Environmental Impact Assessment Report (EIAR)

Crumhach Wind Farm, Co. Sligo

Chapter 8 - Land, Soils and Geology

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8. LAND, SOILS AND GEOLOGY

8.1 Introduction

8.1.1 Background and Objectives

Hydro-Environmental Services (HES) was engaged by MKO to carry out an assessment of the potential likely and significant effects of the proposed Crumhach Wind Farm (Proposed Project) on the Land, Soils and Geology aspects of the receiving environment.

Where the Proposed Project is referred to this encompasses the entirety of the project for the purposed of this EIA in accordance with the EIA Directive. The Proposed Project is described in detail in Chapter 4: Description of the Proposed Project, of this EIAR. An overview of various elements of the Proposed Project is presented in Section 1.1.1 of Chapter 1: Introduction.

Where 'the Site' is referred to, this relates to the primary study area for the Proposed Project EIAR, as delineated by the EIAR Site Boundary and includes the Proposed Wind Farm and Proposed Grid Connection Route.

Where the 'Proposed Wind Farm' is referred to, this refers to 17 no. turbines and associated foundations and hard-standing areas, access tracks, temporary construction compounds, on-site 110kV substation, internal underground cabling, onsite LiDAR compounds, peat and spoil management areas, site drainage, biodiversity enhancement, turbine delivery route (TDR) accommodation works and all ancillary works and apparatus. The Proposed Wind Farm is described in detail in Chapter 4 of the EIAR.

The 'Proposed Turbines' refers to the 17 no. turbines associated with the Proposed Wind Farm as outlined above.

Where the 'Proposed Grid Connection Route' is referred to, this encompasses the 110kV underground cabling connecting the proposed on-site 110kV substation to the existing Srananagh 220kV substation, and all ancillary works and apparatus.

Where the 'Existing Wind Farm' is referred to, this relates to all components of the existing Dunneill and Kingsmountain Wind Farm developments.

Where the 'Existing Grid Connection' is referred to, this related to the existing underground cabling connecting the existing onsite control buildings for the Existing Wind Farm to the existing Cunghill 110kV substation.

In addition, where the construction phase is detailed and assessed within the EIAR, this includes for the removal of the existing 23 no. turbines at the Existing Wind Farm and the construction of 17 no. Proposed Turbines and associated infrastructure on-site.

This report provides a baseline assessment of the environmental setting of the Proposed Project, as described in Chapter 4: Description of the Proposed Project, in terms of land, soils and geology and discusses the potential likely significant effects and cumulative effects that the construction, operation and decommissioning of the Proposed Project will have. Where required, appropriate mitigation measures to avoid any identified significant effects to land, soils, geology and natural resources are recommended and the residual effects of the Proposed Project post-mitigation are assessed.

The Proposed Project Study Area with regard to Land, Soils and Geology is within a 2km distance of the EIAR Site Boundary as per IGI (2013) guidance. However, only direct effects on land, soils and geology within the EIAR Site Boundary are expected with regard the Proposed Project works (i.e. no indirect off-site effects) and therefore 2km is a conservative scoping distance.

8.1.2 Glossary of Terms and Acronyms

Glossary of Terms and Acronyms used in this chapter are shown in **Table 8-1**.

Table 8-1: Glossary of Terms and Acronyms.

Construction Phase	
Term	**Definition**
Aquifer	A geological formation capable of storing and transmitting groundwater in sufficient quantities to support water supplies or groundwater-dependent ecosystems.
Bedrock	Solid geological material underlying the subsoil and superficial deposits.
Blanket Peat	Peat deposits that blanket the landscape, typically formed under high rainfall and poor drainage conditions.
Bog	A peat-forming wetland that receives water primarily from rainfall and is typically acidic and nutrient-poor.
Cutaway Bog	An area of former raised bog from which peat has been mechanically extracted.
Drainage Network	Natural and artificial drains, ditches and watercourses that convey surface water.
EPA	Environmental Protection Agency
Environmental Impact Assessment Report (EIAR)	The report prepared to identify, describe and assess the likely significant environmental effects of a proposed development.
Factor of Safety (FoS)	Ratio of resisting forces to driving forces used to assess slope or peat stability. Values greater than 1.0 indicate stability.
Geological Heritage Site	A site recognised for its geological importance at county or national level.
GSI	Geological Survey of Ireland
Ground Investigation	Field investigations including peat probing, trial pits, boreholes and laboratory testing undertaken to characterise ground conditions.
Groundwater	Water occurring beneath the ground surface within soil, subsoil or rock.
Hydrogeology	The study of groundwater occurrence, movement and interaction with geological materials.
Karst	A landscape formed by dissolution of limestone characterised by features such as swallow holes, sinkholes, caves and underground drainage.

Land Take	Permanent or temporary occupation of land by the proposed development.
Made Ground	Artificially placed material resulting from previous construction or industrial activities.
mbgl	Metres below ground level
Mineral Resource	Naturally occurring rock or mineral deposit with existing or potential economic value.
Mitigation Measures	Measures incorporated into the project to avoid, reduce or offset adverse environmental effects.
Natural Resources	Naturally occurring environmental resources including land, soils, geology, minerals and peat.
Peat	Partially decomposed organic material accumulated under waterlogged conditions.
Peat Depth	Thickness of peat measured from the ground surface to the underlying mineral soil or rock.
Peat Stability	The susceptibility of peat to movement or failure due to natural conditions or construction activities.
Peat Slide	Downslope movement of peat caused by instability or failure of the peat mass.
Peat Spoil Management Area (PSMA)	Designated location for the temporary or permanent storage and management of excavated peat.
PSRA	Peat stability risk assessment
PSMP	Peat and spoil management plan
Permeability	The ability of soil or rock to transmit water.
Residual Effect	The environmental effect remaining after implementation of mitigation measures.
Sensitivity	The importance or vulnerability of an environmental receptor to change.
Significance	The importance of an environmental effect after considering receptor sensitivity and magnitude of impact.
Site Investigation	Physical investigation of ground conditions through peat probing, boreholes, trial pits and laboratory testing.
Subsoil	Unconsolidated geological material between the topsoil and bedrock.
Topsoil	The uppermost soil layer containing organic matter and supporting vegetation growth.
Trial Pit	A shallow excavation undertaken to inspect and sample soils and subsoils.

Von Post Scale	International classification system describing the degree of peat decomposition (H1–H10).

8.1.3 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 our office is located in Dungarvan, County Waterford.

Our core areas of expertise and experience includes soils, subsoils and geology. We 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 Michael Gill, David Broderick, and Adam Keegan.

Michael Gill (P. Geo., B.A.I., MSc, Dip. Geol., MIEI) is an Environmental Engineer/Hydrologist with over 24 years' environmental consultancy experience in Ireland. Michael has completed numerous hydrological and hydrogeological impact assessments of wind farms in Ireland. He has also managed EIAR assessments for infrastructure projects and private residential and commercial developments. In addition, he has substantial experience in wastewater engineering and site suitability assessments, contaminated land investigation and assessment, wetland hydrology/hydrogeology, water resource assessments, surface water drainage design and SUDs design, and surface water/groundwater interactions. For example, Michael has worked on the EIS/EIARs for Seven Hills Wind Farm, Lemanaghan Wind Farm, Glenard Wind Farm, and over 100 other wind farm related projects across the country.

David Broderick (P. Geo., BSc, H. Dip Env Eng, MSc) is a Hydrogeologist with over 19 years' experience in both the public and private sectors. Having spent two years working in the Geological Survey of Ireland working mainly on groundwater and source protection studies David moved into the private sector. David has a strong background in groundwater resource assessment and hydrogeological/hydrological investigations in relation to developments such as quarries and wind farms. David has completed numerous geology and water sections for input into EIARs for a range of commercial developments. David has worked on the EIS/EIARs for Croagh Wind Farm, Knockalough Wind Farm, and Oweninny Wind Farm, and over 60 other wind farm related projects across the country.

Adam Keegan (P.Geo., BSc, MSc) is a Hydrogeologist with 10 years of experience in the environmental sector 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 WF, Lyrenacarriga WF (SID), Cleanrath WF, Carrownagowan WF (SID), and Fossy WF.

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. The requirements of the following legislation are complied with:

- Planning and Development Acts, 2000-2021;
- 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;
- S.I. No. 296 of 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 was prepared in accordance with, where relevant, the 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;
- National Roads Authority (2008): Guidelines on Procedures for Assessment and Treatment of Geology, Hydrology and Hydrogeology for National Road Schemes;
- 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 Desk Study

A desk study of the Site was completed in advance of undertaking the walkover survey and site investigations. This involved collecting all relevant geological data for the Site and receiving environment. This included consultation with the following data sources:

- Environmental Protection Agency database (www.epa.ie);
- Geological Survey of Ireland - Groundwater and Geology Databases (www.gsi.ie);
- Geological Survey of Ireland – Geological Heritage site mapping (www.gsi.ie);
- Bedrock Geology 1:100,000 Scale Map Series, Geological Survey of Ireland;
- Geological Survey of Ireland Groundwater Body Initial Characterization Reports;
- General Soil Map of Ireland 2nd edition (www.epa.ie); and,
- Aerial Photography, 1:5,000 and 6” (six inch) base mapping.

8.2.2 Baseline Monitoring and Site Investigations

A walkover survey, including geological mapping and investigations of the Site, were undertaken by David Broderick and Adam Keegan of HES (refer to Section 8.1.3 above for qualifications and experience) on 3rd and 4th of October and 13th November 2024, 22nd and 23rd May 2025, 3rd February, 4th March, and 2nd April 2026.

The following geotechnical reports were prepared by Fehily and Timoney (FT) in support of the application:

- Geotechnical and Peat Stability Risk Assessment (**Appendix 8-1**); and
- Peat and Spoil Management Plan (**Appendix 4-2**).

A total of no. 850 peat probes were carried out at the Site by FT, MKO and HES and between August 2024 and March 2026.

Geotechnical ground investigations (i.e. trial pitting) were undertaken in July 2025, under the supervision of FT. A total of 19 no. trial pits, supervised by FT, were carried out at the Proposed Wind Farm.

The objectives of the intrusive site investigations included mapping the distribution and depth of peat and mineral subsoils at the Proposed Wind Farm along with assessing the mineral subsoil / bedrock conditions at key Proposed Project locations (i.e. Proposed Turbines, temporary construction compounds, existing and proposed access tracks, peat and peat/spoil management areas, borrow pits and substation). This robust data set was used to inform the impact assessment and final layout design.

The complete geotechnical ground investigations were carried out in accordance with IS EN 1997-2 and BS5930:2015+A1:2020 Code of Practice for Ground Investigations with precedence given to IS EN 1997-2 where applicable.

The baseline geological assessment of the Site was further supplemented by historical trial pit logs, borehole logs and geophysical surveys completed during the development of the Existing Wind Farm.

There are existing trial pit logs (11 no.) and shell and auger borehole logs (11 no.) for Existing Wind Farm (Kingsmountain) when investigations were carried out in October 2001 and March 2002 respectively.

Site investigations at Existing Wind Farm (Dunneill) were carried out between 24th September and 9th October 2008 which included trial pits (16 no.), dynamic probing (6 no.) and geophysical surveys.

In summary, site investigations by the project team to address the Land, Soil and Geology section of the EIAR included the following:

- Walkover surveys and geological mapping of the Site area were undertaken by HES and FT to assess general ground conditions and topography;
- A total of 850 no. peat probes were completed by HES, MKO and FT to determine the thickness and geomorphology of the blanket peat overlying parts of the Site;
- Shear vane strength testing was carried out in-situ using a Geonor H-60 Hand-Field Vane Tester;
- Trial pitting (19 no.) under FT and gouge cores (15 no.) by HES to investigate soil, peat and mineral subsoil lithology as well as depth to bedrock;
- Laboratory testing (classification testing for overburden material rock strength testing); and,
- Mineral subsoils and peat were logged according to BS: 5930 and Von Post Scale respectively.

The above site investigations were also used to inform the Geotechnical and Peat Stability Assessment Report (GPSAR,FT, June 2026) which includes the IDL trial pit logs, and the Peat and Spoil Management Plan (PSMP, FT, June 2026) which are included as **Appendix 8-1** and **Appendix 4-2** of this EIAR respectively.

8.2.3 Scope and Consultation

The scope for this chapter of the EIAR has also been informed by consultation with statutory consultees, bodies with environmental responsibility and other interested parties. This consultation process and the list of Consultees is outlined in Section 2.7 of this EIAR. Matters raised by Consultees in their responses with respect to the land, soils and geological environment are summarised in **Table 8-2** below.

Table 8-2: Summary Scoping Responses.

Consultee	Matters Raised - Description	Addressed in Sections
Geological Survey of Ireland (GSI)	*"Our records show that there is a CGS adjacent to the proposed renewable energy development site boundary. Easky River solifluction lobe, Co. Sligo. (GR 144034, 324767), under IGH theme: IGH 7 Quaternary. With the current plan, although it is on the margins of the site boundary, there may be potential impacts on the integrity of the current CGS, should this site not be assessed as a constraint. Ideally, the site should not be damaged or integrity impacted or reduced in any manner due to any proposed construction and/or modification of access tracks, from traffic due to access track construction, turbine and hard stand installation. This would include impacts that may be related to altered drainage patterns, changes in soil profiles and structures etc. However, this is not always possible, and in this situation appropriate mitigation measures should be put in place to minimize or mitigate potential impacts"*	Sections 8.3.6 & 8.5
	"Landslides are common in areas of peat, rock near surface and in fine to coarse range materials (such as glacial tills), areas which are found within the proposed preferred route option. The Landslide Susceptibility map indicates variable landslide susceptibility within the renewable energy development site boundary, including areas of 'Moderately High' to 'High' susceptibility"	Sections 8.3.8 & 8.3.9 **Appendix 8-1** Geotechnical and Peat Stability Assessment Report (FT, 2026) **Appendix 4-2** Peat and Spoil Management Plan (FT, 2026).
HSE	*The National Environmental Health Service recommends that a detailed Peat Stability/Geotechnical Assessment should be undertaken to assess the suitability of the soil for the proposed development. The EIAR should include provision for a peat stability monitoring programme to identify early signs of potential bog slides ('pre-failure indicators' see the Scottish Government's 'Peat Landslide Hazard and Risk Assessments: Best Practice Guide for Proposed Electricity Developments 2017)".*	Sections 8.3.8 & 8.3.9 **Appendix 8-1** Geotechnical and Peat Stability Assessment Report (FT, 2026) **Appendix 4-2** Peat and Spoil Management Plan (FT, 2026).

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 Site is assessed using the criteria set out in **Table 8-3** (NRA, 2008).

