LAND, SOILS AND GEOLOGY

Ballydermot Wind Farm, Co. Offaly and Co. Kildare

Chapter 8 Land Soils and Geology

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GLOSSARY OF TERMS

Terms	Definition
Geology	The science that deals with the earth's physical structure and substance, its history and the processes that act on it.
Hardstanding	Levelled assembly areas comprising of compacted stone surface or concrete surface to support plant and machinery.
Peat Probing	A method used to measure the depth of peat deposits by pushing specialised, narrow and lightweight rods into the ground until resistance is met.
Piling	A construction technique whereby deep columns are drilled or driven into the ground to provide foundation support.
Morphology	Geological Form or Structure.

GLOSSARY OF ACRONYMS

Acronym	Definition
BMP	Biodiversity Management Plan
CGS	County Geological Site
CO_2	Carbon Dioxide
cSAC	Candidate Special Areas of Conservation
EIAR	Environmental Impact Assessment Report
FoS	Factor of Safety
FTC	Fehily Timoney and Company

GPSRA	Geotechnical Peat Stability Assessment Report
GSI	Geological Survey of Ireland
ha	Hectares
HES	Hydro-Environmental Services
IEL	Industrial Emissions Licensing
ITM	Irish Transverse Mercator[1]
IPC	Integrated Pollution Control
KCC	Kildare County Council
LiDAR	Light Detection and Ranging
NHA	Natural Heritage Area
Nox	Oxides of Nitrogen
OCC	Offaly County Council
PCAS	Peatland Climate Action Scheme
PLHRAG	Peat Landslide Hazard and Risk Assessments: Best Practice Guide for Proposed Electricity Generation Developments
pNHA	Proposed Natural Heritage Area
PSD	Particle Size Distribution
rEIAR	Remedial Environmental Impact Assessment Report
rNIS	Remedial Natura Impact Statement
SAC	Special Area of Conservation
SNH	Scottish Natural Heritage
SO_2	Sulphur Dioxide
SPA	Special Protection Areas
SPT	Standard Penetration Test

[1] *Coordinate Converter Available here: https://gnss.osi.ie/new-converter/*

8. LAND SOILS AND GEOLOGY

8.1 Introduction

8.1.1 Background and Objectives

Hydro-Environmental Services (HES) was engaged by MKO, on behalf of Bord na Móna Powergen (BnM) (the Applicant), to carry out an assessment of the potential likely and significant effects of the Proposed Project on the land, soil and geological environment.

As detailed in Section 1.1.1 in Chapter 1 Introduction, for the purposes of this Environmental Impact Assessment Report (EIAR), the various project components are described and assessed using the following references: 'Proposed Project', 'Proposed Enhancement Areas', 'Proposed Construction Haul Routes', 'Proposed Turbine Delivery Route', 'Project Site', 'Proposed Wind Farm', 'Proposed Turbines', 'Proposed Grid Connection', 'Proposed Onsite Substation' and 'Proposed Offsite Substation'.

The Proposed Project is described in full in Chapter 4 of this EIAR. The Proposed Project encompasses the Proposed Wind Farm, Proposed Grid Connection, Proposed Enhancement Areas, Proposed Construction Haul Routes and Proposed Turbine Delivery Route. The Project Site relates to the Planning Application Boundary. The Land, Soils and Geology Study Area, as described in Section 8.2.1, is used in this chapter of the EIAR.

Where the 'Proposed Wind Farm site' is referred to, this represents the area encompassing the Proposed Wind Farm, the Proposed Onsite Substation, 0.5km of the Proposed Grid Connection underground electrical cabling route, and the Proposed Enhancement Areas; this area spans a large suite of bogs, comprising of a total of 14 no, individual bog basins, which form part of the Allen Bog Group.

This chapter provides a baseline assessment of the environmental setting of the Proposed Project, as described in Chapter 4, in terms of Land, Soils and Geology and discusses the potential likely significant effects that the construction, operation and decommissioning of the Proposed Project will have on the receiving environment. Where required, appropriate mitigation measures to avoid any identified significant effects to Land, Soils and Geology (i.e., natural resources) are recommended and the residual effects of the Proposed Project post-mitigation are assessed.

8.1.2 Statement of Authority

Hydro-Environmental Services (HES) are a specialist geological, hydrological, hydrogeological and environmental practice which delivers a range of water and environmental management consultancy services to the private and public sectors across Ireland and Northern Ireland. HES was established in 2005, and the HES office is located in Dungarvan, County Waterford.

HES's core areas of expertise and experience include soils, subsoils and geology. HES routinely complete impact assessments for land, soils and geology, hydrology and hydrogeology for a large variety of project types including wind farms and renewable energy projects.

This chapter of the EIAR was prepared by Nitesh Dalal, Conor McGettigan, Adam Keegan and Michael Gill.

Michael Gill (BA, BAI, Dip Geol., MSc, MIEI) is an Environmental Engineer and Hydrogeologist with over 24 year's environmental consultancy experience in Ireland. Michael has completed numerous hydrological and hydrogeological impact assessments of wind farms and renewable projects in Ireland.

In addition, he has substantial experience in geological characterisation, peatland morphology, and surface water drainage design and SUDs design and surface water/groundwater interactions. Michael has worked on the EIS/EIAR for Oweninny Wind Farm, Cloncreen Wind Farm, Ballivor Wind Farm, Littleton Wind Farm and Grid Connection, and over 100 other wind farm related projects across the country.

Adam Keegan PGeo (B.Sc., M.Sc.) is a hydrogeologist with 9 years environmental consultancy experience in Ireland. Adam has been involved in Environmental Impact Assessment Reports (EIARs) for numerous projects including wind farms, grid connections, quarries and small housing developments. Adam holds an MSc in Hydrogeology and Water Resource Management. Adam has worked on several wind farm EIAR projects, including Croagh Wind Farm, Lyrenacarriga Wind Farm (SID), Cleanrath Wind Farm, Carrownagowan Wind Farm (SID), and Fossy Wind Farm.

Conor McGettigan (BSc, MSc) is an Environmental Scientist with over 6 years' experience in the environmental sector in Ireland. Conor holds an M.Sc. in Applied Environmental Science (2020) and a B.Sc. in Geology (2016) from University College Dublin. Conor routinely prepares the land, soils and geology chapters of environmental impact assessment reports for wind farm development. Conor has worked on the EIAR for Ballivor Wind Farm, Lemanaghan Wind Farm, Littleton Wind Farm, Briskalagh Wind Farm, Knockshanvo Wind Farm, Seskin Wind Farm and over 20 other wind farm related projects across the country.

Nitesh Dalal (B.Tech, PG Dip., MSc) is an Environmental Scientist with over 7 years' experience in environmental consultancy and environmental management in India and over 1 years' environmental consultancy experience in Ireland. Nitesh holds a M.Sc. in Environmental Science from University College Dublin (2024), a PG Diploma in Health, Safety and Environment from Annamalai University, India (2021) and B.Tech. in Environmental Engineering (2016) from Guru Gobind Singh Indraprastha University, India (2016).

8.1.3 Scoping and Consultation

The scope for this assessment has been informed by consultation with statutory consultees, bodies with environmental responsibility and other interested parties as summarised in Section 2.8 of Chapter 2 of the EIAR. Consultation responses relating to the land, soils and geological environment were received from the Geological Survey of Ireland. Details of the scoping responses and actions taken to address them are outlined in Section 2.8.2 of this EIAR. Their responses are summarised in Table 8-1.

Table 8-1: Summary of Scoping Responses.

Consultee	Description	Addressed in Section
Geological Survey of Ireland (GSI)	The GSI provided a standard response and requested the use of their online geological databases in the assessment.	Refer to Section 8.2.2 which lists the online sources consulted in the preparation of this EIAR chapter.
Environmental Protection Agency (EPA)	The EPA required that the assessment has regard to the rehabilitation plans under Licence Reg No. P0503. The assessment should have regard to the draft Guidelines on the Information to be contained in Environmental Impact Assessment Reports and the EPA's Advice Notes on Current Practice (in the preparation of Environment Impact Assessments) and to satisfy the requirements of the EAI Directive.	The cumulative effects with the draft Cutaway Bog Decommissioning and Rehabilitation Plans are assessed in Section 8.5.7.1. Refer to Section 8.1.4 and 8.1.5 for the list of relevant legislation and guidance.

Consultee	Description	Addressed in Section
Irish Peatland Conservation Council (IPCC)	The IPCC raised concerns regarding the potential for the Proposed Project to impact numerous areas of raised bog remnants and biodiversity hotspots of Lullymore Bog and the surrounding areas. IPCC provided an inventory of sites requiring protection which include: › Lodge Bog Nature Reserve › Lullymore West Nature Reserve › Lullybeg Nature Reserve › Lodge Bog Wetlands › Lullymore Wetlands › Ballysooghan North › Aghameelick › Long Derries SAC › Mouds Bog SAC › Pollardstown Fen SAC	The Proposed Project footprint avoids these areas and there is no potential for effects on the land, soils and geological environment. The potential hydrological/hydrogeological effects are assessed in Chapter 9: Water.

8.1.4 Relevant Legislation

The EIAR is prepared in accordance with the requirements of European Union Directive 2011/92/EU on the assessment of the effects of certain public and private projects on the environment (the 'EIA Directive') as amended by Directive 2014/52/EU. Regard has also been taken of the requirements of the following legislation:

- Planning and Development Act, 2000 (as amended);
- Planning and Development Regulations, 2001 (as amended);
- Directives 2011/92/EU and 2014/52/EU on the assessment of the effects of certain public and private projects on the environment, including Circular Letter PL 1/2017: Implementation of Directive 2014/52/EU on the effects of certain public and private projects on the environment (EIA Directive);
- S.I. No. 296/2018 European Union (Planning and Development) (Environmental Impact Assessment) Regulations 2018;
- The Heritage Act 1995, as amended; and,
- European Communities (Environmental Impact Assessment) Regulations 1989 to 2006.

8.1.5 Relevant Guidance

The Land, Soils and Geology chapter of this EIAR is carried out in accordance with the 'EIA Directive' as amended by Directive 2014/52/EU and having regard where relevant to guidance contained in the following documents:

- Environmental Protection Agency (2022): Guidelines on the Information to be contained in Environmental Impact Assessment Reports;
- Institute of Geologists Ireland (2013): Guidelines for the Preparation of Soils, Geology and Hydrogeology Chapters of Environmental Impact Statements;
- TII (2008) Guidelines on Procedures for Assessment and Treatment of Geology, Hydrology and Hydrogeology for National Road Schemes. Dublin: Transport Infrastructure Ireland (TII Publication PE-ENV-01116);

- Guidelines for Planning Authorities and An Bord Pleanála on carrying out Environmental Impact Assessment (DoHPLG, 2018); and,
- Guidance on the preparation of the EIA Report (Directive 2011/92/EU as amended by 2014/52/EU), (European Commission 2017).

8.2 Assessment Methodology

8.2.1 Study Area

The study area for Land, Soils and Geology has been defined having regard to the nature and extent of the Proposed Project and the potential zone of influence on the land, soils and geological environment and is hereafter referred to as the '**Land, Soils and Geology Study Area'**.

Given the nature of the receptors and the potential direct impacts assessed in this chapter, there is no potential for significant effects on land, soils and geology beyond the Project Site. The Land, Soils and Geology Study Area has been defined as the Project Site and is delineated as follows:

- The Land, Soils and Geology Study Area encompasses the Project Site as no effects on land, soils or the geological environment are anticipated outside of the Project Site.
- The Proposed Construction Haul Routes have been screened out of the land, soils and geological impact assessment and are not included within the Land, Soils and Geology Study Area. There will be no excavations, or land-take along the construction haul routes. There is no potential for significant effects on land, soils or geology.

The Land, Soils and Geology Study Area is presented in Figure 8-1 and forms the basis of the impact assessment detailed in Section 8.5. The desk study undertaken for this chapter considers relevant land, soils and geology features both within and beyond the Land, Soils and Geology Study Area, where appropriate, to provide context for the assessment and to inform an understanding of the wider land, soils and geological environment. These features are located outside the Land, Soils and Geology Study Area because they lie outside of the potential zone of influence (ZoI) of the Proposed Project and are therefore will not be affected. The inclusion of these features in this chapter was limited to providing contextual information.

For clarity and to maintain an appropriate mapping scale, not all Proposed Turbine Delivery Route accommodation areas are shown on every map. However, the baseline conditions within these areas are described in the text of Section 8.3.

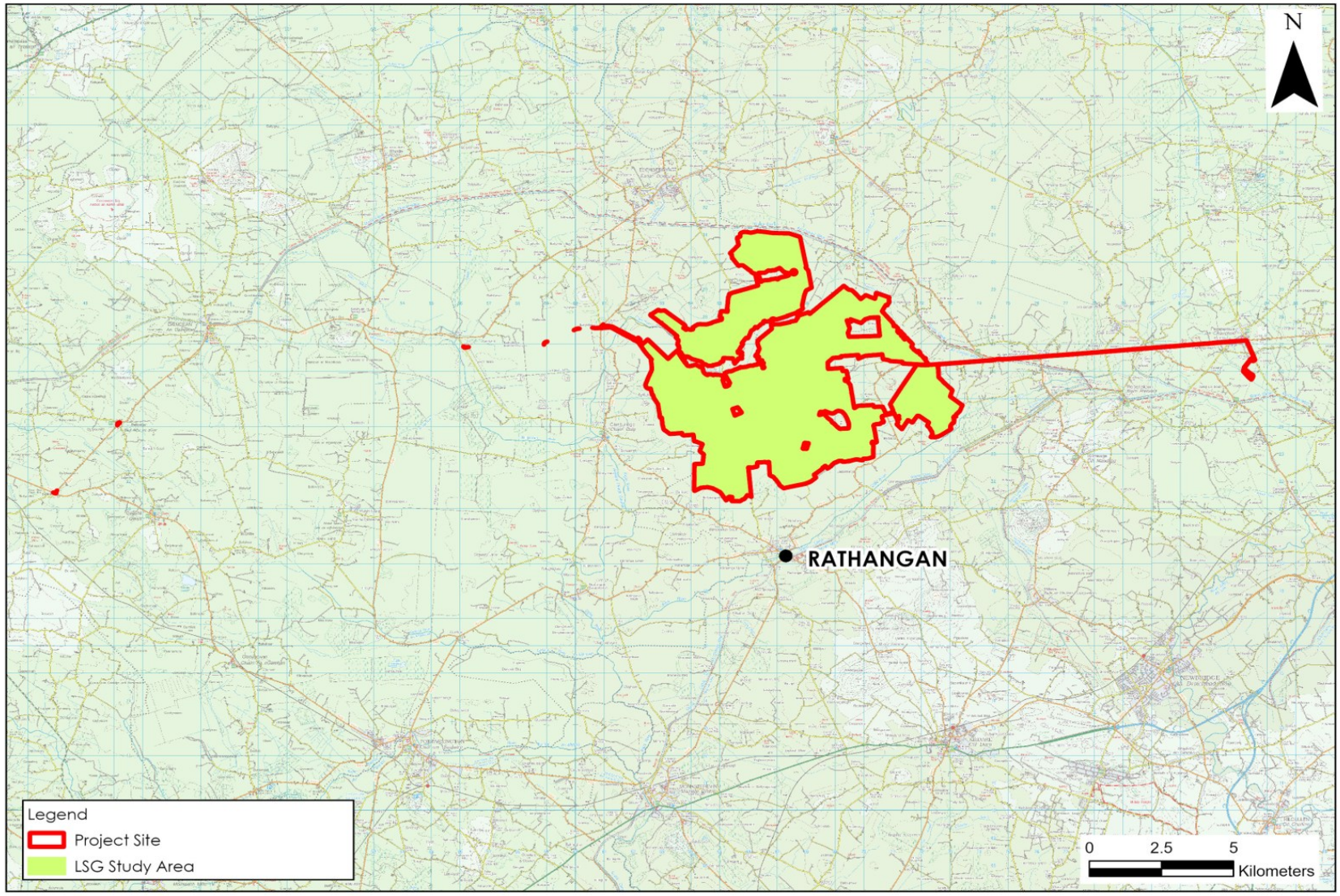


Figure 8-1: Land, Soils and Geology Study Area

8.2.2 Desk Study

A desk study of the Land, Soils and Geology Study Area (refer to Section 8.2.1) was completed in early 2021 to collect all relevant geological data. This initial desk study was completed in advance of undertaking site walkover surveys and site investigations. The desk study was reviewed in full and updated where required, in June and August 2026. The desk study included consultation with the following data sources:

- Integrated Pollution Control Licence (IPC) Allen Bog Group (Ref: P0503-01) Environmental Protection Agency, Appendix 4-1;
- Annual Environmental Reports 2000-2025 (AERs)(the AERs can be accessed at https://www.epa.ie/our-services/licensing/licencesearch/);
- BnM Cutaway Bog Decommissioning and Rehabilitation Plans (2026), Appendix 4-2;
  - Ballydermot Bog Draft Cutaway Bog Decommissioning and Rehabilitation Plan (2026);
  - Barnaran Draft Cutaway Bog Decommissioning and Rehabilitation Plan (2026);
  - Blackriver Bog Draft Cutaway Bog Decommissioning and Rehabilitation Plan (2026);
  - Codd Bog Draft Cutaway Bog Decommissioning and Rehabilitation Plan (2026);
  - Derrybrennan Bog Draft Cutaway Bog Decommissioning and Rehabilitation Plan (2026);
  - Glashabaun Bog Draft Cutaway Bog Decommissioning and Rehabilitation Plan (2026);
  - Killinagh Bog Draft Cutaway Bog Decommissioning and Rehabilitation Plan (2026);
  - Lullybeg Bog Draft Cutaway Bog Decommissioning and Rehabilitation Plan (2026);
  - Lullymore Bog Draft Cutaway Bog Decommissioning and Rehabilitation Plan (2026);
  - Ticknevin Bog Draft Cutaway Bog Decommissioning and Rehabilitation Plan (2026); and,
  - Lodge Bog Cutaway Bog Decommissioning and Rehabilitation Plan (2022).
- Inspection of production records at Ballydermot Works;
- BnM Annual Reports (1946 to 2025) which contain information relevant to the bogs within the Allen Bog Group such as peat depth databases and drainage;
- Aerial Maps from 1973 to 2020;
- BnM LiDAR data;
- Corine Land Cover and Land Cover Change Maps (www.land.copernicus.eu);
- National Parks and Wildlife Services Public Map Viewer (www.npws.ie);
- Environmental Protection Agency soils and subsoils mapping (www.epa.ie);
- Geological Survey of Ireland – Geological databases (www.gsi.ie);
- Bedrock Geology 1:100,000 Scale Map Series. Geological Survey of Ireland. Sheet 16 (Kildare-Wicklow) (GSI, 1994);
- Aerial Photography, 1:5,000 and 1:10,560 (6") base mapping; and,
- Myplan.ie: National Planning Applications Map Viewer (https://myplan.ie/national-planning-application-map-viewer).

8.2.3 Baseline Monitoring and Site Investigations

HES completed site inspections and walkover surveys across the Land, Soils and Geology Study Area to inform the assessment presented in this chapter. These site investigations comprised of peat probing, geological mapping and detailed walkover surveys completed by HES on 6th, 15th and 22nd October

2020, 5th, 10th, 12th and 18th November 2020, 1st April 2021, 11th December 2025 and 15th May 2026. These site investigations and surveys were completed by Michael Gill, Adam Keegan, Conor McGettigan and Nitesh Dalal (refer to Section 8.1.2 for qualifications and experience).

In addition to the site investigations completed by HES, several additional site investigations have been completed to further inform this EIAR. These site investigations included peat probing completed by MKO and Fehily Timoney and Company (FTC), trial pit excavations by FTC, trial pit excavations and borehole drilling by Irish Drilling Limited (IDL). The logs associated with these site investigations are attached to the Geotechnical and Peat Stability Assessment Report (GRPSA) (FTC, 2026a) which is included as Appendix 8-1. FTC have also prepared a Peat and Spoil Management Plan for the Proposed Project (FTC, 2026b) see appendix 4-3 Peat and Spoil Management Plan for further details.

The combined geological dataset collated by HES, MKO, FTC and IDL has been used in the preparation of this EIAR Chapter.

In summary, site investigations to address the land, soils and geology chapter of this EIAR include the following:

- Detailed walkover surveys of the Land, Soils and Geology Study Area completed by HES, MKO and FTC;
- A total of 1,026 no. peat probes have been completed within the Land, Soils and Geology Study Area by HES, MKO and FTC;
- The excavation of 9 no. trial pits by FTC in May 2021, and laboratory analysis of recovered subsoil samples;
- The excavation of 53 no. trial pits by IDL in November 2021 (46 no. within the Land, Soils and Geology Study Area and 7 no. in agricultural lands adjacent to the bogs – to investigate the suitability for a proposed borrow pit), and laboratory analysis of recovered subsoil samples;
- IDL drilled 1 no. rotary core borehole (RC-BP01) in lands adjacent to the Proposed Wind Farm site to investigate the potential suitability for a proposed borrow pit;
- IDL drilled 6 no. rotary core boreholes across the Proposed Wind Farm in September 2022 at the Proposed Onsite Substation location and at several Proposed Turbine locations;
- IDL drilled 3 no. rotary core boreholes in lands adjacent to the Proposed Wind Farm site (the part of the Project Site located on part of the Allen Bog Group) in December 2022 to investigate the suitability for a proposed borrow pit;
- Logging of subsoil exposures where mineral soils and peat profiles were exposed; and,
- Mineral subsoils and peat were logged according to BS: 5930 and the Von Post Scale respectively.

Site specific data obtained by HES, FTC and MKO was supplemented with recent and historic site-specific data supplied by the Applicant. The data includes habitat, soils/land, LiDAR and topographic maps for the site. The maps are included in the Draft Cutaway Bog Decommissioning and Rehabilitation Plans (hereafter the Draft Rehabilitation Plans) attached as Appendix 2-4.

