Planning and Environmental Consultants

Environmental Impact Assessment Report (EIAR)

Lackareagh Wind Farm, Co. Clare

Chapter 8 – Land, Soils and Geology

Table of Contents

TABLE OF TABLES

TABLE OF FIGURES

TABLE OF APPENDICES

8. LAND SOILS AND GEOLOGY

8.1 Introduction

8.1.1 Background and Objectives

Hydro-Environmental Services (HES) was engaged by MKO Ireland (MKO) to carry out an assessment of the potential likely and significant effects of the Proposed Project on the land, soils and geological aspects of the receiving environment.

The Proposed Project is described in full in Chapter 4 of this EIAR.

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

As detailed in Section 1.1.1 in Chapter 1, for the purposes of this EIAR, the various project components are described and assessed using the following references: 'Proposed Project', 'Proposed Wind Farm', 'Proposed Grid Connection Route' and the 'site'.

8.1.2 Statement of Authority

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

Michael Gill P.Geo (BA, BAI, Dip Geol., MSc, MIEI) is an Environmental Engineer and Hydrogeologist with over 22 years' environmental consultancy experience in Ireland. Michael has completed numerous hydrological and hydrogeological impact assessments of wind farms and renewable projects in Ireland. In addition, he has substantial experience in geological characterisation, peatland morphology, and surface water drainage design and SUDs design and surface water/groundwater interactions. Michael has worked on the EIS/EIAR for Oweninny WF, Cloncreen WF, Derrinlough WF and over 100 other wind farm related projects across the country.

Conor McGettigan (BSc, MSc) is an Environmental Scientist with 4 years' experience in the environmental sector in Ireland. Conor holds an M.Sc. in Applied Environmental Science (2020) and a B.Sc. in Geology (2016) from University College Dublin. Conor routinely prepares the land, soils and geology chapters of environmental impact assessment reports for wind farm development on peatlands.

8.1.3 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, 2000-2023;
- 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; and,
- The Heritage Act 1995, as amended.

8.1.4 Relevant Guidance

The Land, Soils and Geology chapter of this EIAR was completed using the following relevant good practice guidance:

- 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).
- Guidance on the preparation of the EIA Report (Directive 2011/92/EU as amended by 2014/52/EU), (European Commission 2017).
- Wind Europe (Nov 2020): Decommissioning of Onshore Wind Turbines Industry Guidance Document

8.2 Methods

8.2.1 Desk Study

A desk study of the Proposed Project site was completed in the Autumn of 2022 to collect all relevant geological data for the Proposed Project site and the surrounding area. The desk study was completed to supplement site walkover surveys and site investigations. The desk study information has been checked and updated, where necessary to ensure any updates were captured, in March and April 2024.

The desk study involved 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, Sheet 17 (Geology of the Shannon Estuary). Geological Survey of Ireland (GSI, 1997);
- Geological Survey of Ireland – 1:25,000 Field Mapping Sheets;
- General Soil Map of Ireland 2nd edition (**www.epa.ie**); and,
- Aerial Photography, 1:5000 and 6 inch base mapping.

8.2.2 Baseline Monitoring and Site Investigations

Site walkover surveys, including geological mapping and investigation of the Proposed Project site were undertaken by Michael Gill and Conor McGettigan of HES (refer to Section 8.1.2 above for qualifications and experience) on 8th September 2022, 13th July 2023 and 12th October 2023.

Geotechnical ground investigations and a peat stability assessment were undertaken by Causeway Geotechnical Limited and AFRY. The combined geological and hydrogeological dataset collated by HES, MKO, AFRY and Causeway Geotechnical has been used in the preparation of this EIAR Chapter.

The objectives of the intrusive site investigations included mapping the distribution and depth of peat at the Proposed Wind Farm site along with assessing the mineral subsoil / bedrock conditions beneath the peat at key development locations (refer to Chapter 4 for a description of the components of the Proposed Project). This data was used to inform the final layout design.

In summary, site investigations to address the Land, Soils and Geology chapter of the EIAR included the following:

- A total of 67 no. peat probes were carried out by MKO between April 2021 and August 2023 to determine the depth and geomorphology of the peat at the Proposed Wind Farm site.
- Gouge core sample points were undertaken by HES (September 2022 and October 2023) at proposed infrastructure locations (turbines, met mast, substation compound) to investigate peat and underlying mineral soil lithology.
- HES also completed a visual assessment of exposed soils, subsoil and bedrock and topographic changes along the Proposed Grid Connection Route.
- Initial site investigations were completed at the Proposed Wind Farm site by Causeway Geotechnical in July 2022. These preliminary investigations comprised the completion of 3 no. trial pits and 7 no. dynamic cone penetration tests.
- Causeway Geotechnical Ltd completed additional site investigations (14 no. trial pits, 3 no. rotary boreholes, 18 no. heavy dynamic probes and 27 no. dynamic cone penetrometers) in December 2023 and January 2024.
- AFRY completed site walkover surveys at the Proposed Wind Farm site in January 2024.
- Logging of subsoil exposures across the site where mineral soils and peat profiles are exposed.
- Mineral subsoils and peat were logged according to BS: 5930 and Von Post Scale respectively.

The Geotechnical and Peat Stability Assessment Report and Peat and Spoil Management Plan prepared by AFRY Ireland Ltd (2024) are included as Appendix 8-1 and Appendix 4-2 of this EIAR respectively.

8.2.3 Scope and Consultation

The scope for this EIAR has been informed by consultation with statutory consultees, bodies with environmental responsibility and other interested parties. This consultation process is outlined in Section 2.5 of this EIAR.

Their responses are summarised in Table 8-1.

Table 8-1: Summary of Scoping Responses

Consultee	Description	Addressed in Section
Department of Housing, Local Government and Heritage	"*Peat Stability should be assessed where required.*"	A Geotechnical and Peat Stability Assessment was completed by AFRY and the results are presented in Section 8.3.8.
Geological Survey of Ireland	Standard response letter	All available online GSI databases have been used in the preparation of this EIAR chapter.
Health Service Executive	"*A detailed assessment of the current ground stability of the site for the proposed windfarm development and all proposed mitigation measures should be detailed in the EIAR.....* *The 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)*"	Refer to Section 8.3.8 and Appendix 8-1.

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 Proposed Project site is assessed using the criteria set out in Table 8-2 (NRA, 2008).

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

Importance	Criteria	Typical Example
Very High	Attribute has a high quality, significance or value on a regional or national scale. Degree or extent of soil contamination is significant on a national or regional scale. Volume of peat and/or soft organic soil underlying route is significant on a national or regional scale.	Geological feature rare on a regional or national scale (NHA). Large existing quarry or pit. Proven economically extractable mineral resource

Importance	Criteria	Typical Example
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 fertile 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 assessment of effects follows the description of the baseline environment and is Stage 6 of 7 of the information which must be included in an EIAR (EPA, 2022). The guideline criteria for the assessment of effects states that the purpose of an EIAR is to identify, describe and present an assessment of the likely significant effects. The likely effects are described with respect to their quality (positive, neutral or negative), significance (imperceptible to profound), extent (i.e. size of area or number of sites effected), context (is the effect unique of being increasingly experienced), probability (likely or unlikely), duration (momentary to permanent), frequency and reversibility. 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 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 8-3.

Table 8-3: Impact descriptors related to the receiving environment.

Impact Characteristics		Potential Hydrological Impacts
Quality	Significance	
Negative only	Profound	Widespread permanent impact on:

Impact Characteristics		Potential Hydrological Impacts
Quality	Significance	
		› 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
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 Study Area

The study area for the land, soils and geological environment is limited to within the EIAR Site Boundary. There is no potential for the Proposed Project to affect the land, soils and geological environment outside of the Proposed Project site.

8.2.6 Limitations and Difficulties Encountered

No limitations or difficulties were encountered during the preparation of the Land, Soils and Geology Chapter of the EIAR.

8.3 Existing Environment

8.3.1 Proposed Project Site Description and Topography

8.3.1.1 Proposed Wind Farm

The Proposed Wind Farm site is located immediately to the east of the village of Kilbane in east Co. Clare. The Proposed Wind Farm site is located ~3.7km northwest of the village of Bridgetown, ~4.6km east of the village of Broadford, Co. Clare and ~14km north of Limerick City. The Proposed Wind Farm site is located in the townlands of Shannaknock, Kilbane Killeagy (Stritch), Killeagy (Ryan) and Ballymoloney in the west and Killeagy (Goonan) Magherareagh and Lackareagh Beg in the east. The Proposed EIAR Site Boundary has a total area of 291 hectares (ha).

The Proposed Wind Farm site is comprised of agricultural lands in the west and existing commercial forestry plantations, dominated by Sitka Spruce and Lodgepole Pine, in the east/northeast. The eastern section of the Proposed Wind Farm site also contains areas which have been felled and are naturally revegetating.

The Proposed Wind Farm site is served by an existing network of local public and private roads. A local road (L7080), known as the 'Gap Road', dissects the Proposed Wind Farm site and joins the village of Kilbane in the west with Garraunboy Cross in the east. This local road is steeply sloping in places and passes between Glennagalliagh Mountain to the north and Lackareagh Mountain to the south. Several small farm tracks and forestry access roads branch off from this local road and facilitate access to the Proposed Wind Farm site.

Topography of the Proposed Wind Farm site is highly variable, ranging from ~90 to 440mOD (metres above Ordnance Datum). The Proposed Wind Farm site is located in the Slieve Bernagh Mountain Range and contains some very steeply sloping ground. The Proposed Wind Farm site is located on the western slopes of Glennagalliagh and Lackareagh mountains. The northwest of the Proposed Wind Farm site is also located on the southern slopes of Cragnamurragh Mountain.

Turbine Delivery Route

The Turbine Delivery Route (TDR) is detailed in Chapter 4, Section 4.5.

A temporary blade set down area will be constructed along the R466 in the townland of O'Briensbridge, ~1km southeast of the small village of Bridgetown in east Co. Clare.

8.3.1.2 Proposed Grid Connection Route

The Proposed Grid Connection Route underground cabling travels from the proposed onsite 38kV substation (located in the townland of Killeagy (Goonan)) to the existing Ardnacrusha 110kV substation and is ~14.7km in length. The Proposed Grid Connection Route travels to the west along the Gap Road as far as Kilbane before it veers to the south and travels along the public road network as far as Ardnacrusha.

Elevations along the Proposed Grid Connection Route range from ~270mOD at the proposed onsite 38kV electrical substation to ~20mOD in the vicinity of Ardnacrusha 110kV Electrical Substation. The Proposed Grid Connection Route is located entirely in the local public road corridor.

8.3.2 Land and Land Use

8.3.2.1 Proposed Wind Farm

Corine land cover maps (2018) show that the Proposed Wind Farm site comprises of agricultural land, coniferous forestry and smaller areas of peat bogs and heathlands. Historic Corine land cover maps (1990-2018) do not record any significant land cover changes at the Proposed Wind Farm site.

Land cover at the Proposed Wind Farm site has been verified during site walkover surveys completed by HES and from the inspection of recent aerial imagery. During walkover surveys the west of the Proposed Wind Farm site was noted to comprise largely of steeply sloping agricultural land. Meanwhile, the east of the Proposed Wind Farm site was noted to comprise of coniferous forestry plantations, with some recently felled areas and some smaller areas of wet heath.

With regards to the key Proposed Wind Farm infrastructure, a total of 4 no. turbines are located in agricultural lands (T1, T2, T6 and T7). 3 no. turbines are located in forested areas (T3, T4 and T5). Meanwhile, the proposed onsite 38kV substation, temporary construction compound and setdown area are located in an area which, at the time site visits had been conducted, were recently felled.

Turbine Delivery Route

The proposed Temporary Transition Compound along the R466 is located in an area mapped by Corine as agricultural surveys. Site walkover surveys have confirmed the landuse at this site.

8.3.2.2 Proposed Grid Connection Route

According to Corine land cover maps (2018) the northern section of the Proposed Grid Connection Route passes through agricultural lands before passing through urban lands near Ardnacrusha.

The Proposed Grid Connection Route to Ardnacrusha is ~14.7km in length. The proposed route is located within the carriageway of regional and local public roads (~14.4km) and ESB access tracks (~300m) on the approach to Ardnacrusha 110kV substation.

The Proposed Grid Connection Route originates from the proposed onsite 38kV electrical substation in the townland of Killeagy (Goonan) within the Proposed Wind Farm site. The Proposed Grid Connection Route underground electrical cabling travels to the west along the Gap Road as far as Kilbane before it veers to the south and travels along the L3022-8. There are 2 no. bridge crossings along this local road, 1 no. unnamed bridge and a crossing over the Glenomra River at Ahnagor Bridge. public road network as far as Ardnacrusha. The route then travels along the R466 for ~950m, before continuing to the south along the L3046 to Harold's Cross. The route then travels along the L3046, the R463 as far as Barry's Cross with an existing crossing at Blackwater Bridge. The route then travels to the southwest along the L3056 before travelling along internal access tracks within Ardnacrusha generation plant.