Table 8-3: 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 (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 guideline criteria (EPA, 2022) for the assessment of likely significant effects require that likely effects are described with respect to their extent, magnitude, type (i.e. negative, positive or neutral) probability, duration, frequency, reversibility, and transfrontier nature (if applicable). The descriptors used in this environmental impact assessment report are those set out in the EPA (2022) 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 8-4**.

In order to provide an understanding of this descriptive system in terms of the geological/hydrological environment, elements of this system of description of effects are related to examples of potential likely significant effects on the geology and morphology of the existing environment, as listed in **Table 8-5**.

Table 8-4: Additional Impact Characteristics.

Impact Characteristic	Degree/ Nature	Description
Proximity	Direct	An impact which occurs within the area of the proposed project, as a direct result of the proposed project.
	Indirect	An impact which is caused by the interaction of effects, or by off-site developments.
Probability	Unlikely	A low likelihood of occurrence of the impact.
	Likely	A medium likelihood of occurrence of the impact.

Table 8-5: Impact descriptors related to the receiving environment.

Impact Characteristics		Potential Hydrological Impacts
Quality	**Significance**	
Negative only	Profound	Widespread permanent impact on: › The extent or morphology of a cSAC. › Regionally important aquifers. › Extents of floodplains. Mitigation measures are unlikely to remove such impacts.
Positive or Negative	Significant	Local or widespread time-dependent impacts on: › The extent or morphology of a cSAC / ecologically important area. › A regionally important hydrogeological feature (or widespread effects to minor hydrogeological features). › Extent of floodplains. Widespread permanent impacts on the extent or morphology of an NHA/ecologically important area. Mitigation measures (to design) will reduce but not completely remove the impact – residual impacts will occur.
Positive or Negative	Moderate	Local time-dependent impacts on: › The extent or morphology of a cSAC / NHA / ecologically important area. › A minor hydrogeological feature. › Extent of floodplains. Mitigation measures can mitigate the impact OR residual impacts occur, but these are consistent with existing or emerging trends

Impact Characteristics		Potential Hydrological Impacts
Quality	Significance	
Positive, Negative or Neutral	Slight	Local perceptible time-dependent impacts not requiring mitigation.
Neutral	Imperceptible	No impacts, or impacts which are beneath levels of perception, within normal bounds of variation, or within the bounds of measurement or forecasting error.

8.2.5 Limitations and Difficulties Encountered

No material limitations or difficulties were encountered during the preparation of this Land, Soils and Geology Chapter. The assessment has been undertaken using the available site investigation data (current and historical), site surveys, geotechnical assessments (completed by FT) and other relevant information available at the time of assessment. This information is considered appropriate to identify and assess the likely significant effects of the Proposed Development on the land, soils and geological environment for the purposes of this EIAR.

8.3 Existing Environment

8.3.1 Site Description and Topography

The Proposed Wind Farm is located on the northwest slopes of the Ox Mountains, located approximately 4.5km south of the village of Dromore West, and approx. 3km southwest of the village of Templeboy in Co. Sligo, at their nearest points.

The Proposed Wind Farm is an upland setting which is dominated by blanket bog and coniferous forestry. There are two existing wind farms within the Proposed Wind Farm ('Existing Wind Farm'), namely Dunneill Wind Farm which is located on the north of the Proposed Wind Farm and Kingsmountain Wind Farm which is located on the east of the Proposed Wind Farm. The Site has existing access tracks (Existing Wind Farm and forestry related), with up to 8.9km of the Existing Wind Farm access tracks and 4.3km of existing public road that will be upgraded and utilised by the Proposed Wind Farm.

The Proposed Wind Farm is accessed via the L6309 and L2702 Local Roads off the N59 National Road, travelling in an east-west direction north of the Site and the N17 National Road, which runs in a north-south direction to the southeast of the Site. The current entrance to the Existing Wind Farm is proposed as the main site entrance, utilising the existing access tracks and infrastructure.

Proposed Turbines T8 to T17 are located within the Existing Wind Farm, while Proposed Turbines T1 to T7 as well as the proposed 110kV substation are located in coniferous forestry and peatlands on the west of the Site that were not previously developed for wind energy.

The topography of the Proposed Wind Farm is mountainous with a ground elevation of between 110 and 390m OD. The highest elevations are on the southeast of the Proposed Wind Farm where the ground slopes steeply up towards the summit of the Ox Mountains. The upper reaches of the Dunneill River (referred to as the Owenduff River within the Site) flows through the Proposed Wind Farm. Ground slopes in the central and western part of the Proposed Wind Farm are gentle to moderate.

Land-cover on the Proposed Wind Farm primarily comprises peat bog, with coniferous forest to the north-west, east and south of the site. South of the Proposed Wind Farm comprises largely of transitional wood scrub, while land-use in the northern end of the Site comprises largely of pastoral agriculture and low-density residential.

Current land-use along the Proposed Grid Connection Route and turbine delivery route (TDR) accommodation works areas comprise public road corridor, pastures, low density residential, industry, commercial forestry and land principally used for agriculture with significant areas of natural vegetation.

The proposed Biodiversity Management and Enhancement Plan (BMEP) lands, situated centrally within the Proposed Wind Farm, are located on open bogland and also at areas proposed for peat and spoil management.

8.3.2 Land and Land Use

Based on the Corine 2018 land cover mapping, the Proposed Wind Farm comprises peat bogs, Transitional woodland scrub and pastures. The Proposed Grid Connection Route follows public roads for approximately 39.6km to connect with the Srananagh 220kV Substation.

Current land-use along the Proposed Grid Connection Route and TDR works areas comprise public road corridor, pastures, low density residential, industry, commercial forestry and land principally used for agriculture with significant areas of natural vegetation.

8.3.3 Soils and Subsoils

8.3.3.1 GSI Mapping

The published Teagasc soils map (www.gsi.ie) for the Proposed Wind Farm shows that blanket peat (BktPt) is the dominant soil type along with areas of poorly draining mineral soil (AminPD) and poorly drained peaty soil (AminPDPT) being mapped along the northern extent of the Proposed Wind Farm. Alluvium is mapped along the Dunneill River (Owenduff River) and Crowagh River that flow through the Proposed Wind Farm on the east and west of the Site respectively.

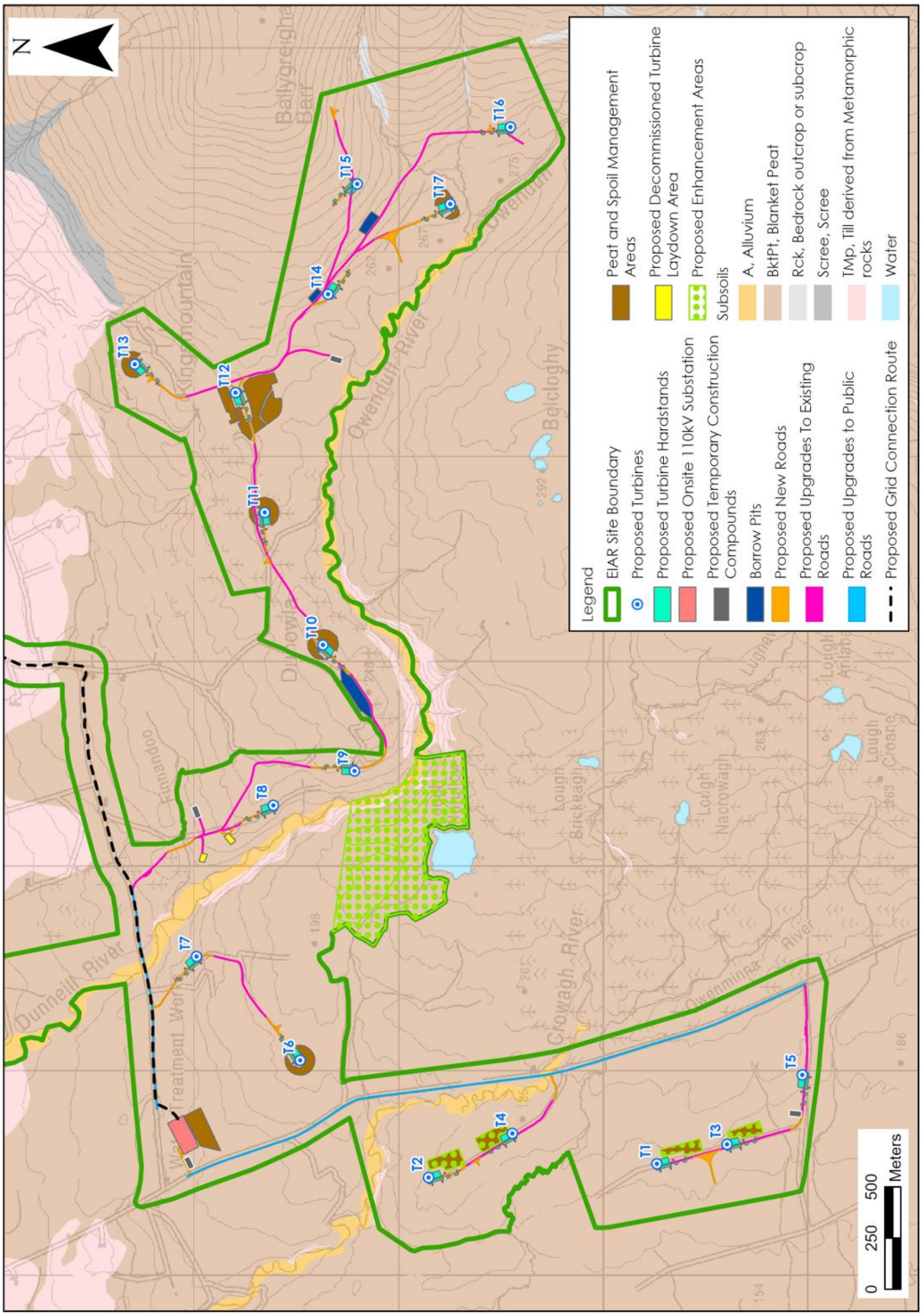
According to GSI subsoil mapping (www.gsi.ie), blanket peat is mapped almost exclusively at the Proposed Wind Farm along with alluvium and pockets of Metamorphic (glacial) tills within the valleys of the Dunneill River and Crowagh River.

GSI subsoils mapped along the Proposed Grid Connection Route comprises blanket peat near the Proposed Wind Farm with metamorphic tills and limestones (glacial) tills mapped along local roads and the N59 stretch of the route and followed by sandstone and shale tills along the R290 and R284 at the eastern end of the Proposed Grid Connection Route.

The TDR accommodation works are located in areas where mapped subsoils transition between blanket peat, Metamorphic tills and limestone tills. The BMEP lands are located on blanket peat with alluvium and Metamorphic tills mapped along the eastern fringe where the Dunneill River flows.

GSI subsoil mapping is shown as **Figure 8-1** below.

Figure 8-1: Local Subsoils Map.



8.3.3.2 Peat Depth Probing

A total of 850 no. peat depth probes were carried out at the Proposed Wind Farm by FT, MKO and HES since October 2024. Peat depths recorded across the Proposed Wind Farm ranged from 0 to 7.2m with an average depth of 1.15m. A peat depth distribution plot for all 850 no. data points is shown as **Figure 8-2** below.

Approximately 55% of the recorded depths were less than 1m, 76% less than 2m and with approximately 90% percent less than 3.0m. A number of localised readings were recorded where peat depths were between 3.0 and 7.2m. The deepest peat area is in the centre of the Existing Wind Farm (Kingsmountain), to the north and southwest of Proposed Turbine T11 (please note the average peat depth at T11 is only 0.7m). The deeper peat areas were generally avoided when optimising the Proposed Wind Farm layout.

The peat depths recorded at the 17 no. Proposed Turbines varied from 0.2 to 3.0m with an average depth of 1.3m. With respect to the proposed access tracks, peat depths are typically less than 2.0m (average 1.8m) with localised depths of up to 4.4m recorded along the existing forestry access tracks between Proposed Turbines T12 and T13.

Peat depths within the BMEP lands range from 0 to 5m with an average of 1.9m.

Please refer to **Table 8-6** for peat depths at the Proposed Turbines and other key Proposed Wind Farm infrastructure locations.

A summary peat depth map for the Proposed Wind Farm is shown as **Figure 8-3** below.

The hand vane results indicate undrained shear strengths in the range 3 to 51kPa, with an average value of about 18kPa. The strengths recorded would be typical of well drained peat as is present across the majority of the Proposed Wind Farm.

The lowest peat strengths were recorded in areas of deep, poorly drained, saturated peat (>3.0m) and as such are not considered representative of the peat strength across the Proposed Wind Farm. Refer to Section 8.3.9 below for a summary of the Geotechnical and Peat Stability Risk Assessment.

Figure 8-2: Peat Depth Distribution Plot.