8.2.4 Impact Assessment Methodology

Using information from the desk study and data from the site investigations, an assessment of the importance of the land, soil and geological environment within the Land, Soils and Geology Study Area is assessed using the criteria set out in Table 8-2 (NRA, 2008).

Table 8-2: Estimation of Importance of Soil and Geology Criteria (NRA, 2008).

Importance	Criteria	Typical Example
Very High	Attribute has a high quality, significance or value on a regional or national scale. Degree or extent of soil contamination is significant on a national or regional scale. Volume of peat and/or soft organic soil underlying route is significant on a national or regional scale.	Geological feature rare on a regional or national scale [Natural Heritage Area (NHA)]. Large existing quarry or pit. Proven economically extractable mineral resource.
High	Attribute has a high quality, significance or value on a local scale. Degree or extent of soil contamination is significant on a local scale. Volume of peat and/or soft organic soil underlying site is significant on a local scale.	Contaminated soil on site with previous heavy industrial usage. Large recent landfill site for mixed wastes Geological feature of high value on a local scale (County Geological Site). Well drained and/or highly fertility soils. Moderately sized existing quarry or pit Marginally economic extractable mineral resource.
Medium	Attribute has a medium quality, significance or value on a local scale. Degree or extent of soil contamination is moderate on a local scale. Volume of peat and/or soft organic soil underlying site is moderate on a local scale.	Contaminated soil on site with previous light industrial usage. Small recent landfill site for mixed Wastes. Moderately drained and/or moderate fertility soils. Small existing quarry or pit. Sub-economic extractable mineral Resource.
Low	Attribute has a low quality, significance or value on a local scale. Degree or extent of soil contamination is minor on a local scale. Volume of peat and/or soft organic soil underlying site is small on a local scale.	Large historical and/or recent site for construction and demolition wastes. Small historical and/or recent landfill site for construction and demolition wastes. Poorly drained and/or low fertility soils. Uneconomically extractable mineral Resource.

The EPA 2022 Guidelines state that there are 7 no. steps in the preparation of the EIAR. The initial steps relate to screening, scoping, the consideration of alternatives and the description of the project. Step 5 relates to the description of the baseline environment which is presented in Section 8.3 for the land, soils and geological environment. Step 6 relates to the identification and assessment of impacts and is presented in Section 8.5. The guideline criteria for the assessment of effects states that the purpose of an EIAR is to identify, describe and present an assessment of the likely significant effects. The likely effects are described with respect to their quality (positive, neutral or negative), significance (imperceptible to profound), extent (i.e. size of area or number of sites affected), context (is the effect unique or being increasingly experienced), probability (likely or unlikely), duration (momentary to permanent), frequency and reversibility. The descriptors used in this chapter are those set out in the EPA 2022 Guidelines glossary of effects as shown in Chapter 1 of this EIAR. In addition, the two impact characteristics, proximity and probability are described for each impact, and these are defined in Table 8-3.

Table 8-3: Criteria for Rating Impact Significance – Estimation of Magnitude of Impact on Geology attributes (Source: NRA, 2008)

Magnitude of Effect	Criteria	Typical Example
Large Adverse	Results in loss of attribute	Loss of high proportion of future quarry or pit reserves Irreversible loss of high proportion of local high fertility soils Removal of entirety of geological heritage feature Requirement to excavate / remediate entire waste site Requirement to excavate and replace high proportion of peat, organic soils and/or soft mineral soils beneath alignment
Moderate Adverse	Results in impact on integrity of attribute or loss of part of attribute	Loss of moderate proportion of future quarry or pit reserves Removal of part of geological heritage feature Irreversible loss of moderate proportion of local high fertility soils Requirement to excavate / remediate significant proportion of waste site Requirement to excavate and replace moderate proportion of peat, organic soils and/or soft mineral soils beneath alignment
Small Adverse	Results in minor impact on integrity of attribute or loss of small part of attribute	Loss of small proportion of future quarry or pit reserves Removal of small part of geological heritage feature Irreversible loss of small proportion of local high fertility soils and/or high proportion of local low fertility soils Requirement to excavate / remediate small proportion of waste site Requirement to excavate and replace small proportion of peat, organic soils and/or soft mineral soils beneath alignment
Negligible	Results in an impact on attribute but of insufficient magnitude to affect either use or integrity	No measurable changes in attributes
Minor Beneficial	Results in minor improvement of attribute quality	Minor enhancement of geological heritage feature
Moderate Beneficial	Results in moderate improvement of attribute quality	Moderate enhancement of geological heritage feature
Major Beneficial	Results in major improvement of attribute quality	Major enhancement of geological heritage feature

Table 8-4: Rating of Significant Environmental Impacts in an EIS (EIAR) (Source: NRA, 2008)

Importance of Attribute	Magnitude of Impact			
	Negligible	Small Adverse	Moderate Adverse	Large Adverse
Extremely High	Imperceptible	Significant	Profound	Profound
Very High	Imperceptible	Significant / Moderate	Profound / Significant	Profound
High	Imperceptible	Moderate / Slight	Significant / Moderate	Profound / /Significant
Medium	Imperceptible	Slight	Moderate	Significant
Low	Imperceptible	Imperceptible	Slight	Slight / Moderate

8.2.5 Limitations and Difficulties Encountered

No significant limitations or difficulties were encountered during the preparation of the Land, Soils and Geology Chapter of this EIAR. The baseline assessment was informed by an iterative programme of desk study, site inspections and site investigations considered sufficient to characterise the land, soils and geological environment and to undertake the assessment of likely significant effects presented in this chapter

8.3 Baseline/Receiving Environment

8.3.1 Site Description and Topography

8.3.1.1 Proposed Wind Farm site

The topography today within the Proposed Wind Farm site ranges between 82 metres above Ordnance Datum (mOD) at its highest point to approximately 68mOD at its lowest point. Topography at the Proposed Wind Farm site has been modified through industrial peat extraction activities and all ancillary works including associated drainage works. Today the highest elevations are found at headlands and remnant peat banks which create a boundary berm, forming a basin effect within the former extraction areas of the bog. These remnant peat banks and headlands provide an approximation (albeit drained and subsided) of the original ground elevations which existed across the Proposed Wind Farm site prior to the commencement of any peat extraction activities.

The Proposed Wind Farm site is accessible via the local road network comprising of the R402 to the north, the R403 to the east, the R401 to the west and the R414 to the south, with the latter cutting through the southeast of the Proposed Wind Farm site.

Current Land use within the Proposed Wind Farm site comprises natural revegetation of cutaway and degraded bog, and public road corridor.

The townlands within which the Proposed Wind Farm site is located are detailed in Table 1-1 in Chapter 1 of this EIAR.

The Proposed Project also includes Proposed Turbine Delivery Route accommodation works which are detailed in Section 4.5.2.3 of Chapter 4.

8.3.1.2 Proposed Grid Connection

The Proposed Grid Connection underground electrical cabling route will traverse through Allenwood, and Prosperous, Co. Kildare, with infrastructure proposed in the townland of Lullymore and Killybegs, Co Kildare and adjacent townlands.

The Proposed Onsite Substation and approximately 522m of the Proposed Grid Connection underground electrical cabling are located in Lodge Bog within the Proposed Wind Farm site (refer to Section 8.3.1.1 above). Topography within Lodge Bog has been historically modified due to the previous peat extraction activities and the completed enhanced rehabilitation works completed under the Peatland Climate Action Scheme (PCAS).

Ground elevations along the Proposed Grid Connection underground electrical cabling route range from approximately76mOD (metres above Ordnance Datum) in the vicinity of the Proposed Onsite Substation to approximately 96mOD along the local road (L6002) to the south of Prosperous, Co. Kildare near The Hatters Crossroads. At the Proposed Offsite Substation local topography slopes gently to the southwest with ground elevations ranging from approximately 96mOD adjacent to the L6002 in the east to approximately 85mOD in the southwest.

8.3.2 Land and Land Use

8.3.2.1 Proposed Wind Farm site

The Proposed Wind Farm site is located within a cutaway peatland. Cutover peatlands are areas where peat extraction has occurred, and commercially viable peat volumes remain. Since the cessation of peat extraction and ancillary activities in June 2020, the Proposed Wind Farm site, which encompasses the Proposed Wind Farm, the Proposed Onsite Substation, 0.5km of Proposed Grid Connection underground electrical cabling route, and the Proposed Enhancement Areas, has begun to revegetate naturally. The degree of revegetation depends on the length of the time since peat extraction ceased at different times across the different bogs. Meanwhile, enhanced rehabilitation works have been completed at Lodge Bog under PCAS.

Historic Corine land cover maps and BnM annual reports were consulted to investigate how land cover has changed historically within the Allen Bog Group and in the surrounding lands. The main historic land use changes have been associated with the peat production operations, with the main changes linked to the initial drainage of the bogs and the removal of vegetation in advance of production. The key dates in terms of drainage, the onset of peat extraction and the cessation of peat extraction activities at the Proposed Wind Farm site are summarised in Table 8-4. Those areas where peat extraction first ceased at the Proposed Wind Farm site correspond with the areas which were noted to be revegetating during the site walkover surveys.

Corine land cover maps (2018) (www.epa.ie) show that the Proposed Wind Farm site is predominantly comprised of “peat bogs” with some areas of “transitional woodland scrub”, “agricultural pastures” and “mixed forests”. The landcover surrounding the Proposed Wind Farm comprises a mixture of forestry, agricultural land, cutover and cutaway peatland, one-off rural housing and small village settlements. The Corine land cover at each of the bogs within the Land, Soils and Geology Study Area is detailed in Table 8-5.

Landcover and Land use at the Proposed Wind Farm site has been verified during the site walkover surveys completed by HES, from the inspection of recent aerial photography and habitat mapping completed by the ecology project team (See Chapter 6 Biodiversity for further details).

Corine land cover maps show that the proposed accommodation works along the Proposed Turbine Delivery Route are mapped in areas of peat bogs, transitional woodland scrub and agricultural

pastures. The land environment at these locations has been verified by walkover surveys completed by MKO.

Table 8-5: First Drainage and First Production Years of 14 no. Bogs of the Allen Bog Group which comprise part of the Project Site.

Bog Unit	Bog Area (ha)	Commencement of Site Preparation Works (vegetation clearance and drainage insertion)	Extraction Commenced	Extraction Ceased
Ballydermot North	456	1946	1950	2020
Ballydermot South	425	1946	1950	2020
Blackriver	732	1947	1950	2020
Barnaran	486	1954	1959	2020
Lullybeg	267	1935	1935	2004
Lullymore	175	1935	1935	1992
Lodge	407	1947	1953	2020
Killina	257	1935	1935	2020
Derrybrennan	132	1959	1969	2015
Glashabaun North	515	1947	1951	2020
Glashabaun South	601	1947	1951	2020
Ticknevin	456	1973*	1981*	2019
Codd 1	247	1959	1973*	2020
Codd 2	290	1973	1981*	2019

*Estimated date indicated by available aerial imagery.

Table 8-6: Summary of Corine Land Cover mapped at the 14 no. Bogs of the Allen Bog Group which comprise part of the Project Site.

Bog Name	Corine Land Cover
Ballydermot North	Peat bogs with central area and small area in the southwest mapped as transitional woodland scrub.
Ballydermot South	Peat Bogs with small area in the south mapped as non-irrigated arable land.
Blackriver	Peat Bogs with small area in the north mapped as Land principally occupied by agriculture with significant areas of natural vegetation, small area in east mapped as Transitional woodland scrub and small area in south mapped as pastures and mixed forests.
Barnaran	Peat Bogs with some area in the northwest and small areas in northeast and south mapped as Transitional woodland scrub.

Bog Name	Corine Land Cover
Lullybeg	Transitional woodland scrub with some area in the southwest mapped as Peat bogs and some area in the northeast mapped as Mixed forests.
Lullymore	Peat Bogs with some area in the north mapped as Transitional woodland scrub and Mixed forests.
Lodge	Peat Bogs with some area in the north and southwest mapped as Transitional woodland scrub and small area in south and southeast is mapped as Pastures.
Killina	Mixed forest with eastern portion as Transitional woodland scrub, some areas in northeast and southeast are mapped as Peat Bogs and some area in southwest is mapped as Pastures.
Derrybrennan	Peat Bogs with some area in the southwest and southeast mapped as Transitional woodland scrub and some area in northeast is mapped as Pastures and Non-irrigated arable land.
Glashabaun North	Peat Bogs with small area in the northwest mapped as Transitional woodland scrub, small area in north mapped as Coniferous forests and some area in southeast is mapped as mixed forests.
Glashabaun South	Transitional woodland scrub with some area in the northwest mapped as Peat bogs and some are in southeast mapped as mixed forests.
Ticknevin	Peat Bogs with small area in the north mapped as Pastures and small area in southwest mapped as Transitional Woodland scrub.
Codd 1	Peat Bogs with small area in the north mapped as Land principally occupied by agriculture with significant areas of natural vegetation, small areas in northwest and west mapped as Pastures and small area in east mapped as Mixed forests.
Codd 2	Peat Bogs with small area in the west and southeast mapped as Land principally occupied by agriculture with significant areas of natural vegetation and small area in south mapped as Mixed forests.

8.3.2.2 Proposed Grid Connection

The Proposed Onsite Substation associated compound, and a small section of the Proposed Grid Connection underground electrical cabling route (0.5km) are located within Lodge Bog and overlaps with the Proposed Wind Farm site. These elements of the Proposed Grid Connection are discussed in Section 8.3.2.1 above.

The Proposed Offsite Substation is mapped by Corine (2018) as agricultural pastures. The Proposed Grid Connection underground electrical cabling route is predominantly located in the carriageway of the existing public road network with the exception of the off-road section which passes through agricultural grasslands on the approach to the Proposed Offsite Substation. The infrastructure associated with the loop-in-connection (steel masts and gantry structures) are also mapped in agricultural pastures. Land and Land use at the Proposed Grid Connection was verified during site walkover surveys and drive-by surveys completed by HES.

8.3.3 Peat/Soils and Subsoils

8.3.3.1 Desk Study

8.3.3.1.1 *Proposed Wind Farm site*

The published Teagasc soils map (www.gsi.ie) for the local area shows that the Proposed Wind Farm site is mapped to be almost exclusively overlain by cutover/cutaway peat except for small area in the northeast of Derrybrennan Bog which is mapped as mainly basic poorly drained mineral soils (BminPD). Soils mapped in the surrounding lands comprise largely of basic deep well drained mineral soil (BminDW), mineral poorly drained (Mainly basic) (BminPD) and basic shallow well drained mineral soil (BminSW). Mineral alluvium (AlluvMIN) is mapped along the Figile River to the southwest and Slate River to the southeast of the bogs.

The published GSI subsoils map (www.gsi.ie) shows that the Proposed Wind Farm site is underlain predominantly by cut over raised peat (Cut) with small areas in the northeast of Derrybrennan Bog mapped to be underlain by till derived from limestones (TLs). The surrounding lands are mapped to be underlain by tills derived from limestones (TLs), cut over raised peat (Cut) and bedrock outcrop or subcrop (Rck). Meanwhile, some esker sands and gravels (BasEsk) and gravels derived from limestones (GLS) are also mapped to the northeast. Alluvium subsoils are mapped along the Figile River to the southwest and Slate River to the southeast.

In terms of the Proposed Wind Farm infrastructure, all infrastructure is mapped in areas underlain by cutover peat.

The published Teagasc soils map (www.gsi.ie) shows that the proposed accommodation works along the Proposed Turbine Delivery Route are mapped to be overlain by cutover/cutaway peat in the east. The works further west along the R402 at Ballinagar and Ballina are mapped to be overlain by mainly basic deep well drained mineral soils (BminDW) and mainly basic poorly drained mineral soils respectively (BminPD). The published GSI subsoils map (www.gsi.ie) shows that the proposed accommodation works along the Proposed Turbine Delivery Route are mapped to be underlain by cut over raised peat in the east. The works further west along the R402 at Ballinagar and Ballina are mapped to be underlain by tills derived from limestone. Roads are not mapped as a separate soil category by the GSI, therefore, existing roads at these locations are not represented on the published soils mapping.

8.3.3.1.2 *Proposed Grid Connection*

The published soils map from Teagasc (www.gsi.ie) shows that Proposed Onsite Substation and much of the western section of the Proposed Grid Connection underground electrical cable route is mapped to be overlain by cutover/cutaway peat (cut) with mainly basic deep well drained mineral soils (BminDW) further to the east. Made ground is also mapped by Teagasc along the Proposed Grid Connection underground cable route at Prosperous, and Allenwood, Co. Kildare. The soils mapped to overlie the Proposed Offsite Substation are predominantly mainly basic poorly drained mineral soils (BminPD), with alluvial deposits (AlluvMin) mapped in the west. Soils in the lands surrounding the Proposed Offsite Substation are typically mapped as basic poorly drained mineral soils and basic deep well drained mineral soils (BminDW). Alluvial deposits are mapped along the length of the drain to the west of the Proposed Offsite Substation. Roads are not mapped as a separate soil category by the GSI, therefore, existing roads along the Proposed Grid Connection underground cabling route are not represented on the published soils mapping.

The published subsoils map from the GSI (www.gsi.ie) shows that the Proposed Onsite Substation and much of the western section of the Proposed Grid Connection underground electrical cable route is mapped to be underlain by cut over raised peat (cut) with till derived from limestones (TLs) further to the east. The Proposed Offsite Substation is mapped to be underlain largely by till derived from

limestones (TLs) with some alluvium (A) in the west. Subsoils in the lands surrounding the Proposed Offsite Substation site comprise limestone derived tills.

A map of the local subsoil cover in the area of the Land, Soils and Geology Study Area is included as Figure 8-2.

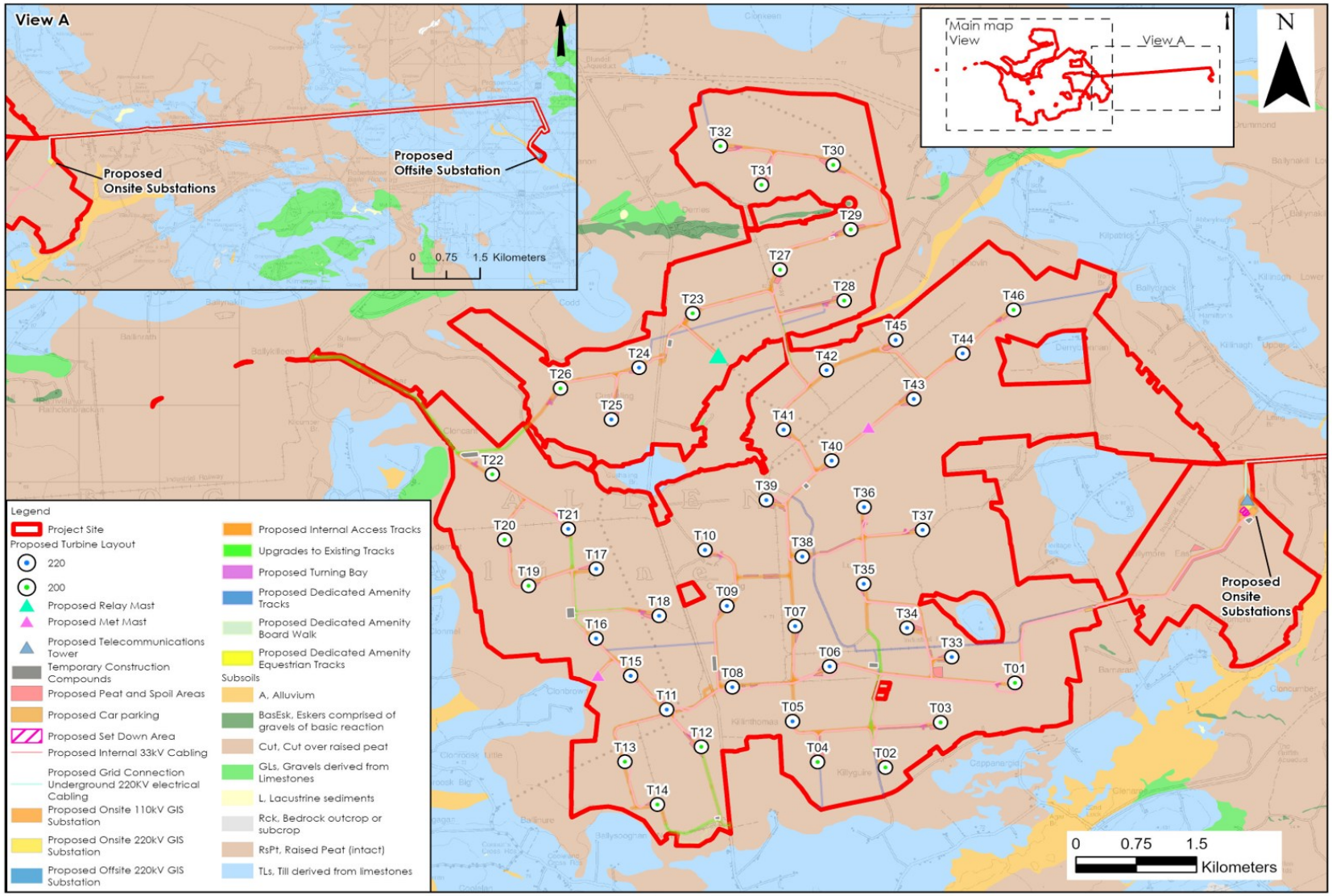


Figure 8-2: Local Subsoils Map

8.3.3.2 Site Investigation Data

8.3.3.2.1 *Proposed Wind Farm site*

The soils and subsoils present at the Proposed Wind Farm site have been verified during site walkover surveys and intrusive site investigations.

Peat Probing

The presence of subsoil peat onsite has been confirmed by peat probing investigations conducted by HES, FTC and MKO. The combined dataset amounts to 1,026 no. peat probes investigation points within the Proposed Wind Farm site.

