PEAT STABILITY ASSESSSMENT REPORT

FOR

MEENBOG WIND FARM, CO. DONEGAL

Prepared for:

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ACRONYMS AND SYMBOLS

AGEC	Applied Ground Engineering Consultants Ltd
BS	British Standard
c’	Effective cohesion
CMS	Construction Method Statement
c_u	Undrained strength
EC7	Eurocode 7
FoS	Factor of Safety
GSI	Geological Survey of Ireland
kPa	Kilopascals
m bgl	Metres below ground level
m	Metres
mm	Millimetres
mOD	Metres ordnance datum
ø’	Effective angle of shearing resistance
PHRAG	Peat Hazard and Risk Assessment Guide

1 NON-TECHNICAL SUMMARY

Applied Ground Engineering Consultants Ltd (AGEC) was engaged by McCarthy Keville O'Sullivan to undertake an assessment of the proposed Meenbog wind farm site with respect to peat stability. In accordance with planning guidelines compiled by the Department of the Environment, Heritage and Local Government (DoEHLG), where peat is present on a proposed wind farm development, a peat stability assessment is required.

The findings of the peat assessment, which involved analysis of over 500 locations, showed that the site has an acceptable margin of safety and is suitable for the proposed wind farm development. The findings include recommendations and control measures for construction work in peat lands to ensure that all works adhere to an acceptable standard of safety.

The proposed wind farm comprises 19 no. wind turbines with associated infrastructure including access roads (new and upgrading of existing roads), substation, construction compound/carpark, met mast, underground cables and borrow pits.

The site is an upland blanket peat area with extensive forestry. The blanket peat areas contain typically shallow peat with typically deeper peat deposits in the flatter areas on site. The forested areas contain both young and mature forestry. Up to 15km of existing access tracks are present across the site and have been in use for a number of years.

Peat thicknesses recorded during the site walkovers from over 500 probes ranged from 0 to 5.8m with an average of 1.7m. Over 80 percent of the probes recorded peat depths of less than 2.5m. Over 96 percent of peat depth probes recorded peat depths of less than 4.0m. A number of localised readings were recorded where peat depths of between 4.0 and 5.8m are present. The deeper peat areas were generally avoided when optimising the wind farm layout for site.

A walkover including intrusive peat depth probing, desk study, stability analysis and risk assessment was carried out to assess the susceptibility of the site to peat failure following the principles in Peat Landslide Hazard and Risk Assessments: Best Practice Guide for Proposed Electricity Generation Developments (Scottish Executive, 2007).

The purpose of the stability analysis is to determine the stability i.e. Factor of Safety (FoS), of the peat slopes. The FoS provides a direct measure of the degree of stability of a peat slope. A FoS of less than 1.0 indicates that a slope is unstable; a FoS of greater than 1.0 indicates a stable slope. An acceptable FoS for slopes is generally taken as a minimum of 1.3.

Based on the stability assessment carried out on the peat slopes the calculated FoS's with respect to peat instability have an acceptable margin of safety and is suitable for the proposed wind farm development. Localised areas of deeper peat deposits are present which may require specific construction methods, but do not represent a peat slide risk. The risk assessment at each infrastructure location includes a number of mitigation/control measures to ensure the continued stability of the site.

2 INTRODUCTION

2.1 Background and Experience

Applied Ground Engineering Consultants Ltd (AGEC) was initially engaged in September 2014 by McCarthy Keville O'Sullivan to undertake an assessment of the proposed wind farm site with respect to peat stability. AGEC were subsequently engaged in March 2017 by McCarthy Keville O'Sullivan to carry out an assessment of a revised wind farm layout for the Meenbog site with respect to peat stability.

AGEC have been involved in over 125 wind farm developments in both Ireland and the UK at various stages of development i.e. preliminary feasibility, planning, design, construction and operational stage and have established themselves as one of the leading engineering consultancies in peat stability assessment, geohazard mapping in peat land areas, investigation of peat failures and site assessment of peat.

The proposed Meenbog site is located approximately 8km southwest of Ballybofey, Co. Donegal.

The proposed wind farm comprises 19 no. wind turbines with associated infrastructure including access roads (new and upgrading of existing roads), substation, construction compounds, met mast and borrow pits.

A number of walkover surveys of the Meenbog wind farm site were carried out by McCarthy Keville O'Sullivan. The peat depth data recorded by McCarthy Keville O'Sullivan (2014a, 2014b & 2014c) during these walkover surveys has been used in the assessment of peat stability for the proposed wind farm site.

A number of walk-over surveys of the site was carried out by AGEC between the 29th September & 3rd October 2014 and between 20th to 24th and 28th to 29th March 2017. The peat depth data recorded by AGEC will also be used in the assessment of peat stability for the proposed wind farm site.

2.2 Peat Stability Assessment Methodology

AGEC undertook the assessment following the principles in Peat Landslide Hazard and Risk Assessments: Best Practice Guide for Proposed Electricity Generation Developments (Scottish Executive, 2007). The Peat Hazard and Risk Assessment Guide (PHRAG) is used in this report as it provides best practice methods to identify, mitigate and manage peat slide hazards and associated risks in respect of consent applications for electricity generation projects.

The best practice guide was produced following peat failures in the Shetland Islands, Scotland in September 2003 but more pertinently following the peat failure in October 2003, during the construction of a wind farm at Derrybrien, County Galway, Ireland.

The assessment of peat stability at the proposed site included the following activities:

(1) Desk study

(2) Site reconnaissance including shear strength and peat depth measurements

(3) Peat stability assessment of the peat slopes on site using a deterministic and qualitative approach

(4) Peat depth contour plan – is compiled based on the peat depth probes carried out across the site by AGEC and McCarthy Keville O'Sullivan

(5) Factor of safety plan – is compiled for the short term critical condition (undrained) for over 500 no. FoS points analysed across the site

(6) Construction buffer zone plan – identifies areas with an elevated or higher construction risk where mitigation/control measures will need to be implemented during construction to minimise the potential risks and ensure they are kept within an acceptable range

(7) A risk register is compiled to assess the potential design/construction risks at the infrastructure locations and determine adequate mitigation/control measures for each location to minimise the potential risks and ensure they are kept within an acceptable range, where necessary

A flow diagram showing the general methodology for peat stability assessment is shown in Figure 1. The methodology illustrates the optimisation of the wind farm layout based on the findings from a site reconnaissance and subsequent feedback from the peat stability and risk assessment results.

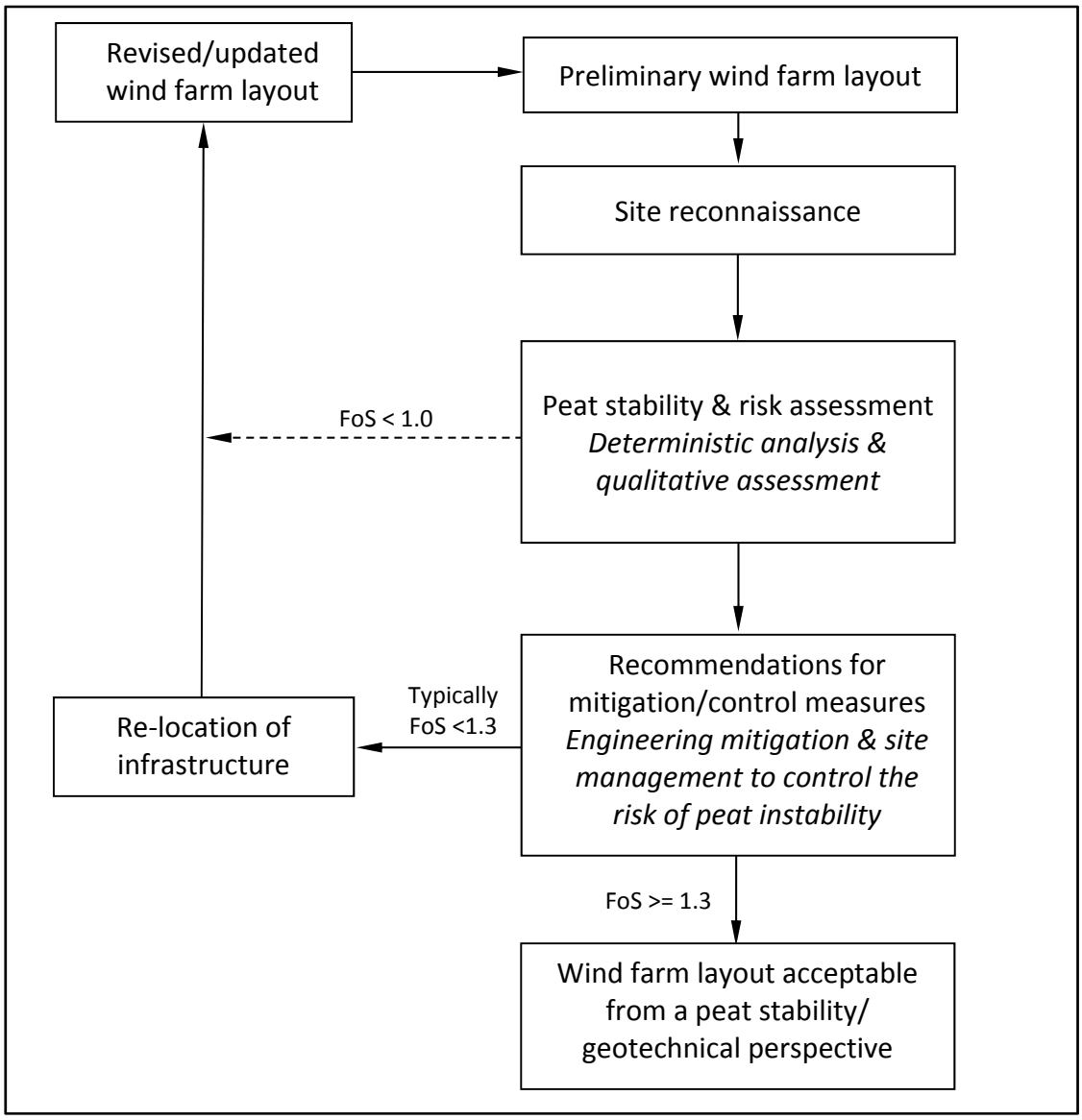

Figure 1 Flow Diagram Showing General Methodology for Peat Stability Assessment

2.3 Peat Failure Definition

Peat failure in this report refers to a significant mass movement of a body of peat that would have an adverse impact on proposed wind farm development and the surrounding environment. Peat failure excludes localised movement of peat that would occur (say) below an access road, creep movement or erosion type events.

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

2.4 Main Approaches to Assessing Peat Stability

The main approaches for assessing peat stability for wind farm developments include the following:

(a) Geomorphological

(b) Qualitative (judgement)

(c) Index/Probabilistic (probability)

(d) Deterministic (factor of safety)

Approaches (a) to (c) listed above would be considered subjective and do not provide a definitive indication of stability; in addition, a high level of judgement/experience is required which makes it difficult to relate the findings to real conditions. AGEC apply a more objective approach, the deterministic approach (as discussed in section 2.4).

As part of AGEC's deterministic approach, a qualitative risk assessment is also carried out taking into account qualitative factors, which cannot necessarily be quantified, such as the presence of mechanically cut peat, quaking peat, bog pools, sub peat water flow, slope characteristics and numerous other factors. The qualitative factors used in the risk assessment are compiled based on AGEC's experience of assessments and construction in peat land sites and peat failures throughout Ireland and the UK. This approach follows the guidelines for geotechnical risk management as given in Clayton (2001), as referenced in the best practice for Peat Hazard and Risk Assessment Guide (Scottish Executive, 2007), and takes into account the approach of MacCulloch (2005).

The risk assessment uses the results of the deterministic approach in combination with qualitative factors, which cannot be reasonably included in a stability calculation but nevertheless may affect the occurrence of peat instability to assess the risk of instability on a peat land site.

2.5 Peat Stability Assessment – Deterministic Approach

The peat stability assessment is carried out across a wide area of peatland to determine the stability of peat slopes and to identify areas of peatland that are suitable for development; this allows the layout of infrastructure on a particular wind farm site to be optimised. The assessment provides a numerical value (factor of safety) of the stability of individual parcels of peatland. The findings of the assessment discriminate between areas of stable and unstable peat, and areas of marginal stability where restrictions may apply. This allows for the identification of the most suitable locations for turbines, access roads and infrastructure.

A deterministic assessment requires geotechnical information and site characteristics which are obtained from desk study and site walkover, e.g. properties of peat/soil/rock, slope geometry, depth of peat, underlying strata, groundwater, etc. An adverse combination of the factors listed above could potentially result in instability. Using the information above a factor of safety is calculated for the stability of individual parcels of peatland on a site (as discussed in section 8).

The factor of safety is a measure of the stability of a particular slope. For any slope, the degree of stability depends on the balance of forces between the weight of the soil/peat working downslope (destabilising force) and the inherent strength of the peat/soil (shear resistance) to resist the downslope weight, see Figure 2.

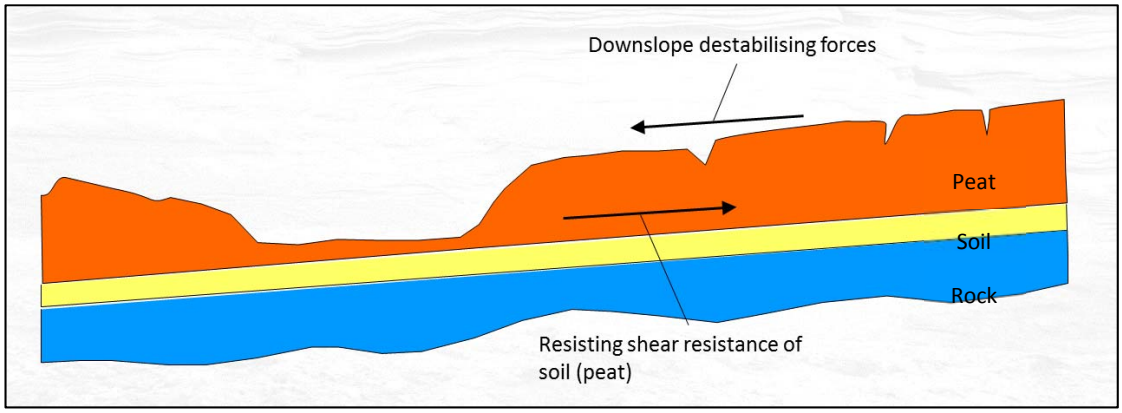

Figure 2 Peat Slope Showing Balance of Forces to Maintain Stability

The factor of safety provides a direct measure of the degree of stability of a slope and is the ratio of the shear resistance over the downslope destabilising force. Provided the available shear resistance is greater than the downslope destabilising force then the factor of safety will be greater than 1.0 and the slope will remain stable. If the factor of safety is less than 1.0 the slope is unstable and liable to fail. The acceptable range for factor of safety is typically from 1.3 to 1.4.

2.6 Applicability of the Factor of Safety (Deterministic) Approach for Peat Slopes

The factor of safety approach is a standard engineering approach in assessing slopes which is applied to many engineering materials, such as peat, soil, rock, etc.

The factor of safety approach is included in The Peat Landslide Hazard and Risk Assessments Best Practice Guide for Proposed Electricity Generation Developments (Scottish Executive, 2007); see section 5.2.2 of the guide. This guide provides best practice methods to identify, mitigate and manage peat slide hazards and associated risks in respect of consent applications for electricity generation projects.

Furthermore, the best practice guide notes that the results from the factor of safety approach 'has provided the most informative results' with respect to analysing peat stability (section 5.2.2 of the guide).

The factor of safety approach in this report includes undrained (short-term stability) and drained (long-term stability) analyses. The undrained condition is the critical condition for the development. The purpose of the drained analysis is to identify the relative susceptibility of rainfall-induced failures at the site.

Notwithstanding the above, the stability analysis used by AGEC in this report also includes qualitative factors to determine the potential for peat stability i.e. the analysis used does not solely rely on the factor of safety approach.

The deterministic analysis would be considered an acceptable engineering design approach. This concurs with best practice guidelines as referenced above.

2.7 Assessment of Intense Rainfall and Extreme Dry Events on the Peat Slopes

The deterministic approach carried out by AGEC examines intense rainfall and extreme dry events. The deterministic approach includes an undrained (short-term stability) and drained (long-term stability) analysis to assess the factor of safety for the peat slopes against a peat failure.

The drained loading condition applies in the long-term. This 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 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 been completely dry and 100% equates to the peat been 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 are considered and analysed. The results of which are presented in section 7 of this report.

3 DESK STUDY AND SITE RECONNAISSANCE

3.1 Desk Study

The main relevant sources of interest with respect to the site include:

- Geological plans
- Ordnance survey plans
- Literature review of peat failures

The Geological Survey of Ireland (GSI, 1999) geological plans for the site were used to verify the bedrock conditions.

The ordnance surveys plans were reviewed to determine if any notable features or areas of particular interest (from a geotechnical point of view) are present on the site.

The desk study also included a review of both published literature and GSI online dataset viewer (GSI, 2017) on peat failures/landslides in the vicinity of the site.

3.2 Site Reconnaissance

As part of the assessment of potential peat failure at the proposed site, AGEC carried out a site reconnaissance. This comprised walk-over inspections of the site with recording of salient geomorphological features with respect to the wind farm development and to provide peat thickness and preliminary assessment of peat strength.

The following salient geomorphological features were considered:

- Active, incipient or relict instability (where present) within the peat deposits
- Presence of shallow valley or drainage line
- Wet areas
- Any change in vegetation
- Peat depth
- Slope inclination and break in slope

The survey covered the proposed locations for the turbine bases and associated infrastructure.

The method adopted for carrying out the site reconnaissance relied on practitioners carrying out a visual assessment of the site supplemented with measurement of slope inclinations.

4 FINDINGS OF SITE RECONNAISSANCE

4.1 Previous Failures

The investigation works carried out at the study area have been used in conjunction with a desk study review to assess the susceptibility of the study area to peat failure.

There are no recorded peat failures at the Meenbog wind farm site (GSI, 2006 & GSI, 2017).

The nearest documented peat failure is located approximately 1km west of the study area. The failure recorded occurred at Barnesmore, Co. Donegal in 1963. The failure mechanism is described as a flow and the material and terrain type were described as peat and blanket bog respectively.

Another recorded failure located approximately 16km southwest of the study area occurred in Donegal town in 1999. No failure mechanism, material or terrain type is given for the failure.

Based on the review carried out no other peat failures occurred within a 20km radius of the site.

The presence, or otherwise, of relict peat failures or clustering of relict failures within an area is an indicator that particular site conditions exist that pre-dispose a site to failure or not as the case may be. Hence based on the historical data reviewed above it can be concluded that site conditions in the area of the Meenbog site have low potential for peat failure.

Based on a broad assessment of landslide susceptibility the site is classified by the GSI (2017) as ‘low’ to ‘moderately low’ and locally ‘moderately high’ susceptibility. It should be noted that the land susceptibility bands typically relates to the material type, topography in an area and incidences of landslides. For example, a rating of ‘moderately high’ is typically assigned where rock is close to the surface and slope angles range from 10 to 20 degrees. Hence the rating of ‘moderately high’ does not necessarily relate to the risk of peat failure. From the walkover survey of the site carried out by AGEC no peatland areas with a ‘moderately high’ susceptibility were identified.

4.2 Ground Conditions along Grid Connection

It is intended that the proposed wind farm will connect to the national grid via the existing Clogher 110 kV Electricity Substation (Clogher Substation), located in the townland of Cullionboy, Co. Donegal. The Clogher Substation is located approximately 6.2km southwest of the proposed development at its closest point.

The route will originate from the proposed substation and run northwest along the proposed wind farm access track for approximately 1.65km before turning southwest off the track for approximately 300m and will then cross under the N15 corridor via a directionally-drilled duct. The cable will emerge on to private lands northwest of the N15, where it will link into the Drumnahough cable (PI. Ref 17/50543, ABP Ref. PL05E.248796) approximately 300m southwest of the N15 crossing point.

It is proposed to excavate the trenches for the underground cable at a uniform level in peat or other overburden material. The trenches will be 600mm wide and 1250mm deep.

No peat stability or geotechnical issues are envisaged as a result of the proposed grid connection works.

4.3 Findings of Site Reconnaissance

A number of walk-over surveys of the site was carried out by AGEC between the 29th September & 3rd October 2014 and between 20th to 24th and 28th to 29th March 2017.

The walkovers were carried out by geotechnical engineers experienced in peat failure assessment. The findings from the site reconnaissance have been used to optimise the layout of the infrastructure on site.

The main findings of the site reconnaissance are as follows:

(1) The site is an upland blanket peat area with extensive forestry. The blanket peat areas contain typically shallow peat with typically deeper peat deposits in the flatter areas on site. The forested areas contain both young and mature forestry (Appendix A – Photos 1 and 2).

(2) Peat depths recorded during the site reconnaissance vary from 0 to 5.8m with an average of 1.7m (Figure 3). A total of over 500 no. peat depth probes were carried out on site.

The deeper peat deposits locally present in the flatter areas on site have been identified and are highlighted on the construction buffer zone plan (Figure 4). The deeper peat areas were generally avoided when optimising the wind farm layout for site.

(3) The peat depths recorded at 17 of the 19 no. turbine locations varied from 0 to 2.7m with an average depth of 1.3m. At the remaining 2 no. turbines T3 and T5 maximum peat depths of between 4.5 and 4.7m were recorded. The turbines where deeper peat deposits are present have shallow slope angles typically 1 degree.

(4) The access roads for the wind farm comprise upgrading of existing access tracks and construction of new proposed access roads. The existing access tracks have been constructed using both excavate and replace and floated construction techniques (Photos 3 and 4). The upgrading works and construction of new proposed access roads will be carried out using both excavate and replace and floated construction techniques.

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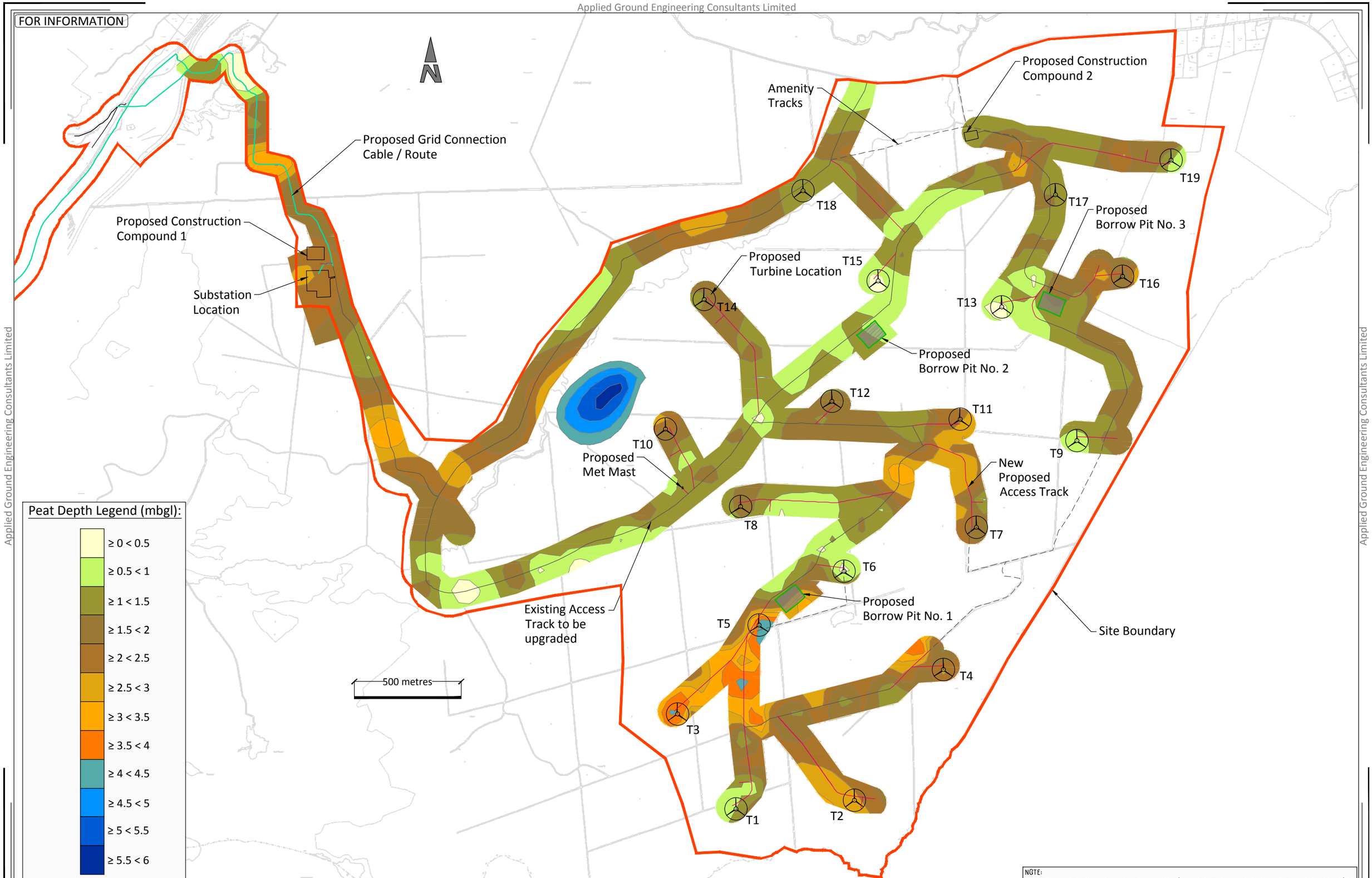

NOTE:
1 The peat depth contour plan shown on the figure is based on peat depth probes carried out by AGEC and McCarthy Keville O'Sullivan

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Figure 3 Peat Depth Contour Plan

(5) With respect to the existing access tracks, peat depths are typically less than 2.0m with localised depths of up to 3.5m recorded. Up to 15km of existing access tracks are present across the site and have been in operation for a number of years.

(6) The typical make-up of the existing floating access tracks on site appears to be (locally) tree brash/trunks laid directly onto the peat surface and/or (locally) geogrid overlain by up to 500mm of coarse granular fill. The make-up of the existing floating access tracks varies across the site.

(7) With respect to the new proposed access roads, peat depths are typically less than 3.0m with localised depths of up to 4.5m recorded.

(8) Slope angles at the turbine locations range from 1 to 9 degrees with an average of 3 degrees. At turbine T6 a slope angle of 15 degrees was recorded, it should however be noted that 0.2m of peaty topsoil is present at this location and hence is not considered a peat stability risk. The slope angle readings are based on site recordings and were obtained during site reconnaissance by AGEC using handheld equipment, namely Silva Clino Master which has an accuracy of +/- 0.25 degrees. The slope angle quoted reflects the slope within the footprint of each infrastructure location.