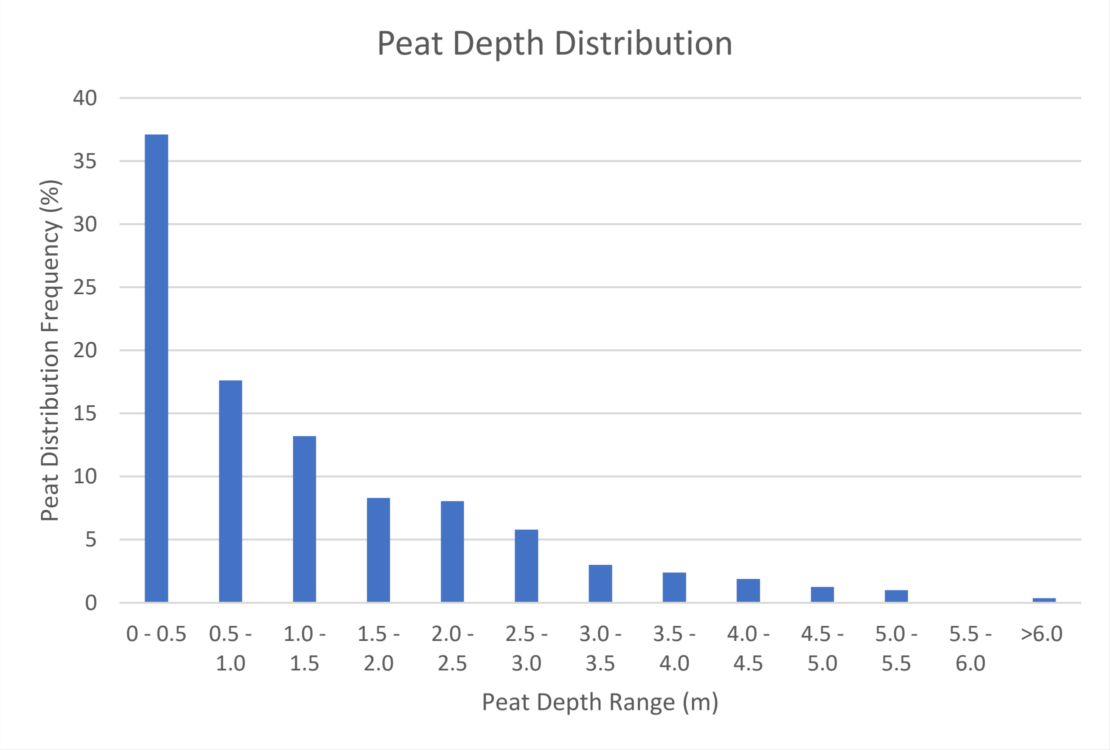
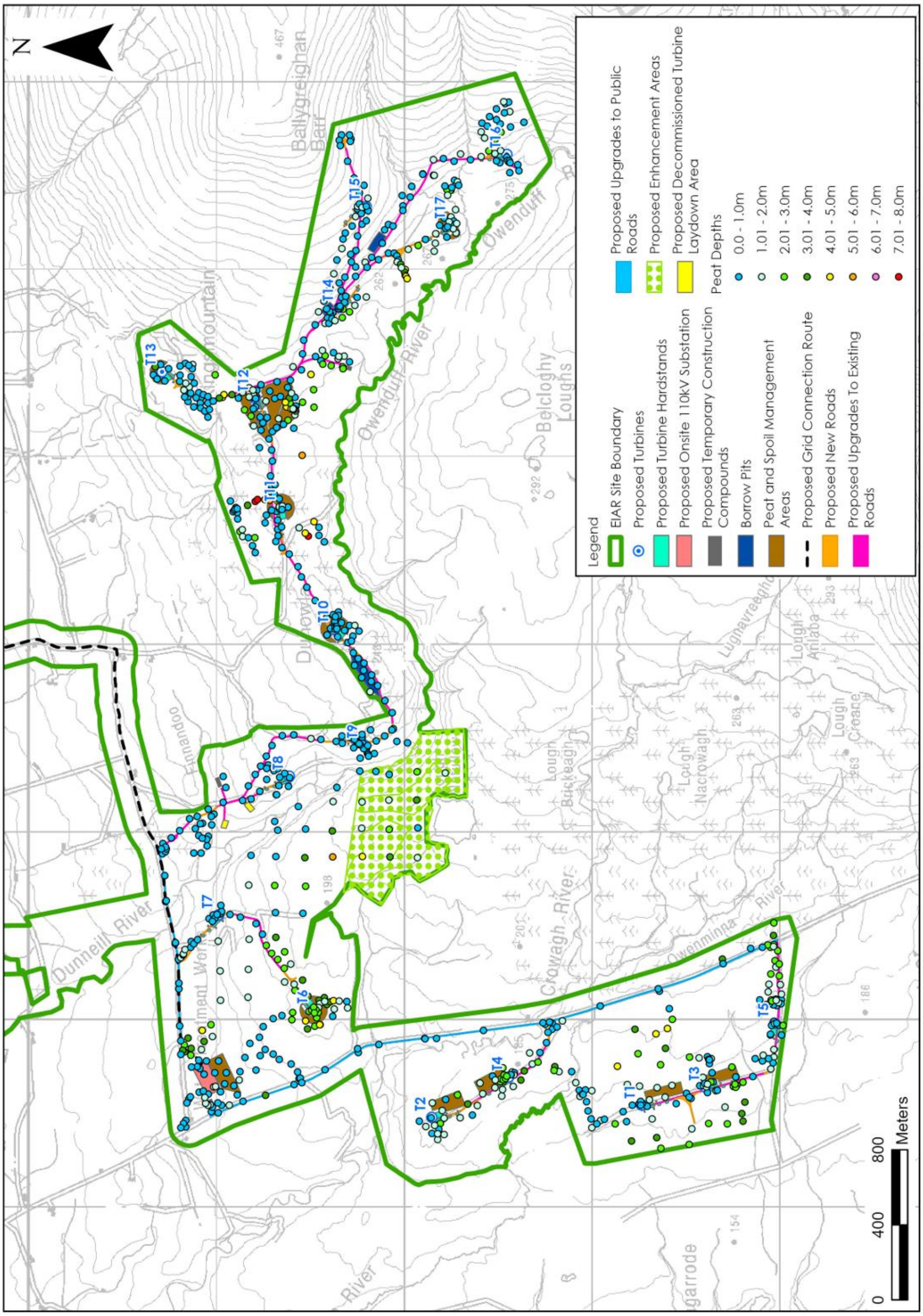


Figure 8-3: Summary Peat Depth Map



8.3.3.3 Historical Investigations

There are historical trial pit logs (11 no.) and shell and auger borehole logs (11 no.) for the Existing Wind Farm (Kingsmountain) when investigations were carried out in October 2001 and March 2002 respectively. These investigations are located on the east of the Proposed Wind Farm where Proposed Turbines T12 to T16 are situated.

The trial pits typically report a sequence of PEAT, firm CLAY and silty GRAVEL over 'SANDSTONE' bedrock. PEAT thickness was reported between 1 and 3m, with CLAY thickness less than 1m and GRAVEL between 0.5 and 3.6m.

'SANDSTONE' bedrock was recorded in 6 no. trial pits at depths ranging from 1.15m to 2.4m below ground level (mbgl) with an average of 1.7mbgl. Where bedrock was not encountered it was typically due to the depth or density of the GRAVEL.

The shell and auger borehole logs recorded a typical sequence of PEAT, gravelly sandy SILT or CLAY over 'SCHIST' bedrock. PEAT thickness was reported between 1 and 2.9m, with SILT/CLAY thickness between 1 and 19m. 'SCHIST' bedrock was recorded in 8 no. boreholes at depths ranging from 2.3 to 6.6mbgl with an average of 4.9m. The GSI mapped bedrock geology in this area of the Proposed Wind Farm is SCHIST and PSAMMITIC which is consistent with the borehole logs. Refer to Section 8.3.4 below for GSI bedrock mapping.

Site investigations at the Existing Wind Farm (Dunneill) were carried out between 24th September and 9th October 2008 which included trial pits (16 no.), dynamic probing (6 no.) and geophysics (electrical resistivity).

The subsoil stratigraphy is similar to the findings of the Kingsmountain 'Existing Wind Farm' investigations as summarised above, but with a more dominance of GRAVEL over SILT/CLAY. This is likely due to the proximity of the Dunneill River valley where alluvium deposits are present.

'SHALE' bedrock was recorded in 12 no. of the trial pits with depths ranging from 2.2 to 3.6mbgl with an average depth of 3.1m. According to GSI bedrock mapping the majority of Dunneill 'Existing Wind Farm' is underlain by SHALE and LIMESTONE formations.

Refer to **Figure 8-4** below for the historical site investigation locations.

8.3.3.4 Proposed Project Site Investigations

The ground investigation by IDL comprised 19 no. trial pits with associated laboratory testing. The Geotechnical and Peat Stability Assessment report prepared by FT (which includes the IDL trial pit logs and laboratory reports) is included as **Appendix 8-1** of this EIAR.

The trial pits were carried out at various locations across the Proposed Wind Farm to provide information on the ground conditions, and to investigate the potential to develop borrow pits within the Proposed Wind Farm.

Trial pits were carried out at 13 no. Proposed Turbines. Where a Proposed Turbine was not accessible for trial pitting, gouge cores (GC) were carried out as an alternative. Refer **Table 8-6** below for a summary of trial pit and gouge core logs. The IDL trial pit locations are shown on **Figure 8-5** below.

Mineral subsoils (glacial tills) typically consisted of brown silty SAND and GRAVEL with cobbles and boulders and/or brown slightly gravelly sandy SILT with cobbles and boulders.

Bedrock was encountered at 4 no. of the trial pit locations (TP-02, TP-03, TP-T17 and TP-T18) which are all located along the Existing Wind Farm (Kingsmountain) access tracks. Depth to bedrock ranged from 0m (TP-T17) to 3.2m (TP-03).

Particle Size Distribution (PSD) analysis was carried out on 11 no. samples. SAND and/or GRAVEL were the primary constituents in 9 no. samples and SILT in 2 no. samples.

Table 8-6: Summary of Site Investigations

Location ID	Site Investigation ID	Probe Average Peat Depth (m)	Depth to Bedrock (mbgl)	Summary of Mineral Subsoil Lithology
T1	TP-T01	0.4	>3	Silty SAND over sandy gravelly SILT
T2	TP-T02	1.5	>3.3	Silty SAND and GRAVEL
T3	TP-T03	1.8	>1.9	ND
T4	TP-T04	2.6	>1.8	Silty SAND and GRAVEL
T5	TP-T07	1.8	>1.8	ND
T6	GC-T06	2.8	>2.8	Sandy gravelly SILT/CLAY
T7	TP-T08	0.25	>2.1	Sandy gravelly SILT
T8	TP-T10	0.2	>2.7	Sandy gravelly SILT over silty SAND and GRAVEL
T9	TP-T11	0.2	>0.4	ND
T10	GC-T10	0.5	>0.5	Sandy gravelly SILT
T11	TP-T13	0.7	>3.2	Sandy gravelly SILT over silty SAND
T12	TP-T14A	1.0	>2.5	Silty SAND and GRAVEL
T13	TP-T15	1.2	>3.7	Silty SAND and GRAVEL
T14	GC-T14	0.5	>0.5	Sandy gravelly SILT/CLAY
T15	TP-T17	0.5	0	Mineral subsoil absent
T16	TP-T18	0.2	2.5	Sandy GRAVEL over sandy gravelly BOULDERS
T17	GC-T17	0.8	>0.8	Gravelly SILT
Substation	GC-SS	1.0	>1.0	Sandy gravelly SILT
Temporary Construction Compound 1	GCTCC1	1.8	-	Sandy gravelly SILT
Temporary Construction Compound 2	GCTCC2	2.1	-	Sandy SILT
Temporary Construction Compound 3	GCTCC3	0.2	-	Sandy gravelly SILT

Location ID	Site Investigation ID	Probe Average Peat Depth (m)	Depth to Bedrock (mbgl)	Summary of Mineral Subsoil Lithology
Temporary Construction Compound (SS)	GCTCC(SS)	1.0	-	Sandy gravelly SILT
Borrow Pit 1	-	0.4	-	-
Borrow Pit 2	-	0.5	-	-
Borrow Pit 3	TP03	0.3	3.2	MADE GROUND
BMEP	-	1.9	-	-

- TP (Trial Pit), GC (Gouge Core), ND (Not Determined)

Figure 8-4: Historical Site Investigation Map

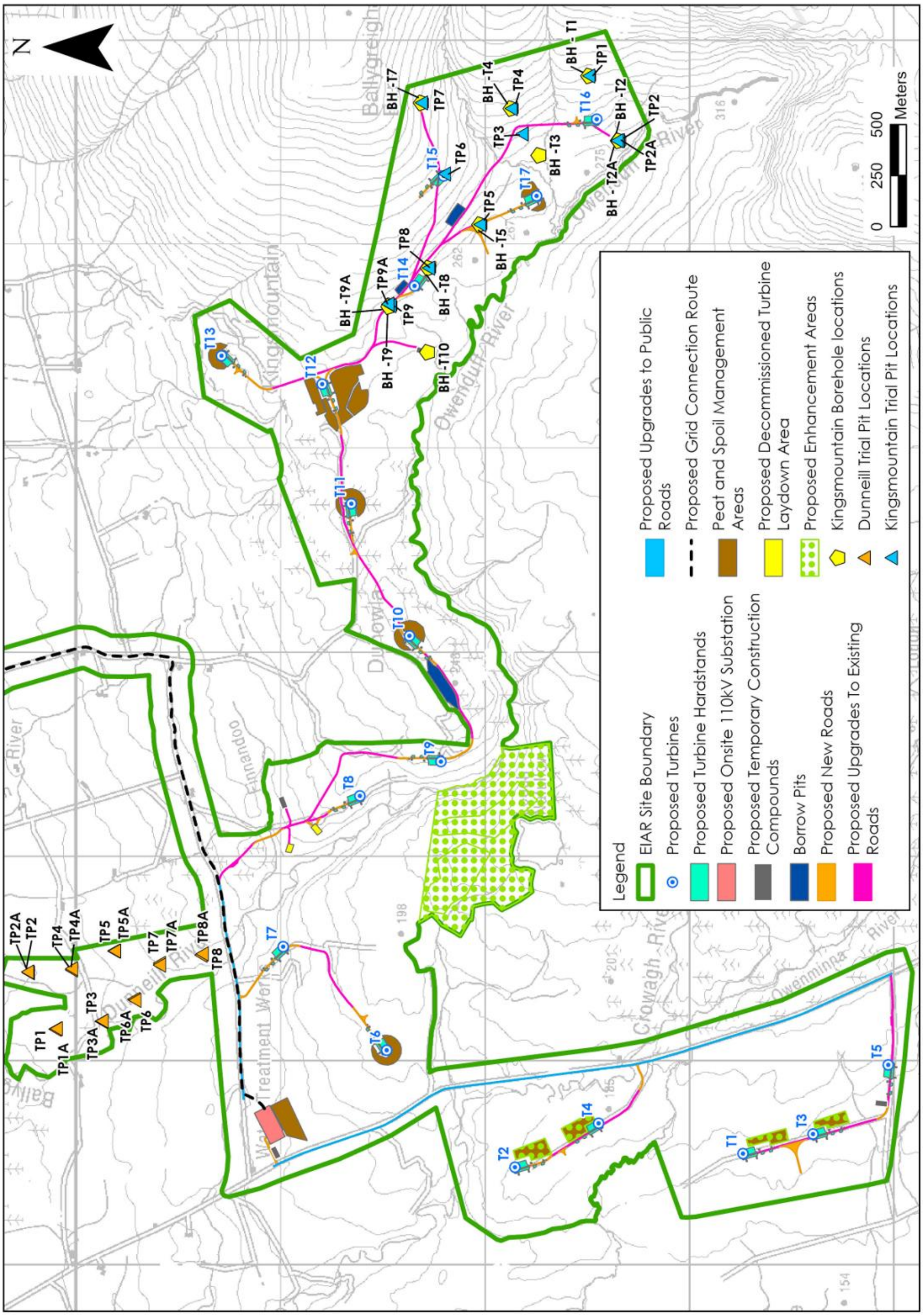
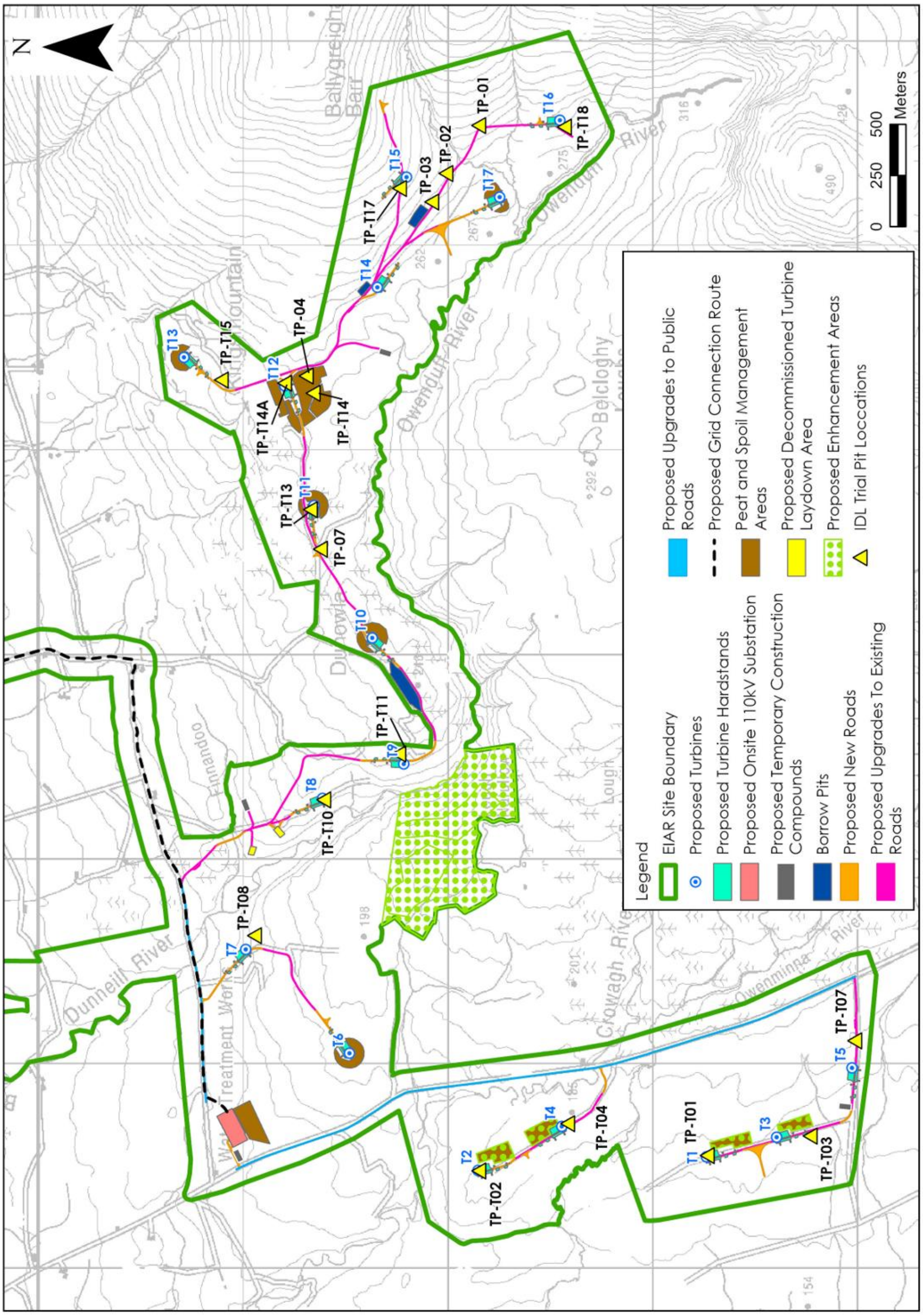