Peat depth intervals recorded across the Proposed Wind Farm site are shown on the bar chart presented as Figure 8-3. Overall peat depths ranged from 0 to 6m with an average of 1.61m. 59% of peat depth probes recorded peat depths of 0.5m to 2.0m, and 21% of peat depth probes recorded peat depths of 2.0m to 3.0m. Approximately 90% of peat depth probes recorded peat depths of less than 3.0m. A number of localised readings were recorded where peat depths were >3.5. The subsoils encountered during the peat probing typically comprised of clay, sandy or gravelly mineral soils.

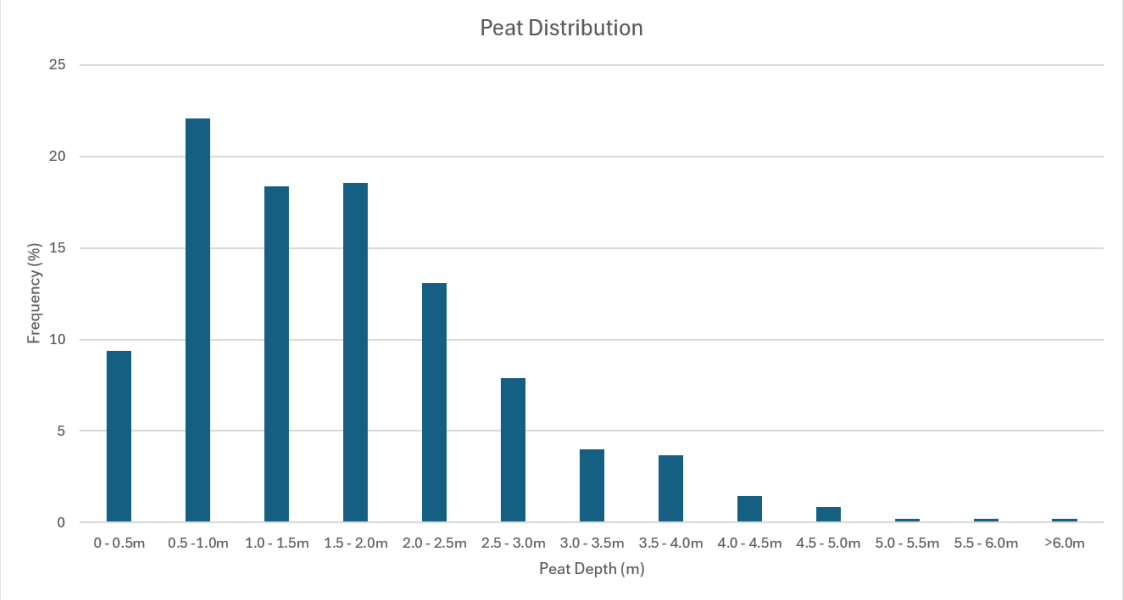


Figure 8-3: Peat Depth Distribution Plot

Table 8-7 below details the peat depths encountered at the Proposed Turbine locations during the peat probing investigations. Peat depths at the Proposed Turbine locations, based on the peat probe dataset, range from 0.1 to 4.0m. The average peat depth at the Proposed Turbine locations, based on the peat probe dataset, ranges from 0.1 at T07 to 3.5m at T30. The average peat depth is less than 1m at 16 no. Proposed Turbine locations (approximately 34%) and is less than 2m at 33 no. Proposed Turbine locations (70%). The average peat depth only exceeds 3m at 2 no. Proposed Turbines (T12 and T30) (4.3% of Proposed Turbine locations).

Table 8-8 below presents details of the peat depths present at other Proposed Project infrastructure including at the Proposed Onsite Substation, the 2 no. met masts and the 10 no. temporary construction compounds (TCC1-TCC10, 2 no. temporary construction compounds are located at the Proposed Onsite Substation and the Proposed Offsite Substation, respectively). For further details on the average peat depths refer to Appendix 4-3 Peat and Spoil Management Plan.

A map of peat depths across the Proposed Wind Farm site is shown as Figure 8-4.

Table 8-7: Peat Depths at Proposed Turbine Locations.

Turbine ID	Peat Depth Range (m)	Average Peat Depth (m)
T01	1 – 1.4	1.1
T02	2.3 – 4.0	2.8
T03	0.6 – 0.9	0.7
T04	2.4 – 3.6	2.7
T05	0.4 – 0.6	0.5
T06	0.2 – 1.0	0.5
T07	0.1 – 0.15	0.1
T08	2.4 – 3.2	2.7
T09	1.4 – 3.5	2.2
T10	1.5 – 2.6	2.2
T11	0.8 – 1.3	0.9
T12	2.2 – 4.0	3.1
T13	1.8 – 2.4	2.1
T14	0.4 – 1.9	1.0
T15	0.7 – 1.5	1.2
T16	0.5 – 2.4	0.9
T17	0.8 – 2.7	1.8
T18	1.9 – 3.8	2.6
T19	0.4 – 1.0	0.7
T20	0.2 – 0.7	0.3
T21	0.7 – 1.5	1.1
T22	0.4 – 1.4	1.0
T23	2.2 – 3.5	2.7
T24	1.3 – 2.2	1.8
T25	2.3 – 2.9	2.6
T26	0.2 – 2.2	0.8
T27	0.2 – 1.9	0.9
T28	0.3 – 1.6	1.1
T29	0.2 – 0.5	0.4
T30	3.2 – 3.8	3.5
T31	2.3 – 3.2	2.5
T32	1.6 – 3.0	2.3
T33	0.4 – 0.9	0.6

Turbine ID	Peat Depth Range (m)	Average Peat Depth (m)
T34	0.5 – 1.2	0.8
T35	0.9 – 2.0	1.7
T36	1.2 – 1.3	1.25
T37	0.8 – 1.5	1.0
T38	0.4 -1.0	0.7
T39	0.8 – 2.4	1.9
T40	1.6 – 2.2	1.8
T41	0.6- 0.9	0.7
T42	0.2 – 2.3	1.9
T43	1.0 -1.8	1.5
T44	0.5- 1.8	1.3
T45	0.4- 1.1	0.6
T46	0.7 – 2.3	1.7

Table 8-8: Peat Depths at Other Proposed Project infrastructure Locations.

Infrastructure	Peat Depth Range (m)	Average Peat Depth (m)
Met Mast 1	1.1	1.1
Met Mast 2	1.8 – 4.7	3.2
Proposed Onsite Substation and associated Temporary Construction Compound	1.1 – 1.8	1.4
Proposed Offsite Substation and associated Temporary Construction Compound	0.1 – 0.9	0.5
TCC 1	0.5 – 0.8	0.6
TCC 2	3.0 -3.3	3.15
TCC 3	1.8 – 3.5	2.2
TCC 4	1.8 – 2.1	1.9
TCC 5	0.6 – 1.0	0.8
TCC 6	1.8 – 2.4	2.0
TCC 7	0.6 – 1.4	1.0
TCC 8	0.15 – 1.8	1.0

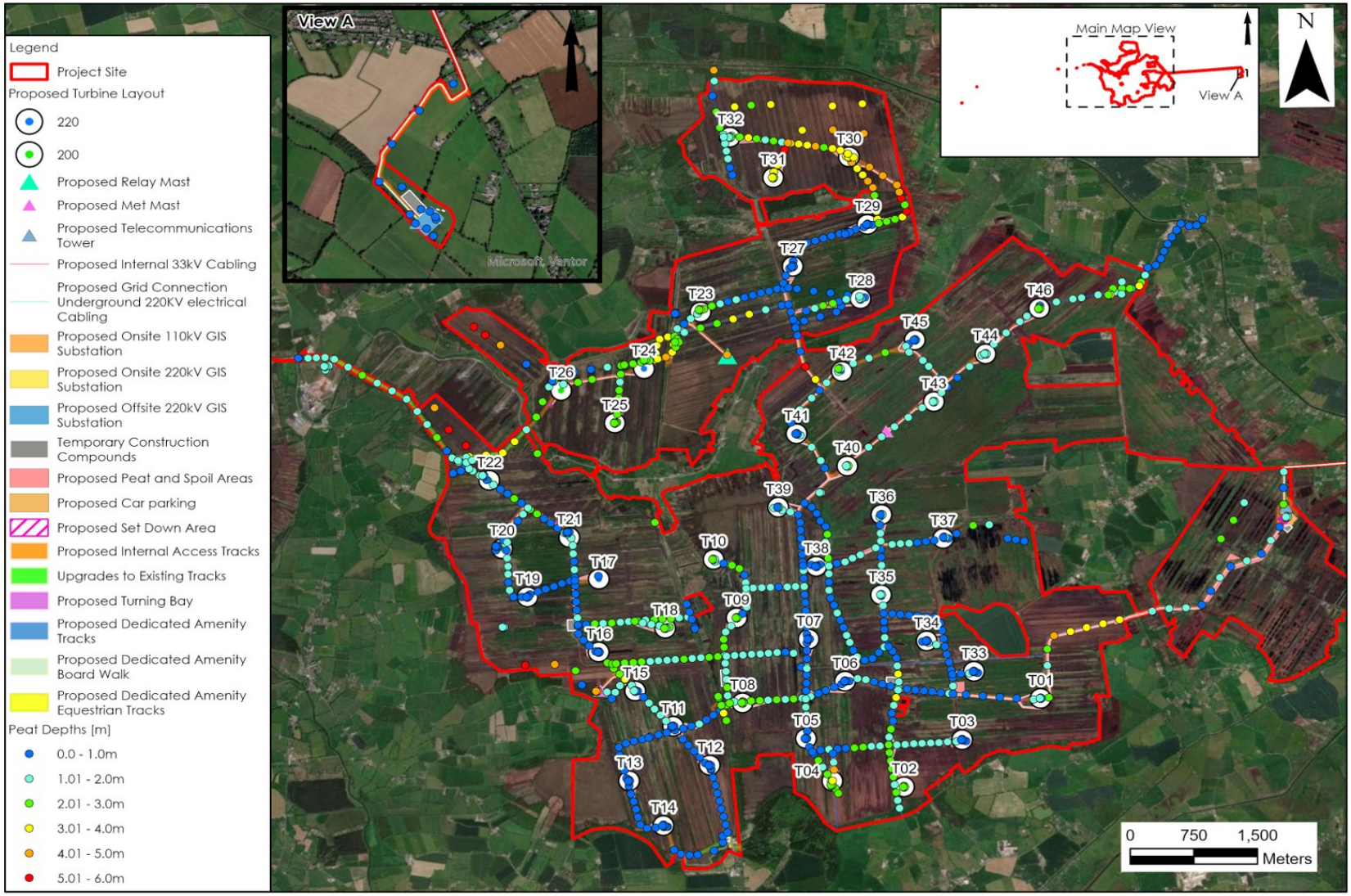


Figure 8-4: Peat Depths across the Proposed Wind Farm site

Trial Pits and Boreholes

Ground investigations were completed at the Project Site (i.e. the Land, Soils and Geology Study Area) (46 no. trial pits), and the surrounding lands (3 no. rotary core boreholes and 7 no. trial pits) by IDL. An additional 9 no. trial pits were excavated at the Project Site by FTC.

The ground conditions encountered during these site investigations, are summarised as follows:

- The trial pits excavated at the Project Site extended to depths of 0.5 to 4.7mbgl;
- The Project Site is overlain by light brown to dark brown amorphous to fibrous PEAT;
- The peat thicknesses recorded during these site investigations ranged from 0.2 to 4m;
- The peat at the Project Site is underlain by lacustrine clay, described as light grey to brown, soft to stiff gravelly SILT/CLAY with some cobbles and boulders;
- The site investigations completed in the agricultural lands to the west of Codd 1 Bog, and outside of the Project Site, encountered fluvioglacial sand and gravel, typically described as grey silty sandy GRAVEL with fine to coarse SAND with cobbles and boulders.

The logs associated with these site investigations are attached to the Geotechnical Peat Stability Risk Assessment (GPSRA) (FTC, 2026) (Appendix 8-1). A map of the TP and BH locations is included as Figure 8-6.

Particle Size Distribution (PSD) analysis was completed at 22 no. trial pit locations completed by IDL within the Project Site. The PSD analysis reports are included as appendices to the GPSRA which is attached as Appendix 8-1. The results of the PSD analysis are also presented in Figure 8-5. The PSD results are summarized below:

- The analysed samples were recovered at depth ranging from 1 to 2.5mbgl.
- The samples were described in the TP logs as predominantly gravelly sandy SILT.
- The fine component (silt and clay) of the recovered samples ranged from 36 to 92%.
- The sand component ranged from 9 – 49%.
- The gravel component ranged from 0 – 48%.

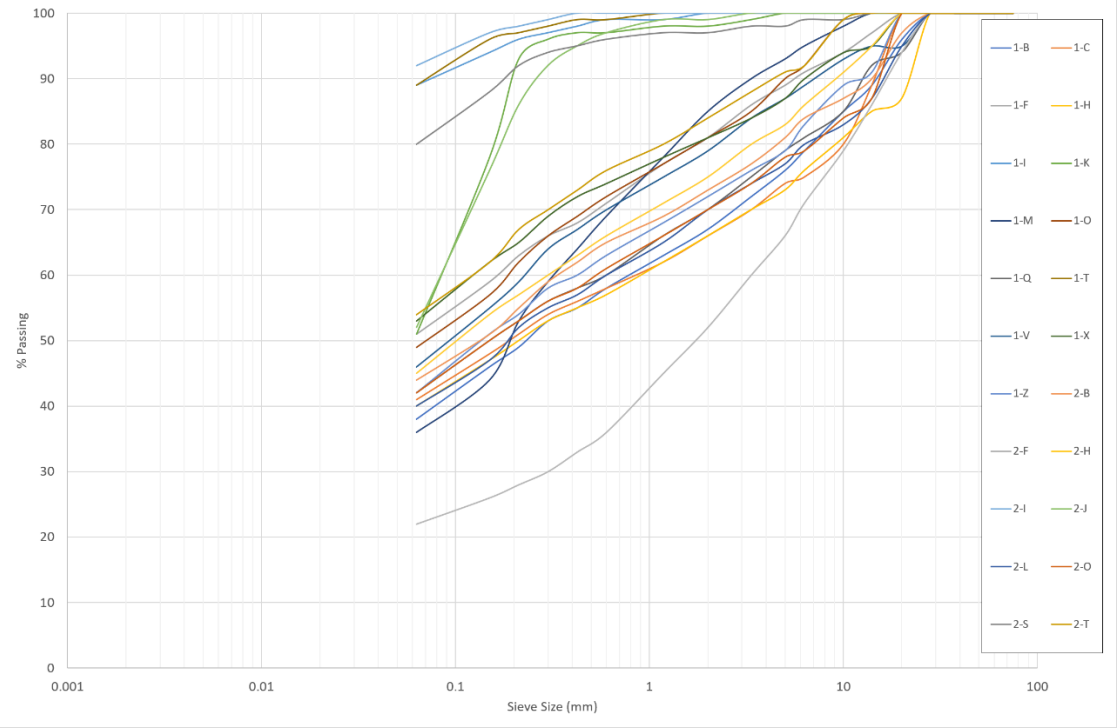


Figure 8-5: PSD Analysis of Subsoils.

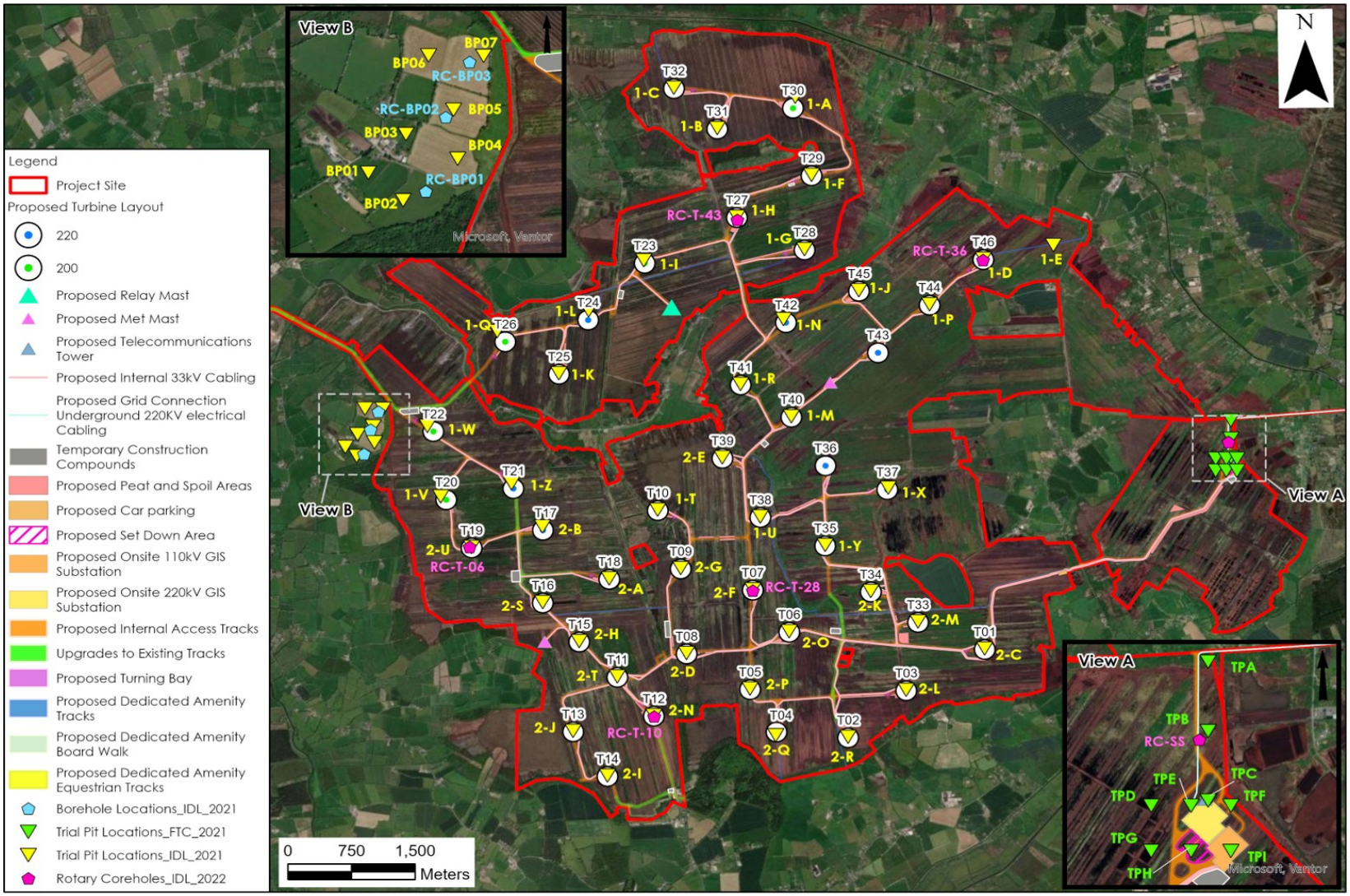


Figure 8-6: Site Investigation Locations (Trial Pits and Boreholes)

8.3.3.2.2 *Proposed Grid Connection*

The Proposed Onsite Substation is located within the Proposed Wind Farm site and the site investigations completed at this located are described above in Section 8.3.3.2.1.

Site investigations comprising peat probing have been completed at the Proposed Offsite Substation. The peat depth in this area is shallow, with an average peat depth of 0.5m (refer to Table 8-8). No peat was found to be present along the access road to the north of the Proposed Offsite Substation.

8.3.4 Bedrock Geology

8.3.4.1 Desk Study

8.3.4.1.1 *Proposed Wind Farm site*

A total of 4 no. bedrock geological formations (Fm) are mapped to underlie the Proposed Wind Farm site (www.gsi.ie). These include the Ballyadams Formation (crinoidal wackestone/packstone limestone), the Lucan Formation (Fm) (dark limestone and shale (`calp')), Allenwood Fm (thick-bedded limestone, locally peloidal) and the Waulsortian Limestones (massive, unbedded lime-mudstone). Table 8-9 summarises the mapped bedrock geology under each of the 14 no. bogs comprising the Proposed Wind Farm.

There are 3 no. faults mapped within the Proposed Wind Farm site. One fault is running north-south through the centre of the Proposed Wind Farm site, another fault is running northwest-southeast and one fault is running west-east in the east. These bedrock geological faults were active millions of years ago and are of no consequence for the Proposed Project.

The GSI do not map any significant areas of bedrock outcrop within the Proposed Wind Farm site.

The proposed accommodation works along the Proposed Turbine Delivery Route are mapped to be underlain by the Edenderry Oolite Member in the east which comprises oolitic limestone. The works further west along the R402 at Ballinagar and Ballina are mapped to be underlain by the Lucan Fm.

