EPA, 2022), is ***long-term, localised, direct, imperceptible*** and ***negative*** which is overall ***not significant*** in EIA terms.

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13.7.2.2 Operational Phase Indirect Air Quality Impacts from Renewable Electricity Production

The generation of electricity due to the installation of the wind farm will lead to indirect net savings in terms of NO_X emissions. The wind farm will have an export capacity of approximately 14 MW and an assumed capacity factor of 28.8%, therefore the power generation from the development is expected to be approximately 35 GWh per annum.

The supply of 35 GWh of renewable electricity to the national grid will lead to a net saving in terms of NO_X emissions which may have been emitted from fossil fuels to produce electricity. Results, outlined in Table 13.18, indicate that the impact of the wind farm on Ireland's obligations under the National Emissions Reduction Directive are positive. The annual impact of the development is to decrease annual NO_X emission levels by 0.03% of the 2030 ceiling of 40.6kt (relative to the NO_X emissions associated with power generation in Ireland 2021 (EPA, 2023)). The total NO_X emissions savings over its 35-year life-span will amount to 11.9 tonnes of NO_X which is equivalent to 5.52% of the total NO_X emissions from power generation in 2021. This is considered a ***long-term, national, indirect, slight*** and ***positive*** effect on air quality, which is overall ***not significant*** in EIA terms.

Table 13.18 Predicted Impact of Cloonanny Wind Farm Project on Ireland's National Emissions Ceiling Obligations

Scenario	NO_X (tonnes/annum)
Emissions Saved Due To Wind Farm Note 1	11.9
National Emission Ceiling 2030 Target Note 2	40,600
Positive Impact of Wind farm (%) (as a percentage of 2030National Emission Ceiling on an annual basis)	0.03%
Total NO_X Saving (%) Over 35 Years Relative To NO_X Emissions From Power Generation in 2021	5.52%

Note 1 For NO_X emissions associated with power generation in Ireland (taken from EPA (2023) Ireland's Air Pollutant Emissions 1990 – 2030)

Note 2 National Emission Ceiling (EU Directive 2016/2284)

13.7.3 Decommissioning Stage

The decommissioning phase will involve the removal of the turbines and associated infrastructure from the site. Vehicles and generators associated with the removal of the turbines have the potential to cause a temporary negative impact on local air quality in the short term. However, due to the short-term nature of any associated works and low background pollutant concentrations in the vicinity of the site (see Section 13.5.2) it is predicted to have a ***short-term, direct, negative*** and ***imperceptible*** effect on local air quality once mitigation measures as per the construction phase mitigation are applied.

13.7.4 Summary

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The following table summarises the identified likely significant effects during the construction phase of the proposed development before mitigation measures are applied.

Table 13-19 Summary of Construction Phase Likely Significant Effects in the absence of mitigation

Likely Significant Effect	Quality	Significance	Extent	Probability	Duration	Type
Construction Dust Impact	Negative	Not significant - slight	Localised	Likely	Short-term	Direct
Construction Traffic Impacts	Negative	Not significant - imperceptible	Localised	Likely	Short-term	Direct

The following table summarises the identified likely significant effects during the operational phase of the proposed development before mitigation measures are applied.

Table 13-20 Summary of Operational Phase Likely Significant Effects in the absence of mitigation

Likely Significant Effect	Quality	Significance	Extent	Probability	Duration	Type
Operational Traffic Impacts	Negative	Not significant - imperceptible	Localised	Likely	Long-term	Indirect
Indirect Air Quality Impact as a result of Renewable Electricity Generation	Positive	Not significant - slight	Nationally	Likely	Long-term	Indirect

The following table summarises the identified likely significant effects during the decommissioning phase of the proposed development before mitigation measures are applied.

Table 13-21 Summary of Decommissioning Phase Likely Significant Effects in the absence of mitigation

Likely Significant Effect	Quality	Significance	Extent	Probability	Duration	Type
Decommissioning Dust Impact	Negative	Not significant - slight	Localised	Likely	Short-term	Construction Dust Impact
Decommissioning Traffic Impacts	Negative	Not significant - imperceptible	Localised	Likely	Short-term	Direct

13.8 Mitigation Measures

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13.8.1 Construction Phase Mitigation

The proposed development has been assessed as having a medium risk of dust soiling impacts and a low risk of dust related human health impacts during the construction phase as a result of earthworks, construction and trackout activities (see Section 13.7.1). Therefore, the following dust mitigation measures shall be implemented during the construction phase of the proposed development. These measures are appropriate for sites with a medium risk of dust impacts and aim to ensure that no significant nuisance occurs at nearby sensitive receptors. While not part of this planning application, these dust mitigation measures are also applicable to the grid connection required for the wind farm. Given that similar construction activities, such as earthworks and vehicle movements, will occur during the grid connection works, these measures will help ensure that dust emissions are controlled and that there is no significant impact on air quality or nuisance to nearby sensitive receptors.

The mitigation measures draw on best practice guidance from Ireland (DCC, 2018), the UK (IAQM (2024), BRE (2003), The Scottish Office (1996), UK ODPM (2002)) and the USA (USEPA, 1997). These measures will be incorporated into the overall Construction Environmental Management Plan (CEMP) prepared for the site. The measures are divided into different categories for different activities.

13.8.1.1 Communications

- Develop and implement a stakeholder communications plan that includes community engagement before works commence on site. Community engagement includes explaining the nature and duration of the works to local residents and businesses.
- 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 should also include head/regional office contact details.

13.8.1.2 Site Management

- During working hours, dust control methods will be monitored as appropriate, depending on the prevailing meteorological conditions. Dry and windy conditions are favourable to dust suspension. Therefore, mitigations must be implemented if undertaking dust generating activities during these weather conditions.
- 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.
- Record any exceptional incidents that cause dust and/or air emissions, either on- or off-site, and the action taken to resolve the situation in the log book.
- Hold regular liaison meetings with other high risk construction sites within 250 m of the site boundary where feasible, to ensure plans are co-ordinated and dust and particulate matter emissions are minimised. It is important to understand the interactions of the off-site transport/deliveries which might be using the same strategic road network routes.

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13.8.1.3 Preparing and Maintaining the Site

- Plan site layout so that machinery and dust causing activities are located away from receptors, as far as is possible.
- Erect solid screens or barriers around dusty activities or the site boundary that are at least as high as any stockpiles on site.
- Avoid site runoff of water or mud.
- Keep site fencing, barriers and scaffolding clean using wet methods.
- Remove materials that have a potential to produce dust from site as soon as possible, unless being re-used on site. If they are being re-used on-site cover as described below.
- Cover, seed or fence stockpiles to prevent wind whipping.

13.8.1.4 Operating Vehicles / Machinery and Sustainable Travel

- Ensure all vehicles switch off engines when stationary - no idling vehicles.
- Avoid the use of diesel or petrol powered generators and use mains electricity or battery powered equipment where practicable.
- Impose and signpost a maximum-speed-limit of 15 kph haul roads and work areas (if long haul routes are required these speeds may be increased with suitable additional control measures provided, subject to the approval of the nominated undertaker and with the agreement of the local authority, where appropriate).
- Produce a Construction Logistics Plan to manage the sustainable delivery of goods and materials.
- Implement a Travel Plan that supports and encourages sustainable travel (public transport, cycling, walking, and car-sharing).

13.8.1.5 Operations

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

13.8.1.6 Waste Management

- No bonfires or burning of waste materials.

13.8.1.7 Measures Specific to Earthworks

- Re-vegetate earthworks and exposed areas/soil stockpiles to stabilise surfaces as soon as practicable.

- Use Hessian, mulches or trackifiers where it is not possible to re-vegetate or cover with topsoil, as soon as practicable.
- Only remove the cover in small areas during work and not all at once.
- During dry and windy periods, and when there is a likelihood of dust nuisance, a bowser will operate to ensure moisture content is high enough to increase the stability of the soil and thus suppress dust.

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13.8.1.8 Measures Specific to Construction

- Ensure sand and other aggregates are stored in bunded areas and are not allowed to dry out, unless this is required for a particular process, in which case ensure that appropriate additional control measures are in place.
- Ensure bulk cement and other fine powder materials are delivered in enclosed tankers and stored in silos with suitable emission control systems to prevent escape of material and overfilling during delivery.
- For smaller supplies of fine powder materials ensure bags are sealed after use and stored appropriately to prevent dust.

13.8.1.9 Measures Specific to Trackout

- A speed restriction of 15 kph will be applied as an effective control measure for dust for on-site vehicles.
- Avoid dry sweeping of large areas.
- Ensure vehicles entering and leaving sites are covered to prevent escape of materials during transport.
- Inspect on-site haul routes for integrity and instigate necessary repairs to the surface as soon as reasonably practicable.
- Record all inspections of haul routes and any subsequent action in a site log book.
- Install hard surfaced haul routes, which are regularly damped down with fixed or mobile sprinkler systems, or mobile water bowsers and regularly cleaned.
- Implement a wheel washing system (with rumble grids to dislodge accumulated dust and mud prior to leaving the site where reasonably practicable).
- Ensure there is an adequate area of hard surfaced road between the wheel wash facility and the site exit, wherever site size and layout permits.
- Access gates to be located at least 10 m from receptors where possible.

13.8.1.10 Monitoring

- Undertake daily on-site and off-site inspections, where receptors (including roads) are nearby, to monitor dust, record inspection results in the site inspection log. This should include regular dust soiling checks of surfaces such as street furniture, cars and windowsills within 100 m of site boundary, with cleaning to be provided if necessary.
- Increase the frequency of site inspections by the person accountable for air quality and dust issues on site when activities with a high potential to produce dust are being carried out and during prolonged dry or windy conditions.

- Monitoring of construction dust deposition along the site boundary near sensitive receptors during the construction phase of the proposed development is recommended to ensure mitigation measures are working satisfactorily. This can be carried out using the Bergerhoff method in accordance with the requirements of the German Standard VDI 2119. The Bergerhoff Gauge consists of a collecting vessel and a stand with a protecting gauge. The collecting vessel is secured to the stand with the opening of the collecting vessel located approximately 2m above ground level. The TA Luft limit value is 350 mg/m^2/day during the monitoring period of 30 days (+/- 2 days).

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13.8.2 Operational Phase Mitigation

There is no mitigation required for the operational phase of the development as effects on air quality are predicted to be ***direct, long-term, national, positive*** and ***slight***.

13.9 Residual Impact Assessment

13.9.1 Construction Phase

When the dust mitigation measures detailed in the mitigation section (Section 13.8) of this report are implemented, the residual effect of fugitive emissions of dust and particulate matter from the site will be ***short-term, direct, localised, negative*** and ***not significant*** in nature and will pose no nuisance at nearby receptors.

13.9.2 Operational Phase

There are no predicted direct impacts to air quality during the operational phase of the proposed development. Emissions from infrequent maintenance vehicles have been assessed as having a ***long-term, direct, localised, negative*** and ***imperceptible*** effect on air quality.

There will be indirect beneficial impacts to air quality from the generation of renewable electricity from the proposed development. There will be NO_X emission savings which may otherwise have been generated from fossil fuels. The generation of 35 GWh of renewable electricity will result in a decrease in annual NO_X emission levels by 0.03% of the 2030 National Air Emissions Target of 40.6kt. This is an ***indirect, long-term, slight*** and ***positive*** effect on air quality.

13.9.3 Summary of Post-mitigation Effects

Table 13-22 summarises the identified likely significant residual effects during the construction phase of the proposed development following the application of mitigation measures.

Table 13-22 Summary of Construction Phase Effects Post Mitigation

Likely Significant Effect	Quality	Significance	Extent	Probability	Duration	Type
Impact of construction dust from demolition, earthworks, construction and trackout in terms of dust soiling, human health and ecosystems	Negative	Not significant	Study area as per Section 13.5.3	Likely	Short-term	Direct
Impact of construction phase traffic on air quality	Negative	Imperceptible	Detailed assessment and study area scoped out as per Section 13.4.3	Likely	Short-term	Direct

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Table 13-23 summarises the identified likely residual significant effects during the operational phase of the proposed development post mitigation.

Table 13-23 Summary of Operational Phase Effects Post Mitigation

Likely Significant Effect	Quality	Significance	Extent	Probability	Duration	Type
Impact of maintenance of proposed development air quality	Negative	Imperceptible	Detailed assessment and study area scoped out as per Section 13.4.4	Likely	Long-term	Direct
Impact of proposed renewable energy development on air quality	Positive	Imperceptible	Nationally	Likely	Long-term	Direct

Table 13-24 summarises the identified likely residual significant effects during the decommissioning phase of the proposed development post mitigation.

Table 13-24 Summary of Decommissioning Phase Effects Post Mitigation

Likely Significant Effect	Quality	Significance	Extent	Probability	Duration	Type
Impact of construction dust from demolition, earthworks, construction and trackout in terms of dust soiling, human health and ecosystems	Negative	Not significant	Study area as per Section 13.5.3	Likely	Short-term	Direct
Impact of construction phase traffic on air quality	Negative	Imperceptible	Detailed assessment and study area scoped out as per Section 13.4.3	Likely	Short-term	Direct

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13.9.4 Cumulative Residual Effects

The most significant potential cumulative residual effects relates to dust. According to the IAQM guidance (2024), if the construction phase of the proposed development coincides with the construction phase of any other permitted projects within 500m of the site, there is a possibility of cumulative residual dust effects occurring at any nearby sensitive receptors. This includes the grid connection required for the wind farm, which, while not part of the primary planning application, will involve similar construction activities such as earthworks and vehicle movements. Should simultaneous construction phases occur, it would lead to cumulative residual dust soiling and dust-related effects on human health, specifically localised to the works area associated with the proposed works.

However, should the construction phases of the development and any localised permitted developments coincide, it is predicted that once the mitigation measures outlined in Section 13.8.1 are put in place impacts will not be significant. Impacts will be ***short-term, direct, localised, negative*** and ***not significant***.

No significant cumulative adverse impacts to air quality are predicted for the construction or operational phases. There will be indirect beneficial impacts to air quality as a result of generating electricity from renewable wind power rather than fossil fuel sources. There will be NOX emission savings which may otherwise have been generated from fossil fuels.

13.10 Risk of Major Accidents or Disasters

There are no likely risks of major accidents and disasters in relation to air quality associated with the proposed development due to the nature and scale of the development. The proposed development is residential in nature and will not require large scale quantities of hazardous materials or fuels.

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13.11 Worst Case Scenario

Reasonable worst case estimates have been used as part of this assessment. As a result, Section 13.9 details the worst-case residual effect of the proposed development.

13.12 Interactions

13.12.1 Air Quality and Population & Human Health

13.12.1.1Construction Phase

Air quality does not have a significant number of interactions with other topics. The most significant interactions are between Population and Human Health and Air Quality. An adverse air quality impact during the construction phase can cause health and dust nuisance issues. There is a low risk of dust-related human health impacts during the construction phase of the proposed development. Best practice mitigation measures will implemented during the construction phase to ensure that the impact of the proposed development complies with all ambient air quality legislative limits. Therefore, the predicted impact is ***direct, short-term, negative, localised*** and ***not significant*** with respect to Population and Human Health during the construction phase.

13.12.1.2Operational Phase

Vehicles accessing the site will emit pollutants which may impact Air Quality and Human Health. However, the increased number of vehicles associated with the proposed development will not cause a significant change in air pollutant emissions in the locality. It has been assessed that emissions will be in compliance with the ambient air quality standards which are set for the protection of human health. Impacts will be ***long-term, localised, direct, negative*** and ***not significant***.

There will be indirect beneficial impacts to air quality as a result of generating electricity from renewable wind power rather than fossil fuel sources. There will be NO_X emission savings which may otherwise have been generated from fossil fuels.

13.12.2 Air Quality and Climate

Air Quality and Climate have interactions as the emissions from the burning of fossil fuels during the construction and operational phases generate both air quality and climate impacts. There is no impact on climate due to air quality. However, the sources of impacts on air quality and climate are strongly linked.

13.12.3 Air Quality and Land & Soils

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13.12.3.1Construction Phase

Construction phase activities such as land clearing, excavations, stockpiling of materials etc. have the potential for interactions between Air Quality and Land & Soils in the form of dust emissions. With the appropriate mitigation measures to prevent fugitive dust emissions, it is predicted that there will be no significant interactions between air quality and land and soils during the construction phase.

13.12.3.2Operational Phase

There are no potentially significant interactions identified between Air Quality, and Land & Soils during the operational phase.

13.12.4 Air Quality and Biodiversity

13.12.4.1Construction Phase

Dust generation can occur during extended dry weather periods due to construction traffic along haul routes and construction activities such as excavations and infilling works. Dust emissions can coat vegetation leading to a reduction in the photosynthesising ability as well as other effects. There are no designated ecological sites within 250 m of the proposed development site area. Significant dust impacts are not predicted beyond this distance. Dust mitigation measures will be implemented on site as set out in Section 13.8.1 of Chapter 8 of the EIAR. With the implementation of these mitigation measures dust emissions will be minimised and impacts will be ***direct, short-term, negative, localised*** and ***not significant*** with respect to biodiversity.

13.12.4.2Operational Phase

There are no potentially significant interactions identified between Air Quality, and Biodiversity during the operational phase.

13.12.5 Air Quality and Material Assets – Traffic & Transport

13.12.5.1Construction Phase

Interactions between Air Quality and Traffic can be significant. With increased traffic movements and reduced engine efficiency, i.e. due to congestion, the emissions of vehicles increase. The impacts of the proposed development on air quality are assessed by reviewing the change in annual average daily traffic on roads close to the site. In this assessment, the impact of the interactions between Traffic and Air Quality are linked but there is no potential for significant impacts from traffic on air quality. The effects are considered to be ***direct, short-term, negative, localised*** and ***not significant*** during the construction phase.

13.12.5.2Operational Phase

The impact of the interactions between Traffic and Air Quality are considered to be ***long-term, direct, negative*** and ***not significant*** during the operational phase.

13.13 Monitoring

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13.13.1 Construction Phase

During working hours, dust control methods will be monitored, in addition to the prevailing meteorological conditions. Dry, windy weather has the potential to increase the potential for dust impacts at sensitive receptors.

Undertake daily on-site and off-site inspections, where receptors (including roads) are nearby, to monitor dust, record inspection results in the site inspection log. This should include regular dust soiling checks (by visual inspection) of surfaces such as street furniture, cars and windowsills within 100 m of site boundary, with cleaning to be provided if necessary.

Increase the frequency of site inspections by the person accountable for air quality and dust issues on site when activities with a high potential to produce dust are being carried out, and during prolonged dry or windy conditions.

Monitoring of construction dust deposition along the site boundary to nearby sensitive receptors during the construction phase of the proposed development is recommended to ensure mitigation measures are working satisfactorily. This can be carried out using the Bergerhoff method in accordance with the requirements of the German Standard VDI 2119. The Bergerhoff Gauge consists of a collecting vessel and a stand with a protecting gauge. The collecting vessel is secured to the stand with the opening of the collecting vessel located approximately 2m above ground level. The TA Luft limit value is 350 mg/m^2/day during the monitoring period of 30 days (+/- 2 days).

13.13.2 Operational Phase

There is no proposed monitoring during the operational phase.

13.14 Summary of Mitigation and Monitoring

Table 13-25 summarises the Construction Phase mitigation and monitoring measures.

Table 13-25 Summary of Construction Phase Mitigation and Monitoring

Likely Significant Effect	Quality	Significance
Impact of construction dust from demolition, earthworks, construction and trackout in terms of dust soiling and human health	Dust control measures as per IAQM Guidance (IAQM, 2024) and Section 13.8.1	Monitoring of construction dust deposition as per Section 13.13.1.

Table 13-26 summarises the Operational Phase mitigation and monitoring measures.

Table 13-26 Summary of Operational Phase Mitigation and Monitoring

Likely Significant Effect	Quality	Significance
No mitigation or monitoring required for the operational phase of the development as impacts to air quality are predicted to be imperceptible.		

Table 13-27 summarises the Decommissioning Phase mitigation and monitoring measures.

Table 13-27 Summary of Decommissioning Phase Mitigation and Monitoring

Likely Significant Effect	Mitigation	Monitoring
Impact of construction dust from demolition, earthworks, construction and trackout in terms of dust soiling, human health and ecosystems	Dust control measures as per IAQM Guidance (IAQM, 2024) and Section 13.8.1	Monitoring of construction dust deposition as per Section 13.13.1.

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13.15 Conclusion

This chapter has reviewed and analysed the potential and the predicted impacts of the proposed development with regards to air quality. These impacts have been considered for both the construction and operational phases of the proposed development. The cumulative impact of the proposed development and surrounding developments have also been considered.

Provided all mitigation measures as set out in this chapter, the overall predicted effect of the proposed development is ***not significant***.

13.16 Difficulties Encountered

There were no difficulties encountered in compiling this assessment.

13.17 References and Sources

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CHAPTER 14
CLIMATE

VOLUME II
ENVIRONMENTAL IMPACT ASSESSMENT REPORT

DECEMBER 2024

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14 Climate

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14.1 Introduction

This chapter of the EIAR was prepared to assess the potential significant effects of the proposed development on climate. This report provides a baseline assessment of the setting of the proposed development in terms of climate and discusses the likely and significant effects that the construction, operation and decommissioning will have on the proposed development. Where required, appropriate mitigation measures to limit any identified likely significant adverse impacts to climate are recommended.

A full description of the proposed development is presented in Chapter 2. This Chapter should be read in conjunction with Chapter 13 Air Quality, Chapter 6 Material Assets - Transportation and the Traffic and Transportation Assessment, Chapter 7 Material Assets – Built Services and Site-Specific Flood Risk Assessment submitted with the planning application.

14.2 Expertise & Qualifications

This chapter was prepared by Aisling Cashell, an Environmental Consultant in the air quality section of AWN Consulting Ltd. She holds a BA and an MAI in Civil, Structural and Environmental Engineering from Trinity College Dublin. She is a member of Engineers Ireland. She has been specialising in the area of air quality, climate and sustainability for 1 year and has prepared air quality and climate assessments for inclusion within EIARs for residential and commercial developments such as Twenties Lane (Planning Application Ref: 22713), Cherrywood T13 (Planning Application Ref: DZ23A/0028), Corballis Donabate LRD (Planning Application Ref: LRD0017/S3), The Paddocks (Planning Application Ref: 2360349), and Dublin Airport Authority.

This chapter was reviewed by Dr. Avril Challoner. Avril is a Principal 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. She is a Chartered Environmentalist (CEnv), Chartered Scientist (CSci), Member of the Institute of Environmental Management and Assessment, Member of the Institute of Air Quality Management and specialises in the fields of air quality, EIA and air dispersion modelling.

14.3 Proposed Development

A brief summary of the development is outlined below. A detailed description of the proposed development is contained within Chapter 2 of this EIAR and the Planning Statement that accompanies the application. The statutory notices should also be referred to.

A 10-year permission is being sought by Natural Forces Renewable Energy 2 Limited for the development of a 14MW wind farm on lands measuring 17.28ha located at the L5046 and L50462 in the townlands of Cloonanny Glebe, Corragarrow, Derryharrow and Gorteenorna, Co. Longford.

The proposed development will consist of the following:

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(i) Demolition of a single-storey derelict shed structure (c. 93 sqm GFA) to facilitate the turbine haul route

(ii) Construction of two E175 EP5 wind energy converters, each with an electrical rating of 7MW, an overall ground-to-blade tip height of 199.9 metres, a rotor blade diameter of 175 metres, hub height of 112.4 metres, associated foundations and hard-standing areas;

(iii) Construction of an 800m permanent internal site access road which will run from the L50462 to the wind energy converter hardstanding areas including a 9.1m clear span bridge crossing a local stream;

(iv) Construction of 1 No. meteorological mast with a height of 32 metres, associated foundation and hardstanding area;

(v) Construction of 1 No. 20kV substation compound comprising 2 No. Modular Buildings each measuring 13.5 sqm in area and 3.5m in height, a Battery Energy Storage System (BESS) comprising 3 storage modules with a height of 2.8 metres and associated electrical works, foundation and hardstanding area;

(vi) Temporary alterations to the L5046 and L50462 public roads and temporary access roads to facilitate the turbine component haul route, including temporary widening of sections of the L5046 and L50462.

(vii) Installation of underground collector circuit and communications cabling in underground cable trenches, from the proposed wind energy converter to the proposed on-site substation;

(viii) All associated and ancillary site development, excavation, construction, and reinstatement works, including the provision of a temporary construction compound, site drainage, spoil management, fencing, lighting, hedge and operational maintenance and tree trimming and cutting.

(ix) This application is seeking a 35- year operational life from the date of commissioning of the entire wind farm.

The grid connection from the proposed on-site substation to the national electricity grid does not form part of the subject planning application. However, as part of the planning application process, this EIAR addresses three potential grid connection options currently considered to ensure a comprehensive environmental assessment of all aspects of the Proposed Development. The grid connection will be via 1 of the 3 potential options outlined below:

- Option 1 Connect the proposed development via (8.03km) to Richmond 110kV Substation
- Option 2 Connect the proposed development via (3.96km) to Longford 38kV Substation
- Option 3 Connect the proposed development via (5.85km) to Glebe 38kV Substation

It is anticipated that the grid connection from the Proposed Development will be by means of an underground cable connecting to one of the Substations identified above via the public road network.

For bridge crossings, the cable will be located within the bridge deck, where there is insufficient depth and width available horizontal directional drilling (HDD) will be employed as an alternative.

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Once the preferred route emerges it will be determined whether the grid connection falls within the category of exempted development under Class 26 of Schedule 2 in the Planning and Development Regulations 2001, as amended or requires planning permission, in which case an application will be made to the planning authority.

All elements of the proposed development as outlined above together with the turbine delivery route and grid connection options have been assessed as part of this EIAR.

14.3.1 Aspects Relevant to this Assessment

During the construction phase engine emissions from site vehicles and machinery have the potential to impact climate through the release of CO_2 and to a lesser extent, other greenhouse gases (GHGs). Embodied carbon of materials used in the construction of the development along with site activities will impact climate. Impacts to climate are assessed against Ireland's obligations under the EU 2030 GHG targets and sectoral emissions ceilings.

Engine emissions from vehicles accessing the site have the potential to impact climate during the operational phase of the development through the release of CO_2. Operational phase impacts will be long-term in duration. There will be no greenhouse gas emissions from the operation of the proposed wind turbines. However, due to the displacement of electricity which otherwise would have been produced from fossil fuels, there will be a net benefit in terms of GHG emissions. In addition, the vulnerability of the proposed development in relation to future climate change must be considered during the operational phase.

14.4 Methodology

The climate assessment is divided into two distinct sections, a greenhouse gas assessment (GHGA) and a climate change risk assessment (CCRA):

- **Greenhouse Gas Emissions Assessment** Quantifies the GHG emissions from a project over its lifetime. The assessment compares these emissions to relevant carbon budgets, targets and policy to contextualise magnitude; and
- **Climate Change Risk Assessment** Identifies the impact of a changing climate on a project and receiving environment. The assessment considers a projects vulnerability to climate change and identifies adaptation measures to increase project resilience.

14.4.1 Relevant Legislation, Policy & Guidance

The assessment of potential impacts on climate has been prepared taking the relevant legislation, policy and guidance described in the following sections into consideration.

14.4.1.1 Legislation

In 2015, the Climate Action and Low Carbon Development Act 2015 (No. 46 of 2015) (the Act) was enacted (Government of Ireland, 2015). 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 2015 Climate Act made provision for a national low carbon transition and mitigation plan (also known as the Climate Action Plan), and a national adaptation framework. In addition, the 2015 Climate Act provided for the establishment of the Climate Change Advisory Council with the function to advise and make recommendations on the preparation of the national mitigation and adaptation plans and compliance with existing climate obligations.

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The first Climate Action Plan (CAP) was published by the Irish Government in June 2019 (Government of Ireland, 2019). The Climate Action Plan 2019 (CAP19) 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 Government published the second Climate Action Plan in November 2021 (Government of Ireland, 2020) and a third update in December 2022 (Government of Ireland, 2022). The most recent Climate Action Plan (CAP24) was published in December 2023 (DECC, 2023).

Following on from Ireland declaring a climate and biodiversity emergency in May 2019, and the European Parliament approving a resolution declaring a climate and environment emergency in Europe in November 2019, the Government approved the publication of the General Scheme in December 2019, followed by the publication of the Climate Action and Low Carbon Development (Amendment) Act 2021 (hereafter referred to as the 2021 Climate Act) in March 2021. The Climate Act was signed into Law on the 23rd of July 2021, giving statutory effect to the core objectives stated within the first Climate Action Plan.

The purpose of the 2021 Climate Act (Government of Ireland, 2021) is to provide for the approval of plans *"to reduce the extent of further global warming, 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"*. This is known as the *'National Climate Objective'*, which supersedes the 2015 Climate Act *'National Transition Objective'.* The 2021 Climate Act will also *"provide for carbon budgets and a decarbonisation target range for certain sectors of the economy"*. The 2021 Climate Act defines the carbon budget as *"the total amount of greenhouse gas emissions that are permitted during the budget period"*.

The second National Adaptation Framework (NAF) (DECC, 2024) was published in June 2024 in line with the five-year requirement of the 2015 Climate and Low Carbon Development Act (the Climate Act). The plan provides a whole of government and society approach to climate adaptation in Ireland to reduce Irelands vulnerability to climate change risks including extreme weather events, flooding, drought, loss of biodiversity, sea level rise and increased temperatures. Similar to the '*Just Transition*' when considering carbon emissions, the NAF aims for *'Just Resilience'* stating that *"A climate resilient Ireland will have a reduced reliance on fossil fuel, it will have widely accessible electrified public transport and will have transitioned towards sustainable agricultural practices such as agroforestry and organic farming."*

The NAF highlights that there is a projected increased frequency of droughts, coupled with higher evapotranspiration rates, which could cause reduced river flow, groundwater recharge, and reservoir refill capacity, leading to potential water supply shortages. The NAF warns that national long-term water supply projects must be planned for within budgets to ensure the adaptation required to make Ireland resilient by 2050 and beyond is funded.

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The National Climate Change Risk Assessment (NCCA) was published in May 2024 (EPA, 2024a). The NCCA was required to be developed under Action 457 from the 2021 Climate Action Plan. Action 457 states *"Further develop Ireland's national climate change risk assessment capacity to identify the priority physical risks of climate change to Ireland."*. The NCCA uses definitions of the risk determinants from the Intergovernmental Panel on Climate Change (IPCC) Risk Framework (IPCC, 2023), which are outlined below.

- **Hazard** The potential occurrence of a natural or human-induced physical event or trend or physical impact that may cause loss of life, injury, or other health impacts, as well as damage and loss to property, infrastructure, livelihoods, service provision, ecosystems, and environmental resources.
- **Exposure** The presence of people, livelihoods, species or ecosystems, environmental functions, services, and resources, infrastructure, or economic, social, or cultural assets in places and settings that could be adversely affected.
- **Vulnerability** The propensity or predisposition to be adversely affected. Vulnerability encompasses a variety of concepts including sensitivity
- **Risk** The potential for adverse consequences for human or ecological systems.

When considering risk, the NCCA assess exposure and vulnerability for two future climate change scenarios or Representative Concentration Pathways (RCPs).

- RCP4.5 was selected as it represents an alignment with the global temperature trajectory; and
- RCP8.5 was selected as it represents a high-emissions scenario and achieves the highest level of modelled temperature increases by the end of the century. Consequently, this scenario will result in the highest level of physical risk for Ireland, and therefore the greatest requirement for adaptation.

These scenarios align with a conservative approach to assess risks to Ireland and assumes that global emissions reduction targets are not met. This aligns with the principle of precaution as stated in the 2024 NAF. In addition to the future climate scenarios, the NCCA assesses risk on the future climate during the following timeframes:

- Present (~2030),
- Medium-Term (~2050) and
- Long-Term (~2100).

In relation to carbon budgets, the 2021 Climate Action and Low Carbon Development (Amendment) Act 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, as shown in Table 14.1. 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. In relation to the sectoral emissions ceiling, the Minister for the Environment, Climate and Communications (the Minister for the Environment) shall prepare and submit to government the maximum amount of GHG emissions that are permitted in different sectors of the economy during a budget period and different ceilings may apply to different sectors. The sectorial emission ceilings for 2030 were published in the Climate Action Plan 2024 (CAP24) (DECC, 2024) and are shown in Table 14.2. Electricity has a 75% reduction requirement and a 2030 emission ceiling of 3 Mt CO_2e (million tonnes carbon dioxide equivalent).

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Table 14.1 5-Year Carbon Budgets 2021 – 2035

Budget Period	Carbon Budget	Reduction Required
2021-2025	295 Mt CO_2e	Reduction in emissions of 4.8% per annum for the first budget period.
2026-2030	200 Mt CO_2e	Reduction in emissions of 8.3% per annum for the second budget period.
2031-2035	151 Mt CO_2e	Reduction in emissions of 3.5% per annum for the third provisional budget.

Table 14.2 2030 Sectoral Emissions Ceilings

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Sector	Baseline (Mt CO_2e)	Carbon Budgets (Mt CO_2e)		2030 Emissions (Mt CO_2e)	Indicative Emissions % Reduction in Final Year of 2025- 2030 Period (Compared to 2018)
	2018	2021-2025	2026-2030		
Electricity	10	40	20	3	75
Transport	12	54	37	6	50
Built Environment - Residential	7	29	23	4	40
Built Environment - Commercial	2	7	5	1	45
Industry	7	30	24	4	35
Agriculture	23	106	96	17.25	25
Other (F-gases, waste, petroleum refining)	2	9	8	1	50
Land Use, Land-use Change and Forestry (LULUCF)	5	Reflecting the continued volatility for LULUCF baseline emissions to 2030 and beyond, CAP24 puts in place ambitious activity targets for the sector reflecting an EU-type approach.			
Total	**68**				
Unallocated Savings	-	-	26	-5.25	-
Legally Binding Carbon Budgets and 2030 Emission Reduction Targets	**-**	**295**	**200**	**-**	**51**

14.4.1.2 Policy

In December 2023, the current Climate Action Plan (CAP24) was published (DECC, 2024). This CAP builds on the progress of CAP23, which first published carbon budgets and sectoral emissions ceilings. It aims to implement the required changes to achieve a 51% reduction in carbon emissions by 2030 and the 2050 Net Zero goal. The CAP has six vital high impact sectors where the biggest savings can be made. These sectors are Renewable Energy, Energy Efficiency of Buildings, Transport, Sustainable Farming, Sustainable Business and Change of Land-Use. CAP24 states that the decarbonisation of Ireland's manufacturing industry is key for Ireland's economy and future competitiveness. There is a target to reduce the embodied carbon in construction materials by 10% for materials produced and used in Ireland by 2025 and by at least 30% for materials produced and used in Ireland by 2030. CAP24 states that these reductions can be brought about by product substitution for construction materials and reduction of clinker content in cement. Cement and other high embodied carbon construction elements can be reduced by the adoption of the methods set out in the Construction Industry Federation 2021 report Modern Methods of Construction (Construction Industry Federation, 2021). The IDA Ireland will also seek to attract businesses to invest in decarbonisation technologies to ensure economic growth can continue alongside a reduction in emission. As outlined in CAP24 the target for renewables on the national grid is 80% by 2030 which includes 9 gigawatts (GW) of onshore wind energy. This is a key target and action within CAP24.

In August 2024, the Government published a *Long-Term Strategy on Greenhouse Gas Emissions Reductions* (Department of the Environment, Climate and Communications, 2024) prepared under *Ireland's Climate Action and Low Carbon Development Acts 2015 to 2021*. This strategy provides a long-term plan on how Ireland will transition towards net carbon zero by 2050 covering a 30-year period, achieving the interim targets set out in the Climate Action Plan 2024. It conforms to both EU and national requirements, and as such, will replace the 2023 Strategy that was submitted to the EU Commission and UNFCCC. The strategy aligns with Ireland's National Energy and Climate Plan. The strategy states that the main challenges facing decarbonisation of the transport sector include decoupling travel demand from economic growth, the absence of suitable alternatives to the car at a national level, associating car ownership with perceptions of freedom and convenience and addressing the significant lead-in times associated with the delivery of major transport infrastructure and rollout of additional public transport services as attractive and compelling alternatives to private car use. The strategy notes that the process of electrifying the light truck and bus fleet will accelerate throughout the 2020s assisting with achieving milestones. The strategy states that cities will lead in transport innovation away from the private car as the population densities assist with the proximity to schemes. The strategy aims to lead to large improvements in the quality of urban living in the coming decades.

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Longford County Council seeks to enable renewable and wind energy resources of County Longford to be harnessed in a manner that is consistent with proper planning and sustainable development of the area. The Longford County Council Development Plan 2021 – 2027 (Longford County Council, 2021) encourages *"the development of wind energy in suitable locations in an environmentally sustainable manner and in accordance with Government policy and any forthcoming Renewable Energy Strategy for County Longford."*

The Longford County Council Climate Action Plan 2024 – 2029 (Longford County Council, 2024) outlines Longford County Council's goals to mitigate GHG emissions and plans to prepare for and adapt to climate change. The vision of the Longford Climate Action Plan is to achieve *"net-zero emissions by 2050 by delivering services in an environmentally sustainable manner and by working with the community, agricultural and business sectors to deliver on common goals*". The Longford County Council Climate Action Plan also highlights the risks that climate change poses to the county. These risks include increases in the number of heatwave events, increases in drought conditions, increased flooding and increased likelihood of extreme windstorms.

14.4.1.3 Guidance

The principal guidance and best practice documents used to inform the assessment of potential impacts on climate are summarised below. The assessment has made reference to national guidelines where available, in addition to international standards and guidelines relating to the assessment of climate impacts. These are as follows:

- Guidelines on the Information to be contained in Environmental Impact Assessment Reports (hereafter referred to as the EPA Guidelines) (EPA, 2022);
- Longford County Council Development Plan 2021 – 2027 (Longford County Council, 2021);
- Longford County Council Climate Action Plan 2024 – 2029 (Longford County Council, 2024);

- Environmental Impact Assessment of Projects: Guidance on the preparation of the Environmental Impact Assessment Report (European Commission, 2017);
- Transport Infrastructure Ireland (TII) PE-ENV-01104: Climate Guidance for National Roads, Light Rail and Rural Cycleways (Offline & Greenways) – Overarching Technical Document (TII, 2022a);
- Transport Infrastructure Ireland (TII) GE-ENV-01106: TII Carbon Assessment Tool for Road and Light Rail Projects and User Guidance Document (TII, 2022b);
- Institute of Environmental Management & Assessment (IEMA) Environmental Impact Assessment Guide to: Assessing GHG Emissions and Evaluating their Significance (hereafter referred to as the IEMA GHG guidance) (IEMA, 2022);
- IEMA Environmental Impact Assessment Guide to: Climate Change Resilience and Adaptation (hereafter referred to as the IEMA 2020 EIA Guide) (IEMA, 2020a);
- IEMA GHG Management Hierarchy (hereafter referred to as the IEMA 2020 GHG Management Hierarchy) (IEMA, 2020b); and
- Technical Guidance on the Climate Proofing of Infrastructure in the Period 2021-2027 (European Commission, 2021).

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14.4.2 Site Surveys/Investigations

No surveys were required as part of the climate assessment.

14.4.3 Greenhouse Gas Assessment

As per the EU guidance document *Guidance on Integrating Climate Change and Biodiversity into Environmental Impact Assessment* (European Commission, 2013) the climate baseline is first established with reference to EPA data on annual GHG emissions (see Section 14.6).

14.4.3.1 Construction Phase

14.4.3.1.1 GHG Assessment – TII Carbon Tool

The GHG assessment has been conducted following the TII PE-ENV-01104 guidance (TII, 2022a). PE-ENV-01104 recommends the calculation of the construction stage GHG emissions, including embodied carbon, using the TII Online Carbon Tool (TII, 2022b). Embodied carbon refers to the sum of the carbon needed to produce a good or service. It incorporates the energy needed in the mining or processing of raw materials, the manufacturing of products and the delivery of these products to site.

The TII Online Carbon Tool has been commissioned by TII to assess GHG emissions associated with road or rail projects using Ireland-specific emission factors and data. However, the tool can also be used to estimate the GHG emissions from other development types, such as that of the proposed development, due to similarities in a number of the material types and activities used. The TII Carbon Tool has been used to assess the GHG emissions associated with site clearance works, excavation, material transport, construction activities, construction worker travel and construction wastes.

The TII Carbon Tool (TII, 2022b) uses emission factors from recognised sources including the Civil Engineering Standard Method of Measurement (CESSM) Carbon and Price Book database (CESSM, 2013). The carbon emissions are calculated by multiplying the emission factor by the quantity of the

material that will be used over the entire construction/maintenance phase. The outputs are expressed in terms of tCO_2e (tonnes of carbon dioxide equivalent).

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The assessment begins with the high-level design and continues through the pre-construction (site clearance) stage. It is then followed by an evaluation of the embodied carbon in all materials used, emissions from construction activities, and emissions related to waste generated during the construction phase. The tool also assesses on-going maintenance associated with the lifetime of the proposed development.