Figure 8-5: IDL (2025) Trial Pit Locations



8.3.4 Bedrock Geology

8.3.4.1 GSI Mapping

According to GSI bedrock mapping, the southern and eastern portion of the Proposed Wind Farm is predominantly underlain by the Attymass Group (undifferentiated), which is comprised of undifferentiated schist & amphibolite.

The southeastern corner is mapped to be underlain by the Meelick Member and Carrick O'Hara Formation, with the former described as schist, aluminous schist, pebble beds and the latter described as semi-pelitic, minor psammitic, schist.

The Attymass Group, Meelick Member and Carrick O'Hara Formation are classified under a Rock Unit Group called the Precambrian Quartzites, Gneisses & Schists. 11 no. of the Proposed Turbines (T3, T5, T9 to T17) as well as the 3 no. proposed borrow pit locations are mapped to be underlain by this Rock Unit Group. The Existing Wind Farm (Kingsmountain) is underlain by this Rock Unit Group.

The northwestern and northern portions of the Proposed Wind Farm is mapped to be underlain mainly by 2 no. limestone formations; named respectively as the Ballina Limestone Formation and the Glencar Limestone Formation with a small portion on the northeast mapped as the Benbulben Shale Formation.

The respective Rock Unit Groups of the above formations being the Dinantian Pure Bedded Limestones, Dinantian Upper Impure Limestones and Dinantian Shales and Limestones.

Dinantian Upper Impure Limestones are mapped below 5 no. Proposed Turbines (T2, T4, T6, T7 and T8) including the proposed 110kV substation location, while Dinantian Pure Bedded Limestones are mapped to underlie Proposed Turbine T1 only. The Dunneill 'Existing Wind Farm' is underlain by the Dinantian Upper Impure Limestones and Dinantian Shales and Limestones.

The Dinantian Pure Bedded Limestones are susceptible to the weathering process of karstfication (i.e. solution weathering). However, the GSI karst database have no karst features mapped within 4km of the Proposed Wind Farm.

As outlined, no karst features are mapped (by the GSI) within the Project 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. 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 850 no. peat probes at the Proposed Wind Farm;
    - Excavation of 19 no. trial pits at the Proposed Wind Farm; and,
    - Historical boreholes (11 no.) and trial pit logs (27 no.)
- 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

The Proposed Wind Farm is mapped to be intercepted by 1 no. northeast/southwest trending fault but faults present no geotechnical risk to the Proposed Wind Farm.

The Rock Unit Groups mapped along the Proposed Grid Connection Route are diverse and comprise Dinantian Pure Bedded Limestones, Dinantian Upper Impure Limestones, Precambrian Quartzites, Gneisses & Schists and Dinantian Sandstones.

Due to the nature of the Proposed Grid Connection Route along the corridor of public roads, the underground cabling will likely have no interaction with the underlying bedrock geology.

A bedrock geology map is shown as **Figure 8-6** below.

8.3.4.2 Historical Site Investigations

Refer to **Figure 8-4** for the historical site investigation map.

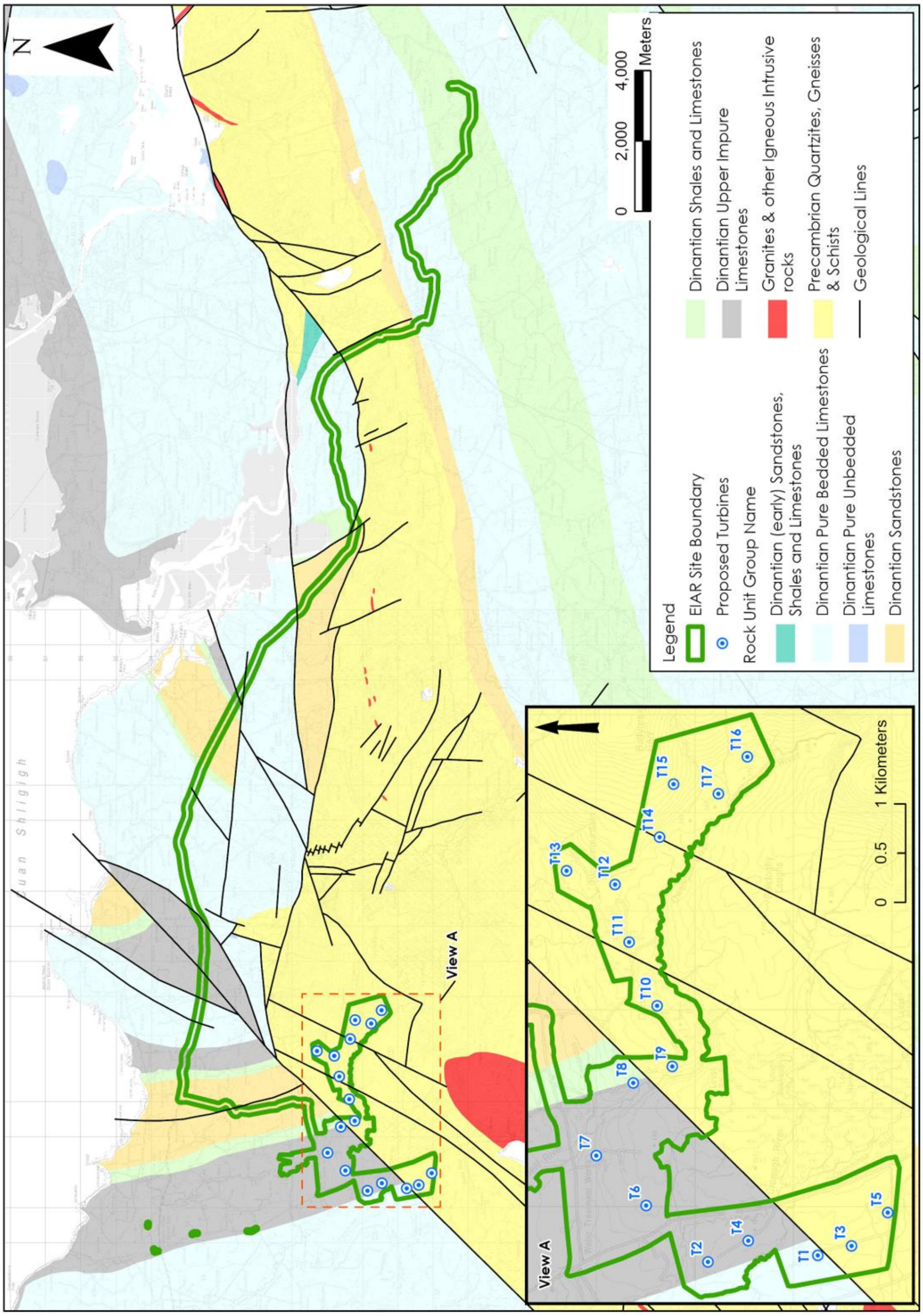
Shell and auger drilling carried at the Kingsmountain 'Existing Wind Farm' (eastern part of the Proposed Wind Farm) in March 2002 recorded SCHIST bedrock at 8 no. boreholes at depths ranging from 2.3 to 6.6mbgl with an average of 4.9m. The SCHIST was described as moderately weak to moderately strong. The GSI mapped geology in this area of the Proposed Wind Farm is SCHIST.

The trial pit investigations conducted at the Dunneill 'Existing Wind Farm' reported SHALE bedrock at 12 no. of the trial pit locations with depths ranging from 2.2 to 3.6mbgl with an average depth of 3.1m. The SHALE competency was variable and reported as highly weathered and weak to moderately strong. The GSI mapped geology in the area of the Proposed Wind Farm is Dark fine LIMESTONE & calcareous SHALE (Glencar Limestone Formation and Benbulben Shale Formation).

8.3.4.3 Proposed Project Site Investigations

Bedrock was encountered at 4 no. of the IDL (2025) trial pit locations (TP-02, TP-03, TP-T17 and TP-T18) which are all located along the Kingsmountain 'Existing Wind Farm' access tracks. Depth to bedrock ranged from 0m (TP-T17) to 3.2m (TP-03). The bedrock was described as SCHIST or PSAMMITE.

Figure 8-6: GSI Bedrock Unit Geology Map.



8.3.5 Geological Resource Importance

The bedrock at the Site is classified as "Low" importance. The bedrock could be used on a "sub-economic" local scale for construction purposes. The bedrock types at the Site are not typically extracted on a commercial scale. Refer to **Table 8-3** for classification criteria.

The peat deposits at the Proposed Wind Farm can be classified as "Low" importance as the peat is not designated within the Site and is significantly degraded in most places by forestry, agriculture and drainage. Similar peat deposits are also locally abundant in the study area.

The GSI online Aggregate Potential Mapping Database (www.gsi.ie) shows that the Proposed Wind Farm is located within an area mapped as ranging from typically Very Low to Low in terms of crushed rock aggregate potential and with no potential for granular aggregate potential (i.e. potential for gravel reserves).

A small area on the northwest of the Site has been mapped as having High potential in terms of crushed rock aggregate.

The GSI online Aggregate Potential Mapping Database shows that the crushed rock aggregate potential along the Proposed Grid Connection Route ranges from very low to low. The majority of the Proposed Grid Connection Route is not mapped in an area for granular aggregate potential.

8.3.6 Geological Heritage & Designated Sites

Within the Republic of Ireland designated sites include Natural Heritage Areas (NHAs), Proposed Natural Heritage Areas (pNHAs), Special Areas of Conservation (SACs), candidate Special Areas of Conservation (cSAC) and Special Protection Areas (SPAs). The Proposed Project infrastructure does not encroach upon with any designated site. Refer to **Figure 8-7** below for designated site mapping (www.npws.ie).

The Proposed Wind Farm is located adjacent to the Ox Mountain Bogs SAC and pNHA. An area of the Ox Mountain Bog SAC is also located within the Site, adjacent to the Existing Wind Farm, however, no new infrastructure is proposed in this area. The Proposed Wind Farm infrastructure including Proposed Turbines, borrow pits, hardstands and access tracks are setback more than 200m from the SAC boundary and therefore there is no potential for direct geological effects. Potential Indirect hydrological effects are assessed in the Chapter 9: Hydrology and Hydrogeology.

Designated sites relevant to the Proposed Grid Connection Route only include Unshin River SAC, Ballysadare Bay SAC and Union Wood SAC. The Proposed Grid Connection Route intercepts the Unshin River SAC at 2 no. locations along the underground cable route, which includes 1 no. existing bridge crossing on the Owenmore River and 1 no. existing bridge crossing on the Unshin River. Due to the Proposed Grid Connection Route being within the carriageway of public roads, no direct geological effects on these designated sites will occur.

Designated sites located within catchments further downstream of the Site are assessed in the Chapter 9: Hydrology and Hydrogeology.

The nearest Geological Heritage site to the Site is the Easky River solifluction lobe (Site Code: SO005), which is located approximately 0.84km southwest of the Proposed Wind Farm at its nearest point (refer to **Figure 8-8** below). The closest Proposed Wind Farm infrastructure is Proposed Turbine T5 which is located approximately 0.9km from the Easky River solifluction lobe.

The Easky River Solifluction lobe is comprised of a lobed surface deposit of unconsolidated material at foot of hillslope. Due to the setback distance from the Site, no direct or indirect geological effects on this Geological Heritage site will occur.

Figure 8-7: Designated Site Mapping (www.npws.ie).