Table 8-9: Bedrock Geological Formations across the 14 no. Bogs of the Allen Bog Group which comprise part the Proposed Wind Farm site

Bog	Mapped Bedrock Geological Formations	Mapped Faults
Ballydermot North	Predominantly Lucan Fm with a small area in the SE underlain by the Ballyadams Fm.	None
Ballydermot South	Predominantly Ballyadams Fm with small area in NW and W underlain by the Lucan Fm.	None
Blackriver	Predominantly Ballyadams Fm with some areas in NW underlain by the Lucan Fm, some area in SW underlain by the Allenwood Fm.	2 faults (NW – SE in northern section and NE – SW in southern section)
Barnaran	Predominantly Waulsortian Limestones with majority of western section underlain by the Allenwood Fm with a small area in W underlain by the Ballyadams Fm.	3 faults (NW – SE in centre, NE – SW in southwestern and N – S in the northwestern section)
Lullybeg	Predominantly Ballyadams Fm with a very small area in the E underlain by Allenwood Fm.	1 fault (N – S in east of the bog)
Lullymore	Predominantly Allenwood Fm with some area in E underlain by Waulsortian	1 fault (N – S in west of the bog)

Bog	Mapped Bedrock Geological Formations	Mapped Faults
	Limestones and some area in the W underlain by Ballyadams Fm.	
Lodge	Ares in NW and SE underlain by the Boston Hill Fm while the central section is underlain by the Waulsortian Limestones.	1 fault (W – E in the south of the bog).
Killina	Area in E is underlain by the Boston Hill Fm, the central section is underlain by the Waulsortian Limestones and the majority of the area in W is underlain by the Allenwood Fm with a very small area in W underlain by the Ballyadams Fm.	1 fault (N – S in the west of the bog)
Derrybrennan	Majority of area in E is underlain by the Allenwood Fm with some area in the NE underlain by the Waulsortian Limestones while the western section is underlain by the Ballyadams Fm.	1 fault (N – S in the centre of the bog)
Glashabaun North	Predominantly Lucan Fm with some area in E underlain by the Ballyadams Fm.	1 fault (NW – SE in south of the bog)
Glashabaun South	Predominantly Ballyadams Fm with some area in W underlain by the Lucan Fm and some area in E underlain by the Allenwood Fm.	1 fault (N – S in the east of the bog)
Ticknevin	Predominantly Lucan Fm with a very small area in the SE underlain by the Ballyadams Fm.	None
Codd 1	Lucan Fm	None
Codd 2	Lucan Fm	1 fault (NW – SE in the east of the bog)

8.3.4.1.2 *Proposed Grid Connection*

The GSI map the Proposed Onsite Substation and the western section of the Proposed Grid Connection underground electrical cabling route to be underlain by several bedrock geological formations including the Boston Hill Fm (comprising of nodular and muddy limestones and shales), the Waulsortian Limestones (consisting of massive, unbedded lime-mudstones) and the Allenwood Fm (comprising of thick-bedded limestone) (www.gsi.ie). A very small section of the Proposed Grid Connection underground electrical cabling route is mapped to be underlain by the Feighcullen Formation which consists of skeletal, oolitic and micritic limestone. Meanwhile, the eastern 4.3km of the Proposed Grid Connection underground electrical cabling route and the Proposed Offsite Substation are mapped to be underlain by the Boston Hill Formation.

A bedrock geology map of the area of the Land, Soils and Geology Study Area is included as Figure 8-7.

8.3.4.2 Site Investigation Data

No bedrock was encountered in any of the trial pits excavated at the Project Site by IDL or FTC. The trial pits extended to depths of 0.5 to 4.7m and did not encounter any weathered or competent bedrock.

Bedrock was encountered during the drilling of 6 no. rotary core boreholes at the Proposed Wind Farm site. These site investigations were completed at 5 no. Proposed Turbine locations (T07, T12, T19, T27 and T46) and at the Proposed Onsite Substation. Competent bedrock was encountered at depths of between 10.4 and 18.6mbgl. Possible weathered bedrock was also encountered in a number of

boreholes at shallower depths. The logs are summarised in Table 8-10 below and are included in full as an appendix to the GPSRA.

The boreholes completed by IDL on the agricultural lands to the west of Codd 1 Bog encountered competent limestone bedrock at depths of 1.4 to 7.1m. The upper 2m of bedrock was described as being weathered in 2 of the 3 no. boreholes. The bedrock was described as comprising strong, massive, dark blackish grey, fine grained calp limestone. This is consistent with the GSI's description of the Lucan Formation which is mapped to underlie this area.

The logs associated with these site investigations are attached to the GPSRA (FTC, 2026) (Appendix 8-1).

Table 8-10: Summary of IDL Drilling Logs (2022).

Rotary Borehole ID	Infrastructure Location	Depth	Summary Description
RC-SS	Proposed Onsite Substation	0 – 3.0	No recovery – Peat
		3.0 – 11.8	GRAVEL
		11.8 – 16.5	Weathered dolomitised LIMESTONE
		16.5 – 22.2	Very strong dolomitised LIMESTONE
RC-T-06	T19	0 – 1.5	No recovery
		1.5 – 8.4	GRAVEL
		8.4 – 10.5	Weathered LIMESTONE
		10.5 – 20.1	Very strong LIMESTONE
RC-T-10	T12	0 – 6.0	No recovery – Peat
		6.0 -12.3	SAND and GRAVEL
		12.3 – 14.9	GRAVEL
		14.9 - 20.1	Strong weakly dolomitised LIMESTONE
RC-T-28	T07	0 – 3.0	No recovery
		3.0 – 15.8	GRAVEL
		15.8 – 17.9	Strong bioclastic LIMESTONE
		17.9 – 19.5	Very strong weakly dolomitised LIMESTONE
		19.5- 20.4	Strong, bioclastic LIMESTONE
RC-T-36	T46	0 – 4.0	No recovery
		4.0 – 10.4	GRAVEL
		10.4 – 20.1	Extremely strong bioclastic cherty LIMESTONE
RC-T-43	T27	0 – 4.5	No recovery – peat and silt
		4.5 – 9.8	GRAVEL

Rotary Borehole ID	Infrastructure Location	Depth	Summary Description
		9.8 – 18.6	Weathered dolomitised limestone
		18.6 – 20.0	Strong dolomitised LIMESTONE

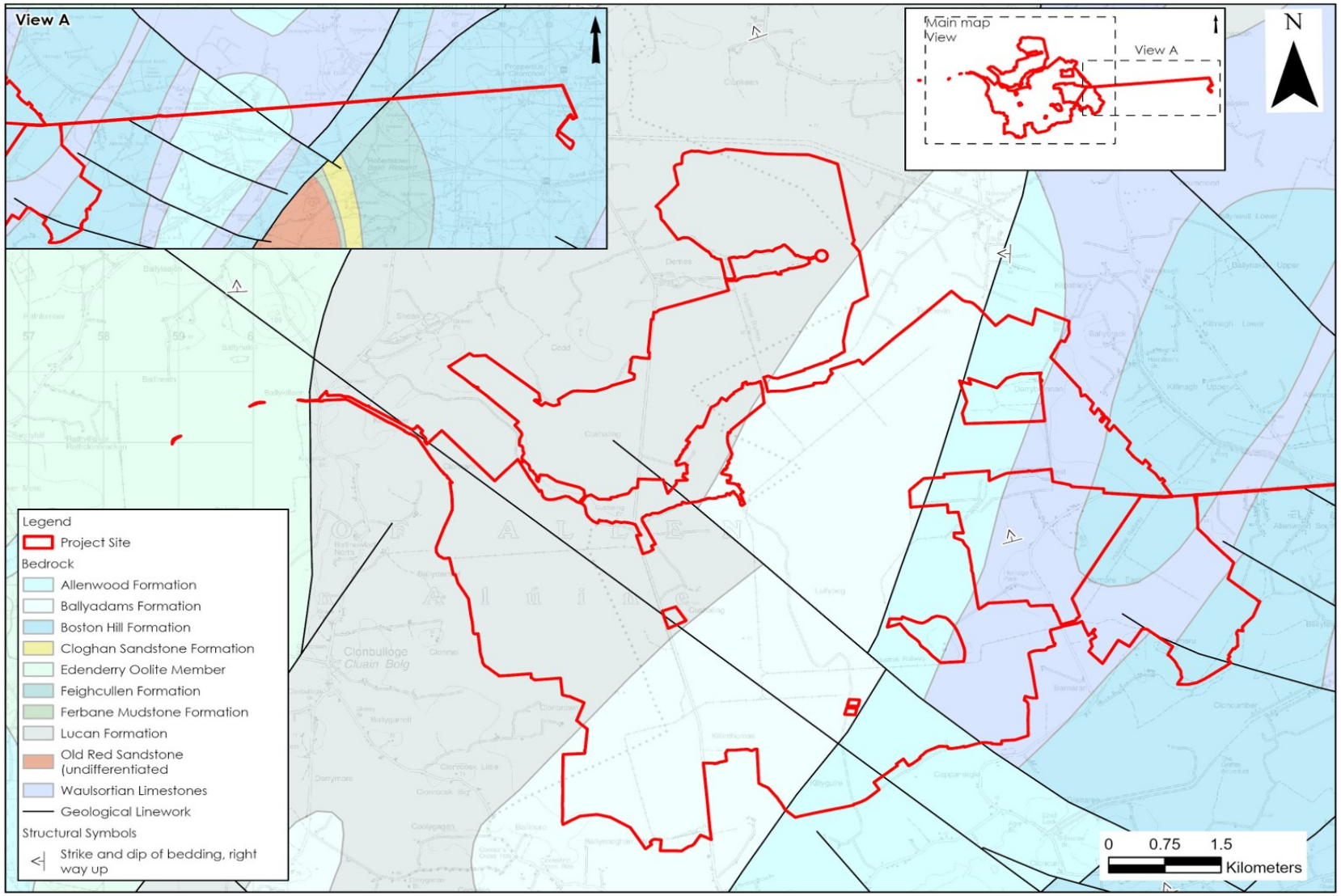


Figure 8-7: Bedrock Geology Map

8.3.5 Karst

8.3.5.1 Proposed Wind Farm site

The GSI classify the Ballyadams and Allenwood formations as a Regionally Important Aquifers-Karstified (diffuse) (www.gsi.ie).

The GSI do not map the presence of any karst features within the Proposed Wind Farm site. The closest GSI mapped karst feature is Clonbullogue Spring, which is a hot spring used as a water supply for Clonbullogue. This feature is located approximately 2.2km to the west of the Proposed Wind Farm site. The closest Proposed Turbine is T19, located approximately 2.9km to the east/northeast. Superficial solution features are also recorded at Clonkeen Mushroom Rock located approximately 2.95km west of the Proposed Wind Farm. There is no other karst features mapped within 5km of the Proposed Wind Farm or the Proposed Enhancement Areas.

As outlined, no karst features are mapped (by the GSI) within the Proposed Wind Farm site. In addition to GSI mapping, we also present the following site-specific information:

- No evidence of karst features has been identified within the Proposed Wind Farm site. This is supported by the extensive site investigation data collected for the Proposed Wind Farm and the surrounding area, including:
    - Extensive site walkover surveys and geological mapping;
    - Completion of 1,026 no. peat probes at the Proposed Wind Farm;
    - Excavation of 55 no. trial pits at the Proposed Wind Farm;
    - Completion of 6 no. rotary core boreholes at the Proposed Wind Farm; and,
    - Excavation of an additional 7 no. trial pits and 3 no. boreholes to the west of Codd 1 Bog.
- A review of available desk study information has not identified the presence of karst features at the Proposed Wind Farm site:
    - The GSI Karst Features database (www.gsi.ie) does not record the presence of any karst features at the Proposed Wind Farm site;
    - Historic 6" or 25" base mapping does not record any karst-related features at the Proposed Wind Farm site;
    - Inspection of recent and historic aerial imagery has not identified any features indicative of karst development at the Proposed Wind Farm site
- BnM's LiDAR data for the Proposed Wind Farm site has been reviewed, and it does not indicate the presence of depressions, sinkholes or other topographical anomalies that may be associated with karstification;
- Site investigations have demonstrated that the Proposed Wind Farm site is overlain by low permeability peat and lacustrine clay. These soils/subsoils significantly restrict groundwater recharge and protect the underlying bedrock aquifers; and,
- A total of 3 no. rotary core boreholes have been drilled in areas mapped to be underlain by a Regionally Important Karst Aquifer at T07, T12 and T46. These rotary core boreholes encountered rock at depths of 10.4 to 15.8mbgl and the bedrock was described as strong to extremely strong, thinly bedded, slightly bioclastic fine to coarse grained limestone. There was no evidence of karstification or water bearing conduits during the drilling of these boreholes.

The proposed accommodation works along the Proposed Turbine Delivery Route are not mapped to be underlain by karst aquifers.

8.3.5.2 Proposed Grid Connection

The GSI map approximately 2.27km of the Proposed Grid Connection underground electrical cabling route to be underlain by a Locally Important Karst Aquifer associated with the Allenwood Formation along the R403 near Allenwood. However, there are no karst features mapped within 5km of the Proposed Grid Connection underground electrical cabling route. No karst features were encountered during the intrusive site investigations.

The Proposed Onsite Substation and the Proposed Offsite Substation are not mapped to be underlain by karst aquifers, and no evidence of karst features were recorded during the walkover surveys or the site investigations completed at these locations. The borehole drilled at the Proposed Onsite Substation encountered overburden to 11.8mbgl, over weathered bedrock to 16.5mbgl over very strong dolomitised LIMESTONE. There was no evidence of karstification.

A map of local GSI mapped karst features is included as Figure 8-8.

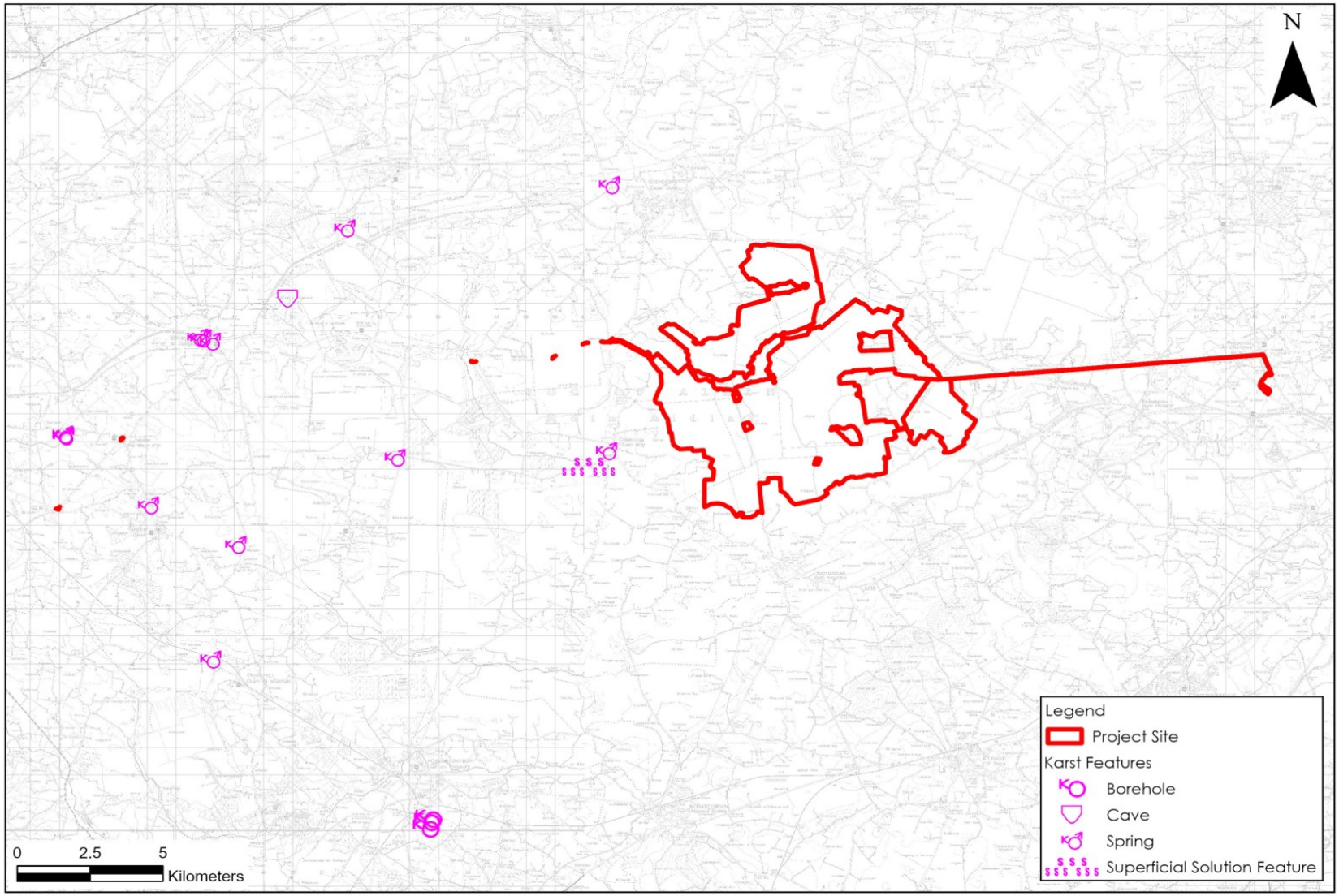


Figure 8-8: GSI Mapped Karst Features

8.3.6 Soil Contamination

According to the EPA online mapping (www.epa.ie), there are no licenced waste facilities or dump sites within the Land, Soils and Geology Study Area. There are several licenced waste facilities in the surrounding lands:

- The closest EPA mapped waste locality is an EPA licensed Composting/Anaerobic Digestion waste facility (Licence No.: W0124) located approximately 900m northeast of the Land, Soils and Geology Study Area. This licence is associated with Carbury Compost Limited.
- A landfill (Licence No.: W0049) is also mapped approximately 2.7km west of the Land, Soils and Geology Study Area. This licence is associated with the Clonbullogue Ash Repository operated by BnM in Cloncreen Bog.
- A waste facility (Licence No: W0201-04) is also mapped approximately 4km to the east of the Land, Soils and Geology Study Area. This is associated with BnM's Drehid Waste Management Facility.

The EPA map several Industrial Emissions Licenced (IEL) facilities and Integrated Pollution Control sites (IPC sites) in the vicinity of the Proposed Wind Farm site. The IEL/IPC licenced sites located in the close proximity are JMW Farms (IRL) Limited (IEL Licence No: P0702) located in immediately to the south of Barnaran Bog, Edenderry Power Limited (P0482) located approximately 600m west of the Proposed Wind Farm site (Codd South Bog) and Clonbullogue Ash Repository (IEL Licence No: P0049) located approximately 3km west of the Proposed Wind Farm site (Codd South Bog). IEL licences are also associated with the Drehid Mechanical Biological Treatment Facility (W0283).

BnM was granted an IPC Licence (Ref. P0503-01) for peat extraction activities from the EPA for the Allen Bog Group in May 1999, where the Proposed Wind Farm site is located. BnM's statutory duties to discharge the conditions of its IPC Licence remain on-going. These ongoing duties such as environmental monitoring, decommissioning and site management do not facilitate the continuation of peat extraction, but rather ensure compliance with BnM's IPC Licence.

The GSI do not map the presence of any historic quarries or pits within the Land, Soils and Geology Study Area which may have contaminated tailings. The GSI record several quarries dating from the early to mid-20th century in the lands surrounding the Land, Soils and Geology Study Area. Site surveys have revealed the presence of historic gravel pits within the Land, Soils and Geology Study Area between Glashabaun North and Ticknevin bogs. These pits occur within the mapped extent of The Long Derries, Edenderry SAC (Site Code: 00925) and are associated with mineral soils/subsoils adjacent to the cutover bogs.

During the site walkover surveys, no areas of contamination concern were identified within the Land, Soils and Geology Study Area. Some minor fly-tipping was noted along the edge of existing access roads.

8.3.7 Geological Resource Importance

8.3.7.1 Proposed Wind Farm site

The GSI Online Minerals Database accessed via the Public Data Viewer (www.gsi.ie) shows a small number of historic quarries and pits in the surrounding lands. These historic extraction sites largely date from the early to mid-20th century. However, none of these historic extraction sites are located within the Proposed Wind Farm site.

The GSI (www.gsi.ie) record no mineral localities within the Proposed Wind Farm site. The nearest GSI mapped mineral locality is mapped within the townland of Bostoncommon approximately 2.9km

southeast where zinc deposits have been recorded. This mineral occurrence is further described by the GSI as "*This prospect is known as Boston Hill-Allenwood. Exploration has revealed zinc-lead deposits of 1 million tonnes and grading 15% combined*".

There are no active bedrock quarries or sand and gravel pits within the Land Soils, and Geology Study Area or in the surrounding lands (GSI, 2026). The closest GSI mapped (www.gsi.ie) active bedrock is located approximately 3.5km southeast of Lodge Bog in the townland of Pluckerstown. The closest mapped active sand and gravel pit is Castlejordan Pit, located approximately 8km northwest of the Ticknevin Bog in the townland of Clongall.

Callan Sand and Gravel, which is not mapped on the GSI database, is also located approximately 2km to the south of the Land, Soils, and Geology Study Area. Arkil Pit is also located to the south of Callan Sand and Gravel.

The GSI online Aggregate Potential Mapping Database (www.gsi.ie) shows that the crushed rock aggregate potential of the Proposed Wind Farm site ranges from 'Very Low' to 'Very High'. The vast majority of the west and northwest of the Proposed Wind Farm site is mapped as having 'Low' potential for a bedrock quarry. Meanwhile, the east and south of the Proposed Wind Farm site are mapped as having 'Moderate' to 'High' potential. There are some areas in the centre which are mapped having 'Very Low' and 'Very High' crushed rock aggregate potential. The underlying bedrock could be classified as 'Medium' importance (refer to Table 8-2). The bedrock could be used on a "sub-economic" local scale for construction purposes. The bedrock has not been used in the past for this purpose because of the covering of peat and glacial till in the local area.

The vast majority of the Proposed Wind Farm site (approximately 99%) is not located within an area mapped for granular aggregate potential (i.e. potential for gravel reserves). Some small areas along the Figile River in the north of Glashabaun North Bog are mapped as having Very Low potential. Areas along the Figile and Slate rivers are also mapped as having 'Very Low' to 'Very High' potential. The overlying peat deposits at the Proposed Wind Farm and the Proposed Enhancement Areas could be classified as 'Low' importance as the peat is not designated in this area and is degraded in most places as a result of industrial peat extraction and drainage. Refer to Table 8-2 for definition of these criteria.

The proposed accommodation work areas along the Proposed Turbine Delivery Route are not mapped in areas of granular aggregate potential. The crushed rock aggregate potential of these areas ranges from 'Low' to 'Moderate'.