The construction phase of the proposed development will result in GHG emissions from various sources. As part of the proposed development, the Construction phase embodied GHG emissions are categorised under the following headings:

- Land clearance activities (i.e. tree felling);
- Transport of excavated material from the site;
- Manufacture of materials and transport to site;
- Construction works (including excavations, construction, water usage, electrical power/fuel usage, personnel travel and project size); and
- Construction waste products (including transport off-site).

Information on the material quantities, site activities, land clearance, waste product and construction traffic were provided by the Mable Consulting Engineers for input into the carbon tool. This information was used to determine an estimate of the GHG emissions associated with the development. Standard maintenance, as indicated through the TII Carbon Tool (TII 2022b), required over the operational phase has also been considered as part of the embodied construction emissions. Complete detailed information regarding the proposed construction materials and exact methodologies was not available at the time of this assessment and will be specified at the detailed design stage. Best estimates have been used in this assessment to provide an estimate of the GHGs associated with the proposed development.

14.4.3.1.2 Turbine Manufacture Lifecycle Assessment

In addition to the TII Carbon Tool, a lifecycle assessment was undertaken to determine the payback period for the turbines. This assessment quantifies the power consumption and greenhouse gas (GHG) emissions associated with the production, operation, transport, and end-of-life of the wind turbines.

The energy balance, calculated based on the expected GWh of production over the turbine's 35-year lifespan, includes energy consumed during manufacturing, operation, transport, dismantling, and disposal. It is expressed in terms of the time taken for the energy consumed throughout the turbine's life cycle to be repaid by the wind energy exported to the electricity grid.

Information on the life cycle assessments of various comparable wind turbines have been reviewed to inform the payback period for the proposed development. Where site specific information was not available, indicative information from similar LCA's was used.

14.4.3.2 Operational Phase

There will be no significant greenhouse gas emissions from the operation of the wind turbines. Due to the displacement of electricity, which otherwise would have been produced from fossil fuels, there

will be a net benefit in terms of greenhouse gas emissions. The savings are calculated and compared to Ireland's 2030 sectoral emissions ceilings (Table 14.2).

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Vehicular traffic is often a dominant source of greenhouse gas emissions resulting from developments. However, there is no significant predicted operational phase vehicle impact due to the relatively low volume of vehicles required for maintenance activities during operation.

14.4.3.3 Significance Criteria for GHGA

The Transport Infrastructure Ireland (TII) guidance document entitled *'PE-ENV-01104 Climate Guidance for National Roads, Light Rail and Rural Cycleways (Offline & Greenways) – Overarching Technical Document*' (TII, 2022a) outlines a recommended approach for determining the significance of both the construction and operational phases of a development.

The significance of GHG effects set out in PE-ENV-01104 (TII, 2022a) is based on the IEMA GHG guidance (IEMA, 2022), which is broadly consistent with the terminology contained within Figure 3.4 of the EPA's *'Guidelines on the information to be contained in Environmental Impact Assessment Reports'* (EPA, 2022).

The 2022 IEMA GHG guidance (IEMA, 2022) sets out the following principles for significance:

- 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 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 IEMA (IEMA, 2022) GHG guidance 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. 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. Where the fundamental reason for a proposed project is to combat climate change (e.g. a wind farm or carbon capture and storage project) and this beneficial effect drives the project need, then it is likely to be significant.

TII (TII, 2022a) states that professional judgement must be taken into account when contextualising and assessing the significance of a project's GHG impact. Significance is determined using the criteria outlined in Table 14.3 (derived from Table 6.7 of PE-ENV-01104 (TII, 2022a)) along with consideration of the following two factors:

- The extent to which the trajectory of GHG emissions from the project aligns with Ireland's GHG trajectory to net zero by 2050; and
- The level of mitigation taking place.

The significance of the effect of GHG emissions on climate is assessed for the total GHG emissions across all project stages.

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Table 14.3 Greenhouse Gas Assessment (GHGA) Significance Criteria

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

Ireland's carbon budgets can also be used to contextualise the magnitude of GHG emissions from the proposed development (TII, 2022a). The approach is based on comparing the net proposed development GHG emissions to the relevant carbon budgets (DECC, 2023). With the publication of the Climate Action Act in 2021 and the Climate Action Plan 2024, sectoral carbon budgets have been published for comparison with the net GHG emissions from the proposed development over its lifespan. The relevant sector budgets are for Electricity, Transport, Waste and Industry. The 2030 sectoral emissions ceilings and reduction requirements relative to the 2018 baseline are detailed in Table 14.2.

14.4.4 Climate Change Risk Assessment

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The operational phase assessment involves determining the vulnerability of the proposed development to climate change. This involves an analysis of the sensitivity and exposure of the development to climate hazards which together provide a measure of vulnerability.

PE-ENV-01104 (TII, 2022a) states that the CCRA is guided by the principles set out in the overarching best practice guidance documents:

- EU Technical guidance on the climate proofing of Infrastructure in the Period 2021-2027 (European Commission, 2021); and
- The Institute of Environmental Management and Assessment, Environmental Impact Assessment Guide to: Climate Change Resilience and Adaptation (2nd Edition) (IEMA, 2020a).

The baseline environment information provided in Section 14.6, future climate change modelling and input from other experts working on the proposed development (i.e. hydrologists) should be used to assess the likelihood of a climate risk.

First an initial screening CCRA based on the operational phase is carried out, according to the TII guidance PE-ENV-01104. This is carried out by determining the sensitivity of proposed development assets (i.e. receptors) and their exposure to climate change hazards.

The proposed development asset categories must be assigned a level of sensitivity to climate hazards. PE-ENV-01104 (TII, 2022a) provides the list of asset categories and climate hazards to be considered. The asset categories will vary for development type and need to be determined on a development-by-development basis.

- **Asset Categories** Pavements; drainage; structures; utilities; landscaping; signs, light posts, buildings, and fences.
- **Climate Hazards** Flooding (coastal, pluvial, fluvial); extreme heat; extreme cold; wildfire; drought; extreme wind; lightning and hail; landslides; fog.

The sensitivity is based on a High, Medium or Low rating with a score of 1 to 3 assigned as per the criteria.

- **High Sensitivity** The climate hazard will or is likely to have a major impact on the asset category. This is a sensitivity score of 3.
- **Medium Sensitivity** It is possible or likely the climate hazard will have a moderate impact on the asset category. This is a sensitivity score of 2**.**
- **Low Sensitivity** It is possible the climate hazard will have a low or negligible impact on the asset category. This is a sensitivity score of 1.

Once the sensitivities have been identified the exposure analysis is undertaken. The exposure analysis involves determining the level of exposure of each climate hazard at the project location irrespective of the project type, e.g. flooding could be a risk if the project location is next to a river in a floodplain. Exposure is assigned a level of High, Medium or Low as per the criteria.

- **High Exposure** It is almost certain or likely this climate hazard will occur at the project location i.e. might arise once to several times per year. This is an exposure score of 3.

- **Medium Exposure** It is possible this climate hazard will occur at the project location i.e. might arise a number of times in a decade. This is an exposure score of 2.
- **Low Exposure** It is unlikely or rare this climate hazard will occur at the project location i.e. might arise a number of times in a generation or in a lifetime. This is an exposure score of 1.

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Once the sensitivity and exposure are categorised, a vulnerability analysis is conducted by multiplying the sensitivity and exposure.

14.4.4.1 Significance Criteria for CCRA

The assessment of vulnerability to climate change combines the outcomes of the sensitivity and exposure analysis. The aim is to identify the key vulnerabilities and potentially significant climate hazards which could impact the proposed development.

The CCRA involves an initial screening assessment to determine the vulnerability of the proposed development to various climate hazards. The vulnerability is determined by combining the sensitivity and the exposure of the proposed development to various climate hazards.

Vulnerability = Sensitivity x Exposure

The vulnerability assessment takes any proposed mitigation into account. Table 14.4 details the vulnerability matrix; vulnerabilities are scored on a high, medium and low scale. A risk that is low or medium is classed as non-significant, while a high or extreme risk is classed as a significant risk.

TII guidance (TII, 2022a) and the EU technical guidance (European Commission, 2021) note that if all vulnerabilities are ranked as low in a justified manner, no detailed climate risk assessment may be needed. The impact from climate change on the proposed development can considered to be not significant. Therefore, the impact from climate change on the proposed development can be considered not significant.

Where residual medium or high vulnerabilities exist, the assessment may need to be progressed to a detailed climate change risk assessment and further mitigation implemented to reduce risks. An assessment of construction phase CCRA impacts is only required according to the TII guidance (TII, 2022a) if a detailed CCRA is required.

Table 14.4 Vulnerability Matrix

		Exposure		
		High (3)	Medium (2)	Low (1)
Sensitivity	High (3)	9 – High	6 – High	3 – Medium
	Medium (2)	6 – High	4 – Medium	2 – Low
	Low (1)	3 – Medium	2 – Low	1 – Low

The screening CCRA did not identify any residual medium or high risks to the proposed development as a result of climate change. Therefore, a detailed CCRA for the construction phase was scoped out.

While a CCRA for the construction phase was not required, best practice mitigation against climate hazards is still recommended in Section 14.9.

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14.5 Difficulties Encountered

There were no difficulties encountered in compiling this assessment.

14.6 Baseline Environment

PE-ENV-01104 (TII, 2022a) states that a baseline climate scenario should identify GHG emissions without the proposed development. This applies to both the current and future baseline and must be consistent with the study area for the proposed development.

Ireland declared a climate and biodiversity emergency in May 2019. In November 2019, there was European Parliament approval of a resolution declaring a climate and environment emergency in Europe. This, in addition to Ireland's current failure to meet its EU binding targets under Regulation 2018/842 (European Union, 2018), results in either beneficial or adverse changes in GHG emissions being of more significance than considered prior to these declarations.

Climate impacts are assessed at a national level and in relation to national targets and sectoral emission ceilings. The study area for climate is the Republic of Ireland and the baseline is determined in relation to this study area.

14.6.1 Current GHGA Baseline

Data published in July 2024 (EPA, 2024) indicates that Ireland exceeded (without the use of flexibilities) its 2023 annual limit set under EU's Effort Sharing Decision (ESD) (EU 2018/842) by 2.27 Mt CO_2e. However, the 2023 emissions were the first time that Irelands emission were below (-1.2%) 1990 levels. ETS[1] emissions decreased (-17.0%) and ESR emissions decreased (-3.4%). Ireland's target is an emission reduction of 626 kt of CO_2e by 2030 on an average baseline of 2016 to 2018[2]. The EPA estimate that 2023 total national greenhouse gas emissions (excluding LULUCF) have decreased by 6.8% on 2022 levels to 55.01 Mt CO_2e, with a 2.2 Mt CO_2e (-21.6%) reduction in electricity industries alone. This was driven by a 40.7% share of energy from renewables in 2023 and increasing our imported electricity. Manufacturing Combustion and Industrial Processes decreased by 5.1% to 6.3 Mt CO_2e in 2023 due to declines in fossil fuel usage. The sector with the highest emissions in 2023 was agriculture at 37.6% of the total, followed by transport at 21.4%. For 2023 total national emissions (including LULUCF) were 60.62 Mt CO_2e (EPA, 2024).

The provisional 2023 figures indicate that Ireland has used 63.9% of the 295 Mt CO_2e Carbon Budget for the five-year period 2021-2025, as shown in Table 14.5 (EPA, 2023).

[1] ETS emissions in this report refers to CO_2 emissions from stationary installations and from domestic aviation. It does not include emissions from intra-EU aviation as those are not considered part of Ireland's total reportable greenhouse gas emissions

[2] Regulation (EU) 2023/839 (19 April 2023)

Table 14.5 Total National GHG Emissions in 2022

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Sector [Note 1]	2021	2022	2023	Total Budget (Mt CO_2e) (2021-2025)	% Budget 2021 – 2025 Used	% Change from 2022 to 2023
Electricity	9.893	9.694	7.558	40	67.90%	-22.00%
Transport	11.089	11.76	11.791	54	64.10%	0.30%
Buildings (Residential)	6.868	5.753	5.346	29	62.00%	-7.10%
Buildings (Commercial sand Public)	1.444	1.447	1.409	7	61.40%	-2.60%
Industry	7.093	6.622	6.288	30	66.70%	-5.00%
Agriculture	21.94	21.795	20.782	106	60.90%	-4.60%
Other [Note 2]	1.864	1.931	1.832	9	62.50%	-5.10%
LULUFC	4.628	3.983	5.614	-	-	40.90%
Total including LULUFC	**64.819**	**62.986**	**60.62**	**295**	**63.90%**	**-3.80%**

Note 1 Reproduced from latest emissions data on the EPA website July 2024 (EPA, 2024).

Note 2 Other includes Petroleum refining, F-Gases and Waste (emissions from solid waste disposal on land, solid waste treatment (composting and anaerobic digestion), wastewater treatment, waste incineration and open burning of waste).

14.6.2 Future GHGA Baseline

The future baseline, in relation to the Greenhouse Gas Assessment (GHGA), should be understood in the context of future climate targets. These targets will serve as benchmarks against which the assessment results are compared. In line with TII (TII, 2022a) and IEMA GHG guidance (IEMA, 2022), the future baseline is a trajectory towards net zero by 2050, *"whether it* [the project] *contributes to reducing GHG emissions relative to a comparable baseline consistent with a trajectory towards net zero by 2050"*.

The future baseline will be determined by Ireland meeting its targets set out in the CAP24, and future CAPs, alongside binding 2030 EU targets. The European Union (EU) enacted *'Regulation (EU) 2018/842 on binding annual GHG 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'* (hereafter referred to as the Regulation) to meet the commitments under the Paris Agreement (European Union, 2018). The Regulation aims to achieve, by 2030, collective and cost-effective reductions in GHG emissions across the EU. These reductions target a 43% decrease in the Emission Trading Scheme (ETS) sector and a 30% decrease in non-ETS sectors, both compared to 2005 levels. The Regulation was amended in April 2023 and Ireland must now limit its greenhouse gas

emissions by at least 42% by 2030. The ETS is an EU-wide scheme which regulates the GHG emissions of larger industrial emitters Including electricity generation, cement manufacturing and heavy industry. The non-ETS sector includes all domestic GHG emitters which do not fall under the ETS scheme and includes GHG emissions from transport, residential and commercial buildings and agriculture.

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In June 2024, the EPA released the report *Ireland's Greenhouse Gas Emissions Projections 2023-2050* (EPA, 2024a), which includes total projected emissions and a breakdown of projected emissions per sector under the '*With Existing Measures'* and *'With Additional Measures'* scenarios. The EPA projections indicate that under the *'With Existing Measures'* scenario, Ireland will achieve a reduction of 11% on 2018 levels by 2030. A reduction of 29% by 2030 can be achieved under the *'With Additional Measures'* scenario, which is still short of the 42% reduction target, set out in the carbon budgets.

Under the '*With Existing Measures'* scenario, total GHG emissions (including LULUCF) are predicted to be 60.1 $MtCO_2e$ in 2030 and 51.6 $MtCO_2e$ by 2045. The EPA projections indicate that the *'With Additional Measures'* scenario will result in 2030 total GHG emissions of 48.0 $MtCO_2e$ and emissions of 38.7 $MtCO_2e$ in 2045. In addition to the total projected emissions, Table 14.6 shows the projected emissions for both the Commercial and Public Services and the Energy Industries sections of the EPA projected emissions.

Table 14.6 Projected Emissions (Environmental Protection Agency, 2024)

Projections	Year	Energy Industries (kt CO_2e)	Commercial/Public Services (kt CO_2e)	Total (kt CO_2e) (including LULUCF)
Projections (with Existing Measures)[3]	2030	4347.12	1,152.81	60,112.01
	2045	4302.92	956.13	51,654.05
Projections (with Additional Measures)[4]	2030	3850.51	611.74	48,011.27
	2045	3039.40	90.84	38,782.56

14.6.3 Current CCRA Baseline

The region of the proposed development has a temperate, oceanic climate, resulting in mild winters and cool summers. The recent weather patterns and extreme weather events recorded by Met Éireann have been reviewed. A noticeable feature of the recent weather has been an increase in the frequency and severity of storms, with notable red warning level events including four in 2017 (Doris, Ophelia, Brian and Dylan), nine in 2018 (Eleanor, Fionn, David, Emma, Hector, Ali, Callum, Diana and

[3] With Existing Measures Scenario assume that no additional policies and measures beyond those already in place by the end of the latest national GHG inventory year at the time of the projections compilation. (EPA, 2023b)

[4] With Additional Measures scenarios assume implementation of the WEM scenario in addition to, based on current progress, further implementation of planned government policies and measures adopted after the end of the latest inventory year. In the case of the latest projections (published in June 2022), this includes the implementation of Ireland's 2023 Climate Action Plan. (EPA, 2023b)

Deirdre), seven in 2019 (Erik, Freya, Gareth, Hannah, Lorenzo, Atiyah and Elsa), seven in 2020 (Brendan, Ciara, Dennis, Jorge, Ellen, Aiden and Bella), two in 2021 (Arwen and Barra), two in 2022 (Eunice and Franklin) and two in 2023 (Noa and Agnes), as well as numerous orange warning level storms.

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The Met Éireann weather station at Casement Metrological Station, located 102 km east of the proposed development, is the nearest representative weather and climate monitoring station. This station has recorded meteorological data for the 30-year period from 1991 to 2020. The historical regional weather data for Casement Metrological Station is representative of the current climate in the region of the proposed development. The data for the 30-year period from 1991 to 2020 indicates that, on average, the wettest months at Casement Metrological Station was November, and the driest month was March. July was the warmest month with a mean temperature of 15.7 Celsius. January was the coldest month with a mean temperature of 5.2 Celsius

Met Éireann's 2023 Climate Statement (Met Éireann, 2024b) states that the average shaded air temperature in Ireland in 2023 is provisionally 11.20 °C. This is 1.65°C above the 1961-1990 long-term average. Previous to this, 2022 was the warmest year on record. However, the year 2023 was 0.38 °C warmer (see Figure 14.1). The year 2023 also had above average rainfall. It included the warmest June and the wettest March and July on record. Record high sea surface temperatures (SST) were measured since April 2023 which included a severe marine heatwave to the west of Ireland during June 2023. This marine heatwave contributed to the record rainfall in July.

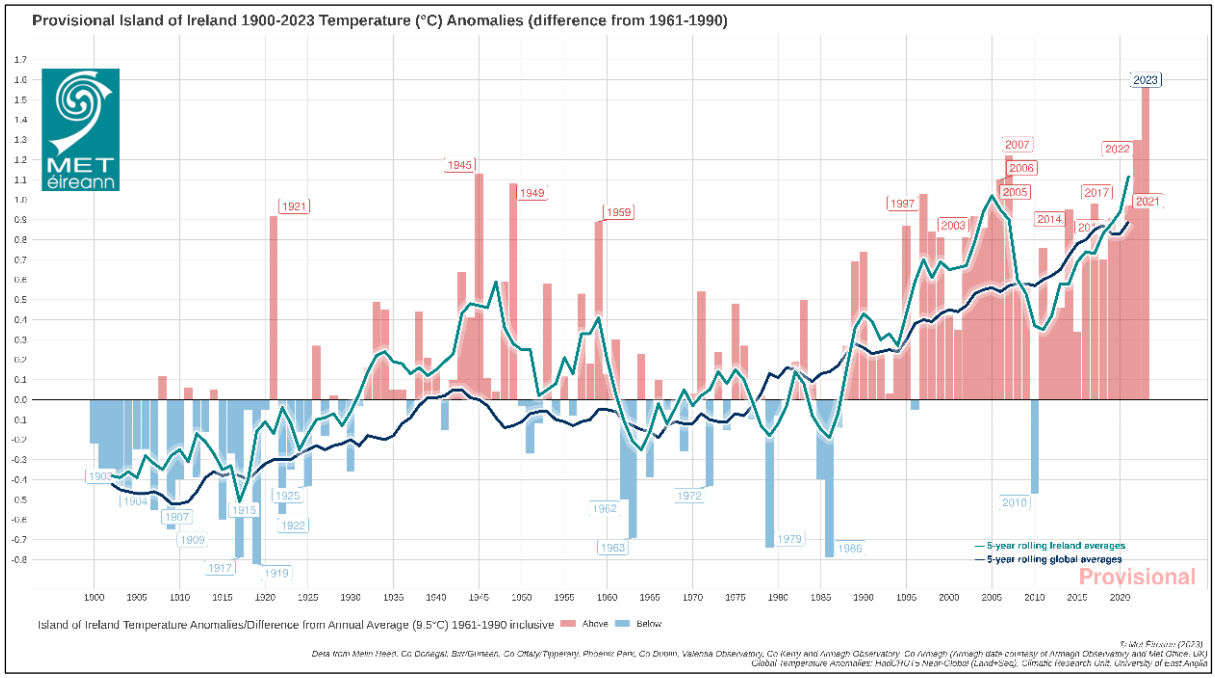


Figure 14.1 1900-2023 Temperature (°C) Anomalies (differences from 1961-1990)

Recent weather patterns and records of extreme weather events recorded by Met Éireann have been reviewed. Considering the extraordinary 2023 data, Met Éireann states that the latest Irish climate change projections indicate further warming in the future, including warmer winters. The record temperatures mean the likelihood of extreme weather events occurring has increased. This will result

in longer dry periods and heavy rainfall events. Storm surges and coastal flooding due to sea level rise. Compound events, where coastal surges and extreme rainfall events occur simultaneously will also increase. Met Éireann has high confidence in maximum rainfall rates increasing but not in how the frequency or intensity of storms will change with climate change.

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14.6.4 Future CCRA Baseline

Impacts as a result of climate change will evolve with a changing future baseline. Changes have the potential to include increases in global temperatures and increases in the number of rainfall days per year. Therefore, it is expected that the baseline climate will evolve over time and consideration is needed with respect to this within the design of the proposed development.

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 including in the region where the proposed development will be located (EPA, 2021). The EPA have compiled a list of potential adverse impacts as a result of climate change (EPA, 2021):

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

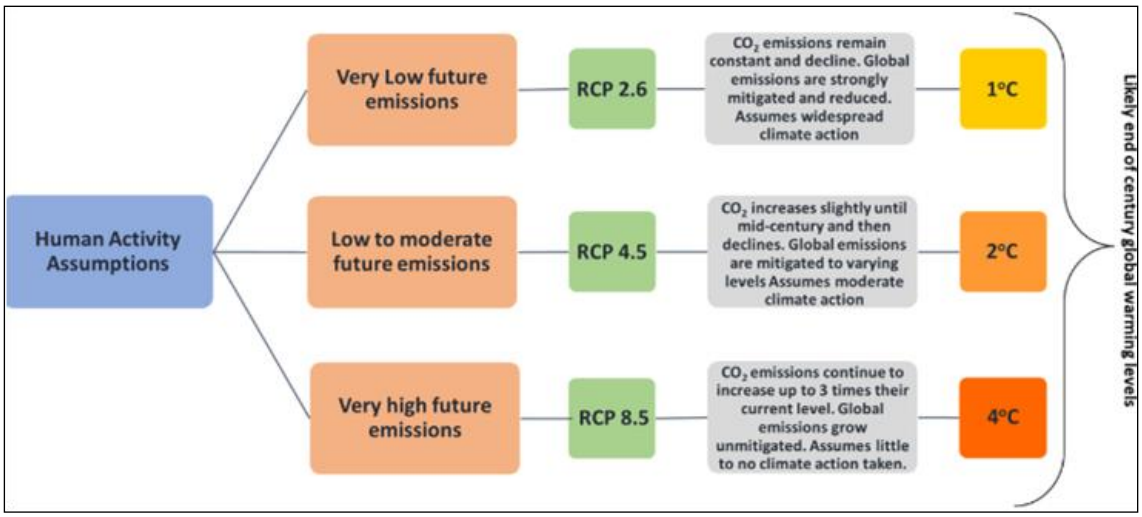
Projections within the EPA's *'State of the Irish Environment Report (Chapter 2: Climate Change)'* (EPA, 2020b) indicate that full implementation of additional policies and measures, outlined in the 2019 Climate Action Plan, will result in a reduction in Ireland's total GHG emissions by up to 25% by 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 EPA state that it is critically important for the public sector to show leadership and decarbonise all public transport across bus and rail networks to the lowest carbon alternatives. The report (EPA, 2020b) underlines that the next decade needs to be one of major developments and advances in relation to Ireland's response to climate change to achieve these targets. 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, 2020b). While individual storms are predicted to have more severe winds, the average wind speed has the potential to decrease (EPA, 2020b).

TII's Guidance document PE-ENV-01104 (TII, 2022a) states that for future climate change a moderate to high Representative Concentration Pathways (RCP) should be adopted. Representative Concentration Pathways (RCPs) describe different 21st century pathways of GHG emissions depending on the level of climate mitigation action undertaken. RPC4.5 is considered moderate while RPC8.5 is considered high.

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, 2020a). 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 is a projected substantial decrease of approximately 50%, 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 power. More frequent storms have the potential to damage the communication networks requiring additional investment to create resilience within the network.

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National Framework for Climate Services (NFCS) was founded in June 2022 to streamline the provision of climate services in Ireland and will be led by Met Éireann. The aim of the NFCS is to enable the co-production, delivery and use of accurate, actionable and accessible climate information and tools to support climate resilience planning and decision making. In addition to the NFCS, further work has been ongoing into climate projects in Ireland through research under the TRANSLATE project. TRANSLATE (Met Éireann, 2023) has been led by climate researchers from University of Galway – Irish Centre for High End Computing (ICHEC), and University College Cork – SFI Research Centre for Energy, Climate and Marine (MaREI), supported by Met Éireann climatologists. TRANSLATE's outputs are produced using a selection of internationally reviewed and accepted models from both CORDEX and CMIP5. Representative Concentration Pathways (RCPs) provide a broad range of possible futures based on assumptions of human activity. The modelled scenarios include for *'least'* (RCP2.6), *'more'* (RCP4.5) or *'most'* (RCP8.5) climate change, see Figure 14.2.

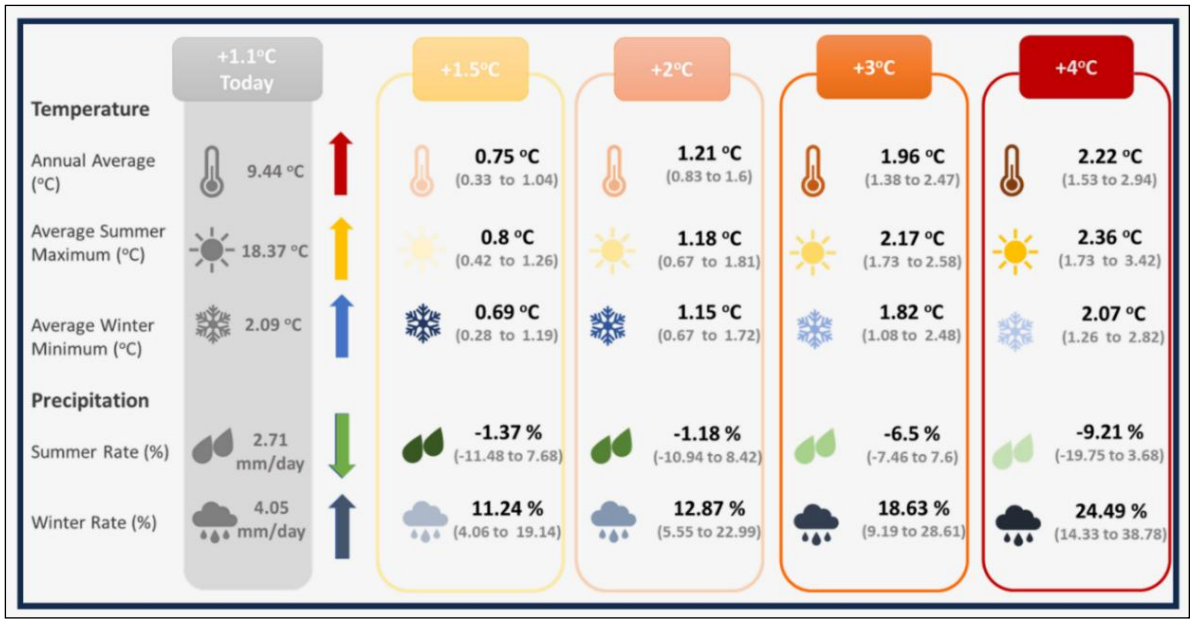


Source TRANSLATE Project Story Map (Met Éireann, 2023b).

Figure 14.2 Representative Concentration Pathways Associated Emission Levels

TRANSLATE (Met Éireann, 2023) manages the first standardised and bias-corrected national climate projections for Ireland to aid climate risk decision making across multiple sectors (e.g. transport, energy, water). This is done by providing information on how Ireland's climate could change as global temperatures increase to 1.5˚C ,2˚C, 2.5˚C, 3˚C or 4˚C (see Figure 14.3). Projections broadly agree with previous projections for Ireland. Ireland's climate is dominated by the Atlantic Meridional Overturning Circulation (AMOC), a large system of ocean currents including the Gulf Stream, characterised by a northward flow of warm water and a southward flow of cold water. Due to the AMOC, Ireland does not suffer from the extremes of temperature experienced by other countries at a similar latitude. Recent studies have projected that the AMOC could decline by 30% to 40% by 2100, resulting in cooler North Atlantic Sea surface temperatures (SST)s (Met Éireann, 2023). Met Éireann projects that Ireland will nevertheless continue to warm, although the AMOC cooling influence may lead to reduced warming compared with continental Europe. AMOC weakening is also expected to lead to additional sea level rise around Ireland. With climate change Ireland's temperature and rainfall will undergo more and more significant changes. On average, summer temperature could increase by more than 2°C, summer rainfall could decrease by 9% while winter rainfall could increase by 24%. Future projects also include a 10-fold increase in the frequency of summer nights (values > 15°C) by the end of the century, a decrease in the frequency of cold winter nights and an increase in the number of heatwaves. A heatwave in Ireland is defined as a period of 5 consecutive days where the daily maximum temperature is greater than 25°C.

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Source TRANSLATE Project Story Map (Met Éireann, 2023b).

Figure 14.3 Change of Climate Variables for Ireland for Different Global Warming Thresholds

14.7 The 'Do-Nothing' Scenario

The Do-Nothing assessment assumes that the proposed development is not built. In this scenario the climate emissions will remain as per the current baseline in the short-term.

In this scenario, the additional renewable energy capacity associated with the proposed development is not generated during the operational phase. Such renewable energy is required to ensure targets set out in CAP24 are met. Such targets include up to 80% of the national grid being generated from renewable sources, including 9 GW of onshore wind by 2030. In addition, CAP24 aims to phase out and end the use of coal and peat in electricity generation by 2030. The Do-Nothing scenario is not in line with such plans. Reducing the use of coal and peat in energy generation and a reliance on renewable energy will also have a beneficial effect on air quality. Therefore, the Do-Nothing effect is a lost opportunity for a beneficial effect on climate in the long term.

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14.8 Potential Significant Effects

14.8.1 Greenhouse Gas Assessment

There is the potential for greenhouse gas emissions to the atmosphere during the construction and operational phases of the proposed development. As per the TII guidance (TII, 2022a), the significance of the effect of GHG emissions on climate is assessed for the total GHG emissions across all stages of the proposed development.

14.8.1.1 Construction Phase

14.8.1.1.1 Wind Turbine Manufacture

Detailed lifecycle assessments of wind turbines and typical wind farm developments are conducted by manufacturers to inform users and determine the payback period of the plant. The payback period is the time required for the renewable energy generated by the wind farm to offset the emissions produced during its construction. A review of lifecycle assessments for wind turbines with similar electrical ratings and rotor diameters, based on a design lifetime of 35 years, estimated that the E175 EP5 E2 wind turbine has a conservative payback period of less than one year. This indicates that over its lifecycle, the turbine will produce significantly more energy than it consumed.

The proposed development involves the installation of two wind turbines with a combined export capacity of approximately 14 MW. For this assessment, a capacity factor of 28.8% for wind generation was applied. With this capacity factor, the expected annual electricity production is approximately 35,320 MWh. As a result, the proposed development is likely to offset the energy used for its construction within its first year of operation, making it a net positive development in terms of climate impact.

Although lifecycle assessment data provided by manufacturers may vary, all potential turbines have a payback period for carbon emissions per kWh produced. A recent review of payback periods, show they range from 5.6 to 10.4 months.

For context, the current carbon intensity of the energy grid in 2022 was 254.8 g CO_2e/kWh (SEAI, 2024), while the lifecycle assessments for the potential turbines estimate significantly lower emissions over 25 years, ranging between 4.53 and 5.28 gCO_2e/kWh, similarly determined while reviewing payback periods. Included within lifecycle assessments are:

- Production of all parts of the wind plant. This includes parts that are manufactured by factories as well as supplier fabricated parts. Most of the information on parts and components (materials, weights, manufacturing operations, scrap rates) was obtained from bills of materials, design drawings and supplier data, covering over 99.4% of the turbine mass.
- Manufacturing processes which includes both the global production factories (i.e. for casting, machining, tower production, generator production, nacelle assembly and blades production), as well as other activities (e.g. sales, servicing, etc.);
- Transport of turbine components to wind plant site and other stages of the life cycle including incoming raw materials to production and transport from the power plant site to end-of-life disposal; Installation and erection of the turbines at the wind power plant site, including usage of cranes, onsite vehicles, diggers and generators;
- Site servicing and operations (including transport). Serviced parts, such as oil and filters, and replaced components (due to wear and tear of moving parts within the lifetime of a wind turbine);
- Use-phase electricity production including wind turbine availability (the capability of the turbine to operate when wind is blowing), wake losses (arising from the decreased wind power generation capacity of wind a certain distance downwind of a turbine in its wake) and transmission losses; and
- End-of-life treatment of the entire power plant including decommissioning activities.

Based on a review of turbine lifecycle assessment, it can be concluded that a conservative payback period for the turbine's full lifecycle is 10.4 months.

14.8.1.1.2 GHG Assessment – TII Carbon Tool

The total GHG emissions arising from the construction of the proposed development have been calculated using the TII online Carbon Tool (TII, 2022b) and are summarised in Table 14.7. This excludes the wind turbines themselves. Detailed project information including volumes of materials were obtained from Mable Consulting Engineers for the purposes of this assessment. Complete detailed information regarding the proposed construction materials and exact methodologies was not available at the time of this assessment and will be specified at the detailed design stage, however best estimates have been made that are reflective of this stage of design. Additionally, exact material suppliers and waste disposal facilities are not known at this stage. Therefore, an estimated distance travelled has been used for the purpose of this assessment. The best estimates used in this assessment have been used to provide an estimate of the GHGs associated with the proposed development.

The predicted GHG emissions associated with the proposed development are presented in Table 14.7. The proposed development is estimated to result in total construction phase GHG emissions of 3,082 tonnes CO_2e.

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Table 14.7 Greenhouse Gas Assessment Results

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Source	Elements Considered	GHG Emissions (tCO_2e)	% Of Total	Relevant Sector	Emissions Annualised Over 35-Year Lifespan as % of Sector Budget
Materials	Fencing, pipework, fill material, road pavement, concrete, blockwork, signage	2,595	84.2%	Industry	0.002%
Material Transport	HGV trips	367	11.9%	Transport	0.0002%
Clearance and demolition	Site preparation, 16Ha clearance of agricultural land	7.5	0.24%	Industry	0.000005%
Excavation	Topsoil and rock excavations	25	0.81%	Industry	0.00002%
Construction Waste Disposal	Mixed C&D waste, general office waste, organic waste, plastic, timber, metals, carboard	34	1.11%	Waste	0.0001%
Construction Waste Transport	HGV trips (Assumed 40 km distance)	54	1.75%	Transport	0.00003%
Total			**3,082 tonnes CO_2e**		

The predicted GHG emissions (as shown in Table 14.7) can be averaged over the lifespan of the proposed development. This figure will provide the predicted annual emissions to allow for direct comparison with national annual emissions and targets.

The GHG emissions from the development as a total cannot be compared against one specific sector 2030 carbon budget. Therefore, the emissions are broken down into different assessment categories and compared separately to the relevant sectoral emissions budget which are detailed in Table 14.2. The relevant sectoral emissions for the proposed development comparison include the industry sector and electricity sector. In Table 14.8, GHG emissions have been compared against the carbon budget for the electricity and industry in 2030 (DECC, 2023), against Ireland's total GHG emissions in 2023 and against Ireland's EU 2030 target of a 30% reduction in non-ETS sector emissions based on 2005 levels (33 Mt CO_2e) (set out in Regulation EU 2018/842 of the European Parliament and of the Council).

The estimated total construction phase GHG emissions, when annualised over the 35-year proposed development lifespan, are equivalent to 0.0001% of Ireland's total GHG emissions in 2023 and 0.0003% of Ireland's non-ETS 2030 emissions target. The total GHG emissions associated with industry-related activities are 0.002% of the 2030 Industry budget and the total GHG emissions associated with transport-related activities are 0.0002% of the 2030 Transport budget (DECC, 2023).

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Table 14.8 Estimated Project GHG Emissions Relative to Sectoral Budgets and GHG Baseline

Target/Sectoral Budget	(tCO_2e)	Annualised (35-Year Lifespan) Proposed Development GHG Emissions	Annualised (35-Year Lifespan) Proposed Development GHG Emissions as % of Relevant Target/Budget
Ireland's 2023 Total GHG Emissions (Existing Baseline)	60,620,000	Total GHG Emissions	0.0001%
Non-ETS 2030 Target	33,000,000	Total GHG Emissions	0.0003%
2030 Sectoral Budget (Industry Sector)	4,000,000	Total Industry Emissions	0.002%
2030 Sectoral Budget (Transport Sector)	6,000,000	Total Transport Emissions	0.0002%

14.8.1.2 Operational Phase

During the operational phase there will be no GHG emissions from the operation of the wind turbines. The 14 MW from the two turbines will generate 35,320 MWh of renewable energy annually, assuming a 28.8% capacity factor. The GHG emissions produced by a typical fossil fuel plant generating the equivalent amount of energy has been calculated to demonstrate the beneficial impact of this renewable energy, which will have zero GHG emissions. The GHG emissions associated with a fossil fuel plant generating 35 GWh of energy will include emissions of CO_2, N_2O and CH_4. The CO_2 equivalent emissions of N_2O and CH_4 have been calculated using the emission rates in Volume 2 Table 2.2 of the IPCC Guidelines (2006).

The most recent figure for carbon intensity of electricity in Ireland is 254.8 gCO_2e/kWh (SEAI, 2024). Using this carbon intensity and the IPPC emission rates for N_2O and CH_4 the total annual GHG emission savings of the proposed development will amount to approximately 6,170 tonnes of CO_2e, when the GHG emissions from the construction phase and the turbines are removed. This is equivalent to 0.2% of the total carbon budget for the electricity sector in 2030 and 0.02% of Ireland's non-ETS 2030 emissions target (DECC, 2023) (Table 14.9) i.e. the proposed development has the potential to reduce Ireland's CO_2e emissions by these percentages.

Table 14.9 Estimated Operational Phase Project GHG Savings

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Category	GHG Emissions (tonnes CO_2e)
Equivalent GHG Emissions/Annum from Fossil Fuel Power Plant (Note 1)	9,252
Construction Phase GHG Emissions (annualised over project lifespan)	3,082
Total/Annum Savings Due to Wind Farm	6,170
Total GHG Saving Over Project Lifespan as % of 2030 Electricity Sectoral Budget	0.2%
Total GHG Saving Over Project Lifespan as % of Non-ETS 2030 Target	0.02%

Note 1 Includes CO_2, N_2O & CH_4 emissions. N_2O & CH_4 emission rates based on Volume 2 Table 2.2 of IPCC Guidelines (2006).

The proposed development will also provide Battery Energy Storage System (BESS) to store the excess renewable energy generated. This stored power can then be supplied power back to the Grid when demand is high. This helps to manage energy peaks and balance the energy supply and demand more effectively. Energy storage will play a significant role in facilitating higher levels of renewable generation on the power system and in helping to achieve national renewable electricity targets (Government of Ireland, 2020). Storage systems can act in the energy, capacity and system services markets to deliver a wide range of benefits such as wholesale energy price reductions, reduced CO_2 emissions and flexible system support services to help manage the grid with higher levels of renewables. Energy storage can also make a significant contribution to the security of supply, thereby replacing the need for fossil fuel generation.

The proposed development will assist in the CAP 2024 goal of producing up to 80% renewables for the grid and 9 GW of onshore wind capacity, which is one of the Key Targets identified in Section 12 of the Climate Action Plan 2024 (DECC, 2023).

14.8.1.3 GHGA Significance of Effects

The TII guidance states that the following two factors should be considered when determining significance:

- The extent to which the trajectory of GHG emissions from the project aligns with Ireland's GHG trajectory to net zero by 2050; and
- The level of mitigation taking place.