(9) Localised areas of waterlogged peat and surface water are present at numerous areas across the site. This is not unexpected given the type of terrain present on site.

(10) A number of deep weak peat areas were identified outside the development footprint during the site walkovers (Figure 4). Locally the peat in these areas was recorded as quaking (or buoyant) indicating highly saturated peat, which would be considered to have low strength. These areas are located outside the proposed development footprint for the site and hence do not represent a peat slide risk.

(11) No evidence of past failures or any significant signs of peat instability were noted on site.

(12) A number of potential borrow areas have been identified across the site. The potential borrow areas identified are deemed suitable for the placement of excavated peat and spoil. Further information on the management of peat and spoil within the borrow areas is given in the Peat & Spoil Management Plan for site (AGEC, 2017).

(13) The findings of the site reconnaissance are as follows:

(a) The peat depths recorded at 17 of the 19 no. turbine locations varied from 0 to 2.7m with an average depth of 1.3m. At the remaining 2 no. turbines T3 and T5 maximum peat depths of between 4.5 and 4.7m were recorded. The turbines where deeper peat deposits are present have shallow slope angles typically 1 degree.

(b) Although greater peat depths were recorded at turbines T3 and T5 these are not considered to represent a peat slide risk due to the flatter topography. The peat depths at these two locations contribute to an elevated construction risk and will be subject to additional mitigation/control measures (see Appendix B).

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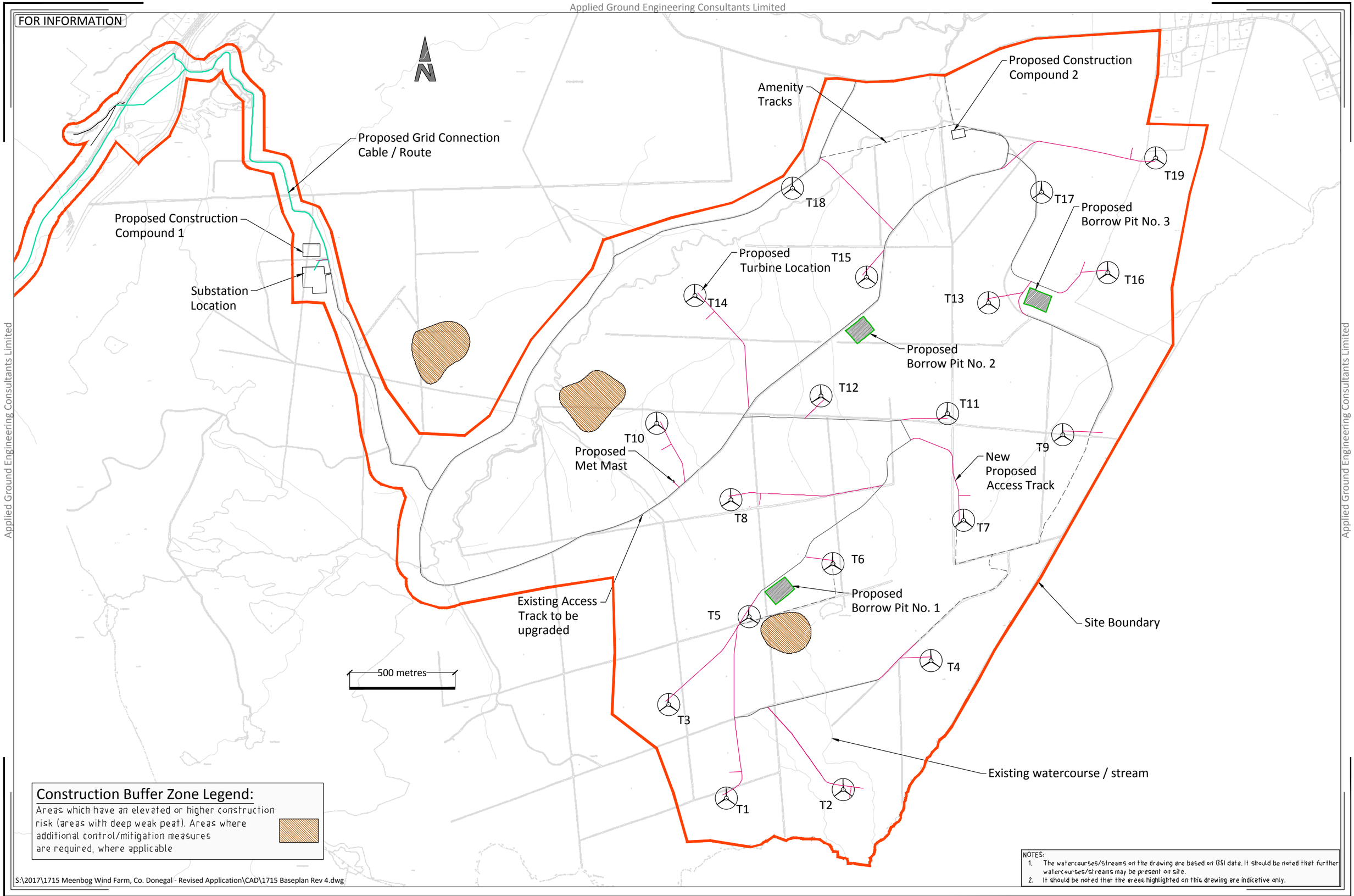

Construction Buffer Zone Legend:

Areas which have an elevated or higher construction risk (areas with deep weak peat). Areas where additional control/mitigation measures are required, where applicable

NOTES:
1. The watercourses/streams on the drawing are based on OSI data. It should be noted that further watercourses/streams may be present on site.
2. It should be noted that the areas highlighted on this drawing are indicative only.

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Figure 4 Construction Buffer Zone Plan

(c) A construction buffer zone plan has been produced for the site (Figure 4). This Figure shows areas which have an elevated or higher construction risk due to the terrain and features encountered during the site reconnaissance. Additional mitigation/control measures will be implemented in these areas, as required (see Appendix B).

5 SITE GROUND CONDITIONS

5.1 Soils & Subsoils

The site is an upland blanket peat area with extensive forestry. The blanket peat areas contain typically shallow peat with typically deeper peat deposits in the flatter areas on site. The forested areas contain both young and mature forestry. Peat depths recorded across the site ranged from 0 to 5.8m with an average of 1.7m.

Based on the site walkover and the exposures present at the site the superficial deposits were typically described as firm brown/black fibrous Peat (in the shallow peat areas) and spongy and plastic black amorphous Peat (in the deeper peat areas), overlying firm and stiff light brown/grey sandy gravelly Clay with cobbles and boulders and/or overlying weathered bedrock (Photos 5 & 6).

A review of the GSI subsoils map indicates that the site is underlain by predominantly blanket peat with some till derived from metamorphic rock and occasional outcrops of rock at the surface.

5.2 Bedrock

The underlying bedrock was described by the Geological Survey of Ireland (GSI, 1999) and shown on sheet 3 and part of sheet 4 (Geology of South Donegal). In the area of the Meenbog site, sheet 3 and part of sheet 4 show two dominant bedrock formations.

The dominant bedrock formations are:

- Lough Eske Psammite Formation – feldspathic psammite, marble
- Lough Mourne Formation – quartz & feldspar pebbles, green matrix

Localised bedrock formations noted in the west of the site include Barnesmore granite.

One mapped fault is shown running across the western area of the site. The fault line has a north to south trend.

No karst features were identified on the site following a review of the GSI database or during the site walkover.

6 PEAT DEPTHS, STRENGTH & SLOPE AT PROPOSED INFRASTRUCTURE LOCATIONS

As part of the site walkover, peat depth, in-situ peat strength and slope angles were recorded at various locations across the site.

6.1 Peat Depth

Peat depth probes were carried out at/near to proposed turbine locations and access roads. At turbine locations up to 5 probes were carried out around the turbine location, where accessible, and an average peat depth was calculated.

6.2 Peat Strength

The strength testing was carried out in-situ using a Geonor H-60 Hand-Field Vane Tester. From AGEC's experience hand vanes give indicative results for in-situ strength of peat and would be considered best practice for the field assessment of peat strength.

6.3 Slope Angle

The slope angles at each of the main infrastructure locations were generally obtained during the site reconnaissance by AGEC using handheld equipment, such as Silva Clino Master which has an accuracy of +/- 0.25 degrees. The slope angles quoted reflect the slope within the footprint of each infrastructure location. Slope angles derived from contour survey plans would be considered approximate, as such surveys are dependent on the density of survey data and do not always reflect local variations in ground topography.

The slope angles used in the peat stability assessment and associated report for the main infrastructure locations were generally recorded during the site reconnaissance by AGEC using handheld equipment and would be deemed more accurate and representative of local topography than slope angles derived from contour plans.

6.4 Summary of Findings

Based on the peat depths recorded across the site by AGEC and McCarthy Keville O'Sullivan (2014a, 2014b & 2014c), the peat varied in depth from 0 to 5.8m with an average of 1.7m. All peat depth probes carried out on site have been utilised to produce a peat depth contour plan for the site (Figure 3).

A summary of the peat depths at the proposed infrastructure locations is given in Table 1. The data presented in Table 1 is used in the peat stability assessment of the site; see Section 7 of this report.

Table 1 Peat Depth & Slope Angle at Proposed Infrastructure Locations

Turbine	Easting	Northing	Peat Depth Range (m) (1)	Average Peat Depth (m)	Slope Angle (°) (2)
T1	207133	384174	0.1 to 1.0	0.3	1
T2	207689	384214	2.3 to 2.7	2.5	1
T3	206859	384619	2.8 to 4.5	3.5	1
T4	208106	384826	2.5 to 2.7	2.6	1
T5	207241	385035	3.9 to 4.7	4.3	1
T6	207639	385286	0.1 to 0.2	0.1	15
T7	208261	385494	1.1 to 1.7	1.4	5
T8	207155	385589	1.6 to 2.0	1.8	5
T9	208732	385899	0.3 to 0.5	0.4	9
T10	206803	385952	1.8 to 2.5	2	2
T11	208183	385999	1.4 to 2.1	1.8	3
T12	207583	386083	0.9 to 1.7	1.4	6
T13	208379	386526	0.1 to 0.3	0.2	2
T14	206983	386559	0.7 to 1.3	0.9	1
T15	207800	386648	0.1 to 0.2	0.2	2
T16	208946	386668	0.3 to 1.0	0.8	3
T17	208631	387052	0.8 to 1.5	1.1	6
T18	207448	387070	0 to 1.0	0.3	3
T19	209173	387212	0 to 0.3	0.1	3
Substation	205184	386668	1.3 to 2.6	2.2	4
Met Mast	206885	385678	1.0 to 1.5	1.2	3

Note (1) Based on probe results from the site walkovers. The range of peat depths for the infrastructure locations are based on a 10m grid carried out around the infrastructure element, where accessible.
Note (2) The slope angles at each of the main infrastructure locations were obtained during site reconnaissance by AGEC using handheld equipment, such as the Silva Clino Master which has an accuracy of +/- 0.25 degrees. The slope angle quoted reflects the slope within the footprint of each infrastructure location.
Note (3) The data presented in the Table above is used in the peat stability assessment of the site; see Section 8.0 of this report.

In addition to probing, in-situ shear vane testing was carried out as part of the ground investigation. Strength testing was carried out at selected locations across the site to provide representative coverage of indicative peat strengths. The results of the vane testing are presented in Figure 5.

The hand vane results indicate undrained shear strengths in the range 5 to 50kPa, with an average value of about 16kPa. The lower bound strengths recorded would be typical of deep weak saturated peat and were recorded in the deeper peat deposits in the flatter areas of the site. These areas have been identified and are highlighted on a construction buffer zone plan for site (Figure 4).

Peat strength at sites of known peat failures (assuming undrained loading failure) are generally very low, for example the undrained shear strength at the Derrybrien failure (AGEC, 2004) as derived from essentially back-analysis, though some testing was carried out, was estimated at 2.5kPa.

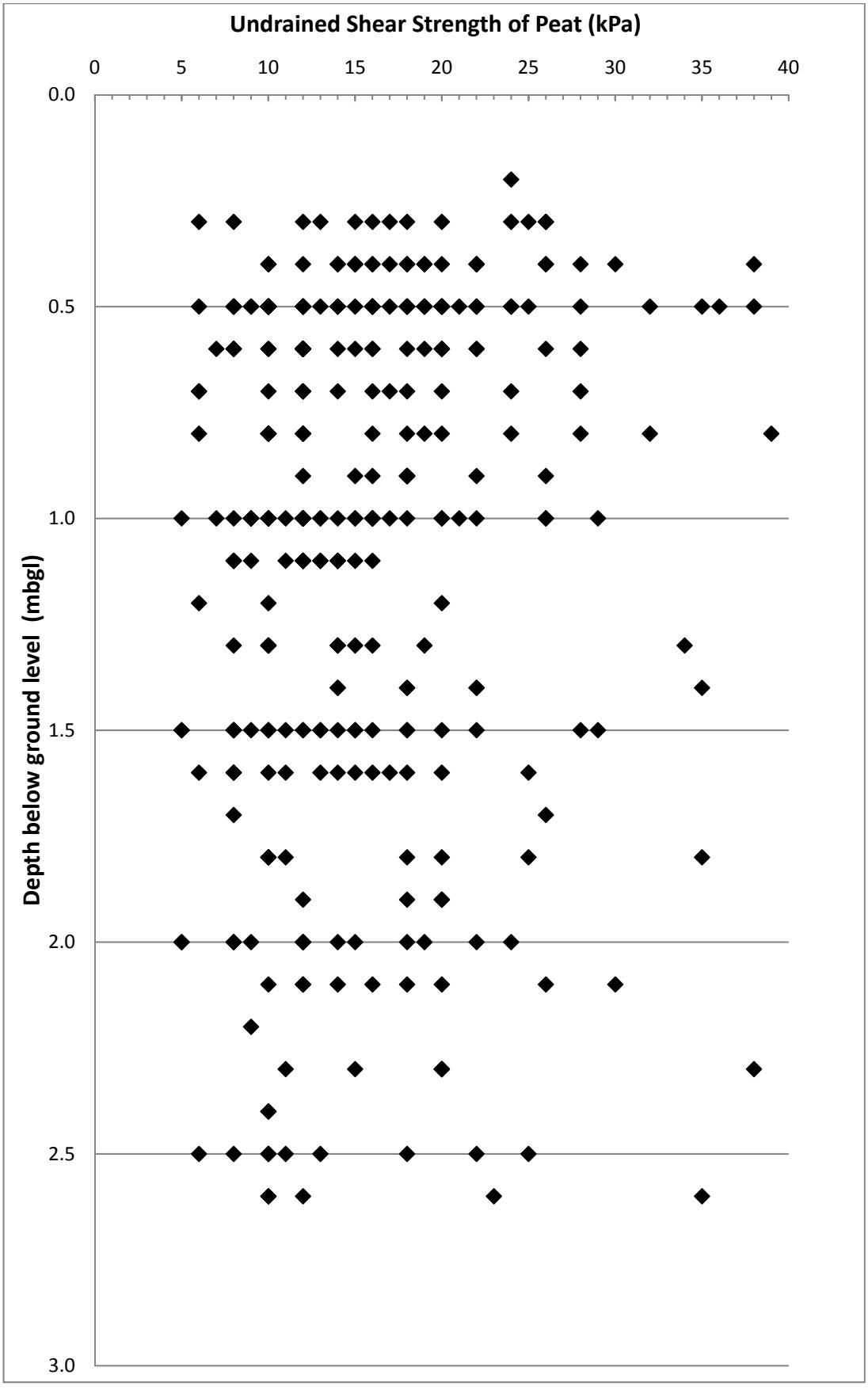

Figure 5 Undrained Shear Strength (C_u) Profile for Peat with Depth

7 PEAT STABILITY ASSESSMENT

The peat stability assessment analyses the stability of the natural peat slopes for individual parcels across the site including at the turbine locations and along the proposed access roads. The assessment also analyses the stability of the natural peat slopes with a surcharge loading of 10kPa, equivalent to placing 1m of stockpiled peat on the surface of the peat slope.

7.1 Methodology for Peat Stability Assessment

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.

1. The undrained loading condition applies in the short-term during construction and until construction induced pore water pressures dissipate.
2. 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.

Undrained shear strength values (c_u) for peat are used for the total stress analysis. Based on the findings of the Derrybrien failure, undrained loading during construction was found to be the critical failure mechanism.

A drained analysis requires effective cohesion (c') and effective friction angle (ø') values for the calculations. These values can be difficult to obtain because of disturbance experienced when sampling peat and the difficulties in interpreting test results due to the excessive strain induced within the peat. To determine suitable drained strength values a review of published information on peat was carried out.

Table 2 shows a summary of the published information on peat together with drained strength values.

Table 2 List of Effective Cohesion and Friction Angle Values

Reference	Cohesion, c' (kPa)	Friction Angle, ø' (degs)	Testing Apparatus/ Comments
Hanrahan et al (1967)	5 to 7	36 to 43	From triaxial apparatus
Rowe and Mylleville (1996)	2.5	28	From simple shear apparatus
Landva (1980)	2 to 4	27.1 to 32.5	Mainly ring shear apparatus for normal stress greater than 13kPa
	5 to 6	-	At zero normal stress
Carling (1986)	6.5	0	-
Farrell and Hebib (1998)	0	38	From ring shear and shear box apparatus. Results are not considered representative.
	0.61	31	From direct simple shear (DSS) apparatus. Result considered too low therefore DSS not considered appropriate
Rowe, Maclean and Soderman (1984)	1.1	26	From simple shear apparatus
	3	27	From DSS apparatus
Sandorini et al (1984)	4.5	28	From triaxial apparatus
McGreever and Farrell (1988)	6	38	From triaxial apparatus using soil with 20% organic content
	6	31	From shear box apparatus using soil with 20% organic content
Hungr and Evans (1985)	3.3	-	Back-analysed from failure
Madison et al (1996)	10	23	-
Dykes and Kirk (2006)	3.2	30.4	Test within acrotelm
Dykes and Kirk (2006)	4	28.8	Test within catotelm
Warburton et al (2003)	5	23.9	Test in basal peat
Warburton et al (2003)	8.74	21.6	Test using fibrous peat
Entec (2008)	3.8	36.8	Generalised values derived from various peat tests (shear box and triaxial)

From Table 2 the values for c' ranged from 1.1 to 10kPa and ø' ranged from 21.6 to 43°. The average c' and ø' values are 5kPa and 30° respectively. Based on the above, it was considered to adopt a conservative approach and to use design values below the averages.

For design the following general drained strength values have been used for the site:

c' = 4kPa
ø' = 25 degrees

7.2 Analysis to Determine Factor of Safety (Deterministic Approach)

The purpose of the analysis was to determine the Factor of Safety (FoS) of the peat slopes using infinite slope analysis. The analysis was carried out at the turbine locations, along the proposed access roads and at various locations across the site.

The FoS provides a direct measure of the degree of stability of the slope. A FoS of less than unity indicates that a slope is unstable, a FoS of greater than unity indicates a stable slope.

The acceptable safe range for FoS typically ranges from 1.3 to 1.4. The previous code of practice for earthworks BS 6031:1981 (BSI, 1981), provided advice on design of earthworks slopes. It stated that for a first time failure with a good standard of site investigation the design FoS should be greater than 1.3.

As a general guide the FoS limits for peat slopes in this report are summarised in table 3.

Table 3 Factor of Safety Limits for Slopes

Factor of Safety (FoS)	Degree of Stability
Less than 1.0	Unstable (red)
Between 1.0 and 1.3	Marginally stable (yellow)
1.3 or greater	Acceptable (green)

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

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

A lower bound undrained shear strength, c_u for the peat of 5kPa was selected for the assessment based on the c_u values recorded at the site. An undrained shear strength of 5kPa was the lowest value recorded on site. It should be noted that a c_u of 5kPa for the peat is considered a conservative value for the analysis and is not representative of all peat present across the site. In reality the peat generally has a higher undrained strength.

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

$$F = \frac{c_u}{\gamma z \sin\alpha \cos\alpha}$$

Where,

F = Factor of Safety
c_u = Undrained strength

γ = Bulk unit weight of material
z = Depth to failure plane assumed as depth of peat
α = Slope angle

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

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

Where,

F = Factor of Safety
c' = Effective cohesion
γ = Bulk unit weight of material
z = Depth to failure plane assumed as depth of peat
γ_w = Unit weight of water
h_w = Height of water table above failure plane
α = Slope angle
ϕ' = Effective friction angle

For the drained analysis the level of the water table above the failure surface is required to calculate the factor of safety for the slope. Since the water level in blanket peat can be variable and can be recharged by rainfall, it is not feasible to establish its precise location throughout the site. Therefore a sensitivity analysis using water level ranging between 0 and 100% of the peat depth was conducted, where 0% equates to the peat been completely dry and 100% equates to the peat been fully saturated.

The following general assumptions were used in the analysis of peat slopes at each location:

(1) Peat depths are based on the maximum peat depth recorded at each location from the walkover survey.
(2) A lower bound undrained shear strength, c_u for the peat of 5kPa was selected for the assessment based on the c_u values recorded at the site. An undrained shear strength of 5kPa was the lowest value recorded on site. It should be noted that a c_u of 5kPa for the peat is considered a conservative value for the analysis and is not representative of all peat present across the site. In reality the peat generally has a higher undrained strength.
(3) Slope angle on base of sliding assumed to be parallel to ground surface.

For the stability analysis two load conditions were examined, namely;

Condition (1): no surcharge loading

Condition (2): surcharge of 10 kPa, equivalent to 1 m of stockpiled peat assumed as a worst case.

7.3 Results of Analysis

7.3.1 Undrained Analysis for the peat

The results of the undrained analysis for the natural peat slopes are presented in Appendix C and the results of the undrained analysis for the most critical load case (load condition 2) are shown on Figure 6. The undrained analysis for load condition 2 is considered the most critical load case as most peat failures occur in the short term upon loading of the peat surface. The results from the main infrastructure locations are summarised in Table 4.

The calculated FoS for load condition (1) is in excess of 1.30 for each of the 540 no. locations analysed with a range of FoS of 1.69 to in excess of 10, indicating a low risk of peat instability.

The calculated FoS for load condition (2) is in excess of 1.30 for each of the 540 no. locations analysed with a range of FoS of 1.31 to in excess of 10, indicating a low risk of peat instability.

Table 4 Factor of Safety Results (undrained condition)

Turbine No./Waypoint	Easting	Northing	Factor of Safety for Load Condition	
			Condition (1)	Condition (2)
T1	207133	384174	28.65	14.33
T2	207689	384214	10.61	7.74
T3	206859	384619	6.37	5.21
T4	208106	384826	10.61	7.74
T5	207241	385035	6.10	5.03
T6	207639	385286	10.00	1.67
T7	208261	385494	3.39	2.13
T8	207155	385589	2.88	1.92
T9	208732	385899	6.47	2.16
T10	206803	385952	5.73	4.10
T11	208183	385999	4.56	3.09
T12	207583	386083	2.83	1.78
T13	208379	386526	47.79	11.03
T14	206983	386559	22.04	12.46
T15	207800	386648	71.68	11.95
T16	208946	386668	9.57	4.78
T17	208631	387052	3.21	1.92
T18	207448	387070	9.57	4.78
T19	209173	387212	31.89	7.36
Substation	205184	386668	2.76	2.00
Met Mast	206885	385678	6.38	3.83

FOR INFORMATION

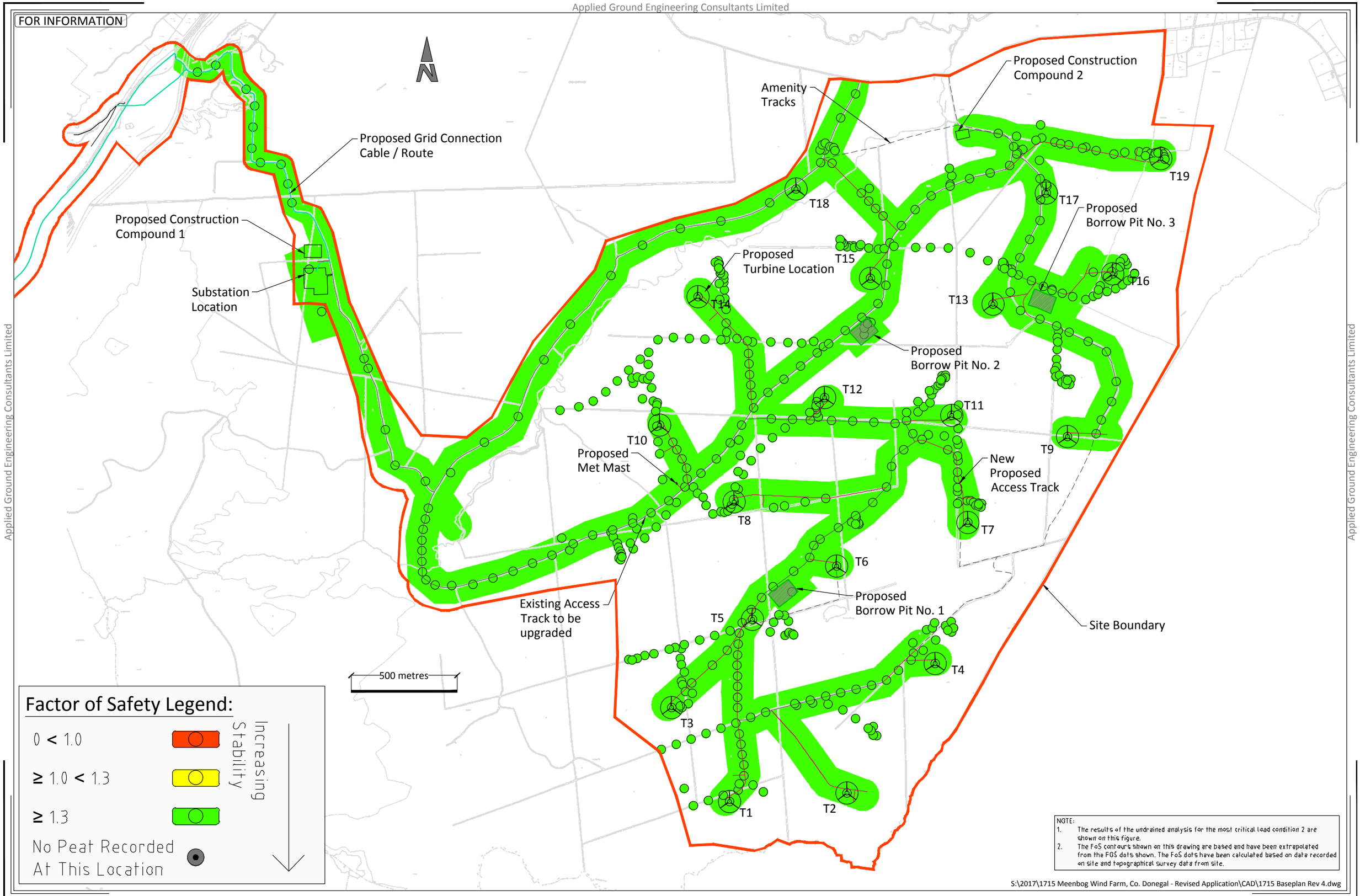

Figure 6 Factor of Safety Plan

7.3.2 Drained Analysis for the peat

The results of the drained analysis for the peat are presented in Appendix C. The results from the main infrastructure locations are summarised in Table 5. As stated previously, the drained loading condition examines the effect of, in particular, rainfall on the existing stability of the natural peat slopes.