8.3.7.2 Proposed Grid Connection

There are no active quarries, active sand and gravel pits or mineral localities mapped at the Proposed Grid Connection (www.gsi.ie).

The GSI online Aggregate Potential Mapping Database (www.gsi.ie) shows that the crushed rock aggregate potential ranges from 'Low' to 'Moderate'.

The majority of the Proposed Grid Connection underground electrical cabling route is not mapped in an area for granular aggregate potential. A small area near Graigues between Allenwood and Prosperous is mapped as having 'Moderate' potential. A small area to the south of the Proposed Offsite Substation is mapped as having 'Very Low' potential. There are no areas in the vicinity of the Proposed Onsite Substation which are mapped as having granular aggregate potential.

8.3.8 Geological Heritage Sites

8.3.8.1 Proposed Wind Farm site

There are no geological heritage sites within the Proposed Wind Farm site (www.gsi.ie).

The closest geological heritage site is Clonbullogue Spring (Site Code: OY006) located ~approximately 2.3km to the west of the Proposed Wind Farm site. This is a County Geological Site (CGS) comprising a significant spring rising 2m from the eastern banks of the Figile River. The spring is managed by Uisce Éireann for the Clonbullogue Public Water Supply (refer to Chapter 9). Clonkeen Mushroom Rock (Site Code: OY007) is located approximately 2.6km southwest of Ballydermot North Bog. This CGS is a Mushroom Rock – isolated upstanding rock in a grass field. This is one of the spreads of mushroom rocks that are particularly well represented in Offaly.

The Carbury Castle (Site Code: KE011) is located approximately 4.2km north of Ticknevin Bog. This is designated as a CGS and may be recommended for Geological NHA. This CGS is a disused quarry at the north end of Carbury hill below the ruined castle. The quarry exposes good sections of Calp limestones; individual beds of limestone around 10-40cm thick in general with thin interbedded black shales.

The Hill of Allen CGS (Site Code: KE003) is located approximately 3.5km southeast of the Proposed Wind Farm site. This CGS is a large working quarry. The Hill of Allen has been heavily excavated on its northwest face. This excavation has exposed part of the Allen Andesite Formation, a massive andesitic lava, which in places within the quarry is porphyritic. Dunmurry Hill (Site Code: KE002) and the Chair of Kildare (Site Code: KE001) CGSs are located approximately 5km to the south.

A map of local geological heritage sites is attached as Figure 8-9. Table 8-11 details the geological heritage sites within 5km of the Proposed Wind Farm site.

There are no geological heritage sites located at the proposed accommodation works areas along the Proposed Turbine Delivery Route. Kilmacormac Esker (Site Code: OY018) is located approximately 1km south of the works proposed at Ballinagar.

Table 8-11: Geological Heritage Sites.

Site Code	Site Name	IGH Theme	Description
KE003	Hill of Allen	IGH4	This is a large working quarry which has exposed part of the Allen Andesite Formation, a massive andesitic lava. Designated as a CGS.
KE001	Chair of Kildare	IGH2 & IGH4	Natural rock exposures scattered over and around a hilltop. Designated as a CGS, recommended for Geological NHA.
KE002	Dunmurry Hill	IGH2	Forested hillside. Graptolite fossils in black mudstones. Designated as a CGS.
KE011	Carbury Castle	IGH8	A disused quarry exposes good section of Calp limestones. Designated as a CGS, recommended for Geological NHA.
OY007	Clonkeen Mushroom Rock	IGH1	An isolated upstanding rock. Designated as a CGS.
OY006	Clonbullogue Spring	IGH16	A significant spring rising 2m from the eastern bank of the Figile River

8.3.8.2 Proposed Grid Connection

There are no geological heritage sites mapped in the vicinity of the Proposed Grid Connection.

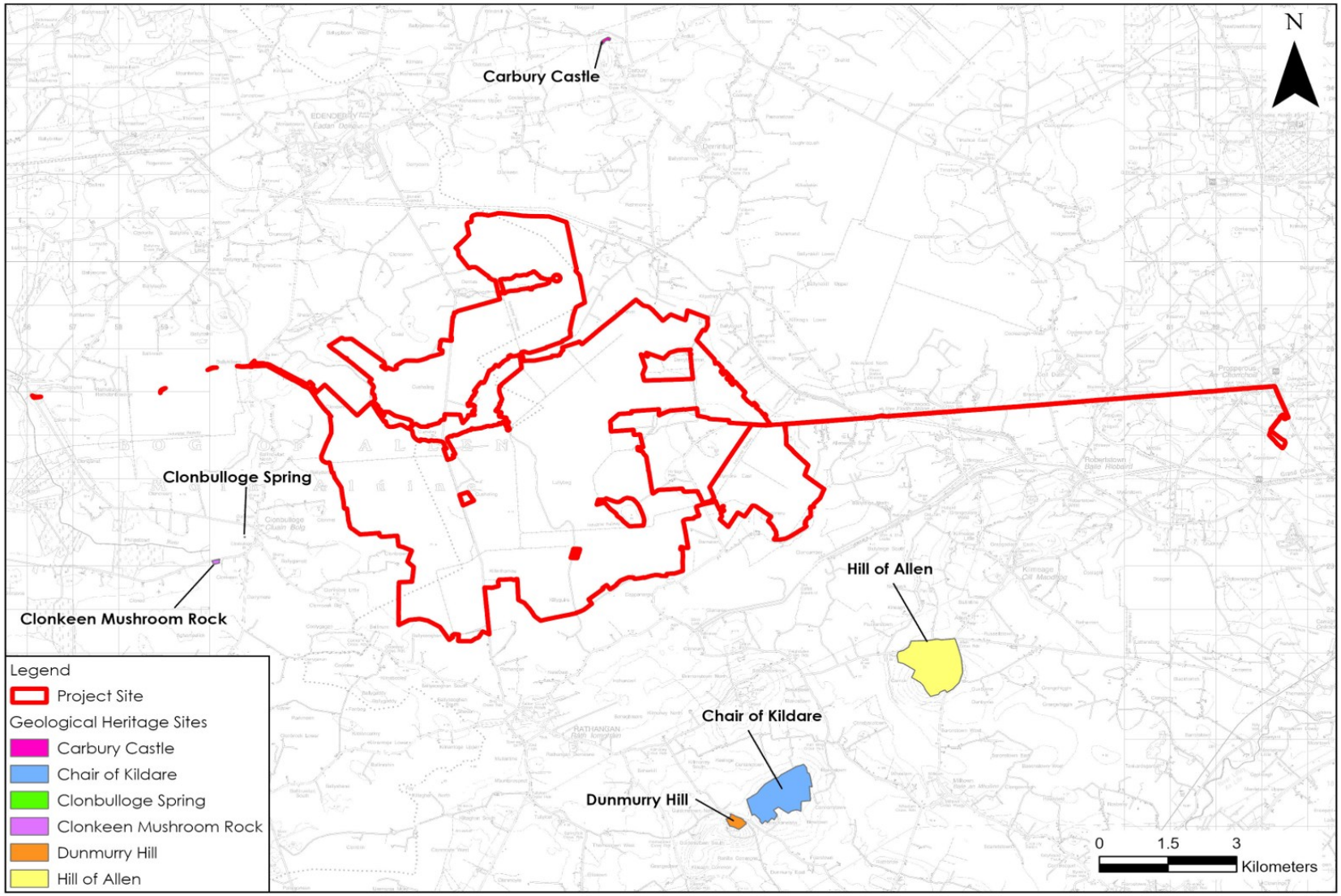


Figure 8-9: Geological Heritage Sites Map.

8.3.9 Designated Sites

Within the Republic of Ireland designated sites include National Heritage Areas (NHAs), Proposed National Heritage Areas (pNHAs), Special Areas of Conservation (SAC), Special Protection Areas (SPAs) and candidate Special Protection Areas.

8.3.9.1 Proposed Wind Farm site

The closest designated site to the Proposed Wind Farm site is the Long Derries, Edenderry SAC and pNHA (Site Code: 000925). The Long Derries, Edenderry SAC/pNHA is located in the lands between Glashabaun North and Ticknevin bogs. This SAC/pNHA is located outside of the Land, Soils and Geology Study Area and no infrastructure associated with the Proposed Project is located within the SAC/pNHA. T29 and T31 are the closest Proposed Turbines to the SAC/pNHA, located approximately 320m and approximately 420m from the SAC/pNHA respectively.

The Grand Canal pNHA (Site Code: 002104) is also mapped adjacent to the north of the Ticknevin Bog. The Proposed Wind Farm site does not encroach upon the mapped extent of this pNHA.

Other designated sites within 10km of the Proposed Wind Farm are as follows:

- Carbury Bog NHA (Site Code: 001388), approximately 4.2km to the north of Ticknevin Bog;
- Ballina Bog (Site Code: 000390), approximately 9.9km north of Ticknevin Bog;
- Black Castle Bog NHA Site Code: 000570), approximately 6.2km northwest of the Ticknevin Bog;
- Hodgestown Bog NHA (Site Code: 001393), approximately 7.8km east of Derrybrennan Bog;
- Ballynafagh Lake SAC and pNHA (Site Code: 001387), approximately 9.4km east of Killina Bog;
- Ballynafagh Bog SAC and pNHA (Site Code: 000391), approximately 8.1km east of Lodge Bog;
- Mouds Bog SAC and pNHA (Site Code: 002331), approximately 5.9km southeast of Lodge Bog;
- Pollardstown Fen SAC and pNHA (Site Code: 000396), approximately 7.6km south of Lodge Bog;
- The River Barrow and River Nore SAC (Site Code: 002162), approximately 9.8km southwest of Ballydermot South Bog; and,
- Curragh (Kildare) pNHA (Site Code: 000392), approximately 8.5km southeast of Lodge Bog.

There are no designated sites located in the vicinity of the proposed accommodation works along the Proposed Turbine Delivery Route.

8.3.9.2 Proposed Grid Connection

The Proposed Grid Connection underground electrical cabling route crosses the Grand Canal pNHA to the west of Allenwood along the R414. The proposed crossing is located approximately 200m west of the existing crossing at Shee Bridge.

Further to the east a small section of the Proposed Grid Connection underground electrical cabling route crosses the Ballynafagh Lake SAC (Site Code: 001387). An existing road bridge crossing, along the R403, over the Blackwood Feeder, which connects Ballynafagh Lake to the Grand Canal, already exists at this location.

The Proposed Grid Connection underground electrical cabling route is also mapped approximately 145m to the south of Ballynafagh Bog SAC/pNHA (Site Code: 000391).

There are no designated sites in the vicinity of the Proposed Onsite Substation (refer to Section 8.3.9.1) or the Proposed Offsite Substation.

A map of local designated sites is included as Figure 8-10.

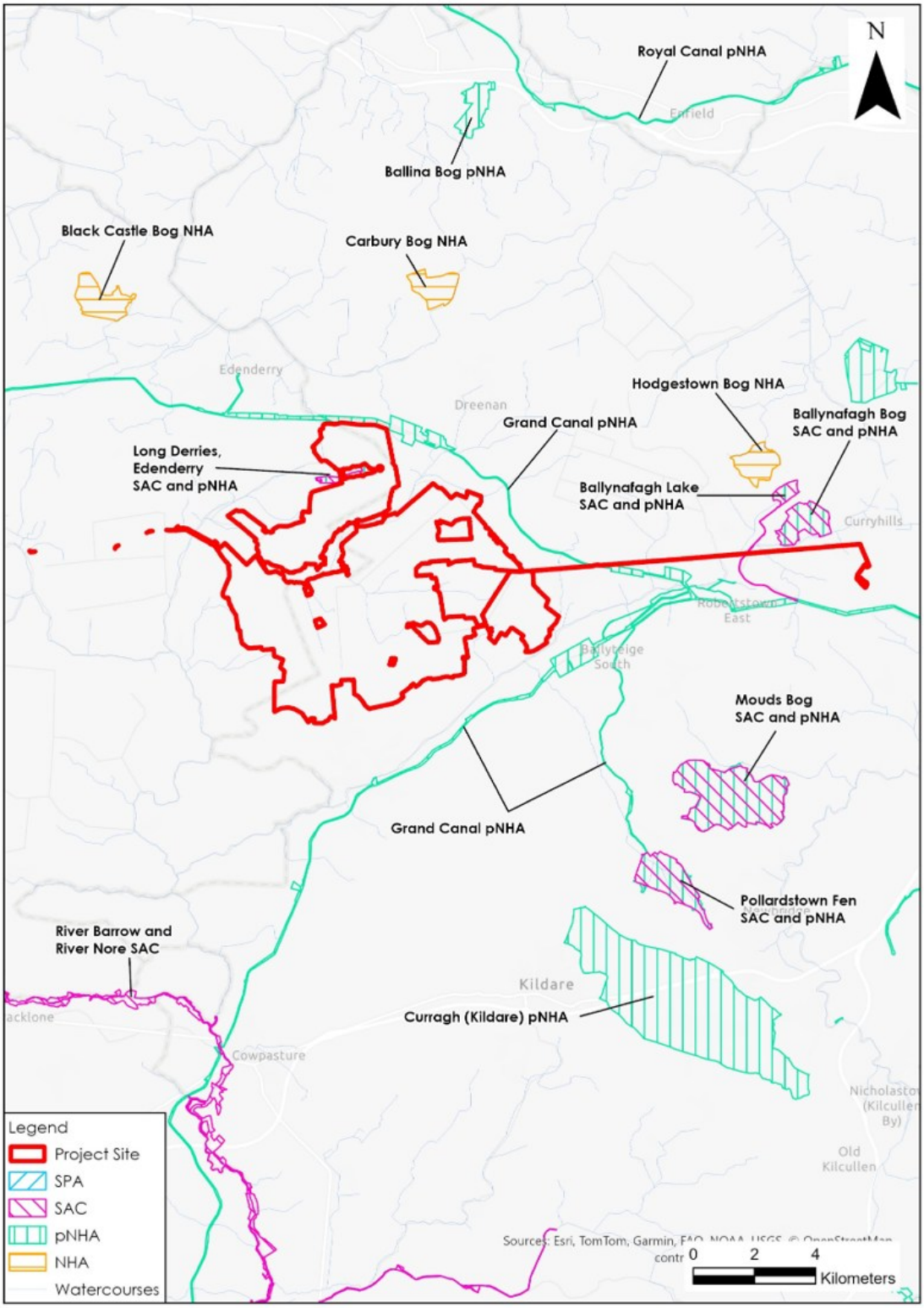


Figure 8-10: Local Designated Sites.

8.3.10 Peat Stability

Fehily Timoney and Company (FTC) was engaged to undertake a geotechnical and peat stability risk assessment (GPSRA) of the Project Site. A GPSRA (FTC, 2026) is attached in Appendix 8-1. The findings of the GPSRA are presented in Section 8.5.2.5.

8.3.10.1 Peat Stability – Desk Study

BnM's records do not document the occurrence of any historic landslides within the Proposed Wind Farm site located on part of the Allen Bog Group. Similarly, the GSI's online database (www.gsi.ie) does not report any historic landslides at the Proposed Grid Connection or the proposed accommodation works along the Proposed Turbine Delivery Route. The closest GSI mapped landslide event, dates from 1989 and is located at the Grand Canal embankment in Edenderry, approximately 250m south of the Proposed Grid Connection at Allenwood.

The GSI Landslide Susceptibility Map (www.gsi.ie) classifies the probability of a landslide occurring at the Land, Soils and Geology Study Area as Low. This is due to the lowland setting and flat topography of the area. Peat failures and landslides are more likely to occur in upland setting where there is sloping ground and high rainfall rates.

8.3.11 Receptor Sensitivity and Importance

Based on the criteria set out in Table 8-2 above, the soils/subsoils at the Proposed Wind Farm site can be classed as being of 'Low' importance as the soils in this area are not designated. Furthermore, the peat soils and subsoils within the Proposed Wind Farm site have been degraded by the historic peat extraction activities and associated drainage works which commenced in 1935 and ceased in June 2020. The bedrock geology underlying the Land, Soils and Geology Study Area can be classed as being of 'Medium' importance where the bedrock could be used on a sub-economic scale.

The land, soils/subsoils and bedrock geological formations underlying the Land, Soils and Geology Study Area will be included in the impact assessment due to their proximal location to the Proposed Wind Farm, the Proposed Enhancement Areas, the Proposed Grid Connection and the proposed accommodation work areas along the Proposed Turbine Delivery Route and the potential for direct effects on these receptors.

All geological heritage sites have been screened out of the impact assessment due to their distant location from the Land, Soils and Geology Study Area. There is no potential for effects to occur on these geological heritage sites.

The Grand Canal pNHA and the Ballynafagh Lake SAC are included due to the overlap between the Land, Soils and Geology Study Area and the mapped extent of these designated sites. The Long Derries, Edenderry SAC is not included due to the lack of any proposed infrastructure with the designated site. There is no potential for effects to occur on the land, soils and geological environment of any other designated site.

8.3.12 Likely Future Receiving Environment

This section identifies the future receiving environment relating to land soils and geology likely to exist at the Proposed Wind Farm site at the commencement of the construction phase. In accordance with the approach set out in Section 1.8.4 of Chapter 1, the likely future receiving environment has been established having regard to the existing geological baseline presented in Section 8.3 and uses observed change over the survey period (i.e., 2020 to 2026) to inform the likely future receiving environment.

The likely future receiving environment has been established having regard to:

- The existing geological baseline described in Section 8.3;
- The relevant findings of Chapter 9 (Water);
- Observed environmental change during site specific surveys covering the period April 2020 to March 2026, including natural revegetation;
- Available BnM site records and environmental data, including management and monitoring undertaken under IPC Licence Reg. No. P0503-01 included within the Annual Environment Reports (AERS) for the Allen Bog Group;
- Published guidance and scientific reports pertaining to land soils and geology as detailed in Section 8.1.5 above

The Project Site is located predominantly on former industrial peat extraction lands within the Allen Bog Group. Industrial peat extraction ceased at different times across the constituent bogs (refer to Table 8-5), with extraction having ceased in June 2020 across all BnM bogs. Consequently, the principal activity responsible for historical modification of the peat morphology and the shallow underlying geological environment has ceased.

Since cessation of peat extraction, ongoing site management, decommissioning activities and natural revegetation have resulted in localised changes to surface conditions. These activities are expected to continue up to commencement of the Proposed Project construction phase. However, they are not anticipated to materially alter the peat thickness, soil and subsoil characteristics, bedrock geology, geological resources or geological heritage features identified in the existing baseline.

The enhanced rehabilitation works already completed at Lodge Bog under the Peatland Climate Action Scheme (PCAS) will also form part of the likely future receiving environment. While these works have altered local drainage and surface conditions and have also included some (peat) cell bunding using local peat, they are not anticipated to have materially changed the local peat morphological conditions or the underlying geological environment at Lodge Bog.

Peat stability at the commencement of the construction phase will continue to reflect the existing peat characteristics, ground conditions, topography, drainage and groundwater conditions.

Accordingly, the existing baseline conditions described in Section 8.3 are considered representative of the likely future receiving environment for land, soils and geology at the commencement of construction. The assessment of likely significant effects in Section 8.5.2 has therefore been undertaken against these conditions.

8.3.12.1 Future Environmental Trends

The long-term future environmental trends for land, soils and geology will be influenced by continued site management and implementation of the Draft Rehabilitation Plans under IPC Licence P0503-01. In accordance with the approach outlined in Section 1.8.4 of Chapter 1, implementation of these plans will follow the Proposed Project construction phase and occur during the operational phase.

The proposed rehabilitation measures will principally involve drain blocking, rewetting and vegetation establishment across the former industrial peatland. While these measures will result in changes to surface conditions, local peat moisture characteristics, and reduction in erosion potential, they are not anticipated to materially alter peat thickness or peat morphology, peat stability, subsoil thickness or distribution, bedrock geology, geological resources or geological heritage features.

The future environmental trends for peat stability will be influenced by the changing hydrological conditions associated with rehabilitation, including increased water retention and rewetting in areas where drains are blocked, as outlined in Section 9.3.18.1 of Chapter 9 (Water). The effect of these changes on peat stability will be limited and spatially variable and will depend on local peat depth, ground conditions, drainage configuration and hydrological conditions. The peat stability assessment completed as part of this assessment (Appendix 8-1) demonstrates a low risk of peat failure under the

assessed conditions. The future management of the rehabilitated peatland will continue to be subject to appropriate monitoring and management.

The underlying geological environment across the Proposed Wind Farm site is therefore expected to remain materially comparable to the existing baseline described in Section 8.3. Local changes in peat moisture conditions may occur following rehabilitation, but these are not anticipated to result in widespread changes to the geological characteristics of the Proposed Wind Farm site.

The Proposed Project construction works will involve localised peat excavation, local subsoil disturbance and the placement of peat and spoil material within designated areas. These activities will occur principally within the Proposed Project infrastructure footprint of approximately 152 ha, representing approximately 2.9% of the total bog area. Consequently, the majority of the Proposed Wind Farm site will remain available for rehabilitation without direct disturbance from the Proposed Project infrastructure.

Accordingly, the future environmental trends for land, soils and geology are not anticipated to result in material changes to the underlying geological environment across the wider Proposed Wind Farm site. The potential effects of the Proposed Project earthworks are assessed separately in Section 8.5, while the hydrological implications of peatland rehabilitation are considered in Chapter 9 (Water).

The implementation of the Draft Rehabilitation Plans in the absence of the Proposed Project is considered in the Do-Nothing Scenario in Section 8.5.1, and the potential for cumulative effects is considered in Section 8.5.7.

8.4 Characteristics of the Proposed Project

The Proposed Project comprises both the Proposed Wind Farm and the Proposed Grid Connection and is described in full in Chapter 4 of this EIAR.