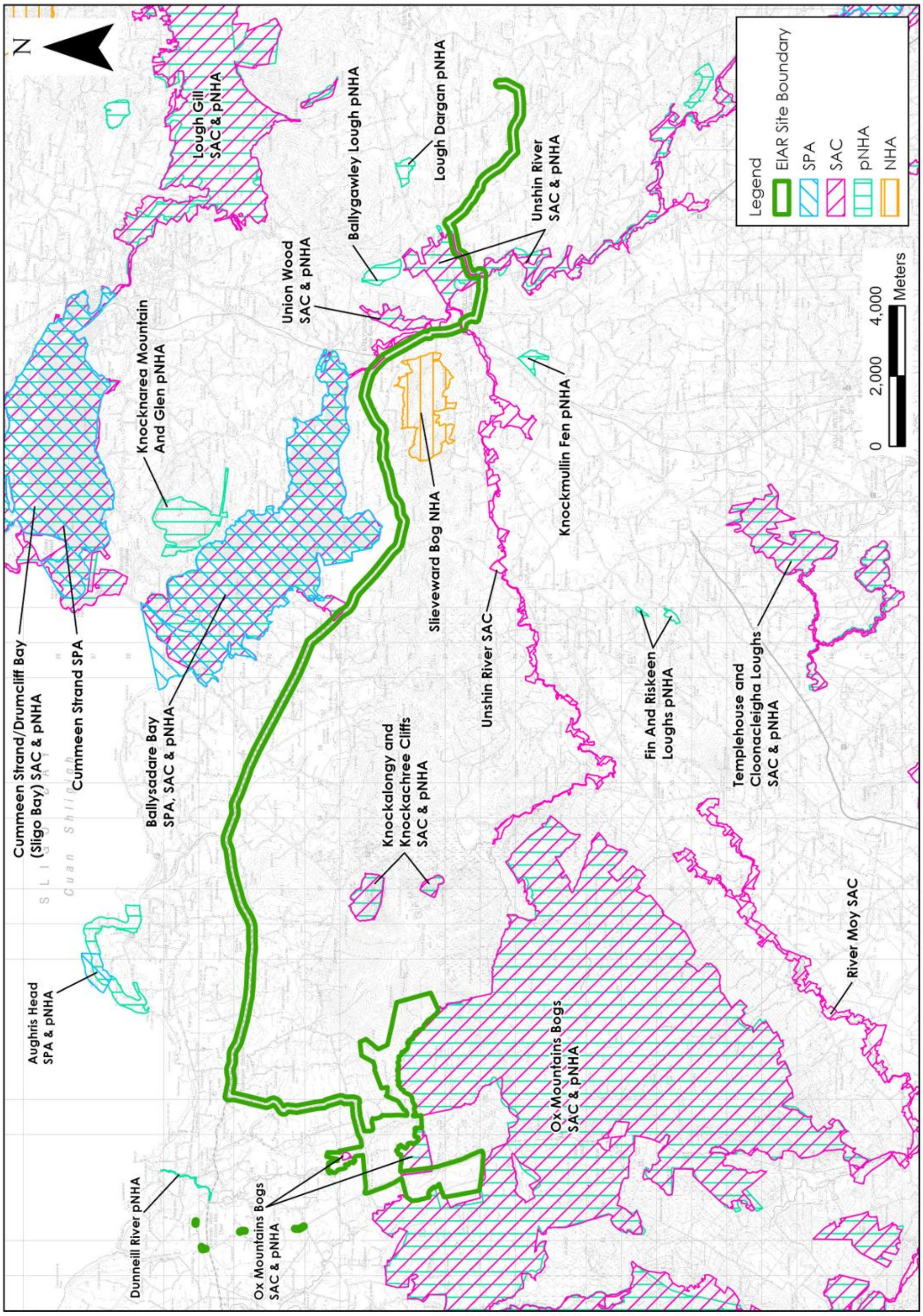
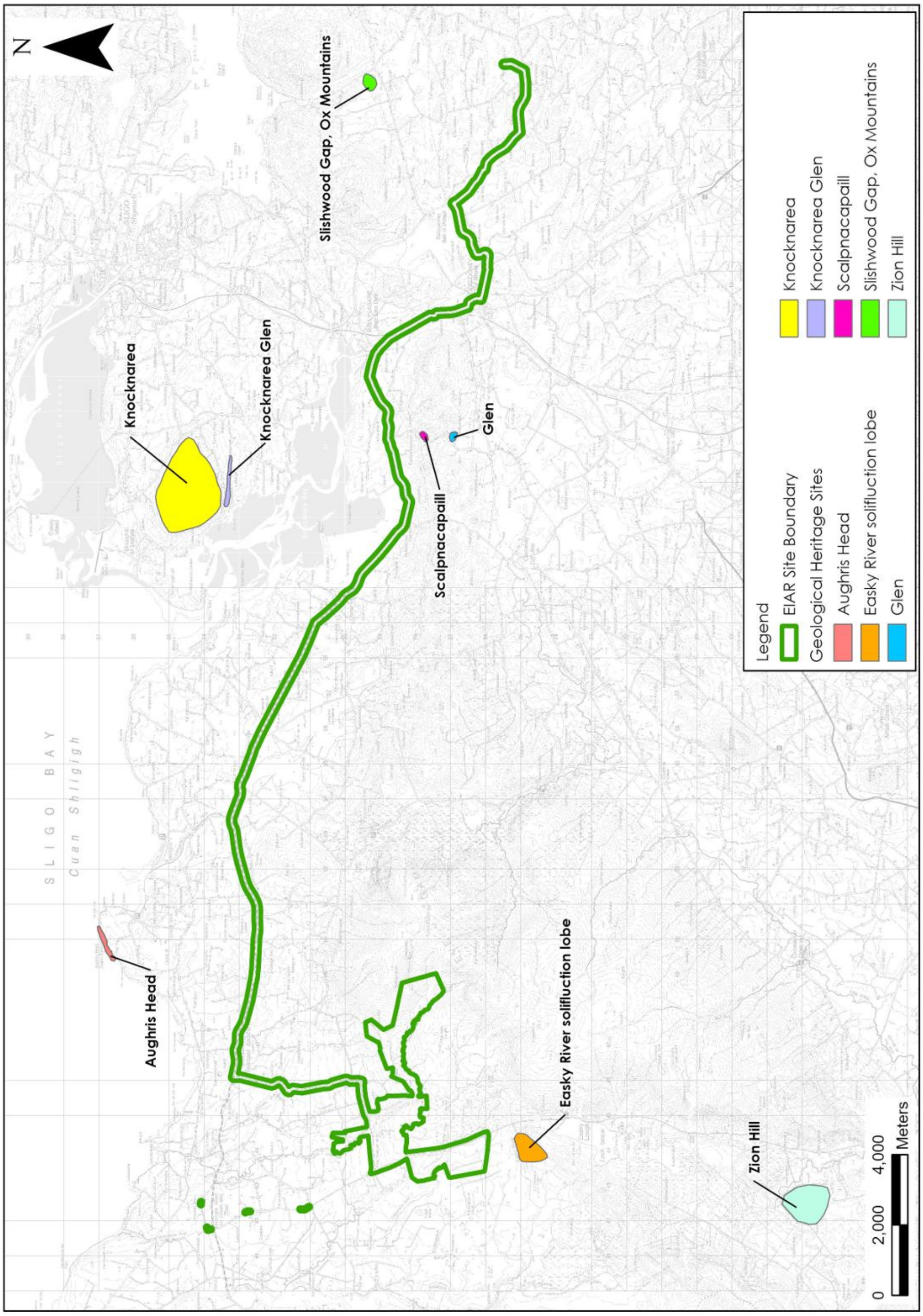


Figure 8-8: GSI County Geological Heritage Sites.



8.3.7 Soil Contamination

There are no known areas of soil contamination on the Site. During the site walkovers and extensive site investigations, no areas of contamination concern were identified.

According to the EPA online mapping (http://gis.epa.ie/Envision), there are no licensed waste facilities on or within the immediate environs of the Site.

There are no historic mines at or in the immediate vicinity of the Site that could potentially have contaminated tailings.

8.3.8 Geohazards

The GSI Landslide database (www.gsi.ie) does not record any historic landslides in the vicinity of the Site or in the surrounding lands.

The GSI Landslide Susceptibility Map (www.gsi.ie) classifies the probability of a landslide occurring at a given location. The Proposed Wind Farm is mapped as having Low to High susceptibility which would be typical given the presence of blanket bog. The areas of 'high' susceptibility correspond to steeper slopes present upslope of T14 and around T15 and T16, where there is little to no peat present.

Refer to Section 8.3.9 below for a summary of the Geotechnical and Peat Stability Risk Assessment (**Appendix 8-1**) which was carried out by FT. All Proposed Project infrastructure elements are located in areas of low risk of peat instability.

The Proposed Wind Farm is mapped to be intercepted by 1 no. northeast/southwest trending fault but this fault presents no geotechnical risk to the Proposed Wind Farm as the faults are geologically stable features.

8.3.9 Geotechnical and Peat Stability Risk Assessment

A Geotechnical and Peat Stability Assessment Report (FT, 2026) is included in **Appendix 8-1** of this EIAR. Summary data and conclusions from that report are provided below.

8.3.9.1 Introduction

Fehily Timoney and Company (FT) was engaged to undertake a geotechnical and peat stability assessment of the Site.

Hydrological, hydrogeological and ecological factors were also assessed in the (GPSRA, FT, 2026), and interaction between FT, HES and MKO were undertaken throughout the iterative design process. The assessment was done in accordance with guidance contained in Peat Landslide Hazard and Risk Assessments: Best Practice Guide for Proposed Electricity Generation Developments (PLHRAG, Scottish Government, 2017).

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 on the Site, prior to the site reconnaissance by engineering geologists/geotechnical engineers from FT.

8.3.9.2 Hydrological Considerations

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 on-site drainage features and wet areas.

Many of the pre-conditions as described by (PLHRAG, Scottish Government, 2017) 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 any pre-conditions at the Site was a key part of the hydrological constraints assessment carried out in conjunction with project design team.

8.3.9.3 Peat Slides – Lessons Learned

The (FT, 2026) peat stability assessment has been undertaken with due regard to documented peat failures that have occurred on peatland sites (such as recent failures at Shass Mountain 2020, Co. Leitrim and Meenbog 2020, Co. Donegal). The lessons learned from both peat slide events have been incorporated into the design of the Proposed Project and the construction methodologies to be implemented. It is important that the existing site drainage is maintained during construction to avoid a similar failure to that on Shass Mountain, which when a large volume of water draining from a forestry plantation was concentrated into the headwaters of a stream, and this is referenced in the Risk Assessments for the turbines/access tracks.

The peat depths across the Proposed Project is significantly shallower than at Meenbog, with the exception of two areas that are downslope of the Proposed Project infrastructure and as such will not be significantly impacted by the Proposed Project. 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, and this is referenced in the Risk Assessments for the turbines/access tracks. However, the Shass Mountain failure occurred in an area containing a deep peat layer (4-5m in depth), and the peat depths across the Site are typically less than 2.0m around the infrastructure of the Proposed Project, meaning that this type of failure is highly unlikely. It is also noted that there have been numerous wind farms successfully constructed on blanket bog sites over the past 15 years without any issues relating to peat failure, such as Galway Wind Park and Arderroo Wind Farm (both Co. Galway).

8.3.9.4 Peat Stability - Desk Study

The GSI Landslide Susceptibility Map (www.gsi.ie) classifies the probability of a landslide occurring. The landslide susceptibility of the Proposed Wind Farm was classified by the GSI (2024) as ranging from “low” to “high” susceptibility, which is expected given the terrain present (Blanket bog). The areas of ‘high’ susceptibility correspond to steeper slopes present upslope of Proposed Turbine T14 and around T15 and T16, where there is little to no peat present.

This assessment is provided by the GSI as guide to the relative susceptibility of an area. The GSI mapping should not be treated as “Hazard” maps which show the potential to cause damage by frequency/probability or intensity or “Risk” maps which shows loss potential.

There are no recorded peat failures within the Site recorded on the GSI database (GSI, 2026). The nearest recorded slope failures are located approximately 6km southwest of the Site in the townland of Tawnaneilleen, Co. Sligo. No details are available for these failures.

8.3.9.5 Peat Stability Analysis

An analysis of peat sliding was carried out at all the main infrastructure locations across the Site. The purpose of the analysis was to determine the Factor of Safety (FoS) of the peat slopes. The FoS provides a direct measure of the degree of stability of the slope. A FoS of less than 1.0 indicates that a slope is unstable, a FoS of greater than 1.0 indicates a stable slope.

The previous code of practice for earthworks BS 6031:1981 (BSI, 1981), provided advice on design of earthworks slopes. It stated that for a first-time failure with a good standard of site investigation the design FoS should be greater than 1.3. For the purposes of this assessment, a design FoS of 1.3 has been adopted, as a precautionary approach.

Eurocode 7 (EC7) (IS EN 1997-1:2005) now serves as the reference document and the basis for design geotechnical engineering works. The design philosophy used in EC7 applies partial factors to soil parameters, actions and resistances. Unlike the traditional approach, EC7 does not provide a direct measure of stability, since global Factors of Safety are not used.

As such, and in order to provide a direct measure of the level of safety on a site, EC7 partial factors have not been used in this stability assessment. The results are given in terms of FoS.

The assigned probability of instability associated with a given FoS value is described in **Table 8-7** below. Hydrological and hydrogeological factors were also assessed in the Geotechnical and Peat Stability Assessment Report, and interaction between FT and HES was undertaken throughout the iterative design process.

No peat failures/landslides are recorded at or adjacent to the Site which suggests that site conditions do not pre-dispose themselves to failures/landslides.

The hand vane results indicate undrained shear strengths in the range 3 to 51kPa, with an average value of 18kPa. The strengths recorded would be typical of well drained peat as is present across the majority of the Proposed Wind Farm. The lowest peat strengths were recorded in areas of deep, poorly drained, saturated peat (>3.0m) and as such are not considered representative of the peat strength across the Proposed Wind Farm. There is no Proposed Wind Farm infrastructure located in areas where the lowest peat strengths were recorded.

Peat strength at sites of known peat failures (assuming undrained loading failure) are generally very low, for example the undrained shear strength at the Derrybrien failure (AGEC, 2004) as derived from back-analysis, was estimated at 2.5kPa. The recorded undrained strength at the Proposed Wind Farm is significantly greater than the lower bound values for Derrybrien indicating that there is no close correlation to the peat conditions at the Derrybrien site and that there is significantly less likelihood of failure on the Site.

Table 8-7: Probability Scale for Factor of Safety.

