Appendix 8-1 – Peat Stability Risk Assessment

Scart Mountain Wind Farm

Planning Stage Peat Stability Risk Assessment

PRODUCED BY
Ciaran Reilly BE PhD CEng MIEI RoGEP (Specialist)

DATE 17 December 2024
DOCUMENT P23044_RP001
REVISION C01
STATUS A1

Report prepared for:
TOBIN Consulting Engineers,
Block 10-4,
Blanchardstown Corporate Park,
Dublin 15,
Ireland.

Report prepared by:
Ciaran Reilly & Associates
Consulting Geotechnical Engineers,
Midland Business Hub,
Mullingar,
Co. Westmeath,
Ireland.

This report is for the private and confidential use of the named client who commissioned the report and is not to be reproduced in whole or in part or relied upon by any third party for any purpose without the express and written authority of Ciaran Reilly & Associates. Any liability arising out of the use of this report by a third party shall be the responsibility of that party, who shall indemnify Ciaran Reilly & Associates against all claims, costs, damages, or losses arising out of such use. This report has been prepared for the titled project by Ciaran Reilly & Associates with all reasonable skill, care, and diligence, and taking account of the manpower and resources devoted to it by agreement with the client.

Note on status flags and revision codes:

Status	**Description**	**Revision Code**
Work in Progress (Non-Contractual)		
S0	Work In Progress	P01.01, etc
Shared (Non-Contractual)		
S1	Suitable for Coordination. The file is available to be 'shared' and used by other disciplines as a background for their information.	P01, P02, etc
S2	Suitable for Information	P01, P02, etc
S3	Suitable for Internal Review and Comment	P01, P02, etc
S4	Suitable for Construction Approval	P01, P02, etc
S6	Suitable for PIM Authorisation (Stages 2a, 2b and 3)	P01, P02, etc
S7	Suitable for PIM Authorisation (Stages 4 and 5)	P01, P02, etc
WIP to Published Unauthorized and (Non-contractual) use at risk.		
D1	Suitable for Costing	P01, P02, etc
D2	Suitable for Tender	P01, P02, etc
D3	Suitable for Contractor Design	P01, P02, etc
D4	Suitable for Manufacture / Procurement	P01, P02, etc
Published (Contractual)		
A1, A2, A3, etc	Approved and accepted as stage complete (C= Contractual/Complete)	C01, C02, etc
B1, B2, B3, etc.	Partially signed-off: with minor comments from the Client. All minor comments should be indicated by the insertion of a cloud and a statement of 'in abeyance' until the comment is resolved, then re-submitted for full authorization.	P01.01, etc
Published for AIM Acceptance		
CR	As Construction Record documentation, PDF, Models etc	C01, C02, etc

Table of contents

1. Executive Summary

Ciaran Reilly & Associates has been instructed by TOBIN Consulting Engineers (TOBIN) on behalf of FuturEnergy Ireland to carry out a planning stage peat stability risk assessment (PSRA) as part of the environmental impact assessment for the proposed Scart Mountain Wind Farm site in the townlands of Knocknamask, Tooranaraheen, Knocknasheega, Scart Mountain, Toor, Moneygorm East and Lackenrea in County Waterford.

The overall proposed development includes 15 no. wind turbines, all associated foundations and hard-standing , upgrading of existing site entrances and locations adjacent the public road to facilitate delivery, permanent road widening, a met mast, internal site access roads, a 110kV electrical substation, and all associated works including watercourse crossings, a cable road, borrow pits, etc.

The proposed wind farm site is located in a forested landscape with limited extents and depths of peat on the site Five of 24 trial pits and 4 of 9 gouge augers found “peat”, to depths of between 0.1 and 1.6m bgl. There were a further eight findings of “peaty” or “organic” material, generally at shallow depths. Typical ground investigation findings were 0.4 to 1.6m of TOPSOIL or PEAT over soft to stiff brown to black slightly sandy gravelly (silty) CLAY with sub angular to sub rounded cobbles and boulders. CLAY was sometimes reported as peaty and with organic content. Several trial pits terminated due to obstructions in the form of large boulders. MADE GROUND was noted in places as gravel, crushed rock, and gravelly clay.

The PSRA was carried out in accordance with Peat Landslide Hazard and Risk Assessments, Best Practice Guide for Proposed Electricity Generation Developments – Second edition (Scottish Government, 2017). The report sets out the methodology used to assess the peat stability risk, the activities undertaken, and the results of the peat stability assessment. The report should be read along with the Soils and Geology chapter of the overall Environmental Impact Assessment Report (EIAR).

The topography of the wind farm is hilly, undulating, steeply in places, with elevation levels ranging from between 160 to 440mOD. Several streams cut through the site, draining typically to the south. The site is underlain by the Knockmealdown Sandstone Formation of medium grained pink-purple sandstone and the Ballytrasna Formation of purple mudstone and sandstone. Mapping indicates the quaternary geology is mainly Glacial Till with significant areas of outcropping rock at the topographical high points of Knocknanask and Knocknasheega. Teagasc soils mapping shows the upper layer of soil at the site is characterised as Peaty Gleys and Peaty Podzols, Lithosols, and Peats.

A comprehensive desk study was undertaken, LiDAR digital terrain model data were acquired and reviewed, and a comprehensive suite of ground investigations were undertaken to assist the assessment. Following application of mitigation measures, including consideration to the siting of infrastructure to minimise the risk, the findings of the planning stage PSRA indicate a *“low”* to *“negligible”* hazard ranking for instability

related to the requirement for excavations on the site. Routine and common place mitigation measures can be put in place during the detailed design and construction of the scheme to reduce the likelihood of a failure. Possible mitigation measures include stepping or battering back of excavations to a safe angle (as determined through a detailed slope stability assessment by a competent temporary works designer) or construction of a temporary sheet pile wall or rock fill berm to support the peat during construction. Best practice guidance regarding the management of peat stability must be inherent in the construction phase of the project.

2. Introduction

In accordance with planning guidelines compiled by the Department of the Environment, Heritage and Local Government (DoEHLG) (2016), where peat is present on a proposed wind farm development, a peat stability assessment is required as part of the environmental impact assessment. Ciaran Reilly & Associates has been instructed by TOBIN Consulting Engineers (TOBIN) on behalf of FuturEnergy Ireland to carry out a planning stage peat stability risk assessment (PSRA) as part of the environmental impact assessment for the proposed Scart Mountain Wind Farm site in the townlands of Knocknanask, Tooranaraheen, Knocknasheega, Scart Mountain, Toor, Moneygorm East and Lackenrea in County Waterford.

This report sets out the methodology used to assess the peat stability risk, the activities undertaken and the results of the peat stability assessment. This report should be read along with Chapter 8 of the Scart Mountain Wind Farm Environmental Impact Assessment Report (EIAR) and its appendices.

2.1. Description of the Development

A summary of the overall proposed project is as follows:

- Erection of 15 no. wind turbines with an overall blade tip height range from 179.5 m to 185 m inclusive, a rotor diameter range from 149 m to 163 m inclusive, a hub height range from 102.5 m to 110.5 m inclusive, and all associated foundations and hard-standing areas in respect of each turbine;
- Permanent upgrade to the existing forest entrance onto the L5055 local road in the townland of Lackenrea to be used as a construction entrance. It will also be used for operational phase access for HGVs only;
- Construction of 6 no. permanent site entrances to form 3 no. local road crossing points to enable site access during construction (on the L5054, L5055 and L1026 in the townlands of Moneygorm, Knocknasheega and Tooranaraheen respectively). The entrance associated with the crossing point on the L5054 will also function as an operational phase access for light vehicles only;
- Temporary improvements and modifications to 1 no. location at the junction of the N72 and the L1027 (known as Boheravaghera Cross or Affane Cross) to facilitate delivery of oversized loads and turbine delivery, in the townland of Crinnaghtaun West, Co. Waterford;
- Construction of 2 no. temporary construction compounds located within the northern and southern ends of the site, with associated temporary site offices, parking areas and security fencing;
- Erection of 1 no. Meteorological Mast of 100 m above existing ground level for the measuring of meteorological conditions, with a lightning finial extending above the mast;
- 2 no. temporary borrow pits;
- Permanent construction of approximately 12 km new internal site access roads and upgrade of approximately 7.2 km existing internal site roads, to include passing bays and all associated drainage, all within the wind farm site;

- Construction of temporary and permanent drainage and sediment control systems;
- Construction of 1 no. permanent 110kV electrical substation including:
- 1 no. EirGrid control building containing worker welfare facilities and equipment store;
- 1 no. Independent Power Producer control building containing high voltage switch room, site offices, kitchen facilities, storeroom and toilet amenities;
- All electrical plant and infrastructure and grid ancillary services equipment;
- Parking;
- Lighting;
- Security Fencing;
- Wastewater holding tank;
- Rainwater harvesting equipment;
- All associated infrastructure and services including site works and signage.
- All related site works and ancillary development including signage, berms, landscaping, and soil excavation;
- Forestry felling (both permanent and temporary) to facilitate construction and operation including biodiversity enhancement measures, of the proposed project and any onsite forestry replanting;
- All associated underground electrical and communications cabling connecting the wind turbines to the proposed wind farm substation.
- Temporary improvements and modifications to 4 no. locations adjacent to the public road to facilitate delivery of oversized loads and turbine delivery in the townlands of Crinnaghtaun West, Ballyduff East and Rathpatrick;
- Permanent widening of sections of the L5055 within the road corridor (to 4.5 m running width) to facilitate delivery of oversized loads/turbines and construction of 9 no. passing bays along the border between the townlands of Crinnaghtaun West, Lacken, Cluttahina, Turbeha, Belleville and Lackenrea;
- All works associated with the connection of the proposed wind farm to the national electricity grid, which will be via a permanent tail fed 110 kV underground cable connection (approximately 15.5 km cable length of which approximately 13.3 km of which will be in the public road corridor) to the existing 110 kV Dungarvan Substation in the townland of Killadangan, Co. Waterford. There are 4 no. watercourse crossings on the proposed grid connection route (GCR) (of which 3 are classed as rivers and 1 is a stream);

A 35-year operational life from the date of full commissioning of the entire wind farm is being sought for all works (other than temporary and permanent works specified above), and the subsequent decommissioning. Permission is being sought for a period of 10 years. The full proposed project has been considered and has been addressed as part of the EIAR.

The proposed wind farm site is located between Cappoquin, Bellinamult and Millstreet, in Co. Waterford. The site of the proposed wind farm is located approximately 4 km northeast of Cappoquin, and approximately 13 km northwest of Dungarvan. Throughout this EIAR, reference may be made to the EIAR study area.

The site of the proposed wind farm has an area of approximately 982 ha and comprises an elongated land parcel approximately 8 km long in the north/south direction and is approximately 1.9 km wide in an east/west direction at the widest point. The site lies between the R671 and the R669, on the southeastern side of the Knockmealdown Mountains.

The land use/activities on the site of the proposed wind farm are primarily commercial forestry, with some areas of open peatland that is grazed. The surrounding landscape is a mixture of agricultural land with some forestry and pockets of peatland (Plate 2.1). Shallow peaty soils /peat was encountered on Knocknanask. Peat was largely removed in the 1940s – 1970s and the remaining shallow peat is in dry condition, with the vast majority less than 0.5m, and many areas with no peat. No deep peat was found to the south of the site.

2.2. Statement of authority

Ciaran Reilly & Associates is a specialist geotechnical engineering practice delivering a range of consultancy services to the private and public sectors across Ireland and the UK. Ciaran Reilly & Associates was established in 2016 and is based in Co. Westmeath.

This report was prepared by Dr Ciaran Reilly. Dr Reilly (BE, PhD, PGDip, CEng, MIEI, Registered Ground Engineering Specialist (UK RoGEP)) is a geotechnical engineer with over 15 years' experience in civil and geotechnical engineering consultancy, contracting, and research. He worked for several years in industry before completing his PhD in Trinity College Dublin in 2014. Since then, he has undertaken a diverse range of environmental impact assessment and engineering design projects as senior engineer and more recently as director of Ciaran Reilly & Associates.

2.3. Peat Failures

Peat landslides represent one end of a spectrum of natural processes of peat degradation. They have potential to cause fatalities, injury and damage to infrastructure and farmland. They also have the potential to cause significant damage to peatland habitats.

Excavations works on electricity infrastructure construction sites can induce slope failures due to the low basal strength in peat, even in relatively flat sites. These peat failures induced by excavations can extend significantly beyond the excavations, likely due to seepage forces caused by intentional or accidental drainage of the peat.

The potential for peat failure at this site is examined with respect to wind farm construction and associated activity.

2.4. Methodology

The evaluation of the peat stability at the site was carried out in accordance with the document "Peat Landslide Hazard and Risk Assessments, Best Practice Guide for Proposed Electricity Generation Developments – Second edition" (Scottish Government, 2017). The geotechnical and peat stability assessment at the site included the following activities:

- Desk Study,
- Site reconnaissance including peat depth measurement,
- Review of ground investigation carried out at the site by Ground investigations Ireland (GII),
- Review of digital surface model data,
- Peat stability assessment using a qualitative approach, and
- Peat stability assessment using a deterministic approach.