8.4.1 Proposed Peat and Spoil Areas

FTC have prepared a Peat and Spoil Management Plan (PSMP) (2026) which describes how peat and spoil, which will be excavated from infrastructure locations, will be handled and placed/reinstated onsite. The Peat and Spoil Management Plan is attached as Appendix 4-3. The main characteristics of the Proposed Project that could affect the local soils and geological environment are described below:

- The establishment of the 10 no. temporary construction compounds and 10 no. security huts will be constructed using floated techniques as appropriate. No excavation of peat or spoil will be required at these locations. Welfare facilities will be provided at the site compounds. Wastewater effluent will be collected in a wastewater holding tank and periodically emptied by a licensed contractor.
- Construction of the Proposed Onsite Substation (and associated infrastructure) will be completed using founded techniques. The Proposed Onsite Substation construction will require the excavation of 67,900m^3 of peat and 12,000m^3 of non-peat (spoil) material (FTC, 2026b). Welfare facilities will be provided at the Proposed Onsite Substation. Wastewater effluent will be collected in an underground concrete holding tank and periodically emptied by a licensed contractor for the operational phase of the Proposed Project.
- Construction of the Proposed Offsite Substation (and associated infrastructure) will be completed using founded techniques. The substation construction will require the excavation of 1,500m^3 of peat and 13,300m^3 of non-peat (spoil) material (FTC, 2026b).
- The construction of new internal access roads within the bog (60km) and the upgrade of existing site access roads (2.8km) will require the removal of 25,300m^3 of peat (FTC, 2026b). Due to the peat depth, internal roads will generally be constructed

using the floated technique. The methodology includes the placement of a geotextile membrane on both sides of the existing access road. Benching of the existing road and placement of granular fill. Overlay existing road with granular fill and new access road to be finished with a layer of capping. No peat extraction will be required in the upgrade of existing floated access roads and/or construction of new floating roads. The upgrade and construction of these roads will require the use of Class 6 crushed stone and general fill;
    - The 13.4km of new dedicated internal amenity access track and 1km of dedicated equestrian amenity track will have a gravel/crushed stone finish surface and will be approximately 3m in width and will be constructed using a similar methodology to the proposed new roads.
- Construction of the Proposed Turbines and associated foundations and hardstands will require the excavation of approximately 636,200 m³ of peat and 112,200 m³ of spoil. The total volume of peat and spoil requiring management across the Proposed Project is estimated to be 870,900 m³ (FTC, 2026b).
- The construction of the 2 no. met masts and 1 no. relay mast is estimated to require the excavation of approximately 1,900m^3 of peat and 600m^3 of spoil (FTC, 2026). The met mast foundations will likely comprise gravity type foundation, with the foundation to be founded on a competent stratum below the peat.
- The construction of the steel masts and associated hardstand areas for the OHL, and the associated crane pads, will be completed using a mixture of gravity and piled foundations and will require the excavation of peat and spoil.

Summary volumes of material to be excavated are provided in Table 8-12.

The total volume of peat and spoil requiring management is estimated to be 870,900m^3. All excavated peat and overburden will be placed/spread alongside the excavations for the infrastructure elements. Excavated peat and spoil will be transported immediately on excavation to designated peat and spoil areas alongside the hardstands and access roads or used for landscaping. Table 8-13 below provides a summary of the potential peat and spoil areas and demonstrates that there is more than sufficient storage capacity to manage all peat and spoil generated during construction.

Table 8-12: Excavated Peat and Spoil volumes.

Infrastructure Element	Peat Volume (m^3)	Spoil Volume (m^3)
46 no. Turbines and Hardstands	636,200	112,200
Access Roads (including turning heads and passing bay)	25,300	-
2 no. Met Masts and 1 no. Relay Mast	1,900	600
10 no. Temporary Construction Compounds / 10 no. Security Huts	-	-
Proposed Onsite Substation (and associated infrastructure)	67,900	12,000
Proposed Offsite Substation (and associated infrastructure)	1,500	13,300
Total (m^3)	**732,800**	**138,100**
Total Peat and Spoil to be managed (m^3)		**870,900**

Table 8-13: Peat and Spoil Areas.

Location	Peat & Spoil Volume (m^3)	Comment
Placement adjacent to hardstands	864,000	Up to 1.5m in height and up to 50m wide corridor around all hardstands
Placement along designated Access Roads	135,500	Up to 1.5m in height and 20m corridor on both sides of Access Roads
Landscaping	47,000	approximately 1,000m^3 of peat required for landscaping at each turbine location
Total (m^3)	**1,046,500**	

8.4.2 Stone Requirements

Table 8-14 below presents the stone volume requirements for the Proposed Project. No borrow pits are proposed and all stone will be sourced externally from 9 no. locally licenced quarries within 20km of the Project Site (see Section 4.5.2 in Chapter 4).

Table 8-14: Summary of Stone Volume Requirements.

Infrastructure Element	Stone Volume (m^3)
46 no. Turbines and Hardstands	637,200
Access Roads (including cabling)	454,000
Proposed Onsite Substation	163,900
Proposed Offsite Substation	55,250
Met Masts and Relay Mast	2,000
Temporary Construction Compounds	49,900
Car Parks	5,000
Total (m^3)	**1,367,250**

8.5 Likely Significant Effects and Associated Mitigation Measures

8.5.1 Do Nothing Scenario

If the Proposed Project were not to proceed, the cutover peat bogs within the Land, Soils and Geology Study Area would continue to be managed under the requirements of the IPC Licence and therefore the ongoing decommissioning activities, site management and environmental monitoring would continue. Irrespective of the consenting or construction of the Proposed Project, BnM's statutory duties to discharge the conditions of its IPC Licence will remain ongoing.

If the Proposed Project were not to proceed, the Proposed Wind Farm site would continue to be managed under the requirements of the IPC licence (P0503-01) and therefore the ongoing decommissioning activities, site management and environmental monitoring would continue, as detailed in Chapter 4, Section 4.6.7. The lands required for the Proposed Project not located within lands under IPC Licence or under PCAS within Lodge Bog (i.e. the Proposed Grid Connection underground cabling route and the Proposed Offsite Substation), would continue to function, with no changes to the current land-use.

In the absence of the Proposed Project, natural revegetation processes would continue across the Proposed Wind Farm site. Areas of bare peat would progressively revegetate and transition through successional stages, potentially developing into heath communities, scrub or bog woodland over time, depending on local hydrological conditions. Therefore, the existing baseline of the landscape will transition from a predominantly industrial cutover peatland landscape, with open exposed peat surfaces and drainage features, to a more natural mosaic landscape of cutaway peatland, wetland and regenerating bog habitats.

If the Proposed Project were not to proceed, the opportunity to further significantly reduce emissions of greenhouse gases, including carbon dioxide (CO_2), oxides of nitrogen (NO_x), and sulphur dioxide (SO_2) from fossil fuels to the atmosphere would be lost. The opportunity to capture a significant part of County Offaly's and Ireland's valuable renewable energy resources would be lost, as would the opportunity to contribute to meeting Government and EU Targets for the production and consumption of electricity from renewable resources and the reduction of greenhouse gas emissions. The opportunity to generate local employment and investment and to diversify the local economy would also be lost. This would be a long-term, slight, negative effect and is Not Significant.

8.5.2 Construction Phase - Likely Significant Effects and Mitigation Measures

The likely significant effects of the construction phase of the Proposed Project and mitigation measures that will be put in place to eliminate or reduce them are shown in this section. The main potential effects on the soils and geology environment will occur during the construction phase. The assessment considers the Proposed Project as a whole *i.e.* the Proposed Wind Farm, the Proposed Enhancement Areas, and the Proposed Grid Connection. Where separate assessment of these elements is required, this is identified accordingly in the text.

8.5.2.1 Potential Effects on Land and Land Use

Pre-Mitigation Effect

The Proposed Wind Farm includes the construction of 46 no. Turbines and associated Hardstands, 10 no. Temporary Construction Compounds, 2 no. Met Masts, relay mast, new access road, upgrades to existing road, crane hardstands, internal 33kV underground electrical cabling, amenity car parks, amenity tracks, bridge crossings, and peat and spoil areas. The Proposed Grid Connection includes the Proposed Onsite 220kV Substation, the Proposed Offsite Substation, the Proposed Grid Connection underground electrical cabling route, and gantry and mast structures at the loop in connection to the existing OHL. The combined infrastructure footprint of the Proposed Project has a total permanent development footprint of 154 ha.

Tree felling and vegetation removal will be required within and around the Proposed Project footprint. A total of 60.7ha of conifer plantation will be clear felled and 176ha of vegetation removal will occur as part of the Proposed Project.

The permanent infrastructure footprint of the Proposed Wind Farm and the Proposed Grid Connection will result in the permanent loss of cutover bog and bog woodland and scrub which will be replaced by

turbine foundations, hardstand areas, access roads and other related infrastructure. The Proposed Project construction works will also result in local topographic changes with the removal of overburden and bedrock. The Proposed Offsite Substation and associated new proposed access road will result in the loss of agricultural land.

The loss of 154 ha of land (cutover peat bog and agricultural land) resulting from the Proposed Project on a local or a regional scale is minimal and therefore the effects of actual land loss are considered not to be significant. The loss of 154 ha represents approximately 2.9% of the Land Soils and Geology Study Area (5,157ha).

The loss of coniferous forestry (60.7 ha) and bog woodland and scrub (176ha) will not have a significant effect on land at the Project Site on the Land, Soils and Geology Study Area due to the small development footprint. The loss of this land is minimal on a local and regional scale and therefore, the effects of land loss is negligible. The loss will be offset by the works proposed as part of the Proposed Enhancement Areas. The effects associated with the Proposed Enhancement Areas are assessed separately in Section 8.5.2.10 below.

There will be no effects on the land or land use adjoining the Land, Soils and Geology Study Area.

Pathway: Construction land-take.

Receptor: Land and Land use (*i.e.* the land upon which the Proposed Project will occur).

Description of Effects: Negative, moderate, direct, likely, long-term effect on land and land use at the Land, Soils and Geology Study Area. There is no potential for significant effects.

Proposed Mitigation Measures

No specific mitigation is proposed in regard to land loss as this is considered to be an acceptable consequence of the Proposed Project.

All felling operations will be completed in line with the Forest Service's published policy and will be subject of a Limited Felling Licence (LFL).

Residual Effect

Due to the relatively small footprint of the Proposed Project infrastructure on a site scale and even more so on a local scale the residual effect is a negative, direct, moderate, likely, long-term effect on land and land use.

Significance of Effects

For the reasons outlined above, no significant effects on land or land use will occur.

8.5.2.2 Potential Effects from Peat and Subsoil Excavation

Pre-Mitigation Effect

Excavation of peat and subsoil will be required for the installation of proposed site roads (new internal access roads, and upgrade of existing site access roads), piled, bored or gravity foundations for Turbine bases and Hardstands, crane hardstands, met and relay masts, substations and associated access roads, internal cable network, biodiversity enhancement and offsetting measures etc. The estimated volumes of peat and subsoils to be relocated are summarised above in Table 8-12. The total combined volume of peat and spoil requiring excavation is estimated to be 870,900m^3. Earthworks of this type, scale and

magnitude have been granted permission and successfully completed at similar sites around the country.

However, there will be no loss of peat and spoil from the Land, Soils and Geology Study Area, peat and spoil will be relocated and stored within the designated peat and spoil areas and will be used in landscaping at the turbine locations or in linear berms (side cast) along access roads where appropriate. Excavated spoil material will also be reused as fill material. Table 8-13 demonstrates that there is sufficient capacity to store all excavated peat and spoil at the within the Land, Soils and Geology Study Area.

Minor haul route works will have a minimal impact on soils and subsoils.

The granular subsoils can be classified as of "Medium" importance whilst the peat deposits can be classified as of "Low" importance as the raised bog is already degraded by historical harvesting and drainage. The Project Site is extensive (i.e. 5,157ha) while the Proposed Project footprint is <3% of the overall site area. The impact is the disturbance and relocation of approximately 870,900m3 of peat and spoil during construction.

Pathway: Excavation/extraction.

Receptor: Peat and spoil.

Description of Effects: Negative, moderate, direct, likely, permanent effect on peat and spoil due to relocation within the Proposed Wind Farm site. There is no potential for significant effects.

Proposed Mitigation Measures

Proposed Mitigation Measures by Design:

- Placement of Proposed Turbines and associated infrastructure in areas with shallower peat where constraints allow;
- Use of floating roads (approximately 56.6km), where appropriate, to reduce peat excavation volumes;
- The peat and spoil which will be removed during the construction phase will be transported immediately on excavation to designated peat and spoil areas alongside the hardstands and access roads or used for landscaping;
- The Proposed Project has been designed to avoid sensitive habitats;
- A minimal volume of peat and subsoil will be removed to allow for infrastructural work to take place in comparison to the total volume present due to optimisation of the layout by mitigation by design;
- Excavated peat and spoil will only be moved short distances from the point of excavation and will be used locally for landscaping;
- Excavated peat and spoil that is not used locally for landscaping will be stored in the designated peat and spoil areas; and,
- Construction of settlement ponds will be volume neutral, and all excess material will be used locally to form pond bunds and surrounding landscaping.

Residual Effect

The residual effect is a negative, slight, direct, likely, permanent effect on peat and subsoils due to disturbance and relocation within the Land, Soils and Geology Study Area.

Significance of Effects

For the reasons outlined above, no significant effects on soils and subsoils will occur.

8.5.2.3 Potential Effects from Leakages and Spillages

Pre-Mitigation Effect

Accidental spillage during refuelling of construction plant with petroleum hydrocarbons is a pollution risk within the Land, Soils and Geology Study Area. The accumulation of small spills of fuels and lubricants during routine plant use can also be a significant pollution risk. Hydrocarbon has a high toxicity to humans, and all flora and fauna, including fish, and is persistent in the environment. Large spills or leaks have the potential to result in significant effects (i.e. contamination of soils, subsoils and pollution of the underlying aquifer) on the geological and water environment, depending on where a spill may occur.

Pathway: Peat, subsoil and underlying bedrock pore space.

Receptor: Peat, subsoil and bedrock at the Land, Soils and Geology Study Area.

Description of Effects: Negative, slight, direct, short-term, unlikely effect on peat, subsoils and bedrock. There is no potential for significant effects.

Proposed Mitigation Measures

The following mitigation measures will be implemented during the construction phase:

- Refuelling and maintenance of construction vehicles and plant will, where practicable, be undertaken off-site at controlled, designated fuelling facilities. Where refuelling or maintenance is required on-site, it will be undertaken at designated areas in accordance with the Construction Environmental Management Plan (CEMP) and appropriate pollution prevention procedures;
- On-site re-fuelling will be undertaken using a double skinned bowser or a refuelling truck with spill kits kept onboard;
- Only designated trained operatives will be authorised to refuel plant on-site;
- Taps, nozzles or valves associated with refuelling equipment will be fitted with a lock system;
- All fuel storage areas will be bunded appropriately for the duration of the construction phase. All bunded areas will be fitted with a storm drainage system and an appropriate oil interceptor. Ancillary equipment such as hoses, pipes will be contained within the bunded area;
- Fuel and oil stores including tanks and drums will be regularly inspected by the appointed EnvCoW for leaks and signs of damage;
- The Proposed Onsite Substation and the Proposed Offsite Substation will be bunded appropriately to the volume of oils likely to be stored and to prevent leakage of any associated chemicals to groundwater or surface water. The bunded area will be fitted with a storm drainage system and an appropriate oil interceptor;
- The plant used during construction will be regularly inspected for leaks and fitness for purpose; and,
- An emergency response plan for the construction phase to deal with accidental spillages is contained within the CEMP (which is contained in Appendix 4-4).

The use and storage of hydrocarbons and small volumes of chemicals is a standard risk associated with all construction sites. Proven and effective measures to mitigate the risk of spills and leaks have been proposed above and will break the pathway between the potential source and the receptor.

Residual Effect

The residual effect is a negative, imperceptible, direct, short-term, unlikely effect on peat, subsoils and bedrock.

Significance of Effects

For the reasons outlined above, and with the implementation of the listed mitigation, no significant effects on soils, subsoils and bedrock will occur.

8.5.2.4 Potential Effects from the Erosion of Exposed Subsoils and Peat

Pre-Mitigation Effect

Erosion of soil/subsoil by the pathways listed below, can have the effect of reducing the overall volume of peat/soil/subsoil within the Land, Soils and Geology Study Area, with the potential for some eroded subsoils to reach watercourses, leading to water quality issues such as high turbidity. Erosion of peat/soils/subsoils may occur at any works area where excavation is ongoing i.e., Proposed Turbine foundations, access roads and immature woodland felling areas within the Land, Soils and Geology Study Area.

The main effects associated with this aspect are related to the water environment, and therefore this aspect is further assessed in detail in Section 9.5.2.1 of Chapter 9.

Pathway: Vehicle movement, surface water and wind action.

Receptor: Peat, soil and subsoil.

Description of Effects: Negative, slight, direct, short-term, likely effect on peat and subsoils by erosion and wind action. There is no potential for significant effects.

Proposed Mitigation Measures

The following mitigation measures will be implemented during the construction phase:

- All works will be completed in accordance with the Peat and Spoil Management Plan (FTC, 2026);
- All excavated peat and spoil will be transported immediately on excavation to designated peat and spoil areas along the access roads and will be used on site for landscaping close to the extraction area;
- Peat and spoil will not be transported further than the minimum distance required to facilitate their appropriate placement within the designated peat and spoil areas, in accordance with the Peat and Spoil Management Plan (FTC, 2026b);
- Upon excavation, the upper vegetative layer (where still present) will be stored with the vegetation part of the sod facing the right way up to keep the plants and vegetation alive to aid construction reinstatement of disturbed ground; and,
- Re-seeding and spreading/planting will also be carried out in areas where ground will be disturbed.

Peat soils and spoil can be eroded by vehicle movements, wind action and by water movement. To prevent this, all excavation works will be completed in accordance with a Peat and Spoil Management

Plan, material will be moved the least possible distance, and reseeding and planting will be completed in many areas to bind landscaped peat and spoil together.

Residual Effect

The residual effect is a negative, slight, direct, short-term, likely effect on peat and subsoils by erosion and wind action.

Significance of Effects

For the reasons detailed above, and with the implementation of the prescribed mitigation measures, no significant effects on peat, soils or subsoils will occur.

8.5.2.5 Potential Effects from Peat Instability and Failure

Pre-Mitigation Effect

Peat instability or failure refers to a significant mass movement of a body of peat that would have an adverse impact on a proposed wind farm development and the surrounding environment. The potential significant effects of peat failure at the Project Site may result in:

- Death or injury to site personnel;
- Damage to machinery;
- Damage or loss of infrastructure;
- Drainage disruption by blockage of drainage pathway by relocated peat and spoil;
- Site works damaged or unstable;
- Contamination of watercourses, water supplies by particulates; and,
- Degradation of the peat environment by relocation of peat and spoil.

A detailed GPSRA (FTC, 2026) (Appendix 8-1) has been completed for the Proposed Wind Farm site.

The peat present at the Proposed Wind Farm site is an area of raised bog which has been historically used for large-scale peat extraction. The Proposed Wind Farm site is flat in nature, and the areas where peat has been extracted have been drained to locally lower the water level within the peat. This has led to an increase in the strength of the in-situ peat when compared to undrained areas. Given the flat topography and the higher strength of the peat, the site conditions at the part of the Proposed Wind Farm site are not considered to be similar to Shass Mountain or Meenbog, nor is it considered likely that a similar type of failure could occur at the Proposed Wind Farm site.

It is important that the existing site drainage is maintained during construction to avoid a similar failure to that on Shass Mountain, which occurred following heavy rainfall; this is referenced in the Risk Assessments for the Proposed Turbines and access roads. However, the topography of Proposed Wind Farm site is also different to that at Shass Mountain and does not contain any areas where a large catchment area is focussed into a localised area of deep peat. There have been numerous wind farms successfully constructed on historically worked raised bog sites over the past 15 years without any issues relating to peat failure, such as Derrinlough Wind Farm, Cloncreen Wind Farm and Mountlucas Wind Farm.

Peat Stability Analysis

FTC completed a peat stability analysis at all the main infrastructure locations across the Land, Soils and Geology Study Area as for both the undrained and drained conditions. The purpose of the analysis was to determine the Factor of Safety (FoS) of the peat slopes. The minimum required Factor of Safety

(FoS) is 1.3 based on BS6031:1981: Code of Practice for Earthworks (BSI, 2009). The assigned probability of instability associated with a given FoS value is described in Table 8-15.

Table 8-15: Probability Scale for Factor of Safety for Peat.

Scale	Factor of Safety	Probability
1	1.30 or greater	Negligible/None
2	1.29 to 1.20	Unlikely
3	1.19 to 1.11	Likely
4	1.01 to 1.10	Probable
5	<1.0	Very Likely

Peat Stability Assessment Results

Stability of a peat slope is dependent on several factors working in combination. The main factors that influence peat stability are slope angle, shear strength of peat, depth of peat, pore water pressure and loading conditions.

An adverse combination of factors could potentially result in peat sliding. An adverse condition of one of the above-mentioned factors alone is unlikely to result in peat failure. The infinite slope model (Skempton and DeLory, 1957) is used to combine these factors to determine a factor of safety for peat sliding. This model is based on a translational slide, which is a reasonable representation of the dominant mode of movement for peat failures.

To assess the FoS for a peat slide, an undrained (short-term stability) and drained (long-term stability) analysis has been undertaken to determine the stability of the peat slopes on site.

- The undrained loading condition applies in the short-term during construction and until construction induced pore water pressures dissipate.
- The drained loading condition applies in the long-term. The condition examines the effect of in particular, the change in groundwater level as a result of rainfall on the existing stability of the natural peat slopes.

As mentioned above, the GPSRA (FTC, 2026) is attached in Appendix 8-1.

Undrained Analysis

The results of the undrained analysis for peat at the proposed infrastructure locations are presented in Table 8-16. The analysis was done for 2 no. conditions: Condition 1 with no surcharge loading and Condition 2 with a surcharge of 10kPa, equivalent to 1m of stockpiled peat. As outlined above the undrained loading condition applies in the short-term during construction and until construction induced pore water pressures dissipate.