8.3.3 Soils and Subsoils

8.3.3.1 Proposed Wind Farm

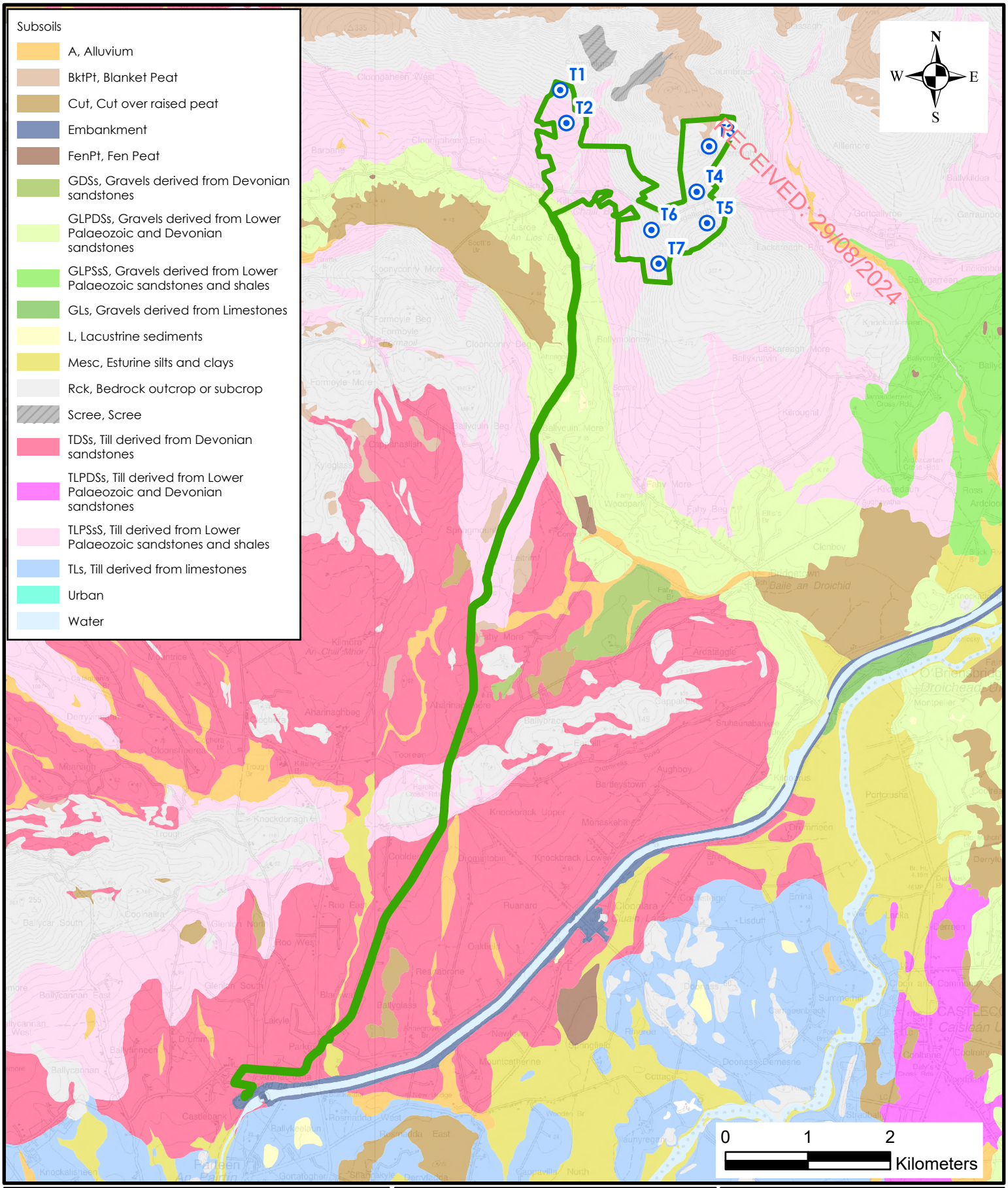
The published Teagasc soils map (www.gsi.ie) for the local area shows that the Proposed Wind Farm site is overlain by a mosaic of soil types. Mapped soils within the Proposed Wind Farm site comprise of acid deep well drained mineral soils (AminDW) and acid shallow well drained mineral soils (AminSW) in the west. Meanwhile, acid, shallow, rocky, peaty mineral soils (AminSRPT) and peat are mapped in the east of the Proposed Wind Farm site.

In terms of the key Proposed Wind Farm infrastructure, a total of 3 no. turbines (T1, T6 and T7) are mapped on acid shallow well drained mineral soils. Meanwhile, T2 is located on acid deep well drained mineral soils. Further to the east, 3 no. turbines (T3, T4 and T5), the proposed onsite 38kV substation, borrow pit, set-down area and temporary construction compound are located on acid, shallow, rocky, peaty mineral soils.

The published subsoils map (www.gsi.ie) shows that much of the west of the Proposed Wind Farm site is underlain by till derived from Lower Palaeozoic sandstones and shales (TLPSsS). A small area in the southwest is underlain by Gravels derived from Lower Palaeozoic and Devonian sandstones (GLPDSs). Due to the elevated nature of the local area, much of the higher ground in the east is mapped to be underlain by Bedrock outcrop or subcrop (Rck). A small area of Blanket Peat is also mapped in the northeast of the Proposed Wind Farm site, near the summit of Glennagalliagh Mountain.

In terms of the key Proposed Wind Farm infrastructure, a total of 6 no. turbines, the proposed onsite 38kV substation, borrow pit, construction compound and set down area are underlain by bedrock outcrop. Only T2 in the west is mapped to be underlain by Lower Palaeozoic sandstones and shales.

A subsoil geology map for the Proposed Wind Farm site is shown as Figure 8-1.



Legend

- EIAR Site Boundary
- Proposed Turbine Layout

Client: EDF Renewables Ireland

Job: Lackareagh Wind Farm, Co. Clare

Title: Local Subsoils Map

Figure No: 8-1

Drawing No: P1598-0-0724-A4-801-00A

Scale: 1:60,000

Drawn By: GA

Sheet Size: A4

Project No: P1598-0

Date: 05/07/2024

Checked By: MG

HYDRO ENVIRONMENTAL SERVICES
22 Lower Main St
Dungarvan
Co.Waterford
Ireland
tel: +353 (0)58 44122
fax: +353 (0)58 44244
email: info@hydroenvironmental.ie
web: www.hydroenvironmental.ie

The nature of the soils and subsoils present at the Proposed Wind Farm site have been confirmed by site investigations comprising peat probes, trial pits and boreholes.

A total of 67 no. peat probes were completed at the Proposed Wind Farm site by MKO between April 2021 and September 2023. These peat probe investigations revealed that peat is not widely present across the site, and peat that was recorded is typically shallow in nature. The peat depths recorded during these site investigations ranged from 0 to 3m, with an average of 0.52m. No peat was recorded at ~13% of the peat probe locations. Approximately 83% of peat probes recorded peat depths <1m. Peat depth was found to exceed 2m in only 1 no. location. The deepest peat (3m) was recorded ~660m southeast of T5. A peat depth distribution plot is shown as Figure 8-2 below.

According to the peat probe investigations no peat was recorded at 4 no. turbine locations (T1, T2, T6 and T7), the met mast and associated access roads. While no peat was found at T7, a peat depth of 0.5m was observed along the spur road leading to T5. Peat depths are T3 and T4 were less than 0.5m, while the peat depth at the construction compound was recorded as 0.5m.

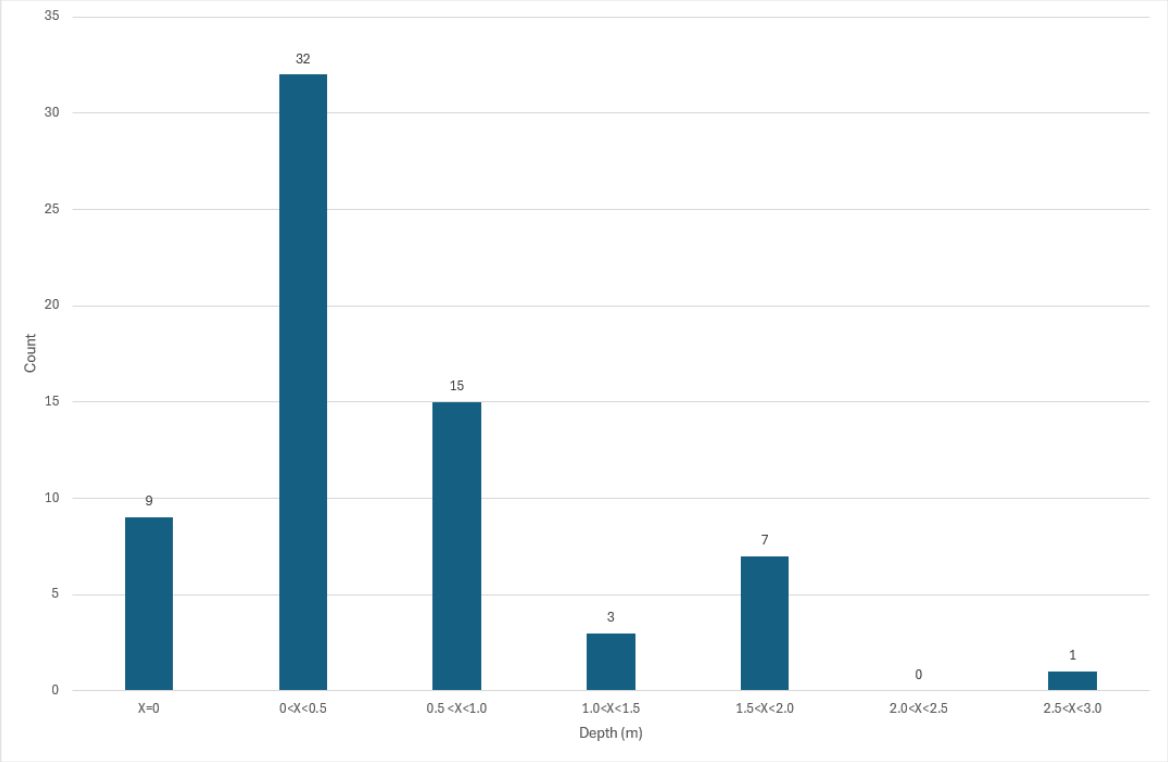


Figure 8-2: Peat Distribution Plot

The peat probe dataset was supplemented by gouge cores completed by HES at the Proposed Project infrastructure locations. The data from these investigations are detailed in Table 8-4 below. Based on these site investigations completed by HES, the peat at the Proposed Project infrastructure locations, if any, was noted to be shallow, ranging from 0 to 0.25m. The peat encountered by HES described as a dry peaty topsoil. No significant peat deposits were encountered at any proposed infrastructure locations. The subsoils beneath the peat were noted to comprise brown, gravelly SILT/CLAY.

Table 8-4: HES Site Investigation Data

Proposed Project Infrastructure Location	HES Gouge Core (peat depth m)	Soil/Subsoil Lithology
T01	No peat – Mineral Topsoil	Brown gravelly Silt/Clay
T02	No peat – Mineral Topsoil	Brown gravelly Silt/Clay
T03	0.15m - Peaty Topsoil	Brown gravelly Silt/Clay
T04	0.25m – Peaty Topsoil	Brown gravelly Silt/Clay with occasional subangular gravels
T05	0 – 0.15 – Peaty Topsoil	Brown gravelly Silt/Clay
T06	0 - 0.2m – Shallow Peaty Topsoil	Brown gravelly Silt/Clay
T07	No peat – Mineral Topsoil	Brown Silt/Clay
Onsite 38kV Substation Compound	0 – 0.2 – Peaty Topsoil	Brown gravelly Silt/Clay

Causeway Geotechnical completed site investigations at the Proposed Wind Farm site between 11th December 2023 and 29th January 2024. These site investigations comprised the completion of 3 no. rotary boreholes, 14 no. trial pits, 18 no. dynamic probes and 27 no. CBR tests. The results are included in full in Appendix D of the Geotechnical and Peat Stability Assessment Report (Appendix 8-1).

The boreholes (RC-SC-01 – RC-SC-03) were completed by rotary drilling techniques only, at the location of the proposed onsite 38kV substation and BESS compound and proposed borrow pit. The boreholes extended to a maximum depth of 6mbgl. The trial pits were completed at the 7 no. proposed turbine locations and at the location of the proposed onsite 38kV substation and BESS compound and proposed borrow pit. The trial pits extended to a maximum depth of 3.4mbgl. The location of these trial pits are shown on Figure 8-4 and detailed logs are included in Appendix D of the Geotechnical and Peat Stability Assessment Report (Appendix 8-1). Based on the site-specific data obtained from the boreholes and trial pit investigations, the ground conditions at the Proposed Wind Farm site can be summarised as follows:

- TOPSOIL was encountered typically in 0.2-0.4m thickness, occasionally comprising of peaty topsoil;
- The topsoil was underlain by glacial till. The till is noted to be comprised of sandy gravelly silty clay, frequently with low cobble content and occasional beds of gravel, typically soft or firm in upper horizons, becoming stiff at depth;
- Weathered Greywacke bedrock was encountered at depths ranging from 2.20-2.50m; and,
- Slightly more competent Greywacke bedrock was recorded at depths ranging from 2.50-6m.