The risk assessment approach is discussed in detail in Section 5.

3. Ground Investigation

3.1. Desk study

A desk study was undertaken to collate and review background information in advance of the site survey. The desk study involved the following:

- Examination of the Geological Survey Ireland (GSI) datasets pertaining to geology, landslide susceptibility, and the GSI borehole database,
- Examination of Environmental Protection Agency (EPA) data, and
- Preparation of site maps and suitable field sheets for the site survey.

The desk study information obtained is referenced below. Following the desk study and the site survey, geological maps were generated in GIS and are included in the Soils and Geology chapter of the main EIAR and reproduced in Appendix 1. The ground investigation information is included in the Soils and Geology chapter of the main EIAR.

Publicly available sources of mapping, aerial photography and satellite imagery were consulted to establish the expected ground conditions, topography, and condition of the site in the past. The following sources were referred to:

- Ordnance Survey historical mapping,
- Geological Survey Ireland mapping,
- EPA mapping,
- Publicly available satellite photography (Google Maps & Bing Maps), and
- LiDAR digital terrain model data.

3.2. Field work

Site surveys relating to the soil and geological environment and ground investigations were undertaken between August and January 2024. These surveys included:

- Site walkovers by Ciaran Reilly & Associates and TOBIN staff between August 2023 and November 2023 to review the ground conditions and assess the topography, geomorphology, and requirements for site investigations,
- 32 nr peat probes and hand vane tests by Ciaran Reilly & Associates staff throughout the site,
- 99 nr peat probes by TOBIN staff throughout the site,
- 9 nr Russian sampler borings, 24 nr trial pits, and 6 nr rotary core boreholes by Ground Investigations Ireland throughout the site.

The logs and records of the investigations can be found in Appendix 8-1 to the Land, Soils and Geology chapter of the main EIAR. The locations of investigations and a resulting peat depth map are provided as Figure 8-6 of the main EIAR, reproduced as 11303-023-P. DEP-S.BO-TOB-A in Appendix 1 of this report. The observations made during the walkover survey are used to prepare the Peat Stability Risk Register included as Appendix 3 of this report.

4. Detailed Site Assessment

4.1. Site Topography and Geomorphology

The site topography and geomorphology are discussed in detail in the Land, Soils & Geology Chapter of the EIAR and reference is made to the chapter herein. The topography of the site is hilly and undulating, steeply in places, with elevation levels ranging from between 160 to 440mOD. Several streams cut through the site, draining typically to the south. For the purposes of the stability assessment, an overall view was taken on the topography of the site and individual drainage features were not assessed. LiDAR digital terrain model data were obtained and interrogated to provide a generalised ground profile for peat stability assessment.

4.2. Local Bedrock Geology

Geological Survey Ireland bedrock mapping shows that the majority of the site is underlain by the Knockmealdown Sandstone Formation of medium grained pink-purple sandstone. The extreme eastern end of the site is underlain by the Ballytrasna Formation of purple mudstone and sandstone. There are no mapped faults within the site footprint.

Bedrock geology beneath the site is illustrated in Figure 8-5 of the Land, Soils and Geology chapter of the main EIAR.

4.3. Local soils and subsoils

Geological Survey Ireland quaternary mapping, representing the top 1.0m of the soil column but excluding the topsoil, shows the majority of the site as underlain by Glacial Till derived from Devonian sandstones with significant areas of outcropping rock at the topographical high points of Knocknanask and Knocknasheega. Scree deposits are indicated around Knocknanask and a narrow band of Alluvium is shown along the Glenshelane River valley. Teagasc soils mapping shows the upper layer of soil at the site is characterised as Peaty Gleys and Peaty Podzols, Lithosols, and Peats.

The quaternary geology (subsoil) is shown in Figure 8-4 of the Land, Soils and Geology chapter of the main EIAR and the Teagasc topsoil mapping is shown in Figure 8-2 and 8-3 of the Land, Soils and Geology chapter of the main EIAR. A thin peaty topsoil layer overlying glacial till was observed regularly during the walkover survey, with an example shown in Figure 1.

Figure 1 – Typical peaty topsoil layer over glacial till

4.4. Water courses

The site is in the Glennafallia, Glenshelane, Farnane, Finisk, and Moneygorm subcatchments of the Blackwater catchment. Drainage is to the south. Many are incised streams which have cut through peat and glacial till to reach an equilibrium level in the till or at bedrock level. The river network in the vicinity of the site is shown in map P23044_DR001 of Appendix 1. Turbine 1 is the closest turbine to a significant stream, at a distance of approximately 50m. Proximity to a water course is used to assess the risk of peat stability at individual infrastructure elements in Section 5 of this report.

4.5. Previous failures

A review of the landslide information on the GSI Irish Landslides Database indicated that the nearest recorded landslides occurred in the Knockmealdown Mountains but more than 4.0km west of the site in. Recorded landslides GSI_LS14-0118 occurred at 300mOD and GSI_LS14-0129 and occurred at elevations over 730mOD. All three events had "no apparent impact". GSI_LS16-0048 was a small landslide on the cliff by the River Blackwater after a few rainy days, again with “no apparent impact”. This was over 8km from the site. A map of these events is provided in Figure 2.

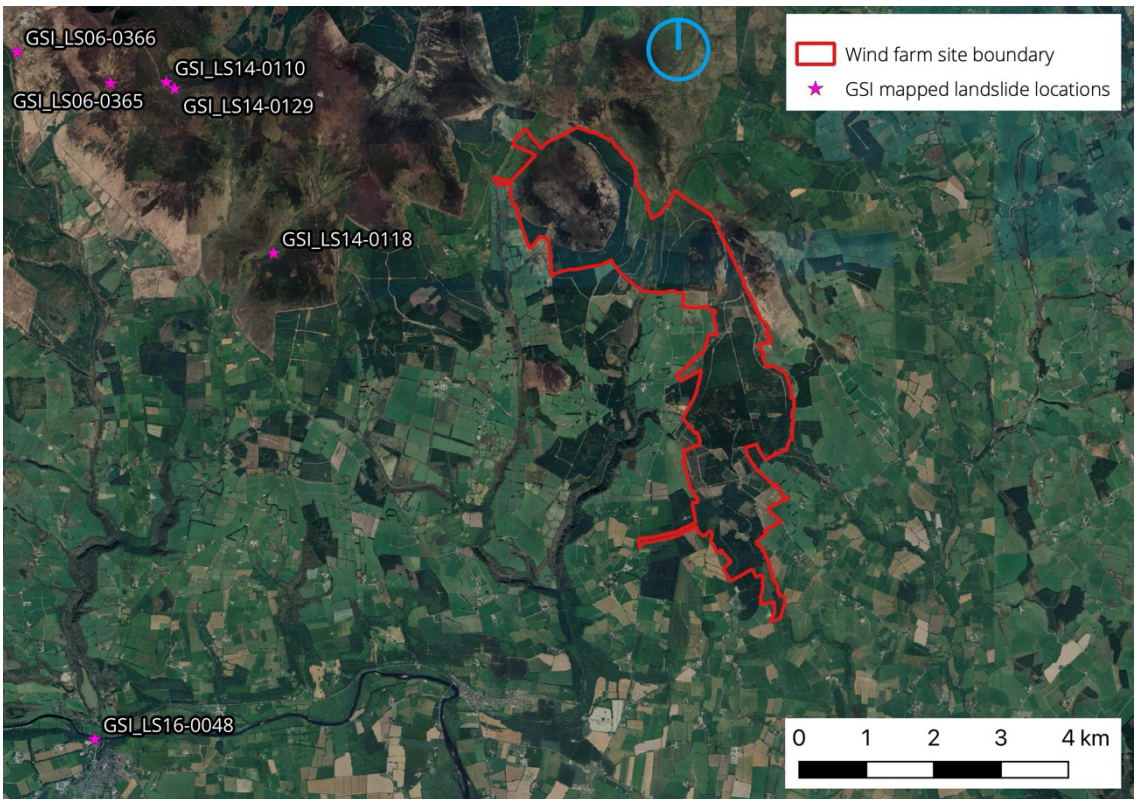


Figure 2 – Mapped landslide events (Source: GSI National Landslide Susceptibility Mapping, 2021)

4.6. Landslide susceptibility

Geological Survey Ireland (2021) publish a national landslide susceptibility map based on a risk assessment approach taking various factors such as topography and soil type into account. It should be noted that the GSI risk assessment is an initial indicative view which is useful to highlight areas for further assessment and is taken account of to assess the risk of peat stability at individual infrastructure elements in Section 5 of this report. Further, the GSI risk assessment only accounts for the current site topographic and hydrological conditions. The development of wind farm infrastructure can alter these parameters in the temporary and/or permanent case.

The mapped landslide susceptibility for the site is shown in map P23044_DR002 in Appendix 1. Of the 15 proposed turbines, 1 is in an area of "high" landslide susceptibility, 6 are in areas of "moderately high" susceptibility, and the remaining 8 are in areas of "low" susceptibility. A summary is shown in Table 1.

Table 1 – Landslide susceptibility (from GSI data)

Turbine Nr	Susceptibility
1	Moderately high
2	Moderately high
3	Moderately high
4	Moderately high
5	Moderately high
6	High
7	Moderately high
8	Low
9	Low
10	Low
11	Low
12	Low
13	Low
14	Low
15	Low

No evidence of historic peat failure was identified during the site walkover. During the geotechnical investigation by trial pits, 21 of the 24 trial pit side walls were noted as being stable, with just 3 spalling or collapsing. This suggests stable soil conditions.

4.7. Ground Investigation

A number of phases of ground investigation (GI) of the development area were carried out as outlined in the previous section. These investigations confirmed the general geology indicated in the geological mapping. Locations of the ground investigations and a peat depth map generated from the data are shown in 11303-023-P. DEP-S.BO-TOB-A provided in Appendix 1. The relevant ground investigation reports and data are presented in Appendix 8-1 to the Land, Soils and Geology chapter of the EIAR.

Typical findings were 0.4 to 1.6m of TOPSOIL or PEAT over soft to stiff brown to black slightly sandy gravelly (silty) CLAY with sub angular to sub rounded cobbles and boulders. CLAY was sometimes reported as peaty and with organic content. Several trial pits terminated due to obstructions in the form of large boulders. MADE GROUND was noted in places as gravel, crushed rock, and gravelly clay. Groundwater was encountered in 13 of the 24 trial pits, at depths from 0.6 to 3.0m bgl.

There was limited peat found at the site. Five of 24 trial pits and 4 of 9 gouge augers found “peat”, to depths of between 0.1 and 1.6m bgl. There were a further eight findings of “peaty” or “organic” material, generally at shallow depths, as shown in Table 2.

Table 2 – Organic soil found by GII investigations

Exploratory hole	Description	Depth (m bgl)
GA01	Dark brown plastic pseudo-fibrous PEAT	0.25
GA05	Very soft brown slightly sandy spongy pseudo-fibrous PEAT with organic matter	0.1
GA07	Soft brown slightly sandy spongy pseudo-fibrous PEAT with organic matter and rootlets	0.2
GA09	Dark brown plastic pseudo-fibrous PEAT	0.4
TP02	Black slightly gravelly slightly clayey plastic pseudo-fibrous PEAT over black slightly clayey plastic pseudo-fibrous PEAT	1.6
	Soft to firm brownish black slightly sandy gravelly peaty CLAY	1.9
TP03	Soft brown sandy gravelly CLAY with some sub angular to sub rounded cobbles and boulder and organic matter	1.3
TP04	MADE GROUND dark brownish grey slightly sandy clayey fine to coarse sub angular to sub rounded Gravel with many angular to sub angular cobbles and boulders and organic matter	0.4
	Soft to firm brown slightly sandy gravelly CLAY with many angular to sub angular cobbles and occasional organic matter	0.7
TP05	Dark brown slightly clayey plastic pseudo-fibrous PEAT	0.7
TP06	Dark brown slightly clayey plastic pseudo-fibrous PEAT with grass and rootlets	0.2
TP07	Black slightly clayey plastic pseudo-fibrous PEAT	0.2
TP09	Black slightly clayey plastic pseudo-fibrous PEAT	0.3
TP13	POSSIBLE MADE GROUND black slightly sandy gravelly Clay with many sub angular to sub rounded cobbles and boulders and organic matter	0.7
TP14	Soft to firm orangish black slightly sandy very gravelly CLAY with many angular to sub angular cobbles and boulders and organic matter	0.4

TP17	Soft to firm black slightly sandy very gravelly CLAY with some sub angular to sub rounded cobbles and organic matter	0.7
TP20	Soft black slightly sandy slightly gravelly CLAY with organic matter	0.9

The walkover study carried out in August 2023 found limited evidence of peat deposits. The peaty or organic deposits found were limited in depth and extent and usually confined to the topsoil layer. Of 32 peat probes undertaken in suspect areas, peaty or soft materials were found in 18, to depths of between 0.1 and 0.8m bgl with an average depth of 0.3m.