The level of mitigation described in Section 14.9 has been taken into account when determining the significance of the proposed development's GHG emissions.

As the proposed development is a windfarm it directly aligns with Ireland's net zero trajectory by 2050 and the CAP24 goal of producing 80% renewable electricity. Additionally, the production of renewable electricity will offset the GHG emissions produced during the construction of the proposed development within the first year of its operation.

According to the TII significance criteria described in Section 14.4.3.3 and Table 14.3, the significance of the GHG emissions is minor adverse.

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IEMA Guidance (which has been embraced by the updated TII Guidance (2022)) describes a minor adverse not significant impact as *"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[5] (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."*

The TII Guidance (2022) (PE-ENV-01104) states that a minor adverse not significant impact is one in which:

- The project's GHG impacts are mitigated through 'good practice' measures;
- The project has complied with existing and emerging policy requirements; and
- The project is fully in line to achieve Ireland's trajectory towards net zero.

Therefore, while the proposed development has an impact on climate, it also addresses the potential impact of climate change. The socio-economic and environmental impacts associated with energy shortages will vary depending on factors such as the geographical areas affected and the duration of the shortages. Potential impacts could include health risks due to energy scarcity, constraints on energy output as demand increases, and economic pressures, especially during peak times. Future energy demands, which the EPA indicates may increase in duration and frequency due to climate change, could further strain existing energy sources. By contributing renewable wind energy to the grid, the proposed development helps to mitigate these pressures and support energy security, particularly in times of higher demand.

In accordance with the EPA guidelines (EPA, 2022), the above significance equates to a significance of effect of GHG emissions during the construction and operational phase, which is ***direct, long-term, positive*** and ***slight***, which is overall ***not significant***.

14.8.2 Climate Change Risk Assessment

14.8.2.1 Construction Phase

A detailed CCRA of the construction phase has been scoped out, as discussed in Section 14.4.4.1. However, consideration has been given to the proposed development's vulnerability to the following climate change hazards with best practice mitigation measures proposed in Section 14.9:

[5] 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."*

- Flood risk due to increased precipitation, and intense periods of rainfall. This includes fluvial and pluvial flooding;
- Increased temperatures potentially causing drought, wildfires and prolonged periods of hot weather;
- Reduced temperatures resulting in ice or snow; and
- Major Storm Damage, including wind damage.

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14.8.2.2 Operational Phase

The sensitivity and exposure of the development to various climate hazards must first be determined to then define the vulnerability of the proposed development to climate change. The climate hazards of flooding (coastal, pluvial, fluvial); extreme heat; extreme cold; wildfire; drought; extreme wind; lightning, hail, landslides and fog have been considered in the context of the proposed development.

The sensitivity of the proposed development to the above climate hazards is assessed irrespective of its location. The sensitivity of the proposed development assets has been established on a scale of high (3), medium (2) and low (1). Once the sensitivity has been established the exposure of the proposed development to each of the climate hazards is determined. This is the likelihood of the climate hazard occurring at the proposed developments location and is also scored on a scale of high (3), medium (2) and low (1). The product of the sensitivity and exposure is then used to determine the overall vulnerability of the proposed development to each of the climate hazards. The results of the vulnerability assessment are detailed Table 14.10.

The sensitivity and exposure of the area was determined with reference to a number of online tools and with input from the various discipline specialists on the project team. It was concluded that the proposed development does not have any significant vulnerabilities to the identified climate hazards described in the following sections. All vulnerabilities are classified as low. There are no residual medium or high-risk vulnerabilities to climate change hazards and a detailed CCRA is not required (TII, 2022a).

14.8.2.2.1 Flooding

A Site-Specific Flood Risk Assessment (SSFRA) for the proposed development was undertaken by IE Consulting and submitted with this planning application. The SSFRA concluded that the location of proposed turbine no.2 falls within a delineated Flood Zone 'A' and Flood Zone 'B' and the proposed turbine no.1, the BESS, substation and MET mast compound don't not fall within a delineated flood zone. The drainage for the development has been designed to allow for increased rainfall in future years as a result of climate change.

The area of the site of the proposed development partially falls within a predictive present-day scenario and mid-range future climate change scenario 1% AEP (1 in 100 year) and a 0.1% AEP (1 in 1000 year) fluvial flood zone. This is found at the site relating to the proposed turbine no. 2. A detailed 1D-2D hydraulic flood modelling exercise has been undertaken utilising OPW CFRAMS flood modelling data for the area to assess the potential impact of the proposal to construct turbine no.2 within a predictive fluvial flood zone. The output of the detailed hydraulic flood modelling exercise indicates that the proposal to construct turbine no.2, and associated infrastructure, within the predictive flood zone will not result in any quantifiable displacement of flood water volumes and will not increase flood

risk elsewhere. Therefore, it will not result in an adverse impact to the existing hydrological regime of the area. The area of the site associated with proposed turbine no.1, substation and BESS does not falls within a predictive, indicative, historic or anecdotal fluvial flood zone.

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It is assumed that access roads associated with the proposed development are to be constructed at or close to existing ground levels. Therefore, the access roads will not result in an adverse impact to the existing hydrological regime of the area. Reference to information provided by the manufacturer and supplier of the proposed wind turbine structures, indicates that proposed turbine no.2 shall be constructed onto a raised platform base structure that will be constructed to a minimum level of 2m above existing ground level. The main turbine structure shall be fixed to this raised platform base structure and any sensitive electrical equipment shall be housed within the main turbine structure. Therefore, main structure of turbine no.2 will not be impacted due to the predictive flood depths in the range of 0.5m-1.5m.

There are a variety of projections which quantify the impacts of climate change in the future. The Mid-Range Future Scenario (MRFS) was applied to the fluvial flows. The MRFS represents the typical or near to the general average future climate projections. The OPW guidance recommend that based on the MRFS projection a 20% increase should be applied to the peak fluvial flood flows (OPW, 2018). Given that the lifespan of the turbines is 35 years, this projection aligns with the timeframe of the MRFS. However, it should be noted that there is a slightly higher risk, as the Site-Specific Flood Risk Assessment (SSFRA) did not account for a 30% increase in flood flows under the High-Range Future Scenario (HRFS), which could lead to more significant impacts beyond the MRFS predictions.

The SSFRA concluded that the "*analysis, hydraulic modelling and flood zone delineation undertaken as part of this Site Specific Flood Risk Assessment (SSFRA) indicates that the south-eastern portion of the proposed windfarm development site falls within a 1% AEP, (1 in 100 year – Fluvial Flood Zone A), 1%+CC AEP (1 in 100 year plus climate change) and a 0.1% AEP (1 in 1000 year – Flood Zone B). The remainder of the site falls within Flood Zone C.*"

EPA data from the TRANSLATE (Met Éireann, 2023) project predicts that precipitation will increase in RCP4.5 and RCP8.5 by an estimated 5.6% and 10.2% respectively for the period 2041 to 2060 within the proposed development study area.

14.8.2.2.2 Extreme Wind, Fog, Lightning & Hail

In relation to extreme winds, the turbines shall be designed to the appropriate standards to account for the relevant wind loadings. The appropriate wind loadings are to be calculated in line with the relevant structure requirements with consideration for increases of wind events due to climate change. The EPA published Ireland's Climate Change Assessment Synthesis Report Volume 1 (EPA 2024c) in early 2024 which states that there is likely to be a reduction in mean average wind speeds and an increase in wind variability. However, any increase in variability or storminess have not been able to be comprehensively assessed to date and projections require further assessment by the EPA or other agencies. The technical datasheet for E-175 EP5 details an extreme wind speed at hub height (3-second gust) of 59.5m/s. This refers to the maximum wind speed that the turbine is designed to withstand, measured over a short time span of three seconds. The turbine is designed to handle gusts of wind reaching 59.5 m/s for a short period, without suffering damage, ensuring the turbine's safety and reliability in extreme weather conditions. The design threshold of 59.5 m/s represents a wind gust

equivalent to hurricane-level winds (Saffir-Simpson Hurricane Wind Scale Category 3) (National Hurricane Centre, 2024). This provides significant resilience to potential extreme events caused by climate change.

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The cut in wind speed and cut out wind speed are 2.0m/s and 25m/s, respectively. This protects the mechanisms of the turbines during wind events which have the potential to cause damage.

Lightning is deemed a risk to the turbines. However, given this is a known risk, lightning prevention systems will be installed to mitigate this. Hail is not predicted to significantly affect the turbines and related infrastructure due to their design.

Fog can obscure visibility of the turbines. However, lighting of the turbines will be required to ensure no impacts with low flying aviation. Fog can also cause access issues however given the maintenance requirements, which require access for one or two vehicles weekly, management of access of vehicles can be restricted during days of significant fog resulting in hazardous access conditions.

14.8.2.2.3 Wildfires

In relation to wildfires, the *Think Hazard!* tool developed by the Global Facility for Disaster Reduction and Recovery (GFDRR, 2023), indicates that the wildfire hazard is classified as medium for the Longford area. This means that there is between a 10% to 50% chance of experiencing weather that could support a hazardous wildfire that may poses some risk of life and property loss in any given year. Future climate modelling indicates that there could be an increase in the weather conditions which are favourable to fire conditions, these include increases in temperature and prolonged dry periods. However, land clearance activities will be conducted as required on site which will remove materials with a high potential for fire within a buffer of the turbines, therefore reducing the risk. Additionally, systems will be in place to prevent impacts from wildfires to the turbines. it can be concluded that the proposed development is of low vulnerability to wildfires.

Wildfire may cause issues with pavement softening for access roads This would be classed as an adverse event that may require repair work. However, it is unlikely to require emergency repair works given the level of access required to the site.

14.8.2.2.4 Landslides

Landslide susceptibility mapping developed by Geological Survey Ireland (GSI, 2024) indicates that the proposed development location is within areas of low susceptibility to landslides and there are no recorded historical landslide events at the proposed developments location. Potential settlement and stability risks for the turbines and associated infrastructure have been considered in Chapter 08 Land and Soils. The chapter states that *"Following an initial scoping assessment, a coarse assessment of the hazard ranking for peat stability was completed and deployed to assist in the determining the need to consider the site for further, detailed, Peat Landslide Hazard Risk Assessment. This preliminary analysis determined that peat or organic soils in excess of 0.50m thick are not present at the Site. Peat Landslide Hazard is classified as negligible and no further, more detailed analysis in this respect is required."*

Landslide prevention measures are detailed in Section 1.4.4.2 of Chapter 08. It can be concluded that landslides are not a risk to the proposed development site.

14.8.2.2.5 Extreme Temperatures (Heat & Cold) & Drought

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In relation to extreme temperatures, both extreme heat and extreme cold, these have the potential to impact the building materials and some related infrastructure. However, based on an increase in average temperature of up to 2°C under RCP8.5, it is considered that the impact of increased temperatures on construction materials will be not be significant once correctly designed.

The technical datasheet for E-175 EP5 details an extreme temperature range of -20°C to +50°C. Therefore, it is not considered to be susceptible to potential extreme temperatures that are predicted even under RCP8.5 in Ireland. At the detailed design stage, the building materials chosen for ancillary structures will be high quality, durable and hard-wearing and chosen to withstand increased variations in temperature in the future as a result of climate change. Heightened temperatures have the potential to strain the cooling systems within the BESS, potentially causing them to enter a state of thermal runaway. However, the cooling systems will be designed to accommodate temperatures extremes predicted for both RCP4.5 and RCP8.5 in Ireland and in a manner that they can be further upgraded should additional thermal loading become likely. This increases the resilience to potential climate risks.

EPA data from the TRANSLATE project (Met Éireann, 2023) predicts that ice days, i.e. the number of days when maximum temperatures are below 0°C will decrease in RCP4.5 and RCP8.5 by an estimated 0.3% and 0.4% respectively for the period 2041 to 2060 within the proposed development study area. The E-175 EP5 technical datasheet contains the optional feature of ice detection system and de-icing system. However, such systems are only required to prevent the build-up of ice on blades where there is the potential for damage to humans should *'ice throw'*[6] occur. This is required for Scandinavian countries but not considered as standard for Ireland.

EPA data from the TRANSLATE project predicts that the number of heatwave events, i.e. periods of at least three consecutive days where maximum temperatures exceed 95% of the normal monthly distribution, will increase in RCP4.5 and RCP8.5 by an estimated 0.1% and 0.3% respectively for the period 2041 to 2060 within the proposed development study area. The sensitivity to drought is considered low and the vulnerability is also low. Therefore, extreme temperatures are not considered a significant risk.

14.8.2.2.6 Summary

The sensitivities of the proposed development have been combined with exposure of the infrastructure to future climate change to assess the potential risk to the proposed projects assets. The risk is shown in Table 14.10.

When the planned detailed design considerations are put in place to avoid vulnerabilities due to future climate change, the vulnerability of the proposed project during the operational phase climate hazards is assessed to be low with the exception of risks due to flooding, extreme heat and wildfires which are considered to be medium. These will be considered in greater detail with the design team during the detailed design phase to ensure that the vulnerability is further reduced to a low risk. The design team

[6] Ice Throw is when ice builds up on the turbine blades and is 'thrown' off during blade rotations, with the potential to cause damage to nearby receptors or road accidents.

is confident that these vulnerabilities can and will be robustly addressed to ensure the proposed development is resilient to future climate change. Given the evolving nature of the global understanding of climate change, the assessment of the proposed development's resilience to future climate change should be iterative.

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Overall, the proposed development exhibits medium-level vulnerabilities to the identified climate hazards. These vulnerabilities will be evaluated during the detailed design phase, with a focus on enhancing the resilience of critical infrastructure. Where feasible, adaptive measures such as structural reinforcements, flood protection, and climate-resilient materials will be incorporated to ensure long-term durability and operational reliability under future climate scenarios.

Table 14.10 Climate Change Vulnerability Assessment

Climate Hazard	Sensitivity	Exposure	Vulnerability
Flooding (Pluvial/Fluvial))	2 (Medium)	2 (Medium)	4 (Medium)
Extreme Heat	2 (Medium)	2 (Medium)	4 (Medium)
Extreme Cold	1 (Low)	1 (Low)	1 (Low)
Drought	1 (Low)	2 (Medium)	2 (Low)
Wind	1 (Low)	2 (Medium)	2 (Low)
Wildfire	2 (Medium)	2 (Medium)	4 (Medium)
Lightning & Hail	1 (Low)	1 (Low)	1 (Low)
Fog	1 (Low)	1 (Low)	1 (Low)
Landslides	1 (Low)	1 (Low)	1 (Low)

14.8.2.3 CCRA Significance of Effects

With design mitigation in place, there are no significant risks to the proposed development as a result of climate change. In accordance with the EPA Guidelines (EPA, 2022), the significance of the climate change impacts to the proposed development are ***direct, long-term, negative*** and ***imperceptible***.

14.8.3 Decommissioning Stage

In the decommissioning phase, the turbines are dismantled and the site is remediated to the agreed state. End-of-life recycling of metals will be carried out for the proposed development to reduce the climate impact, as per the Decommissioning and Reinstatement Plan (Natural Forces, 2024a). The main turbine components including the steel towers, electrical cables, generators and unit transformers will have a retained financial value and will be sent for recycling for both the environmental and financial benefit. Non-recyclable components will be disposed of in a suitable licensed facility.

Vehicles related to the decommissioning phase will give rise to CO_2 emissions. It is not predicted that this development will involve the use of a significant number of vehicles during the decommissioning phase. Therefore, emissions from vehicular traffic are predicted to be imperceptible during the decommissioning phase.

The effect on climate due to decommissioning will be ***direct, temporary, negative*** and ***imperceptible*** if recycling of components is carried out where possible.

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14.8.4 Cumulative Effects

With respect to the requirement for a cumulative assessment the IEMA (IEMA, 2022) and TII (TII, 2022a) guidance, on which the assessment is based, states that "*the identified receptor for the GHG Assessment is the global climate and impacts on the receptor from a project are not geographically constrained, the normal approach for cumulative assessment in EIA is not considered applicable. By presenting the GHG impact of a project in the context of its alignment to Ireland's trajectory of net zero and any sectoral carbon budgets, this assessment will demonstrate the potential for the project to affect Ireland's ability to meet its national carbon reduction target. This assessment approach is considered to be inherently cumulative*".

As a result, the cumulative impact of the proposed development in relation to GHG emissions is considered ***direct, long-term, beneficial*** and ***slight***, which is overall ***not significant*** in EIA terms.

14.8.5 Summary

Table 14.11 summarises the identified likely significant effects during the construction phase of the proposed development before mitigation measures are applied.

Table 14.11 Summary of Construction Phase Likely Significant Effects in the Absence of Mitigation

Likely Significant Effect in accordance with EPA Terminology	Quality	Significance	Extent	Probability	Duration	Type
Proposed project on climate change	Negative	Significant – moderate adverse	National	Likely	Short-term	Direct
Climate change on the proposed project	Negative	Not significant - slight	Local	Likely	Short-term	Direct

Table 14.12 summarises the identified likely significant effects during the operational phase of the proposed development before mitigation measures are applied.

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Table 14.12 Summary of Operational Phase Likely Significant Effects in the Absence of Mitigation

Likely Significant Effect in accordance with EPA Terminology	Quality	Significance	Extent	Probability	Duration	Type
Proposed project on climate change	Positive	Not significant - slight	National	Likely	Long-term	Direct
Climate change on the proposed project	Negative	Not significant - slight	Local	Likely	Long-term	Direct

Table 14.13 summarises the identified likely significant effects during the decommissioning phase of the proposed development before mitigation measures are applied.

Table 14.13 Summary of Decommissioning Phase Likely Significant Effects in the Absence of Mitigation

Likely Significant Effect in accordance with EPA Terminology	Quality	Significance	Extent	Probability	Duration	Type
Proposed project on climate change	Negative	Not significant - imperceptible	Local	Likely	Short-term	Direct

14.9 Mitigation Measures

14.9.1 Construction Phase Mitigation

Embodied carbon of materials and construction activities will be the primary source of climate impacts during the construction phase. Best practice measures to reduce the embodied carbon of the construction works include:

- Appointing a suitably competent contractor who will undertake waste audits detailing resource recovery best practice and identify materials can be reused/recycled;
- Use of low carbon concrete during construction;
- Consideration of the use of locally sourced lower carbon options where feasible;
- Alignment with the local and national climate action plans;

- Materials will be reused on site where possible;
- Prevention of on-site or delivery vehicles from leaving engines idling, even over short periods;
- Ensure all plant and machinery are well maintained and inspected regularly;
- Minimising waste of materials due to poor timing or over ordering on site will aid to minimise the embodied carbon footprint of the site; and
- Sourcing materials locally where possible to reduce transport related CO_2 emissions.

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In terms of impact on the proposed development due to climate change, during construction the contractor will be required to mitigate against the effects of extreme rainfall/flooding through site risk assessments and method statements. The contractor will also be required to mitigate against the effects of extreme wind/storms and temperature extremes through site risk assessments and method statements. All materials used during construction will be accompanied by certified datasheets which will set out the limiting operating temperatures. Temperatures can affect the performance of some materials, and this will require consideration during construction. During construction, the contractor will be required to mitigate against the effects of fog, lightning and hail through site risk assessments and method statements. Further construction phase mitigation measures are detailed in the Waste Management Plan (Natural Forces, 2024).

14.9.2 Operational Phase Mitigation

During the operational phase of the proposed development, the works onsite will be limited to maintenance associated with the wind farm components. Although the intensity of activity will be only a small fraction of the construction phase, all on-site employees and contractors will ensure that machinery used is properly maintained and is switched off when not in use to avoid unnecessary exhaust emissions from maintenance traffic.

A Battery Management System (BMS) will be installed which will detect problems using cell and module voltage measurements and select temperature measurements within the batteries. Automatic disconnect of the batteries will occur if any unusual parameters are measured. Thermal management systems will be installed to ensure all electrical installations are operating at their optimal temperature and will automatically reduce power input if safe temperature ranges are exceeded. In addition, there will be two heating, ventilation and air conditioning units servicing each BESS container within the energy storage compound. Further fire mitigation measures are detailed in the Fire Risk Assessment (Natural Forces, 2024b).

To mitigate the potential risk of flooding, several measures can be implemented to protect key infrastructure such as the turbine, BESS, and substation compound. The BESS and substation will be elevated by 30cm from ground level. The BESS is more than 500m from the CFRAM Flood Extents – High End Future Scenario (River – High Probability). This models the extent of land that might experience fluvial flooding. High Probability flood events have approximately a 1-in-a-10 chance of occurring or being exceeded in any given year. This is also referred to as an Annual Exceedance Probability (AEP) of 10%. The High-End Future Scenario extents were generated taking in the potential effects of climate change using an increase in rainfall of 30% and sea level rise of 1,000 mm (40 inches).

For the turbine, raising the foundation and platform to ensure it is well above the predicted flood levels, as already planned for turbine no. 2, will prevent floodwaters from reaching critical

components. The battery energy storage system and substation compound can be elevated on platforms or berms designed to withstand extreme weather events, with additional protective bunding to prevent water ingress. Foundations will be raised and generally all technical equipment will be at elevated hights inside the turbine tower. Incorporating sustainable drainage systems (SuDS) to manage excess surface water runoff, such as swales and attenuation ponds will reduce flood risk across the entire site. These measures, combined with regular maintenance and flood monitoring, will help ensure the resilience of the site to future flooding scenarios.

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The greatest form of mitigation involves reaching the National Climate Objective of Net Zero by 2050. Such targets include up to 80% of the national grid being generated from renewable sources including 9 GW onshore wind by 2030. The proposed development will help Ireland to achieve this goal as well as to phase out and ultimately end the use of coal and peat in electricity generation by 2030.

14.10 Residual Impact Assessment

The proposed development will result in some impacts to climate through the release of GHGs. TII state that the crux of assessing significance 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*".

The proposed development has proposed some best practice mitigation measures and is committing to increasing the sites resilience to climate change related impacts. This includes raising all modular ancillary buildings and electrical hookups to a minimum 700mm above the 1 in 1,000-year (0.1% AEP) flood level which is a very extreme event in the MRFS for coastal flooding. The MRFS recommends 500mm above the 1 in 1,000-year (0.1% AEP) flood level which the Proposed Development is exceeding.

Other climate related hazards have also been identified and mitigated. As per Section 14.8.1.3, the proposed development will result in overall GHG emission savings.

As per the assessment criteria in Table 14.3 the residual effect of GHG emissions during the construction and operational phases which is ***direct, long-term, beneficial*** and ***slight***.

In relation to climate change vulnerability, it has been assessed that the effect on the proposed development as a result of climate change is ***direct, long-term, negative*** and ***imperceptible***.

14.10.1 Summary of Post-mitigation Effects

Table 14.14 summarises the identified likely significant residual effects in accordance with the EPA Guidelines (EPA, 2022) during the construction, operational and decommissioning phases of the proposed development following the application of mitigation measures.

Table 14.14 Summary of Climate Effects Post Mitigation

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Likely Significant Effect in accordance with EPA Terminology	Quality	Significance	Extent	Probability	Duration	Type
Impact of proposed development greenhouse gas emissions on climate – construction, operational and decommissioning phases.	Beneficial	Not significant	National	Likely	Long-term	Direct
Impact of climate change hazards on proposed development during construction phase	Negative	Imperceptible	Local	Likely	Short-term	Direct
Impact of climate change hazards on proposed development during operational phase	Negative	Imperceptible	Local	Likely	Long-term	Direct

14.10.2 Cumulative Residual Effects

As previously discussed in Section 14.8.4, the assessment approach and climatic effects of the proposed development is inherently cumulative.

14.11 Risk of Major Accidents or Disasters

As detailed in Section 14.8.2, climate change has the potential to alter weather patterns and increase the frequency of rainfall in future years. However, the potential for flooding on site has been reviewed and adequate attenuation and drainage have been provided for to account for increased rainfall in future years.

14.12 Worst Case Scenario

Worst case estimates have been used as part of this assessment. As a result, Section 14.8 details the worst-case impact for the proposed development.

14.13 Interactions

Climate has the potential to interact with a number of other environmental attributes.

14.13.1 Land, Soils, Geology and Hydrology

The impact of flood risk has been assessed and the surface water drainage network will be designed to cater for increased rainfall in future years as a result of climate change. The effect of the interactions of climate with land and soils, and water and hydrology (EIAR Chapters 8 and 9) are ***direct, short-term,***

negative and ***slight*** during the construction phase and ***direct, long-term, negative*** and ***slight*** during the operational phase, which is overall ***not significant*** in EIA terms.

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14.13.2 Air Quality

Air quality (Chapter 13) and climate have interactions due to the emissions from the burning of fossil fuels during the construction and operational phases generating both air quality and climate impacts. Air quality modelling outputs are utilised within the Climate Chapter. There is no impact on climate due to air quality, however, the sources of impacts on air quality and climate are strongly linked.

14.13.3 Traffic and Transportation

During the construction and operational phase, there is the potential for interactions between climate and traffic (for more information see Chapter 06 Material Assets -Traffic and Transportation). Vehicles accessing the site will result in emissions of CO_2, a greenhouse gas. The effects of the proposed development on air quality are assessed by reviewing the change in annual average daily traffic on roads close to the site. In this assessment, the effects of the interactions between traffic and climate are considered to be ***direct, short-term, negative*** and ***not significant*** during the construction phase and ***direct, long-term, negative*** and ***not significant*** during the operational phase, which is overall ***not significant*** in EIA terms.

14.13.4 Waste

Waste (addressed in Chapter 07 Material Assets – Built Services) management measures will be put in place to minimise the amount of waste entering landfill, which has higher associated embodied carbon emissions than other waste management such as recycling. The effect of the interactions between waste and climate are considered to be ***direct, short-term, negative*** and ***not significant*** during the construction phase and ***direct, long-term, negative*** and ***not significant*** during the operational phase, which is overall ***not significant*** in EIA terms.

14.14 Monitoring

Each turbine will also be monitored off-site by the wind turbine supplier. The monitoring of turbine output, performance, wind speeds, and responses to any key alarms will be monitored at an off-site control centre 24-hours per day. Weather conditions will also be continuously monitored during the construction phase to anticipate potential adverse events, allowing the team to take precautionary measures, such as pausing work during extreme weather to ensure safety and protect equipment.

In addition, the construction phase will include the monitoring of waste management and material use to ensure they are minimized and handled responsibly. Efforts will be made to source materials locally where possible, reducing the carbon footprint and supporting local suppliers. Regular audits and tracking will help ensure compliance with best practices in sustainability and resource efficiency throughout the project.

14.15 Summary of Mitigation and Monitoring

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Table 14.15 summarises the Construction Phase mitigation and monitoring measures.

Table 14.15 Summary of Construction Phase Mitigation and Monitoring

Likely Significant Effect	Quality	Significance
Impact of proposed development greenhouse gas emissions on climate.	Mitigation measures as per Sections 14.9.1	No monitoring is required for the development during the construction phase.
Impact of climate change hazards on proposed development.	Mitigation measures, primarily relating to drainage, as per Section 14.9.2	No monitoring is required for the development during the construction phase.
Impact of proposed development on greenhouse gas emissions on climate.	Monitoring measures, primarily relating to waste and material use as per Section 14.14.	Mitigation is key factor in determining likely significance of effect. Implementation of mitigation measures during the construction phase reduces likely significance of effect from moderate significant adverse to slight, not significant adverse.
Impact of climate change hazards on proposed development.	Monitoring measures, primarily relating to potential weather events, as per Section 14.14.	The application of mitigation measures reduces the sensitivity of the site and, therefore, the significance of impacts.

Table 14.16 summarises the Operational Phase mitigation and monitoring measures.

Table 14.16 Summary of Operational Phase Mitigation and Monitoring

Likely Significant Effect	Quality	Significance
Impact of proposed development greenhouse gas emissions on climate.	Mitigation measures as per Sections 14.9.1	No monitoring is required for the development during the operational phase.
Impact of climate change hazards on proposed development.	Mitigation measures, primarily relating to drainage, as per Section 14.9.2	No monitoring is required for the development during the operational phase.

Table 14.17 summarises the Decommissioning Phase mitigation and monitoring measures.

Table 14.17 Summary of Decommissioning Phase Mitigation and Monitoring

Likely Significant Effect	Mitigation	Monitoring
Effects of project on the climate	Control measures as per Section 14.9	Monitoring as per Section 14.14.

14.16 Conclusion

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This chapter has reviewed and analysed the potential and the predicted impacts of the proposed development with regards to climate. These impacts have been considered for both the construction and operational phases of the proposed development. The cumulative impact of the proposed development and surrounding developments have also been considered.

Provided all mitigation measures as set out in this chapter, the overall predicted effect of the proposed development is not significant in relation to GHG emissions and climate change risk.

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CHAPTER 15
CULTURAL HERITAGE: ARCHAEOLOGY & BUILT HERITAGE

VOLUME II
ENVIRONMENTAL IMPACT ASSESSMENT REPORT

DECEMBER 2024

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15 Cultural Heritage: Archaeology & Built Heritage

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15.1 Introduction

This chapter of the EIAR was prepared to assess the potential significant effects of the proposed development on cultural heritage. Icon Archaeology Ltd was commissioned to complete the archaeological, architectural and cultural heritage chapter for a proposed wind farm development project located in the townlands of Cloonanny Glebe, Gorteenorna, Derryharrow, and Corragarrow, County Longford. The Proposed Development will comprise 2 No. wind turbine and all associated ancillary activities (Fig.15.1).



Figure 15.1 Proposed Location of Wind Farm Development, Cloonanny Glebe, County Longford

This chapter should be read in conjunction with reference to Chapter 2 Development Description, Chapter 5 Landscape Visual Impact Assessment (LVIA), Appendix 15.1 (Description of RMP Sites), Appendix 15.2 (Summary Description of NIAH Sites), Appendix 15.3 (Cloonanny Glebe Test Excavation Report, Licence No. 24E0500), Turbine Delivery Route Assessment Report and Grid Connection Route Assessment Report included in the CEMP.

15.2 Expertise & Qualifications

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This chapter of the EIAR has been prepared by John Kavanagh. Project Director with Icon Archaeology Ltd since 2005. John has over 28 years of archaeological experience including 20 years as a licenced director. John Kavanagh holds MA, MSc, MIAI. John Kavanagh has carried out a wide range of archaeological assessments and been involved in the preparation of EIARs for the following projects:

- Ringaskiddy Wind Farm Development, County Cork,
- Templehouse Wind Farm Development, County Sligo,
- Ballyfeeny Wind Farm Development, County Roscommon.

15.3 Proposed Development

A brief summary of the development is outlined below. A detailed description of the proposed development is contained within Chapter 2 of this EIAR and the Planning Statement that accompanies the application. The statutory notices should also be referred to.

A 10-year permission is being sought by Natural Forces Renewable Energy 2 Limited for the development of a 14MW wind farm on lands measuring 17.28ha located at the L5046 and L50462 in the townlands of Cloonanny Glebe, Corragarrow, Derryharrow and Gorteenorna, Co. Longford.

The proposed development will consist of the following:

(i) Demolition of a single-storey derelict shed structure (c. 93 sqm GFA) to facilitate the turbine haul route

(ii) Construction of two E175 EP5 wind energy converters, each with an electrical rating of 7MW, an overall ground-to-blade tip height of 199.9 metres, a rotor blade diameter of 175 metres, hub height of 112.4 metres, associated foundations and hard-standing areas;

(iii) Construction of an 800m permanent internal site access road which will run from the L50462 to the wind energy converter hardstanding areas including a 9.1m clear span bridge crossing a local stream;

(iv) Construction of 1 No. meteorological mast with a height of 32 metres, associated foundation and hardstanding area;

(v) Construction of 1 No. 20kV substation compound comprising 2 No. Modular Buildings each measuring 13.5 sqm in area and 3.5m in height, a Battery Energy Storage System (BESS) comprising 3 storage modules with a height of 2.8 metres and associated electrical works, foundation and hardstanding area;

(vi) Temporary alterations to the L5046 and L50462 public roads and temporary access roads to facilitate the turbine component haul route, including temporary widening of sections of the L5046 and L50462.

(vii) Installation of underground collector circuit and communications cabling in underground cable trenches, from the proposed wind energy converter to the proposed on-site substation;

(viii) All associated and ancillary site development, excavation, construction, and reinstatement works, including the provision of a temporary construction compound, site drainage, spoil management, fencing, lighting, hedge and operational maintenance and tree trimming and cutting.

(ix) This application is seeking a 35- year operational life from the date of commissioning of the entire wind farm.

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The grid connection from the proposed on-site substation to the national electricity grid does not form part of the subject planning application. However, as part of the planning application process, this EIAR addresses three potential grid connection options currently considered to ensure a comprehensive environmental assessment of all aspects of the Proposed Development. The grid connection will be via 1 of the 3 potential options outlined below:

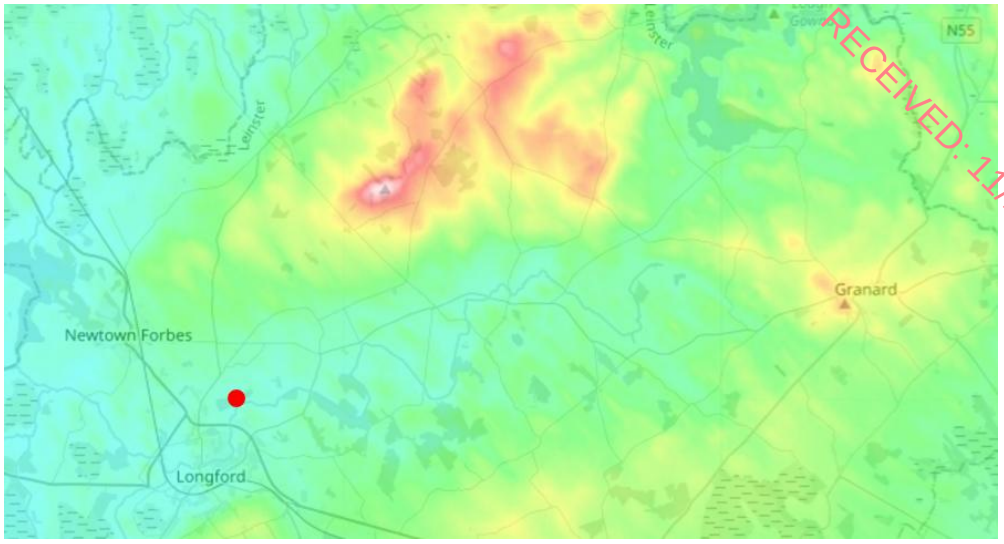
- Option 1 Connect the proposed development via (8.03km) to Richmond 110kV Substation
- Option 2 Connect the proposed development via (3.96km) to Longford 38kV Substation
- Option 3 Connect the proposed development via (5.85km) to Glebe 38kV Substation

It is anticipated that the grid connection from the Proposed Development will be by means of an underground cable connecting to one of the Substations identified above via the public road network. For bridge crossings, the cable will be located within the bridge deck, where there is insufficient depth and width available horizontal directional drilling (HDD) will be employed as an alternative.

Once the preferred route emerges it will be determined whether the grid connection falls within the category of exempted development under Class 26 of Schedule 2 in the Planning and Development Regulations 2001, as amended or requires planning permission, in which case an application will be made to the planning authority.

All elements of the proposed development as outlined above together with the turbine delivery route and grid connection options have been assessed as part of this EIAR.

The Proposed Development is located at Cloonanny Glebe, Gorteenorna, Derryharrow, and Corragarrow which is within an agricultural landscape and is approximately 3.3km from Longford Town, County Longford. The gently undulating low lying landscape is a mixture of bogland, pastureland and wetland with higher ground to the north and east. The area is drained by several small streams and ditches leading to River Camlin which flows in a general EW direction to Lough Ree and Shannon further to the west (Fig.15.2).



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Figure 15.2 Topographical Map and Location of Wind Farm Development

The site layout is shown below (Fig.15. 3). The proposed wind turbines and their corresponding grid co-ordinates (ITM) is set out in Table 14.1.

Table 15.1 Proposed Wind Turbine Coordinates

Turbine ID	ITM Coordinates	
	Easting:	Northing:
Turbine 1 (T1)	615036	777906
Turbine 2 (T2)	615470	777952

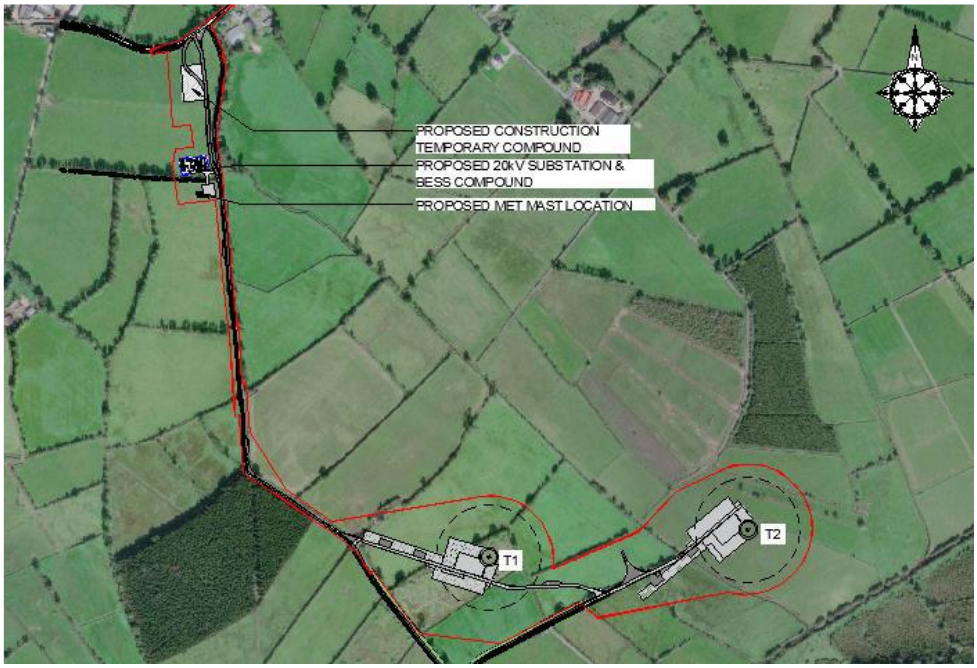


Figure 15.3 Wind Farm Site Layout

15.3.1 Aspects Relevant to this Assessment

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Key aspects relevant to this assessment include the following.

15.3.1.1 Turbine and Associated Infrastructure during Construction Phase

- 2 No Wind Turbines with a blade tip height of 199.9m
- 2 No. Wind Turbine foundations and crane hardstand areas
- 1 No. Permanent Meteorological Mast (Met Mast) (32m High) and associated foundation and hardstand areas
- 1 No. 20kV Substation Compound with 2 No. Modular Buildings, a Battery Energy Storage System (BESS) and associated electrical works
- Underground electrical collection and SCADA system linking the Wind Turbines to the Substation Compound
- Temporary widening of the L50462 public road to accommodate delivery of the Wind Turbines
- Upgraded of an existing field entrance on the L50462 into a Wind Farm Site Entrance
- Construction of a new Site Access Road
- Construction of a new Site Entrance off the L50462 public road into the Substation and Met Mast compounds
- Construction of 2 No. Temporary Site Entrances off the L5046 and the L50462 and a section of Temporary Site Access Road to accommodate delivery of the Wind Turbines
- Localised temporary works on the Wind Turbine delivery route
- 1 No. Temporary Construction Compound and associated temporary welfare accommodation and storage
- Construction of excavated soil repository areas
- Construction of temporary and permanent drainage works

15.3.1.2 Turbine and Associated Infrastructure Operational Phase

- 2 No Wind Turbines with a blade tip height of 199.9m
- 2 No. Wind Turbine foundations and crane hardstand areas
- 1 No. Permanent Meteorological Mast (Met Mast) (32m High) and associated foundation and hardstand areas
- 1 No. 20kV Substation Compound with 2 No. Modular Buildings, a Battery Energy Storage System (BESS) and associated electrical works
- Maintenance and minor upgrades to the turbines and electrical components, if required.

15.3.2 Grid Connection Route

The grid connection for the Proposed Development does not form part of this planning application. Once the preferred route emerges it will be determined whether the grid connection falls within the category of exempted development under Class 26 of Schedule 2 in the Planning and Development Regulations 2001, as amended or requires planning permission, in which case an application will be

made to the planning authority. However, as part of the planning application process, this EIAR addresses three potential grid connection options currently considered to ensure a comprehensive environmental assessment of the whole project (Fig.15.4).