Particle Size Distribution (PSD) analysis was completed at 12 of the trial pit locations. These analysed samples were described as a mixture of slightly gravelly clayey SILT and slightly sandy slightly clayey GRAVEL. The results of the PSD analysis are shown on Figure 8-3 below. Based on the PSD analysis the GRAVEL is the greatest component of these deposits, ranging from 37.2 to 82.9%. Meanwhile, the percentage components of SAND and SILT ranged from 5.2% to 28.7% and 12.2% to 29.4% respectively.

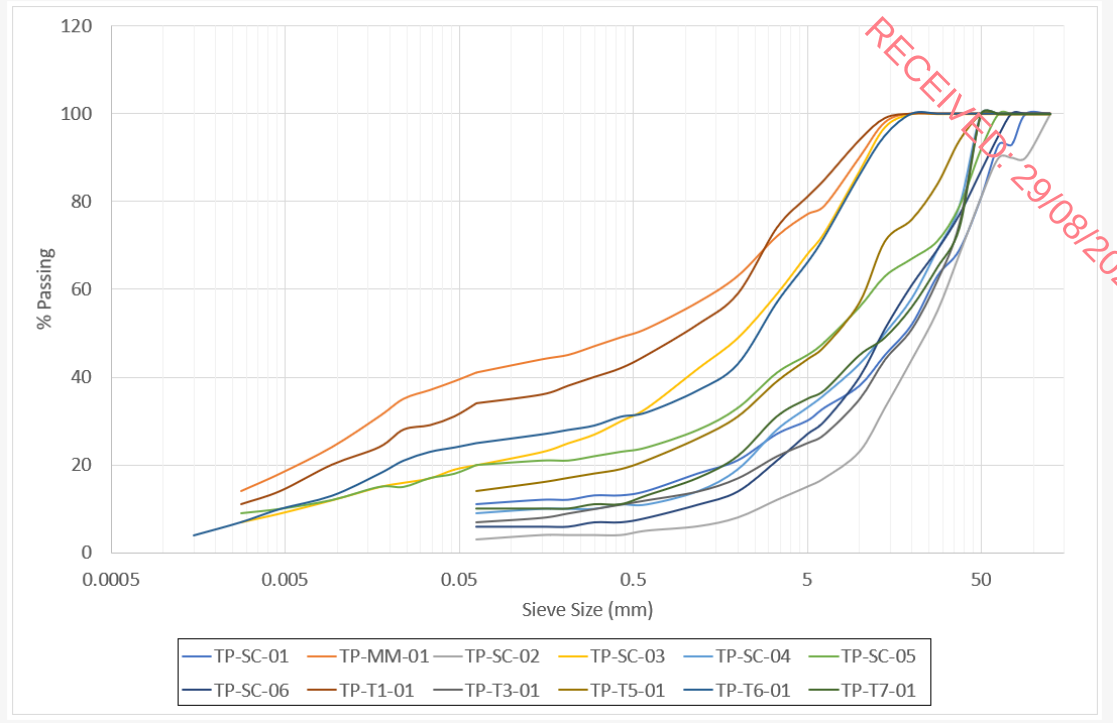


Figure 8-3: PSD Analysis of subsoils

Turbine Delivery Route

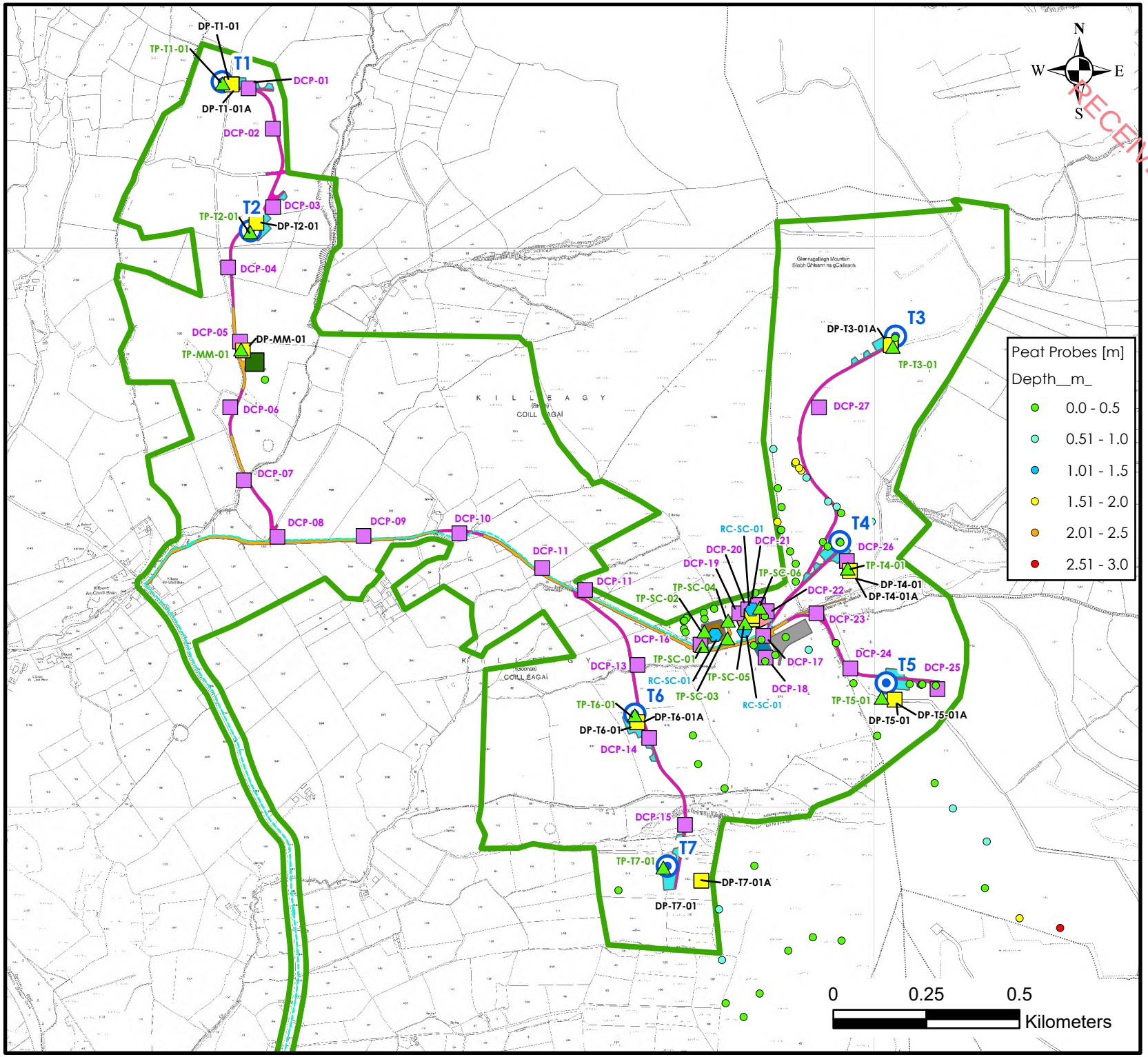
According to the Teagasc soil mapping (www.gsi.ie), the proposed blade transition area along the R466 is predominantly overlain by acidic shallow well drained mineral soils (AminSW). Meanwhile, some cutover/cutaway peat is mapped in the southeast.

The GSI mapped subsoils in this area comprise of gravels derived from Lower Palaeozoic and Devonian sandstones (GLPDSs) with cut over raised peat in the southeast. Meanwhile, estuarine silts and clays (Mesc) are mapped to the southwest of the proposed blade transition area.

8.3.3.2 Proposed Grid Connection Route

According to the Teagasc soil mapping (www.gsi.ie), the majority of the Proposed Grid Connection Route is overlain by mainly acidic poorly drained mineral soils (AminPD). Meanwhile, the northern section, in the vicinity of the Proposed Wind Farm site is overlain by shallow, well drained acidic mineral soils (AminSW). Made ground is mapped in the south of the Proposed Grid Connection Route, in the vicinity of Ardnacrusha.

In terms of subsoils, the GSI (www.gsi.ie) map till derived from Devonian sandstones (TDSs) underlying much of the Proposed Grid Connection Route. Meanwhile, the northern section is mapped to be underlain by Gravels derived from Lower Palaeozoic and Devonian sandstones (GLPSDs) and Till derived from Lower Palaeozoic sandstones and shales (TLPSsS). Bedrock outcrop or subcrop (Rck) is mapped in the townland of Coolderry. An embankment is mapped in the south of the Proposed Grid Connection Route at Ardnacrusha.



Legend

- EIAR Site Boundary
- Proposed Turbine Layout
- Proposed Hardstand Area
- Proposed Met Mast
- Proposed Upgrades to Existing Roads
- Proposed New Roads
- Proposed Borrow Pit
- Proposed Storage Area
- Temporary Construction Compound
- Proposed Onsite 38kV Substation
- Proposed Grid Connection Route
- Dynamic Probes
- Rotary Boreholes
- Trial Pits
- CBR tests

HYDRO ENVIRONMENTAL SERVICES
22 Lower Main St
Dungarvan
Co.Waterford
Ireland
tel: +353 (0)58 44122
fax: +353 (0)58 44244
email: info@hydroenvironmental.ie
web: www.hydroenvironmental.ie

Client: EDF Renewables Ireland

Job: Lackareagh Wind Farm, Co. Clare

Title: Site Investigation Map

Figure No: 8-4

Drawing No: P1598-0-0724-A4-804-00A

Sheet Size: A4	Project No: P1598-0
Scale: 1:14,000	Drawn By: GA
Date: 05/07/2024	Checked By: MG

8.3.4 Bedrock Geology

8.3.4.1 Proposed Wind Farm

The Proposed Wind Farm site is underlain by the Broadford Formation (www.gsi.ie). The Broadford Formation is noted to be comprised of fine to conglomeratic graded greywacke and greywacke sandstone. The GSI state that the Broadford Formation is "*dominated by grey banded mudstones but also contains abundant arenaceous horizons*".

The Proposed Wind Farm site is underlain by several mapped structural geological features. These rocks have been folded and faulted as a result of the Caledonian Orogeny. The GSI map a total of 5 no. faults underlying the Proposed Wind Farm site. A large northeast to southwest orientated fault dissects the Proposed Wind Farm site and is mapped beneath T4, the proposed onsite 38kV substation and T6. This large fault is displaced by several northwest to southeast orientated faults in the east of the Proposed Wind Farm site. One of these faults, extends across the Proposed Wind Farm site and is located between T1 and T2. An additional east to west orientated fault is mapped in the west, ~150m to the south of the proposed met mast. Due to the age of the faulting (Ordovician to early Devonian), the mapped faults are not considered to be of significance with respect to the Proposed Wind Farm site.

The bedrock geology is poorly exposed within the Proposed Wind Farm site. However, the GSI map several small areas of bedrock outcrop along the Gap Road. Furthermore, several streams have eroded valleys into the rock and expose the Broadford Formation. These outcrops were inspected during the walkover surveys are corresponded to the bedrock geology mapped by the GSI.

A bedrock geology map of the area is attached as Figure 8-5.

No competent bedrock was encountered at any of the trial pit investigations. The trial pits completed at T03 and T05 encountered possible weathered bedrock at depths of 0.8 and 1.5mbgl respectively. These deposits were described as brownish sandy angular fine to coarse GRAVEL of greywacke with high cobble content. The rotary boreholes encountered medium strong (locally strong) massive grey fine grained well cemented GREYWACKE at depths ranging of 2.20-2.50m.

Turbine Delivery Route

The proposed temporary blade transition area along the N466 is mapped to be underlain by Old Red Sandstones (undifferentiated) comprising of reg conglomerates, sandstones and mudstones.