5. Qualitative Peat Stability Assessment

5.1. Material properties

For the purposes of the peat stability assessment, material properties are assessed for Peat at the site. The results of the GII (2023) investigation are used along with comparable experience to derive the required properties.

The correlation of Amaryan et al (1973) as cited by Carlsten (2000) is used, along with comparable experience, to derive a conservative characteristic undrained shear strength value for the Peat. Four moisture content tests were carried out on samples of Peat. The moisture content of the Peat ranges from 60% to 476%. Taking the maximum moisture content of 476% and assuming an R value of 4, an undrained shear strength of 28.0kPa is assessed. A conservative view is taken on this, and based on comparable experience, a characteristic undrained shear strength of 10kPa is assessed for the Peat at the site. Where relevant, local strengths are assessed based on local field vane measurements, with a vane correction of 0.5 used (Edil, 2001 and Mesri & Ajlouni, 2007).

Based on a range of published guidance including Long (2005) and O'Kelly and Zhang (2013), the Peat was assumed to have effective stress parameter values φ′ = 28° and c′ = 4kPa.

A bulk weight of 10kN/m^3 is assumed for the Peat based on comparable experience and published data (e.g. Osorio-Salas (2012), O'Kelly (2017), and Trafford and Long, 2019).

The derived and assumed characteristic parameter values for the Peat are summarised in Table 3.

Table 3 – Characteristic parameter values

Material / Parameter	Peat
Bulk Weight (γ_k) [kN/m^3]	10
Undrained shear strength ($c_{u,k}$) [kPa]	10
Effective cohesion (c'_k)	4
Effective angle of shearing resistance (Φ'_k) [degrees]	28

5.2. Qualitative risk assessment procedure

The guidelines set out four categories of risk and recommends various mitigation / avoidance actions for each category. The categories of risk are:

1. Insignificant;
2. Significant;
3. Substantial; and
4. Serious.

The concept of risk analysis for a particular hazard presented in the guidelines referred to the publication entitled "Scottish Road Network Landslides Study" by Winter et al. (2005) and is presented as follows:

Hazard Ranking = Hazard x Exposure

Where:

- Hazard = The likelihood of the landslide event occurring
- Exposure = The effect and consequences that the event may have

Table 4 presents the scale of the likelihood and Table 5 presents the classification of exposure ratings based on a percentage of total project cost/time. These classifications are taken from the report entitled Peat Landslide Hazard and Risk Assessments, Best Practice Guide for Proposed Electricity Generation Developments – Second edition (Scottish Government, 2017).

Table 4 – Qualitative assessment of peat landslide Hazard over the lifetime of the development (Scottish Government, 2017)

Scale	Likelihood	Probability of occurrence
5	Almost certain	> 1 in 3
4	Probable	1 in 10 – 1 in 3
3	Likely	1 in 10^2 – 1 in 10
2	Unlikely	1 in 10^7 – 1 in 10^2
1	Negligible	< 1 in 10^7

Table 5 – Qualitative assessment of peat landslide Exposure over the lifetime of the development (Scottish Government, 2017)

Scale	Exposure	Impact as % damage to (or loss of) receptor
5	Extremely high effect	> 100% of asset
4	Very high effect	10% - 100%
3	High effect	4% - 10%
2	Low effect	1% - 4%
1	Very low effect	< 1% of asset

Using Table 4 and Table 5 it is possible to assign a hazard ranking for each zone by multiplying the hazard by the exposure. This will result in a hazard ranking between 1 to 25 (Table 6). Following the result, mitigation measures can be targeted and a revised assessment, post-control measures, is carried out. Through the various design iterations initial control measures implemented a mitigation by design approach where turbines were moved to lower risk areas. Further control measures are listed in Section 8 and the Peat Stability Risk Register in Appendix 3. This report is therefore an assessment of the final turbine locations.

Table 6 – Hazard ranking and suggested actions (Scottish Government, 2017)

Hazard Ranking	Designation	Action suggested
17-25	High	Avoid project development.
10-16	Medium	Project should not proceed unless the hazard can be avoided or mitigated without significant environmental effect, in order to reduce hazard ranking to low or negligible.
5-9	Low	Project may proceed pending further investigation to refine assessment and mitigate hazard through relocation or re-design.
1-4	Negligible	Project should proceed with monitoring and mitigation of peat landslide hazards as appropriate.

The proposed wind farm and associated infrastructure is located in an elevated and undulating landscape with steep terrain. GSI landslide susceptibility mapping (Geological Survey Ireland, 2021) indicates that 7 of 15 assessment areas are in areas of "moderately high" or "high" landslide susceptibility, as shown in map P23044_DR001 in Appendix 1.

It should be noted that the GSI assessment only accounts for the current site topographic and hydrological conditions and is not intended to be used in isolation to determine actual onsite risk. The development of a wind farm can alter these parameters in the temporary and/or permanent case. Excavations for turbine foundations are often several metres deep and represent a significant alteration to the local topography in the short term. This can have a significant effect on the stability of the material local to the turbine.

During the geotechnical investigation by trial pits, some of the walls of the trial pits spalled and collapsed to a certain extent. The material shear strength was measured in hand vane tests. Given this, the likelihood of an excavation collapsing during construction is generally in the range "likely" to "probable" in the absence of mitigation. A non-exhaustive listing of possible proposed mitigation measures is provided in Section 8 of this report.

The significance of a collapse in terms of cost and programme is likely to be in the range "very low effect" to "extremely high effect" as the affected area due to a collapse could range from a very localised area up to a major peat slide event feeding into a watercourse.

Mitigation measures can be put in place during the construction of the scheme to reduce the likelihood of an excavation collapsing. Possible mitigation measures include stepping or battering back of excavations to a safe angle (as determined through a slope stability assessment by a competent temporary works designer) or construction of a temporary sheet pile wall or rock fill berm to support the peat during construction.

The assessment process described above was applied to discrete areas of the site, with common topography and ground conditions, and is summarised in Table 7. This assessment is based on information from geological maps from GSI, the available aerial and satellite mapping, walkovers, and the site-specific ground investigation undertaken. The Peat Stability Risk Register that this summary table is derived from is presented in Appendix 3, where detailed risk registers for each assessment area are provided.

Table 7 – Peat Stability Risk Register Summary

Assessment area	Pre-control measure risk rating	Post-control measure risk rating
Turbine 1	Low	Low
Turbine 2	Low	Negligible
Turbine 3	Medium	Low
Turbine 4	Low	Low
Turbine 5	Low	Low
Turbine 6	Medium	Low
Turbine 7	Low	Low
Turbine 8	Negligible	Negligible
Turbine 9	Negligible	Negligible
Turbine 10	Negligible	Negligible
Turbine 11	Negligible	Negligible
Turbine 12	Negligible	Negligible
Turbine 13	Negligible	Negligible
Turbine 14	Negligible	Negligible
Turbine 15	Negligible	Negligible
Met mast	Low	Negligible

Notes: Assessment based on mitigation measures suggested in Section 8 and the Peat Stability Risk Register in Appendix 3.

While in the absence of mitigation, two areas are rated as *"medium"* risk, it is noted that in all cases a *"low"* to *"negligible"* risk rating is achieved by the implementation of suitable and common-place mitigation measures. Following mitigation, the risk ranking of the development is considered to be *"low"* to *"negligible"*. It is concluded that the site is suitable for the proposed electricity generation development.

6. Deterministic peat stability assessment

In addition to the qualitative assessment carried out in Section 5, a deterministic peat stability assessment was carried out based on the results of the ground investigation carried out on the site.

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 a peat slide. An adverse condition of one of the above-mentioned factors alone is unlikely to result in peat failure.

6.1. Methodology

To assess the factor of safety for a peat slide, an undrained and drained analysis has been undertaken to determine the stability of the peat slopes on site. The undrained case examines the stability in the short term, while the drained case examines the long term, including the effects of extreme weather events.

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.

The formula used to determine the factor of safety for the undrained condition is as follows (Bromhead, 1986):

$$ODF = \frac{c_{u,d}}{\gamma z \sin\beta \cos\beta}$$

Where:

- ODF = Overdesign Factor (analogous to Factor of Safety, however ODF > 1.0 indicates satisfactory stability.
- $c_{u,d}$ = Design value of undrained shear strength
- γ = Bulk unit weight of material
- z = Depth to failure plane assumed as depth of peat or soft soil
- β = Slope angle

The formula used to determine the factor of safety for the drained condition is as follows (Bromhead, 1986):

$$ODF = \frac{c'_d + (\gamma z - \gamma_w h_w)\cos^2\beta \tan\phi'_d}{\gamma z \sin\beta \cos\beta}$$

Where:

- ODF = Overdesign Factor (analogous to Factor of Safety, however ODF > 1.0 indicates satisfactory stability.
- c'_d = Effective cohesion, assumed as

γ = Bulk unit weight of material
z = Depth to failure plane assumed as depth of peat (minimum 0.3m assumed, higher local values used if found
γ_w = Unit weight of water
h_w = Height of water table above failure plane
β = Slope angle
φ' = Effective stress friction angle

6.2. Effects of weather events

The drained loading condition applies in the long term. This condition examines the effect of the change in groundwater level because of rainfall on the stability of the peat slopes. For the drained analysis the level of the water table above the failure surface is required to calculate the factor of safety for the peat slope. In order to represent varying water levels within the peat slopes, a sensitivity analysis is carried out which assesses varying water level in the peat slopes i.e. water levels ranging between 0 and 100% of the peat depth is conducted, where 0% equates to the peat being completely dry and 100% equates to the peat being fully saturated. By carrying out such a sensitivity analysis with varying water level in the peat slopes, the effects of intense rainfall and extreme dry events were analysed.

6.3. Results and discussion

The results of the analysis are shown in Appendix 2. The assessment takes account of:

1. Slope angle, as derived from LiDAR digital terrain model data,
2. Material strength, as derived from site-specific ground investigation and comparable experience,
3. Likely loadings during the construction period, and
4. Extreme weather events.

The calculations are formulated in accordance with Eurocode 7, where partial factors are applied to soil strength parameters and loadings to achieve a satisfactory level of reliability in the design.

All overdesign factors (ODF) were greater than 1.0, indicating that the stability is satisfactory in both short term (undrained) and long term (drained) condition. Hence, a general *"low"* to *"negligible"* risk rating for peat instability is appropriate for the proposed development.

For the case of Turbine 6, highlighted as *"high"* landslide susceptibility risk in Section 4, local deterministic risk assessments have downgraded the risk to what would be considered *"low"*. This is due to the relatively shallow depths of peat encountered during ground investigations (0.2 to 0.4m).

7. Summary and Conclusions

Ciaran Reilly & Associates has been instructed by TOBIN Consulting Engineers (TOBIN) on behalf of FuturEnergy Ireland to carry out a planning stage peat stability risk assessment (PSRA) as part of the environmental impact assessment for the proposed Scart Mountain Wind Farm site in the townlands of Knocknanask, Tooranaraheen, Knocknasheega, Scart Mountain, Toor, Moneygorm East and Lackenrea in County Waterford.

The PSRA was carried out in accordance with Peat Landslide Hazard and Risk Assessments, Best Practice Guide for Proposed Electricity Generation Developments – Second edition (Scottish Government, 2017). The report sets out the methodology used to assess the peat stability risk, the activities undertaken, and the results of the peat stability assessment. The report should be read along with the Soils and Geology chapter of the overall Environmental Impact Assessment Report (EIAR) and its appendices.

Following application of mitigation measures, including consideration to the siting of infrastructure to minimise the risk, the findings of the planning stage PSRA indicate a *"low"* to *"negligible"* hazard ranking for instability related to the requirement for excavations on the site, subject to appropriate mitigation measures. Routine and common place mitigation measures will be put in place during the detailed design and construction of the scheme to reduce the likelihood of a failure. Required mitigation measures include stepping or battering back of excavations to a safe angle (as determined through a detailed slope stability assessment by a competent temporary works designer) or construction of a temporary sheet pile wall or rock fill berm to support the peat during construction. It is concluded that the site is suitable for the proposed development.

For the case of Turbine 6, highlighted as *"high"* landslide susceptibility risk in Section 4.6 (desktop information), local deterministic risk assessments have downgraded the risk to what would be considered *"low"*. This is due to the relatively shallow depths of peat encountered during ground investigations (0.2 to 0.4m).

Deterministic stability assessments indicate that the materials are considered to be stable in the short (undrained) and long (drained) term, including under the influence of extreme weather events, hence justifying the *"low"* to *"negligible"* hazard rankings assigned.