Scale	Factor of Safety	Stability
1	1.30 or greater	Acceptable
2	1.0 to 1.3	Marginally Stable
3	Less than <1.0	Unstable

8.3.9.6 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 factor of safety for a peat slide, an undrained[1] (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 Geotechnical and Peat Stability Assessment Report is attached in **Appendix 8-1**.

8.3.9.6.1 *Undrained Analysis*

A summary of undrained analysis results is presented in **Table 8-8**. As outlined above the undrained loading condition applies in the short-term during construction and until construction induced pore water pressures dissipate.

The undrained analysis for load condition 2 is considered the most critical load case as most peat failures occur in the short term upon loading of the peat surface.

The calculated FoS for load condition 1 is in excess of 1.30 for each of the locations (287 no. locations) analysed with a range of FoS of 2.01 to 86.22, indicating a low risk of peat instability.

The calculated FoS for load condition 2 is in excess of 1.30 for each of the locations (287 no. locations), analysed with a range of FoS of 1.4 to 13.75, indicating a low risk of peat instability.

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[1] *For the stability analysis two load conditions were examined, namely*

Condition (1):	*no surcharge loading*
Condition (2):	*surcharge of 10 kPa, equivalent to 1 m of stockpiled peat assumed as a worst case.*

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

Turbine No./Waypoint	Factor of Safety for Load Condition	
	Condition (1)	Condition (2)
T1	4.32	2.66
T2	2.39	1.69
T3	3.29	2.23
T4	2.56	1.87
T5	3.14	2.16
T6	3.83	2.87
T7	4.92	1.84
T8	8.71	2.90
T9	2.95	1.48
T10	17.24	5.75
T11	4.84	2.29
T12	4.31	2.87
T13	14.35	6.38
T14	2.75	1.86
T15	2.92	1.59
T16	2.43	1.49
T17	2.90	1.74
Substation	4.65	2.31
Met Mast	3.51	1.75
Construction Comp (1)	3.75	2.61
Construction Comp (2)	2.38	1.77
Construction Comp (3)	17.28	4.94
Construction Comp (SS)	7.65	4.59
Borrow Pit 1	12.76	6.04

Turbine No./Waypoint	Factor of Safety for Load Condition	
	Condition (1)	Condition (2)
Borrow Pit 2	2.95	1.48
Borrow Pit 3	6.22	1.44
Access Tracks	2.48 - 21.56	1.46 – 6.16
PSMAs*	2.1 - 17.24	1.43 – 4.93
BMEP	2.61	2.01

*Peat and Spoil Management Areas

8.3.9.6.2 *Drained Analysis*

A summary of drained analysis results are presented in **Table 8-9.** 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 load condition 1 is in excess of 1.30 for each of the locations (287 no. locations) analysed with a range of FoS of 1.34 to 64.15, indicating a low risk of peat instability.

The calculated FoS for load condition 2 is in excess of 1.30 for each of the locations (287 no. locations) analysed with a range of FoS of 1.94 to 19.86, indicating a low risk of peat instability.

Table 8-9: Summary Factor of Safety Results (drained condition).

Turbine No./Waypoint	Factor of Safety for Load Condition	
	Condition (1)	Condition (2)
T1	2.88	3.82
T2	12.09	11.15
T3	7.52	6.82
T4	7.04	6.58
T5	7.67	7.01
T6	12.27	11.64
T7	5.78	3.73
T8	9.75	5.88
T9	4.68	3.70
T10	20.09	12.42
T11	7.67	5.97

Turbine No./Waypoint	Factor of Safety for Load Condition	
	Condition (1)	Condition (2)
T12	12.16	11.20
T13	22.44	17.12
T14	8.49	7.90
T15	6.07	5.18
T16	6.38	5.75
T17	7.49	6.72
Substation	9.54	8.44
Met Mast	4.98	3.81
Construction Comp (1)	9.17	8.41
Construction Comp (2)	6.92	6.51
Construction Comp (3)	16.85	8.62
Construction Comp (SS)	14.00	11.96
Borrow Pit 1	17.40	12.93
Borrow Pit 2	4.16	3.18
Borrow Pit 3	5.43	2.24
Access Tracks	1.38 - 14.37	2.09 - 8.87
PSMAs	1.34 – 11.70	2.31 – 5.78
BMEP	1.74	2.89

8.3.9.7 Risk Assessment

A peat stability risk assessment was carried out for the infrastructure elements at the Proposed Wind Farm. This approach adheres to best practice guidance for geotechnical/peat stability risk assessments as given in PLHRAG Guidance and MacCulloch (2005).

For each of the main infrastructure elements, a risk rating (product of probability and impact) is calculated. Where a location is rated ‘Medium’ or ‘High’, control measures are required to reduce the risk to at least a ‘Low’ risk rating. Where a subsection is rated ‘Low’ or ‘Negligible’, routine control measures are required. Please refer to the Geotechnical and Peat Stability Assessment Report **(Appendix 8-1).**

The results of the peat stability risk assessment for potential peat failure at the Proposed Project infrastructure is presented as a Geotechnical Risk Register in Appendix B of **Appendix 8-1**.

The risk rating for each infrastructure element of the Proposed Wind Farm is designated as Negligible or Low following some mitigation/control measures being implemented.

Details of the required infrastructure specific mitigation/control measures can be found in Appendix B of the Geotechnical and Peat Stability Assessment Report **(Appendix 8-1)** and the infrastructure specific control measures are briefly summarised below:

- Detailed ground investigation to confirm peat, mineral soil and bedrock condition and properties;
- Use of experienced geotechnical staff for confirmatory site investigation;
- Maintain hydrology of area as far as possible by maintaining the flow of water in existing drains to prevent the build-up of water pressures in the peat, leading to the peat becoming "buoyant"; and,
- Use of contractors with experience in working peat and trained operators to carry out the work.

8.3.9.8 Peat Stability Assessment Conclusions

In summary, the findings of the peat stability risk assessment showed that the Site has an acceptable margin of safety, is suitable for the Proposed Project and is considered to be of negligible to low risk for peat failure provided appropriate control measures, such as implementing and maintaining an appropriate drainage system, are implemented.

The Proposed Grid Connection Route or TDR was not assessed for peat stability risk due to the lack of peat along the public road corridor and at the temporary works area associated with the TDR.

The findings include 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.

8.4 Summary of Geology & Geotechnical Conditions

A detailed description of the geology and geotechnical aspects of the Site is presented in this chapter.

Regional baseline geological data is available from the GSI through their online map viewer (www.gsi.ie). The bedrock across the Site is variable and is mapped by the GSI as mainly SCHIST and PSAMMITIC at the eastern and southern portions, including the Existing Wind Farm (Kingsmountain).

LIMESTONE and SHALES are mapped below the northern and western portions of the Proposed Wind Farm, including the Existing Wind Farm (Dunneill). Subsoils are predominantly mapped as blanket peat with some metamorphic tills and alluvium mapped along river valleys.

The Proposed Project investigations and geotechnical assessments were extensive and consisted of 850 no. peat depth probes and 19 no. trial pits and extensive ground truthing.

In addition, there are historical trial pit logs (27 no.), shell and auger borehole logs (11 no.), dynamic probing (6 no.) and geophysical surveys (electrical resistivity) available for Existing Wind Farm.

The baseline geological setting of the Proposed Project has been thoroughly examined is fully understood.

Site investigations and geotechnical assessments are summarised as follows:

- The results of the factor of safety (FoS >1.3) analysis showed all assessed infrastructure locations to have a low risk of peat instability;
- The risk rating for each infrastructure element at the Proposed Wind Farm is designated Negligible or Low following some mitigation/control measures being implemented;
- Peat depths recorded across the Proposed Wind Farm ranged from 0 to 7.2m with an average depth of 1.15m;
- Approximately 55% of recorded peat depth were less than 1m, 76% less and 2m and 90% less than 3m;
- The average peat depths recorded at the Proposed Turbines varied from 0.2 to 3m with an average of 1.3m;
- With respect to the new proposed access tracks, peat depths are typically less than 2m (average 1.8m) and therefore proposed access track construction will be a combination of floating and founded (i.e. excavate and replace methods);
- At the 3 no. proposed borrow pit locations, peat depths are shallow (<0.5m);
- No evidence of past failures or any significant signs of peat instability were noted on site by FT at the time of the geotechnical walkover surveys;
- The geotechnical hand vane results indicate undrained shear strengths in the range 3 to 51kPa, with an average value of about 18kPa;
- The strengths recorded are typical of well drained peat as is present on the Proposed Wind Farm;
- Mineral subsoils (glacial tills) typically consisted of brown silty SAND and GRAVEL with cobbles and boulders and/or brown slightly gravelly sandy SILT with cobbles and boulders;
- Bedrock was encountered at 4 no. of the IDL trial pit locations which are all located along the Existing Wind Farm (Kingsmountain) access tracks. Depth to bedrock ranged from 0m to 3.2m;
- Historical borehole logs for the Existing Wind Farm (Kingsmountain) encountered strong SCHIST bedrock at depths ranging from 2.3 to 6.6mbgl with an average of 4.9m; and,
- Historical trial pit logs for the Existing Wind Farm (Dunneill) encountered SHALE bedrock at depths ranging from 2.2 to 3.6mbgl with an average of 3.1m.

8.5 Receptor Sensitivity and Importance

Based on the criteria set out in **Table 8-3** above, the soils and peat at the Site can be classed as being of low importance as the overlying peat and soil deposits are not designated in this area and are degraded in places as a result of the forestry and peat cutting operations and associated drainage.

The soils and subsoils along the Proposed Grid Connection Route can also be considered as being of low importance as the underground electrical cabling route is located predominantly along existing public roads and private access tracks, and no peat or soils deposits are designated along the Proposed Grid Connection Route. The bedrock geology underlying the Site can be classed as being of medium importance where the bedrock could be used on a sub-economic scale.

The land, peat, soils and bedrock geological formations underlying the Site are scoped in for impact assessment due to their proximal location to the Proposed Project and the potential effects that the Proposed Project may have on these receptors.

No geological heritage site or designated site will be scoped in for impact assessment due to their distant location from the Proposed Project infrastructure (i.e. from a land, soils and geology perspective, only direct effects within the Site will occur).

There is no potential for the Proposed Project to affect the land, soils and geological environment outside of the Site. Therefore, there is no potential for effects to occur on any geological heritage site or designated site.

8.6 Characteristics of the Proposed Project

The Existing Wind Farm 23 no. turbines and meteorological mast on-site will be removed from the Site in accordance with SSE Renewables (Ireland) Ltd. standards. On the dismantling of existing turbines and meteorological mast, it is not intended to remove the concrete foundation from the ground and therefore no significant earthworks will be required. Therefore, the turbine foundations not incorporated into the Proposed Project will be backfilled and covered with peat soil material and reseeded appropriately with minimal ground disturbance.

The Proposed Project construction phase will involve the removal of peat, soils, subsoils and bedrock for construction of access tracks, internal cabling network, hardstanding emplacement, Proposed Turbine foundations, 110kV substation, peat and spoil management areas, Proposed Grid Connection Route cabling, crane hardstands, temporary construction compounds, drainage works, borrow pits and LiDAR compound installation. The earthworks required for TDR will have minimal and localised effects.

It is proposed that bedrock won from the proposed 3 no. on-site borrow pits (i.e. schist) will be used to construct the sub-base layer of proposed upgraded and new access tracks, hardstand areas and turbine base areas. Once installed the subbase layer will be overlain by a clean capping layer of high-grade limestone which will be sourced from local quarries. Please note that limestone is a sedimentary rock and is used country wide for public road construction. Limestone typically has a high strength/weight bearing capacity and is not prone to erosion.

The estimated quantity of available rock within the proposed 3 no. borrow pits is 92,500m^3. Conservative assumptions were made in estimating the quantity of rock available in the borrow pits.

Generally, the construction methodology for constructing any structure or platform foundation, such as a turbine base, hardstand or substation, involves removing all soft material to a depth where a suitable bearing material is encountered. Based on the site-investigation data it is expected gravity foundations will be constructed at 12 no. Proposed Turbines (i.e. T2, T7 to T17) with either a gravity foundation or piled foundation required at 5 no. Proposed Turbines (i.e. T1, T3 to T6) pending further investigations. Refer to Table 9.1 of the GPSRA report for a summary of Proposed Turbine foundation methods.

Approximately 8.9km of existing access tracks requiring upgrade are present across the Proposed Wind Farm and have been in operation for a significant number of years in relation to the Existing Wind Farm, agricultural and forestry activities. In addition, 4.3km of existing public roads will also be upgraded.

Existing access tracks and existing public roads account for 74% of the overall proposed length of Proposed Wind Farm access tracks (18.3km). In addition, 5.1km of new access track will be constructed at the Proposed Wind Farm. Proposed new access tracks will be a combination of floating and founded (excavate and replace technique). Crane hardstands, the substation platform, the met mast and the temporary construction compounds will all be constructed using the founded technique. The material excavated is required to be properly managed and stored and will be re-used in other elements of the Proposed Wind Farm infrastructure.

The quantities of peat and spoil requiring management at the Site have been calculated and are presented in **Table 8-10** below. The total estimated combined volume of peat and spoil to be managed following excavations during the construction phase of the Proposed Project is approximately 323,500m^3 (this includes a contingency factor of 10% to allow for increase in volume upon excavation).

It should be noted that the aforementioned peat and spoil volume will be extracted and transported throughout the Site on a sequential basis.

It is proposed to manage overburden generated through construction activities locally within the Proposed Wind Farm, in designated peat and spoil management areas, for landscaping at the Proposed Turbine locations and reinstatement of the proposed 3 no. borrow pits.

The total capacity of the identified peat and spoil management areas, including the proposed landscaping and side casting is approx. 333,350m^3 (refer to **Table 8-11** below) and therefore, there is more than enough capacity to manage the total volume of peat and spoil requiring management for the Proposed Project.

The majority of the excess spoil material excavated along the Proposed Grid Connection Route underground cabling trench will be transported to an appropriate licenced facility for disposal/recovery. The main contractor will determine the appropriate location for management of arisings from the route.

Further details are provided in the Peat and Spoil Management Plan (FT, 2026) for the works which is included in **Appendix 4-2.**

The Proposed Project also includes Biodiversity Management and Enhancement (BMEP) areas which are peatland habitats located within the Site (refer to Appendix 6-4). No excavations or generation of spoil will occur at the BMEP areas. The BMEP proposal includes erosion control measures which will be beneficial for peatland.

Table 8-10: Summary of Excavated Peat and Spoil Volumes for Proposed Project.