The calculated FoS for load condition (1) is in excess of 1.30 for each of the 540 no. locations analysed with a range of FoS of 1.36 to in excess of 10, indicating a low risk of peat instability.

The calculated FoS for load condition (2) is in excess of 1.30 for each of the 540 no. locations analysed with a range of FoS of 2.26 to in excess of 10, indicating a low risk of peat instability.

Table 5 Factor of Safety Results (drained condition)

Turbine No./Waypoint	Easting	Northing	Factor of Safety for Load Condition	
			Condition (1)	Condition (2)
T1	207133	384174	22.92	24.82
T2	207689	384214	8.49	13.42
T3	206859	384619	5.09	9.03
T4	208106	384826	8.49	13.42
T5	207241	385035	4.88	8.71
T6	207639	385286	8.00	2.78
T7	208261	385494	2.71	3.68
T8	207155	385589	2.30	3.31
T9	208732	385899	5.18	3.69
T10	206803	385952	4.59	7.09
T11	208183	385999	3.64	5.34
T12	207583	386083	2.26	3.07
T13	208379	386526	38.23	19.09
T14	206983	386559	17.63	21.58
T15	207800	386648	57.34	20.68
T16	208946	386668	7.65	8.28
T17	208631	387052	2.57	3.31
T18	207448	387070	7.65	8.28
T19	209173	387212	25.51	12.73
Substation	205184	386668	2.21	3.45
Met Mast	206885	385678	5.10	6.62

8 RISK ASSESSMENT

A risk assessment was carried out for the main infrastructure elements at the proposed wind farm development. This approach follows the guidelines for geotechnical risk management as given in Clayton (2001), as referenced in PHRAG, and takes into account the approach of MacCulloch (2005).

The risk assessment uses the results of the stability analysis (deterministic approach) in combination with qualitative factors, which cannot be reasonably included in a stability calculation but nevertheless may affect the occurrence of peat instability to assess the risk for each infrastructure element.

For each infrastructure element, a risk rating (product of probability and impact) is calculated and rated as shown in Table 6. Where an infrastructure element is rated 'Substantial' or 'Unacceptable', control measures are required to reduce the risk to at least a 'Tolerable' risk rating. Where an infrastructure element is rated 'Trivial' or 'Tolerable', only routine control measures are required.

Table 6 Risk Rating Legend

10 to 20	Unacceptable: re-location or significant control measures required
5 to 9	Substantial: notable control measures required
3 to 4	Tolerable: only routine control measures required
1 to 2	Trivial: none or only routine control measures required

A full methodology for the risk assessment is given in Appendix D.

8.1 Summary of Risk Assessment Results

The results of the risk assessment for potential peat failure at the main infrastructure elements is presented as a Geotechnical Risk Register in Appendix B and summarised in Table 7.

The risk rating for each infrastructure element at the Meenbog wind farm is designated trivial and tolerable following some mitigation/control measures being implemented. Sections of access roads to the nearest infrastructure element should be subject to the same mitigation/control measures that apply to the nearest infrastructure element.

Details of the required mitigation/control measures can be found in the Geotechnical Risk Register for each infrastructure element (Appendix B).

Table 7 Summary of Geotechnical Risk Register

Infrastructure	Pre-Control Measure Implementation Risk Rating	Pre-Control Measure Implementation Risk Rating Category	Notable Control Measures Required	Post-Control Measure Implementation Risk Rating	Post-Control Measure Implementation Risk Rating Category
Turbine T1	Trivial	1 to 2	No	Trivial	1 to 2
Turbine T2	Tolerable	3 to 4	No	Tolerable	3 to 4
Turbine T3	Tolerable	3 to 4	Yes	Trivial	1 to 2
Turbine T4	Trivial	1 to 2	No	Trivial	1 to 2
Turbine T5	Tolerable	3 to 4	Yes	Trivial	1 to 2
Turbine T6	Tolerable	3 to 4	No	Trivial	1 to 2
Turbine T7	Substantial	5 to 9	No	Tolerable	3 to 4
Turbine T8	Tolerable	3 to 4	No	Trivial	1 to 2
Turbine T9	Substantial	5 to 9	No	Tolerable	3 to 4
Turbine T10	Substantial	5 to 9	Yes	Tolerable	3 to 4
Turbine T11	Trivial	1 to 2	No	Trivial	1 to 2
Turbine T12	Substantial	5 to 9	No	Tolerable	3 to 4
Turbine T13	Trivial	1 to 2	No	Trivial	1 to 2
Turbine T14	Trivial	1 to 2	No	Trivial	1 to 2
Turbine T15	Trivial	1 to 2	No	Trivial	1 to 2
Turbine T16	Trivial	1 to 2	No	Trivial	1 to 2
Turbine T17	Trivial	1 to 2	No	Trivial	1 to 2
Turbine T18	Substantial	5 to 9	No	Tolerable	3 to 4
Turbine T19	Trivial	1 to 2	No	Trivial	1 to 2
Substation	Substantial	5 to 9	Yes	Tolerable	3 to 4
Met Mast	Tolerable	3 to 4	No	Tolerable	3 to 4

9 SUMMARY AND RECOMMENDATIONS

9.1 Summary

The following summary is given.

AGEC was engaged by McCarthy Keville O'Sullivan to undertake an assessment of the proposed wind farm site with respect to peat stability.

The findings of the peat assessment, which involved analysis of over 500 locations, showed that the site has an acceptable margin of safety and is suitable for the proposed wind farm development. The findings include recommendations and control measures for construction work in peat lands to ensure that all works adhere to an acceptable standard of safety.

The site is an upland blanket peat area with extensive forestry. The blanket peat areas contain typically shallow peat with typically deeper peat deposits in the flatter areas on site. The forested areas contain both young and mature forestry. Up to 15km of existing access tracks are present across the site and have been in operation for a number of years.

Peat thicknesses recorded during the site walkovers from over 500 probes ranged from 0 to 5.8m with an average of 1.7m. The deeper peat areas were typically avoided when optimising the wind farm layout for site.

Based on a broad assessment of landslide susceptibility the site is classified by the GSI as 'low' to 'moderately low' and locally 'moderately high' susceptibility. As outlined in the report, from the walkover survey of the site carried out by AGEC no peatland areas with a 'moderately high' susceptibility were identified.

An analysis of peat sliding was carried out at the main infrastructure locations across site for both the undrained and drained conditions. The purpose of the analysis was to determine the Factor of Safety (FoS) of the peat slopes.

An undrained analysis was carried out, which applies in the short-term during construction. For the undrained condition, the calculated FoS for load conditions (1) & (2) for the 540 no. locations analysed, shows that at all locations an acceptable FoS of greater than 1.3 was calculated, indicating a low risk of peat instability.

A drained analysis was carried out, which examines the effect of in particular, rainfall on the existing stability of the natural peat slopes on site. For the drained condition, the calculated FoS for load conditions (1) and (2) for the 540 no. locations analysed, shows that at all locations an acceptable FoS of greater than 1.3 was calculated, indicating a low risk of peat instability.

The risk assessment at each infrastructure location identified a number of mitigation/control measures to reduce the potential risk of peat failure. Sections of access roads to the nearest infrastructure element should be subject to the same mitigation/control measures that apply to the nearest infrastructure element. See Appendix B for details of the required mitigation/control measures for each infrastructure element.

In summary the findings of the peat assessment, which involved analysis of over 500 locations, showed that the proposed Meenbog wind farm site has an acceptable margin

of safety and is suitable for the proposed wind farm development. The findings include recommendations and control measures for construction work in peat lands to ensure that all works adhere to an acceptable standard of safety.

9.2 Recommendations

The following general recommendations are given.

Notwithstanding that the site has an acceptable margin of safety a number of mitigation/control measures are given to ensure that all works adhere to an acceptable standard of safety for work in peatlands. Mitigation/control measures identified for each of the infrastructure elements in the risk assessment should be taken into account and implemented throughout design and construction works (Appendix B).

Recommendations and guidelines given in AGEC's report 'Peat & Spoil Management Plan - Meenbog Wind Farm, County Donegal' (AGEC 2017) should be taken into consideration during the design and construction stage of the wind farm development.

A construction buffer zone plan has been produced for the site (Figure 4). This Figure shows areas which have an elevated or higher construction risk due to the terrain and features encountered during the site reconnaissance. Additional mitigation/control measures will be implemented in these areas, as required (see Appendix B).

To minimise the risk of construction activity causing potential peat instability it is recommended that the Construction Method Statements (CMSs) for the project take into account, but not be limited, to the recommendations above. This will ensure that best practice guidance regarding the management of peat stability will be inherent in the construction phase.

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APPENDIX A

PHOTOS FROM SITE VISIT

Photo 1 Example of site conditions

Photo 2 Example of site conditions

Photo 3 Example of an existing excavated access track on site

Photo 4 Example of an existing floating access track on site

Photo 5 Example of ground conditions on site (shallow peat area)

Photo 6 Example of ground conditions on site (shallow peat area)

APPENDIX B

GEOTECHNICAL RISK REGISTER

Meenbog Wind Farm - Geotechnical Risk Register (Rev 0)

Location:	**Turbine T1**

Grid Reference (Eastings, Northings):	**207133**	**384174**
Distance to Watercourse (m)	**> 150**	
Maximum Measured Peat Depth (m):	**1.0**	
Control Required:	**No**	

		Pre-Control Measure Implementation						Post-Control Measure Implementation			
Ref.	Contributory/Qualitative Factors to Potential Peat Failure	Prob	Impact	Risk	Risk Rating	Control Required	Control measures to be implemented during construction	Prob	Impact	Risk	Risk Rating
1	FOS = 14.33 (u), 22.92 (d)	1	1	1	Trival	No	See Below	1	1	1	Trival
2	Evidence of sub peat water flow	1	1	1	Trival	No		1	1	1	Trival
3	Evidence of surface water flow	2	1	2	Trival	No		1	1	1	Trival
4	Evidence of previous failures/slips	0	1	0	Not Applicable	No		0	1	0	Not Applicable
5	Type of vegetation	2	1	2	Trival	No		2	1	2	Trival
6	General slope characteristics upslope/downslope from infrastructure location	1	1	1	Trival	No		1	1	1	Trival
7	Evidence of very soft/soft clay at base of peat	0	1	0	Not Applicable	No		0	1	0	Not Applicable
8	Evidence of mechanically cut peat	0	1	0	Not Applicable	No		0	1	0	Not Applicable
9	Evidence of quaking or buoyant peat	0	1	0	Not Applicable	No		0	1	0	Not Applicable
10	Evidence of bog pools	0	1	0	Not Applicable	No		0	1	0	Not Applicable
11	Other	0	1	0	Not Applicable	No		0	1	0	Not Applicable

	Control Measures to be Implemented Prior to/and During Construction for **Turbine T1**
i	Maintain hydrology of area as far as possible;
ii	Installation of interceptor drains upslope of works to divert any surface water away from turbine construction area;
iii	Use of experienced geotechnical staff for site investigation;
iv	Use of experienced contractors and trained operators to carry out the work;
v	Detailed ground investigation to determine peat, mineral soil and bedrock condition and properties.

Note
(1) FOS abbreviations are: u: FOS for undrained analysis, d: FOS for drained analysis.

Meenbog Wind Farm - Geotechnical Risk Register (Rev 0)

Location:	**Turbine T2**

Grid Reference (Eastings, Northings):	**207689**	**384214**
Distance to Watercourse (m)	**100 - 150**	
Maximum Measured Peat Depth (m):	**2.7**	
Control Required:	**No**	

		Pre-Control Measure Implementation						Post-Control Measure Implementation			
Ref.	Contributory/Qualitative Factors to Potential Peat Failure	Prob	Impact	Risk	Risk Rating	Control Required	Control measures to be implemented during construction	Prob	Impact	Risk	Risk Rating
1	FOS = 7.74 (u), 8.49 (d)	1	2	2	Trival	No	See Below	1	2	2	Trival
2	Evidence of sub peat water flow	1	2	2	Trival	No		1	2	2	Trival
3	Evidence of surface water flow	2	2	4	Tolerable	No		1	2	2	Trival
4	Evidence of previous failures/slips	0	2	0	Not Applicable	No		0	2	0	Not Applicable
5	Type of vegetation	2	2	4	Tolerable	No		2	2	4	Tolerable
6	General slope characteristics upslope/downslope from infrastructure location	1	2	2	Trival	No		1	2	2	Trival
7	Evidence of very soft/soft clay at base of peat	0	2	0	Not Applicable	No		0	2	0	Not Applicable
8	Evidence of mechanically cut peat	0	2	0	Not Applicable	No		0	2	0	Not Applicable
9	Evidence of quaking or buoyant peat	0	2	0	Not Applicable	No		0	2	0	Not Applicable
10	Evidence of bog pools	0	2	0	Not Applicable	No		0	2	0	Not Applicable
11	Other	0	2	0	Not Applicable	No		0	2	0	Not Applicable

	Control Measures to be Implemented Prior to/and During Construction for **Turbine T2**
i	Maintain hydrology of area as far as possible;
ii	Installation of interceptor drains upslope of works to divert any surface water away from turbine construction area;
iii	Use of experienced geotechnical staff for site investigation;
iv	Use of experienced contractors and trained operators to carry out the work;
v	Detailed ground investigation to determine peat, mineral soil and bedrock condition and properties.

Note

(1) FOS abbreviations are: u: FOS for undrained analysis, d: FOS for drained analysis.

Meenbog Wind Farm - Geotechnical Risk Register (Rev 0)

Location:	**Turbine T3**

Grid Reference (Eastings, Northings):	**206859**	**384619**
Distance to Watercourse (m)	**> 150**	
Maximum Measured Peat Depth (m):	**4.5**	
Control Required:	**Yes**	

		Pre-Control Measure Implementation						Post-Control Measure Implementation			
Ref.	Contributory/Qualitative Factors to Potential Peat Failure	Prob	Impact	Risk	Risk Rating	Control Required	Control measures to be implemented during construction	Prob	Impact	Risk	Risk Rating
1	FOS = 5.21 (u), 5.09 (d)	1	1	1	Trival	No		1	1	1	Trival
2	Evidence of sub peat water flow	1	1	1	Trival	No		1	1	1	Trival
3	Evidence of surface water flow	2	1	2	Trival	No		1	1	1	Trival
4	Evidence of previous failures/slips	0	1	0	Not Applicable	No		0	1	0	Not Applicable
5	Type of vegetation	2	1	2	Trival	No		2	1	2	Trival
6	General slope characteristics upslope/downslope from infrastructure location	1	1	1	Trival	No	See Below	1	1	1	Trival
7	Evidence of very soft/soft clay at base of peat	0	1	0	Not Applicable	No		0	1	0	Not Applicable
8	Evidence of mechanically cut peat	0	1	0	Not Applicable	No		0	1	0	Not Applicable
9	Evidence of quaking or buoyant peat	0	1	0	Not Applicable	No		0	1	0	Not Applicable
10	Evidence of bog pools	0	1	0	Not Applicable	No		0	1	0	Not Applicable
11	Deep peat	3	1	3	Tolerable	Yes		1	1	1	Trival

	Control Measures to be Implemented Prior to/and During Construction for **Turbine T3**
i	Due to deeper peat at this turbine location this will require additional construction measures such as : - access and working area formed using bog mats - excavation side walls to be supported (eg. boulders, retaining wall units) or excavation face battered to shallow angle - temporary works designer may be required to provide excavation support design - daily detailed inspection of excavation faces - potential for greater water inflow into excavation requiring removal of water using pumping - increased exclusion zone around excavation to avoid accidental loading of crest of slope
ii	Maintain hydrology of area as far as possible;
iii	Installation of interceptor drains upslope of works to divert any surface water away from turbine construction area;
iv	Use of experienced geotechnical staff for site investigation;
v	Use of experienced contractors and trained operators to carry out the work;
vi	Detailed ground investigation to determine peat, mineral soil and bedrock condition and properties.

Note

(1) FOS abbreviations are: u: FOS for undrained analysis, d: FOS for drained analysis.

Meenbog Wind Farm - Geotechnical Risk Register (Rev 0)

Location:	**Turbine T4**

Grid Reference (Eastings, Northings):	**208106**	**384826**
Distance to Watercourse (m)	**> 150**	
Maximum Measured Peat Depth (m):	**2.7**	
Control Required:	**No**	

		Pre-Control Measure Implementation						Post-Control Measure Implementation			
Ref.	Contributory/Qualitative Factors to Potential Peat Failure	Prob	Impact	Risk	Risk Rating	Control Required	Control measures to be implemented during construction	Prob	Impact	Risk	Risk Rating
1	FOS = 7.74 (u), 8.49 (d)	1	1	1	Trival	No		1	1	1	Trival
2	Evidence of sub peat water flow	1	1	1	Trival	No		1	1	1	Trival
3	Evidence of surface water flow	2	1	2	Trival	No		1	1	1	Trival
4	Evidence of previous failures/slips	0	1	0	Not Applicable	No		0	1	0	Not Applicable
5	Type of vegetation	2	1	2	Trival	No		2	1	2	Trival
6	General slope characteristics upslope/downslope from infrastructure location	1	1	1	Trival	No	See Below	1	1	1	Trival
7	Evidence of very soft/soft clay at base of peat	0	1	0	Not Applicable	No		0	1	0	Not Applicable
8	Evidence of mechanically cut peat	0	1	0	Not Applicable	No		0	1	0	Not Applicable
9	Evidence of quaking or buoyant peat	0	1	0	Not Applicable	No		0	1	0	Not Applicable
10	Evidence of bog pools	0	1	0	Not Applicable	No		0	1	0	Not Applicable
11	Other	0	1	0	Not Applicable	No		0	1	0	Not Applicable

	Control Measures to be Implemented Prior to/and During Construction for **Turbine T4**
i	Maintain hydrology of area as far as possible;
ii	Installation of interceptor drains upslope of works to divert any surface water away from turbine construction area;
iii	Use of experienced geotechnical staff for site investigation;
iv	Use of experienced contractors and trained operators to carry out the work;
v	Detailed ground investigation to determine peat, mineral soil and bedrock condition and properties.

Note

(1) FOS abbreviations are: u: FOS for undrained analysis, d: FOS for drained analysis.

Meenbog Wind Farm - Geotechnical Risk Register (Rev 0)

Location:	**Turbine T5**

Grid Reference (Eastings, Northings):	**207241**	**385035**
Distance to Watercourse (m)	**> 150**	
Maximum Measured Peat Depth (m):	**4.7**	
Control Required:	**Yes**	

		Pre-Control Measure Implementation						Post-Control Measure Implementation			
Ref.	Contributory/Qualitative Factors to Potential Peat Failure	Prob	Impact	Risk	Risk Rating	Control Required	Control measures to be implemented during construction	Prob	Impact	Risk	Risk Rating
1	FOS = 5.03 (u), 4.88 (d)	1	1	1	Trival	No		1	1	1	Trival
2	Evidence of sub peat water flow	1	1	1	Trival	No		1	1	1	Trival
3	Evidence of surface water flow	2	1	2	Trival	No		1	1	1	Trival
4	Evidence of previous failures/slips	0	1	0	Not Applicable	No		0	1	0	Not Applicable
5	Type of vegetation	2	1	2	Trival	No		2	1	2	Trival
6	General slope characteristics upslope/downslope from infrastructure location	1	1	1	Trival	No	See Below	1	1	1	Trival
7	Evidence of very soft/soft clay at base of peat	0	1	0	Not Applicable	No		0	1	0	Not Applicable
8	Evidence of mechanically cut peat	0	1	0	Not Applicable	No		0	1	0	Not Applicable
9	Evidence of quaking or buoyant peat	0	1	0	Not Applicable	No		0	1	0	Not Applicable
10	Evidence of bog pools	0	1	0	Not Applicable	No		0	1	0	Not Applicable
11	Deep peat	3	1	3	Tolerable	Yes		1	1	1	Trival

	Control Measures to be Implemented Prior to/and During Construction for **Turbine T5**
i	Due to deeper peat at this turbine location this will require additional construction measures such as : - access and working area formed using bog mats - excavation side walls to be supported (eg. boulders, retaining wall units) or excavation face battered to shallow angle - temporary works designer may be required to provide excavation support design - daily detailed inspection of excavation faces - potential for greater water inflow into excavation requiring removal of water using pumping - increased exclusion zone around excavation to avoid accidental loading of crest of slope
ii	Maintain hydrology of area as far as possible;
iii	Installation of interceptor drains upslope of works to divert any surface water away from turbine construction area;
iv	Use of experienced geotechnical staff for site investigation;
v	Use of experienced contractors and trained operators to carry out the work;
vi	Detailed ground investigation to determine peat, mineral soil and bedrock condition and properties.

Note

(1) FOS abbreviations are: u: FOS for undrained analysis, d: FOS for drained analysis.

Meenbog Wind Farm - Geotechnical Risk Register (Rev 0)

Location:	**Turbine T6**

Grid Reference (Eastings, Northings):	**207639**	**385286**
Distance to Watercourse (m)	**> 150**	
Maximum Measured Peat Depth (m):	**0.2**	
Control Required:	**No**	

		Pre-Control Measure Implementation						Post-Control Measure Implementation			
Ref.	Contributory/Qualitative Factors to Potential Peat Failure	Prob	Impact	Risk	Risk Rating	Control Required	Control measures to be implemented during construction	Prob	Impact	Risk	Risk Rating
1	FOS = 1.67 (u), 2.78 (d)	1	1	1	Trival	No		1	1	1	Trival
2	Evidence of sub peat water flow	1	1	1	Trival	No		1	1	1	Trival
3	Evidence of surface water flow	2	1	2	Trival	No		1	1	1	Trival
4	Evidence of previous failures/slips	0	1	0	Not Applicable	No		0	1	0	Not Applicable
5	Type of vegetation	1	1	1	Trival	No		1	1	1	Trival
6	General slope characteristics upslope/downslope from infrastructure location	3	1	3	Tolerable	No	See Below	2	1	2	Trival
7	Evidence of very soft/soft clay at base of peat	0	1	0	Not Applicable	No		0	1	0	Not Applicable
8	Evidence of mechanically cut peat	0	1	0	Not Applicable	No		0	1	0	Not Applicable
9	Evidence of quaking or buoyant peat	0	1	0	Not Applicable	No		0	1	0	Not Applicable
10	Evidence of bog pools	0	1	0	Not Applicable	No		0	1	0	Not Applicable
11	Other	0	1	0	Not Applicable	No		0	1	0	Not Applicable

	Control Measures to be Implemented Prior to/and During Construction for **Turbine T6**
i	Maintain hydrology of area as far as possible;
ii	Installation of interceptor drains upslope of works to divert any surface water away from turbine construction area;
iii	Use of experienced geotechnical staff for site investigation;
iv	Use of experienced contractors and trained operators to carry out the work;
v	Detailed ground investigation to determine peat, mineral soil and bedrock condition and properties.

Note

(1) FOS abbreviations are: u: FOS for undrained analysis, d: FOS for drained analysis.

Meenbog Wind Farm - Geotechnical Risk Register (Rev 0)

Location:	**Turbine T7**

Grid Reference (Eastings, Northings):	**208261**	**385494**
Distance to Watercourse (m)	**50 - 100**	
Maximum Measured Peat Depth (m):	**1.7**	
Control Required:	**No**	

		Pre-Control Measure Implementation						Post-Control Measure Implementation			
Ref.	Contributory/Qualitative Factors to Potential Peat Failure	Prob	Impact	Risk	Risk Rating	Control Required	Control measures to be implemented during construction	Prob	Impact	Risk	Risk Rating
1	FOS = 2.13 (u), 2.71 (d)	1	3	3	Tolerable	No	See Below	1	3	3	Tolerable
2	Evidence of sub peat water flow	1	3	3	Tolerable	No		1	3	3	Tolerable
3	Evidence of surface water flow	2	3	6	Substantial	No		1	3	3	Tolerable
4	Evidence of previous failures/slips	0	3	0	Not Applicable	No		0	3	0	Not Applicable
5	Type of vegetation	1	3	3	Tolerable	No		1	3	3	Tolerable
6	General slope characteristics upslope/downslope from infrastructure location	2	3	6	Substantial	No		1	3	3	Tolerable
7	Evidence of very soft/soft clay at base of peat	0	3	0	Not Applicable	No		0	3	0	Not Applicable
8	Evidence of mechanically cut peat	0	3	0	Not Applicable	No		0	3	0	Not Applicable
9	Evidence of quaking or buoyant peat	0	3	0	Not Applicable	No		0	3	0	Not Applicable
10	Evidence of bog pools	0	3	0	Not Applicable	No		0	3	0	Not Applicable
11	Other	0	3	0	Not Applicable	No		0	3	0	Not Applicable

	Control Measures to be Implemented Prior to/and During Construction for **Turbine T7**
i	Maintain hydrology of area as far as possible;
ii	Installation of interceptor drains upslope of works to divert any surface water away from turbine construction area;
iii	Use of experienced geotechnical staff for site investigation;
iv	Use of experienced contractors and trained operators to carry out the work;
v	Detailed ground investigation to determine peat, mineral soil and bedrock condition and properties.
vi	The proximity of the infrastructure location to the nearest watercourse results in a risk rating of substantial. Given the peat thickness and terrian present at this location, no significant control measures are required.

Note

(1) FOS abbreviations are: u: FOS for undrained analysis, d: FOS for drained analysis.