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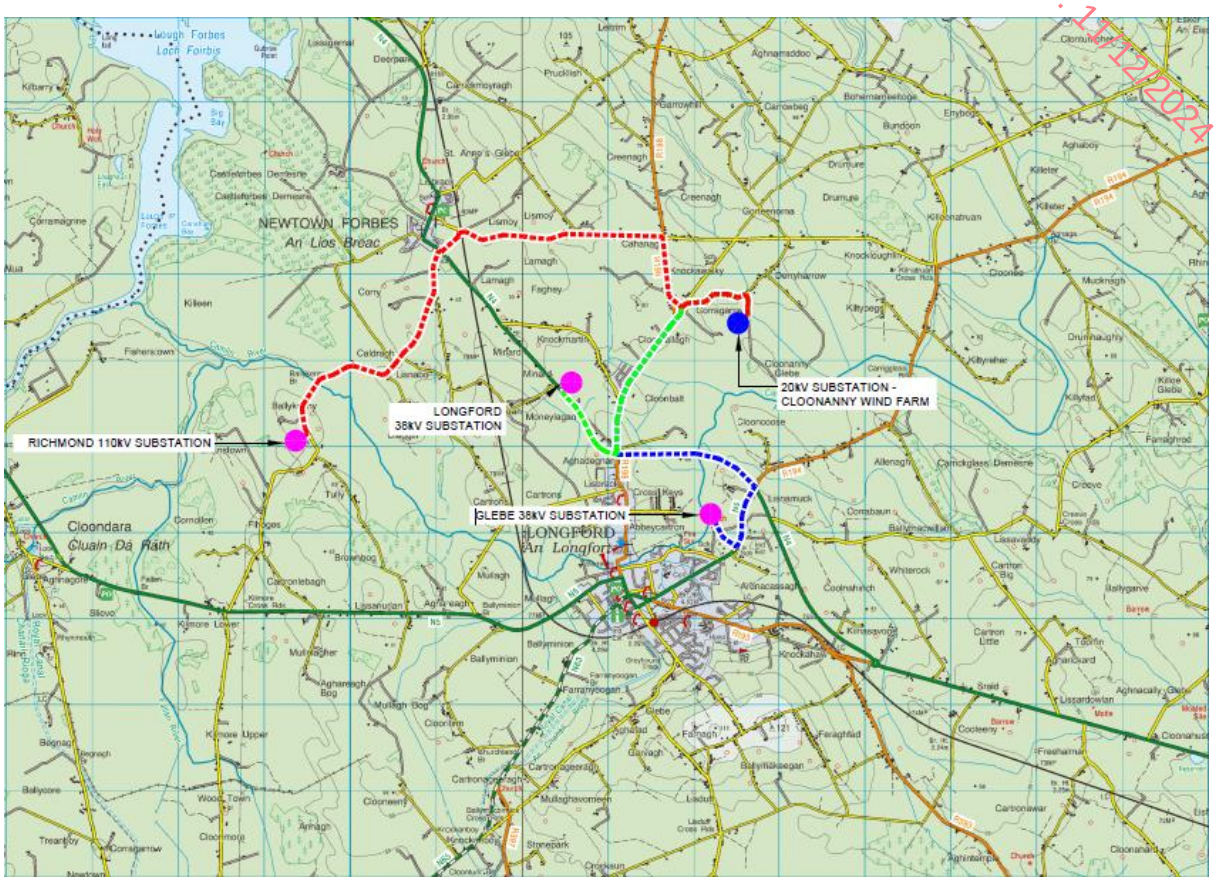


Figure 15.4 Layouts of Grid Route Options

It is anticipated that the grid connection from the Proposed Development will be by means of an underground cable connecting to an existing Eirgrid or ESB Networks Substation via the public road network.

- Aspects relevant to this assessment include the three route options considered as part of the grid connection works. These options include the following:

    - Option 1 - Connection to Existing Richmond 110kV Substation.
    - Option 2 - Connection to Existing Longford 38kV Substation.
    - Option 3 - Connection to Existing Glebe 38kV Substation.

15.3.3 Turbine Delivery Route

A Preliminary Traffic Management Plan (PTMP)) has been prepared for the project and forms part of the EIAR report. The components for the Wind Turbines will be delivered by cargo ships to the Port of Waterford, which is also known as Belview Port. The components will be transported from Belview to the site along the motorway, national, regional and local road network.

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As part of the Proposed Development, it is proposed to upgrade and temporarily widen sections of the L50462 and L5046 to accommodate the delivery of the turbine components to the main Site Entrance. Following Turbine delivery, the temporary widening will be grubbed up and the area will be reinstated.

- Aspects relevant to this assessment include the temporary widening of the L50462 and L5046 public roads to accommodate delivery of the Wind Turbines and the crossing of Carrigglas bridge (Fig.15.5).

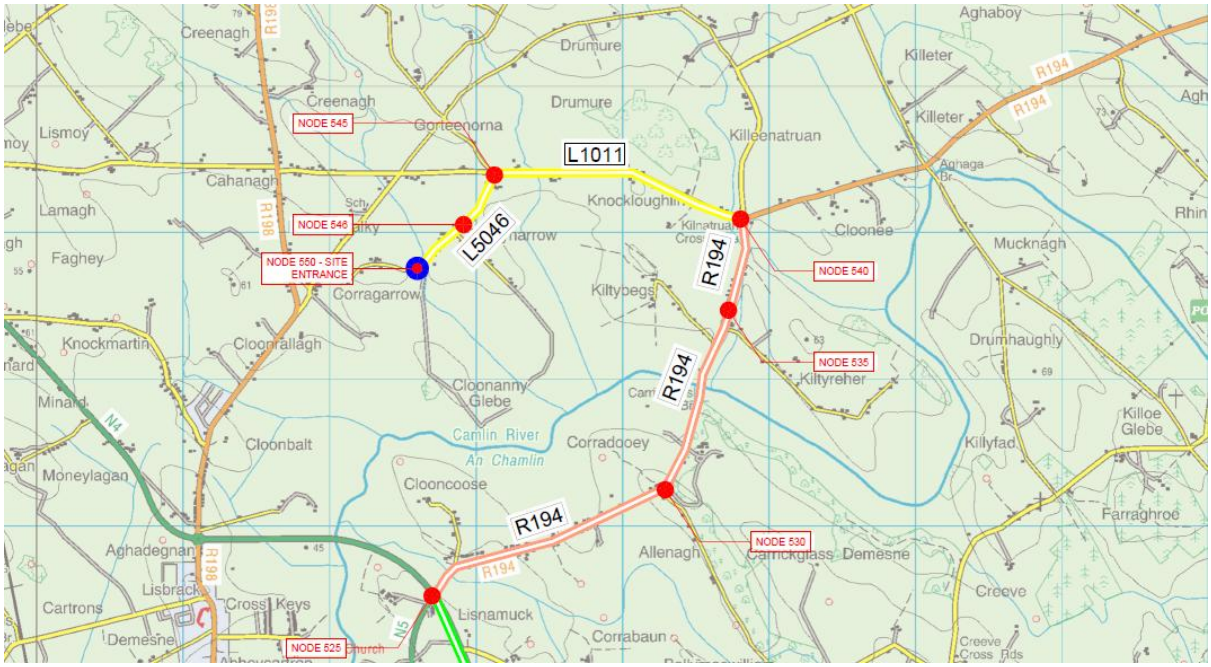


Figure 15.5 Relevant Turbine Delivery Route Section to Wind Farm Development

15.4 Methodology

15.4.1 Primary Study Area

In order to capture sufficient baseline data to robustly assess direct and indirect impacts to cultural heritage assets, the spatial scope of the assessment comprises all the land within the site, together with a 2.5km zone around the Proposed Development site (Fig.15.6) and a 10km zone for UNESCO world heritage sites. Longford Town is 3.3km to the south of the Proposed Development and has been included due to its historic importance. This extent of this zone is considered to be appropriate, given the nature of the Proposed Development.



Figure 15.6 2.5km Area of Study for Wind Farm Development Project

15.4.2 Secondary Study Areas

The Cultural Heritage Assessment also reviewed the potential direct impacts of the Turbine Delivery Route on cultural assets as part of the Preliminary Traffic Management Plan (PTMP). This route extends from the Port of Waterford, County Kilkenny to the subject site along the motorway, national, regional and local road network with temporary widening of the L50462 and L5046 public roads required and a crossing at Carrigglas bridge (NIAH 13400912).

The Cultural Heritage Assessment also reviewed the potential direct impacts of the potential Grid Connection routes (GCR) on cultural assets. Three options have been considered as part of the grid connection works as outlined within Section 15.6.26.

15.4.3 Evaluation Criteria

The evaluation of impacts upon the archaeological, architectural, and cultural heritage resources is based on a desktop study of published and unpublished documentary and cartographic sources, followed by a field survey and test excavation. This assessment has been produced in accordance with national and local legislation and policy, as well as best practice guidance.

This assessment has been produced in accordance with national and local legislation and policy. The impact assessment methodology aligns with general EPA EIAR Guidelines (EPA, 2022) which were adapted by Transport infrastructure Ireland (TII), in their specific Guidelines for Cultural Heritage Impact Assessment of TII National Road and Greenway Projects (TII, 2024). TII guidelines can be equally applied to other development schemes and are ideally suited to Wind Energy Development Projects.

The assessment has been completed using a phased qualitative assessment methodology, as outlined here:

- Cultural heritage assets with the potential to be affected by any Proposed Development are identified and ascribed a 'value', ranging from 'unknown' to 'very high'.
- The 'magnitude' of any effects resulting from any Proposed Development upon the identified assets are established, ranging from 'no change' to 'high' (assuming no mitigation is in place).
- A comparison of the magnitude of effect and asset value is used to calculate the significance of effect.
- Where required, a mitigation strategy is proposed, with the significance of effect re-calculated (assuming any proposed mitigation is in place) to ascertain the significance and duration of residual effects.

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15.4.4 Describing Impacts/Effects on Cultural Heritage Assets

Development projects can have a wide range of impacts/effects on Cultural Heritage Assets. These can be direct, indirect, positive and/or negative.

- **Direct Effect** – where a Cultural Heritage Asset or its setting is physically located within the footprint of a project which would entail its removal in whole or in part. Direct effects can also be defined as those that are directly attributable to the Proposed Development.
    - Direct effects can include:
        - Total or partial loss of Cultural Heritage Assets due to physical impacts,
        - Severance between associated Cultural Heritage Assets, and
        - Reduced or enhanced access to a Cultural Heritage Asset with established amenity value.

- **Indirect Effect** – an effect that results indirectly from the Proposed Development, often occurring away from the development, or because of a sequence of interrelationships or a complex pathway.
    - Indirect effects can include:
        - Physical damage because of vibrations caused by construction machinery,
        - Changes to local hydrology, potentially affecting the preservation of subsurface organic and inorganic archaeological remains,
        - Changes to character of Cultural Asset arising from changes in setting,
        - Changes to views to/from an Asset, including disruption or destruction of designed vistas; and
        - Reduction in traffic and noise on the existing national road adjacent to a Cultural Heritage Asset (positive effect).
- **Positive Effect –** a change which enhances or improves the quality of the Cultural Heritage Asset.
- **Negative Effect –** a change which reduces the quality of the Cultural Heritage Asset.

15.4.5 Assessment of Value of Cultural Heritage Assets

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Determining the importance of Cultural Heritage Assets is a key component of the EIAR process. The assessment of importance is based on the evidence derived from some or all of the following: desktop research, fieldwork, specialist surveys and assessments, consultation and professional opinion. The value of a cultural heritage asset can be assessed using the criteria presented in Table 15.2 below.

Table 15.2 Value of Cultural Heritage Assets

Value of Asset	Criteria
Very High	• Designated Built Heritage Assets rated as being of international importance. • Historic gardens and designed landscape as being of international importance. • Designated features of international intangible heritage value. Designated historic landscapes of international value. • National Monuments and World Heritage Properties.
High	• Architectural Conservation Areas. • Built Heritage Assets rated as being of national importance by the NIAH, including associated historic gardens and designed landscapes. • Historic landscapes (designated or undesignated) of outstanding interest and of demonstrable national value. These will be well-preserved historic landscapes exhibiting considerable coherence, time- depth, or other critical factors. • Other designated or undesignated Cultural Heritage Assets of demonstrable national importance. Places or features of national intangible heritage value. • Protected Structures and Recorded Monuments (or sites and monuments scheduled for inclusion on the RMP) of high quality and importance. Sites and monuments subject to a Preservation Order or Temporary Preservation Order. • Undesignated Assets of high quality and importance.
Medium	• Built Heritage Assets rated as being of regional importance by the NIAH, including associated historic gardens and designed landscapes. • Historic landscapes of regional value (designated or undesignated). • Historic townscapes or built-up areas with demonstrable historic integrity in their buildings or built settings (e.g. including street furniture and other structures). • Other designated or undesignated Assets of regional Cultural Heritage importance. Places or features of regional intangible heritage value. • Recorded Monuments (or sites and monuments scheduled for inclusion on the RMP).
Low	• Built Heritage Assets rated as being of local importance by the NIAH, including associated historic gardens and designed landscapes. • Historic landscapes whose value is limited by poor preservation and/or poor survival of contextual associations. • Historic townscape or built-up areas of limited historic integrity in their buildings or built settings (e.g. including street furniture and other structures). • Other designated or undesignated Cultural Heritage Assets of local importance. Places or features of local intangible heritage value. • Assets compromised by poor preservation of contextual associations with inherent, albeit limited, Cultural Heritage value. • Undesignated historic buildings of modest quality in their fabric or historical association.
Negligible	• Assets/landscapes with very little surviving Cultural Heritage interest.

15.4.6 Assessment of Magnitude of Effect

The scale and magnitude of effects on cultural heritage assets can be assessed using the tiered grading system presented in Table 15.3 below.

Table 15.3 Effects on Cultural Heritage Assets

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Magnitude of Effect	Criteria
High	Major alteration to, or complete loss of, a Cultural Heritage Asset. Effects likely to be experienced at a very large scale; considered permanent and irreversible.
Medium	Notable or long-term change to a Cultural Heritage Asset.
Low	Moderate or long-term change over a restricted area or a moderate change to a Cultural Heritage Asset.
Negligible	Minor, short- or medium-term change over a restricted area or a minor change to a Cultural Heritage Asset.
No Change	Imperceptible change to a Cultural Heritage Asset.

The methodology outlined in this section is reliant on an element of subjectivity, and so inherently requires a level of professional judgement. It is considered, however, that the criteria described in Table 15.2 and Table 15.3 provide robust and transparent decision-making guidance that can be widely applied to a variety of potential cultural heritage assets.

15.4.7 Relevant Legislation & Guidance

The chapter has been prepared in compliance with all relevant EIA and heritage legislation and guidelines including the following:

- Valetta Convention for the Protection of Archaeological Heritage 1997.
- Granada Convention for the Protection of Architectural Heritage 1985.
- National Monuments Legislation 1930 – 2004.
- Framework and Principles for the Protection of the Archaeological Heritage 1999,
- Wind Energy Guidelines 2019 (Draft).
- Longford County Development Plan 20222028.
- EPA Guidelines on the information to be contained in EIA reports 2022.
- TII Guidelines for Cultural Heritage Impact Assessment of TII National Road and Greenway Projects 2024.

15.4.7.1 Valetta Convention for the Protection of Archaeological Heritage

The cultural heritage in Ireland is safeguarded through national and international policy designed to secure the protection of the cultural heritage resource to the fullest possible extent (Department of Arts, Heritage, Gaeltacht, and the Islands 1999, 35). This is undertaken in accordance with the provisions of the European Convention on the Protection of the Archaeological Heritage (Valletta Convention), ratified by Ireland in 1997.

15.4.7.2 Granada Convention for the Protection of Architectural Heritage

The Council of Europe, in Article 2 of the 1985 Convention for the Protection of the Architectural Heritage of Europe (Granada Convention), states that 'for the purpose of precise identification of the monuments, groups of structures and sites to be protected, each member State will undertake to maintain inventories of that architectural heritage'. The Granada Convention emphasises the importance of inventories in underpinning conservation policies.

The National Inventory of Architectural Heritage (NIAH) was established in 1990 to fulfil Ireland's obligations under the Granada Convention, through the establishment and maintenance of a central record, documenting and evaluating the architectural heritage of Ireland. Under the subsequent Heritage Act (1995) architectural heritage is defined to include 'all structures, buildings, traditional and designed, and groups of buildings including streetscapes and urban vistas, which are of historical, archaeological, artistic, engineering, scientific, social or technical interest, together with their setting, attendant grounds, fixtures, fittings and contents'.

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15.4.7.3 National Monuments Legislation 1930 - 2004

Both the National Monuments Acts 1930 to 2004 and relevant provisions of the Cultural Institutions Act 1997 are the primary means of ensuring protection of archaeological monuments, the latter of which includes all man-made structures of whatever form or date. There are a number of provisions under the National Monuments Acts which ensure protection of the archaeological resource.

These include the Register of Historic Monuments (1997 Act) which means that any interference to a monument is illegal under that Act. All registered monuments are included on the Record of Monuments and Places (RMP). A number of mechanisms under the National Monuments Act are applied to secure the protection of archaeological monuments (referred to as assets below). Heritage assets can be protected under the National Monuments Acts 1930 to 2004 in four ways:

- The asset is recorded in the Record of Monuments and Places (RMP).
- The asset is registered in the Register of Historic Monuments (RHM).
- The asset is a national monument subject to a Preservation Order (or Temporary Preservation Order).
- The asset is a National Monument in State Care.

The Record of Monuments and Places (RMP) was established under Section 12 (1) of the National Monuments (Amendment) Act 1994 and consists of a list of known archaeological monuments and accompanying maps.
The Record of Monuments and Places affords some protection to the monuments entered therein. Section 12 (3) of the 1994 Amendment Act states that any person proposing to carry out work at or in relation to a recorded monument must give notice in writing to the Minister (Environment, Heritage, and Local Government) and shall not commence the work for a period of two months after having given the notice. All works, therefore, within or around any archaeological monument are subject to statutory protection and legislation (National Monuments Acts 1930-2014).

15.4.7.4 Framework and Principles for the Protection of the Archaeological Heritage 1999

This document sets out the basic principles of national policy on the protection of the archaeological heritage. The core principle is that full consideration of the protection of the archaeological heritage when undertaking, approving or authorising development is essential if unnecessary and damaging conflict between development and the protection of the archaeological heritage.

15.4.7.5 Wind Energy Development Guidelines 2019 (Revised Draft)

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The revised 2019 guidelines offer advice to planning authorities and developers on planning for wind energy through the development plan process and in determining applications for planning permission. The guidelines outline the following approaches to archaeological and architectural assessment:

Wind Energy Archaeological Guidelines

- The potential impact of the Proposed Development on the archaeological heritage of the site should be assessed. The assessment should address direct impacts on the integrity and visual amenity of monuments and include appropriate mitigation measures, such as through a desktop study and a field inspection where necessary.

- The Framework and Principles for the Protection of the Archaeological Heritage 1999 provides the formal policy and standard approaches to dealing with ground disturbance, development impacts on archaeological heritage with an emphasis on mitigating impact on unknown archaeological sites.

Wind Energy Architectural Heritage Guidelines

- Where applications may impact upon historic settings and landscapes, the input of a conservation architect is recommended to guide the planning/conservation strategy, the appropriate level of intervention and mitigation measures to avoid adverse impact on built and archaeological heritage.

15.4.7.6 Longford County Development Plan (LCDP) 2021 - 2027

Each local authority was obliged to draw up a Development Plan setting out their aims and policies with regard to the growth of the area over a five-year period. They cover a range of issues including archaeology and built heritage, setting out their policies and objectives with regard to the protection and enhancement of both. These policies can vary from county to county.

The Planning and Development Act 2000 recognises that proper planning and sustainable development includes the protection of the archaeological heritage. Conditions relating to archaeology may be attached to individual planning permission.

LCDP Built Heritage Objectives

Chapter 11 of the LCDP outlines the policy objectives relating to built heritage, including the protection of architectural and archaeological heritage features, structures, and areas of special interest such as Architectural Conservation Areas (ACAs).

The key objectives include:

- Promote and direct users to the National Inventory of Architectural Heritage (NIAH) website (www.buildingsofireland.ie) wherever appropriate.
- Implement the County Heritage Plan 2019-2024 and seek to update the Heritage Plan over the lifetime of the County Development Plan.
- Ensure that all development should be appropriate to its setting in the landscape or townscape and responds to and reinforces local character and heritage.

- Encourage the enhancement, management, protection and the promotion of access to and understanding of the architectural heritage of the County.
- Provide detailed guidance notes and continue to develop the Council's advisory/educational role with regard to heritage matters and to promote awareness, understanding and appreciation of the architectural heritage of the County.
- Ensure that proposals for development to structures included as part of the National Inventory of Architectural Heritage (DoEHLG) and any updated version, maintain and enhance the character of these structures.
- Ensure that development in the vicinity of a Recorded Monument or Zone of Archaeological Potential is sited and designed in a sensitive manner with a view to minimal detraction from the monument or its setting.
- Require, as part of the development management process, archaeological impact assessments, geophysical survey, test excavations or monitoring as appropriate.
- Refer any proposed development which may impact on the integrity and/or setting of any monuments, sites, objects or areas of archaeological, cultural, architectural, historical or heritage importance to the relevant section of the Department of Housing, Local Government.

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15.4.7.7 EPA Guidelines EIAR 2022

The Environmental Protection Agency was required by the EPA Act 1992 to prepare and publish guidelines on information to be contained in environmental impact assessment reports. These Guidelines apply to the preparation of all EIA reports undertaken in the State. The EPA EIAR Guidelines 2022 emphasise the importance of the methods used in the preparation of an EIAR to ensure that the information presented is adequate and relevant.

15.4.7.8 TII Guidelines for CHIA of TII National Road and Greenway Projects 2024

Transport infrastructure Ireland (TII) adapted the EPA EIAR Guidelines 2022 for use on development schemes and are ideally suited to Wind Energy Development Projects.

15.4.8 Site Surveys/Investigations

A site walk-over of the Proposed Development area was carried out during November 2023. The turbine location and its surrounds were inspected by John Kavanagh of Icon Archaeology Ltd.

A comprehensive test excavation was also undertaken by John Kavanagh of Icon Archaeology Ltd in July 2024 under licence from the Department of Housing, Local Government and Heritage (Licence No. 24E0500). The summary results of this test excavation are presented in this EIAR chapter and Appendix 15.3.

15.4.9 Consultation

John Kavanagh of Icon Archaeology Ltd liaised with the National Monuments Service following the submission of the Test Excavation Licence Application and associated Method Statement. Following consultation with the National Monuments Service, it was agreed that the programme of testing would be expanded to include areas relevant to the construction phase of the project (i.e. location of

compounds, spoil heaps, turning areas, etc). Following the completion of archaeological testing, a full report detailing the results of the excavation was submitted to the National Monuments Service.

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15.5 Difficulties Encountered

During the course of fieldwork, it was not possible to gain access to Carrickglass Demesne which is privately owned. Standard baseline data was used with photographs taken from the nearest available points adjacent to Carrickglass Demesne. Similarly, with the exception of Historic Longford Town and Battery Road Architectural Conservation Area, the remaining RMP sites and Protected Structures are located on private property and were not accessible (See Appendix 15.1 and 15.2 for details).

15.6 Baseline Environment

The following baseline sources were consulted as part of the desktop assessment for the Proposed Development:

- UNESCO World Heritage Sites.
- National Monuments in State Care.
- The Record of Monuments and Places (RMP).
- The Sites and Monuments Record (SMR).
- Excavations Database.
- The Topographical Files of the National Museum of Ireland.
- Record of Protected Structures (LCDP 2021 – 2027).
- National Inventory of Architectural Heritage (NIAH).
- First and subsequent editions Ordnance Survey maps (OSI).
- Aerial photographs (OSI).
- Placename Evidence.

15.6.1 UNESCO World Heritage Sites

The 'Convention concerning the Protection of the World Cultural and Natural Heritage' (1972) provides The United Nations Educational, Scientific and Cultural Organization (UNESCO) with the power to inscribe assets of international importance on the World Heritage List as a World Heritage Site. Local authorities and stakeholders are encouraged to protect these sites through the production of Management Plans, which aim to manage the site in a suitable fashion.

15.6.2 National Monuments in State Care, Record of Monuments and Places (RMP) and Sites and Monuments Record (SMR)

A review of all National Monuments in State Care and those subject to Preservation Orders was undertaken as part of the assessment in order to ascertain any potential impacts on their setting as a result of the development.

A primary cartographic source and base-line data for the assessment was the consultation of the Sites and Monuments Record (SMR) and Record of Monuments and Places (RMP) for County Longford. All known recorded archaeological monuments are indicated on 6-inch Ordnance Survey (OS) maps and are listed in these records. The SMR/RMP is not a complete record of all monuments as newly discovered sites may not appear in the list or accompanying maps. In conjunction with the consultation of the SMR and RMP the electronic database of recorded monuments.

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15.6.3 Excavations Database

The Excavations Database is an annual account of all excavations carried out under license. The database is available online at www.excavations.ie and includes excavations from 1985 to 2023. This database was consulted as part of the desktop research for this assessment to establish if any archaeological excavations had been carried out within or near to the development area.

15.6.4 Topographical Files - National Museum of Ireland

Details relating to finds of archaeological material and monuments in numerous townlands in the country are contained in the topographical files held in the National Museum of Ireland. In order to establish if any new or previously unrecorded finds had been recovered from the study area these files were consulted for every townland within and adjacent to the same. Heritage Maps (www.heritagemaps.ie) also contains locational detail for Museum find spots.

15.6.5 Record of Protected Structures

The Record of Protected Structures for County Longford was consulted for the schedule of buildings and items of cultural, historical, or archaeological interest. The development plan also outlines policies and objectives relating to the protection of the archaeological, historical, and architectural heritage landscape of Longford. These objectives include the following:

- Review and update the Record of Protected Structures on an on-going basis and to make additions and deletions as appropriate.
- Promote best conservation practice and encourage the use of appropriately qualified professional advisors, tradesmen and craftsmen, with recognised conservation expertise, for works to Protected Structures.
- Ensure the protection of structures included in the Record of Protected Structures.
- Controlling development which would alter the character of Protected Structures and proposed Protected Structures.
- Preventing the endangerment of Protected Structures in the Council's ownership.
- Encourage the rehabilitation, renovation and reuse of existing older buildings/ buildings of architectural merit, where appropriate, in preference to their demolition and redevelopment. In certain cases, land use zoning restrictions may be relaxed in order to secure the conservation of the Protected Structure.
- Facilitate contemporary and innovative design providing that they are of a sufficient high quality and do not detract from the character of the historic fabric of the Protected Structure.

- Require applications for development where a Protected Structure or its setting is likely to be materially affected, to submit a detailed assessment of the building.
- Protect the setting of Protected Structures and refuse permission for development within the curtilage or adjacent to a Protected Structure which would adversely impact on the character and special interest of the structure, where appropriate.

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15.6.6 National Inventory of Architectural Heritage (NIAH)

The purpose of the NIAH is to identify, record, and evaluate the post-1700 architectural heritage of Ireland, uniformly and consistently as an aid in the protection and conservation of the built heritage. NIAH surveys provide the basis for the recommendations of the Minister for the Environment, Heritage, and Local Government to the planning authorities for the inclusion of particular structures in their Record of Protected Structures (RPS). The published surveys are a source of information on the selected structures for relevant planning authorities.

15.6.7 Cartographic Sources

Analysis of historic maps can reveal the changes in land use and field boundaries in the area and can highlight potential areas of archaeological interest that may have been lost in the subsequent years. Relevant maps including the 1st and subsequent editions of the Ordnance Survey were consulted to undertake this analysis as part of the desk-based assessment and site walkover survey.

15.6.8 Aerial Photographs and Satellite Imagery

To identify potential archaeological features within the application site that are not recorded within the relevant databases, aerial photography and satellite imagery of the land was examined in order to identify any cropmarks or markings within the application site that may be indicative of previously unknown features.

15.6.9 Placename Evidence

Placename analysis of the baronies, townlands and parishes containing the land was undertaken as this can often determine the historical land use associated with the application site even when other evidence of this usage has been lost.

15.6.10 Archaeology

15.6.10.1UNESCO World Heritage Sites

There are no UNESCO World Heritage Sites within 10km of the Area of Study.

15.6.11 National Monuments in State Care

Longford County has 6 sites designated as National Monuments in State Care.

- There are no National Monuments in State Care within the Area of Study.
- Monuments subject to Preservation Orders and Temporary Preservation Orders - None in the Study Area.

- Monuments listed in the Register of Historic Monuments - None in the Study Area.

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15.6.12 Record of Monuments and Places, Sites and Monuments Record

The following 28 Recorded Monuments are located within the Area of Study (Fig. 15.7).

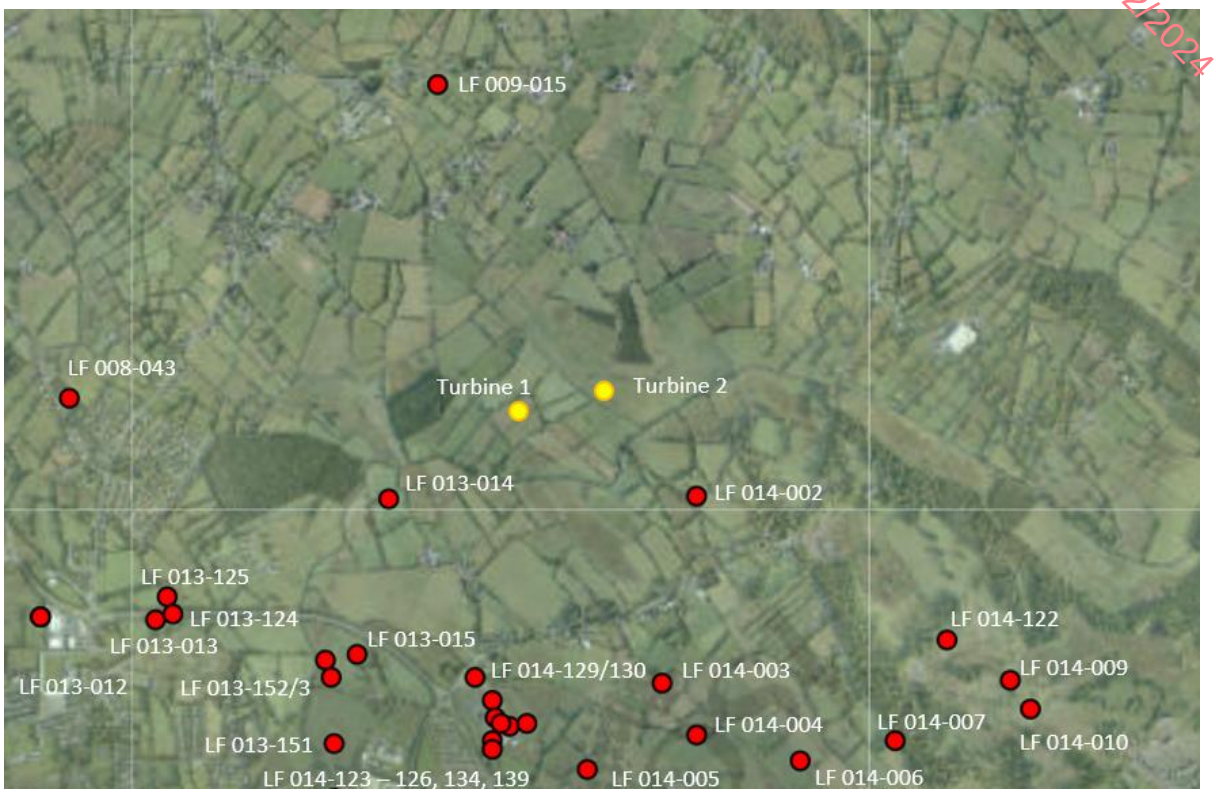


Figure 15.7 Record of Monuments and Places Map Within Area of Study, County Longford

Table 15.4 below lists the RMP sites within the Area of Study. Although, TII guidelines dictate that all RMP sites are of 'Medium to High' value due to their protected status, quality and importance (TII Guidelines, 2024), it should be noted that 11 RMPs are the site of previous excavations with no visible trace (assessed as 'low' value) and 2 RMPs are redundant records (assessed as 'negligible' value).

Table 15.4 Record of Monuments and Places Index

RMP Ref No.	Townland	Site Type	Condition	Value
LF013-026	Townparks	Longford Historic Town	Existing town	High
LF 013-014	Clooncoose	Ringfort	Partial remains visible	Medium
LF 014-002	Corradooey	Enclosure	Partial remains visible	Medium
LF 009-015	Derryharrow	Standing Stone	No visible trace	Medium
LF 008-034	Cloonbolt	Ringfort	No visible trace	Medium
LF 014-003	Clooncoose	Ringfort	Partial remains visible	Medium
LF 014-004	Clooncoose	Ringfort	Partial remains visible	Medium
LF 014-006	Ballymacwilliam	Ringfort	Partial remains visible	Medium
LF 014-007	Allenagh	Ringfort	Partial remains visible	Medium
LF 014-122	Carrickglass Demesne	Landscape design	Tree-ring	Medium
LF 014-009	Carrickglass Demesne	Ringfort	Partial remains visible	Medium
LF 014-010	Carrickglass Demesne	Ringfort	Partial remains visible	Medium

RMP Ref No.	Townland	Site Type	Condition	Value
LF 013-015	Lisnamuck	Ringfort	Partial remains visible	Medium
LF 013-151	Lisnamuck	Burnt mound (excavation)	No visible trace	Low
LF 013-152	Lisnamuck	Two pits (excavation)	No visible trace	Low
LF 013-153	Lisnamuck	Burnt mound (excavation)	No visible trace	Low
LF 014-123	Lisnamuck	Burnt mound (excavation)	No visible trace	Low
LF 014-124	Lisnamuck	Burnt mound (excavation)	No visible trace	Low
LF 014-125	Lisnamuck	Burnt mound (excavation)	No visible trace	Low
LF 014-126	Lisnamuck	Linear ditch (excavation)	No visible trace	Low
LF 014-129	Lisnamuck	Burnt mound (excavation)	No visible trace	Low
LF 014-130	Lisnamuck	Pits (excavation)	No visible trace	Low
LF 014-134	Lisnamuck	Redundant record	No visible trace	Negligible
LF 014-005	Lisnamuck	Ringfort	No visible trace	Medium
LF 014-124	Aghadegnan	Mound (excavation)	No visible trace	Low
LF 013-013	Aghadegnan	EM settlement (excavation)	No visible trace	low
LF 013-012001/2	Aghadegnan	Ringfort/house	Partial remains visible	Medium
LF 013-125	Aghadegnan	Redundant record	No visible trace	Negligible

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15.6.13 RMP LF013-026: Longford Historic Town

The Proposed Development is approximately 3.3km from Longford Town (Fig. 15.8). Longford takes its name from the Irish 'longphort', meaning 'fortress'. The earliest settlement dates from the late-medieval period. There is no evidence of any Anglo-Norman settlement, so Longford belongs to a small sample of urban centres whose genesis occurred under native Irish development.



Figure 15.8 Historic Core Longford Town

A Dominican priory (LF013-026001) was established, on the North side of the river, under the patronage of the O'Farrell's in 1400. By the late 15th century, a native Irish market had developed attracting merchants from the East coast and the censure of the Irish parliament, which forbade

English merchants to have any contact with it or the Irish markets at Granard and Cavan, which were harming the English markets of Meath. It is unclear how permanent this market was, it may have been linked to the castle (LF013-062003), also on the North side of the river, to which there are references from 1571.

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Longford remained in O Fearghail hands until the reign of Elizabeth I and the importance of this settlement is indicated by the fact the county was called Longford when Anghaile was shirred in 1571. During the 17th century settlement appears to have expanded on the South side of the river and this area became known as 'Newtown-Longford'. A large house (LF013-026015-) surrounded by a number of smaller houses is depicted on the Down Survey (1655-6) maps of Ardagh barony and Ballymacormac parish on this side of the river. The first royal grant for a market and fair was issued in 1605 to Richard Nugent, baron of Delvin. It appears that the Nugent family did not take up this licence and a town does not appear to have been successfully established, for in 1613 Longford was unable to send any burgesses to the Irish Parliament because there was in the county 'no town fit for it'.

A new grant for the establishment of the manor and town of Longford was issued in 1620 to Francis Aungier, baron of Longford. Under the conditions of this grant, Aungier was entitled to hold a market and two fairs. In 1666 the town was attacked by Irish forces under the command of Cornet Nangle. In 1668 it was incorporated and made a borough by King Charles II. The town was described by Nicholas Dowdall in 1682 as a 'Large Countrey Village having but few good houses in it'.
There is an Old Abbey (LF013-026001) of the Dominican Order in it which was formerly governed by a prior and a stone bridge (LF008-026004). The town is now concentrated on the S side of the river. The street plan is linear based on Main St., running NNW-SSE, and Bridge St., its continuation to the North of the river. This street ran from the castle (LF013-026003) to the South to where the road divides into three. The area around Bridge St. and Church St. is probably the oldest part of the town and may represent the late-16th-century settlement. The houses fronting onto Main St. have long burgage plots and probably represent the 17th-century town (ibid.). A market-house (LF013-026008), a prison or gaol (LF013-026009), a market cross (LF013-026011) and two 17th-century houses (LF013-026014 and LF013-026015) are associated with the town.

15.6.14 Excavations Database

The database of previous excavations was reviewed. The following 10 excavations are recorded within the Area of Study (Fig. 15.9).



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Figure 15.9 Location of Previous Excavations Within Area of Study

Table 15.5 Previous Excavations Index

Licence No	Townland	Summary Description
05E0003	Carrickglass Demesne	Testing was carried out at Carrickglass Demesne in advance of its redevelopment. Nothing of archaeological significance was found.
08E0808	Lisnamuck	Monitoring of works on the Longford central regional drainage scheme. Isolated pit features.
93E0041	Aghadegnan	Site of Fulacht Fiadh.
07E0868	Longford	Test excavation found nothing of archaeological significance.
01E0873	Aghadegnan	Test excavation found nothing of archaeological significance.
04E0954	Aghadegnan	Test excavation found nothing of archaeological significance.
03E1421	Lisnamuck	Site of Fulacht Fiadh.
03E1422	Lisnamuck	Site of Fulacht Fiadh.
03E1194; 03E1369	Lisnamuck	Site of three Fulacht Fiadh and isolated pits.

15.6.15 Topographical Files - National Museum of Ireland

The topographical files of the National Museum of Ireland were reviewed. There are no recorded finds within the Area of Study.

15.6.16 Placename Evidence

Longford was once part of the kingdom of Conmaicne. In 85AD, the High King formed the province of Meath, which included the present counties of Longford, Meath, Westmeath and Dublin. Ó Fearghail is a family name of the Irish nobility from County Longford who were historically the Princes of Annaly. The patronym means "descendant of Fearghail", whose name means "man of valour". Following the Battle of Clontarf, a Prince of Annaly erected a fort, known as Longfort Ui Ferghail, on the original site of the town of Longford, where the O' Farrells, established their stronghold until the mid- seventeenth century.

The Proposed Development is predominately located in the townland of Cloonanny Glebe which derives from the Irish 'Cluain Eanaigh', meaning meadow or pasture. Glebe refers to an area of land within an ecclesiastical parish used to support a particular parish. Other townlands include Gorteenorna, which refers to the 'little field', Derryharrow to an area of 'oak woodland' and Corragarrow to 'rugged land'.

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15.6.17 Aerial/Satellite Imagery

Aerial photography taken between 1996-2000 shows little change other than the further subdivision of fields into smaller enclosed holdings. No additional features of archaeological or historical interest are recorded (Fig. 15.10).



Figure 15.10 Aerial Photograph 1996-2000, Cloonanny Glebe, County Longford

15.6.18 Cartographic Sources – Ordnance Survey Editions

This edition of the OS was published c.1838. The townland of Cloonanny Glebe comprises 177 acres of low-lying land with an access road and farm complex located in the centre. Carrickglass Demesne is to the east. No other features of archaeological or historical interest are recorded. The townland was subsequently divided into small, enclosed fields with access lanes which are still present today (Figs. 15.11, 15.12).