Best practice guidance regarding the management of peat stability must be inherent in the construction phase of the project and further recommendations are provided in the following section.

8. Recommendations

8.1. Detailed Design

The following outlines an overview of the tasks for the detailed design phase:

- Develop a design stage PRSA to include detailed descriptions of mitigations at specific locations.
- Mitigations to be implemented at detailed design shall include but are not limited to:
    - Detailed design of drainage system.
    - Hydrological assessment of stream flows to inform culvert sizing.
    - Detailing of monitoring regime for peat movement.
    - Identification of areas requiring site-specific temporary works design.
    - Specification of additional site investigations inclusive of in situ testing and laboratory testing in specific risk areas on the site.
- Update the Peat Stability Risk Register.

8.2. Construction Phase:

The following outlines an overview of the tasks for the construction phase:

- Client's Geotechnical Engineer to provide a Geotechnical Induction to all contractor supervisory staff.
- Client to appoint a Site Geotechnical Supervisor to carry out supervision of site works as required. The Site Geotechnical Supervisor will be required to inspect that works are carried in accordance with the requirements of the PSRA, identifying new risks and ensuring all method statements for works are in place and certified.
- Retain a Site Geotechnical Folder which contains all the information relevant to the geotechnical aspects of the site including but not limited to Geotechnical Risk Register, Peat Stability Risk Register, site investigation information, method statements etc.
- Contractor to develop a Method Statement for the works to be carried out in each of the PSRA areas cognisant of the required mitigating measures.
- Mitigations to be implemented at construction stage shall include but are not limited to:
    - Measures to maintain hydrology of area as far as possible.
    - Limiting heights of stockpiling of materials.
    - Excavated material to be removed to designated deposition areas.
    - Stepping or battering back of excavations to a safe angle (as determined through a detailed slope stability assessment by a competent temporary works designer) or construction of a temporary sheet pile wall or rock fill berm to support the peat during construction.
    - Implementation of monitoring regime for peat movement.
    - Frequent monitoring and inspection during construction and operation of floating roads.
    - Provision and management of a robust drainage system.

    - Site-specific temporary works design by competent temporary works designer.
    - If required, carry out additional site investigations inclusive of in situ testing and laboratory testing in specific risk areas on the site.
- Client's Geotechnical Engineer/Site Geotechnical Supervisor to approve the method statement.
- Contractor to provide tool box talks and on-site supervision prior to and during the works.
- Daily sign off by supervising staff on completed works.
- Implementation of emergency plan and unforeseen event plan by the contractor.

8.3. Operation and Maintenance Phase:

The following outlines an overview of the tasks for the operation and maintenance phase:

- Communication of residual peat risk to appropriate site operatives.
- Ongoing monitoring of residual risks and maintenance if required. Such items would consist of regular inspection of drains and culverts to prevent blockages and inspections of specific areas such as settlement ponds and floated access roads after a significant rainfall event.

9. References

Bromhead, E.N. (1986). *The Stability of Slopes.* Surrey University Press.

Carlsten, P. (2000). *Geotechnical properties of some Swedish peats.* NGM – 2000, Nordic Geotechnical Meeting, Helsinki, 2000, pp 51-60.

Edil, T.B. 2001. *Site characterisation in peat and organic soils.* Proc. Int. Conf. on In Situ Measurement of Soil Properties and Case Histories, Bali, Indonesia, pp 49 – 59.

Environmental Protection Agency, 2022. *EPA Map Viewer* https://gis.epa.ie/EPAMaps/.

GeoHive. 2022. Historical Mapping. Ordnance Survey Ireland. *https://webapps.geohive.ie/mapviewer/index.html*

Geological Survey Ireland. 2022. *Online Mapping.* https://www.gsi.ie/Mapping.htm

Geological Survey Ireland. 2021. *Landslide Susceptibility Map Ireland 2021.* https://www.gsi.ie/en-ie/programmes-and-projects/geohazards/projects/Pages/Landslide-Susceptibility-Mapping.aspx

Ground Investigations Ireland. 2023. *Scart Mountain - Broemountain. Ground Investigation Report.* April 2024. Ref. 13014-07-23.

I.S. EN 1997-1:2005 + AC:2013 + NA+2015. *Eurocode 7: Geotechnical design - Part 1: General rules (Including Irish National Annex).* Dublin, National Standards Association of Ireland.

Long, M. 2005. *Review of peat strength, peat characterisation and constitutive modelling of peat with reference to landslides.* Studia Geotechnica et Mechanica, 27 (3-4): 67-90. http://hdl.handle.net/10197/4898

Mesri, G. and Ajlouni, M. 2007. *Engineering properties of fibrous peats.* Journal of Geotechnical and Geoenvironmental Engineering, 133 (7), pp. 850- 866.

O'Kelly, B.C. and Zhang, L. (2013). *Consolidated-drained triaxial compression testing of peat.* Geotechnical Testing Journal 36(3): 310–321, http://dx.doi.org/10.1520/GTJ20120053.

O'Kelly, B.C. (2017). *Measurement, interpretation and recommended use of laboratory strength properties of fibrous peat.* Geotechnical Research, 4(3), 136–171 http://dx.doi.org/10.1680/jgere.17.00006

Ordnance Survey Ireland. 2022. *GeoHive spatial data* www.geohive.ie.

Osorio-Salas, J. P. (2012). *Vacuum consolidation field test on a pseudo-fibrous peat.* PhD thesis, Trinity College Dublin.

Scottish Government. 2017. *Peat Landslide Hazard and Risk Assessments, Best Practice Guide for Proposed Electricity Generation Developments – Second edition.*

Skempton, A. W. & DeLory, F. A. 1957. *Stability of natural slopes in London Clay.* Proc 4th Int. Conf. On Soil Mechanics and Foundation Engineering, Rotterdam, vol. 2, pp.72-78.

Trafford, A. and Long, M. (2019). *Relationship between Shear-Wave Velocity and Undrained Shear Strength of Peat.* Journal of Geotechnical and Geoenvironmental Engineering 146(7), https://doi.org/10.1061/(ASCE)GT.1943-5606.0002298

APPENDIX 1: GEOLOGICAL MAPS, GROUND INVESTIGATION LOCATIONS, AND PEAT DEPTH MAPS

7°48'0"W

52°12'0"N

608000

616000

600000

N

BSdl

KM

BS

KT

LLS

Legend

- Study Area
- Lower Limestone Shale
- Ballytrasna Formation
- Doon Lava Member
- Kiltorcan Formation
- Knockmealdown Sandstone Formation

0 0.5 1 1.5 2

Kilometers

NOTES

1. FIGURED DIMENSIONS ONLY TO BE TAKEN FROM THIS DRAWING
2. ALL DRAWINGS TO BE CHECKED BY THE CONTRACTOR ON SITE
3. ENGINEER TO BE INFORMED OF ANY DISCREPANCIES BEFO REANY WORK COMMENCES
4. ALL LEVELS RELATE TO ORDNANCE SURVEY DATUM AT MALIN HEAD

Rev	Date	Description	By	Chkd.
D01	16/11/2023	Draft issue	S.P	S.OR

Client: FuturEnergy Ireland

Project: Scartmountain Wind Farm

Title: Underlying Bedrock Geology Map

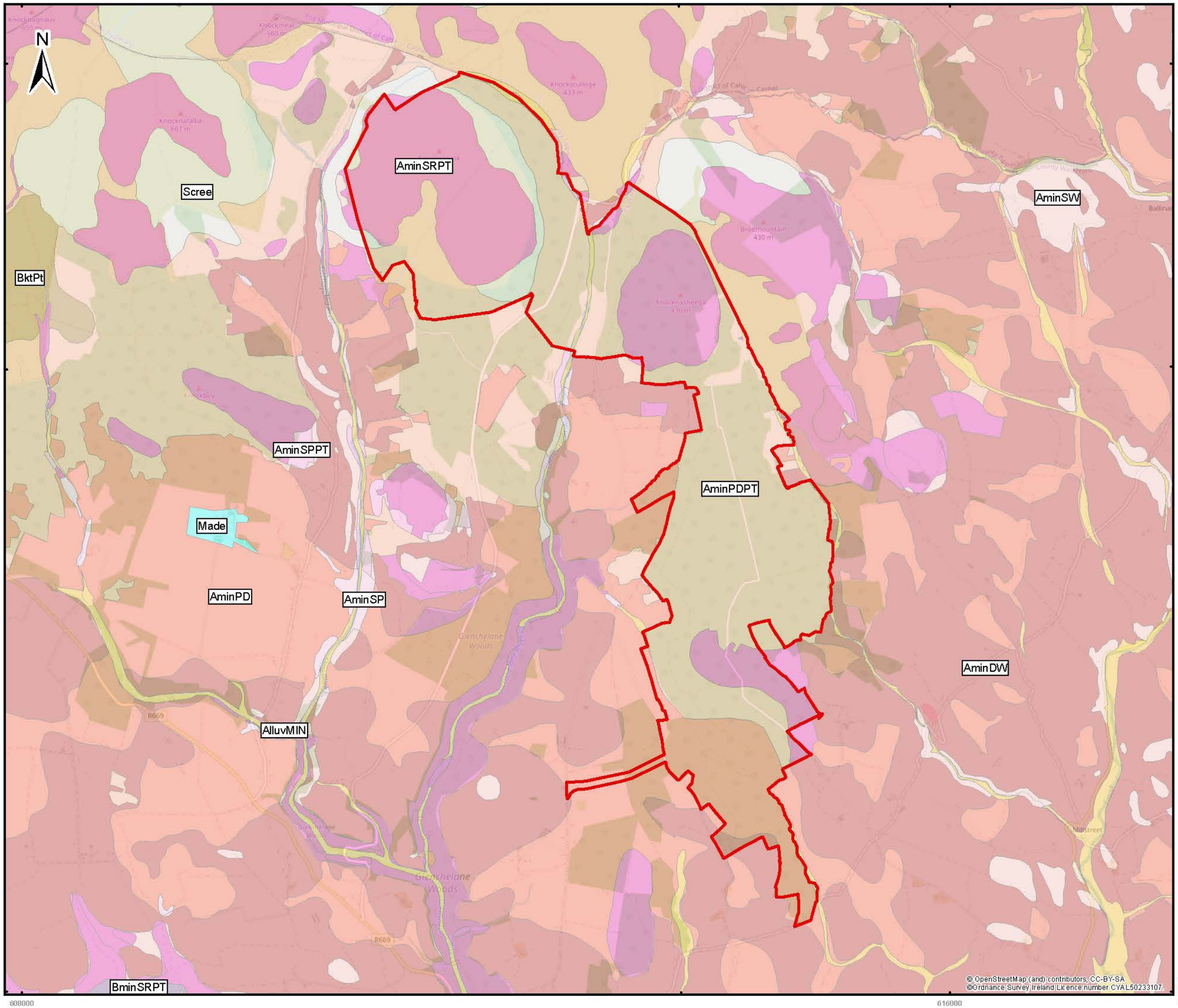
Scale @ A3: 1:30,000

Prepared by:	Checked by:	Date:
M. Nolan	J. Dillon	November 2023

TOBIN CONSULTING ENGINEERS
Tel: +353-(0)1-8030406
Email: info@tobin.ie
www.tobin.ie

Map Ref: 11303-019-B.GEO-S.BO-TOB-D01

Draft: D01



Legend

- Study Area
- AminDW - Acid Brown Earths, Brown Podzolics
- AminPD - Surface water Gleys, Ground water Gleys
- AminPDPT - Peaty Gleys
- AminSW - Lithosols, Regosols
- AminSP - Surface water Gleys (Shallow), Ground water Gleys (Shallow)
- AminSPPT - Peaty Gleys (Shallow)
- AminSRPT - Podzols (Peaty), Lithosols, Peats
- BminSRPT
- BktPt
- AlluvMIN - Mineral alluvium
- Scree
- Made

0 0.5 1 1.5 2
Kilometers

NOTES
1. FIGURED DIMENSIONS ONLY TO BE TAKEN FROM THIS DRAWING
2. ALL DRAWINGS TO BE CHECKED BY THE CONTRACTOR ON SITE
3. ENGINEER TO BE INFORMED OF ANY DISCREPANCIES BEFORE ANY WORK COMMENCES
4. ALL LEVELS RELATE TO ORDNANCE SURVEY DATUM AT MALIN HEAD

Rev	Date	Description	By	Chkd.
D01	16/11/2023	Draft issue	S.P	S.OR

Client: FuturEnergy Ireland

Project: Scartmountain Wind Farm

Title: Soils Map

Scale @ A3: 1:30,000

Prepared by:	Checked by:	Date:
M. Nolan	J. Dillon	November 2023

TOBIN CONSULTING ENGINEERS
Tel: +353-(0)1-8030406
Email: info@tobin.ie
www.tobin.ie