Meenbog Wind Farm - Geotechnical Risk Register (Rev 0)

Location:	**Turbine T8**

Grid Reference (Eastings, Northings):	**207155**	**385589**
Distance to Watercourse (m)	**100 - 150**	
Maximum Measured Peat Depth (m):	**2.0**	
Control Required:	**No**	

		Pre-Control Measure Implementation						Post-Control Measure Implementation			
Ref.	Contributory/Qualitative Factors to Potential Peat Failure	Prob	Impact	Risk	Risk Rating	Control Required	Control measures to be implemented during construction	Prob	Impact	Risk	Risk Rating
1	FOS = 1.92 (u), 2.30 (d)	1	2	2	Trival	No		1	2	2	Trival
2	Evidence of sub peat water flow	1	2	2	Trival	No		1	2	2	Trival
3	Evidence of surface water flow	2	2	4	Tolerable	No		1	2	2	Trival
4	Evidence of previous failures/slips	0	2	0	Not Applicable	No		0	2	0	Not Applicable
5	Type of vegetation	2	2	4	Tolerable	No		2	2	4	Tolerable
6	General slope characteristics upslope/downslope from infrastructure location	2	2	4	Tolerable	No	See Below	1	2	2	Trival
7	Evidence of very soft/soft clay at base of peat	0	2	0	Not Applicable	No		0	2	0	Not Applicable
8	Evidence of mechanically cut peat	0	2	0	Not Applicable	No		0	2	0	Not Applicable
9	Evidence of quaking or buoyant peat	0	2	0	Not Applicable	No		0	2	0	Not Applicable
10	Evidence of bog pools	0	2	0	Not Applicable	No		0	2	0	Not Applicable
11	Other	0	2	0	Not Applicable	No		0	2	0	Not Applicable

	Control Measures to be Implemented Prior to/and During Construction for**Turbine T8**
i	Maintain hydrology of area as far as possible;
ii	Installation of interceptor drains upslope of works to divert any surface water away from turbine construction area;
iii	Use of experienced geotechnical staff for site investigation;
iv	Use of experienced contractors and trained operators to carry out the work;
v	Detailed ground investigation to determine peat, mineral soil and bedrock condition and properties.

Note
(1) FOS abbreviations are: u: FOS for undrained analysis, d: FOS for drained analysis.

Meenbog Wind Farm - Geotechnical Risk Register (Rev 0)

Location:	**Turbine T9**

Grid Reference (Eastings, Northings):	**208732**	**385899**
Distance to Watercourse (m)	**50 - 100**	
Maximum Measured Peat Depth (m):	**0.5**	
Control Required:	**No**	

		Pre-Control Measure Implementation						Post-Control Measure Implementation			
Ref.	Contributory/Qualitative Factors to Potential Peat Failure	Prob	Impact	Risk	Risk Rating	Control Required	Control measures to be implemented during construction	Prob	Impact	Risk	Risk Rating
1	FOS = 2.16 (u), 3.69 (d)	1	3	3	Tolerable	No	See Below	1	3	3	Tolerable
2	Evidence of sub peat water flow	1	3	3	Tolerable	No		1	3	3	Tolerable
3	Evidence of surface water flow	2	3	6	Substantial	No		1	3	3	Tolerable
4	Evidence of previous failures/slips	0	3	0	Not Applicable	No		0	3	0	Not Applicable
5	Type of vegetation	1	3	3	Tolerable	No		1	3	3	Tolerable
6	General slope characteristics upslope/downslope from infrastructure location	2	3	6	Substantial	No		1	3	3	Tolerable
7	Evidence of very soft/soft clay at base of peat	0	3	0	Not Applicable	No		0	3	0	Not Applicable
8	Evidence of mechanically cut peat	0	3	0	Not Applicable	No		0	3	0	Not Applicable
9	Evidence of quaking or buoyant peat	0	3	0	Not Applicable	No		0	3	0	Not Applicable
10	Evidence of bog pools	0	3	0	Not Applicable	No		0	3	0	Not Applicable
11	Other	0	3	0	Not Applicable	No		0	3	0	Not Applicable

	Control Measures to be Implemented Prior to/and During Construction for **Turbine T9**
i	Maintain hydrology of area as far as possible;
ii	Installation of interceptor drains upslope of works to divert any surface water away from turbine construction area;
iii	Use of experienced geotechnical staff for site investigation;
iv	Use of experienced contractors and trained operators to carry out the work;
v	Detailed ground investigation to determine peat, mineral soil and bedrock condition and properties.
vi	The proximity of the infrastructure location to the nearest watercourse results in a risk rating of substantial. Given the peat thickness and terrian present at this location, no significant control measures are required.

Note
(1) FOS abbreviations are: u: FOS for undrained analysis, d: FOS for drained analysis.

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Location:	**Turbine T10**

Grid Reference (Eastings, Northings):	**206803**	**385952**
Distance to Watercourse (m)	**50 - 100**	
Maximum Measured Peat Depth (m):	**2.5**	
Control Required:	**Yes**	

		Pre-Control Measure Implementation						Post-Control Measure Implementation			
Ref.	Contributory/Qualitative Factors to Potential Peat Failure	Prob	Impact	Risk	Risk Rating	Control Required	Control measures to be implemented during construction	Prob	Impact	Risk	Risk Rating
1	FOS = 4.10 (u), 4.59 (d)	1	3	3	Tolerable	No		1	3	3	Tolerable
2	Evidence of sub peat water flow	1	3	3	Tolerable	No		1	3	3	Tolerable
3	Evidence of surface water flow	2	3	6	Substantial	Yes		1	3	3	Tolerable
4	Evidence of previous failures/slips	0	3	0	Not Applicable	No		0	3	0	Not Applicable
5	Type of vegetation	2	3	6	Substantial	Yes		1	3	3	Tolerable
6	General slope characteristics upslope/downslope from infrastructure location	1	3	3	Tolerable	No	See Below	1	3	3	Tolerable
7	Evidence of very soft/soft clay at base of peat	0	3	0	Not Applicable	No		0	3	0	Not Applicable
8	Evidence of mechanically cut peat	0	3	0	Not Applicable	No		0	3	0	Not Applicable
9	Evidence of quaking or buoyant peat	0	3	0	Not Applicable	No		0	3	0	Not Applicable
10	Evidence of bog pools	0	3	0	Not Applicable	No		0	3	0	Not Applicable
11	Relatively deep peat	2	3	6	Substantial	Yes		1	3	3	Tolerable

	Control Measures to be Implemented Prior to/and During Construction for **Turbine T10**
i	Due to deeper peat at this turbine location and its proximity to the nearest watercourse, this location will require additional construction measures such as: - access and working area formed using bog mats - excavation side walls to be supported (eg. boulders, retaining wall units) or excavation face battered to shallow angle - temporary works designer may be required to provide excavation support design - daily detailed inspection of excavation faces - potential for greater water inflow into excavation requiring removal of water using pumping - increased exclusion zone around excavation to avoid accidental loading of crest of slope
ii	Maintain hydrology of area as far as possible;
iii	Installation of interceptor drains upslope of works to divert any surface water away from turbine construction area;
iv	Use of experienced geotechnical staff for site investigation;
v	Use of experienced contractors and trained operators to carry out the work;
vi	Detailed ground investigation to determine peat, mineral soil and bedrock condition and properties.

Note

(1) FOS abbreviations are: u: FOS for undrained analysis, d: FOS for drained analysis.

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Location:	**Turbine T11**

Grid Reference (Eastings, Northings):	**208183**	**385999**
Distance to Watercourse (m)	**> 150**	
Maximum Measured Peat Depth (m):	**2.1**	
Control Required:	**No**	

		Pre-Control Measure Implementation						Post-Control Measure Implementation			
Ref.	Contributory/Qualitative Factors to Potential Peat Failure	Prob	Impact	Risk	Risk Rating	Control Required	Control measures to be implemented during construction	Prob	Impact	Risk	Risk Rating
1	FOS = 3.09 (u), 3.64 (d)	1	1	1	Trival	No		1	1	1	Trival
2	Evidence of sub peat water flow	1	1	1	Trival	No		1	1	1	Trival
3	Evidence of surface water flow	2	1	2	Trival	No		1	1	1	Trival
4	Evidence of previous failures/slips	0	1	0	Not Applicable	No		0	1	0	Not Applicable
5	Type of vegetation	2	1	2	Trival	No		2	1	2	Trival
6	General slope characteristics upslope/downslope from infrastructure location	1	1	1	Trival	No	See Below	1	1	1	Trival
7	Evidence of very soft/soft clay at base of peat	0	1	0	Not Applicable	No		0	1	0	Not Applicable
8	Evidence of mechanically cut peat	0	1	0	Not Applicable	No		0	1	0	Not Applicable
9	Evidence of quaking or buoyant peat	0	1	0	Not Applicable	No		0	1	0	Not Applicable
10	Evidence of bog pools	0	1	0	Not Applicable	No		0	1	0	Not Applicable
11	Other	0	1	0	Not Applicable	No		0	1	0	Not Applicable

	Control Measures to be Implemented Prior to/and During Construction for **Turbine T11**
i	Maintain hydrology of area as far as possible;
ii	Installation of interceptor drains upslope of works to divert any surface water away from turbine construction area;
iii	Use of experienced geotechnical staff for site investigation;
iv	Use of experienced contractors and trained operators to carry out the work;
v	Detailed ground investigation to determine peat, mineral soil and bedrock condition and properties.

Note

(1) FOS abbreviations are: u: FOS for undrained analysis, d: FOS for drained analysis.

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Location:	**Turbine T12**

Grid Reference (Eastings, Northings):	**207583**	**386083**
Distance to Watercourse (m)	**50 - 100**	
Maximum Measured Peat Depth (m):	**1.7**	
Control Required:	**No**	

		Pre-Control Measure Implementation						Post-Control Measure Implementation			
Ref.	Contributory/Qualitative Factors to Potential Peat Failure	Prob	Impact	Risk	Risk Rating	Control Required	Control measures to be implemented during construction	Prob	Impact	Risk	Risk Rating
1	FOS = 1.78 (u), 2.26 (d)	1	3	3	Tolerable	No	See Below	1	3	3	Tolerable
2	Evidence of sub peat water flow	1	3	3	Tolerable	No		1	3	3	Tolerable
3	Evidence of surface water flow	2	3	6	Substantial	No		1	3	3	Tolerable
4	Evidence of previous failures/slips	0	3	0	Not Applicable	No		0	3	0	Not Applicable
5	Type of vegetation	2	3	6	Substantial	No		1	3	3	Tolerable
6	General slope characteristics upslope/downslope from infrastructure location	2	3	6	Substantial	No		1	3	3	Tolerable
7	Evidence of very soft/soft clay at base of peat	0	3	0	Not Applicable	No		0	3	0	Not Applicable
8	Evidence of mechanically cut peat	0	3	0	Not Applicable	No		0	3	0	Not Applicable
9	Evidence of quaking or buoyant peat	0	3	0	Not Applicable	No		0	3	0	Not Applicable
10	Evidence of bog pools	0	3	0	Not Applicable	No		0	3	0	Not Applicable
11	Other	0	3	0	Not Applicable	No		0	3	0	Not Applicable

	Control Measures to be Implemented Prior to/and During Construction for **Turbine T12**
i	Maintain hydrology of area as far as possible;
ii	Installation of interceptor drains upslope of works to divert any surface water away from turbine construction area;
iii	Use of experienced geotechnical staff for site investigation;
iv	Use of experienced contractors and trained operators to carry out the work;
v	Detailed ground investigation to determine peat, mineral soil and bedrock condition and properties.
vi	The proximity of the infrastructure location to the nearest watercourse results in a risk rating of substantial. Given the peat thickness and terrian present at this location, no significant control measures are required.

Note

(1) FOS abbreviations are: u: FOS for undrained analysis, d: FOS for drained analysis.

Meenbog Wind Farm - Geotechnical Risk Register (Rev 0)

Location:	**Turbine T13**

Grid Reference (Eastings, Northings):	**208379**	**386526**
Distance to Watercourse (m)	**> 150**	
Maximum Measured Peat Depth (m):	**0.3**	
Control Required:	**No**	

		Pre-Control Measure Implementation						Post-Control Measure Implementation			
Ref.	Contributory/Qualitative Factors to Potential Peat Failure	Prob	Impact	Risk	Risk Rating	Control Required	Control measures to be implemented during construction	Prob	Impact	Risk	Risk Rating
1	FOS = 11.03 (u), 19.09 (d)	1	1	1	Trival	No		1	1	1	Trival
2	Evidence of sub peat water flow	1	1	1	Trival	No		1	1	1	Trival
3	Evidence of surface water flow	2	1	2	Trival	No		1	1	1	Trival
4	Evidence of previous failures/slips	0	1	0	Not Applicable	No		0	1	0	Not Applicable
5	Type of vegetation	1	1	1	Trival	No		1	1	1	Trival
6	General slope characteristics upslope/downslope from infrastructure location	1	1	1	Trival	No	See Below	1	1	1	Trival
7	Evidence of very soft/soft clay at base of peat	0	1	0	Not Applicable	No		0	1	0	Not Applicable
8	Evidence of mechanically cut peat	0	1	0	Not Applicable	No		0	1	0	Not Applicable
9	Evidence of quaking or buoyant peat	0	1	0	Not Applicable	No		0	1	0	Not Applicable
10	Evidence of bog pools	0	1	0	Not Applicable	No		0	1	0	Not Applicable
11	Other	0	1	0	Not Applicable	No		0	1	0	Not Applicable

	Control Measures to be Implemented Prior to/and During Construction for **Turbine T13**
i	Maintain hydrology of area as far as possible;
ii	Installation of interceptor drains upslope of works to divert any surface water away from turbine construction area;
iii	Use of experienced geotechnical staff for site investigation;
iv	Use of experienced contractors and trained operators to carry out the work;
v	Detailed ground investigation to determine peat, mineral soil and bedrock condition and properties.

Note

(1) FOS abbreviations are: u: FOS for undrained analysis, d: FOS for drained analysis.

Meenbog Wind Farm - Geotechnical Risk Register (Rev 0)

Location:	**Turbine T14**

Grid Reference (Eastings, Northings):	**206983**	**386559**
Distance to Watercourse (m)	**> 150**	
Maximum Measured Peat Depth (m):	**1.3**	
Control Required:	**No**	

		Pre-Control Measure Implementation						Post-Control Measure Implementation			
Ref.	Contributory/Qualitative Factors to Potential Peat Failure	Prob	Impact	Risk	Risk Rating	Control Required	Control measures to be implemented during construction	Prob	Impact	Risk	Risk Rating
1	FOS = 12.46 (u), 17.63 (d)	1	1	1	Trival	No		1	1	1	Trival
2	Evidence of sub peat water flow	1	1	1	Trival	No		1	1	1	Trival
3	Evidence of surface water flow	2	1	2	Trival	No		1	1	1	Trival
4	Evidence of previous failures/slips	0	1	0	Not Applicable	No		0	1	0	Not Applicable
5	Type of vegetation	2	1	2	Trival	No		2	1	2	Trival
6	General slope characteristics upslope/downslope from infrastructure location	1	1	1	Trival	No	See Below	1	1	1	Trival
7	Evidence of very soft/soft clay at base of peat	0	1	0	Not Applicable	No		0	1	0	Not Applicable
8	Evidence of mechanically cut peat	0	1	0	Not Applicable	No		0	1	0	Not Applicable
9	Evidence of quaking or buoyant peat	0	1	0	Not Applicable	No		0	1	0	Not Applicable
10	Evidence of bog pools	0	1	0	Not Applicable	No		0	1	0	Not Applicable
11	Other	0	1	0	Not Applicable	No		0	1	0	Not Applicable

	Control Measures to be Implemented Prior to/and During Construction for **Turbine T14**
i	Maintain hydrology of area as far as possible;
ii	Installation of interceptor drains upslope of works to divert any surface water away from turbine construction area;
iii	Use of experienced geotechnical staff for site investigation;
iv	Use of experienced contractors and trained operators to carry out the work;
v	Detailed ground investigation to determine peat, mineral soil and bedrock condition and properties.

Note
(1) FOS abbreviations are: u: FOS for undrained analysis, d: FOS for drained analysis.

Meenbog Wind Farm - Geotechnical Risk Register (Rev 0)

Location:	**Turbine T15**

Grid Reference (Eastings, Northings):	**207800**	**386648**
Distance to Watercourse (m)	**> 150**	
Maximum Measured Peat Depth (m):	**0.2**	
Control Required:	**No**	

		Pre-Control Measure Implementation						Post-Control Measure Implementation			
Ref.	Contributory/Qualitative Factors to Potential Peat Failure	Prob	Impact	Risk	Risk Rating	Control Required	Control measures to be implemented during construction	Prob	Impact	Risk	Risk Rating
1	FOS = 11.95 (u), 20.68 (d)	1	1	1	Trival	No		1	1	1	Trival
2	Evidence of sub peat water flow	1	1	1	Trival	No		1	1	1	Trival
3	Evidence of surface water flow	2	1	2	Trival	No		1	1	1	Trival
4	Evidence of previous failures/slips	0	1	0	Not Applicable	No		0	1	0	Not Applicable
5	Type of vegetation	1	1	1	Trival	No		1	1	1	Trival
6	General slope characteristics upslope/downslope from infrastructure location	1	1	1	Trival	No	See Below	1	1	1	Trival
7	Evidence of very soft/soft clay at base of peat	0	1	0	Not Applicable	No		0	1	0	Not Applicable
8	Evidence of mechanically cut peat	0	1	0	Not Applicable	No		0	1	0	Not Applicable
9	Evidence of quaking or buoyant peat	0	1	0	Not Applicable	No		0	1	0	Not Applicable
10	Evidence of bog pools	0	1	0	Not Applicable	No		0	1	0	Not Applicable
11	Other	0	1	0	Not Applicable	No		0	1	0	Not Applicable

	Control Measures to be Implemented Prior to/and During Construction for **Turbine T15**
i	Maintain hydrology of area as far as possible;
ii	Installation of interceptor drains upslope of works to divert any surface water away from turbine construction area;
iii	Use of experienced geotechnical staff for site investigation;
iv	Use of experienced contractors and trained operators to carry out the work;
v	Detailed ground investigation to determine peat, mineral soil and bedrock condition and properties.

Note

(1) FOS abbreviations are: u: FOS for undrained analysis, d: FOS for drained analysis.

Meenbog Wind Farm - Geotechnical Risk Register (Rev 0)

Location:	**Turbine T16**

Grid Reference (Eastings, Northings):	**208946**	**386668**
Distance to Watercourse (m)	**> 150**	
Maximum Measured Peat Depth (m):	**1.0**	
Control Required:	**No**	

		Pre-Control Measure Implementation						Post-Control Measure Implementation			
Ref.	Contributory/Qualitative Factors to Potential Peat Failure	Prob	Impact	Risk	Risk Rating	Control Required	Control measures to be implemented during construction	Prob	Impact	Risk	Risk Rating
1	FOS = 4.78 (u), 7.65 (d)	1	1	1	Trival	No		1	1	1	Trival
2	Evidence of sub peat water flow	1	1	1	Trival	No		1	1	1	Trival
3	Evidence of surface water flow	2	1	2	Trival	No		1	1	1	Trival
4	Evidence of previous failures/slips	0	1	0	Not Applicable	No		0	1	0	Not Applicable
5	Type of vegetation	2	1	2	Trival	No		2	1	2	Trival
6	General slope characteristics upslope/downslope from infrastructure location	1	1	1	Trival	No	See Below	1	1	1	Trival
7	Evidence of very soft/soft clay at base of peat	0	1	0	Not Applicable	No		0	1	0	Not Applicable
8	Evidence of mechanically cut peat	0	1	0	Not Applicable	No		0	1	0	Not Applicable
9	Evidence of quaking or buoyant peat	0	1	0	Not Applicable	No		0	1	0	Not Applicable
10	Evidence of bog pools	0	1	0	Not Applicable	No		0	1	0	Not Applicable
11	Other	0	1	0	Not Applicable	No		0	1	0	Not Applicable

	Control Measures to be Implemented Prior to/and During Construction for **Turbine T16**
i	Maintain hydrology of area as far as possible;
ii	Installation of interceptor drains upslope of works to divert any surface water away from turbine construction area;
iii	Use of experienced geotechnical staff for site investigation;
iv	Use of experienced contractors and trained operators to carry out the work;
v	Detailed ground investigation to determine peat, mineral soil and bedrock condition and properties.

Note
(1) FOS abbreviations are: u: FOS for undrained analysis, d: FOS for drained analysis.

Meenbog Wind Farm - Geotechnical Risk Register (Rev 0)

Location:	**Turbine T17**

Grid Reference (Eastings, Northings):	**208631**	**387052**
Distance to Watercourse (m)	**> 150**	
Maximum Measured Peat Depth (m):	**1.5**	
Control Required:	**No**	

		Pre-Control Measure Implementation						Post-Control Measure Implementation			
Ref.	Contributory/Qualitative Factors to Potential Peat Failure	Prob	Impact	Risk	Risk Rating	Control Required	Control measures to be implemented during construction	Prob	Impact	Risk	Risk Rating
1	FOS = 1.92 (u), 2.57 (d)	1	1	1	Trival	No	See Below	1	1	1	Trival
2	Evidence of sub peat water flow	1	1	1	Trival	No		1	1	1	Trival
3	Evidence of surface water flow	2	1	2	Trival	No		1	1	1	Trival
4	Evidence of previous failures/slips	0	1	0	Not Applicable	No		0	1	0	Not Applicable
5	Type of vegetation	1	1	1	Trival	No		1	1	1	Trival
6	General slope characteristics upslope/downslope from infrastructure location	2	1	2	Trival	No		2	1	2	Trival
7	Evidence of very soft/soft clay at base of peat	0	1	0	Not Applicable	No		0	1	0	Not Applicable
8	Evidence of mechanically cut peat	0	1	0	Not Applicable	No		0	1	0	Not Applicable
9	Evidence of quaking or buoyant peat	0	1	0	Not Applicable	No		0	1	0	Not Applicable
10	Evidence of bog pools	0	1	0	Not Applicable	No		0	1	0	Not Applicable
11	Other	0	1	0	Not Applicable	No		0	1	0	Not Applicable

	Control Measures to be Implemented Prior to/and During Construction for **Turbine T17**
i	Maintain hydrology of area as far as possible;
ii	Installation of interceptor drains upslope of works to divert any surface water away from turbine construction area;
iii	Use of experienced geotechnical staff for site investigation;
iv	Use of experienced contractors and trained operators to carry out the work;
v	Detailed ground investigation to determine peat, mineral soil and bedrock condition and properties.

Note

(1) FOS abbreviations are: u: FOS for undrained analysis, d: FOS for drained analysis.

Meenbog Wind Farm - Geotechnical Risk Register (Rev 0)

Location:	**Turbine T18**

Grid Reference (Eastings, Northings):	**207448**	**387070**
Distance to Watercourse (m)	**50 - 100**	
Maximum Measured Peat Depth (m):	**1.0**	
Control Required:	**No**	

		Pre-Control Measure Implementation						Post-Control Measure Implementation			
Ref.	Contributory/Qualitative Factors to Potential Peat Failure	Prob	Impact	Risk	Risk Rating	Control Required	Control measures to be implemented during construction	Prob	Impact	Risk	Risk Rating
1	FOS = 4.78 (u), 7.65 (d)	1	3	3	Tolerable	No	See Below	1	3	3	Tolerable
2	Evidence of sub peat water flow	1	3	3	Tolerable	No		1	3	3	Tolerable
3	Evidence of surface water flow	2	3	6	Substantial	No		1	3	3	Tolerable
4	Evidence of previous failures/slips	0	3	0	Not Applicable	No		0	3	0	Not Applicable
5	Type of vegetation	2	3	6	Substantial	No		1	3	3	Tolerable
6	General slope characteristics upslope/downslope from infrastructure location	1	3	3	Tolerable	No		1	3	3	Tolerable
7	Evidence of very soft/soft clay at base of peat	0	3	0	Not Applicable	No		0	3	0	Not Applicable
8	Evidence of mechanically cut peat	0	3	0	Not Applicable	No		0	3	0	Not Applicable
9	Evidence of quaking or buoyant peat	0	3	0	Not Applicable	No		0	3	0	Not Applicable
10	Evidence of bog pools	0	3	0	Not Applicable	No		0	3	0	Not Applicable
11	Other	0	3	0	Not Applicable	No		0	3	0	Not Applicable

	Control Measures to be Implemented Prior to/and During Construction for **Turbine T18**
i	Maintain hydrology of area as far as possible;
ii	Installation of interceptor drains upslope of works to divert any surface water away from turbine construction area;
iii	Use of experienced geotechnical staff for site investigation;
iv	Use of experienced contractors and trained operators to carry out the work;
v	Detailed ground investigation to determine peat, mineral soil and bedrock condition and properties.
vi	The proximity of the infrastructure location to the nearest watercourse results in a risk rating of substantial. Given the peat thickness and terrian present at this location, no significant control measures are required.

Note

(1) FOS abbreviations are: u: FOS for undrained analysis, d: FOS for drained analysis.

Meenbog Wind Farm - Geotechnical Risk Register (Rev 0)

Location:	**Turbine T19**

Grid Reference (Eastings, Northings):	**209173**	**387212**
Distance to Watercourse (m)	**> 150**	
Maximum Measured Peat Depth (m):	**0.3**	
Control Required:	**No**	

		Pre-Control Measure Implementation						Post-Control Measure Implementation			
Ref.	Contributory/Qualitative Factors to Potential Peat Failure	Prob	Impact	Risk	Risk Rating	Control Required	Control measures to be implemented during construction	Prob	Impact	Risk	Risk Rating
1	FOS = 7.36 (u), 12.73 (d)	1	1	1	Trival	No	See Below	1	1	1	Trival
2	Evidence of sub peat water flow	1	1	1	Trival	No		1	1	1	Trival
3	Evidence of surface water flow	2	1	2	Trival	No		1	1	1	Trival
4	Evidence of previous failures/slips	0	1	0	Not Applicable	No		0	1	0	Not Applicable
5	Type of vegetation	1	1	1	Trival	No		1	1	1	Trival
6	General slope characteristics upslope/downslope from infrastructure location	1	1	1	Trival	No		1	1	1	Trival
7	Evidence of very soft/soft clay at base of peat	0	1	0	Not Applicable	No		0	1	0	Not Applicable
8	Evidence of mechanically cut peat	0	1	0	Not Applicable	No		0	1	0	Not Applicable
9	Evidence of quaking or buoyant peat	0	1	0	Not Applicable	No		0	1	0	Not Applicable
10	Evidence of bog pools	0	1	0	Not Applicable	No		0	1	0	Not Applicable
11	Other	0	1	0	Not Applicable	No		0	1	0	Not Applicable

	Control Measures to be Implemented Prior to/and During Construction for **Turbine T19**
i	Maintain hydrology of area as far as possible;
ii	Installation of interceptor drains upslope of works to divert any surface water away from turbine construction area;
iii	Use of experienced geotechnical staff for site investigation;
iv	Use of experienced contractors and trained operators to carry out the work;
v	Detailed ground investigation to determine peat, mineral soil and bedrock condition and properties.

Note
(1) FOS abbreviations are: u: FOS for undrained analysis, d: FOS for drained analysis.