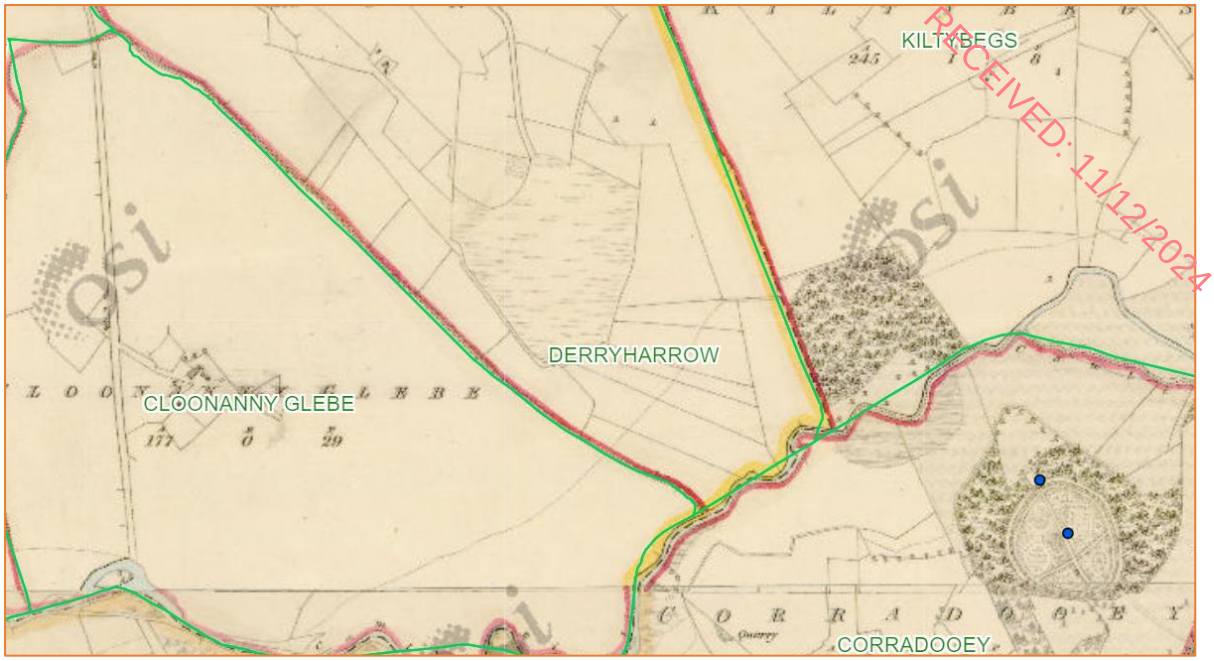


Figure 15.11 1st Edition OS Map, Cloonanny Glebe, County Longford (source OSI)

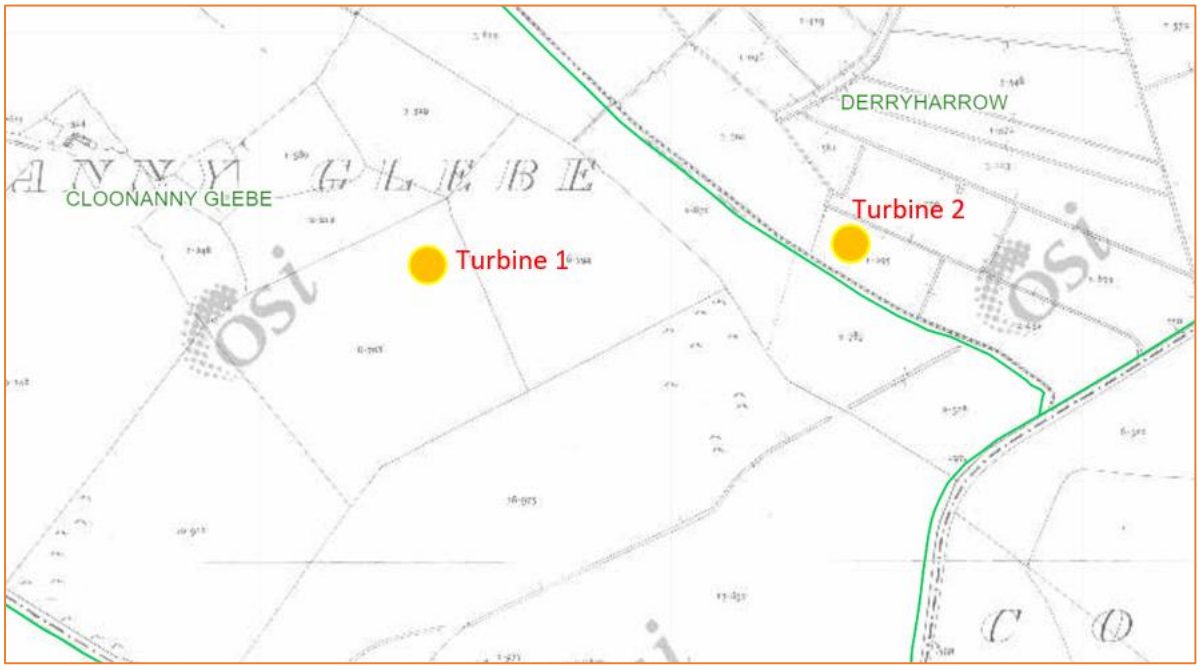


Figure 15.12 25" Edition OS Map, Cloonanny Glebe, County Longford (source OSI)

15.6.19 Test Excavation Results

A total of 19 test trenches (Fig.15.13) were excavated at each of the key locations within the Proposed Development. No features or finds of archaeological significance were identified. Following the completion of archaeological testing, it was subsequently proposed to construct a temporary road in the field to the east of the junction between the local roads L50462 and the L5046 to accommodate abnormal load deliveries. This internal access road was not tested as part of the scope of works.

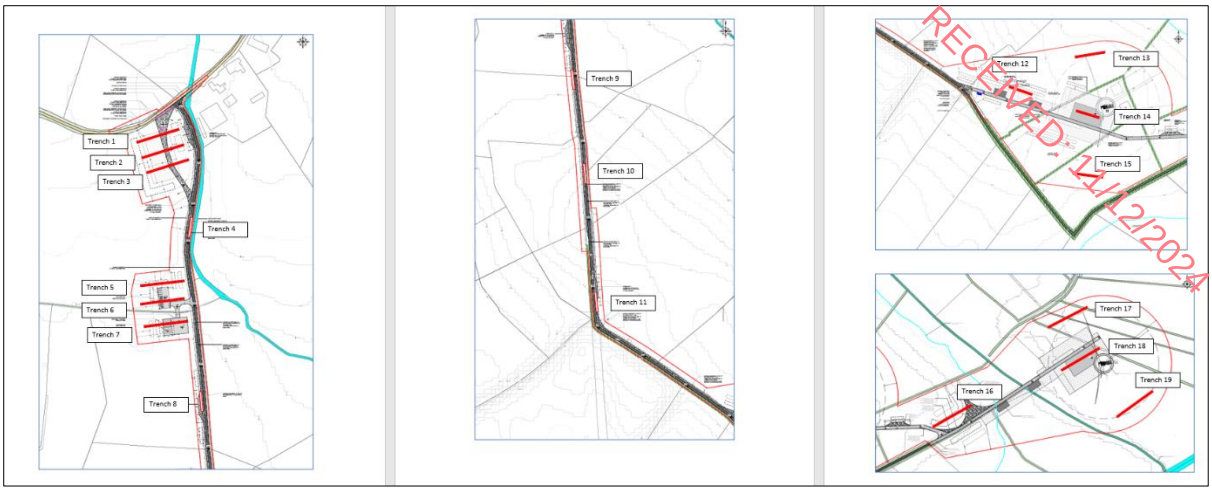


Figure 15.13 Location of Excavated Test Trenches, Cloonanny Glebe, County Longford

Table 15.6 Summary of Excavated Test Trenches

Trench No.	Location	Size	Results
Trench 1	Compound area	aligned E/W, 30m, 1.8m	No features found
Trench 2	Compound area	aligned E/W, 30m, 1.8m	No features found
Trench 3	Compound area	aligned E/W, 30m, 1.8m	No features found
Trench 4	Access road	aligned E/W, 20m, 1.8m	No features found
Trench 5	Substation	aligned E/W, 30m, 1.8m	No features found
Trench 6	Substation	aligned E/W, 30m, 1.8m	No features found
Trench 7	Substation	aligned E/W, 30m, 1.8m	No features found
Trench 8	Access road	aligned E/W, 20m, 1.8m	No features found
Trench 9	Access road	aligned E/W, 20m, 1.8m	No features found
Trench 10	Access road	aligned E/W, 20m, 1.8m	No features found
Trench 11	Access road	aligned E/W, 20m, 1.8m	No features found
Trench 12	Temporary assembly area	aligned E/W, 30m, 1.8m	No features found
Trench 13	Turning area	aligned E/W, 30m, 1.8m	No features found
Trench 14	Turbine 1 hardstand	aligned E/W, 30m, 1.8m	No features found
Trench 15	Turning area	aligned E/W, 30m, 1.8m	No features found
Trench 16	Spoil area	aligned E/W, 30m, 1.8m	No features found
Trench 17	Turning area	aligned E/W, 30m, 1.8m	No features found
Trench 18	Turbine 2 hardstand	aligned E/W, 30m, 1.8m	No features found
Trench 19	Turning area	aligned E/W, 30m, 1.8m	No features found

15.6.20 Architectural Heritage

15.6.20.1 Record of Protected Structures

The Record of Protected Structures - Longford CDP 2021-2027 was reviewed. There are 14 protected structures of 'High' value within the Area of Study. The structures are all associated with Carrickglass Demesne (Fig.15.14).



Figure 15.14 Turbine Locations Protected Structures, Cloonanny, County Longford

Table 15.7 Record of Protected Structures Index

RPS Ref No.	NIAH Ref No.	Townland	Site Type	Value
4	Not listed	Carrickglass Demesne	Demesne walls	High
5	13401414	Carrickglass Demesne	Country house	High
6	12400911	Carrickglass Demesne	Worker's house	High
7	13400913	Carrickglass Demesne	Walled garden	High
8	13401417	Carrickglass Demesne	Gates/railing/walls	High
10	13401413	Carrickglass Demesne	Gates/railing/walls	High
11	13401416	Carrickglass Demesne	Gate lodge	High
12	Not listed	Carrickglass Demesne	Gate Lodge	High
13	13401412	Carrickglass Demesne	Gate Lodge	High
14	Not listed	Carrickglass Demesne	Postal box	High
15	13400415	Carrickglass Demesne	Stables	High
16	Not listed	Carrickglass Demesne	Gate Lodge	High
17	13401411	Carrickglass Demesne	Gates/railing/walls	High
18	Not listed	Carrickglass Demesne	Postal box	High

15.6.20.2 Protected Structure: Carrickglass Demesne

Carrickglass Demesne is a walled estate of land approximately 4km to the northeast of Longford Town and c.1.5km to the southeast of the Proposed Development. Carrickglass is an early 19th century Tudor revival house designed by Daniel Robertson. The stable and farmyards pre-date the house by about 40 years. Designed by James Gandon, these, along with the triumphal arch gate to the south of

the estate, are generally considered more architecturally significant than the house itself. A design for the house was also drawn up by Gandon at this stage but was never built.

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Plate 15.1 Carrickglass Manor House

The demesne area covers about 263ha (650 acres), with the manor house located to the north of the estate, adjacent to the farm and stable yard complexes. The estate was originally a manor of the Anglican Bishops of Ardagh. In the 17th century the estate was leased to the Newcomen family and later bought by, Thomas Lefroy in 1833. The Lefroy family remained at Carrickglass Manor until about 2005, when they sold the estate and grounds.



Plate 15.2 Carrickglass Manor Entrance Gates

Since 2005 the estate has passed through the ownership of several property development companies but remains in a poor state of repair. According to An Taisce, there has been major residential developments proposed on the site in the past decade, however, it has largely stalled with only the first phase of housing having been constructed on the grounds.


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Plate 15.3 Abandoned Housing Projects, Carrickglass Demesne From 2022

15.6.20.3 National Inventory of Architectural Heritage (NIAH)

The NIAH was reviewed and there are 11 listed structures within the Area of Study. 10 are associated with Carrickglass Demense and 1, Ashfield House, is a disused building built in the early 19th century to the SW (Fig.15.15).

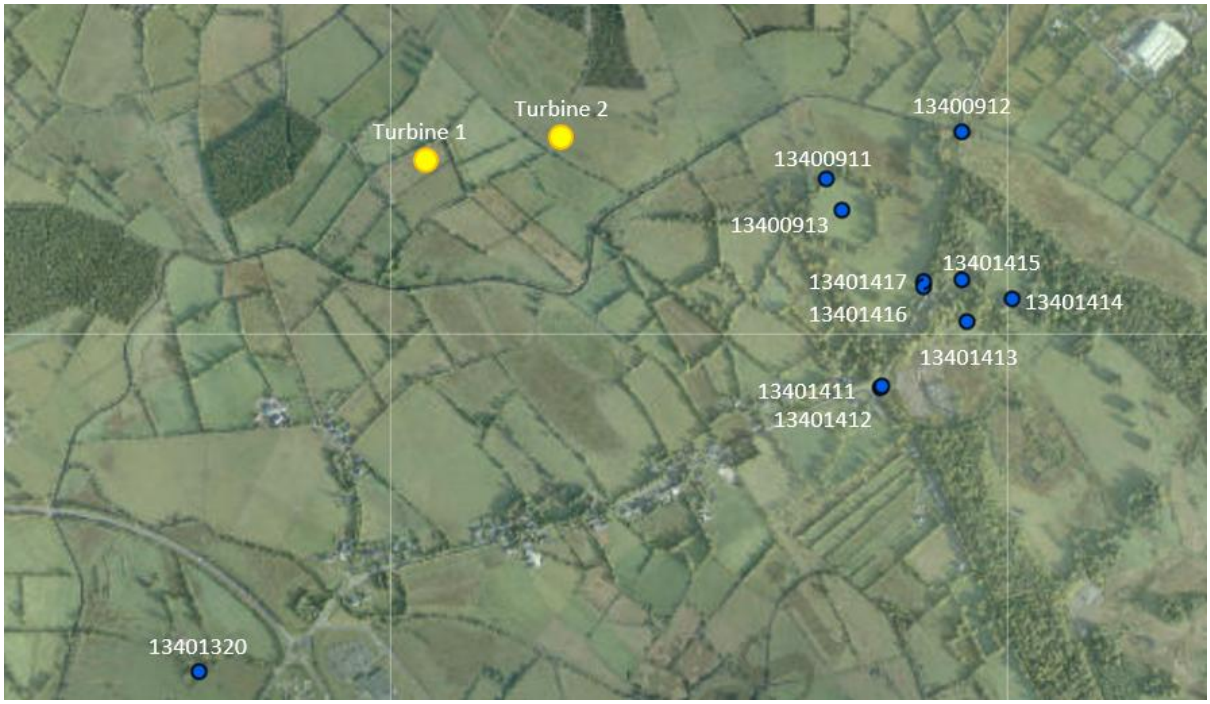


Figure 15.15 NIAH Structures, Cloonanny, County Longford

Table 15.8 NIAH Index of Structures

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NIAH Ref	Townland	Site Type	Rating
13401320	Lisnamuck	Ashfield House (disused)	Regional
13400912	Carrickglass Demesne	Bridge	Regional
13400911	Carrickglass Demesne	Workers House	Regional
13400913	Carrickglass Demesne	Walled Garden	Regional
13401416	Carrickglass Demesne	Gate Lodge	Regional
13401417	Carrickglass Demesne	Gates/railings/walls	Regional
13400415	Carrickglass Demesne	Farmyard Complex	National
13401414	Carrickglass Demesne	Carrigglas Manor	National
13401413	Carrickglass Demesne	Gates/railings/walls	Regional
13401411	Carrickglass Demesne	Gates/railings/walls	Regional
13401412	Carrickglass Demesne	Gate Lodge	Regional

15.6.20.4 Architectural Conservation Areas

There is one designated Architectural Conservation Area (ACA) associated with Longford Town located along Battery Road (Fig.15.16). The ACA is located 2.35km to the southwest of the proposed development. Battery Road is located along the northern section of Longford Town and derives its name from the military installations that once stretched from the existing barracks on Church Street to the Battery, which is now occupied by Pearse Park GAA grounds and Pearse View housing estate. Battery Road is a major existing approach route into the town from the north.



Figure 15.16 Battery Road ACA, Longford Town

Battery Road ACA was largely developed in the 19th century. However, origins can be traced back to the 15th century. The character of the ACA is not rooted in any one architectural dimension. This contributes to its unique quality and character. There are a variety of architecturally distinct building types including a regency terrace, mid-19th century villa, Arts and Crafts homes, interwar and later 20 century dwellings.

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15.6.20.5 Field Inspection

A site walk-over of the turbine location area was carried out during November 2023. Access to the Cloonanny Glebe townland is via a local road heading east for 750m from Melview village. There is a junction at this point adjacent to old farm buildings. A laneway heads south for 130m towards the proposed substation located within a large field on the west side of the laneway. This field which is under tillage and relatively flat is enclosed by mature hedgerows. No features of archaeological interest were noted.

The laneway continues south for another c.1km before turning east for 420m and terminating at a farm gate. Turbine 1 will be located in the eastern half of a flat rectangular field (200m x 80m) enclosed by mature hedgerows. A new access way to the turbine will extend for c.400m across the field in a NE/SW direction. No features of archaeological interest were noted.

Turbine 2 will be located at the end of the existing laneway in the central area of a large rectangular field (340m x 130m) bounded by mature hedgerows to the south and open to the north, east and west. This general area immediately to the east of the farmgate is low lying and was partially flooded at the time of inspection. No features of archaeological interest were noted.

15.6.21 Grid Connection Route

Three options have been considered as part of the grid connection works.

Option 1 - Connection to Existing Richmond 110kV Substation.

Option 2 - Connection to Existing Longford 38kV Substation.

Option 3 - Connection to Existing Glebe 38kV Substation.

15.6.21.1Option 1 - Connection to Existing Richmond 110kV Substation

This connection option consists of connecting the Proposed Development to the national electricity grid via circa 8km of underground 20kV electrical cabling connecting to Richmond 110kV Substation in the townland of Ballykenny, County Longford. The majority of the grid connection will be constructed in public roads (Fig. 15.17).

This connection option involves crossing of the Camlin River and an Iarnród Éireann Irish Rail line. It is proposed to directional drill these sections of the grid route works. The remaining sections will be installed in ducts which will be laid in excavated trenches. Cable trenching along the public road will be carried out in the road verge or in the grassed area on the side of the road where possible. This will depend on the space available in the verge and offset requirements from the existing services. Where there is insufficient space at the edge of the road or in the grassed area to the edge of the road, the cable will be installed in the roadway.

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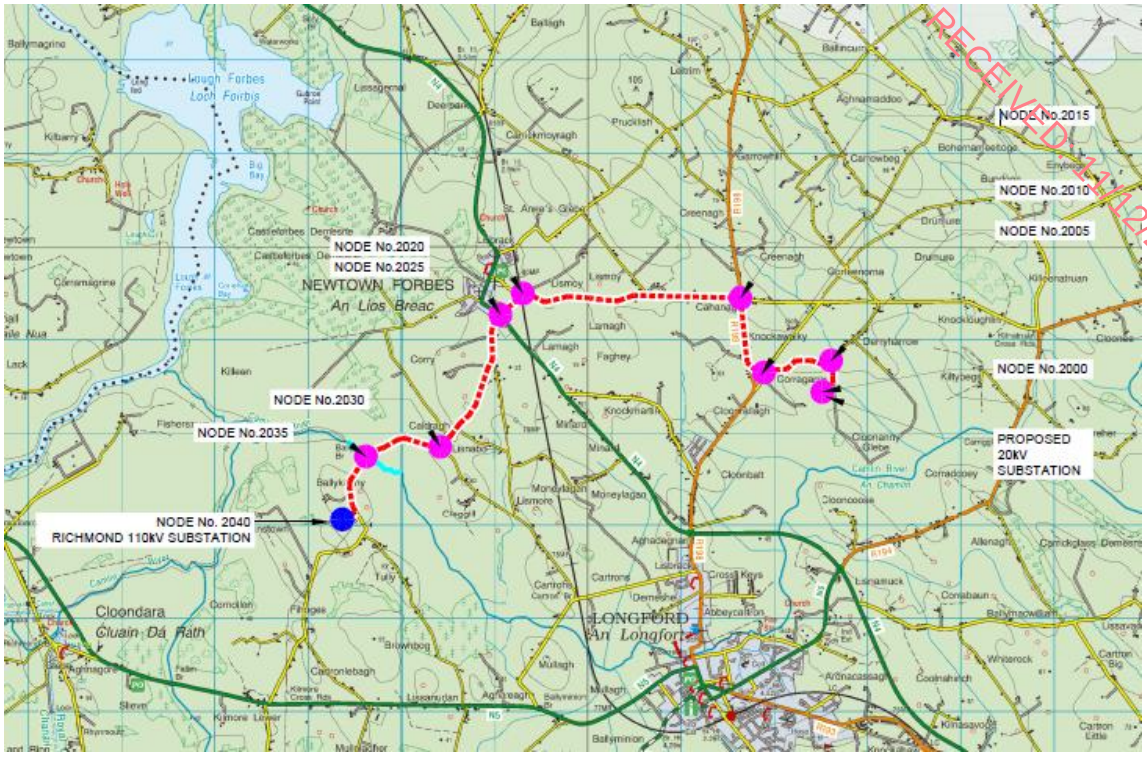


Figure 15.17 Grid Connection Route Option 1

The cultural heritage assessment of Grid Connection Route Option 1 examined cultural assets within 25m of the proposed route (fig. 15.18). Five cultural assets were identified within 25m of the proposed route as outlined in Table 15.9 below. Three are listed in the National Inventory of Architectural Heritage and two are listed in the Record of Monuments and Places index.

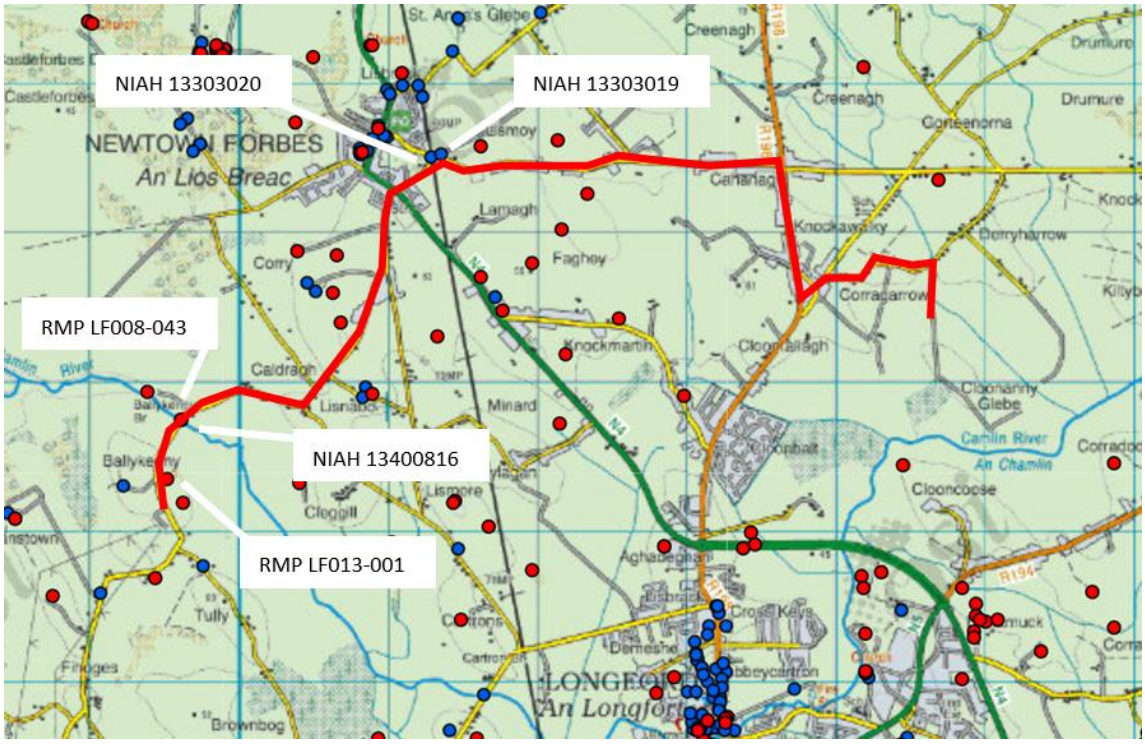


Figure 15.18 Cultural Assets Within 25m of Grid Connection Route

Table 15.9 Index of Cultural Assets

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Asset Ref No.	Site Type	Value
NIAH 1330319	Lismoy House Gates/railings/walls - Entrance gates serving Lismoy House (13400812), erected c. 1860	Regional
NIAH 13400816	Bridge - Single-arch limestone road bridge over the Camlin River, built c. 1860	Regional
NIAH 13303020	Bridge - Single-arched rail bridge carrying road over the Dublin to Sligo railway line, built c. 1857	Regional
RMP LF008-043	Site of Ford - Ballykenny Bridge, dating to the 19th century, may have been built on the site of this ford. No visible surface traces survive	Medium
RMP LF013-001	Ringfort - Depicted as a circular enclosure with the designation 'Fort' on the 1837 ed. of the OS 6-inch map. This rath has been largely levelled due to bulldozing.	Medium

15.6.21.2 Option 2 - Connection to Existing Longford 38kV Substation

This connection option consists of connecting the proposed development to the national electricity grid via circa 4.1km of underground 20kV electrical cabling connecting to Longford 38kV Substation in the townland of Minard, County Longford.

Cable trenching along the public road will be carried out in the road verge or in the grassed area on the side of the road where possible. This will depend on the space available in the verge and offset requirements from the existing services. Where there is insufficient space at the edge of the road or in the grassed area to the edge of the road, the cable will be installed in the roadway.

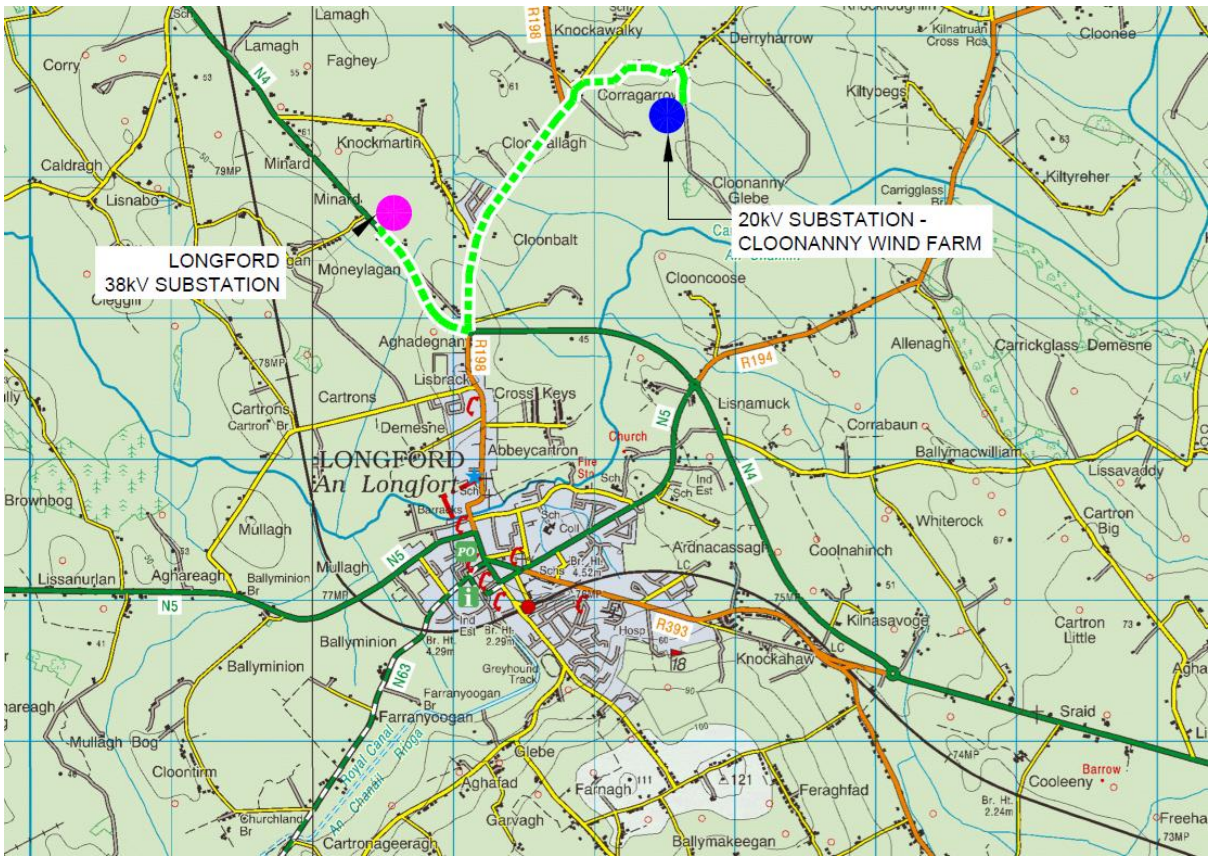


Figure 15.19 Grid Connection Route Option 2

The cultural heritage assessment of Grid Connection Route Option 2 examined cultural assets within 25m of the proposed route (Fig.15.20). There are no cultural assets within 25m of the proposed route.

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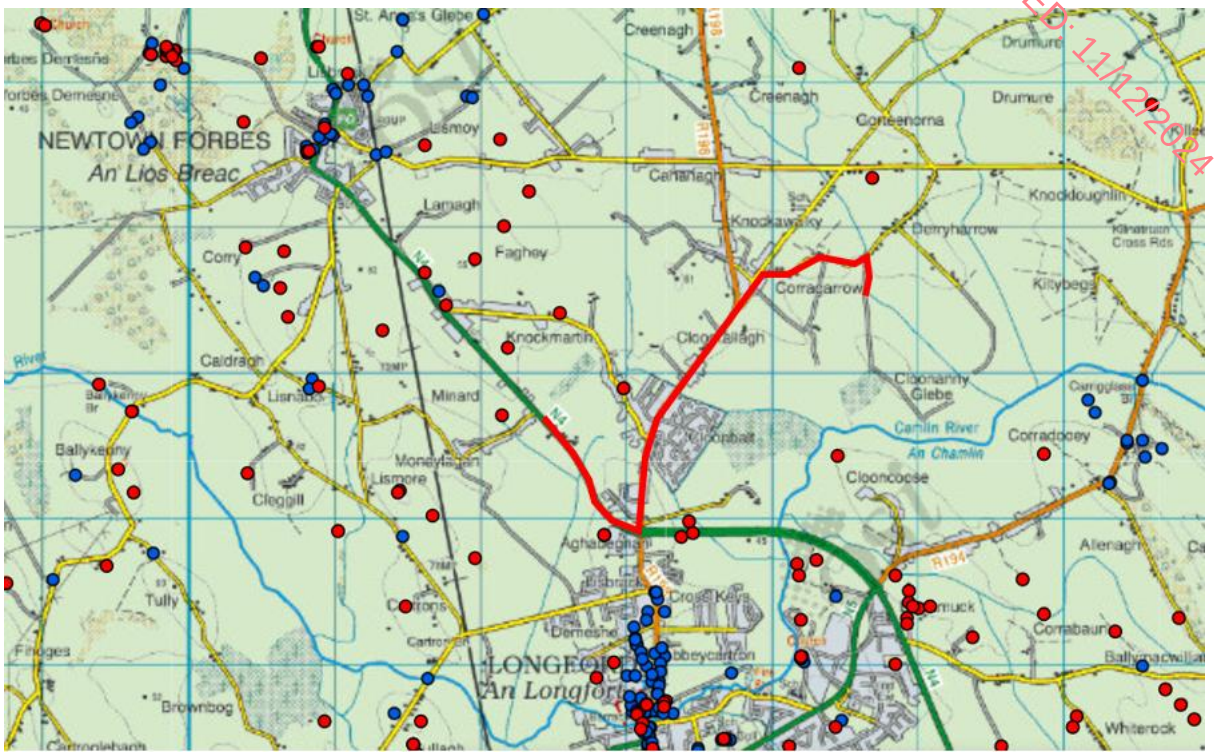


Figure 15.20 Cultural Assets Within 25m of Grid Connection Route

15.6.22 Option 3 - Connection to Existing Glebe 38kV Substation

This connection option consists of connecting the Proposed Development to the national electricity grid via circa 5.9km of underground 20kV electrical cabling connecting to Glebe 38kV Substation in the townland of Lisnamuck, County Longford (Fig.15.21).

This connection option involves crossing of the Camlin River. It is proposed to directional drill this section of the grid route works. The remaining sections will be installed in ducts which will be laid in excavated trenches.

Cable trenching along the public road will be carried out in the road verge or in the grassed area on the side of the road where possible. This will depend on the space available in the verge and offset requirements from the existing services. Where there is insufficient space at the edge of the road or in the grassed area to the edge of the road, the cable will be installed in the roadway.

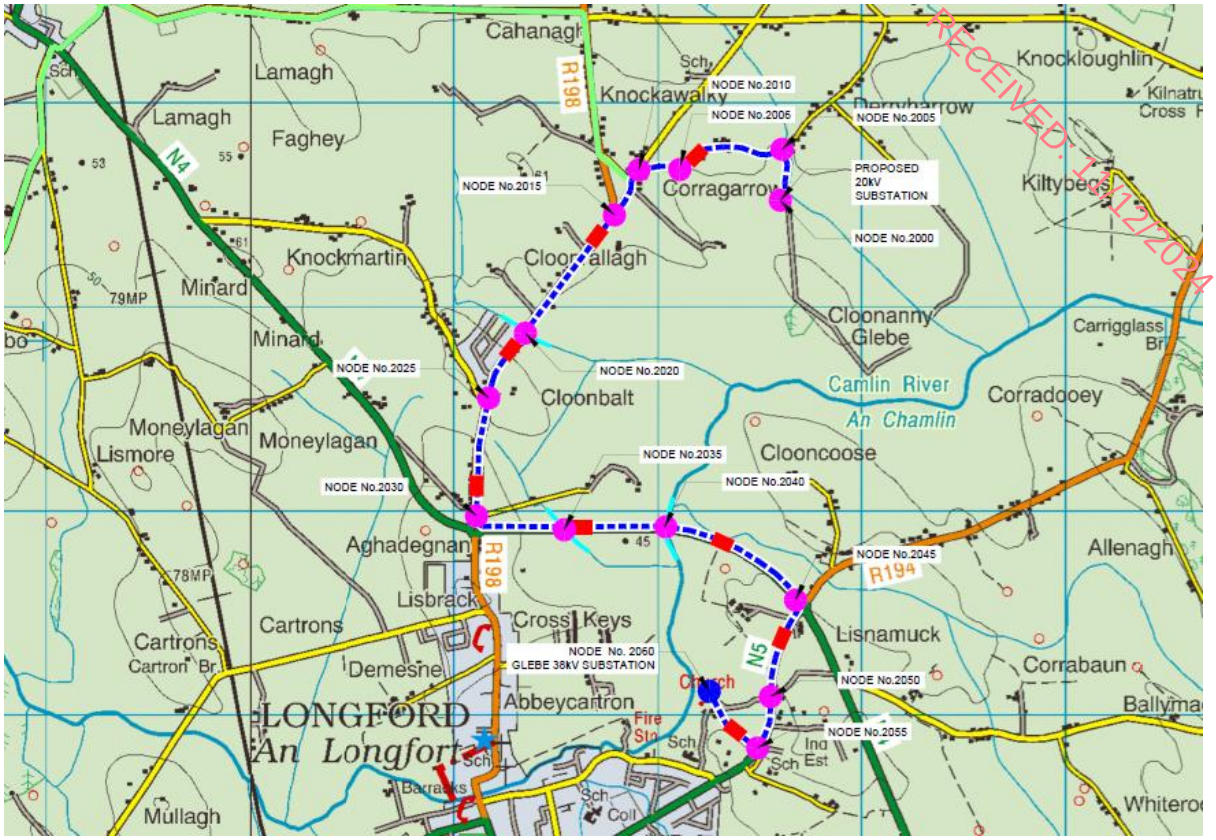


Figure 15.21 Grid Connection Route Option 3

The cultural heritage assessment of Grid Connection Route Option 3 examined cultural assets within 25m of the proposed route (Fig.15.22). Four cultural assets were identified within 25m of the proposed route as outlined in Table 15.10 below. The four assets are listed in the Record of Monuments and Places index.

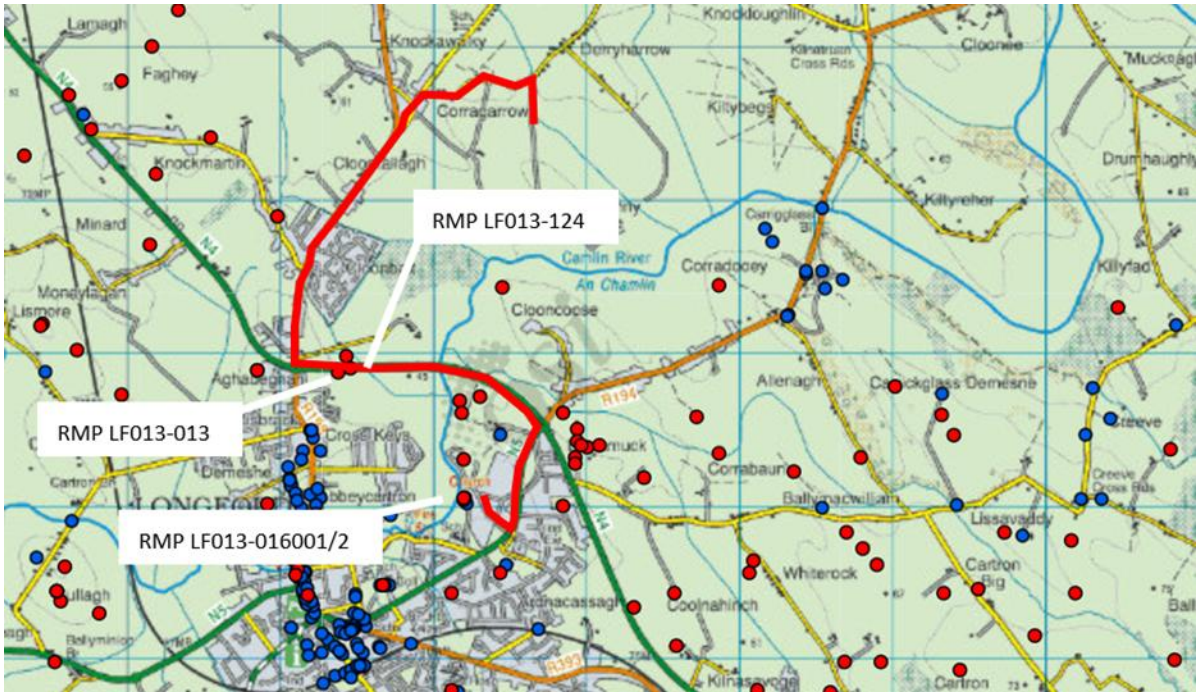


Figure 15.22 Cultural Assets Within 25m of Grid Connection Route

Table 15.10 Index of Cultural Assets

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Asset Ref No.	Site Type	Value
RMP LF013-124	Site of Fulacht Fiadh – Excavated in 1993 as part of road construction	Negligible
RMP LF013-013	Site of Ringfort - Excavated in 1991 and 1993 as part of road construction	Negligible
RMP LF013-016001	Church - The medieval church (ext. dims. 13.6m E-W; 7.5m N-S; wall T 0.9m) is densely overgrown with scrub and overgrowth making detailed examination impossible	High
RMP LF013-016002	Graveyard - The graveyard is disused and is very densely overgrown with scrub and overgrowth. Associated with adjacent medieval church	High

15.6.23 Turbine Delivery Route

The components for the Wind Turbines will be delivered by cargo ships to the Port of Waterford, known as Belview Port. The components will be transported from Belview to the site along the motorway, national, regional and local road network. Comprehensive details on the TDR are outlined in the Preliminary Transport Management Plan. One cultural asset (bridge) listed in the National Inventory of Architectural Heritage is located along the TDR (Fig.15.23). A second cultural asset (derelict vernacular outbuilding) is located at the junction of L1011 and L5046.

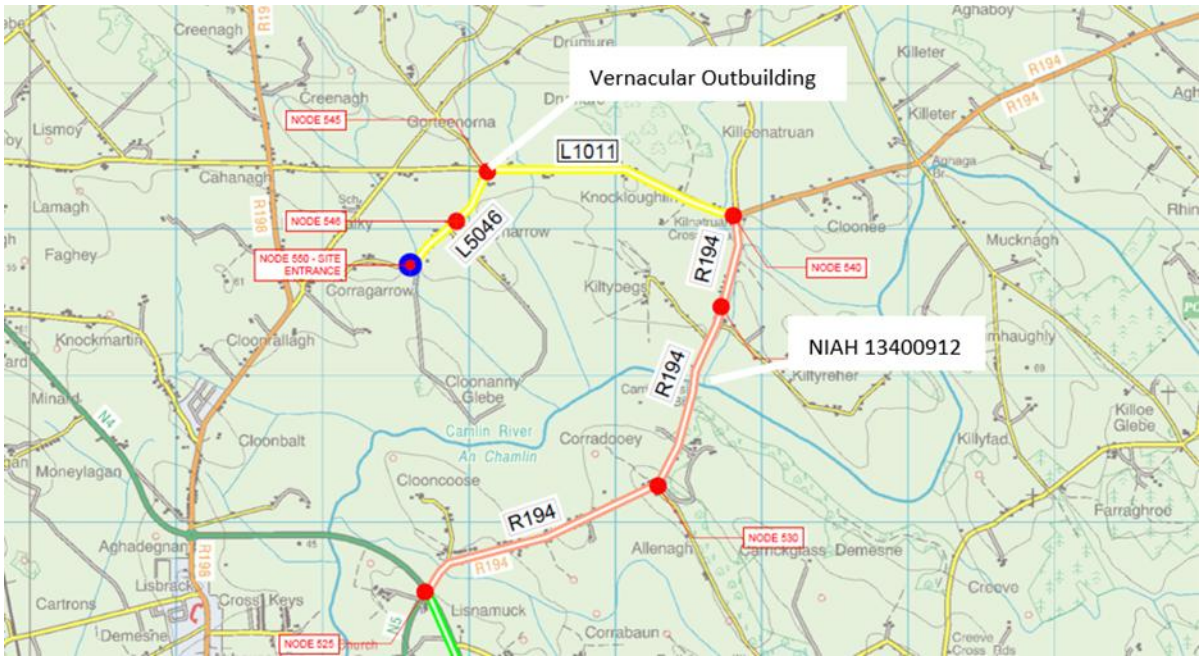


Figure 15.23 Relevant Turbine Delivery Route Section to Wind Farm Development

Table 15.11 Index of Cultural Assets

Asset Ref No.	Site Type	Rating
NIAH 13400912	Bridge - Single-arch Road bridge over the Camlin River, built c. 1860	Regional
Not Listed	Heavily overgrown and derelict outbuilding depicted on 1st Edition OS Map c.1838.	Local

15.6.24 TDR and Internal Access Roads

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Temporary widening of the L50462 and L5046 public road is required to accommodate delivery of the Wind Turbines. It is proposed to construct a new internal Access Road off the L50462 local road for a distance of 0.8km as far as Turbine T2. This road will take the form of an excavated and stone fill road with a clause 804 crushed aggregate capping.