Map Ref: 11303-017-SO-S.BO-TOB-D01

Draft: D01

7°48'0"W

52°12'0"N

608000

616000

600000

N

Rck

Scree

BktPt

TDSs

A

Legend

Study Area

Subsoils

- A, Alluvium
- BktPt, Blanket Peat
- Rck, Bedrock outcrop or subcrop
- Scree, Scree
- TDSs, Till derived from Devonian sandstones

0 0.5 1 1.5 2

Kilometers

NOTES

1. FIGURED DIMENSIONS ONLY TO BE TAKEN FROM THIS DRAWING
2. ALL DRAWINGS TO BE CHECKED BY THE CONTRACTOR ON SITE
3. ENGINEER TO BE INFORMED OF ANY DISCREPANCIES BEFORE ANY WORK COMMENCES
4. ALL LEVELS RELATE TO ORDNANCE SURVEY DATUM AT MALIN HEAD

Rev	Date	Description	By	Chkd.
D01	16/11/2023	Draft issue	S.P	S.OR

Client: FuturEnergy Ireland

Project: Scartmountain Wind Farm

Title: Sub-Soils Map

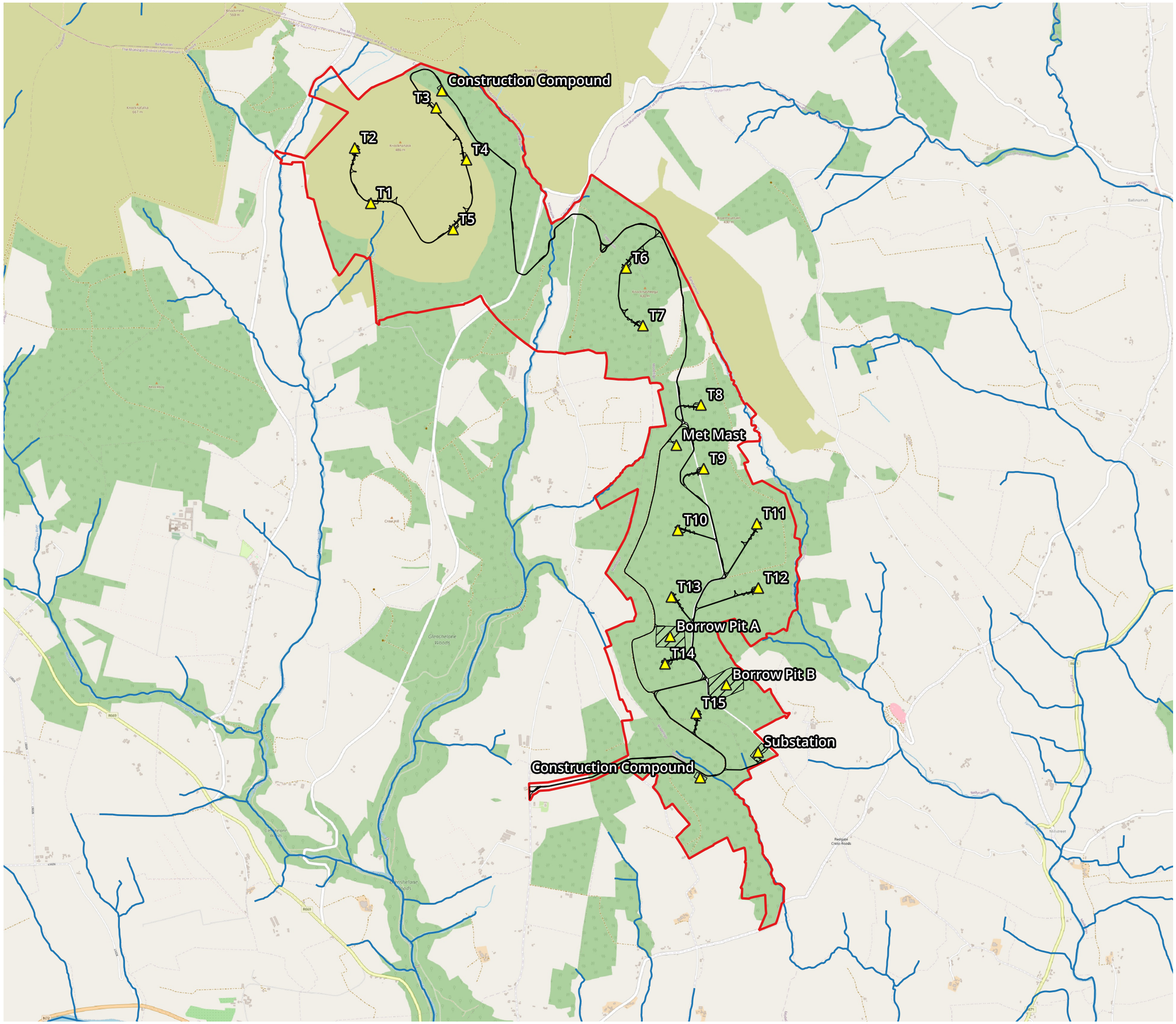
Scale @ A3: 1:30,000

Prepared by:	Checked by:	Date:
M. Nolan	J. Dillon	November 2023

TOBIN CONSULTING ENGINEERS
Tel: +353-(0)1-8030406
Email: info@tobin.ie
www.tobin.ie

Map Ref: 11303-018-SSO-S.BO-TOB-D01

Draft: D01



N

Wind farm site boundary
Proposed infrastructure
Proposed turbine
River route (EPA)

Water courses (EPA mapping)

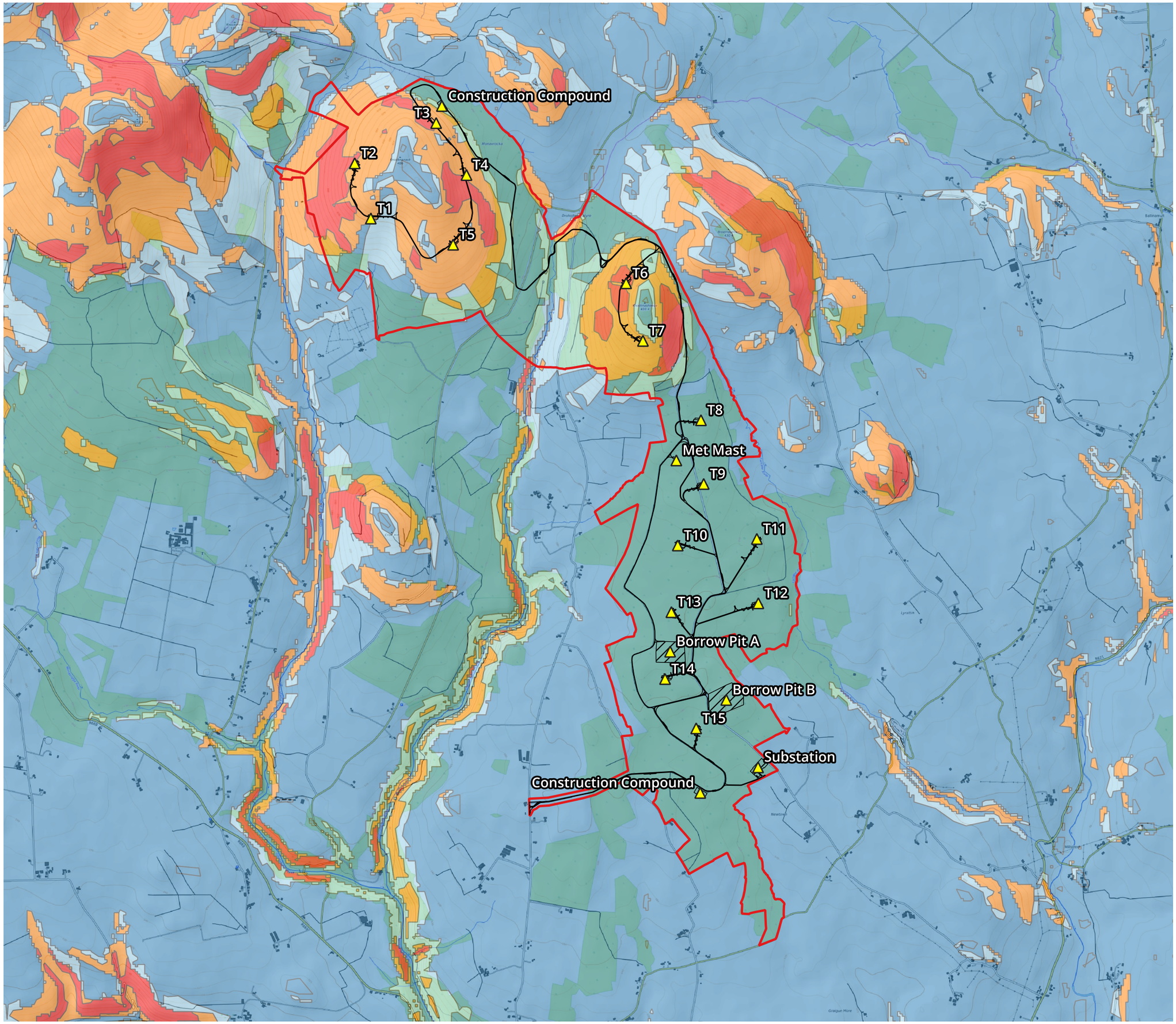
Scart Mountain Wind Farm

Doc Nr: P23044_DR001
Rev: P02
Scale: 1:30,000 @ A3
Date: 31.10.24
Drawn: CR

0 750 1,500 m

Ciaran Reilly & Associates
Consulting Geotechnical Engineers

Midland Business Hub, Mullingar,
Co. Westmeath, Ireland.
M: +353 (0)86 4005110
E: ciaran@ciaranreilly.ie W: www.ciaranreilly.ie



N

- Wind farm site boundary
- Proposed infrastructure
- Proposed turbine

Landslide susceptibility (GSI)

- High
- Moderately High
- Moderately Low
- Low

Landslide susceptibility (GSI, 2021)

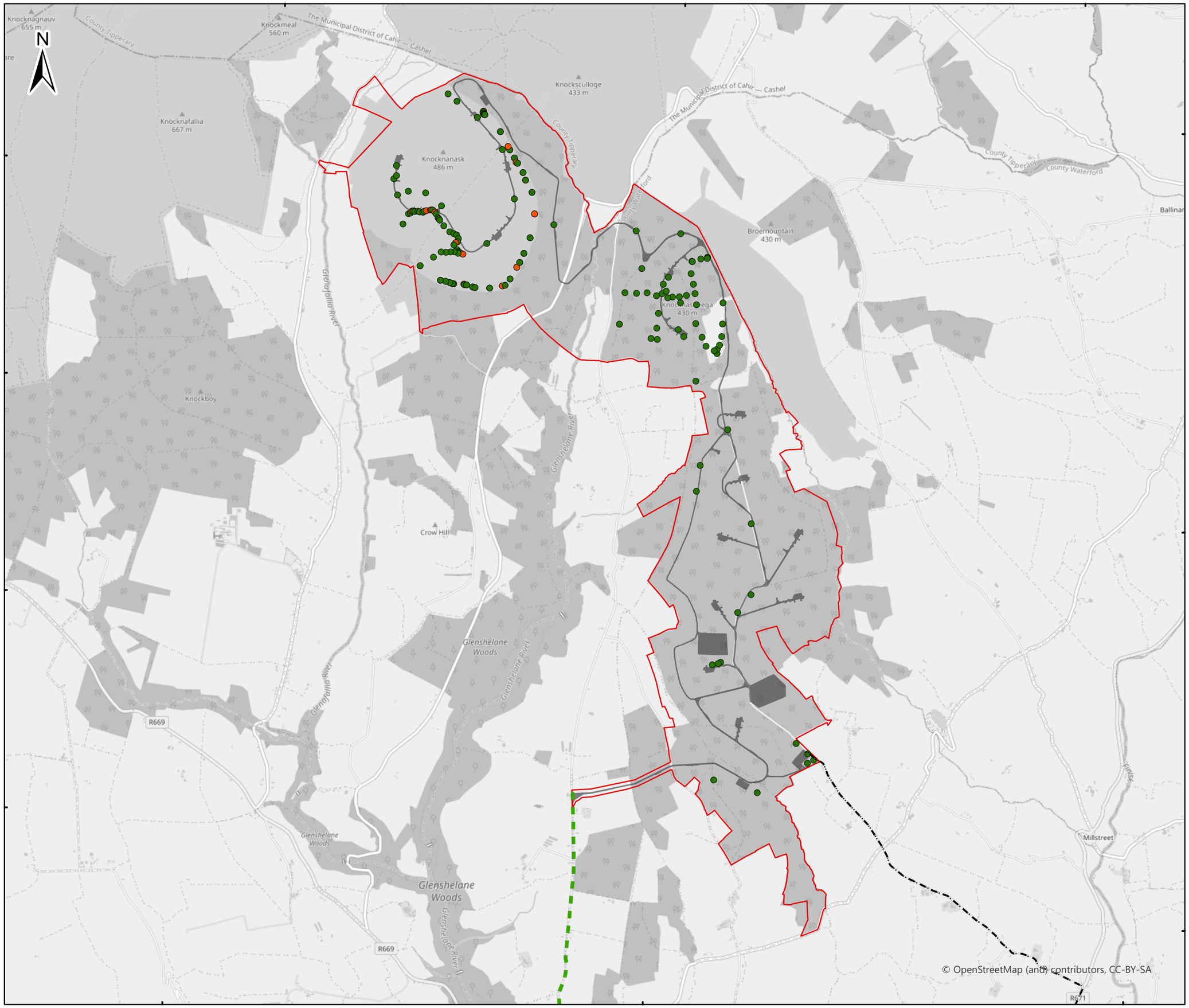
Scart Mountain Wind Farm

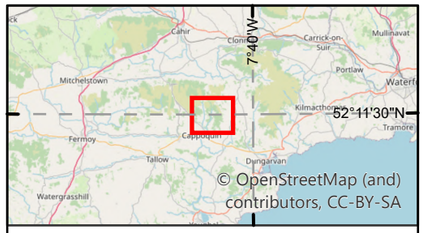
Doc Nr: P23044_DR002
Rev: P02
Scale: 1:30,000 @ A3
Date: 31.10.24
Drawn: CR