Meenbog Wind Farm - Geotechnical Risk Register (Rev 0)

Location:	**Met Mast**

Grid Reference (Eastings, Northings):	**206885**	**385678**
Distance to Watercourse (m)	**100 - 150**	
Maximum Measured Peat Depth (m):	**1.5**	
Control Required:	**No**	

		Pre-Control Measure Implementation						Post-Control Measure Implementation			
Ref.	Contributory/Qualitative Factors to Potential Peat Failure	Prob	Impact	Risk	Risk Rating	Control Required	Control measures to be implemented during construction	Prob	Impact	Risk	Risk Rating
1	FOS = 5.10 (u), 6.62 (d)	1	2	2	Trival	No	See Below	1	2	2	Trival
2	Evidence of sub peat water flow	1	2	2	Trival	No		1	2	2	Trival
3	Evidence of surface water flow	2	2	4	Tolerable	No		1	2	2	Trival
4	Evidence of previous failures/slips	0	2	0	Not Applicable	No		0	2	0	Not Applicable
5	Type of vegetation	2	2	4	Tolerable	No		2	2	4	Tolerable
6	General slope characteristics upslope/downslope from infrastructure location	2	2	4	Tolerable	No		1	2	2	Trival
7	Evidence of very soft/soft clay at base of peat	0	2	0	Not Applicable	No		0	2	0	Not Applicable
8	Evidence of mechanically cut peat	0	2	0	Not Applicable	No		0	2	0	Not Applicable
9	Evidence of quaking or buoyant peat	0	2	0	Not Applicable	No		0	2	0	Not Applicable
10	Evidence of bog pools	0	2	0	Not Applicable	No		0	2	0	Not Applicable
11	Other	0	2	0	Not Applicable	No		0	2	0	Not Applicable

	Control Measures to be Implemented Prior to/and During Construction for **Met Mast**
i	Maintain hydrology of area as far as possible;
ii	Installation of interceptor drains upslope of works to divert any surface water away from turbine construction area;
iii	Use of experienced geotechnical staff for site investigation;
iv	Use of experienced contractors and trained operators to carry out the work;
v	Detailed ground investigation to determine peat, mineral soil and bedrock condition and properties.

Note
(1) FOS abbreviations are: u: FOS for undrained analysis, d: FOS for drained analysis.

Meenbog Wind Farm - Geotechnical Risk Register (Rev 0)

Location:	**Substation**

Grid Reference (Eastings, Northings):	**205184**	**386668**
Distance to Watercourse (m)	**50 - 100**	
Maximum Measured Peat Depth (m):	**2.6**	
Control Required:	**Yes**	

		Pre-Control Measure Implementation						Post-Control Measure Implementation			
Ref.	Contributory/Qualitative Factors to Potential Peat Failure	Prob	Impact	Risk	Risk Rating	Control Required	Control measures to be implemented during construction	Prob	Impact	Risk	Risk Rating
1	FOS = 2.00 (u), 2.21 (d)	1	3	3	Tolerable	No		1	3	3	Tolerable
2	Evidence of sub peat water flow	1	3	3	Tolerable	No		1	3	3	Tolerable
3	Evidence of surface water flow	1	3	3	Tolerable	No		1	3	3	Tolerable
4	Evidence of previous failures/slips	0	3	0	Not Applicable	No		0	3	0	Not Applicable
5	Type of vegetation	2	3	6	Substantial	Yes		2	3	6	Substantial
6	General slope characteristics upslope/downslope from infrastructure location	1	3	3	Tolerable	No	See Below	1	3	3	Tolerable
7	Evidence of very soft/soft clay at base of peat	0	3	0	Not Applicable	No		0	3	0	Not Applicable
8	Evidence of mechanically cut peat	0	3	0	Not Applicable	No		0	3	0	Not Applicable
9	Evidence of quaking or buoyant peat	0	3	0	Not Applicable	No		0	3	0	Not Applicable
10	Evidence of bog pools	0	3	0	Not Applicable	No		0	3	0	Not Applicable
11	Relatively deep peat	2	3	6	Substantial	Yes		1	3	3	Tolerable

	Control Measures to be Implemented Prior to/and During Construction for **Substation**
i	Due to deeper peat at this infrastructure location and its proximity to the nearest watercourse, this location will require additional construction measures such as: - access and working area formed using bog mats - excavation side walls to be supported (eg. boulders, retaining wall units) or excavation face battered to shallow angle - temporary works designer may be required to provide excavation support design - daily detailed inspection of excavation faces - potential for greater water inflow into excavation requiring removal of water using pumping - increased exclusion zone around excavation to avoid accidental loading of crest of slope
ii	Maintain hydrology of area as far as possible;
iii	Installation of interceptor drains upslope of works to divert any surface water away from turbine construction area;
iv	Use of experienced geotechnical staff for site investigation;
v	Use of experienced contractors and trained operators to carry out the work;
vi	Detailed ground investigation to determine peat, mineral soil and bedrock condition and properties.

Note

(1) FOS abbreviations are: u: FOS for undrained analysis, d: FOS for drained analysis.

APPENDIX C

CALCULATED FOS FOR PEAT SLOPES ON SITE

Calculated FoS of Natural Peat Slopes for Meenbog Wind Farm (Undrained Analysis)

Turbine No./Waypoint	Easting	Northing	Slope	Undrained shear strength	Bulk unit weight of Peat	Peat Depth	Surcharge Equivalent Placed Fill Depth (m)	Factor of Safety for Load Condition	
			β (deg)	c_u (kPa)	γ (kN/m^3)	(m)	Condition (2)	Condition (1)	Condition (2)
T1	207133	384174	1.0	5	10	1.0	2.0	**28.65**	**14.33**
T2	207689	384214	1.0	5	10	2.7	3.7	**10.61**	**7.74**
T3	206859	384619	1.0	5	10	4.5	5.5	**6.37**	**5.21**
T4	208106	384825	1.0	5	10	2.7	3.7	**10.61**	**7.74**
T5	207241	385034	1.0	5	10	4.7	5.7	**6.10**	**5.03**
T6	207639	385286	15.0	5	10	0.2	1.2	**10.00**	**1.67**
T7	208261	385494	5.0	5	10	1.7	2.7	**3.39**	**2.13**
T8	207155	385589	5.0	5	10	2.0	3.0	**2.88**	**1.92**
T9	208732	385899	9.0	5	10	0.5	1.5	**6.47**	**2.16**
T10	206803	385952	2.0	5	10	2.5	3.5	**5.73**	**4.10**
T11	208183	385999	3.0	5	10	2.1	3.1	**4.56**	**3.09**
T12	207583	386083	6.0	5	10	1.7	2.7	**2.83**	**1.78**
T13	208379	386526	2.0	5	10	0.3	1.3	**47.79**	**11.03**
T14	206983	386559	1.0	5	10	1.3	2.3	**22.04**	**12.46**
T15	207800	386648	2.0	5	10	0.2	1.2	**71.68**	**11.95**
T16	208946	386668	3.0	5	10	1.0	2.0	**9.57**	**4.78**
T17	208631	387051	6.0	5	10	1.5	2.5	**3.21**	**1.92**
T18	207448	387070	3.0	5	10	1.0	2.0	**9.57**	**4.78**
T19	209193	387211	3.0	5	10	0.3	1.3	**31.89**	**7.36**
Substation 1	205143	386692	4.0	5	10	2.6	3.6	**2.76**	**2.00**
Met Mast 1	206885	385678	3.0	5	10	1.5	2.5	**6.38**	**3.83**
BP 1	205205	386489	3.0	5	10	2.1	3.1	**4.56**	**3.09**
BP 2	207770	386382	3.0	5	10	1.1	2.1	**8.70**	**4.56**
BP 3	207428	385166	5.0	5	10	3.4	4.4	**1.69**	**1.31**
CC1	207795	387071	6.0	5	10	2.2	3.2	**2.19**	**1.50**
MCCKOS 15	206918	384235	4.6	5	10	2.6	3.6	**2.39**	**1.73**
MCCKOS 16	207829	384485	4.5	5	10	0.4	1.4	**15.92**	**4.55**
MCCKOS 17	207812	384487	4.5	5	10	0.5	1.5	**12.74**	**4.25**
MCCKOS 18	207812	384529	3.9	5	10	0.9	1.9	**8.09**	**3.83**
MCCKOS 19	208002	384876	1.9	5	10	3.4	4.4	**4.46**	**3.45**
MCCKOS 20	208000	384923	1.7	5	10	4.4	5.4	**3.92**	**3.20**
MCCKOS 21	208064	384985	2.9	5	10	1.8	2.8	**5.57**	**3.58**
MCCKOS 22	208091	384995	1.9	5	10	3.6	4.6	**4.09**	**3.20**
MCCKOS 23	208102	385018	2.4	5	10	5.0	6.0	**2.39**	**1.99**
MCCKOS 24	208155	385005	3.3	5	10	2.5	3.5	**3.52**	**2.51**
MCCKOS 25	208181	385025	3.2	5	10	2.6	3.6	**3.44**	**2.49**
MCCKOS 26	208191	384993	2.3	5	10	1.9	2.9	**6.43**	**4.21**
MCCKOS 27	208183	384975	0.1	5	10	2.5	3.5	**200.00**	**142.86**
MCCKOS 42	206657	384846	5.7	5	10	1.7	2.7	**2.97**	**1.87**
MCCKOS 43	206696	384852	6.8	5	10	0.1	1.1	**42.27**	**3.84**
MCCKOS 44	206733	384864	6.7	5	10	0.5	1.5	**8.66**	**2.89**
MCCKOS 45	206906	384898	4.0	5	10	1.9	2.9	**3.78**	**2.48**
MCCKOS 46	206901	384851	4.1	5	10	1.9	2.9	**3.67**	**2.41**
MCCKOS 47	206906	384821	3.7	5	10	1.1	2.1	**7.02**	**3.68**
MCCKOS 48	206920	384787	3.1	5	10	2.2	3.2	**4.14**	**2.85**
MCCKOS 49	206904	384742	3.0	5	10	3.5	4.5	**2.70**	**2.10**
MCCKOS 50	206912	384727	1.8	5	10	3.6	4.6	**4.34**	**3.40**
MCCKOS 51	206923	384694	1.7	5	10	3.6	4.6	**4.79**	**3.75**
MCCKOS 52	206957	384686	1.8	5	10	3.6	4.6	**4.48**	**3.51**
MCCKOS 53	206937	384636	1.8	5	10	2.3	3.3	**6.80**	**4.74**
MCCKOS 54	206908	384618	1.9	5	10	2.3	3.3	**6.59**	**4.60**
MCCKOS 55	206900	384627	1.8	5	10	3.3	4.3	**4.74**	**3.64**
MCCKOS 56	206876	384902	4.2	5	10	2.7	3.7	**2.52**	**1.84**
MCCKOS 57	207395	384960	0.1	5	10	4.0	5.0	**71.62**	**57.30**
MCCKOS 58	207413	384971	0.1	5	10	4.4	5.4	**113.64**	**92.59**
MCCKOS 59	207415	384973	0.1	5	10	4.4	5.4	**113.64**	**92.59**
MCCKOS 60	207430	384966	0.1	5	10	4.6	5.6	**108.70**	**89.29**
MCCKOS 61	207412	385026	0.3	5	10	3.5	4.5	**23.81**	**18.52**
MCCKOS 62	207392	385055	1.5	5	10	2.4	3.4	**8.02**	**5.66**
MCCKOS 63	207366	385056	1.8	5	10	3.8	4.8	**4.12**	**3.26**
MCCKOS 64	207342	385022	0.1	5	10	4.2	5.2	**68.21**	**55.09**
MCCKOS 65	207326	384976	0.1	5	10	4.4	5.4	**65.11**	**53.05**
MCCKOS 66	207725	385485	3.8	5	10	1.6	2.6	**4.69**	**2.88**
MCCKOS 67	207744	385486	3.8	5	10	1.1	2.1	**6.92**	**3.62**
MCCKOS 68	207742	385491	3.8	5	10	1.5	2.5	**5.07**	**3.04**
MCCKOS 69	207728	385500	3.8	5	10	1.8	2.8	**4.16**	**2.68**
MCCKOS 70	207732	385518	3.4	5	10	1.0	2.0	**8.50**	**4.25**
MCCKOS 71	207711	385496	4.0	5	10	1.7	2.7	**4.22**	**2.66**
MCCKOS 72	207969	385975	4.5	5	10	1.4	2.4	**4.61**	**2.69**
MCCKOS 73	208023	386017	5.5	5	10	1.0	2.0	**5.26**	**2.63**
MCCKOS 74	208051	386041	5.1	5	10	1.8	2.8	**3.11**	**2.00**
MCCKOS 75	208080	386060	4.9	5	10	2.5	3.5	**2.37**	**1.69**
MCCKOS 76	208088	386096	5.3	5	10	2.3	3.3	**2.38**	**1.66**
MCCKOS 77	208099	386120	5.5	5	10	1.6	2.6	**3.29**	**2.02**
MCCKOS 78	208118	386139	5.8	5	10	1.1	2.1	**4.55**	**2.38**
MCCKOS 79	208131	386149	5.4	5	10	0.4	1.4	**13.42**	**3.83**
MCCKOS 80	208136	386162	5.4	5	10	0.5	1.5	**10.73**	**3.58**
MCCKOS 81	208139	386176	5.5	5	10	1.8	2.8	**2.89**	**1.86**
MCCKOS 82	208138	386187	5.6	5	10	1.1	2.1	**4.68**	**2.45**
MCCKOS 83	208155	386190	5.1	5	10	1.7	2.7	**3.33**	**2.10**
MCCKOS 84	208153	386177	5.1	5	10	1.6	2.6	**3.54**	**2.18**
MCCKOS 85	208216	386047	2.6	5	10	2.6	3.6	**4.19**	**3.03**
MCCKOS 86	208212	386002	2.6	5	10	2.7	3.7	**4.12**	**3.01**
MCCKOS 87	208214	385938	2.5	5	10	3.0	4.0	**3.88**	**2.91**
MCCKOS 88	208215	385862	1.9	5	10	1.4	2.4	**10.83**	**6.32**
MCCKOS 89	208214	385785	1.5	5	10	3.0	4.0	**6.18**	**4.63**
MCCKOS 90	208214	385699	2.9	5	10	3.4	4.4	**2.95**	**2.28**
MCCKOS 91	208212	385639	3.0	5	10	1.1	2.1	**8.60**	**4.50**
MCCKOS 92	208219	385589	3.1	5	10	2.5	3.5	**3.71**	**2.65**
MCCKOS 93	208257	385597	3.3	5	10	1.8	2.8	**4.81**	**3.09**
MCCKOS 94	208274	385596	3.8	5	10	0.9	1.9	**8.33**	**3.95**
MCCKOS 95	208287	385588	3.8	5	10	0.7	1.7	**10.71**	**4.41**
MCCKOS 96	208298	385575	4.0	5	10	1.3	2.3	**5.52**	**3.12**
MCCKOS 97	208311	385585	4.0	5	10	0.9	1.9	**7.98**	**3.78**
MCCKOS 98	208325	385583	3.5	5	10	1.2	2.2	**6.86**	**3.74**
MCCKOS 99	208321	385566	3.9	5	10	2.0	3.0	**3.64**	**2.43**
MCCKOS 100	208309	385571	3.9	5	10	2.1	3.1	**3.47**	**2.35**
MCCKOS 101	207554	385992	4.6	5	10	1.5	2.5	**4.19**	**2.52**
MCCKOS 102	207544	386011	4.3	5	10	1.2	2.2	**5.51**	**3.01**
MCCKOS 103	207542	386027	4.7	5	10	1.8	2.8	**3.37**	**2.17**
MCCKOS 104	207541	386038	4.7	5	10	1.8	2.8	**3.37**	**2.17**
MCCKOS 105	207544	386049	5.0	5	10	1.9	2.9	**3.05**	**2.00**
MCCKOS 106	207555	386051	5.3	5	10	1.9	2.9	**2.85**	**1.87**
MCCKOS 107	207545	386065	5.4	5	10	1.7	2.7	**3.12**	**1.97**
MCCKOS 108	206962	385661	4.6	5	10	0.9	1.9	**6.90**	**3.27**
MCCKOS 109	206981	385631	5.0	5	10	1.0	2.0	**5.79**	**2.90**
MCCKOS 110	207007	385613	5.0	5	10	1.2	2.2	**4.77**	**2.60**
MCCKOS 111	207023	385574	5.5	5	10	1.0	2.0	**5.26**	**2.63**
MCCKOS 112	207054	385534	5.1	5	10	1.5	2.5	**3.73**	**2.24**
MCCKOS 113	207091	385543	5.9	5	10	0.5	1.5	**9.81**	**3.27**
MCCKOS 114	207109	385541	4.7	5	10	0.1	1.1	**61.39**	**5.58**
MCCKOS 115	207126	385547	4.3	5	10	1.6	2.6	**4.14**	**2.54**
MCCKOS 116	207137	385564	4.2	5	10	1.7	2.7	**4.05**	**2.55**
MCCKOS 117	207144	385580	4.5	5	10	1.9	2.9	**3.39**	**2.22**
MCCKOS 118	207149	385593	4.3	5	10	1.6	2.6	**4.19**	**2.58**
MCCKOS 119	207148	385595	4.3	5	10	1.7	2.7	**3.94**	**2.48**
MCCKOS 120	206573	385447	6.4	5	10	1.5	2.5	**3.01**	**1.81**
MCCKOS 121	206583	385425	6.7	5	10	0.3	1.3	**14.32**	**3.30**
MCCKOS 122	206601	385395	6.6	5	10	0.4	1.4	**10.92**	**3.12**
MCCKOS 123	206607	385375	5.1	5	10	1.2	2.2	**4.67**	**2.55**
MCCKOS 124	206616	385356	4.4	5	10	1.1	2.1	**5.94**	**3.11**
MCCKOS 125	206620	385345	4.9	5	10	0.9	1.9	**6.51**	**3.08**
MCCKOS 126	206621	385332	7.9	5	10	1.0	2.0	**3.69**	**1.85**
MCCKOS 127	206610	385324	7.4	5	10	0.4	1.4	**9.85**	**2.81**
MCCKOS 128	206618	385317	8.7	5	10	0.3	1.3	**11.15**	**2.57**
MCCKOS 129	206721	386077	2.4	5	10	2.7	3.7	**4.42**	**3.22**
MCCKOS 130	206679	386151	0.2	5	10	4.0	5.0	**41.67**	**33.33**
MCCKOS 131	206671	386176	1.0	5	10	4.4	5.4	**6.32**	**5.15**
MCCKOS 132	206697	386180	1.2	5	10	4.4	5.4	**5.41**	**4.41**
MCCKOS 133	206723	386174	2.1	5	10	3.3	4.3	**4.10**	**3.15**
MCCKOS 134	206745	386170	2.4	5	10	2.7	3.7	**4.42**	**3.22**

Calculated FoS of Natural Peat Slopes for Meenbog Wind Farm (Undrained Analysis)

Turbine No./Waypoint	Easting	Northing	Slope	Undrained shear strength	Bulk unit weight of Peat	Peat Depth	Surcharge Equivalent Placed Fill Depth (m)	Factor of Safety for Load Condition	
			β (deg)	c_u (kPa)	γ (kN/m^3)	(m)	Condition (2)	Condition (1)	Condition (2)
MCCKOS 135	206755	386186	3.1	5	10	4.2	5.2	**2.17**	**1.75**
MCCKOS 136	206763	386130	4.2	5	10	2.7	3.7	**2.55**	**1.86**
MCCKOS 137	206772	386066	2.9	5	10	1.8	2.8	**5.57**	**3.58**
MCCKOS 138	206792	386060	2.9	5	10	1.6	2.6	**6.14**	**3.78**
MCCKOS 139	206789	386049	2.9	5	10	1.8	2.8	**5.57**	**3.58**
MCCKOS 140	206784	386018	2.6	5	10	3.2	4.2	**3.40**	**2.59**
MCCKOS 141	206789	385947	2.2	5	10	1.5	2.5	**8.78**	**5.27**
MCCKOS 142	206795	385875	2.0	5	10	1.9	2.9	**7.53**	**4.93**
MCCKOS 143	206802	385817	2.8	5	10	1.9	2.9	**5.38**	**3.53**
MCCKOS 144	206816	385696	4.1	5	10	0.5	1.5	**14.16**	**4.72**
MCCKOS 145	207717	386801	3.9	5	10	0.9	1.9	**8.21**	**3.89**
MCCKOS 146	207700	386801	3.8	5	10	0.9	1.9	**8.33**	**3.95**
MCCKOS 147	207688	386797	3.8	5	10	1.0	2.0	**7.50**	**3.75**
MCCKOS 148	207674	386804	3.9	5	10	1.9	2.9	**3.83**	**2.51**
MCCKOS 149	207668	386816	3.9	5	10	2.5	3.5	**2.95**	**2.11**
MCCKOS 150	207660	386823	3.9	5	10	2.0	3.0	**3.64**	**2.43**
MCCKOS 151	207656	386832	3.9	5	10	1.8	2.8	**4.04**	**2.60**
MCCKOS 152	207656	386799	4.1	5	10	2.6	3.6	**2.72**	**1.97**
MCCKOS 153	207724	386793	3.9	5	10	0.4	1.4	**18.47**	**5.28**
MCCKOS 154	207749	386798	3.4	5	10	0.3	1.3	**27.88**	**6.43**
MCCKOS 155	207753	386806	3.3	5	10	0.3	1.3	**29.33**	**6.77**
MCCKOS 156	207791	386791	3.8	5	10	1.2	2.2	**6.25**	**3.41**
MCCKOS 157	207836	386786	1.7	5	10	1.8	2.8	**9.59**	**6.16**
MCCKOS 158	207864	386788	1.7	5	10	1.4	2.4	**12.33**	**7.19**
MCCKOS 159	208175	387091	3.4	5	10	1.0	2.0	**8.50**	**4.25**
MCCKOS 160	208183	387132	3.2	5	10	2.9	3.9	**3.09**	**2.30**
MCCKOS 161	208172	387167	3.1	5	10	1.3	2.3	**7.14**	**4.04**
MCCKOS 168	208496	387253	3.0	5	10	2.0	3.0	**4.73**	**3.15**
MCCKOS 169	208520	387256	3.1	5	10	1.8	2.8	**5.16**	**3.32**
MCCKOS 170	208496	387240	3.0	5	10	2.1	3.1	**4.50**	**3.05**
MCCKOS 171	208490	387236	3.0	5	10	2.0	3.0	**4.73**	**3.15**
MCCKOS 172	208608	387311	3.5	5	10	1.8	2.8	**4.50**	**2.89**
MCCKOS 173	208604	387372	2.9	5	10	0.9	1.9	**10.92**	**5.17**
MCCKOS 182	208673	387291	4.1	5	10	1.0	2.0	**7.08**	**3.54**
MCCKOS 183	208738	387277	4.5	5	10	1.2	2.2	**5.37**	**2.93**
MCCKOS 184	208819	387266	4.2	5	10	1.1	2.1	**6.18**	**3.24**
MCCKOS 185	208866	387251	3.9	5	10	1.9	2.9	**3.83**	**2.51**
MCCKOS 186	209003	387243	3.9	5	10	1.7	2.7	**4.28**	**2.70**
MCCKOS 187	209071	387246	4.1	5	10	1.7	2.7	**4.11**	**2.59**
MCCKOS 188	209106	387245	4.1	5	10	1.9	2.9	**3.67**	**2.41**
MCCKOS 189	209123	387238	3.7	5	10	2.0	3.0	**3.92**	**2.61**
MCCKOS 190	209147	387240	2.6	5	10	1.4	2.4	**7.95**	**4.64**
MCCKOS 191	209163	387243	2.7	5	10	1.8	2.8	**5.92**	**3.81**
MCCKOS 192	209173	387249	2.8	5	10	2.1	3.1	**4.87**	**3.30**
MCCKOS 193	209183	387235	4.2	5	10	1.3	2.3	**5.30**	**2.99**
MCCKOS 194	209189	387221	3.5	5	10	0.1	1.1	**80.96**	**7.36**
MCCKOS 195	208467	386689	5.3	5	10	1.0	2.0	**5.48**	**2.74**
MCCKOS 196	208449	386692	5.0	5	10	0.6	1.6	**9.54**	**3.58**
MCCKOS 197	208434	386703	4.9	5	10	1.5	2.5	**3.90**	**2.34**
MCCKOS 198	208425	386711	4.9	5	10	1.8	2.8	**3.29**	**2.12**
MCCKOS 199	208427	386718	4.9	5	10	0.9	1.9	**6.58**	**3.12**
MCCKOS 200	208431	386718	4.9	5	10	1.0	2.0	**5.92**	**2.96**
MCCKOS 201	208423	386701	4.9	5	10	1.2	2.2	**4.94**	**2.69**
MCCKOS 202	208497	386664	5.5	5	10	0.4	1.4	**13.14**	**3.75**
MCCKOS 203	208560	386637	4.7	5	10	0.1	1.1	**61.39**	**5.58**
MCCKOS 204	208618	386610	3.9	5	10	2.6	3.6	**2.84**	**2.05**
MCCKOS 205	208659	386596	3.5	5	10	1.8	2.8	**4.57**	**2.94**
MCCKOS 206	208755	386559	2.3	5	10	0.6	1.6	**20.36**	**7.63**
MCCKOS 207	208818	386547	2.0	5	10	2.4	3.4	**5.96**	**4.21**
MCCKOS 208	208853	386562	1.7	5	10	3.6	4.6	**4.63**	**3.63**
MCCKOS 209	208875	386572	0.5	5	10	3.6	4.6	**17.36**	**13.59**
MCCKOS 210	208917	386585	2.7	5	10	1.9	2.9	**5.50**	**3.60**
MCCKOS 211	208958	386599	1.8	5	10	2.0	3.0	**8.07**	**5.38**
MCCKOS 212	208991	386616	1.7	5	10	2.3	3.3	**7.50**	**5.23**
MCCKOS 213	209016	386636	1.8	5	10	2.7	3.7	**5.79**	**4.23**
MCCKOS 214	209038	386647	2.3	5	10	1.9	2.9	**6.59**	**4.32**
MCCKOS 215	209049	386671	1.9	5	10	4.0	5.0	**3.79**	**3.03**
MCCKOS 216	209012	386711	2.0	5	10	2.7	3.7	**5.30**	**3.87**
MCCKOS 217	209005	386727	2.8	5	10	1.9	2.9	**5.38**	**3.53**
MCCKOS 218	208998	386743	0.3	5	10	0.3	1.3	**277.79**	**64.10**
MCCKOS 219	208980	386726	0.2	5	10	2.0	3.0	**62.50**	**41.67**
MCCKOS 220	208957	386695	1.9	5	10	2.6	3.6	**5.83**	**4.21**
MCCKOS 221	208941	386680	1.7	5	10	0.5	1.5	**34.51**	**11.50**
MCCKOS 222	208920	386656	1.8	5	10	2.5	3.5	**6.46**	**4.61**
MCCKOS 223	208886	386612	3.0	5	10	1.6	2.6	**6.03**	**3.71**
MCCKOS 224	208878	386592	3.0	5	10	1.7	2.7	**5.67**	**3.57**
MCCKOS 225	208687	386401	3.0	5	10	1.2	2.2	**7.88**	**4.30**
MCCKOS 226	208682	386368	3.5	5	10	1.2	2.2	**6.86**	**3.74**
MCCKOS 227	208682	386312	3.5	5	10	1.2	2.2	**6.75**	**3.68**
MCCKOS 228	208679	386264	3.5	5	10	0.2	1.2	**40.48**	**6.75**
MCCKOS 229	208681	386231	3.7	5	10	1.1	2.1	**7.02**	**3.68**
MCCKOS 230	208671	386210	3.8	5	10	1.4	2.4	**5.35**	**3.12**
MCCKOS 231	208676	386183	3.9	5	10	1.3	2.3	**5.68**	**3.21**
MCCKOS 232	208693	386189	3.9	5	10	1.3	2.3	**5.68**	**3.21**
MCCKOS 233	208704	386156	3.7	5	10	1.9	2.9	**4.13**	**2.71**
MCCKOS 234	208724	386171	3.7	5	10	1.5	2.5	**5.15**	**3.09**
MCCKOS 235	208731	386170	3.7	5	10	1.0	2.0	**7.72**	**3.86**
MCCKOS 236	208748	386171	3.6	5	10	0.7	1.7	**11.38**	**4.69**
MCCKOS 237	208742	386147	3.3	5	10	2.2	3.2	**3.93**	**2.70**
MCCKOS 238	208722	386146	3.7	5	10	2.5	3.5	**3.14**	**2.24**
MCCKOS 239	208622	387094	4.3	5	10	1.1	2.1	**6.02**	**3.15**
MCCKOS 240	208634	387084	4.6	5	10	0.9	1.9	**6.99**	**3.31**
MCCKOS 241	207787	386444	4.9	5	10	1.0	2.0	**5.92**	**2.96**
MCCKOS 242	207772	386440	4.9	5	10	0.5	1.5	**11.85**	**3.95**
MCCKOS 243	207773	386422	5.1	5	10	0.7	1.7	**8.00**	**3.29**
MCCKOS 244	207770	386412	5.1	5	10	0.5	1.5	**11.20**	**3.73**
MCCKOS 245	207802	386438	5.2	5	10	0.8	1.8	**6.93**	**3.08**
MCCKOS 246	207583	387253	3.1	5	10	2.0	3.0	**4.64**	**3.10**
MCCKOS 247	207562	387255	5.0	5	10	1.7	2.7	**3.37**	**2.12**
MCCKOS 248	207573	387278	3.8	5	10	1.9	2.9	**3.95**	**2.58**
MCCKOS 249	207585	387285	3.8	5	10	1.6	2.6	**4.69**	**2.88**
MCCKOS 250	207608	387271	2.9	5	10	1.2	2.2	**8.19**	**4.47**
MCCKOS 251	207627	387264	2.7	5	10	2.5	3.5	**4.18**	**2.98**
MCCKOS 252	207631	387250	2.5	5	10	2.5	3.5	**4.55**	**3.25**
MCCKOS 253	207576	386324	6.1	5	10	1.1	2.1	**4.34**	**2.27**
MCCKOS 254	207531	386349	3.5	5	10	0.9	1.9	**9.14**	**4.33**
MCCKOS 255	207473	386341	3.7	5	10	0.5	1.5	**15.45**	**5.15**
MCCKOS 256	207409	386344	6.4	5	10	0.9	1.9	**5.02**	**2.38**
MCCKOS 257	207329	386347	3.9	5	10	1.1	2.1	**6.62**	**3.47**
MCCKOS 258	207242	386347	2.7	5	10	1.5	2.5	**7.11**	**4.26**
MCCKOS 259	207217	386351	2.9	5	10	1.8	2.8	**5.46**	**3.51**
MCCKOS 260	207169	386363	0.3	5	10	0.9	1.9	**92.60**	**43.86**
MCCKOS 261	207113	386360	3.4	5	10	1.9	2.9	**4.40**	**2.88**
MCCKOS 262	207119	386392	3.6	5	10	1.7	2.7	**4.69**	**2.95**
MCCKOS 263	207117	386436	2.3	5	10	1.7	2.7	**7.36**	**4.64**
MCCKOS 264	207117	386501	2.5	5	10	1.9	2.9	**6.13**	**4.02**
MCCKOS 265	207111	386553	2.1	5	10	1.8	2.8	**7.52**	**4.83**
MCCKOS 266	207109	386594	4.1	5	10	0.9	1.9	**7.86**	**3.73**
MCCKOS 267	207106	386627	3.3	5	10	0.8	1.8	**11.00**	**4.89**
MCCKOS 268	207107	386644	5.5	5	10	0.8	1.8	**6.57**	**2.92**
MCCKOS 269	207106	386664	6.3	5	10	0.4	1.4	**11.50**	**3.29**
MCCKOS 270	207089	386672	5.7	5	10	1.6	2.6	**3.16**	**1.94**
MCCKOS 271	207090	386686	5.7	5	10	1.2	2.2	**4.21**	**2.30**
MCCKOS 272	207082	386703	3.7	5	10	1.8	2.8	**4.36**	**2.80**
MCCKOS 273	207078	386716	4.1	5	10	1.9	2.9	**3.67**	**2.41**
MCCKOS 274	207083	386716	3.7	5	10	2.4	3.4	**3.27**	**2.31**