It is proposed to construct a temporary road in the field to the east of the junction between the local roads L50462 and the L5046 to accommodate abnormal load deliveries. This temporary road will have the same method of construction as the main site Access Road. There are no known cultural assets within 500m of the proposed internal access roads.

15.6.25 Meteorological Mast

A permanent meteorological mast (Met Mast) will be installed as part of the proposed development. The mast will be equipped with wind monitoring equipment at various heights and will be a slender, free-standing lattice structure 32m in height.

The mast will be constructed on a Hardstanding area sufficiently sized to accommodate the crane that will be used for its erection. The mast will be located to the south of the proposed Substation and will be accessed via the L50462 and the Substation compound (Fig.15.24).

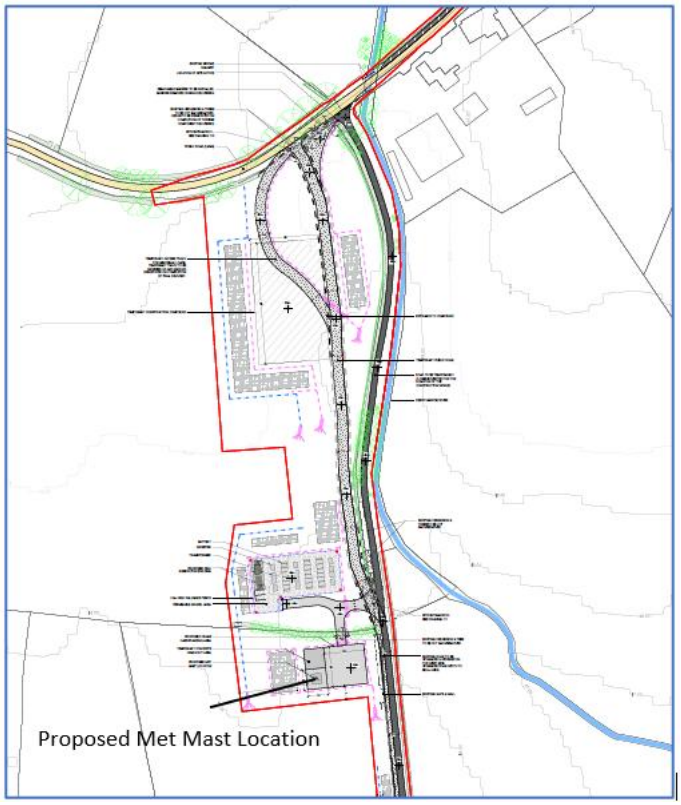


Figure 15.24 Proposed Met Mast Location

There are no known cultural assets within 750m of the proposed met mast location. The cultural heritage impact of this structure will be considered within the broader area of study as outlined in this chapter. The visual impact of this structure is of particular relevance to this study.

15.7 The 'Do Nothing' Scenario

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In this instance the do-nothing scenario would be that the receiving landscape stays in the same or similar condition as it currently is, managed for a combination pastoral farmland and under continued development pressure from Longford.

15.8 Potential Significant Effects

15.8.1 Demolition Phase

The demolition phase involves the demolition, and therefore a direct impact, on one heavily overgrown and derelict vernacular structure to provide for the haul route at the junction L1011/L5046. The rectangular shaped outbuilding is depicted on 1st Edition OS Map c.1838.

15.8.2 Construction Phase

15.8.2.1 Construction Phase: Direct Impacts

- The construction phase of the project will not directly impact any known cultural assets within the Area of Study, Historic Longford Town, Battery Road ACA or Carrickglass Demesne.
    - The comprehensive test excavation undertaken found no evidence of previously unknown archaeological remains within the main footprint of the proposed development.
    - The nearest known cultural asset is 610m from the main footprint of the proposed development (RMP Ref: LF013-014. Partial remains of ringfort)
- Previously unknown archaeological remains located within the main footprint of the proposed development works may be directly impacted during the construction phase. The likelihood of previously unknown archaeological assets within the main footprint of the proposed development is considered 'Low' due to the baseline data review, test excavation results and limited scale of the proposed works.

15.8.2.2 Turbine Delivery Route: Direct Impacts

- One cultural asset listed in the National Inventory of Architectural Heritage is located along the TDR. The cultural asset is located along the haul route (R194) at a bridge crossing the Camlin River.
- One cultural asset scheduled for demolition is located at the junction of L1011 and L5046 and is a heavily overgrown, derelict vernacular outbuilding depicted on 1st Edition OS Map c.1838.

Table 15.12 Index of Cultural Assets Along Relevant Section of TDR

Asset Ref No.	Site Type	Rating	Magnitude of Effect
NIAH 13400912	Bridge - Single-arch Road bridge over the Camlin River, built c. 1860	Regional	Low
Not Listed	Heavily overgrown and derelict vernacular outbuilding depicted on 1st Edition OS Map c.1838.	Local	High

15.8.2.3 Grid Connection Route Options (GCR): Direct Impacts

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In general, previously unknown archaeological remains located along the GCR options may be directly impacted during the construction phase. The likelihood of previously unknown archaeological assets along the proposed routes is considered 'Low' due to the baseline data review, use of public roads/grass verges and the limited dimensions of the proposed excavation trenches.

15.8.2.3.1 Grid Connection Route Option 1

This connection option consists of connecting the Proposed Development to the national electricity grid via circa 8km of underground 20kV electrical cabling connecting to Richmond 110kV Substation in the townland of Ballykenny, County Longford. The majority of the grid connection will be constructed in public roads. This connection option involves crossing of the Camlin River. It is proposed to directional drill this section of the grid route works.

Table 15.13 Index of Cultural Assets GCR Option 1

Asset Ref No.	Site Type	Value	M o E
NIAH 13300319	Lismoy House Gates/railings/walls - Entrance gates serving Lismoy House (13400812), erected c. 1860	Regional	Negligible
NIAH 13400816	Bridge - Single-arch limestone road bridge over the Camlin River, built c. 1860	Regional	Low
NIAH 13303020	Bridge - Single-arched rail bridge carrying road over the Dublin to Sligo railway line, built c. 1857	Medium	Low
RMP LF008-043	Site of Ford - Ballykenny Bridge, dating to the 19th century, may have been built on the site of this ford. No visible surface traces survive	Medium	Moderate
RMP LF013-001	Ringfort - Depicted as a circular enclosure with the designation 'Fort' on the 1837 ed. of the OS 6-inch map. This rath has been largely levelled due to bulldozing.	Medium	Negligible

15.8.2.3.2 Grid Connection Route Option 2

The cultural heritage assessment of Grid Connection Route Option 2 examined cultural assets within 25m of the proposed route. There are no known cultural assets within 25m of the proposed route.

15.8.2.3.3 Grid Connection Route Option 3

This connection option consists of connecting the Proposed Development to the national electricity grid via circa 5.9km of underground 20kV electrical cabling connecting to Glebe 38kV Substation in the townland of Lisnamuck, County Longford. This connection option involves crossing of the Camlin River. It is proposed to directional drill this section of the grid route works. The remaining sections will be installed in ducts which will be laid in excavated trenches.

Table 15.14 Index of Cultural Assets GCR Option 3

Asset Ref No.	Site Type	Value	M o E
RMP LF013-124	Site of Fulacht Fiadh – Excavated in 1993 as part of road construction	Negligible	Negligible
RMP LF013-013	Site of Ringfort - Excavated in 1991 and 1993 as part of road construction	Negligible	Negligible
RMP LF013-016001	Church - The medieval church (ext. dims. 13.6m E-W; 7.5m N-S; wall T 0.9m) is densely overgrown with scrub and overgrowth making detailed examination impossible	High	Negligible
RMP LF013-016002	Graveyard - The graveyard is disused and is very densely overgrown with scrub and overgrowth. Associated with adjacent medieval church	High	Negligible

15.8.2.4 Construction Phase: Indirect Impacts

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- The construction phase of the project will have a 'negligible' or short-term indirect visual impact on known cultural assets within the Area of Study, Historic Longford Town, Battery Road ACA and Carrickglass Demesne.
- The construction phase of the project will have a 'negligible' or short-term indirect visual impact on known cultural assets along the Turbine Delivery Route (TDR) within the TDR assessment area.
- The construction phase of the project will have a 'negligible' or short-term indirect visual impact on known cultural assets along the Grid Connection Route (GCR) within the Option 1, 2 and 3 assessment areas.

15.8.3 Operational Phase

15.8.3.1 Operational Phase: Direct Impacts

- The operational phase of the project will not directly impact any known cultural assets within the Area of Study, Historic Longford Town, Battery Road ACA or Carrickglass Demesne.
- The operational phase of the project will not directly impact any known cultural assets within the Grid Connection Route assessment area.

15.8.3.2 Operational Phase: Indirect Impacts

- The operational phase will have an indirect impact (visual) on known cultural assets within the Area of Study, Historic Longford Town, Battery Road ACA and Carrickglass Demesne. The two turbines and met mast will be partially visible from these cultural assets.
- The 'Value of Asset' and 'Magnitude of Effect' on each cultural asset is presented in the tables below.

15.8.3.2.1 Indirect Impacts: Protected Structures and NIAH Listed Structures

The operational phase will have an indirect visual impact on 14 protected structures. These protected structures and 9 of the 10 NIAH structures are all associated with Carrickglass Demesne. Ashfield House is not a protected structure but is listed in the NIAH as regionally significant.

The protected structures are 'High' value cultural assets. According to Chapter 05 Landscape and Visual Impact Assessment (LVIA) (Section 5.9.4.4) Vantage Point 16 represents the heritage values of Carrickglass Demesne and surrounds and therefore deemed of 'Medium' sensitivity. This close proximity view, with both turbines and met mast visible over the hub between and above the established trees and historic (in disrepair) walled garden of Carrickglass Demesne. The open pasture and layered foreground serve to separate the development somewhat from the more sensitive surroundings. The magnitude of visual impact is deemed 'Medium' magnitude, resulting in Moderate (negative) significance.

Table 15.15 Operational Phase: Visual Impacts Protected Structures

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RPS Ref No.	NIAH Ref No.	Townland	Site Type	Value	Distance	M of E
4	Not listed	Carrickglass Demesne	Demesne walls	High	2.78km	Moderate
5	13401414	Carrickglass Demesne	Country house	High	1.4km	Moderate
6	12400911	Carrickglass Demesne	Worker's house	High	776m	Moderate
7	13400913	Carrickglass Demesne	Walled garden	High	855m	Moderate
8	13401417	Carrickglass Demesne	Gates/railing/walls	High	1.13km	Moderate
10	13401413	Carrickglass Demesne	Gates/railing/walls	High	1.29km	Moderate
11	13401416	Carrickglass Demesne	Gate lodge	High	1.13km	Moderate
12	Not listed	Carrickglass Demesne	Gate Lodge	High	1.17km	Moderate
13	13401412	Carrickglass Demesne	Gate Lodge	High	3.12km	Moderate
14	Not listed	Carrickglass Demesne	Postal box	High	3.4km	Moderate
15	13400415	Carrickglass Demesne	Stables	High	1.23km	Moderate
16	Not listed	Carrickglass Demesne	Gate Lodge	High	3.15km	Moderate
17	13401411	Carrickglass Demesne	Gates/railing/walls	High	1.17km	Moderate
18	Not listed	Carrickglass Demesne	Postal box	High	c.2km	Moderate
Not Listed	13401320	Ashfield House (disused)	Disused Structure	Regional	1.5km	Low

15.8.3.2.2 Indirect Impacts: Recorded Monument - Longford Historic Town & ACA

Longford historic town is a 'High' value cultural asset. According to the LVIA (Section 5.9.4.3), five viewpoints were chosen to represent centres of population within the central and wider study area (VP4, VP9, VP18, VP20, and VP24). Two views are located within Longford (VP18, VP20), both of which were included to address heritage features within the town. The visibility within Longford is limited by vegetation and built form; as such, both these views feature 'Negligible-Low' visual impact and Imperceptible final significance of neutral quality.

Table 15.16 Operational Phase: Visual Impacts Longford Town

RMP Ref No.	Site Type	Condition	Value	Distance	Magnitude of Effect
LF013-026	Longford Town	Existing town	High	3.3km	Negligible-Low

The ACA is located 2.35km to the southwest of the proposed development. The ACA is a 'High' value cultural asset, and the magnitude of effect for indirect visual impact is considered 'Negligible -Low' due to the distances from the turbines and partial visibility due to the urban setting and multiple intervening mature hedgerows.

Table 15.17 Operational Phase: Visual Impacts Longford ACA

Ref No.	Site Type	Condition	Value	Distance	Visual Impact
ACA	Urban area Longford town	Conservation Area	High	2.35km	Negligible-Low

15.8.3.2.3 Indirect Impacts: Recorded Monuments

The operational phase will have an indirect visual impact 15 RMP sites. Redundant RMP records and excavated RMP sites will not be indirectly impacted by the proposed development. The recorded monuments are 'Medium' value cultural assets due to their protected status but relatively poor states of preservation. The magnitude of effect for indirect visual impact is considered 'Negligible-Low' due to the distances from the turbines and partial visibility due to multiple intervening mature hedgerows.

'Negligible' is defined as 'minor, short- or medium-term change over a restricted area or a minor change to a Cultural Heritage Asset. 'Low' which is defined as 'moderate or long-term change over a restricted area or a moderate change to a Cultural Heritage Asset'.

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Table 15.18 Operational Phase: Visual Impacts RMP Sites

RMP Ref No.	Site Type	Condition	Value	Distance	Magnitude of Effect
LF 013-014	Ringfort	Partial remains visible	Medium	610m	Low
LF 014-002	Enclosure	Partial remains visible	Medium	730m	Low
LF 009-015	Standing Stone	No visible trace	Medium	Greater than 1.25km	Negligible
LF 008-034	Ringfort	No visible trace	Medium	Greater than 1.25km	Negligible
LF 014-003	Ringfort	Partial remains visible	Medium	Greater than 1.25km	Low
LF 014-004	Ringfort	Partial remains visible	Medium	Greater than 1.25km	Low
LF 014-006	Ringfort	Partial remains visible	Medium	Greater than 1.25km	Low
LF 014-007	Ringfort	Partial remains visible	Medium	Greater than 1.25km	Low
LF 014-122	Landscape design	Tree-ring	Medium	Greater than 1.25km	Low
LF 014-009	Ringfort	Partial remains visible	Medium	Greater than 1.25km	Low
LF 014-010	Ringfort	Partial remains visible	Medium	Greater than 1.25km	Low
LF 013-015	Ringfort	Partial remains visible	Medium	Greater than 1.25km	Low
LF 014-005	Ringfort	No visible trace	Medium	Greater than 1.25km	Negligible
LF 013-012001/2	Ringfort/house	Partial remains visible	Medium	Greater than 1.25km	Low

15.8.4 Decommissioning Phase

The design life of the Proposed Development is 35 years after which time decommissioning will occur, unless planning permission is granted to extend the duration of operation. At the end of the design life of the project, the Wind Turbines, Met Mast, Substation and all their associated above ground components will be dismantled and removed from site using appropriate decommissioning and reinstatement practices in place at that time. Prior to commencement a decommissioning plan will be prepared for agreement with Longford County Council.

Based on a review of the baseline data, the direct impact of the decommissioning phase is considered 'negligible' as there are no known cultural assets within 610m. Based on a review of the baseline data, the indirect (visual) impact of the decommissioning phase is considered 'negligible' as the decommissioning phase will be a relatively short-term project.

15.8.5 Cumulative Effects

A desktop planning history search for permitted developments in the last five years and within 1.5 km of the Proposed Development was undertaken. Planning applications older than five years have not been assessed as they have been deemed to either have expired or have been constructed (due to the standard five-year life of planning consents). Within the local area of 1.5km of the Proposed Development only minor developments were identified. These minor development projects will have no cumulative residual effects on cultural heritage assets.

In relation to larger scale development projects within the surrounding area, the following developments were noted (Table 15.19).

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Table 15.19 Summary of Cumulative Residual Effects

Planning Ref:	Development Type	Distance from Development	Cumulative Residual Effects
LCC 2017	Quarry	4.5km to NW	No significant cumulative residual effect
ABP Reg Ref 305969	19ha Solar Farm	6km to W	No significant cumulative residual effect
ABP Reg Ref 248470	19ha Solar Farm	4.5km to W	No significant cumulative residual effect
ABP Reg Ref 246850	14.5ha Solar Farm	11.5 km to SE	No significant cumulative residual effect

The closest operating windfarm to the subject site is Sliabh Bawn Wind Farm in County Roscommon, ca 20km west of the subject site. Additionally, an application for a single wind turbine in Lissanore, Co Longford, ca. 14 km southeast of the subject site was granted planning permission in June 20024.

An application for the Derryadd Windfarm (c. 12km southeast of the site) has been granted by ABP in 2020. The decision has subsequently been quashed by Order of the High Court in 2022. However, it is understood that the applicant is currently in the progress to prepare a new application at this site.

15.8.6 Summary

Table 15.20 summarises the identified likely significant effects during the construction phase of the Proposed Development before mitigation measures are applied.

Table 15.20 Summary of Construction Phase Likely Significant Effects in the absence of mitigation

Construction Phase	Cultural Assets	Type	Value	Likely Significant Effect (direct)	Likely Significant Effect (indirect)	Likelihood	Duration
Turbines, Met Mast & Associated Works	No known cultural assets within development area	Not Applicable	None	Negligible	Negligible	Negligible	Short-term
Turbines, Met Mast & Associated Works	Previously unknown cultural assets within development area	Not known at this stage	N/A	Low	Negligible	Low	Short-term
Turbines, Met Mast & Associated Works	RMP LF013-026	Historic Town: Longford	High	Negligible	Negligible	High	Short-term
Turbines, Met Mast & Associated Works	Architectural Conservation Area (ACA)	Battery Road ACA: Longford Town	High	Negligible	Negligible	High	Short-term
Turbines, Met Mast & Associated Works	Protected Structures	Carrickglass Demense and Ashfield House	High	Negligible	Negligible	High	Short-term

Construction Phase	Cultural Assets	Type	Value	Likely Significant Effect (direct)	Likely Significant Effect (indirect)	Likelihood	Duration
Turbine Delivery Route	NIAH 13400912	Bridge - built c. 1860	Regional	Low	Negligible	High	Short-term
	Not Listed	Vernacular outbuilding	Local	High	Negligible	High	Permanent
GCR Option 1	NIAH 13300319	Lismoy House - Gates/railings/walls - erected c. 1860	Regional	Negligible	Negligible	High	Short-term
	NIAH 13400816	Bridge - built c. 1860	Regional	Low	Negligible	High	Short-term
	NIAH 13303020	Bridge - built c. 1857	Regional	Low	Negligible	High	Short-term
	RMP LF008-043	Site of Ford - Ballykenny Bridge, - No visible surface traces survive	Medium	Moderate	Negligible	High	Permanent
	RMP LF013-001	Ringfort - largely levelled due to bulldozing.	Medium	Negligible	Negligible	High	Short-term
GCR Option 3	RMP LF013-124	Site of Fulacht Fiadh – Excavated	Negligible	Negligible	Negligible	Negligible	Negligible
	RMP LF013-013	Site of Ringfort - Excavated	Negligible	Negligible	Negligible	Negligible	Negligible
	RMP LF013-016001	Medieval Church (disused)	High	Negligible	Negligible	High	Short-term
	RMP LF013-016002	Graveyard (disused)	High	Negligible	Negligible	High	Short-term

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Table 15.21 summarises the identified likely significant effects during the operational phase of the Proposed Development before mitigation measures are applied.

Table 15.21 Summary of Operational Phase Likely Significant Effects in the absence of mitigation

Operational Phase	Cultural Assets	Type	Value	Likely Significant Effect (direct)	Likely Significant Effect (indirect)	Likelihood	Duration
Turbines, Met Mast and associated infrastructure	15 RMP Sites	11 ringforts, 1 enclosure, 1 standing stone (site of), 1 landscape design feature, 1 house	Medium	Negligible	Negligible - Low	High	Long-term

Operational Phase	Cultural Assets	Type	Value	Likely Significant Effect (direct)	Likely Significant Effect (indirect)	Likelihood	Duration
Turbines, Met Mast and associated infrastructure	RMP LF013-026	Historic Town: Longford	High	Negligible	Negligible - Low	High	Long-term
Turbines, Met Mast and associated infrastructure	Architectural Conservation Area (ACA)	Battery Road ACA: Longford Town	High	Negligible	Negligible - Low	High	Long-term
Turbines, Met Mast and associated infrastructure	Protected Structures	Carrickglass Demense	National/ Regional	Negligible	Moderate	High	Long-term
Turbines, Met Mast and associated infrastructure	Protected Structures	Ashfield House	Regional	Negligible	Low	High	Long-term

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Table 15.22 summarises the identified likely significant effects during the decommissioning phase of the Proposed Development before mitigation measures are applied.

Table 15.22 Summary of Decommissioning Phase Likely Significant Effects in the absence of mitigation

Operational Phase	Cultural Assets	Type	Value	Likely Significant Effect (direct)	Likely Significant Effect (indirect)	Probability	Duration
Turbines, Met Mast and associated infrastructure	15 RMP Sites	11 ringforts, 1 enclosure, 1 standing stone (site of), 1 landscape design feature, 1 house	Medium	Negligible	Negligible	High	Short-term
Turbines, Met Mast and associated infrastructure	RMP LF013-026	Historic Town: Longford	High	Negligible	Negligible	High	Short-term
Turbines, Met Mast and associated infrastructure	Architectural Conservation Area (ACA)	Battery Road ACA: Longford Town	High	Negligible	Negligible	High	Short-term
Turbines, Met Mast and associated infrastructure	Protected Structures	Carrickglass Demense	National/ Regional	Negligible	Low	High	Short-term
Turbines, Met Mast and associated infrastructure	Protected Structures	Ashfield House	Regional	Negligible	Negligible	High	Short-term

15.9 Mitigation Measures

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15.9.1 Incorporated Design Mitigation

A structural survey should be carried out at the location of the bridge (NIAH 13400912) along the proposed Turbine Delivery Route to ensure that the structure will not be directly and adversely impacted by the heavy loads associated with the delivery of turbine components.

Table 15.23 Summary of Incorporated Design Mitigation

Incorporated Design Mitigation	Cultural Assets	Type	Value	Likely Significant Effect (direct)	Likely Significant Effect (indirect)	Probability	Mitigation
Turbine Delivery Route	NIAH 13400912	Bridge - built c. 1860	Regional	Low	Negligible	High	Structural Survey

15.9.2 Demolition Phase Mitigation

The vernacular outbuilding scheduled for demolition as part the demolition phase is of local historic interest. The mitigation measures include a photographic survey of the structure and archaeological monitoring of the demolition and associated groundworks to ensure preservation by record.

Table 15.24 Summary of Demolition Phase Mitigation

Demolition Phase Mitigation	Cultural Asset	Type	Value	Likely Significant Effect (direct)	Likely Significant Effect (indirect)	Probability	Mitigation
Turbine Delivery Route	Not Listed	Vernacular outbuilding (pre-1838)	Local	High	Negligible	High	1. Photographic survey prior to demolition 2. Archaeological Monitoring of groundworks 3. Preservation by record of associated sub-surface remains

15.9.3 Construction Phase Mitigation

As part of the Construction Phase mitigation measures, all groundworks within the main development area (Turbines, Met Mast & Associated Infrastructure Works) should be archaeologically monitored to ensure that previously unknown no sub-surface archaeological remains are not directly impacted by the proposed development. The proposed directional drilling in proximity to historic bridges should also be archaeologically monitored to ensure that previously unknown archaeological remains are not directly impacted by the proposed works. In addition, it is also recommended that ground works in proximity to known archaeological monuments should also be archaeologically monitored.

Should previously unknown archaeological remains be uncovered during the course of archaeological monitoring, further mitigation measures may be required subject to consultation and agreement with the National Monuments Service.

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Table 15.25 Summary of Construction Phase Mitigation

Construction Phase	Cultural Assets	Type	Value	Likely Significant Effect (direct)	Likely Significant Effect (indirect)	Probability	Mitigation
Turbines, Met Mast & Associated Infrastructure Works	Previously unknown cultural assets within development area	Not known at this stage	N/A	Low	Negligible	Low	Archaeological Monitoring of groundworks within main development area
GCR Option 1	NIAH 13400816	Bridge - built c. 1860	Regional	Low	Negligible	High	Directional drilling to avoid bridge structure
	NIAH 13303020	Bridge - built c. 1857	Regional	Low	Negligible	High	Directional drilling to avoid bridge structure
	RMP LF008-043	Site of Ford - Ballykenny Bridge, - No visible surface traces survive	Medium	Moderate	Negligible	High	Archaeological Monitoring of groundworks within Zone of Notification
GCR Option 3	RMP LF013-016001	Medieval Church (disused)	High	Negligible	Negligible	High	Archaeological Monitoring of groundworks from Ballinalee Road to Sub-station
	RMP LF013-016002	Graveyard (disused)	High	Negligible	Negligible	High	Archaeological Monitoring of groundworks from Ballinalee Road to Sub-station

15.9.4 Operational Phase Mitigation

- There are no additional mitigation measures available to completely negate the current indirect visual impact on the Cultural Assets identified during the operational phase.

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15.9.5 Decommissioning Phase Mitigation

- Prior to the decommissioning phase, an updated Archaeological Impact Assessment should be prepared incorporating potential changes to the legislative environment and associated baseline data used in the compilation of this EIAR chapter.

15.10 Residual Impact Assessment

This section assesses potential significant environmental impacts which remain after mitigation measures are implemented.

15.10.1 Demolition Phase

- No direct or indirect residual impacts on cultural heritage assets are expected.

15.10.2 Construction Phase

- Following the completion of archaeological monitoring of groundworks and any associated mitigation measures should previously unknown archaeological remains be uncovered, no further direct or indirect residual impacts are expected.

15.10.3 Operational Phase

- The negligible to moderate indirect visual impact on cultural assets identified in this study will remain as a residual impact during the Operational Phase.

15.10.4 Decommissioning Phase

- The updated Archaeological Impact Assessment prepared prior to the decommissioning phase will outline any potential changes to the legislative environment and associated baseline data. The future potential direct or indirect residual impacts on cultural heritage assets cannot be determined at this stage.

15.10.5 Summary of Post-mitigation Effects

Table 15.26 summarises the identified likely significant residual effects during the construction phase of the Proposed Development following the application of mitigation measures.

Table 15.26 Summary of Construction Phase Effects Post Mitigation

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Construction Phase	Cultural Assets	Type	Value	Likely Significant Effect (direct)	Likely Significant Effect (indirect)	Probability	Mitigation	Post Mitigation Effects
Turbines, Met Mast & Associated Infrastructure Works	Previously unknown cultural assets within development area	Not known at this stage	N/A	Low	Negligible	Low	Archaeological Monitoring of groundworks within main development area	Not known at this stage
GCR Option 1	NIAH 13400816	Bridge - built c. 1860	Regional	Low	Negligible	High	Directional drilling to avoid bridge structure	None
	NIAH 13303020	Bridge - built c. 1857	Regional	Low	Negligible	High	Directional drilling to avoid bridge structure	None
	RMP LF008-043	Site of Ford - Ballykenny Bridge, - No visible surface traces survive	Medium	Moderate	Negligible	High	Archaeological Monitoring of groundworks within Zone of Notification	None
GCR Option 3	RMP LF013-016001	Medieval Church (disused)	High	Negligible	Negligible	High	Archaeological Monitoring of groundworks from Ballinalee Road to Sub-station	None
	RMP LF013-016002	Graveyard (disused)	High	Negligible	Negligible	High	Archaeological Monitoring of groundworks from Ballinalee Road to Sub-station	None

Table 15.27 summarises the identified likely residual significant effects during the operational phase of the Proposed Development post mitigation.

Table 15.27 Summary of Operational Phase Effects Post Mitigation

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Operational Phase	Cultural Assets	Type	Value	Likely Significant Effect (direct)	Likely Significant Effect (indirect)	Probability	Mitigation/ Post Mitigation Effects
Turbines, Met Mast and associated infrastructure	15 RMP Sites	11 ringforts, 1 enclosure, 1 standing stone (site of), 1 landscape design feature, 1 house	Medium	Negligible	Negligible - Low	High	None
Turbines, Met Mast and associated infrastructure	RMP LF013-026	Historic Town: Longford	High	Negligible	Negligible - Low	High	None
Turbines, Met Mast and associated infrastructure	Architectural Conservation Area (ACA)	Battery Road ACA: Longford Town	High	Negligible	Negligible - Low	High	None
Turbines, Met Mast and associated infrastructure	Protected Structures	Carrickglass Demense	National/Regional	Negligible	Moderate	High	None
Turbines, Met Mast and associated infrastructure	Protected Structures	Ashfield House	Regional	Negligible	Low	High	None

15.10.6 Cumulative Residual Effects

There are no cumulative residual effects associated with the Proposed Development in relation to cultural heritage.

15.11 Risk of Major Accidents or Disasters

There is low probability of major accidents or disasters in relation to the cultural heritage aspect of this Proposed Development. Archaeological monitoring and excavation are relatively low risk activities providing the necessary risk assessments, safety plans and mitigations measures are put in place prior to the commencement of archaeological works.

15.12 Worst Case Scenario

In relation to Cultural Heritage, the worst-case scenario is the discovery of previously unknown significant archaeological remains within the footprint of the Proposed Development during archaeological monitoring of groundworks. The likelihood of this scenario occurring is mitigated by the analysis of baseline data, site inspections and a comprehensive test excavation which indicate that this scenario is highly unlikely.

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15.13 Interactions

This chapter should be read in conjunction with reference to Chapter 2 Development Description, Chapter 5 Landscape Visual Impact Assessment (LVIA), Appendix 15.1 (Description of RMP Sites), Appendix 15.2 (Summary Description of NIAH Sites), Appendix 15.3 (Cloonanny Glebe Test Excavation Report, Licence No. 24E0500), Turbine Delivery Route Assessment Report and Grid Connection Route Assessment Report included in the CEMP.

15.14 Monitoring

Archaeological monitoring is carried out under licence from the National Monuments Service. Archaeological monitoring is the recommended mitigation strategy for the following:

- Turbine Delivery Route: Monitoring of the demolition of vernacular outbuilding located at the junction of L1011 and L5046.
- Main Turbine Development Area: Monitoring of all groundworks within the footprint of the main development area.
- Grid Connection Route Option 1: Monitoring of all groundworks at RMP LF008-043 (Site of Ford) of which no visible trace survives, and the exact location is not known.
- Grid Connection Route Option 3: Monitoring of all groundworks from Ballinalee Road to Sub-station. Proposed route is adjacent to the Zone of Notification associated with RMP LF013-016001 (Medieval Church) and RMP LF013-016002 (Graveyard).

15.15 Summary of Mitigation and Monitoring

Table 15.28 summarises the Construction Phase mitigation and monitoring measures.

Table 15.28 Summary of Construction Phase Mitigation and Monitoring

Construction Phase	Cultural Assets	Type	Value	Likely Significant Effect (direct)	Likely Significant Effect (indirect)	Probability	Mitigation/ Monitoring
Turbines, Met Mast & Associated Infrastructure Works	Previously unknown cultural assets within development area	Not known at this stage	N/A	Low	Negligible	Low	Archaeological Monitoring of groundworks within main development area

Construction Phase	Cultural Assets	Type	Value	Likely Significant Effect (direct)	Likely Significant Effect (indirect)	Probability	Mitigation/ Monitoring
GCR Option 1	RMP LF008-043	Site of Ford - Ballykenny Bridge, - No visible surface traces survive	Medium	Moderate	Negligible	High	Archaeological Monitoring of groundworks within Zone of Notification
GCR Option 3	RMP LF013-016001	Medieval Church (disused)	High	Negligible	Negligible	High	Archaeological Monitoring of groundworks from Ballinalee Road to Sub-station
	RMP LF013-016002	Graveyard (disused)	High	Negligible	Negligible	High	Archaeological Monitoring of groundworks from Ballinalee Road to Sub-station

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Table 15.29 summarises the Operational Phase mitigation and monitoring measures.

Table 15.29 Summary of Operational Phase Mitigation and Monitoring

Likely Significant Effect	Mitigation	Monitoring
No operational phase effects	No operational phase mitigation measures	No operational phase monitoring measures

Table 15.30 summarises the Decommissioning Phase mitigation and monitoring measures.

Table 15.30 Summary of Decommissioning Phase Mitigation and Monitoring

Likely Significant Effect	Mitigation	Monitoring
No decommissioning phase effects	Prior to commencement a decommissioning plan will be prepared for agreement with Longford County Council An updated Archaeological Impact Assessment should be prepared prior to the decommissioning phase based on any potential changes to the legislative environment and associated baseline data	No decommissioning phase monitoring measures can be determined until the completion of an updated Archaeological Impact Assessment

15.16 Conclusion

The desk-based assessment was conducted to ascertain all historical and archaeological information relevant to the Subject Site and the local area. All types of heritage assets were identified within the

Area of Study around the Proposed Development, while additional baseline information was also obtained through a comprehensive program of archaeological testing.

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The proposed turbine development will not directly impact any known cultural assets within the footprint of the main development area. Archaeological testing found no evidence of previously unknown sub-surface archaeological remains. Archaeological monitoring of associated groundworks will ensure that no potential sub-surface archaeological remains are directly impacted by the proposed works. Should archaeological material be identified, the Project Archaeologist will liaise with the National Monuments Service to agree suitable mitigation measures.

The proposed Turbine Delivery Route will involve the demolition of one vernacular outbuilding of limited local historical interest only. A photographic survey and associated monitoring of groundworks will ensure that this structure is preserved by record. It is further proposed that the historic bridge (NIAH13400912) is subject to a structural survey to ensure its suitability in relation to heavy loads.

Three options have been considered in relation to the Grid Connection Route. The mitigation measures include archaeological monitoring in relation to directional drilling at the location of two bridges (NIAH 13400816 & 13303020), the site of the ford (RMP LF008-043) and along the Ballinalee Road to the sub-station. The bridges will not be directly impacted by the proposed works and the site of the ford is not currently known.

Archaeological monitoring may identify the location of this fording point. Should archaeological material be found associated with the fording site, the Project Archaeologist will liaise with the National Monuments Service to agree suitable mitigation measures.

The Indirect impacts of the proposed development are primarily concerned with the Operational Phase. The visual impact on RMP sites is considered Negligible-Low as the partial remains of a ringfort is located 610m from the turbines and the partial remains of an enclosure is located at 730m. The remaining RMP sites are over 1.25km from the turbines.

The indirect visual impact on Longford Historic Town and the ACA is also considered Negligible-Low based on the associated distances at 3.3km and 2.35km respectively and partial visibility due to the urban setting and multiple intervening mature hedgerows. The indirect visual impact on Carrickglass Demesne concluded that both turbines and met mast will be visible over the hub between and above the established trees and historic (in disrepair) walled garden of Carrickglass Demesne. The principal country house is located at a distance of 1.4km from the turbines with open pasture and a layered foreground separating the development from the more sensitive surroundings resulting in a moderate impact.

15.17 References and Sources

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CHAPTER 16
INTERACTIONS OF THE FOREGOING

VOLUME II
ENVIRONMENTAL IMPACT ASSESSMENT REPORT

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16 Interactions of the Foregoing

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16.1 Introduction

The construction, operational and cumulative impacts of the proposed development have been assessed within each chapter of the EIAR. This chapter considers the significant interactions of impacts between each of the separate disciplines.

In practice many impacts have slight or subtle interactions with other disciplines. This chapter highlights in Table 16.1 (located at the end of this section) those interactions which are considered to potentially be of a significant nature. Discussions of the nature and effect of the impact is primarily undertaken within each of the relevant chapters, while this chapter identifies the most important potential interactions.

16.2 Population & Human Health

During the construction and decommissioning phase, all environmental factors interact with population and human health. The following are the key areas of interaction:

- **Landscape and Visual** - Construction processes, plant and hoarding used during the construction phase may give rise to visual impacts.
- **Material Assets – Traffic & Transport:** Increased construction traffic movements on the local road network during the construction phase may give rise to noise, dust, and road safety impacts.
- **Material Assets – Built Services:** Excavation during the construction phase may give rise to risks to human health as a result of any excavation work in areas where built services exist through coming into contact with live electricity lines or damaging watermains.
- **Noise & Vibration:** There is potential for effects on human health associated with noise during the construction phase which may impact upon amenity.
- **Air Quality:** There is potential for impact on human health from dust associated with construction activities and thus impacting air quality.

The potential impact on human health arising from these interactions have been considered within the relevant discipline and mitigation measures outlined where required. With mitigation measures in place, no significant permanent residual negative impacts will occur.

During the operational phase, the following are the key areas of interaction with population and human health:

- **Landscape and Visual:** Implemented turbines may give rise to visual impacts.
- **Noise and Vibration:** There is potential for effects on human health associated with noise during the operational phase.
- **Climate:** The Proposed Development will contribute to reduce greenhouse gas emissions for future energy production.

The potential significant impacts on human health arising from these interactions have been considered within the relevant discipline and mitigation measures outlined where required. With mitigation measures in place, no significant permanent residual negative impacts will occur.

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16.3 Landscape & Visual

The following aspects have potential to interact with landscape and visual:

- **Population and Human Health:** Landscape and Visual impacts arising from the construction, operation, and decommissioning of the wind turbines are considered in the LVIA with respect to the effect on perceived landscape character, views and on the general visual amenity experienced by people, including local residents. Proportionately, the operational effects of the turbines are considered to give rise to the most notable landscape and visual effects given the long-term nature of the change, and a greater focus is placed on them. However, whilst they have the potential to be prominent, the turbines will be seen in the context of a modified landscape, and it is noted that the findings of the assessment did not identify any significant impacts in relation to receptors in the Central or Wider Study Area. The findings of the LVIA have contributed to the Population and Human Health assessment.
- **Landscape and Visual and Cultural Heritage:** Common receptors were considered in relation to landscape character and the setting of heritage features as well as views from heritage features visited by the public and for whom views of the landscape are a contributing factor to the experience. Whilst the turbines have the potential to be visible, they will be seen in the context of an extensively modified landscape. From particularly important locations, the turbines would be seen at a considerable distance as a small part of wider panoramic views within which other turbines are visible. Again, it is noted that the findings of the assessment did not identify any significant impacts in relation to receptors in the Central or Wider Study Area.

The potential significant effects on landscape and visual arising from these interactions have been considered within the relevant discipline and mitigation measures outlined where required. With mitigation measures in place, no significant permanent residual negative impacts will occur.

16.4 Material Assets: Traffic & Transport

The following aspects have potential to interact with traffic & transport:

Increased traffic generation particularly from construction related HGVs for projects requiring significant volumes of materials haulage can result in impacts on air quality and noise. Also, temporary traffic management and temporary road closures could result in queuing of traffic or diversions to traffic causing localised impacts on air quality and noise.

The potential significant effects on traffic and transport arising from these interactions have been considered within the relevant discipline and mitigation measures outlined where required. With mitigation measures in place, no significant permanent residual negative effects will occur.

16.5 Material Assets: Built Services

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The following aspects have potential to interact with built services:

- **Population and Human Health and Material Assets:** Overall, the interaction of population and human health with Material Assets is considered a positive effect, resulting from the project's contribution to the electricity supply with the provision of a clean energy source.

The potential significant impacts on built services arising from these interactions have been considered within the relevant discipline, and mitigation measures have been outlined where required. With mitigation measures implemented, no significant permanent residual negative impacts will occur.