0 750 1,500 m

Ciaran Reilly & Associates
Consulting Geotechnical Engineers

Midland Business Hub, Mullingar,
Co. Westmeath, Ireland.
M: +353 (0)86 4005110
E: ciaran@ciaranreilly.ie W: www.ciaranreilly.ie





Legend

- Proposed Wind Farm Site
- Proposed infrastructure footprint within the proposed wind farm site
- Proposed Grid Connection Route

Peath Depth (m)

- ≤ 0.50
- 0.5- 0.7

0 500 1,000
Meters

NOTES

1. FIGURED DIMENSIONS ONLY TO BE TAKEN FROM THIS DRAWING\
2. ALL DRAWINGS TO BE CHECKED BY THE CONTRACTOR ON SITE\
3. ENGINEER TO BE INFORMED OF ANY DISCREPANCIES BEFORE ANY \ WORK COMMENCES\
4. ALL LEVELS RELATE TO ORDNANCE SURVEY DATUM AT MALIN HEAD

Rev	Date	Description	By	Chkd.
A	12/12/2024	First issue	S.P	J.S

Client: FuturEnergy Ireland

Project: Scart Mountain Wind Farm

Title: Figure 8-6 Peat Depth

Scale @ A3: 1:30,000

Prepared by:	Checked by:	Date:
S.Pezzetta	J.Staunton	December 2024

TOBIN
Tel: +353-(0)1-8030406
Email: info@tobin.ie
www.tobin.ie

Map Ref: 11303-023-P. DEP-S.BO-TOB-A

Draft: A

APPENDIX 2: PEAT STABILITY CALCULATIONS

Peat stability calculations for Scart Mountain Wind Farm
Deterministic stability calculcation outputs
Drained Case 1 and Case 2

Nr	Assessment area	Land use	Relevant GI	Description	φ'_k	φ'_d	c'k	c'd	Peat depth	Water level in peat	Slope (deg)	Surcharge	Design surcharge	Unit weight	Case 1	Case 2
					deg	*deg*	*kPa*	*kPa*	*m*	*m*	*deg*	*m*	*m*	*kN/m³*	*ODF*	*ODF*
1	Turbine 1	Forestry	CRA & TOBIN probes	Probes found 0.1 to 0.8m peat	28	23.0	4.0	2.9	0.8	0.8	12.8	1	1.3	17	1.77	1.83
2	Turbine 2	Forestry	CRA & TOBIN probes for T1	Probes found 0.1 to 0.8m peat	28	23.0	4.0	2.9	0.8	0.8	17.0	1	1.3	16	1.34	1.37
3	Turbine 3	Forestry	TP02, TP05, TP09, CRA & TOBIN peat probes	1.6m peat in TP, probes 0.1 to 0.7m	28	23.0	4.0	2.9	1.2	1.2	16.4	1	1.3	15	1.08	1.27
4	Turbine 4	Forestry	TP07, TOBIN probes	Probes found 0.1 to 0.6m peat	28	23.0	4.0	2.9	0.6	0.6	16.4	1	1.3	14	1.68	1.52
5	Turbine 5	Forestry	TP06, TP10	Probes found 0.1 to 0.7m peat	28	23.0	4.0	2.9	0.7	0.7	12.8	1	1.3	13	1.91	1.88
6	Turbine 6	Forestry	TP11, TP17, TOBIN probes	Probes found 0.2 to 0.4m peat	28	23.0	4.0	2.9	0.4	0.4	17.4	1	1.3	11	2.42	1.61
7	Turbine 7	Forestry	TP12, TP20, TOBIN probes	Probes found 0.2 to 0.4m peat	28	23.0	4.0	2.9	0.4	0.4	12.5	1	1.3	12	3.18	2.22
8	Turbine 8	Fire road & forestry	TP19, TP20	No peat found, 0.3m assumed	28	23.0	4.0	2.9	0.3	0.3	2.8	1	1.3	10	20.03	10.95
9	Turbine 9	Fire road & forestry	TP19, TP16	No peat found, 0.3m assumed	28	23.0	4.0	2.9	0.3	0.3	3.0	1	1.3	10	18.29	9.99
10	Turbine 10	Fire road & forestry	TP19, TP16	No peat found, 0.3m assumed	28	23.0	4.0	2.9	0.3	0.3	3.1	1	1.3	10	17.52	9.57
11	Turbine 11	Fire road & forestry	TP19, TP16	No peat found, 0.3m assumed	28	23.0	4.0	2.9	0.3	0.3	3.8	1	1.3	10	14.62	7.98
12	Turbine 12	Fire road & forestry	TP19, TP16	No peat found, 0.3m assumed	28	23.0	4.0	2.9	0.3	0.3	3.4	1	1.3	10	16.23	8.86
13	Turbine 13	Fire road & forestry	TP19, TP16	No peat found, 0.3m assumed	28	23.0	4.0	2.9	0.3	0.3	3.4	1	1.3	10	16.06	8.77
14	Turbine 14	Fire road & forestry	CRA & TOBIN probes	No peat found, 0.3m assumed	28	23.0	4.0	2.9	0.3	0.3	2.7	1	1.3	10	20.53	11.22
15	Turbine 15	Fire road & forestry	TP15	No peat found, 0.3m assumed	28	23.0	4.0	2.9	0.3	0.3	2.0	1	1.3	10	27.01	14.77
16	Met mast	Forestry	TP19	No peat found, 0.3m assumed	28	23.0	4.0	2.9	0.3	0.3	3.1	1	1.3	10	17.84	9.74

	Case 1	Case 2
Minimum	1.1	1.3
Average	1.6	1.6
Maximum	1.9	1.9

Notes:

Characteristic drained shear strength of peat used.

Condition 1 relates to no surcharge loading.

Condition 2 takes account of a surcharge equivalent to fill depth of 1m of peat or typical construction traffic i.e. 10kPa.

Slope inclination (β) based on site readings and analysis of LiDAR data.

A minimum slope of 0.5 degrees has been considered.

Peat depths based on desk study, walkover, trial pits, boreholes, and peat probes at the site.

31/10/2024

Nr	Assessment area	Land use	Relevant GI	Description	$c_{u,fv,avg}$	Vane correction	$c_{u,k}$	$c_{u,d}$	Peat depth	Slope	Surcharge	Design surcharge	Unit weight	Case 1	Case 2
					kPa		*kPa*	*kPa*	*m*	*deg*	*m*	*m*	kN/m^3	*ODF*	*ODF*
1	Turbine 1	Forestry	CRA & TOBIN probes	Probes found 0.1 to 0.8m peat	30	0.5	10.0	7.1	0.8	12.8	1	1.3	10	4.1	1.6
2	Turbine 2	Forestry	CRA & TOBIN probes for T1	Probes found 0.1 to 0.8m peat	30	0.5	10.0	7.1	0.8	17.0	1	1.3	10	3.2	1.2
3	Turbine 3	Forestry	TP02, TP05, TP09, CRA & TOBIN peat probes	1.6m peat in TP, probes 0.1 to 0.7m	23	0.5	10.0	7.1	1.2	16.4	1	1.3	10	2.2	1.1
4	Turbine 4	Forestry	TP07, TOBIN probes	Probes found 0.1 to 0.6m peat		0.5	10.0	7.1	0.6	16.4	1	1.3	10	4.4	1.4
5	Turbine 5	Forestry	TP06, TP10	Probes found 0.1 to 0.7m peat	25	0.5	10.0	7.1	0.7	12.8	1	1.3	10	4.7	1.7
6	Turbine 6	Forestry	TP11, TP17, TOBIN probes	Probes found 0.2 to 0.4m peat		0.5	10.0	7.1	0.4	17.4	1	1.3	10	6.3	1.5
7	Turbine 7	Forestry	TP12, TP20, TOBIN probes	Probes found 0.2 to 0.4m peat		0.5	10.0	7.1	0.4	12.5	1	1.3	10	8.5	2.0
8	Turbine 8	Fire road & forestry	TP19, TP20	No peat found, 0.3m assumed		0.5	10.0	7.1	0.3	2.8	1	1.3	10	49.7	9.3
9	Turbine 9	Fire road & forestry	TP19, TP16	No peat found, 0.3m assumed		0.5	10.0	7.1	0.3	3.0	1	1.3	10	45.3	8.5
10	Turbine 10	Fire road & forestry	TP19, TP16	No peat found, 0.3m assumed		0.5	10.0	7.1	0.3	3.1	1	1.3	10	43.4	8.1
11	Turbine 11	Fire road & forestry	TP19, TP16	No peat found, 0.3m assumed		0.5	10.0	7.1	0.3	3.8	1	1.3	10	36.2	6.8
12	Turbine 12	Fire road & forestry	TP19, TP16	No peat found, 0.3m assumed		0.5	10.0	7.1	0.3	3.4	1	1.3	10	40.2	7.5
13	Turbine 13	Fire road & forestry	TP19, TP16	No peat found, 0.3m assumed		0.5	10.0	7.1	0.3	3.4	1	1.3	10	39.8	7.5
14	Turbine 14	Fire road & forestry	CRA & TOBIN probes	No peat found, 0.3m assumed		0.5	10.0	7.1	0.3	2.7	1	1.3	10	50.9	9.5
15	Turbine 15	Fire road & forestry	TP15	No peat found, 0.3m assumed		0.5	10.0	7.1	0.3	2.0	1	1.3	10	67.0	12.6
16	Met mast	Forestry	TP19	No peat found, 0.3m assumed		0.5	10.0	7.1	0.3	3.1	1	1.3	10	44.2	8.3

	Case 1	Case 2
Minimum	2.2	1.1
Average	3.7	1.4
Maximum	4.7	1.7

Notes:

Undrained shear strength of peat is limited to 10kPa (characteristic value) or local values if less than 10kPa.

Condition 1 relates to no surcharge loading.

Condition 2 takes account of a surcharge equivalent to fill depth of 1m of peat or typical construction traffic i.e. 10kPa.

Slope inclination (β) based on site readings and analysis of LiDAR data.

A minimum slope of 0.5 degrees has been considered.

Peat depths based on desk study, walkover, trial pits, boreholes, and peat probes at the site.

31/10/2024

APPENDIX 3: PEAT STABILITY RISK REGISTER

SCART MOUNTAIN WIND FARM - PEAT STABILITY RISK REGISTER

Assessment area nr: 1
Location: Turbine 1

Factor	Value	Pre-control measures			Post-control measures		
		Probability	Impact	Risk	Probability	Impact	Risk
Ground conditions							
Peat depth & condition	Probes found 0.1 to 0.8m peat	2	3	**6**	2	2	**4**
Peat strength (kPa)	10	2	3	**6**	2	2	**4**
Visible surface geology	Peaty topsoil	2	3	**6**	2	2	**4**
Topography							
Elevation (mOD)	390 to 420	4	3	**12**	3	3	**9**
Slope angle (deg.)	12	4	3	**12**	3	3	**9**
Evidence of previous slips	No	2	3	**6**	2	2	**4**
Landslide susceptibility	Moderately high	3	3	**9**	2	2	**4**
Hydrology							
Distance from watercourse	< 50m	4	4	**16**	3	3	**9**
Evidence of surface water flow	Yes	3	4	**12**	2	3	**6**
Evidence of subsurface flow	No	1	3	**3**	1	3	**3**
Quantative assessment							
FOS - drained	1.8	1	4	**4**	1	3	**3**
FOS - undrained	1.6						
Total (pre / post control measures)			**92**			59	
Max possible			**275**			**275**	
Overall hazard assessment (pre / post control measures)			**8**			5	
Overall hazard ranking			**Low**			**Low**	

Control Measures	
1	Develop design stage Peat Stability Risk Assessment.
2	Maintain hydrology of area as far as possible.
3	Installation of interceptor drains upslope to divert any surface water away from works area.
4	Use of experienced geotechnical staff for detailed design & temporary works design.
5	Engage experienced contractors and trained operatives to carry out the work.
6	Inspection regime for access roads during works.