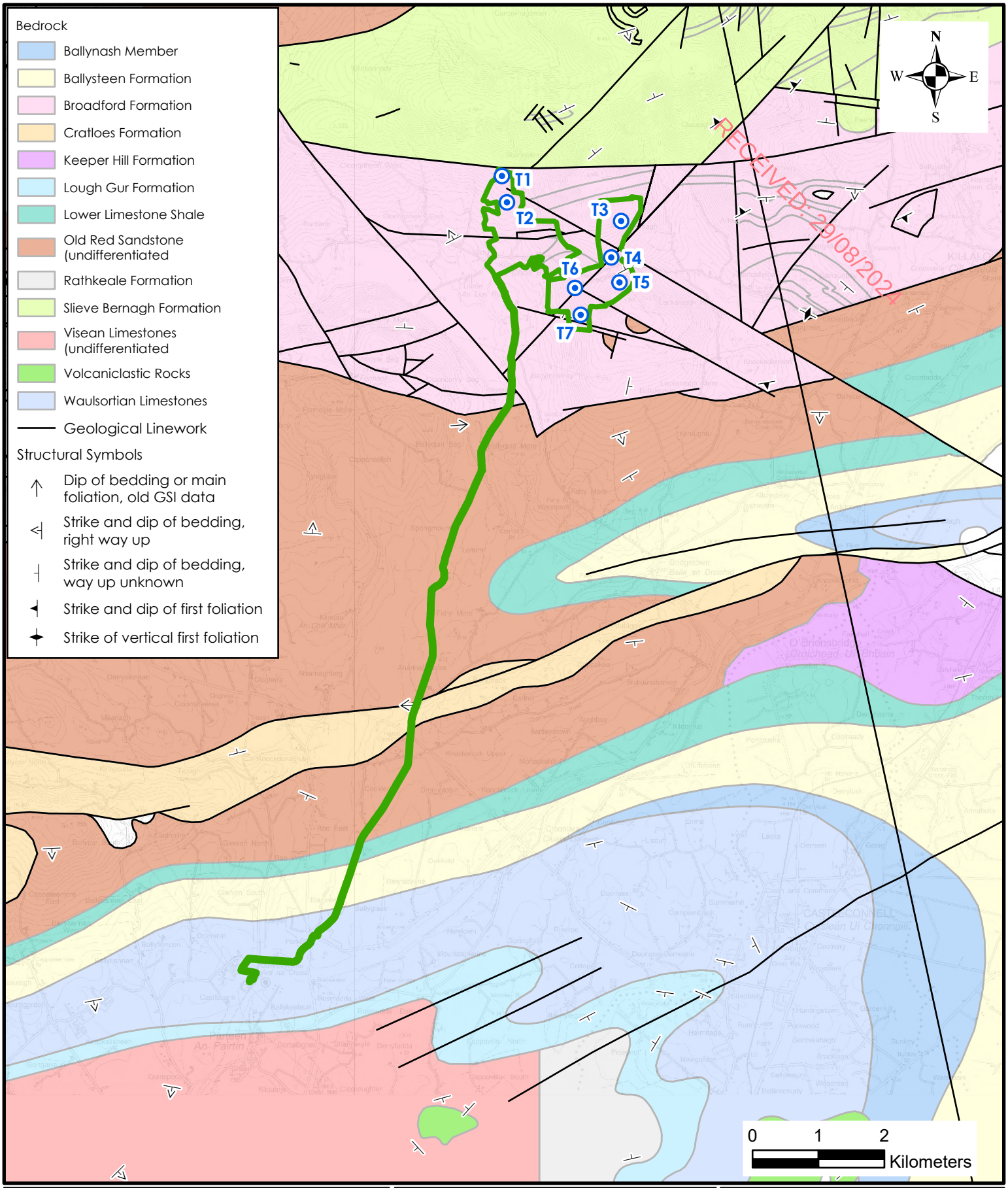
8.3.4.2 Proposed Grid Connection Route

In the vicinity of the Proposed Wind Farm site, the Proposed Grid Connection Route is underlain by the Broadford Formation. Further south much of the Proposed Grid Connection Route is mapped by the GSI to be underlain by Old Red Sandstones which comprise of red mudstones, siltstones and sandstones, and poorly sorted, polymict pebble conglomerates and breccias (www.gsi.ie).

Meanwhile, in the townland of Knockdonagh, the Proposed Grid Connection Route is mapped to be underlain by the Cratloes Formation. The Cratloes Formation is noted by the GIS to be comprised of laminated siltstone and sandstones. The southern section is underlain by the Lower Limestone Shales and the Ballysteen Formation to the north of Ardnacrusha. The Lower Limestone Shale is comprised of sandstones, mudstone and thin limestones, while the Ballysteen Formation is described as irregularly bedded and nodular bedded argillaceous bioclastic limestones, interbedded with fossiliferous calcareous shales. The Waulsortian Limestones underlie Ardnacrusha and the southern section of the Proposed Grid Connection Route and are described as massive, unbedded lime mudstones.

This GSI map shows some small areas of bedrock outcrop in the vicinity of the Proposed Wind Farm site and further south in the townlands of Fahy More and Coolderry.

A large, approximately east-west orientated fault is mapped to underlie the Proposed Grid Connection Route in the townland of Tooreen and separates the Old Red Sandstones to the north from the Cratloes Formation to the south.



Legend

- EIAR Site Boundary
- Proposed Turbine Layout

Client: EDF Renewables Ireland

Job: Lackareagh Wind Farm, Co. Clare

Title: Local Bedrock Geology Map

Figure No: 8-5

Drawing No: P1598-0-0724-A4-805-00A | Scale: 1:75,000 | Drawn By: GA

Sheet Size: A4 | Project No: P1598-0 | Date: 05/07/2024 | Checked By: MG

HYDRO ENVIRONMENTAL SERVICES
22 Lower Main St
Dungarvan
Co.Waterford
Ireland
tel: +353 (0)58 44122
fax: +353 (0)58 44244
email: info@hydroenvironmental.ie
web: www.hydroenvironmental.ie

8.3.5 Geological Resource Importance

8.3.5.1 Proposed Wind Farm

The GSI Online Database accessed via the Public Data Viewer (www.gsi.ie) does not record the presence of any active quarries or pits within the Proposed Wind Farm site. The closest mapped active sand and gravel pit is Jim Bolton Sand and Gravel in Kilbane, is located ~1.5km south of the Proposed Wind Farm site in the townland of Ballyquin More. Meanwhile, the closest mapped active bedrock quarry is located ~10km southwest of the Proposed Wind Farm site. This bedrock quarry, Ballycar Quarry, is located in the townland of Ballycar South in the Cratloes Formation. According to the GSI the main deposit at the quarry location is greywacke.

The GSI record the presence of an inactive slate quarry to the east of Kilbane village. Several additional pits and quarries dating from the Mid-19th to Mid-20th Century are also mapped at Kilbane village.

The GSI record several mineral localities within the Proposed Wind Farm site and in the surrounding lands (www.gsi.ie). In the townland of Killeagy, the GSI record the presence of quartz veins in blue and grey grits and shales. The GSI also record the presence of slate in an inactive quarry to the east of the village of Kilbane. Traces of lead deposits have also been reported in the townland of Ballymoloney in the vicinity of the Proposed Wind Farm site. Pyrite has also been reported immediately to the north of the Proposed Wind Farm site in Shannaknock.

The GSI online Aggregate Potential Mapping Database (www.gsi.ie) shows that the crushed rock aggregate potential of the Proposed Wind Farm site ranges from Moderate to Very High. The majority of the Proposed Wind Farm site is noted to have a high to very high potential for a bedrock quarry. The bedrock at the Proposed Wind Farm site could be used on a "sub-economic" local scale for construction purposes.

The Proposed Wind Farm site is not located within an area mapped for granular aggregate potential (i.e., potential for gravel reserves). The closest mapped area of granular aggregate potential is mapped near the village of Kilbane where there is very high potential. Some areas of low and very low potential are also mapped to the north of the Proposed Wind Farm site. The soil and subsoil deposits at the Proposed Wind Farm site can be considered to be of "Low" importance due to the largely thin occurrence, given the fact that soils are not designated in this area. In places the soils and subsoils are degraded as a result of forestry plantations and associated drainage.

Turbine Delivery Route

There are no active quarries or active sand and gravel pits or mineral occurrences mapped in the area of the proposed blade transition area along the R466 (www.gsi.ie).

The GSI online Aggregate Potential Mapping Database (www.gsi.ie) shows that the crushed rock aggregate potential at the proposed blade transition area along the R466 ranges from moderate to high. The northwest is also mapped as having high potential for granular aggregate.

8.3.5.2 Proposed Grid Connection Route

There are no active quarries or pits mapped along the Proposed Grid Connection Route. Jim Bolton Sand and Gravel is located ~300m to the east in the townland of Ballyquin More.

The GSI online Aggregate Potential Mapping Database (www.gsi.ie) shows that the crushed rock aggregate potential along the Proposed Grid Connection Route ranges from Low to Very High. The

greatest potential is found in the north of the Proposed Grid Connection Route, in the vicinity of the Proposed Wind Farm site.

The majority of the Proposed Grid Connection Route is not mapped in an area for granular aggregate potential. However, the northern section to the south of Kilbane is mapped as having very high potential for gravel reserves.

8.3.6 Geological Heritage and Designated Sites

There are no geological heritage sites located within the Proposed Wind Farm site, along the Proposed Grid Connection Route or in the vicinity of the proposed Temporary Transition Compound along the TDR.

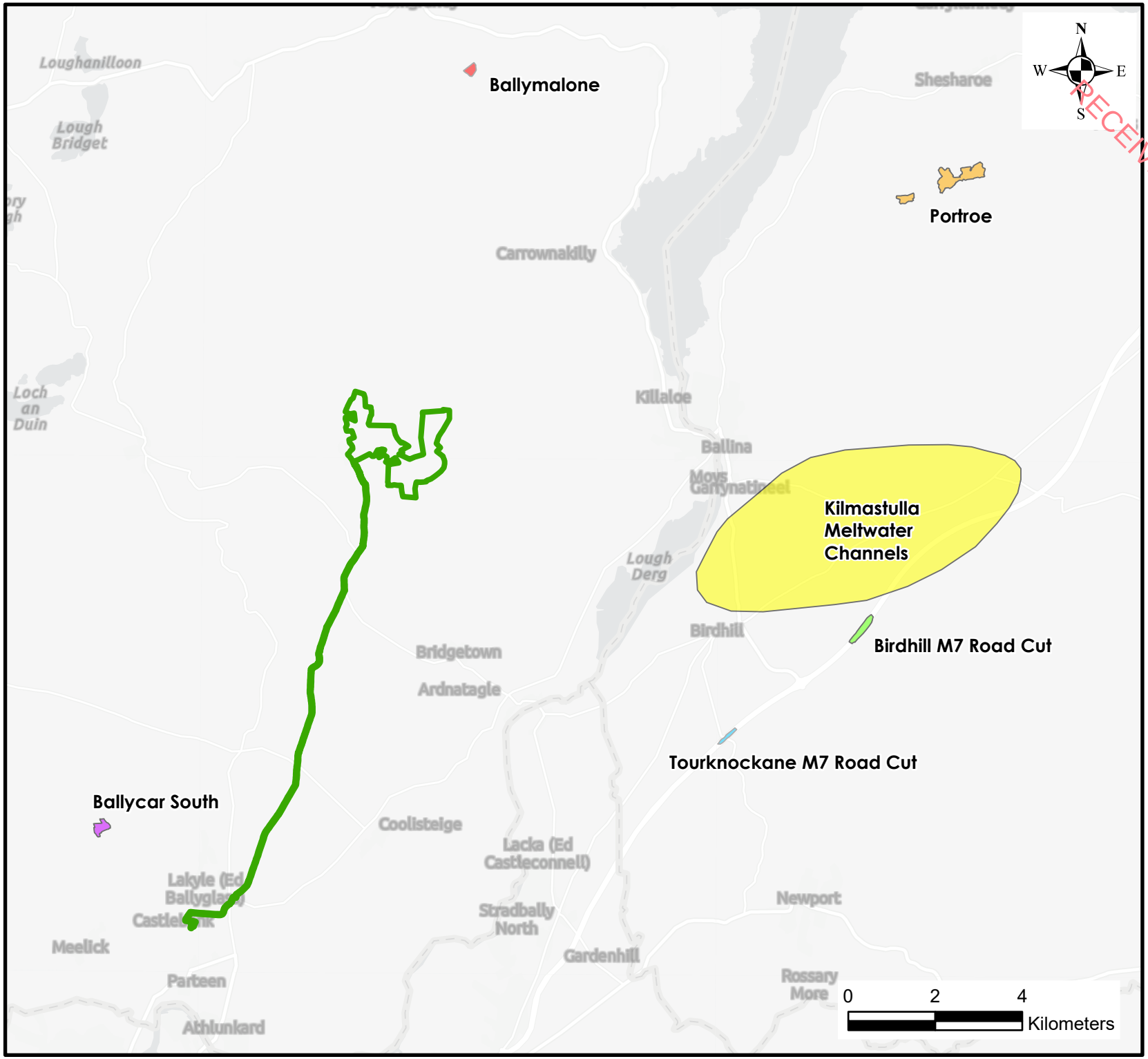
The closest Geological Heritage site to the Proposed Wind Farm site is Kilmastulla Meltwater Channels. This County Geological Site (CGS) is located in Co. Tipperary, ~6.2km to the east of the Proposed Wind Farm site. This CGS is of geological interest as it contains a series of deep channels that were formed by meltwater erosion.

Ballymalone CGS is located ~7.7km north of the Proposed Wind Farm site and is a small quarry. This site is of importance as the Ordovician rocks of the Ballymalone Formation provide the only representative section of these rocks in the northeastern part of the Slieve Bernagh inlier.

The Ballycar South CGS is located ~10km southwest of the Proposed Wind Farm site and ~2.8km northwest of Ardnacrusha substation. This CGS is recommended to be designated as a Geological Natural Heritage Area. The site is of importance of the rocks here, which are not presently exposed at the surface, have yielded a very diverse assemblage of fossils of Silurian age.

There are no other sites of geological importance within 10km of the Proposed Project.

A map of local geological heritage sites is attached as Figure 8-6.



Legend

- EIAR Site Boundary

Geological Heritage Site

- Ballycar South (IGH2)
- Ballymalone
- Birdhill M7 Road Cut (IGH4)
- Kilmastulla Meltwater Channels (IGH7)
- Portroe (IGH15)
- Tourknockane M7 Road Cut (IGH8)

HYDRO ENVIRONMENTAL SERVICES
22 Lower Main St
Dungarvan
Co.Waterford
Ireland
tel: +353 (0)58 44122
fax: +353 (0)58 44244
email: info@hydroenvironmental.ie
web: www.hydroenvironmental.ie

Client: EDF Renewables Ireland	
Job: Lackareagh Wind Farm, Co. Clare	
Title: Geological Heritage Sites	
Figure No: 8-6	
Drawing No: P1598-0-0724-A4-806-00A	
Sheet Size: A4	Project No: P1598-0
Scale: 1:120,000	Drawn By: GA
Date: 05/07/2024	Checked By: MG

8.3.7 Soil Contamination

There are no known areas of soil contamination within the Proposed Wind Farm site, along the Proposed Grid Connection Route or in the vicinity of the proposed Temporary Transition Compound along the TDR. During the site walkovers and investigations, no areas of contamination concern were identified within the Proposed Project. Several historic pits are located to the west of the Proposed Wind Farm site at Kilbane village.