The calculated FoS for Condition 1 is in excess of 1.30 for all of the key infrastructure locations and across the 768 no. locations subject to the analysis. The calculated FoS for Condition 1 at the key development locations was found to range from 3.03 to 152.91, indicating a low risk of peat instability.

The calculated FoS for Condition 2 is in excess of 1.30 for all key infrastructure locations and across the 768 no. locations subject to the analysis. The calculated FoS for Condition 2 at the key development locations was found to range from 2.08 to 19.95, indicating a low risk of peat instability.

Table 8-16: Factor of Safety Results (undrained condition).

Turbine / Location	Easting	Northing	Factor of Safety of Load Condition	
			Condition (1)	Condition (2)
T01	669577	723417	10.93	6.38
T02	667966	722318	8.50	6.20
T03	668652	722904	25.49	12.07
T04	667122	722389	7.65	5.10
T05	666811	722918	19.16	7.19
T06	667272	723632	17.01	8.06
T07	666843	724155	152.91	19.95
T08	666062	723362	6.38	4.50
T09	665993	724419	6.38	4.50
T10	665722	725145	8.82	6.37
T11	665245	723070	7.09	4.01
T12	665675	722587	16.98	12.39
T13	664725	722393	19.10	13.48
T14	665129	721837	4.85	3.18
T15	664797	723510	15.29	9.17
T16	664366	723995	32.77	13.49
T17	664368	724900	5.67	4.14
T18	665151	724290	4.03	3.19
T19	663527	724680	15.31	7.65
T20	663228	725279	38.32	8.84
T21	664020	725419	11.77	6.66
T22	663076	726129	38.32	8.84
T23	665568	728222	7.40	5.59
T24	664901	727516	5.89	4.25
T25	664557	726842	5.28	3.92
T26	663924	727245	9.57	5.89
T27	666654	728789	13.92	7.29
T28	667453	728387	22.99	7.66
T29	667535	729311	22.99	7.66
T30	667317	730151	3.03	2.40
T31	666424	729892	3.59	2.74
T32	665913	730395	3.83	2.87
T33	668791	723754	25.49	12.07

Turbine / Location	Easting	Northing	Factor of Safety of Load Condition	
			Condition (1)	Condition (2)
T34	668234	724133	12.76	6.96
T35	667696	724705	12.07	7.91
T36	667700	725703	17.64	9.97
T37	668428	725406	7.66	4.60
T38	666932	725059	32.77	13.49
T39	666484	725794	9.17	6.55
T40	667297	726306	6.96	4.78
T41	666699	726708	25.49	12.07
T42	667233	727483	9.97	6.95
T43	668319	727108	6.39	4.11
T44	668927	727701	12.74	8.19
T45	668094	727874	13.92	7.29
T46	669561	728266	22.94	11.47
Met Mast 1	667735	726740	12.74	8.19
Met Mast 2	664363	723502	4.88	4.02
Proposed Onsite Substation	672491	725533	45.85	22.92
Proposed Offsite Substation	683275	725942	57.48	9.58
Construction Compound 1	667300	729202	25.51	9.57
Construction Compound 2	665284	727834	2.85	2.08
Construction Compound 3	662797	726383	6.76	4.26
Construction Compound 4	666981	725978	6.39	4.11
Construction Compound 5	664050	724328	22.94	11.47
Construction Compound 6	665840	723670	11.47	7.65
Construction Compound 7	667818	723648	16.38	9.56
Construction Compound 8	665879	721662	25.47	16.37

Drained Analysis

Drained analysis results are presented in Table 8-17. Similar to the undrained analysis, the drained analysis was done for 2 no. conditions: Condition 1 with no surcharge loading and Condition 2 with a surcharge of 10kPa, equivalent to 1m of stockpiled peat. As outlined above, the drained loading condition applies in the long-term. The condition examines the effect of in particular, the change in groundwater level as a result of rainfall on the existing stability of the natural peat slopes.

The calculated FoS for Condition 1 was in excess of 1.30 at all key infrastructure locations (and at all of the 768 no. locations subject to the analysis). The FoS ranged from 1.33 to 114.68, indicating a low risk of peat instability.

The calculated FoS for Condition 2 was in excess of 1.30 at all key infrastructure locations (and at all of the 768 no. locations subject to the analysis). The FoS ranged from 2.12 to 41.36, indicating a low risk of peat instability.

Table 8-17: Factor of Safety Results (drained condition)

Turbine / Location	Easting	Northing	Factor of Safety of Load Condition	
			Condition (1)	Condition (2)
T01	669577	723417	5.47	6.90
T02	667966	722318	4.25	6.71
T03	668652	722904	12.74	13.06
T04	667122	722389	3.83	5.52
T05	666811	722918	9.58	7.76
T06	667272	723632	8.50	8.71
T07	666843	724155	76.46	21.58
T08	666062	723362	3.19	4.87
T09	665993	724419	3.19	4.87
T10	665722	725145	4.41	6.89
T11	665245	723070	3.54	4.32
T12	665675	722587	8.49	13.42
T13	664725	722393	9.55	14.60
T14	665129	721837	2.42	3.43
T15	664797	723510	7.65	9.93
T16	664366	723995	16.38	14.60
T17	664368	724900	2.83	4.47
T18	665151	724290	2.01	3.45
T19	663527	724680	7.65	8.28
T20	663228	725279	19.16	9.55
T21	664020	725419	5.89	7.20
T22	663076	726129	19.16	7.55
T23	665568	728222	3.70	6.05

Turbine / Location	Easting	Northing	Factor of Safety of Load Condition	
			Condition (1)	Condition (2)
T24	664901	727516	2.94	4.60
T25	664557	726842	2.64	4.24
T26	663924	727245	4.78	6.37
T27	666654	728789	6.96	8.08
T28	667453	728387	11.50	8.28
T29	667535	729311	11.50	8.28
T30	667317	730151	1.51	2.59
T31	666424	729892	1.80	2.96
T32	665913	730395	1.92	3.10
T33	668791	723754	12.74	13.06
T34	668234	724133	6.38	7.52
T35	667696	724705	6.04	8.56
T36	667700	725703	8.82	10.79
T37	668428	725406	3.83	4.97
T38	666932	725059	16.38	14.60
T39	666484	725794	4.59	7.09
T40	667297	726306	3.48	5.17
T41	666699	726708	12.74	13.06
T42	667233	727483	4.99	7.52
T43	668319	727108	3.19	4.43
T44	668927	727701	6.37	8.86
T45	668094	727874	6.96	7.88
T46	669561	728266	11.47	12.41
Met Mast 1	667735	726740	6.37	8.86
Met Mast 2	664363	723502	2.44	4.46
Proposed Onsite Substation	672491	725533	22.92	24.82
Proposed Offsite Substation	683275	725942	28.74	10.86
Construction Compound 1	667300	729202	12.76	10.34
Construction Compound 2	665284	727834	1.43	2.24
Construction Compound 3	662797	726383	3.38	4.60

Turbine / Location	Easting	Northing	Factor of Safety of Load Condition	
			Condition (1)	Condition (2)
Construction Compound 4	666981	725978	3.19	4.43
Construction Compound 5	664050	724328	11.47	12.41
Construction Compound 6	665840	723670	5.73	8.27
Construction Compound 7	667818	723648	8.19	10.34
Construction Compound 8	665879	721662	12.73	18.17

GPSRA Conclusions

The findings of the peat assessment showed that Proposed Wind Farm site has an acceptable margin of safety, is suitable for the Proposed Project and is considered to be at low risk of peat failure provided appropriate mitigation measures are implemented. The findings include recommendations and mitigation/control measures for construction work in peat lands, all of which will be implemented in full to ensure that all works adhere to an acceptable standard of safety.

Pathway: Vehicle movement and excavations.

Receptor: Peat and subsoils.

Description of Effects: The findings of the GPSRA showed that the Project Site has an acceptable margin of safety, is suitable for development of the Proposed Project and is considered to be at low risk of peat failure. The findings include recommendations and control measures for construction work in peatlands to ensure that all works adhere to an acceptable standard of safety. The pre-mitigation potential effect is a negative, significant, direct, permanent, unlikely effect on peat and subsoils. There is no potential for significant effects.

Proposed Mitigation Measures

Hydrological, hydrogeological and ecological factors were assessed in the GPSRA, with continuous engagement and consultation between FTC, HES and MKO were undertaken throughout the iterative design process. A constraints study was initially undertaken by the Environmental (MKO), Hydrological (HES) and Ecological (MKO) members of the project design team to determine the developable area at the Project Site, prior to the site reconnaissance by engineering geologists/geotechnical engineers from FTC.

The hydrological factors with regard to peat stability were assessed using a combination of desk study data, aerial photography (historical and contemporary), topographic LiDAR data flow-path drainage analysis, site walkovers, field drainage mapping and gouge coring. Detailed drainage maps were prepared along with hydrological constraints mapping for onsite drainage features and wet areas.

Many of the pre-conditions as described by the Peat Landslide Hazard and Risk Assessments: Best Practice Guide for Proposed Electricity Generation Developments (PLHRAG) are hydrological in nature and are listed in the guidance as follows:

- Impeded drainage caused by a peat layer overlying an impervious clay or mineral base (hydrological discontinuity, especially an iron pan at the base of the peat deposit);
- A convex slope or a slope with a break of slope at its head (concentration of subsurface flow);
- Proximity to local drainage, either from flushes, pipes or streams (supply of water); and,
- Connectivity between surface drainage and the peat/impervious interface (mechanism for generation of excess pore pressures).

Identifying the above pre-conditions at the Project Site was a key part of the hydrological constraints assessment carried out in conjunction with the Proposed Project design team.

The following general control measures incorporated into the construction phase of infrastructure within the Proposed Wind Farm site will assist in the management of the risks:

- Appointment of experienced and competent contractors;
- Works will be supervised by experienced and qualified personnel;
- Allocate sufficient time for the construction of the Proposed Project (be aware that decreasing the construction time has the potential to increase the risk of initiating a localised peat movement);
- Prevent undercutting of slopes and unsupported excavations;
- Maintain and manage a robust drainage system;
- Prevent placement of loads/overburden on marginal ground;
- Set up, maintain and report findings from monitoring systems (as outlined in the GPSRA);
- Ensure construction method statements are developed and agreed before commencement of construction and are followed by the contractor; and,
- Revise and amend the Construction Risk Register as construction progresses to ensure that risks are managed and controlled for the duration of construction.

Refer to Section 4.4.1.1 and Section 4.4.1.2 of Chapter 4 for Proposed Turbine specifics and road section design proposals, respectively.

Residual Effect

The residual effect is negative, imperceptible, direct, unlikely, permanent effect on peat and subsoils.

Significance of Effects

For the reasons detailed above, and with the implementation of the prescribed mitigation measures, no significant effects on peat and subsoils will occur.

8.5.2.6 Potential Effects from Piling Works

Pre-Mitigation Effect

Piling foundations may be required at several proposed turbine locations. The requirement for piling will be determined during post-consent ground investigations.

For the piled turbine foundations, a piling type and configuration could be up to 20 no. 900-1,200mm square concrete driven piles. A similar type pile and configuration was used for the turbine foundations on the Mountlucas wind farm (Offaly Co. Co. Planning Ref: 11232). Proposed foundation and pile configurations are detailed in Section 4.9.1.1, Chapter 4. Piling foundations will also be required for the construction of the Proposed Onsite Substation and the met masts.

The potential effects associated with the driving of piles relate to peat/soil/subsoil compaction and displacement in the area of the proposed works.

Other than surface level and minor excavation works, any driven piles will not produce significant volumes of peat/spoil, these will displace soil/subsoil within the ground. The bored pile option could produce between 230 to 410m^3 of spoil material per turbine base. Excess spoil will be removed for permanent storage in the designated peat and spoil areas. Bored pile spoil volumes only amount to between approximately 1 to 1.5% of the overall peat and spoil volumes for the Proposed Project.

Pathway: piling works.

Receptor: peat/soils and subsoils.

Description of Effects: Negative, slight, direct, permanent unlikely effect on peat/soils/subsoils by piling works. There is no potential for significant effects.

Proposed Mitigation Measures

No mitigation measures are proposed or required for soils and geology environment. Proposed mitigation to protect the water environment are outlined in Chapter 9.

Residual Effect

The residual effect is a negative, direct, imperceptible, permanent, unlikely effect on peat and subsoils by piling works.

Significance of Effects

For the reasons detailed above, and with the implementation of the proposed mitigation measures, no significant effects on peat, soils/subsoils will occur.

8.5.2.7 Potential Effects Associated with the Proposed Onsite Substation and Proposed Offsite Substation

Pre-Mitigation Effect

As presented in Table 8-12 above the estimated volumes of material to be excavated at the Proposed Onsite Substation and the Proposed Offsite Substation is approximately 79,900m^3 and approximately 14,800m^3 respectively. The exact location of the Proposed Onsite Substation has been selected based on detailed geotechnical investigations and peat stability risk assessments. The location of the Proposed Offsite Substation has been subject to comprehensive walkover surveys and probing investigations. Material excavated at each substation locations will be used for landscaping and the remainder will be permanently stored in the designated peat and spoil areas.

Pathway: Extraction/excavation of peat and soil/subsoils (spoil).

Receptor: Peat and underlying subsoil.

Description of Effects: Negative, slight/moderate, direct, permanent, likely effect on peat and subsoil. There is no potential for significant effects.

Proposed Mitigation Measures

- Mitigation measures in respect of peat and subsoil excavation are detailed in Section 8.5.2.2.
- Mitigation measures in respect of proposed piling works are detailed at Section 8.5.2.6 where the residual effect of all piling works is also assessed.
- Mitigation measures to prevent soil / subsoil contamination (leaks / spills) are dealt with in Section 8.5.2.3; and,
- Mitigation measures dealing with soil erosion are dealt with in Section 8.5.2.4.

No additional specific mitigation measures are required.

Residual Effect

The residual effect of this is a negative, slight, direct, permanent likely effect on peat and subsoils due to disturbance and relocation within the Project Site.

Significance of Effects

For the reasons detailed above, and with the implementation of the proposed mitigation measures, no significant effects on soils and subsoils will occur.

8.5.2.8 Potential Effects Associated with the Amenity Proposals

Pre-Mitigation Effect

The Proposed Project includes 62.6 km of amenity track. This includes 13.44km of a new dedicated internal amenity access track, 40km of proposed internal access road, 0.84km (844m) of amenity board walk and 8.525km of dedicated circular trail for equestrian users only. These amenity tracks will provide amenity access opportunities, facilitate a variety of walking loops, enhance connectivity with local roads and existing off-site amenities, and provide local access to the Proposed Wind Farm.

The proposed construction methodology for the new dedicated amenity tracks and carparks is by floating road construction over the peat. Floating roads will be used to minimise the requirement for additional excavation or spoil generation.

Other than at the point of insertion of each timber pile, where some minor local displacement can occur, the board walk will not have a significant effect on peat as it will be inserted into and over (as a deck) peat mass. No peat removal or excavation is required for the board walk.

Pathway: Extraction/excavation of peat and soil/subsoils (spoil).

Receptor: Peat and underlying subsoil.

Description of Effects: Negative, slight, direct, likely, permanent effect on peat and subsoil. There is no potential for significant effects.

Proposed Mitigation Measures

- Mitigation measures in respect of peat and subsoil excavation are detailed in Section 8.5.2.2.
- Mitigation measures in respect of proposed piling works are detailed at Section 8.5.2.6 where the residual effect of all piling works is also assessed.

- Mitigation measures to prevent soil / subsoil contamination (leaks / spills) are dealt with in Section 8.5.2.3; and,
- Mitigation measures dealing with soil erosion are dealt with in Section 8.5.2.4.

No additional specific mitigation measures are required.

It is proposed to place amenity pathways on top of existing ground using the floating road technique. Ground disturbance and peat and spoil relocation during these works will be minimal.

Residual Effect

The residual effects of these works are negative, imperceptible, direct, likely, permanent effect on peat and subsoils by covering with 3m wide pathway.

Significance of Effects

For the reasons detailed above, along with the implementation of the prescribed mitigation measures, no significant effects on soils and subsoils will occur.

8.5.2.9 Proposed Works Associated with Proposed Turbine Delivery Route Accommodation Works

Pre-Mitigation Effect

Minor temporary haul route works are required at several locations listed in Section 4.5.2.3 of Chapter 4. Also, all proposed accommodation works are small-scale and localised. Due to the minor nature of the works, there is no potential for significant effects.

Pathway: Extraction/excavation of peat and soil/subsoils (spoil).

Receptor: Peat and underlying subsoil.

Description of Effects: Negative, slight, direct, likely, permanent effect on peat and subsoil. There is no potential for significant effects.

Proposed Mitigation Measures

- Mitigation measures in respect of peat and subsoil excavation are detailed in Section 8.5.2.2.
- Mitigation measures in respect of proposed piling works are detailed at Section 8.5.2.6 where the residual effect of all piling works is also assessed.
- Mitigation measures to prevent soil / subsoil contamination (leaks / spills) are dealt with in Section 8.5.2.3; and,
- Mitigation measures dealing with soil erosion are dealt with in Section 8.5.2.4.

Residual Effect

The residual effects of these works are considered negative, imperceptible, direct, likely, permanent effect on peat and subsoils.

Significance of Effects

For the reasons detailed above, along with the implementation of the prescribed mitigation measures, no significant effects on soils and subsoils will occur.

8.5.2.10 Potential Effects Associated with Proposed Enhancement

Pre-Mitigation Effect

A Biodiversity Management Plan (BMP) has been prepared for the Proposed Project and is included as Appendix 6-5 of this EIAR. This plan has been developed to offset the loss of habitats identified within the Project Site and further to enhance the biodiversity (flora and fauna, including birds) of the Project Site and its environs.

The Proposed Enhancement Areas includes the following ornithological mitigation and enhancement measures:

- The creation of a 242.8ha scrub mosaic habitat within 250m of the Proposed Turbines including the application of agricultural line (calcium carbonate) and slow release fertiliser to accelerate the growth of scrub species and drain blocking where dry cutover peat exists and conditions are not optimal for germination;
- The enhancement of Lodge Bog will be achieved through:
  - Scrub removal and management and drain blocking;
  - The creation of 2 no. permanent waterbodies for Whooper Swan (7.8ha and 5.6ha). These areas coincide with wetland areas which have already undergone drain blocking and water pumping has ceased. The proposed measures include the controlled flooding of these areas to a depth of 1.5m.
  - The creation of 3 no. breeding wader areas (12ha, 7ha and 6ha). Drains in these areas have already been blocked under PCAS or the IPC Licence rehabilitation works. There may be some requirement for areas to be reprofiled, and slow-release fertiliser will be applied.
- Approximately 60.7ha of forestry and woodland within Killina Bog will be felled and managed as open peatland. The process will be aided by drain blocking to create suitable habitat for golden plover.

The Proposed Enhancement Areas includes the following ecological mitigation and enhancement measures:

- Mitigation and enhancement for Marsh Fritillary;
- Peatland Enhancement across 4 no. blocks totalling an area of 231.6ha. The proposed works include drain blocking and rewetting to re-establish water levels at the bog levels at the bog surface, where possible, and to increase the extent of favourable conditions for the establishment of raised bog vegetation;
- Management of Peatland Adjacent to Proposed Project infrastructure;
- Pollinator connectivity; and,
- Woodland Enhancement.

Pathway: Biodiversity management land-take.

Receptor: Land and Land use (*i.e.* the land upon which the Proposed Enhancement Areas measures will be implemented) and peat/subsoils.

Description of Effects: Positive, moderate, direct, likely, long-term effect on land and land use at the Land Soils and Geology Study Area and a negative, slight, direct, likely, permanent effect on peat and

subsoils due to disturbance and relocation within the Proposed Wind Farm site. There is no potential for significant effects.

Proposed Mitigation Measures

The BMP will have a positive effect on the land environment and no specific mitigation measures are required. During the works the following mitigation measures will be implemented for the protection of the land, soils and geological environment:

- Mitigation measures in respect of peat and subsoil excavation are detailed in Section 8.5.2.2.
- Mitigation measures to prevent soil / subsoil contamination (leaks / spills) are dealt with in Section 8.5.2.3; and,
- Mitigation measures dealing with soil erosion are dealt with in Section 8.5.2.4.

No additional specific mitigation measures are required.

The Proposed Enhancement Areas will result in a positive effect on land and land use through the improvement of habitat condition and biodiversity. Localised disturbance of peat and subsoils will occur during implementation; however, this will be minimised through the mitigation measures.

Residual Effect

The residual effect is positive, moderate, direct, likely, long-term effect on land, peat and subsoils at the Land, Soils and Geology Study Area.

Significance of Effects

For the reasons detailed above, along with the implementation of the prescribed mitigation measures, no significant effects will occur.

8.5.2.11 Potential Effects Associated with the Proposed Grid Connection OHL Loop in Connection

Pre-Mitigation Effect

The Proposed Grid Connection includes the construction of steel masts and associated hardstand areas and crane pads under the existing OHL. These works will require the excavation of peat and spoil, and the volumes are detailed in Table 8-12. These elements will be constructed using both founded and piled techniques. Ground disturbance and peat and underlying subsoil relocation during these works will be minimal due to the relatively small footprint of the works areas.

Pathway: Extraction/excavation of peat and soil/subsoils (spoil).

Receptor: Peat and underlying subsoil.

Description of Effects: Negative, slight, direct, likely, permanent effect on peat and subsoil. There is no potential for significant effects.

Proposed Mitigation Measures

- Mitigation measures in respect of peat and subsoil excavation are detailed in Section 8.5.2.2;

- Mitigation measures in respect of proposed piling works are detailed at Section 8.5.2.6 where the residual effect of all piling works is also assessed;
- Mitigation measures to prevent soil / subsoil contamination (leaks / spills) are dealt with in Section 8.5.2.3; and,
- Mitigation measures dealing with soil erosion are dealt with in Section 8.5.2.4.