16.6 Land & Soils

Interactions between the following disciplines must be considered in tandem with the effects relating to Soils and Geology and include:-

- **Material Assets: Built Services:** Utilities are sensitive receptors when it comes to potential soils and geology related effects. In particular both underground and overhead utilities can be susceptible to detrimental affects arising from soil failure and contamination**.**
- **Water and Hydrology:** Many potential soils and geology effects have the ability to directly affect local hydrology, such as watercourses and lakes. Soils entering water systems have the ability to extend the reach of these effects far from the site, affecting sensitive receptors well removed from the normal range of such actions. E.g. soil movement at the Site causing siltation of watercourses and indirect impacts on downstream environments.
- **Climate:** Climate change in the form of evolving weather conditions can alter the long-term condition of soils (e.g. drying out normally moist clay soils to form a more brittle substrate, prone to erosion). Climate change can also alter the frequency and severity of storm events that can make rare natural hazards, such as landslip/landside to become a more significant issue.

The potential significant impacts on land and soils arising from these interactions have been considered within the relevant discipline and mitigation measures outlined where required. With mitigation measures in place, no significant permanent residual negative impacts will occur.

16.7 Water & Hydrology

During the construction and decommissioning phase, the following aspects have potential to interact with water & hydrology:

- **Biodiversity:** proximity to sensitive sites such as the River Blackwater SAC – whereby changes in water quality or flow in this sensitive waterbody could affect aquatic ecosystems. More generally, increased surface runoff and potential soil erosion during construction can lead to sedimentation in nearby water bodies, impacting aquatic habitats and reducing water quality.
- **Land & Soils:** excavation activities for turbine foundations and access roads will disturb the soil and subsoil layers. In areas where the overburden is thinner (e.g., near T2 infrastructure),

this increases groundwater vulnerability, particularly affecting the Regionally Important Karstified Aquifer. Earthworks and vegetation removal increase the potential for soil erosion. Mobilized suspended solids can enter nearby surface water bodies, affecting water quality. The exposed soils, particularly during periods of heavy rainfall, can contribute to sedimentation in the Camlin River, impacting aquatic habitats downstream.

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The following interactions with the water environment during operation phase include:

- **Biodiversity**: operation of the development, particularly the hard-standing areas and access roads, can lead to permanent changes in surface water runoff patterns and groundwater recharge which can impact aquatic ecosystems.
- **Land & Soils:** the installation of impermeable surfaces (e.g., turbine foundations, access roads) reduces natural infiltration and alters groundwater recharge patterns. This can affect the flow dynamics of the Regionally Important Karstified Aquifer beneath the site. Over time, changes in groundwater flow could impact the hydrogeological balance and affect local water-dependent ecosystems. Additionally increased stormwater runoff from impermeable surfaces can lead to changes in the hydrological regime. The water management infrastructure will include sediment control measures and filtration systems to ensure no adverse impacts on surface water quality.

The potential significant effects on water and hydrology arising from these interactions have been considered within the relevant discipline and mitigation measures outlined where required. With mitigation measures in place, no significant permanent residual negative effects will occur.

16.8 Biodiversity

During the construction and operation phase, the following aspects have potential to interact with biodiversity:

- **Lands, Soils & Geology and Hydrology & Hydrogeology:** There is potential for the biodiversity to overlap with the impact of construction works via the ecological and geological environment via excavation and subsequent accidental pollution. With the mitigation measures outlined in the CEMP as well as Chapter 8 and 9 will be implemented ensuring that no adverse interactions take place via protecting water bodies from pollution and sedimentation.
- **Landscape and Visual:** There will be no significant interaction between biodiversity and landscape and visual, as outlined within Chapter 3, the Proposed Development will have no significant visual impacts throughout construction, a slight impact through operation but still does not appear out of place in terms of its scale or function in this diverse landscape context, and none through the decommissioning phase therefore no adverse interactions will take place between biodiversity and landscape and visual.
- **Biodiversity, Noise and Vibration and Traffic and Transport:** There is potential for interaction between biodiversity, noise and vibration and traffic and transport during the construction phase of the development. As outlined within Chapter 12, the noise and vibration impacts during both the construction and operational phases (and the decommissioning phase) of the

proposed development are predicted to be within the relevant guidance limits. Traffic using the site during the construction, operational and decommissioning phases of the development will be restricted to the use of the designated internal access roads. Mitigation measures outlined within Chapter 6 will be followed to ensure no adverse interactions will take place between biodiversity and traffic.

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The potential significant impacts on biodiversity arising from these interactions have been considered within the relevant discipline and mitigation measures outlined where required. With mitigation measures in place, no significant permanent residual negative impacts will occur.

16.9 Ornithology

All of the potential significant effects of the Proposed Development and the measures proposed to mitigate them have been outlined above. However, for any development with the potential for significant environmental effects there is also the potential for interaction between these potential significant effects.

- **Water:** Site activities during the construction phase have the potential to give rise to some water pollution, and consequential indirect effects on birds and their prey species (such as disturbance and deterioration of habitat quality due to impacts to water quality). The site activities during the construction phase would without mitigation likely to give rise to potential water quality issues. Given the implementation of the measures set out in the surface water management plan (SWMP) and the CEMP. No adverse interactions are expected between water and Ornithology
- **Air Quality and Climate:** During the operational phase, the proposed development will help offset carbon emissions from fossil fuel based electricity generation plants, which will help contribute to a slower increase in the rate of global warming and, consequently, could in combination with other renewable energy projects, contribute to preventing the loss of bird species from Ireland as a result of climate change.
- **Noise and Vibration:** Site activity during the construction phase could give rise to noise that could cause disturbance to birds that use the site, therefore, causing a temporary, slight, negative effect on ornithology. Best practice mitigation measures are included in Chapter 12 and Chapter 11 to minimise the potential negative effect of noise generated during the construction phase on ornithology.
- **Landscape and Visual**: There will be no significant interaction between Ornithology and Landscape and Visual Impacts during the construction phase of the development, with the exception of site lighting during those portions of the construction period spanning winter months. This is a short-term, temporary impact and is addressed in the CEMP. There is no potential for interaction between Ornithology, in terms of Landscape Character, and Landscape and Visual during the operational phase of the development. There will be no significant light-spill from the site during the operational phase as the vast majority of site activity will occur during daylight hours and there will be little requirement for external lighting of the operations facilities.

The potential significant impacts arising on ornithology from these interactions have been considered within the relevant discipline and mitigation measures outlined where required. With mitigation measures in place, no significant permanent residual negative impacts will occur.

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16.10 Noise & Vibration

There are interactions between the noise and vibration assessment and traffic assessment. With additional traffic movements during the construction phase, the noise level increases during this phase. In this assessment, the effect of the interactions between traffic and noise are considered to be imperceptible to not significant due to the low level changes in traffic flows associated with the construction of the proposed development.

The potential significant impacts on noise and vibration arising from these interactions have been considered within the relevant discipline and mitigation measures outlined where required. With mitigation measures in place, no significant permanent residual negative impacts will occur.

16.11 Air Quality

Air quality does not have a significant number of interactions with other topics. The following aspects have potential to interact with air quality:

- **Human Health** The most significant interactions are between Population and Human Health and Air Quality. An adverse air quality impact during the construction phase can cause health and dust nuisance issues. There is a low risk of dust-related human health impacts during the construction phase of the proposed development. Best practice mitigation measures will implemented during the construction phase to ensure that the impact of the proposed development complies with all ambient air quality legislative limits. Therefore, the predicted impact is direct, short-term, negative, localised and not significant with respect to Population and Human Health during the construction phase.
  During operational phase, vehicles accessing the site will emit pollutants which may impact Air Quality and Human Health. However, the increased number of vehicles associated with the proposed development will not cause a significant change in air pollutant emissions in the locality. It has been assessed that emissions will be in compliance with the ambient air quality standards which are set for the protection of human health. Impacts will be long-term, localised, direct, negative and not significant. There will be indirect beneficial impacts to air quality as a result of generating electricity from renewable wind power rather than fossil fuel sources. There will be NOX emission savings which may otherwise have been generated from fossil fuels.
- **Air Quality and Climate** Air Quality and Climate have interactions as the emissions from the burning of fossil fuels during the construction and operational phases generate both air quality and climate impacts. There is no impact on climate due to air quality. However, the sources of impacts on air quality and climate are strongly linked.
- **Land & Soils** Construction phase activities such as land clearing, excavations, stockpiling of materials etc. have the potential for interactions between Air Quality and Land & Soils in the form of dust emissions. With the appropriate mitigation measures to prevent fugitive dust

emissions, it is predicted that there will be no significant interactions between air quality and land and soils during the construction phase.

- **Biodiversity:** During construction, dust generation can occur during extended dry weather periods due to construction traffic along haul routes and construction activities such as excavations and infilling works. Dust emissions can coat vegetation leading to a reduction in the photosynthesising ability as well as other effects. There are no designated ecological sites within 250 m of the proposed development site area. Significant dust impacts are not predicted beyond this distance. Dust mitigation measures will be implemented on site as set out in Section **Error! Reference source not found.** of Chapter 8 of the EIAR. With the implementation of these mitigation measures dust emissions will be minimised and impacts will be direct, short-term, negative, localised and not significant with respect to biodiversity.
- **Traffic & Transport:** Interactions between Air Quality and Traffic can be significant. With increased traffic movements and reduced engine efficiency, i.e. due to congestion, the emissions of vehicles increase. The impacts of the proposed development on air quality are assessed by reviewing the change in annual average daily traffic on roads close to the site. In this assessment, the impact of the interactions between Traffic and Air Quality are linked but there is no potential for significant impacts from traffic on air quality. The effects are considered to be direct, short-term, negative, localised and not significant during the construction phase.

  The impact of the interactions between Traffic and Air Quality during operation of the proposed development are considered to be ***long-term, direct, negative*** and ***not significant*** during the operational phase.

The potential significant impacts arising on air quality from these interactions have been considered within the relevant discipline, and mitigation measures have been outlined where required. With mitigation measures implemented, no significant permanent residual negative impacts will occur.

16.12 Climate

Climate has the potential to interact with a number of other environmental attributes, the following aspects have potential to interact with air quality:

- **Land, Soils, Geology and Hydrology:** The impact of flood risk has been assessed and the surface water drainage network will be designed to cater for increased rainfall in future years as a result of climate change. The effect of the interactions of climate with land and soils, and water and hydrology (EIAR Chapters 8 and 9) are direct, short-term, negative and slight during the construction phase and direct, long-term, negative and slight during the operational phase, which is overall not significant in EIA terms.
- **Air Quality:** Air quality and climate have interactions due to the emissions from the burning of fossil fuels during the construction and operational phases generating both air quality and climate impacts. Air quality modelling outputs are utilised within the Climate Chapter. There is no impact on climate due to air quality, however, the sources of impacts on air quality and climate are strongly linked.

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- **Traffic and Transportation:** During the construction and operational phase, there is the potential for interactions between climate and traffic (for more information see Chapter 06 Material Assets -Traffic and Transportation). Vehicles accessing the site will result in emissions of CO_2, a greenhouse gas. The effects of the proposed development on air quality are assessed by reviewing the change in annual average daily traffic on roads close to the site. In this assessment, the effects of the interactions between traffic and climate are considered to be ***direct, short-term, negative*** and ***not significant*** during the construction phase and ***direct, long-term, negative*** and ***not significant*** during the operational phase, which is overall ***not significant*** in EIA terms.
- **Waste Management:** Waste (addressed in Chapter 07 Material Assets – Built Services) management measures will be put in place to minimise the amount of waste entering landfill, which has higher associated embodied carbon emissions than other waste management such as recycling. The effect of the interactions between waste and climate are considered to be ***direct, short-term, negative*** and ***not significant*** during the construction phase and ***direct, long-term, negative*** and ***not significant*** during the operational phase, which is overall ***not significant*** in EIA terms.

The potential significant impacts arising on climate from these interactions have been considered within the relevant discipline, and mitigation measures have been outlined where required. With mitigation measures implemented, no significant permanent residual negative impacts will occur.

16.13 Cultural Heritage: Archaeology & Built Heritage

The following aspects have the potential to interact with cultural heritage:

- **Landscape & Visual:** The emergence of construction plant and hoarding to secure the development site would interact with the landscape and visual environment in the short term. The operational phase visual impact of the turbines would have an impact on the visual environment.
- **Material Assets- Built Services:** There is a slight possibility that the Turbine Delivery Route and construction of the Grid Connection would have an impact on bridges along the route that are cultural assets.

The potential significant impacts on cultural heritage arising from these interactions have been considered within the relevant discipline, and mitigation measures have been outlined where required. With mitigation measures implemented, no significant permanent residual negative impacts will occur.

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16.14 Conclusion

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As outlined above, the proposed development has the potential to impact on various environmental aspects, with interactions and inter-relationships between these aspects as described above. The EIAR has considered these interactions and inter-relationships throughout the appraisal, firstly through the design and layout of the proposed developments, to avoid impacts where possible, and also in the definition of suitable mitigation measures to minimise the impacts.

No significant likely impacts arising from interactions are identified.

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Table 16-1 Interactions with Potential for Significant Impacts Before the Implementation of Mitigation Measures

Interaction	Pop&HH	L&V	MA:T&T	MA:BS	Land&S	Water&H	Biodiv	Ornith	Noise&V	AirQual	Climate	CH
Population & H. Health		✓	✗	✓	✗	✗	✗	✗	✗	✓	✗	✗
Landscape & Visual	✓		✗	✗	✗	✗	✓	✓	✗	✗	✗	✓
MA: Traffic & Transport	✓	✗		✗	✗	✗	✓	✗	✓	✓	✓	✗
MA: Built Services	✓	✗	✗		✓	✗	✗	✗	✗	✗	✓	✓
Land & Soils	✗	✗	✗	✗		✓	✓	✗	✗	✓	✓	✗
Water & Hydrology	✗	✗	✗	✗	✓		✓	✓	✗	✗	✓	✗
Biodiversity	✗	✗	✗	✗	✗	✓		✗	✗	✓	✗	✗
Ornithology	✗	✗	✗	✗	✗	✗	✗		✗	✗	✗	✗
Noise & Vibration	✓	✗	✓	✗	✗	✗	✓	✓		✗	✗	✗
Air Quality	✓	✗	✓	✗	✗	✗	✗	✓	✗		✗	✗
Climate	✓	✗	✗	✗	✓	✗	✗	✓	✗	✓		✗
Cultural Heritage	✗	✓	✗	✗	✗	✗	✗	✗	✗	✗	✗	

✓ - Potential Significant Interaction | ✗ - No Significant Interaction

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CHAPTER 17
SUMMARY OF MITIGATION & MONITORING MEASURES

VOLUME II
ENVIRONMENTAL IMPACT ASSESSMENT REPORT

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17 Summary of Proposed Mitigation and Monitoring Measures

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17.1 Introduction

Article 5(1) of the EIA Directive sets out what the developer has to include as a minimum in the EIA Report including mitigation or compensation measures: measures to avoid, prevent or reduce, and offset any identified adverse effects on the environment shall be provided by the developer (Article 5(1)(c) and Annex IV.7).

This chapter summarises the mitigation measures proposed for the construction and operational stage of the proposed development as set out in the preceding assessments contained in Chapters 4 to 15.

All the mitigation measures proposed within the individual specialists' assessments will be incorporated into the Construction and Environmental Management Plan (CEMP) prior to works commencing on-site.

17.2 Incorporated Design Mitigation Measures

The measures outlined in Table 17.1 have been incorporated into the design of the proposed development as appropriate.

Table 17.1 Incorporated Design Mitigation

Aspect	Incorporated Design Mitigation
Population & Human Health (Ch. 4)	▪ The layout of the Proposed Development has been designed to maximise the distance of any sensitive receptors from the proposed turbines and no dwelling is located within 800m of the proposed turbines. Based on initial feedback from local residents, the layout has also been reduced form initially 4 proposed turbines, to now 2 proposed turbines. ▪ To ensure the risk to maintenance staff, landowners and site visitors remains negligible throughout the operational life of the Wind Farm, access to the turbines is restricted through a door at the base of the structure, which will be locked at all times outside maintenance visits. Furthermore, fencing will be erected in areas of the site where uncontrolled access is not permitted, and appropriate health and safety signage will also be erected at relevant locations around the site. ▪ As a precaution the turbines will also be fitted with a shadow shutoff system to allow controlling of the turbines and prevent the occurrence of shadow flicker at sensitive receptors surrounding the Wind Farm. This is a function that is integrated into the control system of the wind energy converter. The shutdown times and parameters are determined and programmed into the wind energy converter control system. Shadow shutdown is activated as soon as the shutdown intensity falls below the set values. ▪ The developer will implement a community benefit fund for the Proposed Development which can be used by the local community to invest in and support the wider economic, recreational, environmental, social and cultural amenities and initiatives in the locality of the proposed development.

Aspect	Incorporated Design Mitigation
Landscape & Visual (Ch. 5)	▪ Reduction of layout to two turbines
Material Assets: **Traffic & Transport (Ch. 6)**	▪ A section of access road to the west of the existing L5046/L50462 junction will be constructed to accommodate both daily construction traffic to and from the wind farm site with improved exit sightlines and a fully constructed road specification with drainage measures, adequate to accommodate the expected loads and traffic volumes expected across the construction period. ▪ The existing alignment of the L54062 from the L5046 junction will be retained as a non-trafficked route to accommodate pedestrian and cyclist activity using the L50462 as an access/leisure route. ▪ The delivery haul route (via the N4 to the wind farm site) was selected with regard to the largest wind turbine components that will be delivered as abnormal load transport, and swept path assessments to determine the most appropriate measures requiring minimal interventions and temporary works along the selected route (via the R194, L1011 and L5046. ▪ Where temporary construction and haul delivery junction exit sightlines for the design speed/posted speed limit of the existing road cannot be incorporated, it is proposed to implement temporary traffic management (TTM) measures as set out in the PTMP, which will be subject to detailed agreement with LCC as part of the Road Opening Licences that will have to be in place before works can commence. ▪ Road surfaces on the public road will be reinstated as temporary works are completed, and temporary 'stone' areas for abnormal load delivery swept paths will be barriered off to prevent access by non-construction road users. At interfaces between temporary works and public road areas, the Contractor will monitor and clean the road to ensure construction materials, spoil or stone from the temporary areas is not deposited onto the public road. ▪ Construction staff parking will be accommodated within the compound at the wind farm site, and staff will not park their personal vehicles on the public road or at temporary works sites Staff working at temporary works sites will be transported to the work sites from the wind farm compound using a contractor van/flatbed truck (which will be accommodated within the controlled temporary works area so it is not parked on the public road).
Material Assets: Built Services (Ch. 7)	Electrical Infrastructure & Supply ▪ Turbine Delivery Route: As far as practicable the turbine delivery route has been designed to avoid existing overground electrical infrastructure cables, reducing the potential for conflict. ▪ Grid Route Design: As far as practicable the underground Grid Connection route will be designed to avoid existing underground electrical infrastructure cables, reducing the potential for conflict. ▪ Design Standards: The development will be designed to relevant codes of practice and standards for each part of infrastructure which is to be installed/ constructed. Telecommunications ▪ Wind Turbine Layout: The turbine locations have been selected to avoid impacting on telecommunication infrastructure, however, prior to construction, the location of the wind turbines will be further reviewed to ensure they do not interfere with point-to-point transmission services.

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Aspect	Incorporated Design Mitigation
	▪ Turbine Delivery Route: As far as practicable the turbine delivery route has been designed to avoid existing overground Telecommunication infrastructure cables, reducing the potential for conflict. ▪ Grid Route Design: As far as practicable the underground Grid Connection route will be designed to avoid existing underground Telecommunication infrastructure cables, reducing the potential for conflict. Aviation ▪ An aeronautical lighting scheme for the Development will be agreed with the IAA and will be installed on the turbines; Gas ▪ Review and confirmation of absence of gas infrastructure: Prior to construction, the Gas Networks Ireland DBYD maps will be revisited to verify that no new gas pipelines or services have been installed since the initial assessment. Water and Wastewater Infrastructure ▪ Grid Route Design: As far as practicable the underground Grid Connection route will be designed to avoid existing underground water and wastewater infrastructure, reducing the potential for conflict. Waste Management ▪ See Construction Stage Mitigation Measures
Land & Soils (Ch. 8)	▪ Iterative layout design to ensure that positioning of turbines, access roads, material storage areas and other site infrastructure on agricultural lands and minor forestry, where the soils are extensively worked and drained, so as to be remote from residential and sensitive commercial properties. ▪ Infrastructure has been positioned within areas where organic soils are absent and slope gradients are low and has been moved away from designated watercourses and other sensitive features. ▪ Extensive preliminary peat assessment has been employed to screen for the presence of peat or other organic soil deposits across the Proposed Development. ▪ Undertaking of preliminary site investigations, including excavation of trial pits and undertaking of geophysical surveys, to establish overburden and bedrock characteristics at the main structures and optimise Project design. ▪ Relocation and micro-siting of turbines, hardstandings, access roads and other infrastructure based on the site assessments and geotechnical assessments in order to reduce ground risk associated with the proposed project. ▪ All construction works will be designed and checked by geotechnical engineers, who are suitably qualified and experienced in wind farm construction, earthworks design and construction methodologies.
Water & Hydrology (Ch. 9)	▪ Surface Water Management to include erosion control measures such as interceptor drains and temporary settlement tanks. ▪ Groundwater Management to include buffer zones, with Vegetative cover within these zones to help absorb runoff, filter sediments, and reduce the flow of potentially polluted water. ▪ Flood protection measures to include berm around Turbin base of T2 to divert stormwater away and prevent water from inundating the worksite. Also,

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Aspect	Incorporated Design Mitigation
	temporary drainage systems to effectively manage stormwater runoff, especially in flood-prone areas.
Biodiversity (Ch. 10) **Ornithology (Ch 11)**	▪ Mitigation-by-Design Approach: The Proposed Development was designed to avoid, reduce, and minimise effects on Key Ecological Receptors (KERs) following established guidance. ▪ Iterative Design Process: Ongoing consultations among the developer, Project Manager, Engineers, Ecologists, and Ornithologists optimised the wind farm layout. ▪ Avoidance of Sensitive Areas: Construction activities and infrastructure placement have been planned to avoid ecologically sensitive locations, priorities the use of low sensitivity areas and minimise habitat loss for all ecological receptors.
Noise & Vibration (Ch. 12)	▪ N/A
Air Quality (Ch. 13)	▪ There is no incorporated design mitigation required for the development.
Climate (Ch. 14)	▪ A Battery Management System (BMS) will be installed which will detect problems using cell and module voltage measurements and select temperature measurements within the batteries. Automatic disconnect of the batteries will occur if any unusual parameters are measured. Thermal management systems will be installed to ensure all electrical installations are operating at their optimal temperature and will automatically reduce power input if safe temperature ranges are exceeded. In addition, there will be two heating, ventilation and air conditioning units servicing each BESS container within the energy storage compound. Further fire mitigation measures are detailed in the Fire Risk Assessment. ▪ The BESS and substation will be elevated by 30cm from ground level. For the turbine, raising the foundation and platform to ensure it is well above the predicted flood levels, as already planned for turbine no. 2, will prevent floodwaters from reaching critical components. The battery energy storage system and substation compound can be elevated on platforms or berms designed to withstand extreme weather events, with additional protective bunding to prevent water ingress. Both foundations will be raised and generally all technical equipment will be at elevated hights inside the turbine tower.
Cultural Heritage: (Ch. 15)	A structural survey should be carried out at the location of the bridge (NIAH 13400912) along the proposed Turbine Delivery Route to ensure that the structure will not be directly and adversely impacted by the heavy loads associated with the delivery of turbine components. ▪ The vernacular outbuilding scheduled for demolition as part the demolition phase is of local historic interest. The mitigation measures include a photographic survey of the structure and archaeological monitoring of the demolition and associated groundworks to ensure preservation by record.

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17.3 Mitigation Measures

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The recommended mitigation measures for the Construction, Operational and Decommissioning Stages are summarised in Tables 17.2 – 17.4 below.

Table 17.2 Construction Phase Mitigation

Aspect	Construction Phase Mitigation
Population & Human Health (Ch. 4)	▪ Construction and Environmental Management Plan (CEMP): The appointed contractor(s) will update the Outline CEMP submitted with the application and submit to Longford County Council prior to the commencement of development. ▪ The CEMP will comply with all appropriate legal and best practice guidance for construction sites. ▪ The purpose of a CEMP is to provide a mechanism for the implementation of the various mitigation measures which are described in this EIAR and to incorporate relevant conditions attached to a grant of permission. The CEMP requires that these measures will be checked, maintained to ensure adequate environmental protection. The CEMP also requires that records will be kept and reviewed as required to by the project team and that the records will be available on site for review by the planning authority. ▪ All construction personnel will be required to understand and implement the requirements of the Contractor's CEMP and shall be required to comply with all legal requirements and best practice guidance for construction sites. ▪ All mitigation and monitoring measures included in the Summary of Mitigation and Monitoring Measures in Chapter 17 of this EIAR will be included in the CEMP and adhered to. ▪ Community Liaison Officer: The contractor will appoint a community liaison officer to ensure that any issues from the local community are dealt with promptly and efficiently during construction. These details will be included in the contractor's CEMP. ▪ Construction Working Hours will generally be limited to the hours 0700 – 1900 Monday to Friday and 0700 – 1400 hours on Saturday. To ensure that optimal use is made of good weather periods or at critical periods within the programme it may be necessary on occasion to work outside of these hours. Any such out of hours working will be agreed in advance with Longford County Council. ▪ Project supervisors for the construction phase (PSCS) will be appointed in accordance with the Health, Safety and Welfare at Work (Construction Regulations) 2013, and a Health and Safety Plan will be formulated during the detailed design stage which will address health and safety issues from the design stages, through to the completion of the construction phase. ▪ The Waste Management Plan (WMP) will be updated, implemented and maintained by the Contractor.
Landscape & Visual (Ch. 5)	▪ There are no specific landscape and visual construction stage mitigation measures
Material Assets: Traffic & Transport (Ch. 6)	▪ The Preliminary Traffic Management Plan incorporates traffic management measures for the construction stage which will be applied for the construction phase and will be further developed and agreed with the planning authority in advance of any works being undertaken. ▪ The hours of construction activity will be limited to avoid unsociable hours, where possible. Construction operations shall generally be restricted to

Aspect	Construction Phase Mitigation

	between 07:00hrs and 19:00hrs on weekdays and between 07:00hrs and 14:00hrs on Saturdays. However, to ensure that optimal use is made of good weather periods or at critical periods within the programme (i.e. concrete pours or to accommodate delivery of large turbine components along public routes), it may be necessary on occasion to work outside of these hours. Any such out of hours working will be agreed in advance with Longford Co. Co.
	▪ Adequate advance public information including advertising and promotion of any temporary works closures or diversions though social media, print media and websites (TII, AA Roadwatch, and Local Authorities) and adequate VMS (variable message signage) on approach routes to the site area and temporary accommodation works areas, and also for the turbine delivery activity will be key to minimising disruption to travel which can lead to queuing and increased vehicle emissions.
	▪ Where practical, construction staff will be encouraged to vehicle share car pool travelling to and from work sites.
	▪ It is intended that the topsoil and subsoil excavated at the windfarm and temporary accommodation works sites will be stored for reuse in reinstatement and landscaping works, to reduce the volume of waste and other materials transported off-site by road. Where materials such as construction related waste materials cannot be recycled and reused on site, these will be removed from site by backloading of delivery haulage vehicles where practical to avoid additional HGV trips.
	▪ A detailed CTMP for the construction phase will be agreed with LCC in advance of construction commencing. As set out in the PTMP prepared or the planning application, this will include:
	  ▪ Appointment of a Traffic Management Coordinator
	  ▪ Engagement/Liaison with locals
	  ▪ Pre-condition survey
	  ▪ Road opening licence for any temporary or permanent works on or adjacent to the public roads (and for Grid connection works)
	▪ Adherence to the CTMP and any Temporary Traffic Management (TTM) measures in place at worksites (including management of construction related vehicles to ensure there is no inappropriate parking or loading/unloading on public roads), and strictly following agreed haulage delivery routes, which will be monitored by the Project Management Team throughout the construction period.
	▪ Reinstatement of the temporary accommodation works areas (where widening or bend overswing areas are required to assist the turbine delivery areas) after these delivery activities are complete will return the road network to the 'Do Nothing' current condition.

Material Assets: Built Services (Ch. 7)	Electrical Infrastructure & Supply ▪ Utility Provider Coordination: The developer will liaise with utility providers to ensure all services are identified, and safe practices are employed during excavation near underground services; ▪ Utility Provider Guidelines: Compliance with all relevant service provider guidelines, including safe working procedures near live electrical infrastructure, will be enforced;

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Aspect	Construction Phase Mitigation
	▪ Confirmatory Survey: Prior to construction, a confirmatory survey of all existing services will be conducted to verify and identify the precise location of underground and overhead services; ▪ Hand Digging: Excavation around identified services will be carried out by hand where necessary to minimize the risk of accidental damage; ▪ Backup Services for Relocated Poles: Backup services, such as mobile units, may be arranged if telecommunications poles are temporarily relocated, minimizing disruption to the local network; ▪ Post-construction Testing and Validation: After construction, a full survey will confirm that no services have been disrupted. If disruptions are found, the developer will work with utility providers to restore functionality before operations begin. Telecommunications ▪ Telecommunications Provider Coordination: The developer will liaise with utility providers to ensure all services are identified, and safe practices are employed during excavation near underground services; ▪ Telecommunications Provider Guidelines: Compliance with all relevant service provider guidelines, including safe working procedures near live telecommunications infrastructure, will be enforced; ▪ Confirmatory Survey: Prior to construction, a confirmatory survey of all existing services will be conducted to verify assumptions and identify the precise location of underground and overhead services; ▪ Hand Digging: Excavation around identified services will be carried out by hand where necessary to minimize the risk of accidental damage; ▪ Real-time Monitoring of Signal Interference: During the construction and decommissioning phases, real-time monitoring equipment will detect any signal interference, enabling immediate corrective action if required; ▪ Backup Services for Relocated Poles: Backup services, such as mobile units, will be arranged, if required, if telecommunications poles are temporarily relocated, minimizing disruption to the local network; ▪ Post-construction Testing and Validation: After construction, a full survey will confirm that no services have been disrupted. If disruptions are found, the developer will work with utility providers to restore functionality before operations begin. Aviation ▪ As-constructed coordinates in WGS84 format together with ground and tip height elevations at each wind turbine location will be provided to the IAA; ▪ The IAA will be notified of intention to commence crane operations with at least 30 days prior notification of their erection. Gas ▪ Liaison with Gas Networks Ireland (GNI): Although no gas infrastructure is currently identified, GNI will be consulted to ensure that no unforeseen services are present or planned, ensuring full compliance with any additional safety or procedural requirements. ▪ Compliance with safety guidelines: As a precaution, all construction activities will follow standard industry safety protocols for working in areas where there could be undetected services or utilities, similar to the approach taken for electrical and telecommunications infrastructure. Water and Wastewater Infrastructure

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Aspect	Construction Phase Mitigation
	▪ Utility Provider Coordination: The developer will liaise with utility providers to ensure all services are identified, and safe practices are employed during excavation near underground services; ▪ Utility Provider Guidelines: Compliance with all relevant service provider guidelines, including safe working procedures near water and wastewater infrastructure, will be enforced; ▪ Confirmatory Survey: Prior to construction, a confirmatory survey of all existing services will be conducted to verify assumptions and identify the precise location of underground; ▪ Hand Digging: Excavation around identified services will be carried out by hand where necessary to minimize the risk of accidental damage; ▪ Post-construction Testing and Validation: After construction, a full survey will confirm that no services have been disrupted. If disruptions are found, the developer will work with utility providers to restore functionality before operations begin. ▪ Compliance with guidelines: All works will be in compliance with the relevant service provider's requirements or guidelines, including safety practices for working near underground services; ▪ Availability of materials: Additional materials will be kept on-site to make any necessary temporary repairs in case of accidental damage to water or wastewater services. On-site contingency plans will ensure that in the event of accidental service damage, immediate temporary repairs can be made until permanent solutions are implemented by the service provider. Waste Management <u>Waste Prevention</u> During the detailed design, the appointed contractor will have responsibility for the development and management of waste handling procedures in accordance with waste legislation and the waste management hierarchy. Measures implemented to achieve these aims will include, but are not limited to, the following: ▪ Efficient Ordering: Materials will be ordered in precise quantities using a "just in time" approach. ▪ Handling Protocols: Special handling measures will be in place to prevent damage to materials. ▪ Supply Coordination: Coordinated delivery schedules will minimize excess and redundant deliveries. <u>Waste Management Documentation and Compliance:</u> The construction project will adhere to comprehensive documentation and compliance requirements to ensure all waste management activities are traceable and compliant with regulations: ▪ Compliance: Where waste is created, it will be managed in accordance with the waste hierarchy in Council Directive 2008/98/EC on waste and section 21A of the Waste Management Act 1996, as amended, as follows: (a)Prevention; (b)re-use; (c)Recycling; (d)Other recovery (including energy recovery); and (e) Disposal. ▪ Permit and License Verification: The contractor will keep a detailed file of Waste Collection Permits, Waste Facility Permits, Certificates of Registration, and Waste Licenses for all materials leaving the site.

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Aspect	Construction Phase Mitigation
	▪ On-Site Record-Keeping: Receipts from waste disposal facilities will be maintained to verify that waste has been transferred to licensed facilities. Waste Storage and Containment: Temporary storage and containment of waste on-site will follow strict safety and environmental guidelines: ▪ Designated Storage Areas: Clearly marked and appropriately contained areas will be set up for temporary waste storage to prevent contamination and ensure safety. ▪ Containment Procedures: All waste containers will be sealed and regularly inspected to prevent spills, leaks, or exposure to weather elements. ▪ Inventory and Inspection: Regular inspections will be carried out to ensure that stored waste complies with site management policies and does not pose environmental or safety risks. Management of the Movement of Waste All movement of waste and the use of waste contractors will be undertaken in accordance with waste legislation including the following: ▪ Waste Management Acts 1996 (as amended); ▪ Waste Management (Collection Permit) Regulations 2007 as amended; and ▪ Waste Management (Facility Permit and Registration) Regulations 2007 as amended. Turbine Re-use: ▪ At the end of their operational lifespan, turbines will be inspected and evaluated for functionality and safety standards. Where deemed suitable, turbines will be refurbished or maintained as necessary to meet second-hand market requirements.
Land & Soils (Ch. 8)	▪ A robust Construction Environmental Management Plan (CEMP) to be implemented ▪ The Proposed Development will be constructed in a phased manner in order to reduce the potential effects on the Soils and Geology. Phased construction reduces the amount of open, exposed excavations at any one time. ▪ Any excavation, piling and construction related works will be subject to a design risk assessment. Identified impacts will be minimised by the application of principles of avoidance, prevention and protection. ▪ Detailed method statements for each element of the works will be prepared by the Contractor ▪ Suitably qualified and experienced geotechnical personnel will be required on site to supervise the works. ▪ The Contractor will programme the works such that earthworks are not scheduled during severe weather conditions ▪ Spoil loaded onto sensitive topsoil, organic soils or sensitive mineral soils will be at a gradient of no more than an average of 5 degrees to the horizontal. Topsoils and organic soils will always be removed prior to such actions and retained for re-use as landscaping a material. ▪ Battering back the sides of an excavation to approx. 60 degrees in clay soils and 30 degrees in granular soils will be employed to reduce the potential for slippage. ▪ Action to be taken to ensure surface water flows does not compromise soils.

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Aspect	Construction Phase Mitigation
	▪ Excavated spoil will not be deposited on the down slope or up slope edges of any excavation. This spoil will instead be deposited on the two flanks either side of the excavation (where gradient is least) and spread in such a way as to limit the surcharge pressure on sensitive soils. ▪ The hardstanding areas surrounding the turbine bases will be designed in a manner such that crane loadings can be transferred directly onto the competent strata underlying any sensitive mineral soils. To ensure effective sidewall support during these operations the contractor will adopt an approved engineering solution (such as sheet piling or other bracing method) to maintain sidewall stability at all times. ▪ Movement can often occur during or following severe rainstorm events, particularly when following a prolonged dry spell. Extra vigilance will be maintained at such times, during construction to ward against this potential effect. ▪ All slopes are to be regularly checked for development of tension cracks indicative of slope movement. ▪ Method statements will be followed at all times. Where modification is required this will be agreed by the supervising engineer. ▪ Slopes will not be undercut, nor excavations left unsupported for periods in excess of 24 hours. Excavations are to be backfilled as soon as practicable. Excavation and filling operations shall be coordinated to minimise the time an excavation remains opened. ▪ Pore water pressure within excavations should be kept low at all times by draining or by installing sumps at regular intervals. This will prevent ponding of water within excavations which could increase hydraulic heads locally and potentially lead to instability. ▪ Soil Movement will be monitored regularly during the construction works, by means of regular site visits and assessments, by a suitably qualified and experienced professional. ▪ Only experienced and competent contractors will be appointed to carry out the construction works. ▪ Low ground bearing pressure machinery will be used for transport of construction materials in sensitive areas, where ground conditions dictate its requirement. ▪ Construction at less sensitive areas will be completed first to allow suitable construction practices to be established before works commence in the more difficult areas. ▪ Site staff will also undergo induction training to learn about the risks associated with working on “upland environments” and procedures aimed at reducing soil movement. ▪ Sufficient time should be allowed to carry out the works in a safe and timely manner. ▪ Mineral soil spoil disposal will take place at various locations within the wind farm land holding where low surface gradients combine with minimal peat depth and sufficient distance from sensitive receptors. Refer to CEMP. ▪ Spoil movements will be minimised by disposing of the material within or immediately adjacent to the construction footprint of the structure from whence it was excavated.

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Aspect	Construction Phase Mitigation
	▪ Preparation of Spoil Disposal sites will involve the removal of the topsoil which will be transferred to a specific location to be stockpiled and maintained for re-use during restoration operations. ▪ Spoil will be deposited, in layers of 0.50m and will not exceed a total thickness of 2.00m, unless contained by suitably designed berms. ▪ Spoil will only be deposited on slopes of < 5 degrees to the horizontal and greater than 10m from the top of a cutting. The exact location of such areas will be determined in consultation with the construction phase geotechnical specialist. ▪ Spoil Disposal Sites used will have a regular weekly assessment, made by the construction manager or other suitably qualified individual, to ensure that stability and good condition is maintained ▪ Once disposal is complete the disposal sites will be re-vegetated with the "Top Mat" removed at the commencement of disposal operations. Upon commencement of the restoration phase guidance from a suitably qualified ecologist will be sought to provide a suitable methodology and programme of maintenance for the restored areas. ▪ Drainage infrastructure will be put in place in advance of excavations. Drains will divert surface water and groundwater away from excavations into the existing and proposed surface drainage network. Uncontrolled, direct and concentrated discharges of water onto the ground surface will be avoided. ▪ Earthworks will not be commenced when heavy or sustained rainfall is forecast. A rainfall gauge will be installed on site to provide a record of rainfall intensity. An inspection of site stability and drainage by the Geotechnical Engineer will be carried out on site when a daily rainfall of over 25mm is recorded on site, works will only recommence after heavy rain with the prior approval of the Geotechnical Engineer following inspection. ▪ Vehicular movements will be restricted to the footprint of the Proposed Development and demarcated on-site visually. ▪ Vehicular traffic will be minimised through the re-use of excavated material reducing the need to source material from external quarries ▪ Best practice as described in the IWEA and Scottish Best Practice Guidelines will be applied during construction which will minimise double handling, again reducing the traffic. ▪ Fuel management procedures to be followed as per CEMP ▪ All materials used and wastes generated will be reduced by good practice and attention to the CEMP (EMP15 – Waste Management Plan). A policy of reduce, re-use and recycle will apply. ▪ All waste will be segregated and re-used where possible or removed for recycling. Any waste which is not recyclable or compostable will be properly disposed to landfill. ▪ Excavated spoil materials will be re-used close to the area of excavation.
Water & Hydrology (Ch. 9)	Possible Impacts on Groundwater Vulnerability: ▪ Implementing best practices for oil use and machinery refuelling to prevent any contamination of groundwater. ▪ All construction phase activities on-site will be carried out in strict accordance with a detailed Environmental Management Plan. ▪ EMP Monitoring to ensure adherence to best practices. Surface and Groundwater Contamination from Oil/Fuel Spills and Leaks:

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Aspect	Construction Phase Mitigation
	▪ Mitigation will include the following: ▪ All plant and machinery will be serviced before being granted access to the site; ▪ Designate specific areas for refuelling and maintenance in a controlled manned, located on impervious surfaces/bunded trays to prevent spills from spilling / seeping into the ground; ▪ Only trained personnel will handle refuelling and maintenance to reduce the likelihood of accidental spills; ▪ A comprehensive spill response plan and procedures will be in place, that can be actioned in the event of an accident or emergency; ▪ Refuelling and equipment maintenance will be prohibited near watercourses or drainage areas to minimise contamination risks; ▪ All drilling operations will be closely controlled, with continuous monitoring of fluid returns to ensure minimal impact and prompt response to any issues; ▪ All drilling fluid and lubricants shall be biodegradable and non-toxic; ▪ Silt fencing should be in place to prevent contaminated runoff from reaching. surface water; ▪ 20 m buffer zones should be in place around all watercourses where possible; ▪ All activities will be completed in line with the EMP. ▪ Wastewater/greywater from the temporary construction compound will be transferred offsite by a suitably licensed wastewater facility for treatment and disposal. Earthworks Leading to the Mobilization of Suspended Solids into Surface Waterbodies ▪ Silt fencing will be installed prior to commencement of works, around the perimeter of the work site and along watercourses boundaries (including field drains where there is connectivity to the streams adjacent to the site which drain into the Camlin River) to capture and retain sediment before it enters surface waters. These silt fences will be embedded into the local soil to ensure water is adequately captured and filtered reducing the likelihood of suspended sediment in surface water being transferred into the local watercourses and field drains. ▪ Earthmoving activities will be ceased during heavy rainfall to reduce the likelihood of erosion and runoff. Construction activities will be planned where possible during dry periods of low rainfall to minimise the risk of erosion and sediment mobilisation caused by heavy rain. ▪ Disturbed areas will be revegetated as quickly as possible once earthworks are completed to promote natural soil stabilisation and reduce sediment runoff. ▪ All groundworks should be completed in line with the CEMP. ▪ Daily monitoring and inspections of runoff, plus surface water near construction sites will be completed to detect any increases in suspended solids and take immediate corrective actions. Potential Effects on Surface and Groundwater WFD Status: ▪ No direct discharge to streams or rivers. All runoff from work areas will pass through an in-line water treatment system before being released via buffered outfalls to vegetated natural surfaces. Mitigation Measures for Construction Activities in Flood-Prone Areas: ▪ All topsoil and subsoil excavated during construction will be stored outside of the flood zone area to prevent loss or contamination during flooding events.