Calculated FoS of Natural Peat Slopes for Meenbog Wind Farm (Undrained Analysis)

Turbine No./Waypoint	Easting	Northing	Slope	Undrained shear strength	Bulk unit weight of Peat	Peat Depth	Surcharge Equivalent Placed Fill Depth (m)	Factor of Safety for Load Condition	
			β (deg)	c_u (kPa)	γ (kN/m^3)	(m)	Condition (2)	Condition (1)	Condition (2)
MCCKOS 275	207079	386730	2.9	5	10	1.3	2.3	**7.71**	**4.36**
MCCKOS 276	207066	386723	2.9	5	10	2.2	3.2	**4.47**	**3.07**
T1 - SS	209193	387211	4.4	5	10	0.4	1.4	**16.33**	**4.67**
T2 - SS	208426	386722	4.9	5	10	1.8	2.8	**3.29**	**2.12**
T3 - SS	208979	386701	2.1	5	10	2.7	3.7	**5.15**	**3.76**
T5 -SS	207081	386715	4.1	5	10	3.7	4.7	**1.89**	**1.49**
T7 - SS	206748	386241	0.3	5	10	2.7	3.7	**37.04**	**27.03**
T8 - SS	208137	386173	5.5	5	10	2.4	3.4	**2.19**	**1.55**
T9 - SS	208730	386166	3.7	5	10	1.4	2.4	**5.52**	**3.22**
T10 - SS	206332	386023	0.1	5	10	4.7	5.7	**106.38**	**87.72**
T11 - SS	207543	386047	5.0	5	10	2.3	3.3	**2.52**	**1.75**
T12 - SS	205814	385728	2.6	5	10	2.9	3.9	**3.76**	**2.79**
T13 - SS	207151	385600	4.3	5	10	1.7	2.7	**3.89**	**2.45**
T14 - SS	207728	385484	3.8	5	10	1.7	2.7	**4.41**	**2.78**
T15 - SS	208310	385580	4.0	5	10	1.8	2.8	**3.99**	**2.56**
T16 - SS	206624	385330	7.9	5	10	1.2	2.2	**3.08**	**1.68**
T17 - SS	206696	384852	6.8	5	10	0.3	1.3	**14.09**	**3.25**
T18 - SS	207437	384961	2.3	5	10	5.2	6.2	**2.35**	**1.97**
T19 - SS	208191	384993	2.3	5	10	2.8	3.8	**4.36**	**3.21**
T21 - SS	207294	384219	2.9	5	10	3.8	4.8	**2.59**	**2.05**
T22 - SS	207801	384510	4.2	5	10	0.5	1.5	**13.59**	**4.53**
Met Mast 1 - SS	206376	385361	7.1	5	10	0.4	1.4	**10.16**	**2.90**
CC 1 - SS	208632	387090	4.3	5	10	1.0	2.0	**6.62**	**3.31**
B2	207532	385384	5.7	5	10	0.1	1.1	**50.50**	**4.59**
B3	208657	386589	3.5	5	10	2.0	3.0	**4.11**	**2.74**
T1 ALT - SS	209158	387240	2.7	5	10	1.8	2.8	**5.92**	**3.81**
T3 - SS	209049	386669	1.9	5	10	3.9	4.9	**3.89**	**3.10**
CT1_1	208491	387319	3.1	5	10	1.6	2.6	**5.70**	**3.51**
CT1_3	208699	387284	4.3	5	10	1.7	2.7	**4.01**	**2.50**
CT1_4	208598	387206	3.4	5	10	1.4	2.4	**5.97**	**3.48**
SUB1 - SS	206675	385515	5.1	5	10	1.6	2.6	**3.54**	**2.18**
SUB2 - SS	207784	386434	5.2	5	10	0.5	1.5	**11.08**	**3.69**
WP063	205505	385930	4.5	5	10	3.6	4.6	**1.78**	**1.39**
WP064	205550	385764	4.3	5	10	2.0	3.0	**3.35**	**2.23**
WP065	205694	385687	2.3	5	10	2.0	3.0	**6.26**	**4.17**
WP066	205708	385560	1.9	5	10	1.4	2.4	**10.83**	**6.32**
WP068	205741	385199	2.1	5	10	1.0	2.0	**13.91**	**6.95**
WP069	205974	385871	4.6	5	10	1.9	2.9	**3.27**	**2.14**
WP070	206134	385993	6.3	5	10	1.6	2.6	**2.88**	**1.77**
WP071	206254	386261	2.5	5	10	1.9	2.9	**5.99**	**3.93**
WP072	206380	386431	3.2	5	10	0.8	1.8	**11.20**	**4.98**
WP073	206573	386662	0.2	5	10	1.0	2.0	**166.67**	**83.33**
WP076	206720	386805	3.1	5	10	1.8	2.8	**5.16**	**3.32**
WP077	206901	386884	0.1	5	10	2.6	3.6	**192.31**	**138.89**
WP078	207093	386918	2.9	5	10	2.6	3.6	**3.86**	**2.78**
WP079	207323	387004	0.1	5	10	1.6	2.6	**312.50**	**192.31**
WP080	207565	387193	4.3	5	10	1.4	2.4	**4.79**	**2.79**
WP081	207658	387405	3.7	5	10	1.1	2.1	**7.02**	**3.68**
WP082	207728	387520	1.8	5	10	0.7	1.7	**23.06**	**9.50**
1 - SS	207294	384219	2.9	5	10	3.4	4.4	**2.89**	**2.23**
2 - SS	207245	384252	5.3	5	10	0.6	1.6	**9.04**	**3.39**
3 - SS	207174	384228	5.4	5	10	1.2	2.2	**4.43**	**2.41**
4 - SS	207103	384203	6.3	5	10	0.4	1.4	**11.40**	**3.26**
5 - SS	207032	384179	6.5	5	10	0.5	1.5	**8.89**	**2.96**
6 - SS	206961	384154	8.5	5	10	1.5	2.5	**2.29**	**1.37**
17 - SS	206810	384420	3.2	5	10	1.6	2.6	**5.60**	**3.44**
18 - SS	206881	384445	3.9	5	10	3.2	4.2	**2.31**	**1.76**
19 - SS	206951	384470	3.5	5	10	3.5	4.5	**2.35**	**1.83**
20 - SS	207022	384495	3.5	5	10	2.7	3.7	**3.00**	**2.19**
21 - SS	207093	384520	3.2	5	10	2.6	3.6	**3.51**	**2.52**
22 - SS	207163	384546	1.8	5	10	1.3	2.3	**12.42**	**7.02**
23 - SS	207234	384571	2.9	5	10	4.6	5.6	**2.14**	**1.76**
24 - SS	207305	384596	3.2	5	10	1.8	2.8	**5.12**	**3.26**
26 - SS	207450	384629	2.7	5	10	1.6	2.6	**6.66**	**4.10**
27 - SS	207524	384639	2.8	5	10	2.6	3.6	**3.93**	**2.84**
28 - SS	207599	384634	2.6	5	10	1.6	2.6	**6.81**	**4.19**
29 - SS	207669	384608	3.2	5	10	2.1	3.1	**4.27**	**2.89**
30 - SS	207730	384565	4.0	5	10	2.4	3.4	**3.05**	**2.14**
31 - SS	207789	384519	3.9	5	10	1.8	2.8	**4.10**	**2.64**
32 - SS	207441	384636	2.7	5	10	1.2	2.2	**8.70**	**4.75**
33 - SS	207514	384653	2.5	5	10	3.2	4.2	**3.64**	**2.77**
34 - SS	207587	384671	3.0	5	10	1.7	2.7	**5.56**	**3.50**
35 - SS	207660	384688	3.2	5	10	1.0	2.0	**8.96**	**4.48**
36 - SS	207732	384706	3.3	5	10	2.5	3.5	**3.46**	**2.47**
37 - SS	207805	384723	4.5	5	10	1.3	2.3	**4.96**	**2.80**
38 - SS	207875	384747	3.3	5	10	1.1	2.1	**8.38**	**4.29**
39 - SS	207933	384794	3.8	5	10	2.7	3.7	**2.78**	**2.03**
40 - SS	207991	384842	3.0	5	10	1.5	2.5	**6.43**	**3.86**
41 - SS	208050	384889	1.5	5	10	1.8	2.8	**10.30**	**6.62**
42 - SS	208108	384936	2.1	5	10	1.3	2.3	**10.83**	**6.01**
43 - SS	208166	384984	0.1	5	10	2.5	3.5	**200.00**	**142.86**
55 - SS	206671	384842	6.7	5	10	0.5	1.5	**8.59**	**2.86**
56 - SS	206775	384873	5.6	5	10	1.5	2.5	**3.43**	**2.06**
57 - SS	206847	384894	4.2	5	10	2.2	3.2	**3.09**	**2.12**
58 - SS	206919	384916	4.0	5	10	1.8	2.8	**3.99**	**2.56**
59 - SS	206991	384938	2.7	5	10	3.8	4.8	**2.81**	**2.22**
60 - SS	207063	384959	2.6	5	10	2.1	3.1	**5.30**	**3.59**
61 - SS	207135	384980	0.1	5	10	1.8	2.8	**277.78**	**178.57**
62 - SS	207194	385019	1.4	5	10	2.5	3.5	**8.34**	**5.96**
63 - SS	207236	385081	3.4	5	10	3.4	4.4	**2.50**	**1.93**
64 - SS	207284	385138	5.4	5	10	1.6	2.6	**3.32**	**2.04**
65 - SS	207338	385190	5.5	5	10	0.8	1.8	**6.50**	**2.89**
66 - SS	207436	385263	6.7	5	10	1.2	2.2	**3.61**	**1.97**
67 - SS	207511	385328	5.6	5	10	2.0	3.0	**2.58**	**1.72**
68 - SS	207562	385415	7.0	5	10	1.2	2.2	**3.47**	**1.89**
69 - SS	207647	385467	5.9	5	10	0.9	1.9	**5.40**	**2.56**
70 - SS	207730	385525	3.5	5	10	1.6	2.6	**5.06**	**3.11**
71 - SS	207809	385587	2.6	5	10	0.8	1.8	**13.62**	**6.05**
72 - SS	207876	385660	2.3	5	10	2.5	3.5	**4.89**	**3.49**
73 - SS	207899	385757	2.1	5	10	3.7	4.7	**3.76**	**2.96**
74 - SS	207957	385838	4.2	5	10	2.1	3.1	**3.28**	**2.22**
75 - SS	207999	385913	3.6	5	10	1.1	2.1	**7.24**	**3.79**
76 - SS	208074	385907	2.7	5	10	3.0	4.0	**3.48**	**2.61**
77 - SS	208148	385902	2.2	5	10	2.5	3.5	**5.27**	**3.76**
78 - SS	208209	385882	1.9	5	10	3.3	4.3	**4.46**	**3.42**
79 - SS	208210	385807	1.5	5	10	3.4	4.4	**5.66**	**4.37**
80 - SS	208212	385732	2.1	5	10	2.7	3.7	**5.15**	**3.76**
81 - SS	208212	385657	2.7	5	10	2.2	3.2	**4.85**	**3.33**
82 - SS	208212	385582	2.8	5	10	2.9	3.9	**3.53**	**2.62**
84 - SS	207914	385963	4.5	5	10	1.2	2.2	**5.31**	**2.89**
85 - SS	207969	386014	5.0	5	10	1.2	2.2	**4.83**	**2.63**
86 - SS	208024	386066	5.4	5	10	1.3	2.3	**4.09**	**2.31**
87 - SS	208078	386117	5.8	5	10	2.0	3.0	**2.48**	**1.65**
88 - SS	208133	386169	5.5	5	10	1.4	2.4	**3.75**	**2.19**
89 - SS	207815	385967	5.8	5	10	1.6	2.6	**3.13**	**1.92**
90 - SS	207715	385972	5.6	5	10	1.9	2.9	**2.71**	**1.78**
91 - SS	207615	385975	5.2	5	10	1.8	2.8	**3.08**	**1.98**
92 - SS	207515	385979	4.9	5	10	1.5	2.5	**3.90**	**2.34**
93 - SS	207512	386014	3.9	5	10	1.5	2.5	**4.85**	**2.91**
94 - SS	207430	385982	3.8	5	10	1.8	2.8	**4.23**	**2.72**
95 - SS	207330	385984	4.2	5	10	1.2	2.2	**5.66**	**3.09**
96 - SS	207231	385987	No peat recorded at location						
97 - SS	207395	385940	3.1	5	10	2.0	3.0	**4.64**	**3.10**
98 - SS	207335	385894	3.2	5	10	1.4	2.4	**6.40**	**3.73**
99 - SS	207280	385844	4.7	5	10	1.0	2.0	**6.14**	**3.07**
100 - SS	207235	385785	5.5	5	10	1.8	2.8	**2.92**	**1.88**
101 - SS	207198	385719	4.3	5	10	1.6	2.6	**4.14**	**2.54**
102 - SS	207173	385650	4.2	5	10	1.6	2.6	**4.30**	**2.65**
103 - SS	207161	385660	4.3	5	10	1.7	2.7	**3.89**	**2.45**
104 - SS	207173	385734	4.7	5	10	0.9	1.9	**6.82**	**3.23**
105 - SS	207183	385808	7.7	5	10	0.9	1.9	**4.19**	**1.98**
106 - SS	207177	385883	8.6	5	10	1.4	2.4	**2.40**	**1.40**

Calculated FoS of Natural Peat Slopes for Meenbog Wind Farm (Undrained Analysis)

Turbine No./Waypoint	Easting	Northing	Slope	Undrained shear strength	Bulk unit weight of Peat	Peat Depth	Surcharge Equivalent Placed Fill Depth (m)	Factor of Safety for Load Condition	
			β (deg)	c_u (kPa)	γ (kN/m^3)	(m)	Condition (2)	Condition (1)	Condition (2)
108 - SS	206881	385586	5.4	5	10	1.2	2.2	**4.43**	**2.41**
109 - SS	206833	385529	4.9	5	10	1.3	2.3	**4.56**	**2.58**
110 - SS	206786	385472	5.4	5	10	0.6	1.6	**8.94**	**3.35**
111 - SS	206733	385418	7.1	5	10	0.9	1.9	**4.55**	**2.15**
112 - SS	206677	385368	5.3	5	10	0.8	1.8	**6.85**	**3.04**
113 - SS	206663	385394	5.4	5	10	1.2	2.2	**4.47**	**2.44**
114 - SS	206694	385463	5.7	5	10	1.0	2.0	**5.10**	**2.55**
115 - SS	205819	385196	3.1	5	10	0.3	1.3	**30.39**	**7.01**
116 - SS	205919	385200	7.8	5	10	0.4	1.4	**9.30**	**2.66**
117 - SS	206014	385230	4.4	5	10	1.0	2.0	**6.53**	**3.27**
118 - SS	206109	385262	3.3	5	10	2.2	3.2	**4.00**	**2.75**
119 - SS	206201	385300	5.6	5	10	0.3	1.3	**17.17**	**3.96**
120 - SS	206293	385339	5.3	5	10	1.0	2.0	**5.42**	**2.71**
121 - SS	206393	385392	7.3	5	10	1.0	2.0	**3.97**	**1.99**
122 - SS	206484	385433	6.2	5	10	1.2	2.2	**4.04**	**2.16**
123 - SS	206581	385457	5.9	5	10	0.5	1.5	**9.72**	**3.24**
124 - SS	206676	385489	4.7	5	10	0.5	1.5	**12.13**	**4.04**
125 - SS	206762	385540	3.8	5	10	1.6	2.6	**4.69**	**2.88**
126 - SS	206845	385596	2.6	5	10	1.2	2.2	**9.08**	**4.95**
127 - SS	206921	385660	3.7	5	10	1.6	2.6	**4.90**	**3.02**
128 - SS	206996	385726	4.3	5	10	1.8	2.8	**3.68**	**2.36**
129 - SS	207069	385794	3.9	5	10	1.4	2.4	**5.20**	**3.03**
130 - SS	207135	385869	3.6	5	10	1.5	2.5	**5.31**	**3.19**
131 - SS	207190	385952	3.3	5	10	1.6	2.6	**5.50**	**3.38**
132 - SS	207246	386035	9.1	5	10	0.5	1.5	**6.37**	**2.12**
133 - SS	207313	386109	7.5	5	10	1.6	2.6	**2.50**	**1.52**
134 - SS	207391	386171	6.8	5	10	0.4	1.4	**10.65**	**3.04**
135 - SS	207470	386233	5.2	5	10	1.0	2.0	**5.54**	**2.77**
136 - SS	207548	386295	7.1	5	10	1.2	2.2	**3.39**	**1.85**
137 - SS	207602	386338	5.7	5	10	0.3	1.3	**16.83**	**3.88**
146 - SS	207087	386547	2.3	5	10	2.6	3.6	**4.82**	**3.48**
147 - SS	207084	386622	3.4	5	10	1.0	2.0	**8.50**	**4.25**
148 - SS	207081	386697	3.7	5	10	2.1	3.1	**3.74**	**2.53**
149 - SS	207092	386356	3.7	5	10	1.8	2.8	**4.36**	**2.80**
150 - SS	207017	386360	3.6	5	10	1.2	2.2	**6.64**	**3.62**
151 - SS	206942	386364	2.6	5	10	1.8	2.8	**6.19**	**3.98**
152 - SS	206868	386367	3.0	5	10	2.1	3.1	**4.50**	**3.05**
153 - SS	206795	386357	5.0	5	10	1.0	2.0	**5.79**	**2.90**
154 - SS	206751	386297	1.8	5	10	2.6	3.6	**6.21**	**4.48**
155 - SS	207681	386400	3.3	5	10	1.3	2.3	**6.65**	**3.76**
156 - SS	207759	386462	4.6	5	10	1.1	2.1	**5.72**	**3.00**
157 - SS	207835	386527	4.6	5	10	0.6	1.6	**10.48**	**3.93**
158 - SS	207872	386615	3.2	5	10	0.7	1.7	**12.80**	**5.27**
159 - SS	207877	386715	1.8	5	10	1.1	2.1	**14.68**	**7.69**
160 - SS	207891	386814	3.2	5	10	0.8	1.8	**11.20**	**4.98**
161 - SS	207946	386896	3.0	5	10	1.3	2.3	**7.42**	**4.19**
162 - SS	208011	386972	3.7	5	10	0.4	1.4	**19.61**	**5.60**
163 - SS	208087	387037	3.3	5	10	0.8	1.8	**11.00**	**4.89**
164 - SS	208176	387082	3.7	5	10	0.4	1.4	**19.61**	**5.60**
165 - SS	208269	387118	3.9	5	10	1.1	2.1	**6.62**	**3.47**
166 - SS	208366	387145	3.7	5	10	1.2	2.2	**6.54**	**3.57**
167 - SS	208456	387180	3.1	5	10	3.5	4.5	**2.61**	**2.03**
168 - SS	208476	387271	3.2	5	10	2.7	3.7	**3.32**	**2.42**
170 - SS	208600	387119	3.9	5	10	1.0	2.0	**7.28**	**3.64**
171 - SS	208604	387019	4.6	5	10	1.6	2.6	**3.88**	**2.39**
172 - SS	208601	386919	4.7	5	10	1.2	2.2	**5.05**	**2.76**
173 - SS	208553	386831	5.3	5	10	1.6	2.6	**3.43**	**2.11**
174 - SS	208506	386743	4.1	5	10	1.3	2.3	**5.44**	**3.08**
175 - SS	208469	386675	5.4	5	10	1.0	2.0	**5.37**	**2.68**
185 - SS	208460	386581	5.0	5	10	1.4	2.4	**4.14**	**2.41**
186 - SS	208510	386495	4.2	5	10	0.7	1.7	**9.84**	**4.05**
187 - SS	208600	386453	4.5	5	10	1.0	2.0	**6.45**	**3.22**
188 - SS	208679	386421	3.2	5	10	1.2	2.2	**7.46**	**4.07**
189 - SS	208684	386346	3.3	5	10	1.6	2.6	**5.41**	**3.33**
193 - SS	208581	387301	3.3	5	10	1.6	2.6	**5.50**	**3.38**
196 - SS	208802	387261	4.2	5	10	1.2	2.2	**5.66**	**3.09**
198 - SS	208950	387234	3.9	5	10	2.7	3.7	**2.70**	**1.97**
200 - SS	209100	387226	4.0	5	10	2.1	3.1	**3.42**	**2.32**
205 - SS	208405	387333	3.4	5	10	1.6	2.6	**5.32**	**3.27**
601	206419	386040	0.3	5	10	5.2	6.2	**19.23**	**16.13**
602	206489	386066	1.4	5	10	5.7	6.7	**3.66**	**3.11**
603	206548	386111	1.8	5	10	5.6	6.6	**2.88**	**2.45**
604	206602	386163	1.4	5	10	5.8	6.8	**3.45**	**2.94**
605	206657	386214	1.0	5	10	4.3	5.3	**6.84**	**5.55**
606	206711	386266	1.1	5	10	3.6	4.6	**7.31**	**5.72**
MCC1b	207911	386798	3.0	5	10	1.8	2.8	**5.36**	**3.44**
MCC2b	208014	386793	4.0	5	10	0.9	1.9	**7.98**	**3.78**
MCC3b	208084	386793	4.5	5	10	1.0	2.0	**6.45**	**3.22**
MCC4b	208167	386791	5.5	5	10	1.1	2.1	**4.78**	**2.50**
MCC5b	208271	386768	5.5	5	10	0.9	1.9	**5.84**	**2.77**
MCC6b	208354	386731	5.8	5	10	1.2	2.2	**4.13**	**2.25**
MCC7b	208434	386693	5.0	5	10	1.0	2.0	**5.73**	**2.86**
1	204512	387710	No peat recorded at location						
4	204615	387622	4.0	5	10	1.5	2.5	**4.79**	**2.87**
6	204703	387654	3.0	5	10	1.4	2.4	**6.83**	**3.99**
8	204772	387712	No peat recorded at location						
10	204783	387614	No peat recorded at location						
12	204847	387540	1.0	5	10	0.3	1.3	**95.51**	**22.04**
14	204886	387462	2.0	5	10	2.0	3.0	**7.17**	**4.78**
16	204880	387362	5.0	5	10	1.1	2.1	**5.24**	**2.74**
18	204873	387263	1.0	5	10	3.0	4.0	**9.55**	**7.16**
20	204913	387195	2.0	5	10	3.5	4.5	**4.10**	**3.19**
22	205011	387186	2.0	5	10	3.6	4.6	**3.98**	**3.12**
24	205045	387093	3.0	5	10	1.7	2.7	**5.63**	**3.54**
26	205064	387003	3.0	5	10	1.6	2.6	**5.98**	**3.68**
27	205404	386267	10.0	5	10	0.9	1.9	**3.25**	**1.54**
28	205424	386221	9.0	5	10	1.3	2.3	**2.49**	**1.41**
35	205695	385508	0.1	5	10	1.7	2.7	**294.12**	**185.19**
36	205683	385460	3.1	5	10	2.0	3.0	**4.56**	**3.04**
37	205678	385410	5.7	5	10	1.2	2.2	**4.21**	**2.30**
38	205678	385360	5.3	5	10	0.9	1.9	**6.03**	**2.85**
39	205679	385310	4.9	5	10	0.5	1.5	**11.71**	**3.90**
40	205681	385260	2.5	5	10	1.4	2.4	**8.13**	**4.74**
41	205697	385223	6.9	5	10	1.8	2.8	**2.33**	**1.50**
42	206933	385699	3.0	5	10	1.3	2.3	**7.36**	**4.16**
43	206929	385749	3.0	5	10	1.8	2.8	**5.31**	**3.42**
44	206909	385795	4.0	5	10	0.4	1.4	**17.96**	**5.13**
45	206883	385837	3.0	5	10	0.9	1.9	**10.63**	**5.04**
46	206864	385872	2.0	5	10	1.3	2.3	**11.03**	**6.23**
47	207239	386093	9.0	5	10	0.8	1.8	**4.05**	**1.80**
48	207232	386142	5.0	5	10	1.6	2.6	**3.60**	**2.21**
49	207228	386192	4.0	5	10	0.8	1.8	**8.98**	**3.99**
50	207226	386242	4.0	5	10	1.1	2.1	**6.53**	**3.42**
51	207223	386292	4.0	5	10	1.9	2.9	**3.78**	**2.48**
54	207860	386942	15.0	5	10	0.4	1.4	**5.00**	**1.43**
55	207825	386978	1.0	5	10	2.5	3.5	**11.46**	**8.19**
56	207790	387014	0.1	5	10	1.6	2.6	**179.05**	**110.18**
57	207755	387050	1.0	5	10	1.7	2.7	**16.86**	**10.61**
61	207616	387192	1.0	5	10	0.7	1.7	**40.93**	**16.86**
62	208708	386576	4.0	5	10	1.6	2.6	**4.49**	**2.76**
66	208855	386676	0.1	5	10	3.0	4.0	**95.49**	**71.62**
67	208739	386392	1.0	5	10	1.6	2.6	**17.91**	**11.02**
69	208830	386350	2.0	5	10	1.6	2.6	**8.96**	**5.51**
71	208915	386301	3.0	5	10	1.5	2.5	**6.38**	**3.83**