Development Component	Peat Volume(m^3) (approx.)		Spoil Volume(m^3) (approx.)
17 no. Turbines and Hardstanding Areas (including foundations)	69,000		111,000
Access Tracks	20,000		26,000
Temporary Construction Compounds (4 no.)	2,500		1,500
Proposed 110kV onsite substation	20,000		3,500
Proposed Grid Connection Route cable trench	5,400		14,600
Borrow Pits (3 no.)	9,000		41,000
Sub-Total	**125,900**		**197,600**
Total (m^3)		**323,500 (Peat & Spoil Volume)**	

Table 8-11: Summary of Peat and Spoil Reinstatement Volumes for Proposed Project.

Development Component	Peat and Spoil Volume(m^3) (approx.)	Comment
Peat and spoils management areas	171,250	1.25m in height across specific areas
Landscaping	27,100	It is estimated that 1,000m^3 of peat will be required for landscaping purposes and 500m^3 of spoil as ballast backfill to turbines at each of the 17 no. turbine locations. A further 1,600m3 of material is proposed for reuse in the landscaping of turbines around the areas where turbines will be removed from the Existing Wind Farm.
Borrow Pits (3 no.)	135,000	See Appendix 4-2 for further details
Total (m^3)	333,350	

8.7 Likely and Significant Impacts on Land, Soils and Geology

8.7.1 'Do-Nothing' Scenario

An alternative land use option to repowering the Existing Wind Farm as part of the Proposed Project would be to leave the Existing Wind Farm as it is, with no changes made to the existing operating 23 no. wind turbines within the Existing Wind Farm. In doing so, environmental effects in terms of emissions are likely to be neutral for the short term, however 13 no. of the existing turbines (existing Dunneill Wind Farm) are due to be decommissioned in accordance with their planning permissions in 2039. Once the 13 no. turbines are decommissioned, there will be a negative effect on greenhouse gas emissions. The 10 no. turbines which were commissioned in 2003 will be left in situ (existing Kingsmountain Wind Farm). However, these machines are aging and are not as efficient as the newer machines. Although these turbines do not have a decommissioning date, they will eventually break down and have to be decommissioned. The opportunity to continue capturing the available renewable energy resource with the Existing Wind Farms would be lost.

An alternative land use option to developing a renewable energy project in the greenfield sections of the Proposed Wind Farm (i.e. areas of the Proposed Wind Farm located outside the footprint of the Existing Wind Farm) would be to leave the area as it is with no changes made to the current land use practices of commercial forestry, residential turf cutting, and public road corridor.

In implementing the 'Do-Nothing' alternative, however, the opportunity to capture a significant part of Co. Sligo's renewable energy resource would be missed, as would the opportunity to contribute to meeting Government and EU 2030 targets for the production and consumption of electricity from renewable resources and the reduction of greenhouse gas emissions. The opportunity to generate local employment, development contributions, and rates would also be forgone. Furthermore, the opportunity to implement the measures outlined in the Biodiversity Management and Enhancement Plan (BMEP) as outlined in Appendix 6-4 would also be lost.

8.7.2 Likely impacts and Mitigation Measures – Construction Phase

The likely impacts of the Proposed Project and mitigation measures that will be put in place to eliminate or reduce them are shown below.

The impact assessment below assesses the overall Proposed Project as the Proposed Wind Farm and Grid Connection Route are not likely to be constructed as separate projects.

8.7.2.1 Potential Effects on Land (Land-Take)

The Proposed Project includes the construction of 17 no. Proposed Turbines, associated hardstand areas, 3 no. temporary construction compound, an onsite substation, new access tracks, 3 no. borrow pits and upgrades to the existing road network. The total permanent footprint of the Proposed Wind Farm infrastructure is 27.6ha.

These works will result in a change in the land environment within these areas. For example, the proposed works will result in the loss of 29.3ha of coniferous forestry due to the proposed infrastructure, along with 0.18ha of agricultural land, 0.66ha of upland blanket bog and 4.11ha of cutover bog.

Therefore, the existing baseline habitats will be replaced by turbine bases, hardstand areas, access tracks and other related infrastructure.

The Proposed Wind Farm construction works will only result in very local topographic changes with the removal of overburden at the Proposed Wind Farm.

There will be no effects on the lands adjoining the Proposed Wind Farm.

The Proposed Grid Connection Route will result in the excavation of a narrow trench to accommodate the cabling. This trench will be reinstated once the cabling is emplaced with a comparable ground surface (tarmacadam or subsoil/topsoil). Therefore, no effects on land or landuse will occur along the majority of the Proposed Grid Connection Route underground cable route.

Pathways: Excavation and infrastructure construction.

Receptors: Land (i.e. land upon which the Proposed Project will occur).

Pre-Mitigation Potential Effect: Negative, slight, direct, permanent, likely effect on land (land-take) within the Site. In the absence of mitigation measures, there will be no potential for significant effects on land at the Site.

Mitigation Measures / Impact Assessment: The Proposed Grid Connection Route is located predominantly along existing public roads. 3.7ha of Existing Wind Farm Footprint (from 9.0 ha) is being used in design which limits the area of landuse change. There will be no change in the land environment along the existing roads, whereby the roads will be reinstated with a comparable ground surface. The use of the existing road network reduces the area which will be altered or disturbed as a result of the works associated with the Proposed Grid Connection Route.

Following the construction phase, greenfield areas of the Proposed Wind Farm will be replaced by hardstand surfaces with a permanent development footprint of 23.9ha (minus the 3.7ha of the Existing Wind Farm Footprint). This represents a change in landcover of 1.8% of the overall Site.

The loss of coniferous forestry (29.3ha), 0.18ha of agricultural land, 0.66ha of upland blanket bog and 4.11ha of cutover bog will not have a significant effect on land at the Proposed Wind Farm 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 Biodiversity Management and Enhancement Plan.

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). The Forest Service policy requires replacement or replanting on a hectare for hectare basis for the footprint of the infrastructure developments. Therefore, while the loss of coniferous forestry (29.3ha) will be a permanent change to the land at these locations, all forestry lost will be replaced elsewhere within Ireland as per the Forest Service felling policy.

Given the undulating nature of the local topography resulting from the quaternary deposits, any change in topography is likely to be minimal in the overall landscape.

Post-Mitigation Residual Effect: The residual effect will be a negative, direct, slight, likely, permanent effect on land and landuse.

Significance of Effects: For the reasons outlined above (small development footprint), no significant effects on land (land-take) will occur.

8.7.2.2 Existing Turbines and Meteorological Mast Decommissioning

On the dismantling of existing turbines and meteorological mast, it is not intended to remove the concrete foundation from the ground. It is considered that its removal will be the least preferred options in terms of having potential effects on the environment.

Therefore, the turbine foundations not incorporated into the Proposed Project will be backfilled and covered with soil material. If there is usable soil or overburden material on the site, this material will be used. Alternatively, where material is not readily available on site, soil will be sourced locally and imported to site on heavy good vehicles (HGVs). The imported soil will be spread and graded over the foundation using a tracked excavator and revegetation enhanced by spreading of an appropriate seed mix to assist in revegetation and accelerate the resumption of the natural drainage management that will have existed prior to any construction. Hardstands shall be covered with soil material and regraded to match existing ground contours and profile. The area shall then be seeded out or allowed to vegetate naturally.

The decommissioning works with follow on reinstatement and revegetation is seen as having a positive effect to the land, soils and geology of the Proposed Wind Farm.

Pathways: Reinstatement and revegetation.

Receptors: Land, soils and geology.

Final Effect: Positive, slight, direct, permanent, likely effect on land, soils and geology

8.7.2.3 Peat, Subsoil and Bedrock Excavation

Excavation of peat, subsoil and bedrock will be required for construction of works for the installation of access tracks foundations for Proposed Turbine bases, crane hardstands, temporary construction compounds, met mast, internal cable network and borrow pits. This will result in a permanent removal and relocation of in-situ peat, subsoil and bedrock at most excavation locations.

Estimated volumes of peat, subsoils and bedrock to be relocated are summarised in Section 8.6 above.

There will be no loss of peat, spoil or bedrock from the Proposed Wind Farm, as it will be accommodated within the 5 no. designated peat management areas, 3 no. borrow pits and for landscaping. Spoil will be used for landscaping at the Proposed Turbine locations and in linear berms along access tracks where appropriate.

Pathway: Extraction/excavation.

Receptor: Peat, subsoil and bedrock.

Pre-Mitigation Potential Effect: Negative, slight/moderate, direct, likely, permanent effect on peat, subsoil and bedrock due to relocation within the Site.

Proposed Mitigation Measures by Design:

All work will be in accordance with the Peat and Spoil Management Plan (**Appendix 4-2**). The site layout design has been iteratively developed using comprehensive site-specific site investigation dataset, which includes peat probes, gouge cores, boreholes and trial pits.

<u>Proposed Wind Farm</u>

- Utilisation of Existing Wind Farm infrastructure where possible to reduce extent of new works;
- Placement of turbines and associated infrastructure in areas with suitable ground conditions (based on detailed site investigation data – the areas of deeper peat and high instability have been avoided by the Proposed Wind Farm infrastructure);
- The peat/soils and subsoils which will be removed during the construction of turbine hardstands will be localised to the turbine locations. The peat/soil/subsoil will be placed/used for landscaping alongside the excavations or stored within the designated peat management areas or borrow pits;
- Excavated peat/soils/subsoils shall be excavated and stored separately to topsoil; this will prevent mixing of materials and facilitate reuse afterwards;
- The peat placed within the peat management areas will be restricted to a maximum height of 1.25m. Weak/liquified peat will be stored in the centre of the peat management areas with firmer/drier peat placed around the outside;
- The placement of excavated peat will be avoided without first establishing the adequacy of the ground to support the load. The placement of peat within the peat management areas will require the use of long reach excavators, low ground pressure machinery and possibly bog mats in particular for drainage works;
- It will be ensured that the surface of the placed peat will be shaped to allow efficient run-off of surface water. Shaping of the surface of the peat will be carried out as placement of peat within the peat and spoil management area progresses. This will reduce the likelihood of debris run-off and reduce the risk of instability of the placed peat;
- Finished/shaped side slopes in the placed peat will be not greater than 1 (v): 3 (h). This slope inclination will be reviewed during construction, as appropriate;
- Where available, the acrotelm will be placed on the finished surface with the vegetation part of the sod facing the right way up to encourage

growth of plants and vegetation at the surface of the placed peat and spoil within the management areas;
- Movement monitoring instrumentation will be placed around the areas where peat has been placed. The locations where monitoring is required will be identified by the Project Geotechnical Engineer on site;
- Supervision by the Project Geotechnical Engineer will be carried out for the works; and,
- An interceptor drain will be installed upslope of the designated peat management areas to divert any surface water away from these areas. This will help ensure stability of the placed peat and reduce the likelihood of debris run-off. (interceptor drains will not be required at all areas as the existing drainage network can function as interceptor drains – silt fences will be installed upgradient of the peat management areas in these locations).

Proposed Grid Connection Route:

- Excess spoil material or pavements materials containing tar generated during the cable route construction will be transported by permitted waste contractors to a suitable permitted/licensed site for disposal/recovery.

Post Mitigation Residual Effect: With the implementation of the prescribed mitigation measures the residual effect will be negative, slight, direct, likely, permanent effect on soils and subsoils due to disturbance and relocation within the Site.

Significance of Effects: No significant effects on soils, subsoils or bedrock will occur.

8.7.2.4 Contamination of Soil by Leakages and Spillages

Accidental spillage during refuelling of construction plant with petroleum hydrocarbons is a pollution risk. 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 peat, subsoils and pollution of the underlying aquifer) on the geological and water environment.

Pathway: Peat and subsoil and underlying bedrock pore space.

Receptor: Peat and subsoil, bedrock.

Pre-Mitigation Potential Effect: Negative, slight, direct, short-term, unlikely effect on peat, subsoils and bedrock.

Proposed Mitigation Measures:

- On-site re-fuelling will be undertaken at the compound or using a mobile fuel bowser with spill kits kept both onboard and on site for accidental leakages or spillages;
- 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. 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 for leaks and signs of damage;
- The proposed 110kV onsite substation and Existing Wind Farm control buildings 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 will be contained within the Construction Environmental Management Plan (which is contained in **Appendix 4-5**).

Post Mitigation Residual Effect: The residual effect is negative, imperceptible, direct, short-term, unlikely effect on peat and subsoils and bedrock.

Significance of Effects: No significant effects on peat, subsoils and bedrock will occur.

8.7.2.5 Erosion of Exposed Subsoils and Peat During Construction of Infrastructure

There is a high likelihood of erosion of peat and spoil during its excavation and during landscaping works. The main impacts associated with this aspect is to the water environment, and therefore this aspect is further assessed in detail in Chapter 9: Hydrology and Hydrogeology.

Pathway: Vehicle movement, surface water and wind action.

Receptor: Peat and subsoil.

Pre-Mitigation Potential Effect: Negative, slight, direct, short-term, likely effect on peat and subsoils by erosion and wind action.

Proposed Mitigation Measures:

- Peat removed from turbine locations and access tracks will be used for landscaping close to the extraction area;
- Where possible, the upper vegetative layer (where still present) of peat will be stored with the vegetation part of the sod (acrotelm) facing the right way up to encourage growth of plants and vegetation at the surface of the stored peat within the peat storage areas;
- Re-seeding and spreading/planting will also be carried out in these areas; and,
- A full Peat and Spoil Management Plan for the development is included in **Appendix 4-2** of the EIAR.

Post Mitigation Residual Effect: Following implementation of these mitigation measures the residual effected is imperceptible, direct, short-term, likely effect on peat and subsoils by erosion and wind action.

Significance of Effects: No significant effects on soils, subsoils or bedrock will occur.

8.7.2.6 Peat Instability and Failure

Peat instability or failure refers to a significant mass movement of a body of peat that would have an adverse impact on the Proposed Project and the surrounding environment. The potential significant effects of peat failure at the study area 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.

Pathway: Vehicle movement and excavations.

Receptor: Peat and subsoils.

Pre-Mitigation Potential Impact: Negative, slight, direct, unlikely permanent effect on peat and subsoils.

Impact Assessment:

The findings of the PSRA (FT, 2026) showed that the Proposed Wind Farm has an acceptable margin of safety, is suitable for 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.

Proposed Mitigation Measures:

The following general control measures incorporated into the construction phase of the Proposed Project will assist in the management of the risks for the Site:

- Appointment of experienced and competent contractors;
- The site should be supervised by experienced and qualified personnel;
- Allocate sufficient time for the 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 a managed robust drainage system;
- Prevent placement of loads/overburden on marginal ground;
- Set up, maintain and report findings from monitoring systems (as outlined in the Geotechnical and Peat Stability Report);
- 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.

Please refer to **Appendix 8-1** for Proposed Turbine specific and road section design proposals.