SCART MOUNTAIN WIND FARM - PEAT STABILITY RISK REGISTER

Assessment area nr: 2
Location: Turbine 2

Factor	Value	Pre-control measures			Post-control measures		
		Probability	Impact	Risk	Probability	Impact	Risk
Ground conditions							
Peat depth & condition	Probes found 0.1 to 0.8m peat	2	3	**6**	2	2	**4**
Peat strength (kPa)	10	2	3	**6**	2	2	**4**
Visible surface geology	Peaty topsoil	2	3	**6**	2	2	**4**
Topography							
Elevation (mOD)	400 to 440	3	3	**9**	2	3	**6**
Slope angle (deg.)	17	4	3	**12**	3	3	**9**
Evidence of previous slips	No	2	3	**6**	2	2	**4**
Landslide susceptibility	Moderately high	3	3	**9**	2	2	**4**
Hydrology							
Distance from watercourse	>400	1	3	**3**	1	2	**2**
Evidence of surface water flow	No	1	3	**3**	1	3	**3**
Evidence of subsurface flow	No	1	3	**3**	1	3	**3**
Quantative assessment							
FOS - drained	1.3	3	4	**12**	3	3	**9**
FOS - undrained	1.2						
Total (pre / post control measures)		**75**			**52**		
Max possible		**275**			**275**		
Overall hazard assessment (pre / post control measures)		**7**			**5**		
Overall hazard ranking		**Low**			**Negligible**		

Control Measures	
1	Develop design stage Peat Stability Risk Assessment.
2	Installation of interceptor drains upslope to divert any surface water away from works.
3	Use of experienced geotechnical staff for detailed design & temporary works design.
4	Engage experienced contractors and trained operatives to carry out the work.
5	Inspection regime for access roads during works.

SCART MOUNTAIN WIND FARM - PEAT STABILITY RISK REGISTER

Assessment area nr: 3
Location: Turbine 3

Factor	Value	Pre-control measures			Post-control measures		
		Probability	Impact	Risk	Probability	Impact	Risk
Ground conditions							
Peat depth & condition	1.6m peat in TP, probes 0.1 to 0.7m	4	4	**16**	3	4	**12**
Peat strength (kPa)	10	3	3	**9**	2	2	**4**
Visible surface geology	Peaty topsoil	2	3	**6**	2	2	**4**
Topography							
Elevation (mOD)	400 to 430	3	3	**9**	2	3	**6**
Slope angle (deg.)	15 to 16	4	3	**12**	3	3	**9**
Evidence of previous slips	No	2	3	**6**	2	2	**4**
Landslide susceptibility	Moderately high	4	3	**12**	4	2	**8**
Hydrology							
Distance from watercourse	>300m, downslope	4	4	**16**	4	3	**12**
Evidence of surface water flow	No	2	3	**6**	1	3	**3**
Evidence of subsurface flow	No	1	3	**3**	1	3	**3**
Quantative assessment							
FOS - drained	1.1	4	4	**16**	3	3	**9**
FOS - undrained	1.1						
Total (pre / post control measures)		**111**			**74**		
Max possible		**275**			**275**		
Overall hazard assessment (pre / post control measures)		**10**			**7**		
Overall hazard ranking		**Medium**			**Low**		

Control Measures	
1	Develop design stage Peat Stability Risk Assessment.
2	Maintain hydrology of area as far as possible, including adequate sizing of watercourse diversion routes & culverts.
3	Installation of interceptor drains upslope to divert any surface water away from works.
4	Use of experienced geotechnical staff for detailed design & temporary works design.
5	Engage experienced contractors and trained operatives to carry out the work.
6	Inspection regime for access roads during works.

SCART MOUNTAIN WIND FARM - PEAT STABILITY RISK REGISTER

Assessment area nr: 4
Location: Turbine 4

Factor	Value	Pre-control measures			Post-control measures		
		Probability	Impact	Risk	Probability	Impact	Risk
Ground conditions							
Peat depth & condition	Probes found 0.1 to 0.6m peat	3	4	**12**	3	4	**12**
Peat strength (kPa)	10	3	3	**9**	2	2	**4**
Visible surface geology	Peaty topsoil	2	3	**6**	2	2	**4**
Topography							
Elevation (mOD)	390 to 420	3	3	**9**	2	3	**6**
Slope angle (deg.)	15 to 16	4	3	**12**	3	3	**9**
Evidence of previous slips	No	2	3	**6**	2	2	**4**
Landslide susceptibility	Moderately high	4	3	**12**	4	2	**8**
Hydrology							
Distance from watercourse	>400m, downslope	4	4	**16**	4	3	**12**
Evidence of surface water flow	No	1	3	**3**	1	3	**3**
Evidence of subsurface flow	No	1	3	**3**	1	3	**3**
Quantative assessment							
FOS - drained	1.7	3	4	**12**	3	3	**9**
FOS - undrained	1.4						
Total (pre / post control measures)		**100**			**74**		
Max possible		**275**			**275**		
Overall hazard assessment (pre / post control measures)		**9**			**7**		
Overall hazard ranking		**Low**			**Low**		

Control Measures	
1	Develop design stage Peat Stability Risk Assessment.
2	Maintain hydrology of area as far as possible, including adequate sizing of watercourse diversion routes & culverts.
3	Installation of interceptor drains upslope to divert any surface water away from works.
4	Use of experienced geotechnical staff for detailed design & temporary works design.
5	Engage experienced contractors and trained operatives to carry out the work.
6	Inspection regime for access roads during works.

SCART MOUNTAIN WIND FARM - PEAT STABILITY RISK REGISTER

Assessment area nr: 5
Location: Turbine 5

Factor	Value	Pre-control measures			Post-control measures		
		Probability	Impact	Risk	Probability	Impact	Risk
Ground conditions							
Peat depth & condition	Probes found 0.1 to 0.7m peat	3	4	**12**	3	4	**12**
Peat strength (kPa)	10	3	3	**9**	2	2	**4**
Visible surface geology	Peaty topsoil	2	3	**6**	2	2	**4**
Topography							
Elevation (mOD)	390 to 420	3	3	**9**	2	3	**6**
Slope angle (deg.)	10 to 13	3	3	**9**	3	2	**6**
Evidence of previous slips	No	2	3	**6**	2	2	**4**
Landslide susceptibility	Moderately high	4	3	**12**	4	2	**8**
Hydrology							
Distance from watercourse	>500m	3	4	**12**	3	3	**9**
Evidence of surface water flow	No	1	3	**3**	1	3	**3**
Evidence of subsurface flow	No	1	3	**3**	1	3	**3**
Quantative assessment							
FOS - drained	1.9	2	3	**6**	2	2	**4**
FOS - undrained	1.7						
Total (pre / post control measures)			**87**			**63**	
Max possible			**275**			**275**	
Overall hazard assessment (pre / post control measures)			**8**			**6**	
Overall hazard ranking			**Low**			**Low**	

Control Measures	
1	Develop design stage Peat Stability Risk Assessment.
2	Installation of interceptor drains upslope to divert any surface water away from works.
3	Use of experienced geotechnical staff for detailed design & temporary works design.
4	Engage experienced contractors and trained operatives to carry out the work.
5	Inspection regime for access roads during works.

SCART MOUNTAIN WIND FARM - PEAT STABILITY RISK REGISTER

Assessment area nr: 6
Location: Turbine 6

Factor	Value	Pre-control measures			Post-control measures		
		Probability	Impact	Risk	Probability	Impact	Risk
Ground conditions							
Peat depth & condition	Probes found 0.2 to 0.4m peat	3	3	**9**	3	3	**9**
Peat strength (kPa)	10	3	3	**9**	2	2	**4**
Visible surface geology	Peaty topsoil	2	3	**6**	2	2	**4**
Topography							
Elevation (mOD)	370 to 400	3	3	**9**	2	3	**6**
Slope angle (deg.)	10 to 18	4	4	**16**	3	3	**9**
Evidence of previous slips	No	2	3	**6**	2	2	**4**
Landslide susceptibility	High	5	5	**25**	5	2	**10**
Hydrology							
Distance from watercourse	>500m	3	3	**9**	3	3	**9**
Evidence of surface water flow	Yes	3	4	**12**	2	3	**6**
Evidence of subsurface flow	No	1	3	**3**	1	3	**3**
Quantative assessment							
FOS - drained	2.4	2	3	**6**	2	2	**4**
FOS - undrained	1.5						
Total (pre / post control measures)		**110**			**68**		
Max possible		**275**			**275**		
Overall hazard assessment (pre / post control measures)		**10**			**6**		
Overall hazard ranking		**Medium**			**Low**		

Control Measures	
1	Develop design stage Peat Stability Risk Assessment.
2	Installation of interceptor drains upslope to divert any surface water away from works.
3	Use of experienced geotechnical staff for detailed design & temporary works design.
4	Engage experienced contractors and trained operatives to carry out the work.
5	Inspection regime for access roads during works.

SCART MOUNTAIN WIND FARM - PEAT STABILITY RISK REGISTER

Assessment area nr: 7
Location: Turbine 7

Factor	Value	Pre-control measures			Post-control measures		
		Probability	Impact	Risk	Probability	Impact	Risk
Ground conditions							
Peat depth & condition	Probes found 0.2 to 0.4m peat	3	3	**9**	3	3	**9**
Peat strength (kPa)	10	3	3	**9**	2	2	**4**
Visible surface geology	Peaty topsoil	2	3	**6**	2	2	**4**
Topography							
Elevation (mOD)	380 to 400	3	3	**9**	2	3	**6**
Slope angle (deg.)	10 to 13	3	3	**9**	3	2	**6**
Evidence of previous slips	No	2	3	**6**	2	2	**4**
Landslide susceptibility	Moderately high	4	4	**16**	3	3	**9**
Hydrology							
Distance from watercourse	>500m	3	3	**9**	3	3	**9**
Evidence of surface water flow	No	1	3	**3**	1	3	**3**
Evidence of subsurface flow	No	1	3	**3**	1	3	**3**
Quantative assessment							
FOS - drained	3.2	1	3	**3**	1	2	**2**
FOS - undrained	2.0						
Total (pre / post control measures)				**82**			59
Max possible				**275**			**275**
Overall hazard assessment (pre / post control measures)				**7**			5
Overall hazard ranking				**Low**			**Low**

Control Measures	
1	Develop design stage Peat Stability Risk Assessment.
2	Installation of interceptor drains upslope to divert any surface water away from works.
3	Use of experienced geotechnical staff for detailed design & temporary works design.
4	Engage experienced contractors and trained operatives to carry out the work.
5	Inspection regime for access roads during works.

SCART MOUNTAIN WIND FARM - PEAT STABILITY RISK REGISTER

Assessment area nr: 8
Location: Turbine 8

Factor	Value	Pre-control measures			Post-control measures		
		Probability	Impact	Risk	Probability	Impact	Risk
Ground conditions							
Peat depth & condition	No peat found, 0.3m assumed	2	2	**4**	2	2	**4**
Peat strength (kPa)	10	2	2	**4**	2	2	**4**
Visible surface geology	Mineral soil	2	3	**6**	2	2	**4**
Topography							
Elevation (mOD)	260 to 270	3	2	**6**	2	2	**4**
Slope angle (deg.)	2 to 3	2	2	**4**	2	2	**4**
Evidence of previous slips	No	2	2	**4**	2	2	**4**
Landslide susceptibility	Low	2	2	**4**	2	2	**4**
Hydrology							
Distance from watercourse	>300m	2	2	**4**	2	2	**4**
Evidence of surface water flow	No	1	3	**3**	1	3	**3**
Evidence of subsurface flow	No	1	3	**3**	1	3	**3**
Quantative assessment							
FOS - drained	20.0	1	2	**2**	1	2	**2**
FOS - undrained	9.3						
Total (pre / post control measures)		**44**			40		
Max possible		**275**			**275**		
Overall hazard assessment (pre / post control measures)		**4**			4		
Overall hazard ranking		**Negligible**			**Negligible**		

Control Measures	
1	Installation of interceptor drains upslope to divert any surface water away from works.
2	Use of experienced geotechnical staff for detailed design & temporary works design.
3	Engage experienced contractors and trained operatives to carry out the work.
4	Inspection regime for access roads during works.