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Aspect	Construction Phase Mitigation
	▪ A flood protection berm will be constructed around the excavation area for T2 to shield it from potential floodwaters. ▪ Construction materials will either be stored within the protection berm or in areas outside the flood zone to ensure they remain dry and uncontaminated during flood events. ▪ Temporary drainage infrastructure will be installed to effectively manage stormwater runoff, preventing water accumulation and mitigating localized flooding during periods of heavy rainfall. ▪ Measures will be taken to secure all reinforcements, ensuring they are properly anchored and remain stable during potential flooding scenarios. ▪ Concrete pouring and other critical construction activities will be scheduled for the drier summer months to minimize the risk of flooding-related disruptions and to improve construction efficiency. ▪ All procedures outlined in Environmental Management Plan (EMP) 11 will be strictly followed when Met Éireann issues a weather warning, ensuring proactive response to extreme weather conditions. Surface water quality monitoring: Surface water quality monitoring will be completed at the discharge point (downstream of the buffered outfalls of the drainage system) plus in the unnamed stream which will run through the T2 infrastructure and the Camlin River. The monitoring will include the following: ▪ Visual inspection (colour, turbidity, odour, sheen) ▪ In-situ physio-chemical parameters including Temperature, pH and Conductivity
Biodiversity (Ch. 10)	Watercourses and Aquatic Ecology ▪ Surface Water Management Plan (SWMP) has been prepared as part of the Construction Environmental Management Plan (CEMP), ensuring compliance with guidance, legislation, and drainage design. This includes the following elements: ▪ Clean Water Cut-off Drains to divert water from disturbed zones and minimize contamination. ▪ Dirty Water Cut-off Drains to capture sediment-laden water and direct it to treatment facilities. ▪ Silt Fencing to capture sediment along watercourses and drainage paths, with regular inspections. ▪ Silt Busters to filter suspended solids from pumped water on-site. ▪ Silt Bags for passive filtration to reduce suspended solids before water discharge. ▪ Swales to capture and transport sediment-laden runoff to treatment areas. ▪ Check Dams in swales and drains to slow water flow and promote sediment deposition. ▪ Buffered Outfalls to release treated water gently onto vegetated ground, minimizing erosion risks. ▪ Settlement Ponds to capture sediment-laden runoff with rock aprons for flow regulation. ▪ Sedimats and Vegetation Filters for additional filtration after silt bags. ▪ Allow Revegetation.

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Aspect	Construction Phase Mitigation
	▪ Hydrologist Oversight: The Project Hydrologist ensures drainage controls are implemented according to the planning documents. ▪ Pre-emptive Strategies: Construction schedule will adapt to weather forecasts, minimizing runoff during heavy rainfall. ▪ Reactive Management: Monitoring by the Environmental Manager, halting work if siltation occurs and additional measures are needed. ▪ Field Monitoring: Regular monitoring of water parameters (pH, conductivity, temperature) and field chemistry, particularly after heavy rain. Habitats and Flora ▪ Habitat Preservation: The development avoids or minimises loss of habitats with high local or higher ecological value. ▪ Biodiversity Management and Enhancement Plan (BMEP): Includes restoration of grasslands, hedgerows, and pollinator habitats, with monitoring by an experienced ecologist. ▪ Root Protection Zones: Used to protect hedgerows and tree lines during construction, with measures to prevent unnecessary disturbance. ▪ Conduct Invasive Species Monitoring Mitigation for Terrestrial Mammals (Excluding Bats): ▪ Avoidance of Mammal Habitats: Setts and sensitive areas for mammals like badgers and otters are avoided. ▪ Pre-construction Walkover Survey: Identifies mammal resting/breeding places for exclusion zones and timing of construction activities. ▪ Construction Measures: ▪ Limiting construction to daylight hours. ▪ Providing escape points in excavations. ▪ Employing an Ecological Clerk of Works (ECoW) for monitoring mammal sensitivities. ▪ Exclusion Zones: For species like red squirrel, pine marten, otter, and badger, with NPWS licensing as required. Bats ▪ Noise Restrictions: Plant machinery will be turned off when not in use. All equipment will comply with the Construction Plant and Equipment Permissible Noise Levels Regulations ▪ Lighting Restrictions: Directional lighting will be used to avoid overspill onto adjacent hedgerows. Lighting, both will be designed to minimise light spillage to reduce impacts on surrounding habitats.
Ornithology (Ch 11)	▪ Displacement and/or disturbance impacts, and habitat degradation will be limited by controlling the movement of vehicles; vehicles will not encroach onto habitats beyond the Proposed Development footprint. ▪ Any vegetation clearance required, including the cutback and any clearance of hedgerows and scrub, will take place outside the breeding season (March to August, inclusive) unless permission is obtained from NPWS outside of these times. ▪ Where possible, construction will take place outside the breeding season to minimise disturbance and or displacement to breeding birds, but where works are necessary, there will be a commitment to undertake relevant pre-work surveys by the project ECoW or ornithologist;

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Aspect	Construction Phase Mitigation
	▪ All plant and equipment will conform with the Construction Plant and Equipment Permissible Noise Levels Regulations. ▪ Plant and equipment will be turned off when not in use, with no unnecessary revving.
Noise & Vibration (Ch. 12)	Regarding construction activities, reference shall be made to BS5228-1 (BSI 2014a), which offers detailed guidance on the control of noise and vibration from construction activities. It is proposed that various practices be adopted during construction as required, including the following: ▪ limiting the hours during which site activities likely to create high levels of noise or vibration are permitted. ▪ establishing channels of communication between the contractor/developer, Local Authority, and residents. ▪ appointing a site representative responsible for matters relating to noise and vibration. ▪ monitoring typical levels of noise and vibration during critical periods and at sensitive properties; and ▪ keeping the surface of the site access tracks even to mitigate the potential for vibration from lorries. Furthermore, a variety of practicable noise control measures will be employed. These include: ▪ regular maintenance and servicing of machinery. ▪ selection of plant with low inherent potential for generation of noise and/ or vibration. ▪ placing of noisy / vibratory plant as far away from sensitive properties as permitted by site constraints Noise The contract documents shall specify that the Contractor undertaking the construction of the works will be obliged to take specific noise abatement measures when deemed necessary to comply with the recommendations of BS5228-1 (BSI 2014a). The following list of measures will be considered, where necessary, to ensure compliance with the relevant construction noise criteria: ▪ No plant used on site will be permitted to cause an on-going public nuisance due to noise. ▪ The best means practicable, including proper maintenance of plant, will be employed to minimise the noise produced by on site operations. ▪ All vehicles and mechanical plant will be fitted with effective exhaust silencers and maintained in good working order for the duration of the contract. ▪ Compressors will be attenuated models, fitted with properly lined and sealed acoustic covers which will be kept closed whenever the machines are in use and all ancillary pneumatic tools shall be fitted with suitable silencers. ▪ Machinery that is used intermittently will be shut down or throttled back to a minimum during periods when not in use. ▪ Any plant, such as generators or pumps, which is required to operate before 07:00hrs or after 19:00hrs will be surrounded by an acoustic enclosure or portable screen. ▪ During the construction programme, supervision of the works will include ensuring compliance that significant noise effects are avoided.

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Aspect	Construction Phase Mitigation
	▪ The hours of construction activity will be limited to avoid unsociable hours where possible. Construction operations shall generally be restricted to between 7:00hrs and 19:00hrs Mondays to Fridays and to between 7:00hrs and 14:00hrs on Saturdays. However, to ensure that optimal use is made of good weather period or at critical periods within the programme (i.e., concrete pours) or to accommodate delivery of large turbine component along public routes it could be necessary on occasion to work outside of these hours. Vibration It is recommended that vibration from construction activities be limited to the values set out in Table 12.4. of chapter 12.
Air Quality (Ch. 13)	▪ Develop and implement a stakeholder communications plan that includes community engagement before works commence on site. Community engagement includes explaining the nature and duration of the works to local residents and businesses. ▪ 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 should also include head/regional office contact details. ▪ During working hours, dust control methods will be monitored as appropriate, depending on the prevailing meteorological conditions. Dry and windy conditions are favourable to dust suspension. Therefore, mitigations must be implemented if undertaking dust generating activities during these weather conditions. ▪ 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. ▪ Record any exceptional incidents that cause dust and/or air emissions, either on- or off-site, and the action taken to resolve the situation in the log book. ▪ Hold regular liaison meetings with other high risk construction sites within 250 m of the site boundary where feasible, to ensure plans are co-ordinated and dust and particulate matter emissions are minimised. It is important to understand the interactions of the off-site transport/deliveries which might be using the same strategic road network routes. ▪ Plan site layout so that machinery and dust causing activities are located away from receptors, as far as is possible. ▪ Erect solid screens or barriers around dusty activities or the site boundary that are at least as high as any stockpiles on site. ▪ Avoid site runoff of water or mud. ▪ Keep site fencing, barriers and scaffolding clean using wet methods. ▪ Remove materials that have a potential to produce dust from site as soon as possible, unless being re-used on site. If they are being re-used on-site cover as described below. ▪ Cover, seed or fence stockpiles to prevent wind whipping. ▪ Ensure all vehicles switch off engines when stationary - no idling vehicles. ▪ Avoid the use of diesel or petrol powered generators and use mains electricity or battery powered equipment where practicable. ▪ Impose and signpost a maximum-speed-limit of 15 kph haul roads and work areas (if long haul routes are required these speeds may be increased with suitable additional control measures provided, subject to the approval of the

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Aspect	Construction Phase Mitigation
	nominated undertaker and with the agreement of the local authority, where appropriate). ▪ Produce a Construction State Traffic Management Plan to manage the sustainable delivery of goods and materials. ▪ Implement a Travel Plan that supports and encourages sustainable travel (public transport, cycling, walking, and car-sharing). ▪ Only use cutting, grinding or sawing equipment fitted or in conjunction with suitable dust suppression techniques such as water sprays or local extraction, e.g., suitable local exhaust ventilation systems. ▪ Ensure an adequate water supply on the site for effective dust/particulate matter suppression/mitigation, using non-potable water where possible and appropriate. ▪ Use enclosed chutes and conveyors and covered skips. ▪ Minimise drop heights from conveyors, loading shovels, hoppers and other loading or handling equipment and use fine water sprays on such equipment wherever appropriate. ▪ Ensure equipment is readily available on site to clean any dry spillages and clean up spillages as soon as reasonably practicable after the event using wet cleaning methods. ▪ No bonfires or burning of waste materials. ▪ Re-vegetate earthworks and exposed areas/soil stockpiles to stabilise surfaces as soon as practicable. ▪ Use Hessian, mulches or trackifiers where it is not possible to re-vegetate or cover with topsoil, as soon as practicable. ▪ Only remove the cover in small areas during work and not all at once. ▪ During dry and windy periods, and when there is a likelihood of dust nuisance, a bowser will operate to ensure moisture content is high enough to increase the stability of the soil and thus suppress dust. ▪ Ensure sand and other aggregates are stored in bunded areas and are not allowed to dry out, unless this is required for a particular process, in which case ensure that appropriate additional control measures are in place. ▪ Ensure bulk cement and other fine powder materials are delivered in enclosed tankers and stored in silos with suitable emission control systems to prevent escape of material and overfilling during delivery. ▪ For smaller supplies of fine power materials ensure bags are sealed after use and stored appropriately to prevent dust. ▪ A speed restriction of 15 kph will be applied as an effective control measure for dust for on-site vehicles. ▪ Avoid dry sweeping of large areas. ▪ Ensure vehicles entering and leaving sites are covered to prevent escape of materials during transport. ▪ Inspect on-site haul routes for integrity and instigate necessary repairs to the surface as soon as reasonably practicable. ▪ Record all inspections of haul routes and any subsequent action in a site log book. ▪ Install hard surfaced haul routes, which are regularly damped down with fixed or mobile sprinkler systems, or mobile water bowsers and regularly cleaned. ▪ Implement a wheel washing system (with rumble grids to dislodge accumulated dust and mud prior to leaving the site where reasonably practicable).

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Aspect	Construction Phase Mitigation
	▪ Ensure there is an adequate area of hard surfaced road between the wheel wash facility and the site exit, wherever site size and layout permits. ▪ Access gates to be located at least 10 m from receptors where possible. ▪ Undertake daily on-site and off-site inspections, where receptors (including roads) are nearby, to monitor dust, record inspection results in the site inspection log. This should include regular dust soiling checks of surfaces such as street furniture, cars and windowsills within 100 m of site boundary, with cleaning to be provided if necessary. ▪ Increase the frequency of site inspections by the person accountable for air quality and dust issues on site when activities with a high potential to produce dust are being carried out and during prolonged dry or windy conditions. ▪ Monitoring of construction dust deposition along the site boundary near to nearby sensitive receptors during the construction phase of the proposed development is recommended to ensure mitigation measures are working satisfactorily. This can be carried out using the Bergerhoff method in accordance with the requirements of the German Standard VDI 2119. The Bergerhoff Gauge consists of a collecting vessel and a stand with a protecting gauge. The collecting vessel is secured to the stand with the opening of the collecting vessel located approximately 2m above ground level. The TA Luft limit value is 350 mg/m2/day during the monitoring period of 30 days (+/- 2 days).
Climate (Ch. 14)	▪ Appointing a suitably competent contractor who will undertake waste audits detailing resource recovery best practice and identify materials can be reused/recycled; ▪ Use of low carbon concrete during construction; ▪ Consideration of the use of locally sourced lower carbon options where feasible; ▪ Alignment with the local and national climate action plans; ▪ Materials will be reused on site where possible; ▪ Prevention of on-site or delivery vehicles from leaving engines idling, even over short periods; ▪ Ensure all plant and machinery are well maintained and inspected regularly; ▪ Minimising waste of materials due to poor timing or over ordering on site will aid to minimise the embodied carbon footprint of the site; and ▪ Sourcing materials locally where possible to reduce transport related CO2 emissions.
Cultural Heritage: (Ch. 15)	As part of the Construction Phase mitigation measures, all groundworks within the main development area (Turbines, Met Mast & Associated Infrastructure Works) should be archaeologically monitored to ensure that previously unknown no sub-surface archaeological remains are not directly impacted by the proposed development. The proposed directional drilling in proximity to historic bridges should also be archaeologically monitored to ensure that previously unknown archaeological remains are not directly impacted by the proposed works. In addition, it is also recommended that ground works in proximity to known archaeological monuments should also be archaeologically monitored. Should previously unknown archaeological remains be uncovered during the course of archaeological monitoring, further mitigation measures may be required subject to consultation and agreement with the National Monuments Service.

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Table 17.3 Operational Phase Mitigation

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Aspect	Operational Phase Mitigation
Population & Human Health (Ch. 4)	▪ Other than mitigation incorporated in the design and mitigation measures outlined in other chapters of this EIAR relating to human health, no further mitigation measures are proposed with respect to population and human health.
Landscape & Visual (Ch. 5)	▪ There are no specific landscape and visual operational stage mitigation measures
Material Assets: Traffic & Transport (Ch. 6)	▪ Where practical, operational maintenance staff will be encouraged to vehicle share car pool travelling to and from the site. ▪ Sightlines will have to be maintained at the access from the L50462 to the substation and wind turbine sites. Where vegetation and foliage regrowth occurs within the public road area, this can be undertaken by the local authority as part of routine road maintenance activities, while any maintenance within the operator's lands/private lands would be undertaken by the operator/landowner.
Material Assets: Built Services (Ch. 7)	▪ See Construction Stage Mitigation Measures
Land & Soils (Ch. 8)	▪ All wastes from the substation, battery storage and ancillary facilities will be removed by the appropriate contractor. The operational team will carry out maintenance works (to Site Access Tracks, Substation, Battery Energy Storage and Turbines) and will put in place control measures to mitigate the risk of hydrocarbon or oil spills during the operational phase of the windfarm ▪ Any vehicles utilised during the operational phase will be maintained on a weekly basis and checked daily to ensure any damage or leakages are corrected. ▪ Fuels, lubricants and hydraulic fluids for equipment used will be carefully handled to avoid spillage. ▪ Any spillage of fuels, lubricants or hydraulic oils will be immediately contained, and the contaminated soil removed from the site and properly disposed of ▪ Waste oils and hydraulic fluids will be collected in leak-proof containers and removed from the site for recycling ▪ Appropriate spill control equipment, such as oil soakage pads, will be kept within the refuelling areas and in each item of plant to deal with any accidental spillage.
Water & Hydrology (Ch. 9)	Increased Storm Water Run-off: ▪ Storm water attenuation so that any increase in discharge volume during storm events are gradual and controlled, preventing an increase in the flood risk downstream. ▪ Drainage discharge points will be inspected and managed throughout the Operational stage of the project. Potential Impacts on Surface Water Quality: ▪ Water management system specifically designed to prevent surface water contamination from suspended solids, hydrocarbons, and other pollutants. This system will include features such as sediment control measures, oil-water separators, and filtration mechanisms to ensure that runoff from operational activities is properly managed. ▪ All maintenance activities on site will be completed in accordance with the EMP. Potential Impacts on Groundwater Quality: ▪ All plant and machinery will be serviced before being granted access to the site;

Aspect	Operational Phase Mitigation
	▪ Designate specific areas for refuelling and maintenance in a controlled manned, located on impervious surfaces/bunded trays to prevent spills from spilling / seeping into the ground; ▪ Only trained personnel will handle refuelling and maintenance to reduce the likelihood of accidental spills; ▪ A comprehensive spill response plan and procedures will be in place, that can be actioned in the event of an accident or emergency; ▪ Refuelling and equipment maintenance will be prohibited near watercourses or drainage areas to minimise contamination risks; ▪ Silt fencing should be in place to prevent contaminated runoff from reaching surface water; ▪ 20 m buffer zones should be in place around all watercourses where possible; ▪ Avoid use of herbicides for vegetation control around turbines and access roads. Where herbicides are necessary, use environmentally friendly alternatives and apply them following strict guidelines to prevent infiltration into groundwater; ▪ All activities will be completed in line with the EMP. ▪ Conduct baseline groundwater quality testing before the wind farm becomes operational to establish existing conditions; ▪ Implement a regular groundwater monitoring program to detect any potential contamination early and take immediate corrective action; Potential Impacts on Designated Sites: ▪ Implementation of the mitigation measures for protection of surface and groundwater as outlined in above will also ensure that Ballykenny-Fisherstown Bog SPA will not be affected by the Proposed Development. Potential Impacts on WFD Status: ▪ Strict mitigation measures regarding hydrocarbon use and the prevention of increased suspended solids during the operation phase will ensure the protection of the Surface and Groundwater Water Framework Directive (WFD) status. ▪ All runoff from work areas will pass through an in-line water treatment system before being released via buffered outfalls to vegetated natural surfaces.
Biodiversity (Ch. 10)	▪ Maintain Settlement Ponds and Check Dams within the drainage system ▪ Allow Revegetation of Drainage Channels and Roadsides. ▪ Implement Surface Water Management Plan (SWMP), including clean and dirty water cut-off drains. ▪ Monitoring by Project Hydrologist and Environmental Manager ▪ Follow a Biodiversity Management and Enhancement Plan ▪ Enforce Root Protection Zones ▪ Execute Bat Monitoring and Mitigation Plan (BMMP) ▪ Support habitat recovery through Biodiversity Management and Enhancement Plan
Ornithology (Ch 11)	Once operational, the availability of suitable habitats in the area will not significantly decrease. Given the buffer distance from the Camlin and adjacent grasslands and the final turbine layout, no significant disturbance or displacement of avian species is anticipated. Collision Risk Assessment modelling indicated no greater than low impacts for any avian receptors, and no evidence of a barrier effect caused by the

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Aspect	Operational Phase Mitigation
	Proposed Development was identified. Therefore, no mitigation measures are required for the operational phase.
Noise & Vibration (Ch 12)	The findings of the assessment confirmed that the predicted operational noise levels from the Proposed Development will be within the relevant best practice noise criteria. Therefore, no specific mitigation measures are required.
Air Quality (Ch. 13)	▪ There is no mitigation required for the operational phase of the development
Climate (Ch. 14)	▪ All on-site employees and contractors will ensure that machinery used is properly maintained and is switched off when not in use to avoid unnecessary exhaust emissions from maintenance traffic. ▪ Incorporating sustainable drainage systems (SuDS) to manage excess surface water runoff, such as swales and attenuation ponds will reduce flood risk across the entire site. These measures, combined with regular maintenance and flood monitoring, will help ensure the resilience of the site to future flooding scenarios.
Cultural Heritage: (Ch. 15)	▪ There are no additional mitigation measures available to completely negate the current indirect visual impact on the Cultural Assets identified during the operational phase.

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Table 17.4 Decommissioning Phase Mitigation

Aspect	Decommissioning Phase Mitigation
Population & Human Health (Ch. 4)	The mitigation measures outlined for the construction phase will also be implemented during the decommissioning phase. A decommissioning plan will be agreed with the local authorities prior to decommissioning of the Proposed Development.
Landscape & Visual (Ch. 5)	▪ There are no specific landscape and visual decommissioning stage mitigation measures
Material Assets: Traffic & Transport (Ch. 6)	▪ A decommissioning plan will be prepared for agreement with LCC including a traffic management plan and mitigation measures similar to those implemented during the construction phase will be put in place.
Material Assets: Built Services (Ch. 7)	▪ As per Construction Stage Mitigation Measures
Land & Soils (Ch. 8)	▪ Mitigation measures applied during decommissioning activities will be similar to those applied during construction where relevant.
Water & Hydrology (Ch. 9)	Possible Impacts on Groundwater Vulnerability: ▪ Implementing best practices for oil use and machinery refuelling to prevent any contamination of groundwater. ▪ All construction phase activities on-site will be carried out in strict accordance with a detailed Environmental Management Plan. ▪ EMP Monitoring to ensure adherence to best practices. Surface and Groundwater Contamination from Oil/Fuel Spills and Leaks: ▪ Mitigation will include the following: ▪ All plant and machinery will be serviced before being granted access to the site; ▪ Designate specific areas for refuelling and maintenance in a controlled manned, located on impervious surfaces/bunded trays to prevent spills from spilling / seeping into the ground;

Aspect	Decommissioning Phase Mitigation
	▪ Only trained personnel will handle refuelling and maintenance to reduce the likelihood of accidental spills; ▪ A comprehensive spill response plan and procedures will be in place, that can be actioned in the event of an accident or emergency; ▪ Refuelling and equipment maintenance will be prohibited near watercourses or drainage areas to minimise contamination risks; ▪ All drilling operations will be closely controlled, with continuous monitoring of fluid returns to ensure minimal impact and prompt response to any issues; ▪ All drilling fluid and lubricants shall be biodegradable and non-toxic; ▪ Silt fencing should be in place to prevent contaminated runoff from reaching. surface water; ▪ 20 m buffer zones should be in place around all watercourses where possible; ▪ All activities will be completed in line with the EMP. ▪ Wastewater/greywater from the temporary construction compound will be transferred offsite by a suitably licensed wastewater facility for treatment and disposal. Earthworks Leading to the Mobilization of Suspended Solids into Surface Waterbodies ▪ Silt fencing will be installed prior to commencement of works, around the perimeter of the work site and along watercourses boundaries (including field drains where there is connectivity to the streams adjacent to the site which drain into the Camlin River) to capture and retain sediment before it enters surface waters. These silt fences will be embedded into the local soil to ensure water is adequately captured and filtered reducing the likelihood of suspended sediment in surface water being transferred into the local watercourses and field drains. ▪ Earthmoving activities will be ceased during heavy rainfall to reduce the likelihood of erosion and runoff. Construction activities will be planned where possible during dry periods of low rainfall to minimise the risk of erosion and sediment mobilisation caused by heavy rain. ▪ Disturbed areas will be revegetated as quickly as possible once earthworks are completed to promote natural soil stabilisation and reduce sediment runoff. ▪ All groundworks should be completed in line with the CEMP. ▪ Daily monitoring and inspections of runoff, plus surface water near construction sites will be completed to detect any increases in suspended solids and take immediate corrective actions. Potential Effects on Surface and Groundwater WFD Status: ▪ No direct discharge to streams or rivers. All runoff from work areas will pass through an in-line water treatment system before being released via buffered outfalls to vegetated natural surfaces. Mitigation Measures for Decommissioning Activities in Flood-Prone Areas: ▪ All topsoil and subsoil excavated during construction will be stored outside of the flood zone area to prevent loss or contamination during flooding events. ▪ A flood protection berm will be constructed around the excavation area for T2 to shield it from potential floodwaters. ▪ Construction materials will either be stored within the protection berm or in areas outside the flood zone to ensure they remain dry and uncontaminated during flood events.

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Aspect	Decommissioning Phase Mitigation
	▪ Temporary drainage infrastructure will be installed to effectively manage stormwater runoff, preventing water accumulation and mitigating localized flooding during periods of heavy rainfall. ▪ Measures will be taken to secure all reinforcements, ensuring they are properly anchored and remain stable during potential flooding scenarios. ▪ Construction activities will be scheduled for the drier summer months to minimize the risk of flooding-related disruptions and to improve construction efficiency. ▪ All procedures outlined in Environmental Management Plan (EMP) 11 will be strictly followed when Met Éireann issues a weather warning, ensuring proactive response to extreme weather conditions. Surface water quality monitoring: ▪ Surface water quality monitoring will be completed at the discharge point (downstream of the buffered outfalls of the drainage system) plus in the unnamed stream which will run through the T2 infrastructure and the Camlin River. The monitoring will include the following: ○ Visual inspection (colour, turbidity, odour, sheen) ○ In-situ physio-chemical parameters including Temperature, pH and Conductivity
Biodiversity (Ch. 10)	Mitigation measures for decommissioning will be similar to those for the construction phase, and will include pre-construction surveys of the site and the surrounding area, for the full range of flora and fauna. Mitigation will then be tailored to suit the baseline ecological condition found on the site at that time. However the magnitude required will be less, as track and turbine installation will not be required.
Ornithology (Ch 11)	During the decommissioning phase, disturbance limitation measures will follow from the construction phase described in Table 5 above. In addition, if winter roosting or breeding activity of birds of high conservation concern identified within monitoring activities, no works shall be undertaken within a species-specific buffer (as per Goodship, N.M. and Furness, R.W. 2022), in line with industry best practice. No works shall be permitted within the buffer until it can be demonstrated that the roost/nest is no longer occupied.
Noise & Vibration (Ch. 12)	The decommissioning will entail similar activities to the construction phase. The mitigation measures described for the construction phase will also be applied to the decommissioning phase in order to ensure noise levels remain within criteria.
Air Quality (Ch. 13)	Mitigation measures as per the construction phase mitigation are applied.
Climate (Ch. 14)	Mitigation measures as per the construction phase mitigation are applied.
Cultural Heritage: (Ch. 15)	Prior to the decommissioning phase, an updated Archaeological Impact Assessment should be prepared incorporating potential changes to the legislative environment and associated baseline data used in the compilation of this EIAR chapter.

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17.4 Monitoring Measures

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Table 17.5 below summarise the recommended monitoring measures for the proposed development.

Table 17.5 Monitoring

Aspect	Monitoring
Population & Human Health (Ch. 4)	▪ No specific monitoring is proposed in relation to this section. Monitoring of standard construction mitigation measures as outlined in this EIAR will be undertaken by the appointed contractor. ▪ Where required, monitoring for other environmental aspects associated with the Proposed Development which may be human related are discussed in the relevant chapters of this EIAR.
Landscape & Visual (Ch. 5)	None
Material Assets: Traffic & Transport (Ch. 6)	▪ A detailed CTMP will be prepared for construction and decommissioning of the proposed development with reference to the TMP will be implemented in conjunction with the requirements of the Local Authority Roads Departments and the TII. Good record keeping on deliveries, and a requirement for vehicle tracking data for large loads will confirm that all haulage operators are following the agreed procedures and routes to and from the wind farm site and the temporary accommodation works sites, including a log of delivery times, dates and loads transported. ▪ An initial visual inspection and record photographs of road pavement conditions and existing road signage from the N4 to the wind farm site via the proposed delivery haul route will be completed to provide a benchmark and regular agreed monitoring after periods of high-volume delivery activities (stone and concrete deliveries, and wind turbine deliveries), will identify any issues so that measures can be implemented in a timely manner. ▪ Public liaison officer to report to client and contractor of any feedback from LCC or members of the public.
Material Assets: Built Services (Ch. 7)	None additional to Mitigation set out in section 17.3
Land & Soils (Ch. 8)	▪ All drainage systems will be properly maintained at regular intervals. ▪ Excavations, slopes, disposal sites and roads will be inspected and audited regularly for signs of soil or spoil movement and where possible, early warning systems will be established. ▪ Regular analysis of watercourses will be undertaken. Refer to Chapter 9, Water and Hydrology for further details. ▪ All activity on site, and at site boundaries, including plant and visitors, will be monitored and a register kept. ▪ Only authorised and suitably qualified personnel on-site – access will be strictly controlled at all times.
Water & Hydrology (Ch. 9)	▪ Surface water quality monitoring should be completed during all phases of the Proposed Development. Surface water quality monitoring will be completed at the discharge point (downstream of the buffered outfalls of the drainage system) plus in the unnamed stream which will run through the T2 infrastructure and the Camlin River. The monitoring will include the following: • Visual inspection (colour, turbidity, odour, sheen) • In-situ physio-chemical parameters including: Temperature, pH and Conductivity

Aspect	Monitoring
Biodiversity (Ch. 10)	**General Pre-Construction Confirmation Surveys** ▪ To prevent accidental disturbance to resting places of mammals (badgers, red squirrel, pine marten, otter and hedgehog), an ecological walkover survey will be undertaken prior to any construction activities within the development footprint. Similarly, trees within the works corridor and grid route will be re-assessed for bat roosting potential, with any inspections or emergence surveys carried out as required. Checks for nesting birds will be required for construction undertaken during the bird breeding season. If nests are recorded, ongoing monitoring and appropriate exclusion zones will be implemented to determine when and where works can proceed. If exclusion zones cannot be implemented, NPWS will be contacted and based on their advice, additional mitigation and compensation will be implemented, with relevant licences applied for if required. **Water Quality (During and Post-Construction)** ▪ A construction-phase Surface Water Monitoring Plan (SWMP) has been developed and can be seen accompanying this EIAR. ▪ This sets out specific parameters, inspection routines, and reporting protocols to manage water quality impacts during and after construction and assessed against pre and post construction conditions. Monitoring at three designated surface water locations will measure key indicators, including Nitrogen as NH4, BOD, chlorides, nitrates, pH, phosphates, and total suspended solids. **Construction Phase Monitoring** ▪ **Daily Visual Inspections:** Site drains and outfalls will be visually inspected daily to check for sediment build-up or obstructions, with extra attention following heavy rainfall. Any deviations in suspended solids compared to baseline levels will prompt further inspection and potential mitigation. Records, including photos, will document inspection results. ▪ **Water Monitoring:** Water monitoring devices will track turbidity, flow rate, and water depth at specific site locations, supplemented by daily visual checks to ensure consistent oversight. ▪ **Monthly Laboratory Tests:** Monthly lab analysis at baseline locations (SW1-SW3) will track construction impacts on water quality, with additional sampling points as needed. ▪ **Monthly Laboratory Tests**: Weekly field measurements of pH, temperature, and conductivity, plus checks after rainfall, will complement laboratory results. Field assessments will help the Project Hydrologist advise on real-time water quality trends. **Reporting and Post-Construction Monitoring** ▪ The Environmental Clerk of Works will compile visual inspection and lab results to evaluate drainage and pollution controls. Regular reporting at site meetings will summarise these findings, compare them to baseline data, and document any necessary corrective actions. ▪ After construction, monthly sampling and analysis will continue until monitoring results indicate no adverse impacts on water quality, as verified by the Project Hydrologist. This comprehensive monitoring approach ensures that water quality remains protected throughout and beyond the project timeline. **Bats Post Construction** ▪ The Bat Monitoring and Mitigation Plan (BMMP) includes several measures which will be monitored and assessed to reduce bat collisions with wind

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Aspect	Monitoring
	turbines. Key strategies involve feathering (adjusting turbine blade angles), curtailment (limiting turbine operation under certain conditions), Enercon's SCADA Bat Protection, and casualty searches to monitor fatalities. If monitoring reveals a significant number of bat collisions, additional actions, such as increased feathering or further curtailment, may be implemented in coordination with the Planning Authority and the National Parks and Wildlife Service (NPWS). ▪ Further mitigation steps will be implemented if monitoring records significant impacts on local bat populations. The monitoring process will assess the effectiveness of these adjustments in conjunction with consultation with NPWS and refine the strategy as needed. Please refer to Appendix 10.2 for the full BMMP.

Ornithology (Ch 11)	**Pre-construction Monitoring**
	▪ To minimise disturbance during the avian breeding season, construction activities will commence outside this period, which falls between 1st March and 31st August (inclusive).
	▪ Before commencing any work at the Study Area, a qualified ornithologist will undertake confirmatory bird surveys within one month of the start date. These surveys aim to identify any sensitive sites, such as roosting locations, within a 500-meter radius of the development footprint and all work areas where access permits.
	▪ If construction works extend into subsequent breeding or winter seasons following commencement, pre-construction surveys will be repeated to identify any new sensitive sites (e.g., nests). Additionally, breeding season surveys (where applicable) will be conducted once per month from April to July inclusive.
	▪ The ornithologist will conduct a thorough walkover survey of the development area. If winter roosts or nests of high conservation concern bird species are identified, the location will be earmarked for continued monitoring throughout the construction works.
	▪ Toolbox talks will inform all site personnel and subcontractors of any restrictions. A clear map demarcating the "no-work zone" will be provided to construction staff. The restricted area will also be physically marked on-site to alert personnel to the work suspension within that specific area.
	Operational Phase Avian Monitoring
	▪ Bird surveys will continue during the operational phase at the VP locations used pre-construction, taking note of any bird behaviour indicative of avoidance or change of activity from baseline studies. The timing and extent of bird surveys will be agreed with NPWS. If there are detectable changes in bird behaviour or collisions are greater than those predicted, then additional mitigation, such as curtailing operation times, may be required. A detailed Operational Avian Monitoring Programme has been prepared for the project's operational phase and can be seen in Appendix 11.4. The monitoring programme includes:
	  ▪ Breeding bird surveys
	  ▪ Winter bird surveys; and
	  ▪ Targeted bird collision surveys (corpse searches).
	▪ The monitoring programme was not proposed in response to any identified significant effect but rather as a best practice measure (SNH, 2009). The monitoring is comprehensive and considered entirely adequate in this regard.
	Decommissioning Phase Avian Monitoring

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Aspect	Monitoring
	▪ Taking a precautionary approach, it is proposed that work commence outside the bird nesting season (1st of March to 31st of August inclusive). Decommissioning monitoring surveys will be undertaken prior to works associated with decommissioning at the Proposed Development. The surveys will include a thorough walkover survey of a 500m radius of the development footprint and all work areas. Any requirement for decommissioning works to run into the subsequent breeding season following commencement will be subject to a repeat of the decommissioning bird surveys to confirm the absence of breeding birds of conservation concern. If winter roosting or breeding activity of birds of high conservation concern is identified, the roost or nest site will be located and earmarked for monitoring at the beginning of the first winter or breeding season of the decommissioning phase. **Avian Monitoring Reporting** ▪ At the conclusion of each designated monitoring period, a report summarising the findings of bird and collision monitoring surveys will be submitted to the Planning Authority and the National Parks and Wildlife Service. This report will present the survey results, evaluate potential impacts on birds, with a particular focus on Avian KERs and offer recommendations that may guide additional mitigation measures during the operational phase of the Proposed Development.
Noise & Vibration (Ch. 12)	▪ Commissioning noise surveys will be undertaken to ensure compliance with any noise conditions applied to the development. In the unlikely instance that an exceedance of these noise criteria is identified, the assessment guidance outlined in the IOA GPG and Supplementary Guidance Note 5: Post Completion Measurements (July 2014) should be followed, and relevant corrective actions will be taken. For example, implementation of noise operational modes resulting in curtailment of turbine operation can be implemented for specific turbines in specific wind conditions to ensure predicted noise levels are within the relevant noise criterion curves/planning conditions. Such curtailment can be applied using the wind farm SCADA system without undue effect on the wind turbine performance.
Air Quality (Ch. 13)	▪ During working hours at construction stage, dust control methods will be monitored, in addition to the prevailing meteorological conditions. Dry, windy weather has the potential to increase the potential for dust impacts at sensitive receptors. ▪ Undertake daily on-site and off-site inspections during construction, where receptors (including roads) are nearby, to monitor dust, record inspection results in the site inspection log. This should include regular dust soiling checks (by visual inspection) of surfaces such as street furniture, cars and windowsills within 100 m of site boundary, with cleaning to be provided if necessary. ▪ Increase the frequency of site inspections by the person accountable for air quality and dust issues on site when construction activities with a high potential to produce dust are being carried out, and during prolonged dry or windy conditions. ▪ Monitoring of construction dust deposition along the site boundary to nearby sensitive receptors during the construction phase of the proposed development is recommended to ensure mitigation measures are working satisfactorily. This can be carried out using the Bergerhoff method in accordance with the

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Aspect	Monitoring
	requirements of the German Standard VDI 2119. The Bergerhoff Gauge consists of a collecting vessel and a stand with a protecting gauge. The collecting vessel is secured to the stand with the opening of the collecting vessel located approximately 2m above ground level. The TA Luft limit value is 350 mg/m2/day during the monitoring period of 30 days (+/- 2 days).
Climate (Ch. 14)	▪ The construction phase will include the monitoring of waste management and material use to ensure they are minimized and handled responsibly. Efforts will be made to source materials locally where possible, reducing the carbon footprint and supporting local suppliers. Regular audits and tracking will help ensure compliance with best practices in sustainability and resource efficiency throughout the project. ▪ During the operational phase each turbine will be monitored off-site by the wind turbine supplier. The monitoring of turbine output, performance, wind speeds, and responses to any key alarms will be monitored at an off-site control centre 24-hours per day. Weather conditions will also be continuously monitored during the construction phase to anticipate potential adverse events, allowing the team to take precautionary measures, such as pausing work during extreme weather to ensure safety and protect equipment.
Cultural Heritage: (Ch. 15)	Archaeological monitoring is carried out under licence from the National Monuments Service. Archaeological monitoring is the recommended mitigation strategy for the following: ▪ Turbine Delivery Route: Monitoring of the demolition of vernacular outbuilding located at the junction of L1011 and L5046. ▪ Main Turbine Development Area: Monitoring of all groundworks within the footprint of the main development area. ▪ Grid Connection Route Option 1: Monitoring of all groundworks at RMP LF008-043 (Site of Ford) of which no visible trace survives, and the exact location is not known. ▪ Grid Connection Route Option 3: Monitoring of all groundworks from Ballinalee Road to Sub-station. Proposed route is adjacent to the Zone of Notification associated with RMP LF013-016001 (Medieval Church) and RMP LF013-016002 (Graveyard).

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