According to the EPA online mapping (www.epa.ie), there are no licensed waste facilities or dump sites located within the Proposed Wind Farm site, along the Proposed Grid Connection Route or in the vicinity of the proposed Temporary Transition Compound along the TDR.

The closest EPA mapped waste facility is Longpavement landfill, located ~13.5km southwest of the Proposed Wind Farm site and ~2.6km south of the Proposed Grid Connection Route.

8.3.8 Peat Stability Assessment

8.3.8.1 Introduction

AFRY Ireland Limited was engaged by MKO to complete a Geotechnical and Peat Stability Assessment for the Proposed Project. The Geotechnical and Peat Stability Assessment Report (AFRY, 2024) is attached in Appendix 8-1.

The report investigates the geotechnical and peat-related characteristics of the Proposed Wind Farm site based on the published geology and data obtained from walkover surveys and site investigations. The report includes an analysis of the ground conditions to assess the risk of a peat slide occurring. This report was developed for the purposes of planning and detailed site investigations and further geotechnical assessments will be completed prior to construction.

Hydrological, hydrogeological and ecological factors were assessed in the Geotechnical and Peat Stability Assessment Report, and interaction between AFRY, HES and MKO were undertaken throughout the iterative design process. The Geotechnical and Peat Stability Assessment was done in accordance with Peat Landslide Hazard and Risk Assessments: Best Practice Guide for Proposed Electricity Generation Developments (PLHRAG, Scottish Government, 2017) and Guidelines for the Risk Management of Peat Slips (MacCulloch, 2006).

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 of the Proposed Wind Farm site, prior to the site reconnaissance by engineering geologists/geotechnical engineers from AFRY and Causeway Geotechnical.

8.3.8.2 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 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);
- Presence of historical and recent failure scars and debris;
- Presence of indicative tension cracks or features of compression (ridge, thrust or extrusion features); and
- Connectivity between surface drainage and the peat/impervious interface (mechanism for generation of excess pore pressures).

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

8.3.8.3 Peat Slides – Lessons Learned

This peat stability assessment has been undertaken taking into account 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. The Meenbog failure occurred during the construction of a section of floating road on sidelong ground in an area of weak peat. This construction technique is not proposed on sidelong ground on the Proposed Wind Farm site. It is important that the existing site drainage is maintained during construction to avoid a similar failure to that on Shass Mountain, which occurred following heavy rainfall, and this is referenced in the Risk Assessments for the turbines/access roads (AFRY, 2024).

8.3.8.4 Peat Stability – Desk Study

The initial desk study involved consultation with all available relevant geological and hydrogeological online databases to collate and review the published geological information for the Proposed Project site and to inform the site investigations.

In relation to Proposed Wind Farm site the desks study found that:

- The Proposed Wind Farm site is predominantly underlain by till and bedrock outcrop or subcrop. A small patch of blanket peat is present in the northeastern part of the site; however, no infrastructure has been proposed in that area (as detailed in Section 8.3.3);
- The bedrock geological formations underlying the Proposed Wind Farm site are detailed in Section 8.3.4;
- The GSI do not record the occurrence of any historic landslides within the Proposed Wind Farm site (www.gsi.ie). The closest recorded landslide is located on the northeastern slopes of Slieve Bernagh, ~4km north of the Proposed Wind Farm Site. This peat slide event dated from 2003 and the trigger is unknown. However, given the distant location of this mapped historic landslide event to the Proposed Wind Farm site, and its location on the opposite side of the Slieve Bernagh mountain the site-specific causes of that peat slide are deemed to not be pertinent to the Proposed Wind Farm site.
- The GSI Landslide Susceptibility Map (www.gsi.ie) classifies the probability of a landslide occurring. The landslide susceptibility of the Proposed Wind Farm site was classified by the GSI (2023) as being “Low”- “High”, with the higher risk areas corresponding to steeper slopes within the Proposed Wind Farm site. The location of all key Proposed Wind Farm infrastructure, with the exception of T2, are proposed in areas mapped as having “moderately high” to “high” susceptibility to landslides. However, as the GSI Landslide Susceptibility Map is only to a scale of 1:50,000, site specific stability assessments were completed at all proposed infrastructure locations to assess landslide susceptibility at the Proposed Wind Farm site.

- The Proposed Wind Farm site is underlain by a Poor Bedrock Aquifer;
- Subsoil permeability is mapped by the GSI in the western half of the site as Moderate to High (www.gsi.ie); and,
- Three watercourses traverse the Proposed Wind Farm site.

Furthermore, in order to characterise the slope conditions at the Proposed Wind Farm site, AFRY analysed slopes using a Digital Terrain Model derived from Bluesky (2018) orthophoto data. Table 2 of Appendix 8-1 presents the slope analysis at the Proposed Wind Farm site, with slopes ranging from 4.6° to 15.1°.

8.3.8.5 Peat Stability Investigations

The following surveys and investigations were completed to assess the susceptibility of the Proposed Wind Farm site to peat failure following the principles in PLHRAG:

- AFRY completed preliminary site walkover surveys in January 2024;
- Preliminary site investigations comprising of peat probing were completed by MKO between April 2021 and August 2023;
- Causeway Geotech Ltd carried out preliminary site investigations (3 no. trial pits, 7 no. DCP tests, shear box testing and laboratory testing on soil and rock samples taken from trial pits) in July 2022; and,
- Causeway Geotechnical Ltd completed additional site investigations (14 no. trial pits, 3 no. rotary boreholes, 18 no. heavy dynamic probes and 27 no. dynamic cone penetrometers) in December 2023 and January 2024.
- During walkover surveys it was noted that the site is characterised by steep topography, with most areas covered in sod and some shallow, firm peat overlap. No areas of surface water ponding or soft ground were observed, likely due to the presence of steep slopes which facilitate efficient drainage.

The nature of the soils/subsoils encountered during these site investigations at the Proposed Wind Farm site are detailed in Section 8.3.3 above.

A walkover survey and inspection of the Proposed Grid Connection Route and the proposed Temporary Transition Compound along the TDR identified no peat stability issues and therefore there was no requirement to carry out the detailed analysis as described below for the Proposed Wind Farm site (AFRY, 2024).

8.3.8.6 Quantitative Assessment

The purpose of the analysis was to determine the Factor of Safety (FoS) of the peat slopes at the Proposed Wind Farm site. The minimum required FoS is 1.3 based on BS6031:1981: Code of Practice for Earthworks (BSI, 2009). The assigned probability of instability associated with a given FoS value is described in Table 8-5 below. Hydrological and hydrogeological factors were also assessed in the Geotechnical and Peat Stability Assessment Report, and interaction between AFRY and HES was undertaken throughout the iterative design process.

No peat failures/landslides are recorded on the Proposed Wind Farm site which suggests that site conditions do not pre-dispose themselves to failures/landslides.

The following assumptions have been incorporated into the quantitative analysis:

- Peat depths were determined based on the maximum depths recorded in peat probes.
- Slope angles were analysed from DEM data.

- The undrained shear strength was estimated based on description in the trial pit logs and the guidance of BS 5930.

Table 8-5: Probability Scale for Factor of Safety.

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

8.3.8.6.1 *Quantitative 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 (short-term stability) and drained (long-term stability) analysis has been undertaken to determine the stability of the peat slopes on site.

- The undrained condition applies in the short-term during construction and until construction induced pore water pressures dissipate.
- The drained 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.

For the undrained and drained conditions, 2 no. surcharge loading conditions were considered during the stability analysis:

- No surcharge load (Condition 1); and,
- Surcharge load of 10kPa, equivalent to 1m of stockpiled peat (Condition 2).

In accordance with the planning guidelines compiled by the Department of the Environment, Heritage and Local Government (DoEHLG 2019 Guidelines) the quantitative analysis was completed for all areas where peat >0/5m in thickness.

Undrained Analysis

An analysis of peat stability was carried out at the key Proposed Wind Farm infrastructure locations for the undrained condition. As outlined above the undrained loading condition applies in the short-term during construction and until construction induced pore water pressures dissipate. The analysis in the Geotechnical and Peat Stability Assessment Report concentrated on areas where peat was present. Peat deposits were found near T3, T4, along the access road to T3 (between chainages T3+350 and T3+400),

proposed onsite 38kV substation and BESS compound, temporary construction compound, setdown area and borrow pit. The undrained analysis results are presented in Table 8-6.

For the undrained analysis, the calculated FoS for the 2 no. load conditions was found to be in excess of 1.3 at all locations. This analysis indicates that there is a 'low' risk of peat failure at the Proposed Wind Farm site.

Table 8-6: Factor of Safety Results (undrained condition)

Turbine No./Waypoint	Factor of Safety for Load Condition	
	Condition (1)	Condition (2)
T3	15.5	3.6
T4	12.9	3.7
T3+350 - T3+400	7.9	4.3
Substation and BESS Compound	22.2	6.4
Temporary Construction Compound	25.0	8.3
Storage Area	146.9	10.9
Borrow Pit	22.1	4.4

Drained Analysis

An analysis of peat stability was carried out at the key Proposed Wind Farm infrastructure locations for the drained condition. 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. Similar to the undrained analysis, the analysis for the drained conditions presented in the Geotechnical and Peat Stability Assessment Report concentrated on areas where peat was present. The drained analysis results are presented in in Table 8-7.

For the drained analysis, the calculated FoS for the 2 no. load conditions was found to be in excess of 1.3 at all locations. This analysis indicates that there is a 'low' risk of peat failure at the Proposed Wind Farm site.

Table 8-7: Factor of Safety Results (drained condition)

Turbine No./Waypoint	Factor of Safety for Load Condition	
	Condition (1)	Condition (2)
T3	6.2	1.4
T4	5.2	1.5
T3+350 - T3+400	3.2	1.7
Substation and BESS Compound	8.9	2.5
Temporary Construction Compound	10.0	3.3
Setdown Area	58.8	4.4
Borrow Pit	8.8	1.8

8.3.8.6.2 *Summary of Quantitative Analysis*

The FoS obtained from both undrained and drained analyses is greater than 1.3 at all locations where peat is present and exceeds 0.5m. This indicates that the probability or the likelihood of peat slide occurrence within the Proposed Wind Farm site is deemed to be 'low'.

8.3.8.7 Qualitative Assessment

In addition to the quantitative assessment of peat stability presented above, AFRY completed a qualitative assessment of peat stability at the Proposed Wind Farm site based on the Guidelines for the Risk Management of Peat Slips (MacCulloch, 2006).

This assessment is based on 8 no. factors (slope angle, peat depth, moisture content, cracking, underground hydrology, surface hydrology, historical slides and weather). Each of these factors have been identified as contributory factors to peat slides.

For example, the probability of different slope angles and different peat depths contributing to peat slides are detailed in Table 8-8 and Table 8-9 below. Similar tables exist for the other 6 no. factors and are detailed in Section 7.3.1 of the Geotechnical and Peat Stability Assessment (Appendix 8-1).

The data within these eight principal factors, some of which is not numeric, is used to derive a single representative value for individual areas of the Proposed Wind Farm site. The methodology has been adopted from Guidelines for the Risk Management of Peat Slips (MacCulloch 2006) in which the measured value of the principal factors is linked to the likelihood of contributing to a peat slide. Table 8-10 presents the probability values for the likelihood of a peat slide occurring based on the Guidelines for the Risk Management of Peat Slips (MacCulloch, 2006).

Table 8-8: Probability of Slope Angles Contributing to a Peat Slide

Slope Angle (°)	Probability
0 - 3°	Unlikely
4 - 9°	Probable
10 - 15°	Likely
16 - 20°	Very Likely
≥ 20°	High Risk

Table 8-9: Probability of Peat Depths Contributing to a Peat Slide

Probability of a Peat Slide Occurring	Peat Depth (m)
Very Likely	0 – 0.5
Likely	0.5 – 1.0
Probable	1.0 -1.5
Unlikely	1.5 – 2.0
Negligible	≥2

Table 8-10: Probability Values for Likelihood of Peat Slide Occurring)

Probability of a Landslide Occurring		AFRY Probability Terminology
Very Likely	>75%	High
Likely	50-75%	Medium
Probable	25-50%	
Unlikely	10-25%	Low
Negligible	<10%	Negligible

8.3.8.7.1 *Qualitative Assessment Results*

The qualitative assessment was based on the likelihood of the occurrence of a peat slide based on each of the 8 no. contributory factors and was determined for individual areas of the Proposed Wind Farm site from the available information (desk study info and site investigation data).

After considering the 8 no. contributory factors and the site-specific conditions at the Proposed Wind Farm site, the probability of a peat slide occurring has been assessed and is summarised in Table 8-11. Similar to the quantitative analysis, this was only completed in areas where peat was recorded during site investigations.