Calculated FoS of Natural Peat Slopes for Meenbog Wind Farm (Undrained Analysis)

Turbine No./Waypoint	Easting	Northing	Slope	Undrained shear strength	Bulk unit weight of Peat	Peat Depth	Surcharge Equivalent Placed Fill Depth (m)	Factor of Safety for Load Condition	
			β (deg)	c_u (kPa)	γ (kN/m^3)	(m)	Condition (2)	Condition (1)	Condition (2)
74	208963	386160	5.0	5	10	1.4	2.4	**4.11**	**2.40**
76	208941	386065	4.0	5	10	1.9	2.9	**3.78**	**2.48**
78	208892	385978	4.0	5	10	1.3	2.3	**5.53**	**3.12**
80	208867	385914	6.0	5	10	1.7	2.7	**2.83**	**1.78**
81	208043	385885	2.0	5	10	2.0	3.0	**7.17**	**4.78**
84	208165	385837	1.0	5	10	2.3	3.3	**12.46**	**8.68**
88	207589	385605	1.0	5	10	0.8	1.8	**35.82**	**15.92**
90	207490	385589	5.0	5	10	0.8	1.8	**7.20**	**3.20**
92	207392	385571	5.0	5	10	0.8	1.8	**7.20**	**3.20**
93	207342	385564	1.0	5	10	0.3	1.3	**95.51**	**22.04**
96	207179	384970	1.0	5	10	3.6	4.6	**7.96**	**6.23**
98	207122	384888	1.0	5	10	3.7	4.7	**7.74**	**6.10**
100	207051	384819	1.0	5	10	3.4	4.4	**8.43**	**6.51**
103	206955	384733	1.0	5	10	2.7	3.7	**10.61**	**7.74**
104	207175	384918	1.0	5	10	3.5	4.5	**8.19**	**6.37**
105	207171	384868	2.0	5	10	2.1	3.1	**6.83**	**4.62**
106	207169	384818	1.0	5	10	3.6	4.6	**7.96**	**6.23**
107	207170	384768	1.0	5	10	4.3	5.3	**6.66**	**5.41**
108	207170	384718	1.0	5	10	4.0	5.0	**7.16**	**5.73**
109	207171	384668	1.0	5	10	3.0	4.0	**9.55**	**7.16**
110	207171	384618	2.0	5	10	3.5	4.5	**4.10**	**3.19**
112	207180	384494	3.0	5	10	0.7	1.7	**13.67**	**5.63**
113	207187	384445	4.0	5	10	1.7	2.7	**4.23**	**2.66**
114	207193	384395	1.0	5	10	2.7	3.7	**10.61**	**7.74**
115	207200	384346	3.0	5	10	1.6	2.6	**5.98**	**3.68**
116	207200	384296	2.0	5	10	0.8	1.8	**17.92**	**7.96**
117	207179	384257	3.0	5	10	0.9	1.9	**10.63**	**5.04**
							Minimum =	**1.69**	**1.31**
							Maximum =	**312.50**	**192.31**
							Average =	**13.24**	**7.27**

Notes:

(1) Assuming a bulk unit weight for peat of 10kN/m^3

(2) Assuming a surcharge equivalent to fill depth of 1m of peat i.e. 10kPa.

(3) Slope inclination (β) based on site readings and site contour plans.

(4) A lower bound undrained shear strength, cu for the peat of 5kPa was selected for the assessment. It should be noted that a cu of 5kPa for the peat is considered a conservative value for the analysis and is not representative of all peat present across the site. In reality the peat on site has a significantly higher undrained strength.

(5) Peat depths based on probes carried out by AGEC and McCarthy Keville O'Sullivan.

(6) For load conditions see report text.

Calculated FoS of Natural Peat Slopes for Meenbog Wind Farm (Drained Analysis)

Turbine No./Waypoint	Slope	Design c'	Bulk unit weight of Peat	Unit weight of Water	100% Water to height of Peat	Depth of In situ Peat	Friction Angle	Equivalent Total Depth of Peat (m)	Factor of Safety for Load Condition	
	α (deg)	c' (kPa)	γ (kN/m^3)	γ_w (kN/m^3)	(m)	(m)	ø' (deg)	Condition (2)	Condition (1)	Condition (2)
									100% Water	100% Water
T1	1.0	4	10.0	10.0	1.0	1.0	25	2.0	**22.92**	**24.82**
T2	1.0	4	10.0	10.0	2.7	2.7	25	3.7	**8.49**	**13.42**
T3	1.0	4	10.0	10.0	4.5	4.5	25	5.5	**5.09**	**9.03**
T4	1.0	4	10.0	10.0	2.7	2.7	25	3.7	**8.49**	**13.42**
T5	1.0	4	10.0	10.0	4.7	4.7	25	5.7	**4.88**	**8.71**
T6	15.0	4	10.0	10.0	0.2	0.2	25	1.2	**8.00**	**2.78**
T7	5.0	4	10.0	10.0	1.7	1.7	25	2.7	**2.71**	**3.68**
T8	5.0	4	10.0	10.0	2.0	2.0	25	3.0	**2.30**	**3.31**
T9	9.0	4	10.0	10.0	0.5	0.5	25	1.5	**5.18**	**3.69**
T10	2.0	4	10.0	10.0	2.5	2.5	25	3.5	**4.59**	**7.09**
T11	3.0	4	10.0	10.0	2.1	2.1	25	3.1	**3.64**	**5.34**
T12	6.0	4	10.0	10.0	1.7	1.7	25	2.7	**2.26**	**3.07**
T13	2.0	4	10.0	10.0	0.3	0.3	25	1.3	**38.23**	**19.09**
T14	1.0	4	10.0	10.0	1.3	1.3	25	2.3	**17.63**	**21.58**
T15	2.0	4	10.0	10.0	0.2	0.2	25	1.2	**57.34**	**20.68**
T16	3.0	4	10.0	10.0	1.0	1.0	25	2.0	**7.65**	**8.28**
T17	6.0	4	10.0	10.0	1.5	1.5	25	2.5	**2.57**	**3.31**
T18	3.0	4	10.0	10.0	1.0	1.0	25	2.0	**7.65**	**8.28**
T19	3.0	4	10.0	10.0	0.3	0.3	25	1.3	**25.51**	**12.73**
Substation 1	4.0	4	10.0	10.0	2.6	2.6	25	3.6	**2.21**	**3.45**
Met Mast 1	3.0	4	10.0	10.0	1.5	1.5	25	2.5	**5.10**	**6.62**
BP 1	3.0	4	10.0	10.0	2.1	2.1	25	3.1	**3.64**	**5.34**
BP 2	3.0	4	10.0	10.0	1.1	1.1	25	2.1	**6.96**	**7.88**
BP 3	5.0	4	10.0	10.0	3.4	3.4	25	4.4	**1.36**	**2.26**
CC1	6.0	4	10.0	10.0	2.2	2.2	25	3.2	**1.75**	**2.59**
MCCKOS 15	4.6	4	10.0	10.0	2.6	2.6	25	3.6	**1.91**	**2.98**
MCCKOS 16	4.5	4	10.0	10.0	0.4	0.4	25	1.4	**12.74**	**7.86**
MCCKOS 17	4.5	4	10.0	10.0	0.5	0.5	25	1.5	**10.19**	**7.33**
MCCKOS 18	3.9	4	10.0	10.0	0.9	0.9	25	1.9	**6.47**	**6.62**
MCCKOS 19	1.9	4	10.0	10.0	3.4	3.4	25	4.4	**3.57**	**5.97**
MCCKOS 20	1.7	4	10.0	10.0	4.4	4.4	25	5.4	**3.14**	**5.53**
MCCKOS 21	2.9	4	10.0	10.0	1.8	1.8	25	2.8	**4.46**	**6.20**
MCCKOS 22	1.9	4	10.0	10.0	3.6	3.6	25	4.6	**3.27**	**5.54**
MCCKOS 23	2.4	4	10.0	10.0	5.0	5.0	25	6.0	**1.91**	**3.44**
MCCKOS 24	3.3	4	10.0	10.0	2.5	2.5	25	3.5	**2.82**	**4.35**
MCCKOS 25	3.2	4	10.0	10.0	2.6	2.6	25	3.6	**2.76**	**4.30**
MCCKOS 26	2.3	4	10.0	10.0	1.9	1.9	25	2.9	**5.14**	**7.29**
MCCKOS 27	0.1	4	10.0	10.0	2.5	2.5	25	3.5	**160.00**	**247.52**
MCCKOS 42	5.7	4	10.0	10.0	1.7	1.7	25	2.7	**2.38**	**3.22**
MCCKOS 43	6.8	4	10.0	10.0	0.1	0.1	25	1.1	**33.81**	**6.61**
MCCKOS 44	6.7	4	10.0	10.0	0.5	0.5	25	1.5	**6.93**	**4.97**
MCCKOS 45	4.0	4	10.0	10.0	1.9	1.9	25	2.9	**3.02**	**4.28**
MCCKOS 46	4.1	4	10.0	10.0	1.9	1.9	25	2.9	**2.94**	**4.16**
MCCKOS 47	3.7	4	10.0	10.0	1.1	1.1	25	2.1	**5.62**	**6.36**
MCCKOS 48	3.1	4	10.0	10.0	2.2	2.2	25	3.2	**3.32**	**4.93**
MCCKOS 49	3.0	4	10.0	10.0	3.5	3.5	25	4.5	**2.16**	**3.64**
MCCKOS 50	1.8	4	10.0	10.0	3.6	3.6	25	4.6	**3.48**	**5.89**
MCCKOS 51	1.7	4	10.0	10.0	3.6	3.6	25	4.6	**3.83**	**6.50**
MCCKOS 52	1.8	4	10.0	10.0	3.6	3.6	25	4.6	**3.59**	**6.08**
MCCKOS 53	1.8	4	10.0	10.0	2.3	2.3	25	3.3	**5.44**	**8.21**
MCCKOS 54	1.9	4	10.0	10.0	2.3	2.3	25	3.3	**5.28**	**7.96**
MCCKOS 55	1.8	4	10.0	10.0	3.3	3.3	25	4.3	**3.79**	**6.30**
MCCKOS 56	4.2	4	10.0	10.0	2.7	2.7	25	3.7	**2.01**	**3.17**
MCCKOS 57	0.1	4	10.0	10.0	4.0	4.0	25	5.0	**57.30**	**99.27**
MCCKOS 58	0.1	4	10.0	10.0	4.4	4.4	25	5.4	**90.91**	**160.43**
MCCKOS 59	0.1	4	10.0	10.0	4.4	4.4	25	5.4	**90.91**	**160.43**
MCCKOS 60	0.1	4	10.0	10.0	4.6	4.6	25	5.6	**86.96**	**154.70**
MCCKOS 61	0.3	4	10.0	10.0	3.5	3.5	25	4.5	**19.05**	**32.09**
MCCKOS 62	1.5	4	10.0	10.0	2.4	2.4	25	3.4	**6.41**	**9.80**
MCCKOS 63	1.8	4	10.0	10.0	3.8	3.8	25	4.8	**3.29**	**5.64**
MCCKOS 64	0.1	4	10.0	10.0	4.2	4.2	25	5.2	**54.57**	**95.45**
MCCKOS 65	0.1	4	10.0	10.0	4.4	4.4	25	5.4	**52.09**	**91.92**
MCCKOS 66	3.8	4	10.0	10.0	1.6	1.6	25	2.6	**3.75**	**4.98**
MCCKOS 67	3.8	4	10.0	10.0	1.1	1.1	25	2.1	**5.53**	**6.26**
MCCKOS 68	3.8	4	10.0	10.0	1.5	1.5	25	2.5	**4.06**	**5.26**
MCCKOS 69	3.8	4	10.0	10.0	1.8	1.8	25	2.8	**3.33**	**4.63**
MCCKOS 70	3.4	4	10.0	10.0	1.0	1.0	25	2.0	**6.80**	**7.35**
MCCKOS 71	4.0	4	10.0	10.0	1.7	1.7	25	2.7	**3.38**	**4.59**
MCCKOS 72	4.5	4	10.0	10.0	1.4	1.4	25	2.4	**3.69**	**4.64**
MCCKOS 73	5.5	4	10.0	10.0	1.0	1.0	25	2.0	**4.21**	**4.53**
MCCKOS 74	5.1	4	10.0	10.0	1.8	1.8	25	2.8	**2.49**	**3.45**
MCCKOS 75	4.9	4	10.0	10.0	2.5	2.5	25	3.5	**1.90**	**2.92**
MCCKOS 76	5.3	4	10.0	10.0	2.3	2.3	25	3.3	**1.91**	**2.86**
MCCKOS 77	5.5	4	10.0	10.0	1.6	1.6	25	2.6	**2.63**	**3.49**
MCCKOS 78	5.8	4	10.0	10.0	1.1	1.1	25	2.1	**3.64**	**4.10**
MCCKOS 79	5.4	4	10.0	10.0	0.4	0.4	25	1.4	**10.73**	**6.61**
MCCKOS 80	5.4	4	10.0	10.0	0.5	0.5	25	1.5	**8.59**	**6.17**
MCCKOS 81	5.5	4	10.0	10.0	1.8	1.8	25	2.8	**2.31**	**3.20**
MCCKOS 82	5.6	4	10.0	10.0	1.1	1.1	25	2.1	**3.75**	**4.23**
MCCKOS 83	5.1	4	10.0	10.0	1.7	1.7	25	2.7	**2.66**	**3.62**
MCCKOS 84	5.1	4	10.0	10.0	1.6	1.6	25	2.6	**2.83**	**3.76**
MCCKOS 85	2.6	4	10.0	10.0	2.6	2.6	25	3.6	**3.35**	**5.24**
MCCKOS 86	2.6	4	10.0	10.0	2.7	2.7	25	3.7	**3.30**	**5.21**
MCCKOS 87	2.5	4	10.0	10.0	3.0	3.0	25	4.0	**3.11**	**5.04**
MCCKOS 88	1.9	4	10.0	10.0	1.4	1.4	25	2.4	**8.67**	**10.94**
MCCKOS 89	1.5	4	10.0	10.0	3.0	3.0	25	4.0	**4.94**	**8.02**
MCCKOS 90	2.9	4	10.0	10.0	3.4	3.4	25	4.4	**2.36**	**3.94**
MCCKOS 91	3.0	4	10.0	10.0	1.1	1.1	25	2.1	**6.88**	**7.79**
MCCKOS 92	3.1	4	10.0	10.0	2.5	2.5	25	3.5	**2.97**	**4.59**
MCCKOS 93	3.3	4	10.0	10.0	1.8	1.8	25	2.8	**3.84**	**5.34**
MCCKOS 94	3.8	4	10.0	10.0	0.9	0.9	25	1.9	**6.66**	**6.82**
MCCKOS 95	3.8	4	10.0	10.0	0.7	0.7	25	1.7	**8.57**	**7.62**

Calculated FoS of Natural Peat Slopes for Meenbog Wind Farm (Drained Analysis)

Turbine No./Waypoint	Slope	Design c'	Bulk unit weight of Peat	Unit weight of Water	100% Water to height of Peat	Depth of In situ Peat	Friction Angle	Equivalent Total Depth of Peat (m)	Factor of Safety for Load Condition	
	α (deg)	c' (kPa)	γ (kN/m^3)	γ_w (kN/m^3)	(m)	(m)	ø' (deg)	Condition (2)	Condition (1)	Condition (2)
									100% Water	100% Water
MCCKOS 96	4.0	4	10.0	10.0	1.3	1.3	25	2.3	**4.42**	**5.39**
MCCKOS 97	4.0	4	10.0	10.0	0.9	0.9	25	1.9	**6.38**	**6.53**
MCCKOS 98	3.5	4	10.0	10.0	1.2	1.2	25	2.2	**5.48**	**6.47**
MCCKOS 99	3.9	4	10.0	10.0	2.0	2.0	25	3.0	**2.91**	**4.19**
MCCKOS 100	3.9	4	10.0	10.0	2.1	2.1	25	3.1	**2.77**	**4.06**
MCCKOS 101	4.6	4	10.0	10.0	1.5	1.5	25	2.5	**3.35**	**4.34**
MCCKOS 102	4.3	4	10.0	10.0	1.2	1.2	25	2.2	**4.41**	**5.20**
MCCKOS 103	4.7	4	10.0	10.0	1.8	1.8	25	2.8	**2.70**	**3.74**
MCCKOS 104	4.7	4	10.0	10.0	1.8	1.8	25	2.8	**2.70**	**3.74**
MCCKOS 105	5.0	4	10.0	10.0	1.9	1.9	25	2.9	**2.44**	**3.45**
MCCKOS 106	5.3	4	10.0	10.0	1.9	1.9	25	2.9	**2.28**	**3.22**
MCCKOS 107	5.4	4	10.0	10.0	1.7	1.7	25	2.7	**2.50**	**3.39**
MCCKOS 108	4.6	4	10.0	10.0	0.9	0.9	25	1.9	**5.52**	**5.65**
MCCKOS 109	5.0	4	10.0	10.0	1.0	1.0	25	2.0	**4.63**	**5.00**
MCCKOS 110	5.0	4	10.0	10.0	1.2	1.2	25	2.2	**3.82**	**4.49**
MCCKOS 111	5.5	4	10.0	10.0	1.0	1.0	25	2.0	**4.21**	**4.53**
MCCKOS 112	5.1	4	10.0	10.0	1.5	1.5	25	2.5	**2.99**	**3.86**
MCCKOS 113	5.9	4	10.0	10.0	0.5	0.5	25	1.5	**7.85**	**5.63**
MCCKOS 114	4.7	4	10.0	10.0	0.1	0.1	25	1.1	**49.11**	**9.63**
MCCKOS 115	4.3	4	10.0	10.0	1.6	1.6	25	2.6	**3.31**	**4.40**
MCCKOS 116	4.2	4	10.0	10.0	1.7	1.7	25	2.7	**3.24**	**4.41**
MCCKOS 117	4.5	4	10.0	10.0	1.9	1.9	25	2.9	**2.72**	**3.84**
MCCKOS 118	4.3	4	10.0	10.0	1.6	1.6	25	2.6	**3.35**	**4.45**
MCCKOS 119	4.3	4	10.0	10.0	1.7	1.7	25	2.7	**3.15**	**4.29**
MCCKOS 120	6.4	4	10.0	10.0	1.5	1.5	25	2.5	**2.41**	**3.11**
MCCKOS 121	6.7	4	10.0	10.0	0.3	0.3	25	1.3	**11.46**	**5.68**
MCCKOS 122	6.6	4	10.0	10.0	0.4	0.4	25	1.4	**8.74**	**5.37**
MCCKOS 123	5.1	4	10.0	10.0	1.2	1.2	25	2.2	**3.73**	**4.39**
MCCKOS 124	4.4	4	10.0	10.0	1.1	1.1	25	2.1	**4.75**	**5.37**
MCCKOS 125	4.9	4	10.0	10.0	0.9	0.9	25	1.9	**5.21**	**5.32**
MCCKOS 126	7.9	4	10.0	10.0	1.0	1.0	25	2.0	**2.95**	**3.17**
MCCKOS 127	7.4	4	10.0	10.0	0.4	0.4	25	1.4	**7.88**	**4.83**
MCCKOS 128	8.7	4	10.0	10.0	0.3	0.3	25	1.3	**8.92**	**4.40**
MCCKOS 129	2.4	4	10.0	10.0	2.7	2.7	25	3.7	**3.53**	**5.58**
MCCKOS 130	0.2	4	10.0	10.0	4.0	4.0	25	5.0	**33.33**	**57.75**
MCCKOS 131	1.0	4	10.0	10.0	4.4	4.4	25	5.4	**5.05**	**8.91**
MCCKOS 132	1.2	4	10.0	10.0	4.4	4.4	25	5.4	**4.33**	**7.64**
MCCKOS 133	2.1	4	10.0	10.0	3.3	3.3	25	4.3	**3.28**	**5.45**
MCCKOS 134	2.4	4	10.0	10.0	2.7	2.7	25	3.7	**3.53**	**5.58**
MCCKOS 135	3.1	4	10.0	10.0	4.2	4.2	25	5.2	**1.74**	**3.03**
MCCKOS 136	4.2	4	10.0	10.0	2.7	2.7	25	3.7	**2.04**	**3.22**
MCCKOS 137	2.9	4	10.0	10.0	1.8	1.8	25	2.8	**4.46**	**6.20**
MCCKOS 138	2.9	4	10.0	10.0	1.6	1.6	25	2.6	**4.91**	**6.54**
MCCKOS 139	2.9	4	10.0	10.0	1.8	1.8	25	2.8	**4.46**	**6.20**
MCCKOS 140	2.6	4	10.0	10.0	3.2	3.2	25	4.2	**2.72**	**4.49**
MCCKOS 141	2.2	4	10.0	10.0	1.5	1.5	25	2.5	**7.03**	**9.13**
MCCKOS 142	2.0	4	10.0	10.0	1.9	1.9	25	2.9	**6.02**	**8.54**
MCCKOS 143	2.8	4	10.0	10.0	1.9	1.9	25	2.9	**4.31**	**6.10**
MCCKOS 144	4.1	4	10.0	10.0	0.5	0.5	25	1.5	**11.32**	**8.15**
MCCKOS 145	3.9	4	10.0	10.0	0.9	0.9	25	1.9	**6.57**	**6.72**
MCCKOS 146	3.8	4	10.0	10.0	0.9	0.9	25	1.9	**6.66**	**6.82**
MCCKOS 147	3.8	4	10.0	10.0	1.0	1.0	25	2.0	**6.00**	**6.48**
MCCKOS 148	3.9	4	10.0	10.0	1.9	1.9	25	2.9	**3.07**	**4.34**
MCCKOS 149	3.9	4	10.0	10.0	2.5	2.5	25	3.5	**2.36**	**3.65**
MCCKOS 150	3.9	4	10.0	10.0	2.0	2.0	25	3.0	**2.91**	**4.19**
MCCKOS 151	3.9	4	10.0	10.0	1.8	1.8	25	2.8	**3.24**	**4.49**
MCCKOS 152	4.1	4	10.0	10.0	2.6	2.6	25	3.6	**2.18**	**3.40**
MCCKOS 153	3.9	4	10.0	10.0	0.4	0.4	25	1.4	**14.77**	**9.12**
MCCKOS 154	3.4	4	10.0	10.0	0.3	0.3	25	1.3	**22.30**	**11.12**
MCCKOS 155	3.3	4	10.0	10.0	0.3	0.3	25	1.3	**23.47**	**11.71**
MCCKOS 156	3.8	4	10.0	10.0	1.2	1.2	25	2.2	**5.00**	**5.89**
MCCKOS 157	1.7	4	10.0	10.0	1.8	1.8	25	2.8	**7.67**	**10.67**
MCCKOS 158	1.7	4	10.0	10.0	1.4	1.4	25	2.4	**9.86**	**12.45**
MCCKOS 159	3.4	4	10.0	10.0	1.0	1.0	25	2.0	**6.80**	**7.35**
MCCKOS 160	3.2	4	10.0	10.0	2.9	2.9	25	3.9	**2.47**	**3.97**
MCCKOS 161	3.1	4	10.0	10.0	1.3	1.3	25	2.3	**5.71**	**6.98**
MCCKOS 168	3.0	4	10.0	10.0	2.0	2.0	25	3.0	**3.78**	**5.46**
MCCKOS 169	3.1	4	10.0	10.0	1.8	1.8	25	2.8	**4.13**	**5.74**
MCCKOS 170	3.0	4	10.0	10.0	2.1	2.1	25	3.1	**3.60**	**5.28**
MCCKOS 171	3.0	4	10.0	10.0	2.0	2.0	25	3.0	**3.78**	**5.46**
MCCKOS 172	3.5	4	10.0	10.0	1.8	1.8	25	2.8	**3.60**	**5.00**
MCCKOS 173	2.9	4	10.0	10.0	0.9	0.9	25	1.9	**8.74**	**8.95**
MCCKOS 182	4.1	4	10.0	10.0	1.0	1.0	25	2.0	**5.66**	**6.11**
MCCKOS 183	4.5	4	10.0	10.0	1.2	1.2	25	2.2	**4.30**	**5.06**
MCCKOS 184	4.2	4	10.0	10.0	1.1	1.1	25	2.1	**4.94**	**5.59**
MCCKOS 185	3.9	4	10.0	10.0	1.9	1.9	25	2.9	**3.07**	**4.34**
MCCKOS 186	3.9	4	10.0	10.0	1.7	1.7	25	2.7	**3.43**	**4.66**
MCCKOS 187	4.1	4	10.0	10.0	1.7	1.7	25	2.7	**3.28**	**4.47**
MCCKOS 188	4.1	4	10.0	10.0	1.9	1.9	25	2.9	**2.94**	**4.16**
MCCKOS 189	3.7	4	10.0	10.0	2.0	2.0	25	3.0	**3.14**	**4.52**
MCCKOS 190	2.6	4	10.0	10.0	1.4	1.4	25	2.4	**6.36**	**8.03**
MCCKOS 191	2.7	4	10.0	10.0	1.8	1.8	25	2.8	**4.74**	**6.59**
MCCKOS 192	2.8	4	10.0	10.0	2.1	2.1	25	3.1	**3.90**	**5.71**
MCCKOS 193	4.2	4	10.0	10.0	1.3	1.3	25	2.3	**4.24**	**5.17**
MCCKOS 194	3.5	4	10.0	10.0	0.1	0.1	25	1.1	**64.76**	**12.73**
MCCKOS 195	5.3	4	10.0	10.0	1.0	1.0	25	2.0	**4.38**	**4.73**
MCCKOS 196	5.0	4	10.0	10.0	0.6	0.6	25	1.6	**7.63**	**6.17**
MCCKOS 197	4.9	4	10.0	10.0	1.5	1.5	25	2.5	**3.12**	**4.04**
MCCKOS 198	4.9	4	10.0	10.0	1.8	1.8	25	2.8	**2.63**	**3.65**
MCCKOS 199	4.9	4	10.0	10.0	0.9	0.9	25	1.9	**5.27**	**5.38**
MCCKOS 200	4.9	4	10.0	10.0	1.0	1.0	25	2.0	**4.74**	**5.11**
MCCKOS 201	4.9	4	10.0	10.0	1.2	1.2	25	2.2	**3.95**	**4.65**
MCCKOS 202	5.5	4	10.0	10.0	0.4	0.4	25	1.4	**10.51**	**6.47**