Post Mitigation Residual Effect: With the implementation of the control measures outlined above the residual effect will be negative, imperceptible, direct, unlikely, permanent effect on peat and subsoils.

Significance of Effects: No significant effects on soils and subsoils will occur.

8.7.2.7 Biodiversity Management and Enhancement Plan (BMEP)

The BMEP (Appendix 6-4) sets out the measures to be implemented to ensure that the Proposed Project will result in a net gain in biodiversity. Specifically, proposed peatland restoration, peatland safeguarding and restoration of peat and spoil management areas.

This Plan has set out measures to be implemented during establishment and management phases to ensure that the measures are successful, as well as regularly monitoring by an ecologist to ensure the success of the measures outlined in the BMEP.

Pathway: Enhancement measures and restoration

Receptor: Peatland

Pre-Mitigation Potential Effect: Positive, slight, direct, permanent likely effect of BMEP on peatlands.

Mitigation Measures:

A site-specific monitoring and evaluation programme will be implemented to ensure that the success of the proposed measures remains long-term. It will also assist in situations where the habitat establishment may not have been successful by providing evidence of shortcomings, allowing a revised management plan to be formulated. Monitoring results will be reported by the Project Ecologist will produce monitoring reports per the schedule outlined in the BMEP. Reports detailing the monitoring works carried out, the results obtained and a review of their success, along with any suggestions for amendments to the plan will be prepared. The enhancement plan will be updated and amended where required to improve the efficacy of the enhancement work.

Post Mitigation Residual Effect: The likely residual effect of the BMEP on peat following the implementation of the Peatland Enhancement is a moderate, positive, direct, permanent effect on peat as it will be wetter and closer to its natural condition with increases in vegetation cover across all bogs.

Significance of Effects No negative effects on soils and subsoils will occur.

8.7.2.8 Erosion of Exposed Peat, Soils and Subsoils During Tree Felling

Tree felling is a component of the Proposed Project works, with ~29.3ha of felling of coniferous forestry proposed.

During felling operations there is a high likelihood of erosion due to the distance of soils and subsoils associated with vehicle and plant movements. This also has associated potential effects on the water environment; and therefore, this aspect is assessed in further detail in Chapter 9: Hydrology and Hydrogeology.

Pathway: Vehicle movement, surface water and wind action.

Receptor: Soils, subsoil and weathered bedrock.

Pre-Mitigation Potential Effect: Negative, slight, direct, permanent, likely effect on soils, subsoils and weathered bedrock due to felling operations. In the absence of mitigation measures, there will be no potential for significant effects on soils, subsoils and weathered bedrock at the Proposed Wind Farm.

Proposed Mitigation Measures:

All proposed felling works will be completed in accordance with the best practice Forest Service regulation, policies and strategic guidance documents as well as Coillte and DAFM guidance documents to ensure that felling results in minimal potential negative effects on the local soil and subsoil environment.

In addition, the following mitigation measures will be implemented during felling operations:

- Before any works are completed silt fences will be installed to limit the movement of entrained sediment in surface water runoff;
- The harvester and the forwarder are designed specifically for the forest environment and are low ground pressure machines;
- All machinery will be operated by suitably qualified personnel;
- These machines will traverse the Proposed Wind Farm along specified off-road routes (referred to as racks);
- Brash mats will be placed on the racks to support the vehicles on soft ground, reducing mineral soil disturbance and erosion and avoiding the formation of rutted areas, in which surface water ponding can occur;
- As felling progresses, the harvester will collect brash produced by the felling and place it in front of the machine before it advances forward along the rack;
- The condition of the racks will be continually monitored and fresh brash will be applied when the brash mat becomes heavily used and worn, ensuring that the mat remains effective throughout the operational phase; and,
- The location of racks will be chosen to avoid wet and potentially sensitive areas.

Post Mitigation Residual Effect: With the implementation of the prescribed mitigation measures the residual effect will be a negative, imperceptible, direct, permanent, unlikely effect on soils, subsoils and weathered bedrock.

Significance of Effects: For the reasons outlined above, and with the implementation of the proposed mitigation measures, no significant effects on soils, subsoils or bedrock will occur.

8.7.2.9 Potential Effects from Turbine Delivery Route Works

Minor earthworks are required for turbine delivery. These include for temporary widening of existing roads and junctions (including demolition of property walls). These TDR works are described in Section 4.2.10.4 of the EIAR.

Pathway: Extraction/excavation/landscaping.

Receptor: Soil and subsoil

Pre-Mitigation Potential Effect: Negative, imperceptible, direct, likely, temporary effect on land, peat and subsoil. No potential for significant effects.

Proposed Mitigation Measures:

- All works are minor and localised and cover very small areas;
- These works are distributed over a wide area; and,
- All works are temporary in nature.

Post Mitigation Residual Effect: The TDR related earthworks are minor in nature and will be temporary in duration. They are also separated from each other by considerable distances. Residual effects will be negative, imperceptible, direct, likely, temporary effects on soils and subsoil.

Significance of Effects: For the reasons outlined above, no significant effects on soils or subsoils will occur.

8.7.3 Operational Phase - Likely Significant Effects and Mitigation Measures

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

- Some construction vehicles or plant may be necessary for maintenance of Proposed Wind Farm which could result in minor accidental leaks or spills of fuel/oil;
- The transformers in the proposed 110kV onsite substation, Existing Wind Farm control buildings and in each turbine are oil cooled. There is potential for spills / leaks of oils from this equipment resulting in contamination of soils and groundwater; and,
- 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.

8.7.3.1 Potential Effects from Site Access Track/Road Maintenance

In relation to indirect effects a small amount of granular material will be required to maintain access tracks/site roads during operation which will place intermittent minor demand on local quarries.

Pathway: Peat, subsoil and bedrock pore space.

Receptor: Peat, subsoil and bedrock.

Potential Pre-Mitigation Effect: Negative, indirect, imperceptible, long term, likely effect on peat, subsoil and bedrock. In the absence of mitigation measures, there will be no potential for significant effects on peat, soils, subsoils and bedrock at the Proposed Wind Farm.

Proposed Mitigation Measures:

- Use of aggregate from authorised quarries for use in road and hardstand maintenance.

Post-Mitigation Residual Effect: Due to the small scale and intermittent nature of any maintenance works the residual effect will be a negative, imperceptible, indirect, long-term, unlikely effect on bedrock.

Significance of Effects: For the reasons outlined above, no significant effects on land, soils or geology will occur.

8.7.3.2 Potential Effects from Site Vehicle/Plant Use

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. Hydrocarbon has a high toxicity to humans, and all flora and fauna, and is persistent in the environment.

Pathway: Peat, subsoil and bedrock pore space.

Receptor: Peat, subsoil and bedrock.

Potential Pre-Mitigation Effect: Negative, direct, slight, long term, unlikely effect on peat, subsoil and bedrock. In the absence of mitigation measures, there will be no potential for significant effects on peat, subsoils and bedrock at the Proposed Wind Farm.

Proposed Mitigation Measures:

- Vehicles used during the operational phase will be refuelled off site before entering the site;
- No fuels will be stored on-site 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 CEMP (Appendix 4-5).

Post-Mitigation Residual Effect: With the implementation of the prescribed mitigation measures the residual effect will be a negative, imperceptible, direct, long-term, unlikely effect on peat, subsoils, and bedrock.

Significance of Effects: For the reasons outlined above, no likely significant effects on land, soils, subsoils or bedrock will occur.

8.7.3.3 Potential Effects from the Use of Oil in Transformers

The transformers in the 110kV substation, Existing Wind Farm control buildings and in each 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, and all flora and fauna, and is persistent in the environment.

Pathway: Peat, subsoil and bedrock pore space.

Receptor: Peat, subsoil and bedrock.

Potential Pre-Mitigation Effect: Negative, direct, slight, long term, unlikely effect on peat, subsoil and bedrock. In the absence of mitigation measures, there will be no potential for significant effects on peat, subsoils and bedrock at the Proposed Wind Farm.

Proposed Mitigation Measures:

- All transformers will be bunded to 110% of the volume of oil used in each transformer; and,
- An emergency plan for the operational phase to deal with accidental spillages will be contained in the CEMP (Appendix 4-5).

Post-Mitigation Residual Effect: With the implementation of the prescribed mitigation measures the residual effect will be a negative, imperceptible, direct, long-term, unlikely effect on peat, subsoils, and bedrock.

Significance of Effects: For the reasons outlined above, no likely significant effects on land, soils, subsoils or bedrock will occur.

8.7.4 Decommissioning Phase - Likely Significant Effects and Mitigation Measures

The potential impacts associated with decommissioning of the Proposed Wind Farm will be similar to those associated with construction but of reduced magnitude. The Proposed Grid Connection Route will not be decommissioned.

A Decommissioning Plan has been prepared (Appendix 4-6), the details 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 competent authority at that time. The potential for effects during the decommissioning phase of the Proposed Wind Farm has been fully assessed in the EIAR.

During decommissioning, it may be possible to reverse or at least reduce some of the potential impacts caused during construction by rehabilitating construction areas such as turbine bases, hardstanding areas. This will be done by covering with peatland vegetation/scraw or poorly humified peat to encourage vegetation growth and reduce run-off and sedimentation. Other impacts such as possible soil compaction and contamination by fuel leaks will remain but will be of reduced magnitude. However, as noted in the Scottish Natural Heritage report (SNH) *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 wind farm, 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".*

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

Some of the impacts will be avoided by leaving elements of the Proposed Wind Farm in place where appropriate. The Proposed Turbine bases will be rehabilitated by covering with local topsoil/peat in order to regenerate vegetation which will reduce runoff and sedimentation effects. Internal roads will remain in situ.

The Proposed Grid Connection Route underground cabling and proposed 110kV onsite substation will remain in place as it will be under the ownership and control of the ESBN and Eirgrid.

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

No significant effects on the soils and geology environment are envisaged during the decommissioning stage of the Proposed Wind Farm.

The residual effects will be negative, direct, slight, likely, permanent effects on local peat and local subsoils.

8.7.5 Cumulative Effects

Due to the localised nature of the proposed construction works which will be kept within the Site there is no potential for significant cumulative effects in-combination with other local developments on the land, soils and geology environment. The only way the Proposed Project can have in combination effects with other off-site projects and plans is via the drainage and off-site surface water network, and this hydrological pathway is assessed in Chapter 9: Hydrology and Hydrogeology.

8.7.6 Post Construction Monitoring

None required.

8.7.7 Risk of Major Accidents and Disasters

Due to the nature of the Site, *i.e.* soft peat deposits, there is a risk of peat movement occurring. However, due to the generally shallow and drained nature of peat at the Site, the risk is low.

A comprehensive Geotechnical and Peat Stability Assessment (FT, 2026) has been undertaken for all Proposed Wind Farm infrastructure locations, and it concludes that with the implementation of the proposed control (mitigation) measures, the residual effect of a landslide occurring is determined to be negligible to low.

8.7.8 Assessment of Human Health Effects

Potential human health effects arise mainly through the potential for soil and ground contamination. A wind farm or grid connection route is not a recognized source of pollution and so the potential for effects during the operational phase are negligible.

Hydrocarbons will be used onsite during construction and decommissioning 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 negligible.

Peat failure has also the potential to affect human health, but this would likely require a catastrophic failure to occur. The residual risk of significant peat slide/failure occurring is determined to be negligible to low following the implementation of the proposed control (mitigation) measures.

8.7.9 Conclusion

Excavation of peat, subsoil and bedrock will be required for site levelling and for the installation of the Proposed Project infrastructure. This will result in a permanent removal of peat, subsoil and possibly bedrock at most excavation locations. Excavated peat will be utilized to re-instate the borrow pits and will also be used for reinstatement and landscaping works around the Site. The handling and management of peat will be undertaken in accordance with the Peat and Spoil Management Plan (FT, 2026) (Appendix 4-2). Storage and handling of hydrocarbons/chemicals will be carried out using best practice methods.

Measures to prevent peat and subsoil erosion during excavation, reinstatement, and permanent placement in borrow pit will be undertaken to prevent water quality impacts.

A Geotechnical and Peat Stability Assessment (FT, 2026) undertaken for the site shows that there is a low risk of peat instability/failure at the Site and along the proposed construction access track.

No significant effects on the land, soil, and geology of the Site will occur during construction, operation, or during decommissioning phases.

Our assessment also concludes that there will be no cumulative effects on land, soil and geology environment as a result of the Proposed Project.

8.8 EIA Classification Summary

Please refer **Table 8-12** below to for a summary of all identified impacts for the Proposed Project relating to land soils and geology.

Table 8-12: Assessment Classification Summary.

Topic	Pre-Mitigation Effect	Mitigation Section Reference	Residual Effect	Significance
Construction Phase				
Land and Land-Use	Permanent, Slight, Negative	Section 8.7.2.1	Permanent, Slight, Negative	Not Significant
Existing Turbines and Meteorological Mast Decommissioning	n/a	Section 8.7.2.2	Permanent, Slight, Positive	Not Significant
Peat and Subsoil Excavation	Permanent, Slight/Moderate, Negative	Section 8.7.2.3	Permanent, Sight, Negative	Not Significant
Leakages and Spillages	Short-Term, Slight, Negative	Section 8.7.2.4	Short-Term, Imperceptible, Negative	Not Significant
Erosion of Exposed Subsoils and Peat	Short-Term, Slight, Negative	Section 8.7.2.5	Short-Term, imperceptible, Negative	Not Significant
Peat Instability and Failure	Permanent, Slight, Negative	Section 8.7.2.6	Permanent, Imperceptible, Negative	Not Significant
Biodiversity Management and Enhancement Plan	Permanent, Slight, Positive	Section 8.7.2.7	Permanent, Moderate, Positive	Not Significant
Erosion of Exposed Peat, Soils and Subsoils During Tree Felling	Permanent, Slight, Negative	Section 8.7.2.8	Permanent, Imperceptible, Negative	Not Significant
Potential Effects from Turbine Delivery Route Works	Temporary, Slight, Negative	Section 8.7.2.9	Temporary, Imperceptible, Negative	Not Significant
Operational Phase				

Site Road Maintenance	Long-Term, Imperceptible, Negative	Section 8.7.3.1	Long-Term, Imperceptible, Negative	Not Significant
Site Vehicle / Plant Use	Long-Term, Slight, Negative	Section 8.7.3.2	Long-Term, Imperceptible, Negative	Not Significant
Potential effects from the Use of Oil in Transformers	Long-Term, Slight, Negative	Section 8.7.3.3	Long-Term, Imperceptible, Negative	Not Significant
Decommissioning Phase				
Land Soils and Geology	The potential impacts associated with decommissioning of the Proposed Project will be similar to those associated with construction but of reduced magnitude.	Section 8.7.4	Not Significant	Not Significant