Based on the qualitative assessment, the probability/likelihood of peat slide occurrence at the borrow pit, turbine locations T3 and T4, and along the access road to T3 (between chainages T3+350 and T3+400) is deemed as 'medium'. Based on Table 8-8, the slope angles at these locations, which range from 4.6 to 23.7°, are likely to contribute to a peat slide (MacCullogh, 2006). In addition, the peat depth along the access road to T3 (between chainages T3+350 and T3+400) is recorded as being 1.2m and is probably likely to contribute to a peat slide, based on Table 8-9 above.

The proposed onsite 38kV substation and BESS compound, temporary construction compound, and storage area are assessed as having a 'low' likelihood of peat slide occurrence. All other areas of the Proposed Wind Farm site have no likelihood of peat slide occurrence.

Table 8-11: Summary Results of Qualitative Risk Assessment (AFRY, 2024)

Turbine No./ Location	Probability of a Peat Slide Occurring
T3	27% (Medium)
T4	27% (Medium)
T3+350 - T3+400	28% (Medium)
Substation and BESS Compound	24% (Low)
Temporary Construction Compound	24% (Low)
Set down Area	24% (Low)
Borrow Pit	27% (Medium)

8.3.8.8 Peat Stability and Risk Assessment Summary

The findings of the Geotechnical and Peat Stability Assessment showed that the Proposed Wind Farm site has an acceptable margin of safety and is suitable for the Proposed Project.

When a quantitative assessment for undrained condition was carried out, FoS ranged from 3.6 to 146.9 for 1m peat surcharge. The drained analysis resulted in FoS values between 1.4 to 58.8 for 1m peat surcharge. FoS values higher than 1.3 are deemed to have a negligible probability of instability once mitigation/control measures are implemented.

A qualitative assessment of the peat stability returned a 'low' risk at the proposed onsite 38kV substation and BESS compound, temporary construction compound, and set down area. The risk at the proposed borrow pit, turbine locations T3 and T4, and along the access road to T3 (between chainages T3+350 and T3+400) was ''medium'. This was based on steep slopes and previous periods of dry conditions.

As stated in Appendix 8-1, '*while a qualitative assessment can provide valuable insights, quantitative analysis offer a more informed and data-driven understanding of the risk of peat instability*' (AFRY, 2024). Quantitative analyses provide a more robust reflection of site conditions by examining numerical data, specific to the Proposed Project site. The risk assessment methodology was adopted from *Peat Landslide Hazard and Risk Assessments: Best Practice Guide for Proposed Electricity Generation Developments* (Energy Consents Unit Scottish Government, 2017) and *Guidelines for the Risk Management of Peat Slips* (MacCulloch 2006).

Although the site features steep slopes, peat is restricted to the topsoil layer at all infrastructure locations. For the construction of the Proposed Project, it is recommended to remove the topsoil layer; this topsoil layer will be utilised for reinstatement purposes after the construction phase has been completed.

The report includes recommendations and mitigation measures for construction work in peatlands to ensure that all works adhere to an acceptable standard of safety. The risk rating at all areas at the Proposed Wind Farm site is reduced to 'low' provided all mitigation measured are adhered to. In summary, the findings of the Geotechnical and Peat Stability Assessment indicate that the Proposed Wind Farm site has an acceptable margin of safety and is suitable for the Proposed Project.

8.3.9 Receptor Sensitivity and Importance

Based on the criteria set out in Table 8-2 above, the soils and peat at the Proposed Wind Farm 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 commercial forestry operations and associated drainage. The bedrock geology underlying the Proposed Wind Farm 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 Proposed Wind Farm site, the Proposed Grid Connection Route and the proposed Temporary Transition Compound along the TDR will be included in the 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 will be included in the impact assessment due to their distant location from the Proposed Project. There is no potential for the Proposed Project to affect the land, soils and geological environment outside of the Proposed Project. Therefore, there is no potential for effects to occur on these geological heritage sites.

8.4 Characteristics of the Proposed Project

The Proposed Project is defined in full in Chapter 4.

The Proposed Project will involve removal of peat, soils and subsoils for the construction of access roads, internal cable network, hardstanding emplacement, turbine foundations, onsite 38kV substation and BESS, crane hardstands, construction compounds, drainage works and met mast installation, etc. Rock for construction purposes will be sourced largely from cuttings during the construction phase and will be supplemented from material extracted from the proposed borrow pit.

Generally, the construction methodology for constructing any structure or platform foundation, such as a turbine base, hardstand or substation, removing all soft material is required to a depth where a suitable bearing material is encountered. Due to the sloping topography rock breaking will be required at the turbines and hard-standing locations to create the reduced foundation level and the levelling required for construction. The material excavated is required to be properly managed and stored and should be re-used in other elements of the Proposed Wind Farm design.

During the construction phase, peat, where present, will be permanently excavated to the substrate to make room for the concrete turbine foundation and a small working area surrounding the foundation footprint. Breaking and excavation of bedrock may be required where it is encountered at shallow depths to achieve the reduced foundation level and level surface required by design. Turbine base excavations of 25.5m in diameter are proposed (23.5m turbine diameter plus 1m working area all around the turbine), with detailed foundation design dictated by the local ground conditions and the requirements of the turbine supplier. The plan area for the material to be removed will be dictated by the enabling temporary works design, allowable excavation angle and the mean peat and overburden depths across each turbine location. The design of the turbine base foundations is subject to further ground investigation and the detailed design designer's assessment.

Similarly, all turbine crane hardstands will be required to be founded on a suitable bearing material requiring the excavation of all peat and other soft ground materials, where present. The platform will be constructed in the excavated area using a suitable specified engineered stone fill. Following the placement of the platform, the excavated peat can be re-used to batter the platform edges and landscape the platform back into the existing topography.

The quantities of peat and spoil, requiring management at the Proposed Project site has been calculated, as presented in Table 8-12 below. The quantities were calculated by AFRY as part of the Peat and Spoil Management Plan included as Appendix 4-2 of this EIAR.

The total volumes of peat/topsoil and spoil requiring placement/reinstatement on Proposed Wind Farm site is estimated to be 41,010m^3 and 148,983m^3 respectively (refer to Table 8-12 below). A contingency factor of 15% has been applied and is included in the excavated spoil volumes, and a bulking factor of 15% has been used for excavated peat volumes to allow for expected increase in volume upon excavation and to allow for a variation in ground conditions across the site.

It is proposed to reuse any peat/spoil generated through construction activities in reinstatement and landscaping areas whereas any excess material will be stored in the borrow pit. With regards to soil volumes, it is proposed to reuse a significant volume of excavated spoil material as fill with any excess being stored in the borrow pit (refer to Table 8-13). A detailed breakdown of the capacity of the peat and spoil management areas within the Proposed Project is detailed in the Peat and Spoil Management Plan (Appendix 4-2).

The total volume of peat/topsoil and spoil requiring management on site is estimated at 189,993m^3. This material will be reused or stored, with a total capacity volume of 191,010m^3, around turbine bases and hardstands, sidecast along access roads with gentle gradients, landscaping and within the onsite borrow pit. As such, there is enough capacity within the Proposed Project site, for the total volumes of peat and spoil requiring management for the Proposed Project.

The majority of material excavated along the Proposed Grid Connection Route will be reinstated back into the trench. However, some excess spoil material generated during the cable route construction will be transported by permitted waste contractors to a suitable permitted/licensed site for disposal/recovery. This is dependent on the road makeup at locations along the Proposed Grid Connection Route. The main contractor will determine the appropriate location for management of arisings from the Proposed Grid Connection Route.

In order to facilitate the construction of the Proposed Project, all crushed stone, hardcore materials that cannot be sourced onsite from the cut earthworks will be sourced from the proposed onsite borrow pits. Ready-mix concrete that will be required during the construction phase will be sourced from nearby appropriately licenced quarries (no on-site batching of concrete is proposed). Trial pit assessments have also confirmed that the glacial till material is suitable for reuse as a fill material. Therefore, a significant proportion of the 148,983m^3 of spoil generated during the construction phase will be as fill material and the remaining material will be deposited in the borrow pit. Some aggregate material due to a requirement for specific grade or quality may be sourced from suitable licenced quarries.

Table 8-12: Estimated Peat/Topsoil and, Mineral Soil Excavation Volumes

Infrastructure Element	Excavated Peat/Topsoil Volume (m^3)	Excavated Spoil Volume (m^3)
7 no. turbines and associated hardstands	20,597	114,195
Access Roads	13,179	14,375
Temporary Construction Compounds	966	0
Substation & BESS Compound	2,225	13,340
Met Mast	242	173
Borrow Pit	1,438	5,750
Storage Area (Set down area)	2,363	1,150
Sub-Total Volume (m^3)	**41,010**	**148,983**

Table 8-13: Summary of Peat/Topsoil and Spoil Placement/Reinstatement available volumes

Location	Peat/Topsoil Volume (m^3)	Spoil Volume (m^3)
Borrow Pit	11,010	5,240
Reinstatement and landscaping	30,000	-
Reuse of material for ballast	-	4,000
Reuse of material as fill volume	-	140,760
Total Volume (m^3)	**41,010**	**150,000**

8.5 Likely Significant Effects and Associated Mitigation Measures

8.5.1 Do Nothing Scenario

If the Proposed Project was not developed, the site will continue to function as it does at present, with no changes made to the current land-use of commercial forestry and agricultural land. The impact of this is considered neutral in the context of the EIAR. If the Proposed Project were not to proceed, the opportunity to capture an even greater part of County Clare's valuable renewable energy resource would be lost, as would the opportunity to further contribute to meeting Government and EU targets for the production and consumption of electricity from renewable resources and the reduction of greenhouse gas emissions. The opportunity to generate local employment and investment and to diversify the local economy would also be lost.

If the Proposed Project were not to proceed, the Proposed Wind Farm site would continue to function as a coniferous forestry plantation and agricultural land. The ongoing activities of forestry management, tree felling and potential replanting (as required) in conjunction with agricultural activities such as grassland management and grazing would continue to form the main pursuits at the site.

8.5.2 Construction Phase - Likely Significant Effects and Mitigation Measures

The likely effects of the Proposed Project and mitigation measures that will be put in place during the construction phase to eliminate or reduce them are outlined below.

8.5.2.1 Potential Effects on Land (Land-Take)

The Proposed Project includes the construction of 7 no. turbines, associated hardstand areas, temporary construction compound, an onsite 38kV substation and BESS compound, new access roads and upgrades to the existing road network. The EIAR Site Boundary measures approximately 291 hectares (ha) in area.

These works will result in a change in the land environment within these areas. For example, the Proposed Project works will result in the loss of ~13.8ha of coniferous forestry due to the proposed infrastructure (8.4ha). Therefore, forestry will be replaced by turbine bases, hardstand areas, access roads and other related infrastructure.

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

Furthermore, no effects on land will occur along the Proposed Grid Connection Route as all works will occur within the carriageway of the existing public road network.

With regards to the TDR, there will be a loss of ~0.47ha of agricultural land which will be replaced by the proposed blade transition area to facilitate the delivery of the turbine components.

Pathways: Excavation and infrastructure construction.

Receptors: Land.

Pre-Mitigation Potential Effect: Negative, slight, direct, permanent, likely effect on land (land-take).

Mitigation Measures / Impact Assessment: The Proposed Project layout has been designed to utilise the existing road network at the Proposed Wind Farm site and the Proposed Grid Connection Route,

therefore reducing the area of the site which will be altered from existing land covers to site access roads.

The loss of ~13.8ha of coniferous forestry will not have a significant effect on land at the Proposed Wind Farm site and represents a change in landcover of ~4.7% of the EIAR site.

Following the construction phase areas of the site will be replaced by hardstand areas with a permanent development footprint of 8.4ha. This represents a change in landcover of ~2.9% of the total Proposed Wind Farm site area (~291ha).

Post-Mitigation Residual Effect: The Proposed Project will result in the loss of ~13.8ha of coniferous forestry which will be replaced by turbine bases, hardstands and other proposed infrastructure; please note, in line with the Forest Service's published policy on granting felling licences for wind farm developments, areas cleared of forestry for access roads, and any other wind farm-related uses will be replaced by replanting at an alternative site or sites. 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 13.8ha of forestry 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.

The Proposed Project will also result in the loss of agricultural land at proposed infrastructure locations. This will result in a permanent change to land at these locations. However, due to the relatively small footprint (8.4ha) of the Proposed Project infrastructure on a site scale (the permanent footprint represents 2.9% of the EIAR Site Boundary (291ha) and even more so on a local scale the residual effect is considered to be negative, direct, slight, permanent, likely effect on land (land-take).

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

8.5.2.2 Potential Effects from Peat, Subsoil and Bedrock Excavation

Excavation of peat, subsoil and bedrock will be required for the proposed works during the construction phase including:

- The installation of new proposed access roads and the upgrade of existing site access roads will require the excavation of 13,179m^3 of peat/topsoil and 14,375m^3 of spoil materials;
- Construction of 7 no. turbine foundations and associated turbine hardstands will require the excavation of 20,597m^3 of peat/topsoil and 114,195m^3 of spoil;
- Construction of 1 no. met mast will require the excavation of 242m^3 of peat/topsoil and 173m^3 of spoil;
- Construction 1 no. onsite 38kV substation and BESS compound will require the excavation of 2,225m^3 of peat/topsoil and 13,340m^3 of spoil;
- Excavation of the proposed borrow pit will require the removal of 1,438m^3 of peat/topsoil and 5,750m^3 of spoil;
- Construction of the temporary construction compound will require the removal of 966m^3 of peat/topsoil and no spoil;
- Insertion of the Proposed Project drainage network; and
- Construction of the Proposed Grid Connection Route from the onsite 38kV substation to the existing Ardnacrusha 110kV substation – excavation of material will be reinstated and nay surplus material arising will be disposed of in a nearby licensed waste facility and/or managed on site.