SCART MOUNTAIN WIND FARM - PEAT STABILITY RISK REGISTER

Assessment area nr: 9
Location: Turbine 9

Factor	Value	Pre-control measures			Post-control measures		
		Probability	Impact	Risk	Probability	Impact	Risk
Ground conditions							
Peat depth & condition	No peat found, 0.3m assumed	2	2	**4**	2	2	**4**
Peat strength (kPa)	10	2	2	**4**	2	2	**4**
Visible surface geology	Mineral soil	2	3	**6**	2	2	**4**
Topography							
Elevation (mOD)	230 to 240	3	2	**6**	2	2	**4**
Slope angle (deg.)	2 to 3	2	2	**4**	2	2	**4**
Evidence of previous slips	No	2	2	**4**	2	2	**4**
Landslide susceptibility	Low	2	2	**4**	2	2	**4**
Hydrology							
Distance from watercourse	>300m	2	2	**4**	2	2	**4**
Evidence of surface water flow	No	1	3	**3**	1	3	**3**
Evidence of subsurface flow	No	1	3	**3**	1	3	**3**
Quantative assessment							
FOS - drained	18.3	1	2	**2**	1	2	**2**
FOS - undrained	8.5						
Total (pre / post control measures)		**44**			40		
Max possible		**275**			**275**		
Overall hazard assessment (pre / post control measures)		**4**			4		
Overall hazard ranking		**Negligible**			**Negligible**		

Control Measures	
1	Installation of interceptor drains upslope to divert any surface water away from works.
2	Use of experienced geotechnical staff for detailed design & temporary works design.
3	Engage experienced contractors and trained operatives to carry out the work.
4	Inspection regime for access roads during works.

SCART MOUNTAIN WIND FARM - PEAT STABILITY RISK REGISTER

Assessment area nr: 10
Location: Turbine 10

Factor	Value	Pre-control measures			Post-control measures		
		Probability	Impact	Risk	Probability	Impact	Risk
Ground conditions							
Peat depth & condition	No peat found, 0.3m assumed	2	2	**4**	2	2	**4**
Peat strength (kPa)	10	2	2	**4**	2	2	**4**
Visible surface geology	Mineral soil	2	3	**6**	2	2	**4**
Topography							
Elevation (mOD)	210 to 220	3	2	**6**	2	2	**4**
Slope angle (deg.)	2 to 3	2	2	**4**	2	2	**4**
Evidence of previous slips	No	2	2	**4**	2	2	**4**
Landslide susceptibility	Low	2	2	**4**	2	2	**4**
Hydrology							
Distance from watercourse	>500m	1	2	**2**	1	2	**2**
Evidence of surface water flow	No	1	3	**3**	1	3	**3**
Evidence of subsurface flow	No	1	3	**3**	1	3	**3**
Quantative assessment							
FOS - drained	17.5	1	2	**2**	1	2	**2**
FOS - undrained	8.1						
Total (pre / post control measures)		**42**			38		
Max possible		**275**			**275**		
Overall hazard assessment (pre / post control measures)		**4**			3		
Overall hazard ranking		**Negligible**			**Negligible**		

Control Measures	
1	Installation of interceptor drains upslope to divert any surface water away from works.
2	Use of experienced geotechnical staff for detailed design & temporary works design.
3	Engage experienced contractors and trained operatives to carry out the work.
4	Inspection regime for access roads during works.

SCART MOUNTAIN WIND FARM - PEAT STABILITY RISK REGISTER

Assessment area nr: 11
Location: Turbine 11

Factor	Value	Pre-control measures			Post-control measures		
		Probability	Impact	Risk	Probability	Impact	Risk
Ground conditions							
Peat depth & condition	No peat found, 0.3m assumed	2	2	**4**	2	2	**4**
Peat strength (kPa)	10	2	2	**4**	2	2	**4**
Visible surface geology	Mineral soil	2	3	**6**	2	2	**4**
Topography							
Elevation (mOD)	200 to 210	3	2	**6**	2	2	**4**
Slope angle (deg.)	3 to 4	3	2	**6**	2	2	**4**
Evidence of previous slips	No	2	2	**4**	2	2	**4**
Landslide susceptibility	Low	2	2	**4**	2	2	**4**
Hydrology							
Distance from watercourse	>300m	2	2	**4**	2	2	**4**
Evidence of surface water flow	No	1	3	**3**	1	3	**3**
Evidence of subsurface flow	No	1	3	**3**	1	3	**3**
Quantative assessment							
FOS - drained	14.6	1	2	**2**	1	2	**2**
FOS - undrained	6.8						
Total (pre / post control measures)		**46**			40		
Max possible		**275**			**275**		
Overall hazard assessment (pre / post control measures)		**4**			4		
Overall hazard ranking		**Negligible**			**Negligible**		

Control Measures	
1	Installation of interceptor drains upslope to divert any surface water away from works.
2	Use of experienced geotechnical staff for detailed design & temporary works design.
3	Engage experienced contractors and trained operatives to carry out the work.
4	Inspection regime for access roads during works.

SCART MOUNTAIN WIND FARM - PEAT STABILITY RISK REGISTER

Assessment area nr: 12
Location: Turbine 12

Factor	Value	Pre-control measures			Post-control measures		
		Probability	Impact	Risk	Probability	Impact	Risk
Ground conditions							
Peat depth & condition	No peat found, 0.3m assumed	2	2	**4**	2	2	**4**
Peat strength (kPa)	10	2	2	**4**	2	2	**4**
Visible surface geology	Mineral soil	2	3	**6**	2	2	**4**
Topography							
Elevation (mOD)	180 to 190	2	2	**4**	2	2	**4**
Slope angle (deg.)	3 to 4	3	2	**6**	2	2	**4**
Evidence of previous slips	No	2	2	**4**	2	2	**4**
Landslide susceptibility	Low	2	2	**4**	2	2	**4**
Hydrology							
Distance from watercourse	>300m	2	3	**6**	2	2	**4**
Evidence of surface water flow	No	1	3	**3**	1	3	**3**
Evidence of subsurface flow	No	1	3	**3**	1	3	**3**
Quantative assessment							
FOS - drained	16.2	1	2	**2**	1	2	**2**
FOS - undrained	7.5						
Total (pre / post control measures)		**46**			40		
Max possible		**275**			**275**		
Overall hazard assessment (pre / post control measures)		**4**			4		
Overall hazard ranking		**Negligible**			**Negligible**		

Control Measures	
1	Installation of interceptor drains upslope to divert any surface water away from works.
2	Use of experienced geotechnical staff for detailed design & temporary works design.
3	Engage experienced contractors and trained operatives to carry out the work.
4	Inspection regime for access roads during works.

SCART MOUNTAIN WIND FARM - PEAT STABILITY RISK REGISTER

Assessment area nr: 13
Location: Turbine 13

Factor	Value	Pre-control measures			Post-control measures		
		Probability	Impact	Risk	Probability	Impact	Risk
Ground conditions							
Peat depth & condition	No peat found, 0.3m assumed	2	2	**4**	2	2	**4**
Peat strength (kPa)	10	2	2	**4**	2	2	**4**
Visible surface geology	Mineral soil	2	3	**6**	2	2	**4**
Topography							
Elevation (mOD)	180 to 190	2	2	**4**	2	2	**4**
Slope angle (deg.)	3 to 4	3	2	**6**	2	2	**4**
Evidence of previous slips	No	2	2	**4**	2	2	**4**
Landslide susceptibility	Low	2	2	**4**	2	2	**4**
Hydrology							
Distance from watercourse	>500m	2	2	**4**	2	2	**4**
Evidence of surface water flow	No	1	3	**3**	1	3	**3**
Evidence of subsurface flow	No	1	3	**3**	1	3	**3**
Quantative assessment							
FOS - drained	16.1	1	2	**2**	1	2	**2**
FOS - undrained	7.5						
Total (pre / post control measures)		**44**			40		
Max possible		**275**			**275**		
Overall hazard assessment (pre / post control measures)		**4**			4		
Overall hazard ranking		**Negligible**			**Negligible**		

Control Measures	
1	Installation of interceptor drains upslope to divert any surface water away from works.
2	Use of experienced geotechnical staff for detailed design & temporary works design.
3	Engage experienced contractors and trained operatives to carry out the work.
4	Inspection regime for access roads during works.

SCART MOUNTAIN WIND FARM - PEAT STABILITY RISK REGISTER

Assessment area nr: 14
Location: Turbine 14

Factor	Value	Pre-control measures			Post-control measures		
		Probability	Impact	Risk	Probability	Impact	Risk
Ground conditions							
Peat depth & condition	No peat found, 0.3m assumed	2	2	**4**	2	2	**4**
Peat strength (kPa)	10	2	2	**4**	2	2	**4**
Visible surface geology	Mineral soil	2	3	**6**	2	2	**4**
Topography							
Elevation (mOD)	200 to 210	3	2	**6**	2	2	**4**
Slope angle (deg.)	2 to 3	2	2	**4**	2	2	**4**
Evidence of previous slips	No	2	2	**4**	2	2	**4**
Landslide susceptibility	Low	2	2	**4**	2	2	**4**
Hydrology							
Distance from watercourse	>500m	2	2	**4**	2	2	**4**
Evidence of surface water flow	No	1	3	**3**	1	3	**3**
Evidence of subsurface flow	No	1	3	**3**	1	3	**3**
Quantative assessment							
FOS - drained	20.5	1	2	**2**	1	2	**2**
FOS - undrained	9.5						
Total (pre / post control measures)		**44**			40		
Max possible		**275**			**275**		
Overall hazard assessment (pre / post control measures)		**4**			4		
Overall hazard ranking		**Negligible**			**Negligible**		

Control Measures	
1	Installation of interceptor drains upslope to divert any surface water away from works.
2	Use of experienced geotechnical staff for detailed design & temporary works design.
3	Engage experienced contractors and trained operatives to carry out the work.
4	Inspection regime for access roads during works.

SCART MOUNTAIN WIND FARM - PEAT STABILITY RISK REGISTER

Assessment area nr: 15
Location: Turbine 15

Factor	Value	Pre-control measures			Post-control measures		
		Probability	Impact	Risk	Probability	Impact	Risk
Ground conditions							
Peat depth & condition	No peat found, 0.3m assumed	2	2	**4**	2	2	**4**
Peat strength (kPa)	10	2	2	**4**	2	2	**4**
Visible surface geology	Mineral soil	2	3	**6**	2	2	**4**
Topography							
Elevation (mOD)	170 to 190	2	2	**4**	2	2	**4**
Slope angle (deg.)	1 to 2	2	2	**4**	2	2	**4**
Evidence of previous slips	No	2	2	**4**	2	2	**4**
Landslide susceptibility	Low	2	2	**4**	2	2	**4**
Hydrology							
Distance from watercourse	>200m	3	3	**9**	2	2	**4**
Evidence of surface water flow	No	1	3	**3**	1	3	**3**
Evidence of subsurface flow	No	1	3	**3**	1	3	**3**
Quantative assessment							
FOS - drained	27.0	1	2	**2**	1	2	**2**
FOS - undrained	12.6						
Total (pre / post control measures)		**47**			40		
Max possible		**275**			**275**		
Overall hazard assessment (pre / post control measures)		**4**			4		
Overall hazard ranking		**Negligible**			**Negligible**		

Control Measures	
1	Installation of interceptor drains upslope to divert any surface water away from works.
2	Use of experienced geotechnical staff for detailed design & temporary works design.
3	Engage experienced contractors and trained operatives to carry out the work.
4	Inspection regime for access roads during works.

SCART MOUNTAIN WIND FARM - PEAT STABILITY RISK REGISTER

Assessment area nr: 16
Location: Met mast

Factor	Value	Pre-control measures			Post-control measures		
		Probability	Impact	Risk	Probability	Impact	Risk
Ground conditions							
Peat depth & condition	No peat found, 0.3m assumed	2	2	**4**	2	2	**4**
Peat strength (kPa)	10	2	2	**4**	2	2	**4**
Visible surface geology	Mineral soil	2	3	**6**	2	2	**4**
Topography							
Elevation (mOD)	240 to 250	3	2	**6**	2	2	**4**
Slope angle (deg.)	3 to 4	3	2	**6**	2	2	**4**
Evidence of previous slips	No	2	2	**4**	2	2	**4**
Landslide susceptibility	Low	2	2	**4**	2	2	**4**
Hydrology							
Distance from watercourse	<150m	4	4	**16**	3	3	**9**
Evidence of surface water flow	No	1	3	**3**	1	3	**3**
Evidence of subsurface flow	No	1	3	**3**	1	3	**3**
Quantative assessment							
FOS - drained	17.8	1	2	**2**	1	2	**2**
FOS - undrained	8.3						
Total (pre / post control measures)		**58**			**45**		
Max possible		**275**			**275**		
Overall hazard assessment (pre / post control measures)		**5**			**4**		
Overall hazard ranking		**Low**			**Negligible**		

Control Measures	
1	Installation of interceptor drains upslope to divert any surface water away from works.
2	Use of experienced geotechnical staff for detailed design & temporary works design.
3	Engage experienced contractors and trained operatives to carry out the work.
4	Inspection regime for access roads during works.
5	Maintain hydrology of area as far as possible, including adequate sizing of watercourse diversion routes & culverts.
6	Installation of interceptor drains upslope to divert any surface water away from works.