No additional specific mitigation measures are required.

Residual Effect

As such the residual effects of these works are negative, imperceptible, direct, likely, permanent effect on peat and subsoils.

Significance of Effects

For the reasons detailed above, along with the implementation of the prescribed mitigation measures, no significant effects on soils and underlying subsoils will occur.

8.5.2.12 Potential Effects on Designated Sites

Pre-Mitigation Effect

The only designated sites located within the Land, Soils and Geology Study Area are the Grand Canal pNHA and the Ballynafagh Lake SAC.

The Proposed Grid Connection underground electrical cabling route crosses the Grand Canal pNHA to the west of Allenwood along the R414, approximately 200m west of the existing crossing at Shee Bridge. This crossing will be undertaken by HDD, avoiding the need for a trench through the canal or its immediate environs. The potential for effects on land, soils and geology is limited due to the small footprint of the Proposed Grid Connection within the pNHA boundary, which includes the land surrounding the canal.

Further east a short section of the Proposed Grid Connection underground electrical cabling route crosses the Ballynafagh Lake SAC; the Proposed Grid Connection underground electrical cabling route at this crossing is located entirely within the public road corrdior. An existing road bridge on the R403 crosses the Blackwood Feeder, which connects Ballynafagh Lake to the Grand Canal, at this location. There is no potential for effects on land, soils and geology as all construction works and the shallow trench (~1m deep) will be confined to the existing road carriageway, which is located above the SAC and there will be no disturbance to any designated lands.

Works within the SAC/pNHA boundary will be of a short duration, and all temporary disturbed land for the HDD launch and receiver pits will be fully reinstated following completion of the works. Topsoil will be stripped and stored separately with the vegetated surface intact to allow for reinstatement. The HDD crossing will avoid any disturbance to the canal. The works over the Blackwood feeder will be completed in the road carriageway, avoiding any disturbance to the canal.

Pathway: Construction land-take.

Receptor: Soils/land at the Grand Canal pNHA and Ballynafagh Lake SAC.

Description of Effects: Negative, imperceptible, direct, likely, temporary effect on land and soils at the Grand Canal pNHA and the Ballynafagh Lake SAC. There is no potential for significant effects.

Proposed Mitigation Measures

No specific mitigation works are required.

Residual Effect

Given the limited extent and temporary nature of the proposed works, the residual effects on land and soils within the Grand Canal pNHA and the Ballynafagh Lake SAC will be negative, imperceptible, direct, unlikely, temporary.

Significance of Effects

No significant effects on designated sites will occur.

8.5.2.13 Potential Effects from Karst

Pre-Mitigation Effect

There are no GSI mapped karst features in the Land, Soils and Geology Study Area. However, 29 no. turbines at the Proposed Wind Farm and 2.27km of the Proposed Grid Connection underground electrical cabling route are mapped to be underlain by a Karst Aquifer.

If any karst features are encountered during the construction of the Proposed Wind Farm there is the potential for instability.

The potential for effects is limited for the following reasons:

- No evidence of karst features has been identified within the Land, Soils and Geology Study Area. This is supported by the extensive site investigation data collected for the Land, Soils and Geology Study Area and the surrounding area, including:
    - Site walkover surveys and geological mapping;
    - Completion of 1,026 no. peat probes at the Proposed Wind Farm site;
    - Excavation of 55 no. trial pits at the Proposed Wind Farm;
    - Completion of 6 no. rotary core boreholes at the Proposed Wind Farm; and, Excavation of an additional 7 no. trial pits and 3 no. boreholes to the west of Codd 1 Bog.
- A review of available desk study information has not identified the presence of karst features at the Proposed Wind Farm:
    - The GSI Karst Features database (www.gsi.ie) does not record the presence of any karst features at the Proposed Wind Farm;
    - Historic 6" or 25" base mapping does not record any karst-related features at the Proposed Wind Farm;
    - Inspection of recent and historic aerial imagery has not identified any features indicative of karst development at the Proposed Wind Farm
    - BnM's LiDAR data for the Proposed Wind Farm site does not indicate the presence of depressions, sinkholes or other topographical anomalies that may be associated with karstification;
    - Site investigations have demonstrated that the Proposed Wind Farm site is overlain by low permeability peat and lacustrine clay. These soils/subsoils significantly restrict groundwater recharge and protect the underlying bedrock aquifers;
- The substantial thickness of overlying peat and subsoil also substantially reduces the likelihood of shallow karst influencing the Proposed Project.

The potential for effects along the Proposed Grid Connection underground electrical cabling route are limited for the following reasons:

- There are no mapped karst features in the immediate vicinity of the Proposed Grid Connection underground electrical cabling route;
- The proposed works are minor and transient in nature; and,
- Detailed, tried and tested, best practice mitigation measures have been prescribed in relation to the protection of surface water and groundwater quality.

Pathway: Direct interception of karst voids or conduits or loading or karst voids leading to collapse.

Receptor: Karst features and Proposed Project infrastructure.

Description of Effects: Direct, negative, slight, unlikely effect on karst features and Proposed Project infrastructure. In the absence of mitigation measures there is no potential for significant effects.

Proposed Mitigation Measures

In the unlikely event that a previously unidentified karst feature is encountered the following procedures (Karst Protocol) will be implemented:

- All work will be stopped in the area where a karst feature is suspected;
- The area will be secured to ensure the safety of workers and plant;
- The Project Engineering Geologist will be notified, and the feature will be investigated to determine its nature, size, extend and/or significance;
- Appropriate mitigation measures (in relation to ground stability and water quality protection) will be developed in consultation with geotechnical specialists and the project hydrologist/hydrogeologist; and,
- No work will recommence in the area until written approval is obtained from the relevant project personnel.

Residual Effect

The residual effect is a direct, negative, imperceptible, short-term, unlikely effect.

Significance of Effects

No significant effects will occur.

8.5.3 Operational Phase - Likely Significant Effects and Mitigation Measures

Very few potential direct impacts are envisaged during the operational phase of the Proposed Project. These may include:

- Some construction vehicles or plant may be necessary for maintenance of the Proposed Project which could result in minor accidental leaks or spills of fuel/oil; and,
- The transformer in the substation and transformers in each turbine are oil cooled. There is potential for spills / leaks of oils from this equipment resulting in contamination of soils and groundwater.
- In relation to indirect impacts a small amount of granular material may be required to maintain access tracks during operation which will place intermittent minor demand on local quarries.

8.5.3.1 Site Road Maintenance

Pre-Mitigation Effect

In relation to indirect impacts a small amount of granular material will be required to maintain internal access site roads during operation which will place intermittent minor demand on local quarries. The use of aggregate for site road maintenance will be minor and infrequent, and all material will be imported to the Project Site from local authorised quarries.

Pathway: Peat, subsoil and bedrock pore space.

Receptor: Peat, subsoil and bedrock.

Description of Effects: Negative, indirect, imperceptible, short term, likely effect on peat, subsoil and bedrock. There is no potential for significant effects.

Proposed Mitigation Measures

- Use of aggregate from authorised quarries, operating in accordance with the applicable planning and environmental requirements, for use in road and hardstand maintenance.

Residual Effect

The residual effect is a negative, imperceptible, indirect, short-term, unlikely effect on peat, subsoil and bedrock.

Significance of Effects

For the reasons detailed above, no significant effects on land, soils or geology will occur.

8.5.3.2 Site Vehicle/Plant Use

Pre-Mitigation Effect

Plant and site vehicles used in site maintenance will be run on fuels and use hydraulic oils. Accidental spillage during refuelling of construction plant with petroleum hydrocarbons is a significant pollution risk to land, soils and associated ecosystems. The accumulation of small spills of fuels and lubricants during routine plant use can also be a pollution risk. Hydrocarbons are highly toxic to humans, flora and fauna, and is persistent in the environment.

Pathway: Peat, subsoil and bedrock pore space.

Receptor: Peat, subsoil and bedrock.

Description of Effects: Negative, direct, slight, temporary, unlikely effect on peat, subsoil and bedrock. There is no potential for significant effects.

Proposed Mitigation Measures

- Vehicles used during the operational phase will be refuelled off site before entering the Project Site;

- Vehicles will be inspected prior to entering the Project Site to ensure that they are in good working order and that there are no leaks;
- No fuels will be stored onsite during the operational phase;
- Spill kits will be available in all site vehicles to deal with an accidental spillage and breakdowns; and,
- An emergency plan for the operational phase to deal with accidental spillages and breakdowns will be contained in the finalised CEMP (Appendix 4-5).

Proven and effective measures to mitigate the risk of spills and leaks have been proposed above and will break the pathway between the potential source and the receptor.

Residual Effect

The residual effect is a negative, imperceptible, direct, temporary, unlikely effect on peat and subsoils and bedrock.

Significance of Effects

For the reasons detailed above, no likely significant effects on land, soils, subsoils or bedrock will occur.

8.5.3.3 Use of Oils in Substation and Proposed Turbine Transformers

Pre-Mitigation Effect

The transformer in the Proposed Onsite Substation and Proposed Offsite Substation and transformers in each Proposed Turbine are oil cooled. There is potential for spills / leaks of oils from this equipment resulting in contamination of soils and groundwater. Hydrocarbon has a high toxicity to humans, flora and fauna, and is persistent in the environment.

Pathway: Peat, subsoil and bedrock pore space.

Receptor: Peat, subsoil and bedrock.

Description of Effects: Negative, direct, slight, temporary, unlikely effect on peat, subsoil and bedrock. There is no potential for significant effects.

Proposed Mitigation Measures

- The electrical control building (at the Proposed Onsite Substation and Proposed Offsite Substation) will be bunded appropriately to the volume of oils likely to be stored and to prevent leakage of any associated chemicals to groundwater or surface water. The bunded area will be fitted with a storm drainage system and an appropriate oil interceptor;
- All transformer areas at the turbines will be bunded to 110% of the volume of oil used in each transformer;
- All equipment at the substations will be inspected and regularly serviced as per the manufacturer's guidelines; and,
- An emergency plan for the operational phase to deal with accidental spillages will be contained in the CEMP (Appendix 4-5).

The use of hydrocarbons in transformers and substations is a common risk associated with operational wind farm sites. Proven and effective measures to mitigate the risk of spills and leaks have been proposed above and minimise potential effects on the local environment.

Residual Effect

The residual effect is a negative, imperceptible, direct, temporary, unlikely effect on peat and subsoils and bedrock.

Significance of Effects

For the reasons detailed above, no likely significant effects on land, soils, subsoils or bedrock will occur.

8.5.4 Decommissioning Phase - Likely Significant Effects and Mitigation Measures

The wind turbines proposed as part of the Proposed Wind Farm are expected to have a lifespan of approximately 35 years. Following the end of their useful life, the equipment may be replaced with a new technology, subject to planning permission being obtained, or the Proposed Wind Farm may be decommissioned fully.

Upon decommissioning of the Proposed Wind Farm, the Proposed Turbines will be disassembled in the reverse order to how they were erected. The Proposed Turbines will be disassembled with a similar model of crane that was used for their erection. The Proposed Turbines will likely be removed from Proposed Wind Farm using the same transport methodology adopted for delivery to the Proposed Wind Farm initially. The Proposed Turbines materials will be transferred to a suitable, licenced recycling or recovery facility.

The underground electrical cabling connecting the Proposed Turbines to the Proposed Onsite Substation will be removed from the cable ducts and any direct buried cables will be cut and left in-situ.

All above-ground turbine components would be separated and removed from the Project Site for recycling. Leaving the turbine foundations in-situ is considered a more environmentally prudent option, as to remove that volume of reinforced concrete from the ground could result in unnecessary environmental emissions such as noise, dust and/or vibration.

Project Site roadways could be in use for purposes other than the operation of the Proposed Project by the time the decommissioning of the Proposed Wind Farm is to be considered, and therefore it may be more appropriate to leave the Project Site roads in-situ for future use. It is envisaged that the roads will be widely utilised for amenity purposes by the local community.

Upon decommissioning of the Proposed Wind Farm, the Proposed Grid Connection including all the associated transmission infrastructure i.e. underground cables, overhead line cabling, steel masts, Proposed Onsite Substation and Proposed Offsite Substation will form part of the national grid infrastructure and operate in perpetuity as part of Transmission System and TAO assets and will remain in-situ. The assets transferred to the TAO will not form part of the decommissioning works.

A Decommissioning Plan has been prepared (Appendix 4-7), the detail of which will be agreed with the Local Authority prior to any decommissioning. The Decommissioning Plan will be updated prior to the end of the operational period in line with decommissioning methodologies that may exist at the time and will be agreed with the Planning Authority at that time. The potential for effects during the decommissioning phase of the Proposed Project has been fully assessed in the EIAR.

As noted in the Scottish Natural Heritage (SNH) report *Research and Guidance on Restoration and Decommissioning of Onshore Wind Farms* (SNH, 2013) reinstatement proposals for a wind farm are made approximately 30 years in advance, so within the lifespan of the Proposed Project, technological advances and preferred approaches to reinstatement are likely to change. According to the SNH guidance, it is therefore:

"best practice not to limit options too far in advance of actual decommissioning but to maintain informed flexibility until close to the end-of-life of the wind farm".

8.5.5 Risk of Major Accidents and Disasters

Due to the nature of the Proposed Wind Farm, i.e. cutover raised bog, with residual peat deposits occurring in basins, and with relatively flat ground conditions, the risk of a landslide occurring at the Proposed Wind Farm site is low. To confirm this, a comprehensive Geotechnical and Peat Stability Risk Assessment has been undertaken for the proposed site (FTC, 2026) (Appendix 8-1), and it concludes that with the implementation of the proposed control (mitigation) measures outlined in Section 8.5.2.5 and in Appendix 8-1, the risk is determined to be low.

See Chapter 17 of the EIAR for further details on major accidents and disasters.

8.5.6 Assessment of Health Effects

Potential health effects arise mainly through the potential for soil and ground contamination. The Proposed Project is not a recognized source of pollution (e.g. it's not a waste management site, or a chemical plant), and so the potential for effects during the operational phase are negligible. Hydrocarbons will be used onsite during construction however the volumes will be small in the context of the scale of the Proposed Project and will be handled and stored in accordance with best practice mitigation measures. The potential residual effects associated with soil or ground contamination and subsequent health effects are imperceptible.

8.5.7 Potential Cumulative Effects

Due to the localised nature of the proposed construction works which will be within the Land, Soils and Geology Study Area, there is no potential for significant cumulative effects with other local developments on the land, soils and geology environment.

All of the developments, plans and projects listed in Section 2.10 of Chapter 2 were reviewed in terms of the potential for cumulative effects with the Proposed Project.

The only pathway through which the Proposed Project could give rise to cumulative effects in combination with other off-site projects or developments is via the drainage and surface water network. This hydrological pathway is assessed in Chapter 9.

8.5.7.1 Cumulative Effects with Draft Rehabilitation Plans

Pre-Mitigation Effect

The Draft Rehabilitation Plans will be implemented in order to meet the requirements of Condition 10.2 of the IPC Licence No. P0503-01. The plans, attached as Appendix 2-4, will be subject to consultation as well as input from the EPA prior to their implementation across the Proposed Wind Farm site. Given the overlap of these proposals and the Land, Soils and Geology Study Area, the Proposed Project has the potential to interact with the Draft Rehabilitation Plans.

The objective of the Draft Rehabilitation Plans is to stabilise and rehabilitate the peat bogs within the Land, Soils and Geology Study Area. The Draft Rehabilitation Plans use bespoke interventions designed to firstly stabilise the environment and secondly to rehabilitate the Proposed Wind Farm site as much as possible by placing the existing peatland environments on a path towards naturally functioning peatlands.

Much of the work associated with the decommissioning and rehabilitation will occur during the initial stages of the Draft Rehabilitation Plans. Once drain blocking and other measures have been implemented the operational activities will comprise non-intrusive ecological and hydrological monitoring and will also include minimal maintenance and repair works.

The Proposed Project has a total development footprint of 154ha. Therefore, the Proposed Project will result in the loss of cutover peat bog which will have a negative effect on land as peat bogs will be replaced by access roads, turbine bases, hardstands etc. The Proposed Project also includes Proposed Enhancement Areas (detailed in the BMP included as Appendix 6-5), and these lands will also not be available for rehabilitation. However, the Proposed Enhancement incudes drain blocking and other works which are compatible with peatland restoration.

The loss of peat bog land is minimal (<3% loss of the total landmass within the Project Site). On a wider scale, the Draft Rehabilitation Plan will be implemented across the entire bog areas within the Land, Soils and Geology Study Area, a total area of 5,157ha. If the Proposed Project proceeds this land (152 ha and the Proposed Enhancement Areas) will no longer be available for rehabilitation. However, due to the small footprint of the Proposed Project, both in terms of the Project Site and the wider area, the effects of actual peat bog land loss associated with the Proposed Project is negligible.

The Draft Rehabilitation Plans will have a positive effect on land at the Proposed Wind Farm site as the degraded bog, which currently largely comprise bare peat fields, will be replaced by an array of scrub, woodlands, wetland and peatland habitats.

Pathway: Excavation/hardstand construction and rewetting measures, natural revegetation and targeted revegetation.

Receptor: Soils/land.

Description of Effects: Moderate, positive, direct, likely, long-term effect on land and soils/land. There is no potential for significant effects.

Proposed Mitigation Measures

The Draft Rehabilitation Plans will be updated to account for the Proposed Project infrastructure footprint; therefore, no additional mitigation measures are required.

Residual Effects

The Proposed Project and the Draft Rehabilitation Plans have the potential to change landcover at the Project Site. The Proposed Project will negatively affect soils/land whilst the Draft Rehabilitation Plans will have a positive effect on soils/land. Given the small footprint of the Proposed Project, the residual cumulative effect is a positive, direct, moderate, likely, long-term effect on soils/land.

Significance of Effects

No significant effects on land or soils/land will occur.

8.5.7.2 Cumulative Effects with Uisce Éireann Water Supply Project

Planning permission for the Eastern and Midlands Region Water Supply Project (WSP) has been submitted to ACP (Case no: 323980). The WSP includes an abstraction from Parteen Basin on the Lower River Shannon, and various elements of water supply infrastructure, which will extend from Parteen Basin, through the midlands, to Peamount in Co. Dublin. The Water Supply Project aim to increase water supply resilience in the East and Midlands region.

The pipeline associated with the UÉ Water Supply is proposed to pass through Codd 2, Glashabaun North, Glashabaun South and Derrybrennan bogs. The planning application was submitted to ACP in December 2025, and the construction phase will commence in Q1 of 2028 and completes at Q4 of 2032, subject to planning approval. The WSP has been considered in the design of the Proposed Project and is considered in the cumulative impact assessments of this EIAR chapter. This approach has been adopted due to the potential for temporal overlap between the construction phases of the Proposed Project and the WSP, resulting in the possibility of concurrent construction activities within the Proposed Wind Farm site. Without appropriate management, concurrent construction works could result in cumulative effects on peat and soils/subsoils, including increased disturbance and excavation of peat.

To minimise the potential for cumulative effects, the respective project teams will maintain ongoing liaison during the construction phases, as required. This will facilitate the exchange of programme information and coordination of construction activities where appropriate.

Furthermore, the EIAR submitted for the WSP concludes that following the implementation of the mitigation and control measures, there would be no significant effect on land, peat, soils/subsoils and geology. Similarly, the mitigation measures prescribed in this EIAR for the Proposed Project, will ensure that there are no significant effects on the land, soils and geological environment.

Considering the mitigation measures prescribed for both projects, and the coordination between construction teams, significant cumulative effects will not occur.

8.5.7.3 Cumulative Effects with Forestry

Replacement afforestation associated with the Proposed Project has also been considered as part of the cumulative assessment. From a land, soils and geology perspective, the principal potential effects associated with afforestation establishment relate to localised soil and subsoil disturbance arising from ground preparation, drainage and access works. Such effects are generally confined to the footprint of the afforestation works and their immediate surroundings. Consequently, the potential for cumulative effects with the Proposed Project would arise primarily where replacement afforestation works are located in close proximity to, or overlap with, areas affected by Proposed Project infrastructure or associated earthworks, and where the respective works occur concurrently. Where replacement afforestation is spatially separate from the Proposed Project works, there is no meaningful pathway for cumulative effects on the land, soils and geological environment. Where lands in proximity to the Proposed Project are considered for replacement afforestation, appropriate siting and sequencing of the works would avoid significant cumulative effects.

8.5.7.4 Cumulative Effects with Peatland Climate Action Scheme (PCAS)

PCAS is a programme of enhanced peatland rehabilitation measures with the primary aim of optimising climate action benefits of rewetting former industrial peat extraction areas by creating soggy peatland conditions that will allow compatible peatland habitats to redevelop. These measures are separate to those defined by the IPC Licence. This programme has been developed to optimise ecosystem service benefits of peatland rehabilitation and restoration, particularly carbon storage and reducing carbon emissions. In addition, this will also benefit biodiversity and water (water quality and catchment management), as well as providing space for local communities and people to enjoy the outdoors. PCAS is supported by Government through the Climate Action Fund and Ireland's National Recovery and Resilience Plan administered by the Department of Environment, Climate and Communications (DECC). Refer to https://www.bnmpcas.ie/ for details. The National Parks and Wildlife Service (NPWS) acts as the Scheme regulator and there is ongoing engagement with the EPA. To date the PCAS has rehabilitated approximately 24,503ha of peatland.

Within the Project Site, PCAS has been completed on Lodge Bog, with a total of 365.7 ha being rehabilitated.

Any PCAS works, including those already completed at Lodge Bog, would have a positive long-term effect on the land environment. There would be no potential for significant cumulative effects.

8.5.8 Post Construction Monitoring

None required.