These construction phase activities will result in the permanent removal and relocation of in-situ peat/topsoil and subsoil at most excavation locations. Estimated volumes of peat, subsoils and bedrock to be relocated are summarised above in Table 8-12. It is estimated that the total volume of peat/topsoil and spoil excavated will be 41,010m^3 and 148,983m^3 respectively. Much of the spoil material will be

used as fill material and material for the construction will also be sourced from the onsite borrow pit. It is noted that earthworks of this type, scale and magnitude have been granted permission and successfully completed at similar sites around the country.

However, there will be no loss of peat or spoil from the Proposed Wind Farm site, as it will be relocated within the Proposed Wind Farm site. It is proposed to store the excavated material in the proposed borrow pit, and also through the method of side-casting. Peat/topsoil materials will also be used for landscaping at the 7 no. turbine locations and around other elements of the Proposed Wind Farm infrastructure (i.e. proposed onsite 38kV substation). Excavated spoil material will be reused as fill with any excess material stored in the borrow pit. Meanwhile, the excavated rock will be used to facilitate the construction of the Proposed Project.

Excavation of subsoils will also be required along the Proposed Grid Connection Route. However, these deposits will be reinstated back into the trench and there will be no requirement to store these materials elsewhere. However, materials which are unsuitable for reinstatement will be disposed of an appropriately licenced facility. Any excess spoil material generated during the cable route construction will be transported by permitted waste contractors to a suitable permitted/licensed site for disposal/recovery.

Excavation of material will also be required at the proposed blade transition area along the TDR. Any surplus material arising will be managed locally.

Pathway: Extraction/excavation.

Receptor: Peat and subsoil.

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

Negative, slight, direct, permanent, likely effect on soils and subsoils along the Proposed Grid Connection Route.

Proposed Mitigation Measures:

Proposed Wind Farm site:

- Placement of turbines and associated infrastructure in areas of shallow peat and suitable ground conditions (based on detailed site investigation data);
- The peat and subsoil which will be removed during the construction phase will be localised to the Proposed Wind Farm infrastructure turbine location, substation and temporary compounds and access roads;
- The Proposed Project has been designed to avoid sensitive habitats;
- A minimal volume of peat, subsoil and rock will be excavated and removed to allow for infrastructure works to take place in comparison to the total volume of these materials present on the site due to optimisation of the Proposed Project design;
- At the identified repository areas, the vegetative topsoil layer will be removed to allow for spoil to be placed and upon reaching the recommended height, the vegetative topsoil layer will be reinstated;
- The identified spoil management areas will be developed in a phased approach, with the topsoil removed and temporarily stockpiled within the defined area while the spoil it being placed. The stockpiled topsoil will then be reinstated over the placed spoil, and the exercise will continue within the same spoil management area until the area is full;
- The placement of spoil will be restricted to a maximum height of 1.0m, subject to confirmation by the Geotechnical Engineer;
- Where practical, the surface of the placed spoil is shaped to allow efficient run-off of surface water. Where possible, shaping of the surface of the spoil will be carried out as

placement of spoil within the area progresses. This will reduce the likelihood of debris run-off and ensure stability of the placed spoil;
- Finished/shaped side slopes of the placed spoil will be not greater than 1 (v): 2 (h) in the dedicated spoil management zones and not greater than 1 (v): 1 (h) alongside access tracks;
- Inspections of the spoil management areas will be made by a Geotechnical Engineer through regular monitoring of the works. The appointed contractor will review work practices at spoil management areas when periods of heavy rainfall are expected so as to prevent excessive dirty water runoff from being generated;
- An interceptor drain will be installed upslope of the identified spoil management areas to divert any surface water away from these areas;
- Silt fences and double silt-fences will be emplaced down-gradient of spoil management areas and will remain in place throughout the entire construction phase, or until reseeding has been established to a sufficient level;
- The surface of the deposited spoil will be profiled to a gradient to be agreed with the Geotechnical Engineer and vegetated or allowed to vegetate naturally as indicated by the Project Ecologist;
- All the above-mentioned general guidelines and requirements will be confirmed by the Geotechnical Engineer prior to construction;
- The material will be backfilled into the spoil management areas and will be spread evenly across the area;
- It will be compacted to reduce air voids and reduce the migration paths for infiltration by precipitation. This will reduce the amount of potentially silt laden surface water run-off from these spoil management areas. Excavated soils/subsoils shall be excavated and stored separately to topsoil; this will prevent mixing of materials and facilitate reuse afterwards;
- All materials which require management will be stockpiled at low angles (< 5-10°) to ensure their stability and secured using silt fencing where necessary. This will help to mitigate erosion and unnecessary additions of suspended solids to the drainage system; and,
- Spoil management will take place within a minimal distance of each turbine to avoid excessive transport of materials within the site.

Proposed Grid Connection Route:

- Soils and subsoils excavated along the Proposed Grid Connection Route underground cabling route will be temporarily stored in covered stockpiles along the edge of the road carriageway;
- Once the emplacement of the 110kV cable has been completed, the stored soils and subsoils will be reinstated, with the minimal amount of compaction required to level the top surface; and,
- The tarmacadam road surface will be replaced with the same design standard as the surrounding carriageway and in compliance with any requirements of Clare County Council.

Post-Mitigation-Residual Effect: The granular subsoils and peat at the Proposed Wind Farm site can be classified as of "Low" importance and the bedrock of "Medium" importance.

The overall EIAR Site Boundary area measures approximately 291ha in size, while the development footprint of the Proposed Project measures approximately 8.4ha is approximately 2.9% of the overall area. The negative effect is the disturbance and relocation of ~41,010m^3 of peat/topsoil and 148,983m^3 of spoil during construction. The design measures incorporated into the Proposed Project as described above in particular the avoidance of deeper peat areas combined with the 'low' importance of the peat deposits and the 'medium' importance of the local bedrock means that the residual effect will be - Negative, slight, direct, likely, permanent effect on peat, subsoils and bedrock due to disturbance and relocation within the Proposed Wind Farm site.

The cohesive and granular soil/subsoil along the Proposed Grid Connection Route are classified as being of 'low' to 'moderate' importance. Following the excavation and construction of the Proposed Grid Connection Route underground cabling, the area excavated will be reinstated with a comparable ground cover. The residual effect is considered to be a negative, imperceptible, direct, likely, permanent effect.

Significance of Effects: For the reasons outlined above, no significant effects on peat, subsoils and bedrock will occur.

8.5.2.3 Potential Effects from the Excavation and Reinstatement of the Borrow Pit

The excavation of 1,438m^3 of peat/peaty topsoil and 5,750m^3 of spoil will be completed at the proposed borrow pit location. The peat depth at the proposed borrow pit location is typically less than 0.5m. Once the overlying peat has been removed, bedrock will be excavated from the borrow pit to facilitate the construction of the Proposed Project. It is estimated that a total of 15,000m^3 of material will be excavated from the borrow pit, out of which, it is estimated that roughly ~10,000m^3 of rock can be obtained.

Upon removal of the rock from the individual cells within the borrow pit, it is proposed to reinstate the borrow pit using excavated peat and spoil.

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 Proposed Wind Farm site.

Proposed Mitigation Measures by Design:

The Peat and Spoil Management Plan (AFRY, 2024) attached as **Appendix 4-2** sets out the guidelines for the construction and reinstatement of the on-site borrow pit. Upon the removal of the required volumes of material (for the construction of the infrastructure elements at the wind farm) from the borrow pit it is proposed to reinstate the pit using excavated peat/peaty topsoil and spoil. The borrow pit is designed and will be constructed in a way which will allow the excavated peat/peaty topsoil and spoil to be placed safely, with areas within the borrow pit designated for the storage of excavated peat. Other mitigation measures included in the design of the borrow pit are as follows:

- Excavation works will be undertaken and supervised by an experienced contractor and suitably qualified personnel;
- Rock will be removed by breaking using a hydraulic breaker (no crushing needed);
- Borrow pit will be developed with stable ground inclinations;
- Exposed slopes will be left with irregular faces to promote re-vegetation;
- The stability of the rock faces will be inspected by the Project Geotechnical Engineer upon excavation to ensure stability;
- Rock buttresses will be constructed within the borrow pit to help retain placed peat and spoil. The founding stratum for each buttress will be inspected and approved by the Project Geotechnical Engineer;
- Infilling of peat and spoil should commence at the back of the borrow pit and progress towards the pit entrance;
- Following reinstatement of the borrow pit, the surface of the deposited materials will be profiled to a maximum gradient of 5° to ensure stability and promote revegetation;
- Consistent monitoring of the deposition areas will be completed throughout the construction process, particularly during periods of wet weather.

Post Mitigation Residual Effect: The bedrock at the Proposed Wind Farm site can be classified as of "Medium" importance, while the peat/topsoil and spoil deposits can be classified as being of "Low" importance. The overall EIAR Site Boundary area is extensive (291ha) while the footprint of the borrow pit (0.25ha) is approximately 0.1% of the overall Proposed Project site area. The effect is the excavation of ~5,000m^3 of peat/spoil and spoil during construction and the relocation of rock (~10,000m^3) used for the construction of the Proposed Project. The design measures as described above in particular the avoidance of deeper peat areas combined with the 'Medium' and 'Low' importance of the deposits means that the residual effect is considered - Negative, slight, direct, likely, permanent effect on peat, subsoils and bedrock due to disturbance and relocation within the Proposed Wind Farm site.

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

8.5.2.4 Potential Effects from Leakages and Spillages of Hydrocarbons

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. Additionally, waste tar, removed from the road hardstanding along the Proposed Grid Connection Route has the potential to affect soil/subsoil geochemistry.

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 using a double skinned bowser with spill kits kept 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. All bunded areas will be fitted with a storm drainage system and an appropriate oil interceptor. Ancillary equipment such as hoses, pipes will be contained within the bunded area;
- Fuel and oil stores including tanks and drums will be regularly inspected for leaks and signs of damage;
- The electrical control building (at the proposed onsite 38kV substation) will be bunded appropriately to the volume of oils likely to be stored and to prevent leakage of any associated chemicals to groundwater or surface water. The bunded area will be fitted with a storm drainage system and an appropriate oil interceptor;
- The plant used during construction will be regularly inspected for leaks and fitness for purpose;
- All waste tar material arising from works on hard top roads will be removed off site and taken to licenced waste facility; 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 4-3).

Post-Mitigation Residual Effect: The use and storage of hydrocarbons and small volumes of chemicals is a standard risk associated with all construction sites. Proven and effective measures to mitigate the risk of spills and leaks have been proposed above and will break the pathway between the potential source and the receptor. The residual effect will be - Negative, imperceptible, direct, short-term, low unlikely effect on peat and subsoils and bedrock.

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

8.5.2.5 Potential Effects from the Erosion of Exposed Subsoils and Peat During Construction of Proposed Wind Farm

There is a high likelihood of erosion of peat and spoil during its excavation and during landscaping works at the Proposed Wind Farm site. 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 the development locations and access roads will be reinstated within the Proposed Wind Farm site;
- The upper vegetative layer (where still present) will be stored with the vegetation part of the sod 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;
- Brash/bog mats will be put in place to support vehicles on soft ground, reducing peat and mineral soils erosion and avoiding the formation of rutted areas, in which surface water ponding can occur; and,
- A full Peat and Spoil Management Plan for the site is shown as Appendix 4-2 and details control measures for the removal, storage and general management of the materials to be excavated during construction.

Post-Mitigation Residual Effect: Peat soils and spoil can be eroded by vehicle movements, wind action and by water movement. To prevent this, all excavation works will be completed in accordance with a detailed Peat and Spoil Management Plan, material will remain within the Proposed Wind Farm site and reseeding and planting will be completed to bind landscaped peat and spoil together. Following implementation of these measures the residual effected will be - Negative, slight, direct, short-term, likely effect on peat and subsoils by erosion and wind action.

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

8.5.2.6 Potential Effects from the Erosion of Exposed Subsoils During Construction of the Proposed Grid Connection Route

Erosion of soil/subsoil by the pathways listed below, can have the effect of reducing the overall volume of soil/subsoil at the site, with the potential for some eroded subsoils to reach watercourses, leading to

water quality issues such as high turbidity. Erosion of soils/subsoils may occur at any works area where excavation is ongoing (i.e., along the Proposed Grid Connection Route).

Pathway: Vehicle movement, surface water and wind action along the underground electrical cabling route.

Receptor: Soil, subsoil and weathered bedrock along the Proposed Grid Connection Route.

Pre-Mitigation Potential Impact: Negative, direct, slight, high probability impact on soil, subsoils and bedrock.

Proposed Mitigation Measures:

- Soil/subsoil removed from the trench will be transported to the on-site spoil management areas or to a local licenced facility.
- Temporary drainage systems will limit runoff impacts during the construction phase.
- The Proposed Grid Connection Route will be constructed in a stepwise manner along its length. This will minimise the time any particular section of the Proposed Grid Connection Route cabling trench is open before being reinstated.

Residual Effects: Soil and subsoil can be eroded by vehicle movements, wind action and by water movement. To prevent this, all excavation works will be temporary and silt fencing will be used where appropriate near surface watercourses. Following implementation of these measures the residual effected is considered to be - Negative, slight, direct, likely effect on soil and subsoils, and possibly bedrock.

Significance of Effects: For the reasons outlined above, no significant effects on soils, subsoils or bedrock relating to the Proposed Grid Connection Route will occur.

8.5.2.7 Potential Effects from the Erosion of Exposed Soils/Subsoils and Peat During Tree Felling

Tree felling is a component of the proposed works at the Proposed Wind Farm site, with ~13.8ha of felling proposed. As noted above, areas cleared of forestry for access roads, and any other wind farm-related uses will be replaced by replanting at an alternative site or sites as per the Forest Service policy on granting felling licenses. Therefore, while the loss of 13.8ha of forestry 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.

During felling operations there is a high likelihood of erosion of peat and spoil due to the disturbance of soils and subsoils associated with vehicle and plant movements across the Proposed Wind Farm site. This also has associated potential effects on the water environment; and therefore this aspect is assessed in further detail in Chapter 9 Hydrology & Hydrogeology.

Pathway: Vehicle movement, surface water and wind action.

Receptor: Peat, subsoil and weathered bedrock.

Pre-Mitigation Potential Effect: Negative, slight, direct, permanent, likely effect on peat, subsoil and weathered bedrock due to felling operations.

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 peat, 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 site 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 peat and 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 worm, 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: The proposed felling works will result in the disturbance and erosion of peat and subsoil within the Proposed Wind Farm site. However, given the minimal footprint of the proposed felling areas combined with the mitigation measures above, the residual effect is - negative, imperceptible, direct, permanent, unlikely effect on peat, 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 peat, soils/subsoils or bedrock will occur.

8.5.2.8 Potential Effects from Peat Instability and Failure

A peat stability risk assessment was carried out by AFRY for the main infrastructure elements at the Proposed Wind Farm site. This approach takes into account guidelines for geotechnical/peat stability risk assessments as given in PLHRAG (2017) and MacCulloch (2005). The peat stability risk assessment is attached in full as Appendix 8-1.

Peat instability or failure refers to a significant mass movement of a body of peat that would have an adverse impact on the Proposed Wind Farm site 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.

The findings of the peat assessment, which involved both a quantitative and qualitative analysis, showed that the Proposed Wind Farm site largely has an acceptable margin of safety and that the site is suitable for the Proposed Project. Only the borrow pit, turbine locations T3 and T4, and along the access road to T3 (between chainages T3+350 and T3+400) was noted to have a 'medium' probability of peat failure based on the qualitative analysis. However, the quantitative analysis found that the probability of a peat failure to be low at all proposed infrastructure locations where peat was in excess of 0.5m. While qualitative assessments can provide valuable insights, quantitative analyses offer a more informed and

data-driven understanding of risks across various locations, therefore quantitative analyses better reflect site conditions for the Proposed Project by examining numerical data (AFRY, 2024). The management of peat stability and appropriate construction practices will be inherent in the construction phase of the Proposed Project to ensure peat failures do not occur at the Proposed Wind Farm site.

Pathway: Vehicle movement and excavations.

Receptor: Peat and subsoils.

Pre-Mitigation Potential Effect: The findings of the Geotechnical and Peat Stability Assessment showed that the Proposed Wind Farm site has an acceptable margin of safety, is suitable for the Proposed Project and is considered to be at low risk of peat failure. The pre-mitigation residual effect is considered to be - Negative, significant, direct, permanent, likely effect on peat and subsoils.

Proposed Mitigation Measures:

Firstly, the key mitigation with regard peat stability risk at the Proposed Wind Farm site was the completion of a robust, multidisciplinary site investigation and peat stability risk assessment carried out in accordance with best practice guidance (PLHRAG, Scottish Government, 2017).

Also, 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. These lessons show that 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 roads.

A key mitigation measure is the avoidance of areas which are assessed as having a high risk of failure. This scenario does not apply to the Proposed Project and there was no necessity for a revised planning layout.

The findings of the quantitative assessment showed that the Proposed Project areas have an acceptable margin of safety and that the site is suitable for the Proposed Project. Meanwhile, the qualitative assessment found that all areas, with the exception of the borrow pit, turbine locations T3 and T4, and along the access road to T3 (between chainages T3+350 and T3+400), have a low risk of peat failure. The borrow pit, turbine locations T3 and T4, and along the access road to T3 (between chainages T3+350 and T3+400) were found to have a medium probability of peat failure based on the steep slopes and previous periods of dry conditions. With the implementation of the mitigation measures outlined below and in the Geotechnical and Peat Stability Assessment, the risk rating at all areas of the Proposed Wind Farm site is considered to be low (AFRY, 2024).

The management of peat stability and appropriate construction practices will be inherent in the construction phase of the Proposed Project to ensure peat failures do not occur.

The following control measures incorporated into the construction phase of the Proposed Project will ensure the management of the risks for this site:

- Appointment of experienced and competent contractors;
- The site will be supervised by experienced and qualified personnel;
- Allocate sufficient time for the Proposed Project (be aware that decreasing the construction time has the potential to increase the risk of initiating a localised peat movement);
- Prevent undercutting of slopes and unsupported excavations;
- Upslope cut-off drains will be installed in advance of construction activities to prevent water build up in excavations.
- The sides within excavated peat will be sloped back at an angle of 30 degrees to the horizontal to prevent slippage.

- No excavations shall take place unless fill material is available for filling at the point of excavation. Excavation will be limited to the reach of the excavator sitting on the constructed road surface.
- Any excavations will be immediately backfilled with suitable material when available.
- Excavation for access track to be backfilled as soon as practicable in intact peat. Excavation and filling operations will be co-ordinated to minimise the time an excavation remains unfilled.
- Deposition of excavated material must not occur outside designated areas; temporary stock piling would take place within the Proposed Wind Farm footprint of turbine hardstands before reinstatement and disposal at proposed peat and spoil repository areas.
- Temporary deposition of excavated soils will only be allowed in areas with peat depth less than 0.5m.
- Excavated spoil will not be deposited on the downslope or upslope edges of adjacent peat.
- Existing drainage patterns in peat will be maintained whenever possible, and any uncontrolled discharges of water onto peat will be prevented.
- Engineered drainage to prevent concentrated flow onto slopes or into excavations. Pumping to be used as required until a permanent solution is in place.
- As per *Peat Landslide Hazard and Risk Assessments: Best Practice Guide for Proposed Electricity Generation Developments* (Energy Consents Unit Scottish Government, 2017) catch wall fences shall be positioned downslope of the suspected or known landslide prone area to slow or halt runout. Similarly, catch ditches may also be used to slow or halt runout, although it is preferable that they are cut in non-peat material.
- Machinery use on peat surfaces would be minimized, and dependant on site topography the use of vibrating rollers may not be permitted.
- Materials must not be stockpiled, and heavy machinery must not be parked on peat surfaces.
- The use of low ground bearing pressure machines to be used on areas of peat exceeding 1m depth.
- No operatives other than the excavator driver to be allowed in close proximity to open excavations.
- Monitoring posts to be installed in vicinity of risk areas and to be inspected prior to and following works each day by a competent person.
- A qualified geotechnical and/or environmental engineer will conduct regular site visits and assessments to monitor the potential for a peat slide regularly during construction.
- Upon commencement of the reinstatement works, guidance from a suitably qualified environmental professional will be sought to confirm the methodology and programme.
- Exclusion zones delineating the working corridor will be established around all working areas using post and rope fences. No activity will be permitted past this fence.
- The environmental manager or other designated person will conduct induction training and toolbox talks with site staff to explain the risks associated with working on peat, the procedures for reducing the risk of peat slides, and the location of exclusion zones.
- Strict adherence to method statements is required at all times, and any deviation from the agreed work methodology must be approved by a suitably qualified environmental professional or the site geotechnical engineer.
- Particular attention will be paid to conditions during and after heavy rainstorms, especially following extended dry periods when the likelihood of peat movement is higher. The site supervisor would suspend work if either work practices or weather conditions are deemed unsafe.

- After reinstatement is completed, the peat and spoil repository areas will be re-vegetated using the topsoil, sod or harvested peat.

The above mitigation measures are proposed to reduce any existing risks to acceptable levels (AFRY, 2024).

Post Mitigation Residual Effect: A detailed Geotechnical and Peat Stability Assessment has been completed for the Proposed Project. The findings of that assessment have demonstrated that there is a low risk of peat failure. 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.

8.5.3 Operational Phase - Likely Significant Effects and Mitigation Measures

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

- Some vehicles or plant may be necessary for maintenance of turbines which could result in minor accidental leaks or spills of fuel/oil;
- The transformer in the substation and transformers in each turbine are oil cooled. There is potential for spills / leaks of oils from this equipment resulting in contamination of soils and groundwater; 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.

8.5.3.1 Potential Effects from Site 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, short term, likely effect on peat, subsoil and bedrock.

Proposed Mitigation Measures:

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

Post-Mitigation Residual Effect: The use of aggregate for site road maintenance will be minor and infrequent, and all material will be imported to the Proposed Project site from local authorised quarries. The residual effect is considered to be - negative, imperceptible, indirect, short-term, unlikely effect on bedrock.

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

8.5.3.2 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, short term, unlikely effect on peat, subsoil and bedrock.

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; and
- 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 4-3).

Post-Mitigation Residual Effect: The use of hydrocarbons in plant and vehicles is a standard risk associated with all operational wind farm sites. Proven and effective measures to mitigate the risk of spills and leaks have been proposed above and will break the pathway between the potential source and the receptor. The residual effect is considered to be - negative, imperceptible, direct, short-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.

8.5.3.3 Potential Effects from Oils in Transformers

The transformer in the substation and transformers in each turbine are oil cooled. There is potential for spills / leaks of oils from this equipment resulting in contamination of soils and groundwater. 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, short term, unlikely effect on peat, subsoil and bedrock.

Proposed Mitigation Measures:

- All transformers and substation areas will be bunded to 110% of the volume of oil used in each transformer/substation;
- An emergency plan for the operational phase to deal with accidental spillages will be contained in the Environmental Management Plan.

Post-Mitigation Residual Effect: The use of hydrocarbons in transformers and substations is a standard risk associated with all operational wind farm sites. Proven and effective measures to mitigate the risk of spills and leaks have been proposed above and will break the pathway between the potential source and the receptor. The residual effect is considered to be - negative, imperceptible, direct, short-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.

8.5.4 Decommissioning Phase - Likely Significant Effects and Mitigation Measures

The potential effects associated with decommissioning of the Proposed Project will be similar to those associated with construction but of reduced magnitude.

During decommissioning, it will be possible to reverse or at least reduce some of the potential impacts caused during construction by rehabilitating construction areas such as turbine bases and hard standing areas. Turbine hardstands and foundations will remain in place and will be left to revegetate naturally. Leaving the turbine hardstands and foundations in-situ is considered a more environmentally prudent option. Other impacts such as possible soil contamination by fuel leaks will remain but will be of reduced magnitude.

Mitigation measures applied during decommissioning activities will be similar to those applied during the construction phase (refer to Section 8.1.2) where relevant.

Some of the effects will be avoided by leaving elements of the Proposed Project in place where appropriate. The proposed onsite 38kV electrical substation and cabling will be retained by EirGrid or the relevant Transmisison System Operator (TSO). Internal roads will remain in situ, as appropriate to facilitate forestry and agricultural activities. 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 land, soils and geological environment will occur during the decommissioning stage of the Proposed Project.

8.5.5 Risk of Major Accidents and Disasters

Due to the nature of the Proposed Project site, *i.e.,* mountainous terrain with peat covered slopes, there is a risk of a landslide occurring.

A comprehensive Peat Stability Risk Assessment (AFRY, 2024) has been undertaken for all Proposed Project infrastructure locations, and it concludes that with the implementation of the proposed control (mitigation) measures. The residual risk of a landslide occurring is determined to be negligible/none.

Please refer to Chapter 16 Major Accidents and Natural Disasters for a full assessment relating to the risk of landslides.

8.5.6 Human Health Effects

Potential health effects arise mainly through the potential for soil and ground contamination. The Proposed Project is not a recognized source of pollution (e.g., it's not a waste management site, or a chemical plant), and so the potential for effects during the operational phase is very low.

Hydrocarbons will be used onsite during construction; however, the volumes will be small in the context of the scale of the Proposed Project and will be handled and stored in accordance with best practice mitigation measures. The potential residual effects associated with soil or ground contamination and subsequent health effects are imperceptible.

8.5.7 Potential Cumulative Effects

Due to the localised nature of the proposed construction works which will be kept within the EIAR Site Boundary, there is no potential for significant cumulative effects in-combination with other local developments on the land, soils and geology environment. The only pathway the Proposed Wind Farm 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 & Hydrogeology.

The construction of the Proposed Grid Connection Route and works along the TDR will only require relatively localised excavation works within the site boundary and therefore will not contribute to any significant cumulative effects.

8.5.8 Post Construction Monitoring

None required.