Calculated FoS of Natural Peat Slopes for Meenbog Wind Farm (Drained Analysis)

Turbine No./Waypoint	Slope	Design c'	Bulk unit weight of Peat	Unit weight of Water	100% Water to height of Peat	Depth of In situ Peat	Friction Angle	Equivalent Total Depth of Peat (m)	Factor of Safety for Load Condition	
	α (deg)	c' (kPa)	γ (kN/m^3)	γ_w (kN/m^3)	(m)	(m)	ø' (deg)	Condition (2)	Condition (1)	Condition (2)
									100% Water	100% Water
MCCKOS 203	4.7	4	10.0	10.0	0.1	0.1	25	1.1	**49.11**	**9.63**
MCCKOS 204	3.9	4	10.0	10.0	2.6	2.6	25	3.6	**2.27**	**3.55**
MCCKOS 205	3.5	4	10.0	10.0	1.8	1.8	25	2.8	**3.66**	**5.08**
MCCKOS 206	2.3	4	10.0	10.0	0.6	0.6	25	1.6	**16.29**	**13.22**
MCCKOS 207	2.0	4	10.0	10.0	2.4	2.4	25	3.4	**4.77**	**7.28**
MCCKOS 208	1.7	4	10.0	10.0	3.6	3.6	25	4.6	**3.71**	**6.28**
MCCKOS 209	0.5	4	10.0	10.0	3.6	3.6	25	4.6	**13.89**	**23.54**
MCCKOS 210	2.7	4	10.0	10.0	1.9	1.9	25	2.9	**4.40**	**6.23**
MCCKOS 211	1.8	4	10.0	10.0	2.0	2.0	25	3.0	**6.46**	**9.32**
MCCKOS 212	1.7	4	10.0	10.0	2.3	2.3	25	3.3	**6.00**	**9.06**
MCCKOS 213	1.8	4	10.0	10.0	2.7	2.7	25	3.7	**4.63**	**7.32**
MCCKOS 214	2.3	4	10.0	10.0	1.9	1.9	25	2.9	**5.27**	**7.47**
MCCKOS 215	1.9	4	10.0	10.0	4.0	4.0	25	5.0	**3.03**	**5.25**
MCCKOS 216	2.0	4	10.0	10.0	2.7	2.7	25	3.7	**4.24**	**6.69**
MCCKOS 217	2.8	4	10.0	10.0	1.9	1.9	25	2.9	**4.31**	**6.10**
MCCKOS 218	0.3	4	10.0	10.0	0.3	0.3	25	1.3	**222.23**	**111.07**
MCCKOS 219	0.2	4	10.0	10.0	2.0	2.0	25	3.0	**50.00**	**72.19**
MCCKOS 220	1.9	4	10.0	10.0	2.6	2.6	25	3.6	**4.67**	**7.30**
MCCKOS 221	1.7	4	10.0	10.0	0.5	0.5	25	1.5	**27.61**	**19.92**
MCCKOS 222	1.8	4	10.0	10.0	2.5	2.5	25	3.5	**5.17**	**7.99**
MCCKOS 223	3.0	4	10.0	10.0	1.6	1.6	25	2.6	**4.82**	**6.42**
MCCKOS 224	3.0	4	10.0	10.0	1.7	1.7	25	2.7	**4.54**	**6.18**
MCCKOS 225	3.0	4	10.0	10.0	1.2	1.2	25	2.2	**6.31**	**7.44**
MCCKOS 226	3.5	4	10.0	10.0	1.2	1.2	25	2.2	**5.48**	**6.47**
MCCKOS 227	3.5	4	10.0	10.0	1.2	1.2	25	2.2	**5.40**	**6.36**
MCCKOS 228	3.5	4	10.0	10.0	0.2	0.2	25	1.2	**32.38**	**11.66**
MCCKOS 229	3.7	4	10.0	10.0	1.1	1.1	25	2.1	**5.62**	**6.36**
MCCKOS 230	3.8	4	10.0	10.0	1.4	1.4	25	2.4	**4.28**	**5.40**
MCCKOS 231	3.9	4	10.0	10.0	1.3	1.3	25	2.3	**4.55**	**5.55**
MCCKOS 232	3.9	4	10.0	10.0	1.3	1.3	25	2.3	**4.55**	**5.55**
MCCKOS 233	3.7	4	10.0	10.0	1.9	1.9	25	2.9	**3.30**	**4.68**
MCCKOS 234	3.7	4	10.0	10.0	1.5	1.5	25	2.5	**4.12**	**5.34**
MCCKOS 235	3.7	4	10.0	10.0	1.0	1.0	25	2.0	**6.18**	**6.68**
MCCKOS 236	3.6	4	10.0	10.0	0.7	0.7	25	1.7	**9.11**	**8.10**
MCCKOS 237	3.3	4	10.0	10.0	2.2	2.2	25	3.2	**3.15**	**4.67**
MCCKOS 238	3.7	4	10.0	10.0	2.5	2.5	25	3.5	**2.51**	**3.87**
MCCKOS 239	4.3	4	10.0	10.0	1.1	1.1	25	2.1	**4.81**	**5.44**
MCCKOS 240	4.6	4	10.0	10.0	0.9	0.9	25	1.9	**5.59**	**5.72**
MCCKOS 241	4.9	4	10.0	10.0	1.0	1.0	25	2.0	**4.74**	**5.11**
MCCKOS 242	4.9	4	10.0	10.0	0.5	0.5	25	1.5	**9.48**	**6.82**
MCCKOS 243	5.1	4	10.0	10.0	0.7	0.7	25	1.7	**6.40**	**5.68**
MCCKOS 244	5.1	4	10.0	10.0	0.5	0.5	25	1.5	**8.96**	**6.44**
MCCKOS 245	5.2	4	10.0	10.0	0.8	0.8	25	1.8	**5.54**	**5.31**
MCCKOS 246	3.1	4	10.0	10.0	2.0	2.0	25	3.0	**3.71**	**5.35**
MCCKOS 247	5.0	4	10.0	10.0	1.7	1.7	25	2.7	**2.69**	**3.66**
MCCKOS 248	3.8	4	10.0	10.0	1.9	1.9	25	2.9	**3.16**	**4.47**
MCCKOS 249	3.8	4	10.0	10.0	1.6	1.6	25	2.6	**3.75**	**4.98**
MCCKOS 250	2.9	4	10.0	10.0	1.2	1.2	25	2.2	**6.55**	**7.73**
MCCKOS 251	2.7	4	10.0	10.0	2.5	2.5	25	3.5	**3.34**	**5.16**
MCCKOS 252	2.5	4	10.0	10.0	2.5	2.5	25	3.5	**3.64**	**5.63**
MCCKOS 253	6.1	4	10.0	10.0	1.1	1.1	25	2.1	**3.47**	**3.91**
MCCKOS 254	3.5	4	10.0	10.0	0.9	0.9	25	1.9	**7.31**	**7.49**
MCCKOS 255	3.7	4	10.0	10.0	0.5	0.5	25	1.5	**12.36**	**8.90**
MCCKOS 256	6.4	4	10.0	10.0	0.9	0.9	25	1.9	**4.02**	**4.09**
MCCKOS 257	3.9	4	10.0	10.0	1.1	1.1	25	2.1	**5.30**	**5.99**
MCCKOS 258	2.7	4	10.0	10.0	1.5	1.5	25	2.5	**5.69**	**7.38**
MCCKOS 259	2.9	4	10.0	10.0	1.8	1.8	25	2.8	**4.37**	**6.07**
MCCKOS 260	0.3	4	10.0	10.0	0.9	0.9	25	1.9	**74.08**	**75.99**
MCCKOS 261	3.4	4	10.0	10.0	1.9	1.9	25	2.9	**3.52**	**4.99**
MCCKOS 262	3.6	4	10.0	10.0	1.7	1.7	25	2.7	**3.75**	**5.10**
MCCKOS 263	2.3	4	10.0	10.0	1.7	1.7	25	2.7	**5.89**	**8.03**
MCCKOS 264	2.5	4	10.0	10.0	1.9	1.9	25	2.9	**4.91**	**6.95**
MCCKOS 265	2.1	4	10.0	10.0	1.8	1.8	25	2.8	**6.01**	**8.37**
MCCKOS 266	4.1	4	10.0	10.0	0.9	0.9	25	1.9	**6.29**	**6.44**
MCCKOS 267	3.3	4	10.0	10.0	0.8	0.8	25	1.8	**8.80**	**8.46**
MCCKOS 268	5.5	4	10.0	10.0	0.8	0.8	25	1.8	**5.26**	**5.03**
MCCKOS 269	6.3	4	10.0	10.0	0.4	0.4	25	1.4	**9.20**	**5.66**
MCCKOS 270	5.7	4	10.0	10.0	1.6	1.6	25	2.6	**2.53**	**3.35**
MCCKOS 271	5.7	4	10.0	10.0	1.2	1.2	25	2.2	**3.37**	**3.96**
MCCKOS 272	3.7	4	10.0	10.0	1.8	1.8	25	2.8	**3.49**	**4.84**
MCCKOS 273	4.1	4	10.0	10.0	1.9	1.9	25	2.9	**2.94**	**4.16**
MCCKOS 274	3.7	4	10.0	10.0	2.4	2.4	25	3.4	**2.61**	**3.99**
MCCKOS 275	2.9	4	10.0	10.0	1.3	1.3	25	2.3	**6.17**	**7.54**
MCCKOS 276	2.9	4	10.0	10.0	2.2	2.2	25	3.2	**3.57**	**5.31**
T1 - SS	4.4	4	10.0	10.0	0.4	0.4	25	1.4	**13.06**	**8.06**
T2 - SS	4.9	4	10.0	10.0	1.8	1.8	25	2.8	**2.63**	**3.65**
T3 - SS	2.1	4	10.0	10.0	2.7	2.7	25	3.7	**4.12**	**6.51**
T5 -SS	4.1	4	10.0	10.0	3.7	3.7	25	4.7	**1.51**	**2.57**
T7 - SS	0.3	4	10.0	10.0	2.7	2.7	25	3.7	**29.63**	**46.83**
T8 - SS	5.5	4	10.0	10.0	2.4	2.4	25	3.4	**1.75**	**2.67**
T9 - SS	3.7	4	10.0	10.0	1.4	1.4	25	2.4	**4.41**	**5.56**
T10 - SS	0.1	4	10.0	10.0	4.7	4.7	25	5.7	**85.11**	**151.98**
T11 - SS	5.0	4	10.0	10.0	2.3	2.3	25	3.3	**2.01**	**3.03**
T12 - SS	2.6	4	10.0	10.0	2.9	2.9	25	3.9	**3.00**	**4.83**
T13 - SS	4.3	4	10.0	10.0	1.7	1.7	25	2.7	**3.11**	**4.23**
T14 - SS	3.8	4	10.0	10.0	1.7	1.7	25	2.7	**3.53**	**4.80**
T15 - SS	4.0	4	10.0	10.0	1.8	1.8	25	2.8	**3.19**	**4.43**
T16 - SS	7.9	4	10.0	10.0	1.2	1.2	25	2.2	**2.46**	**2.88**
T17 - SS	6.8	4	10.0	10.0	0.3	0.3	25	1.3	**11.27**	**5.59**
T18 - SS	2.3	4	10.0	10.0	5.2	5.2	25	6.2	**1.88**	**3.41**
T19 - SS	2.3	4	10.0	10.0	2.8	2.8	25	3.8	**3.49**	**5.56**
T21 - SS	2.9	4	10.0	10.0	3.8	3.8	25	4.8	**2.07**	**3.54**
T22 - SS	4.2	4	10.0	10.0	0.5	0.5	25	1.5	**10.87**	**7.82**

Calculated FoS of Natural Peat Slopes for Meenbog Wind Farm (Drained Analysis)

Turbine No./Waypoint	Slope	Design c'	Bulk unit weight of Peat	Unit weight of Water	100% Water to height of Peat	Depth of In situ Peat	Friction Angle	Equivalent Total Depth of Peat (m)	Factor of Safety for Load Condition	
	α (deg)	c' (kPa)	γ (kN/m^3)	γ_w (kN/m^3)	(m)	(m)	ø' (deg)	Condition (2)	Condition (1)	Condition (2)
									100% Water	100% Water
Met Mast 1 - SS	7.1	4	10.0	10.0	0.4	0.4	25	1.4	**8.13**	**4.99**
CC 1 - SS	4.3	4	10.0	10.0	1.0	1.0	25	2.0	**5.29**	**5.71**
B2	5.7	4	10.0	10.0	0.1	0.1	25	1.1	**40.40**	**7.91**
B3	3.5	4	10.0	10.0	2.0	2.0	25	3.0	**3.29**	**4.74**
T1 ALT - SS	2.7	4	10.0	10.0	1.8	1.8	25	2.8	**4.74**	**6.59**
T3 - SS	1.9	4	10.0	10.0	3.9	3.9	25	4.9	**3.11**	**5.36**
CT1_1	3.1	4	10.0	10.0	1.6	1.6	25	2.6	**4.56**	**6.07**
CT1_3	4.3	4	10.0	10.0	1.7	1.7	25	2.7	**3.21**	**4.31**
CT1_4	3.4	4	10.0	10.0	1.4	1.4	25	2.4	**4.78**	**6.03**
SUB1 - SS	5.1	4	10.0	10.0	1.6	1.6	25	2.6	**2.83**	**3.76**
SUB2 - SS	5.2	4	10.0	10.0	0.5	0.5	25	1.5	**8.86**	**6.37**
WP063	4.5	4	10.0	10.0	3.6	3.6	25	4.6	**1.42**	**2.40**
WP064	4.3	4	10.0	10.0	2.0	2.0	25	3.0	**2.68**	**3.86**
WP065	2.3	4	10.0	10.0	2.0	2.0	25	3.0	**5.01**	**7.22**
WP066	1.9	4	10.0	10.0	1.4	1.4	25	2.4	**8.67**	**10.94**
WP068	2.1	4	10.0	10.0	1.0	1.0	25	2.0	**11.13**	**12.04**
WP069	4.6	4	10.0	10.0	1.9	1.9	25	2.9	**2.62**	**3.70**
WP070	6.3	4	10.0	10.0	1.6	1.6	25	2.6	**2.30**	**3.05**
WP071	2.5	4	10.0	10.0	1.9	1.9	25	2.9	**4.79**	**6.80**
WP072	3.2	4	10.0	10.0	0.8	0.8	25	1.8	**8.96**	**8.61**
WP073	0.2	4	10.0	10.0	1.0	1.0	25	2.0	**133.33**	**144.39**
WP076	3.1	4	10.0	10.0	1.8	1.8	25	2.8	**4.13**	**5.74**
WP077	0.1	4	10.0	10.0	2.6	2.6	25	3.6	**153.85**	**240.64**
WP078	2.9	4	10.0	10.0	2.6	2.6	25	3.6	**3.08**	**4.82**
WP079	0.1	4	10.0	10.0	1.6	1.6	25	2.6	**250.00**	**333.20**
WP080	4.3	4	10.0	10.0	1.4	1.4	25	2.4	**3.83**	**4.83**
WP081	3.7	4	10.0	10.0	1.1	1.1	25	2.1	**5.62**	**6.36**
WP082	1.8	4	10.0	10.0	0.7	0.7	25	1.7	**18.45**	**16.45**
1 - SS	2.9	4	10.0	10.0	3.4	3.4	25	4.4	**2.31**	**3.87**
2 - SS	5.3	4	10.0	10.0	0.6	0.6	25	1.6	**7.23**	**5.85**
3 - SS	5.4	4	10.0	10.0	1.2	1.2	25	2.2	**3.54**	**4.16**
4 - SS	6.3	4	10.0	10.0	0.4	0.4	25	1.4	**9.12**	**5.61**
5 - SS	6.5	4	10.0	10.0	0.5	0.5	25	1.5	**7.11**	**5.10**
6 - SS	8.5	4	10.0	10.0	1.5	1.5	25	2.5	**1.83**	**2.35**
17 - SS	3.2	4	10.0	10.0	1.6	1.6	25	2.6	**4.48**	**5.96**
18 - SS	3.9	4	10.0	10.0	3.2	3.2	25	4.2	**1.85**	**3.04**
19 - SS	3.5	4	10.0	10.0	3.5	3.5	25	4.5	**1.88**	**3.16**
20 - SS	3.5	4	10.0	10.0	2.7	2.7	25	3.7	**2.40**	**3.78**
21 - SS	3.2	4	10.0	10.0	2.6	2.6	25	3.6	**2.81**	**4.36**
22 - SS	1.8	4	10.0	10.0	1.3	1.3	25	2.3	**9.94**	**12.16**
23 - SS	2.9	4	10.0	10.0	4.6	4.6	25	5.6	**1.71**	**3.04**
24 - SS	3.2	4	10.0	10.0	1.8	1.8	25	2.8	**4.09**	**5.63**
26 - SS	2.7	4	10.0	10.0	1.6	1.6	25	2.6	**5.33**	**7.10**
27 - SS	2.8	4	10.0	10.0	2.6	2.6	25	3.6	**3.15**	**4.92**
28 - SS	2.6	4	10.0	10.0	1.6	1.6	25	2.6	**5.45**	**7.25**
29 - SS	3.2	4	10.0	10.0	2.1	2.1	25	3.1	**3.41**	**5.00**
30 - SS	4.0	4	10.0	10.0	2.4	2.4	25	3.4	**2.44**	**3.70**
31 - SS	3.9	4	10.0	10.0	1.8	1.8	25	2.8	**3.28**	**4.56**
32 - SS	2.7	4	10.0	10.0	1.2	1.2	25	2.2	**6.96**	**8.21**
33 - SS	2.5	4	10.0	10.0	3.2	3.2	25	4.2	**2.91**	**4.80**
34 - SS	3.0	4	10.0	10.0	1.7	1.7	25	2.7	**4.45**	**6.06**
35 - SS	3.2	4	10.0	10.0	1.0	1.0	25	2.0	**7.17**	**7.75**
36 - SS	3.3	4	10.0	10.0	2.5	2.5	25	3.5	**2.77**	**4.27**
37 - SS	4.5	4	10.0	10.0	1.3	1.3	25	2.3	**3.97**	**4.84**
38 - SS	3.3	4	10.0	10.0	1.1	1.1	25	2.1	**6.71**	**7.42**
39 - SS	3.8	4	10.0	10.0	2.7	2.7	25	3.7	**2.22**	**3.50**
40 - SS	3.0	4	10.0	10.0	1.5	1.5	25	2.5	**5.14**	**6.67**
41 - SS	1.5	4	10.0	10.0	1.8	1.8	25	2.8	**8.24**	**11.46**
42 - SS	2.1	4	10.0	10.0	1.3	1.3	25	2.3	**8.66**	**10.41**
43 - SS	0.1	4	10.0	10.0	2.5	2.5	25	3.5	**160.00**	**247.52**
55 - SS	6.7	4	10.0	10.0	0.5	0.5	25	1.5	**6.87**	**4.93**
56 - SS	5.6	4	10.0	10.0	1.5	1.5	25	2.5	**2.75**	**3.55**
57 - SS	4.2	4	10.0	10.0	2.2	2.2	25	3.2	**2.47**	**3.67**
58 - SS	4.0	4	10.0	10.0	1.8	1.8	25	2.8	**3.19**	**4.43**
59 - SS	2.7	4	10.0	10.0	3.8	3.8	25	4.8	**2.24**	**3.84**
60 - SS	2.6	4	10.0	10.0	2.1	2.1	25	3.1	**4.24**	**6.22**
61 - SS	0.1	4	10.0	10.0	1.8	1.8	25	2.8	**222.22**	**309.40**
62 - SS	1.4	4	10.0	10.0	2.5	2.5	25	3.5	**6.67**	**10.32**
63 - SS	3.4	4	10.0	10.0	3.4	3.4	25	4.4	**2.00**	**3.34**
64 - SS	5.4	4	10.0	10.0	1.6	1.6	25	2.6	**2.66**	**3.52**
65 - SS	5.5	4	10.0	10.0	0.8	0.8	25	1.8	**5.20**	**4.98**
66 - SS	6.7	4	10.0	10.0	1.2	1.2	25	2.2	**2.89**	**3.39**
67 - SS	5.6	4	10.0	10.0	2.0	2.0	25	3.0	**2.06**	**2.96**
68 - SS	7.0	4	10.0	10.0	1.2	1.2	25	2.2	**2.77**	**3.25**
69 - SS	5.9	4	10.0	10.0	0.9	0.9	25	1.9	**4.32**	**4.41**
70 - SS	3.5	4	10.0	10.0	1.6	1.6	25	2.6	**4.05**	**5.38**
71 - SS	2.6	4	10.0	10.0	0.8	0.8	25	1.8	**10.89**	**10.47**
72 - SS	2.3	4	10.0	10.0	2.5	2.5	25	3.5	**3.91**	**6.04**
73 - SS	2.1	4	10.0	10.0	3.7	3.7	25	4.7	**3.01**	**5.12**
74 - SS	4.2	4	10.0	10.0	2.1	2.1	25	3.1	**2.62**	**3.84**
75 - SS	3.6	4	10.0	10.0	1.1	1.1	25	2.1	**5.79**	**6.56**
76 - SS	2.7	4	10.0	10.0	3.0	3.0	25	4.0	**2.78**	**4.52**
77 - SS	2.2	4	10.0	10.0	2.5	2.5	25	3.5	**4.22**	**6.52**
78 - SS	1.9	4	10.0	10.0	3.3	3.3	25	4.3	**3.57**	**5.93**
79 - SS	1.5	4	10.0	10.0	3.4	3.4	25	4.4	**4.53**	**7.57**
80 - SS	2.1	4	10.0	10.0	2.7	2.7	25	3.7	**4.12**	**6.51**
81 - SS	2.7	4	10.0	10.0	2.2	2.2	25	3.2	**3.88**	**5.77**
82 - SS	2.8	4	10.0	10.0	2.9	2.9	25	3.9	**2.82**	**4.54**
84 - SS	4.5	4	10.0	10.0	1.2	1.2	25	2.2	**4.25**	**5.00**
85 - SS	5.0	4	10.0	10.0	1.2	1.2	25	2.2	**3.86**	**4.54**
86 - SS	5.4	4	10.0	10.0	1.3	1.3	25	2.3	**3.27**	**3.98**
87 - SS	5.8	4	10.0	10.0	2.0	2.0	25	3.0	**1.98**	**2.84**
88 - SS	5.5	4	10.0	10.0	1.4	1.4	25	2.4	**3.00**	**3.78**

Calculated FoS of Natural Peat Slopes for Meenbog Wind Farm (Drained Analysis)

Turbine No./Waypoint	Slope	Design c'	Bulk unit weight of Peat	Unit weight of Water	100% Water to height of Peat	Depth of In situ Peat	Friction Angle	Equivalent Total Depth of Peat (m)	Factor of Safety for Load Condition	
	α (deg)	c' (kPa)	γ (kN/m^3)	γ_w (kN/m^3)	(m)	(m)	ø' (deg)	Condition (2)	Condition (1)	Condition (2)
									100% Water	100% Water
89 - SS	5.8	4	10.0	10.0	1.6	1.6	25	2.6	**2.50**	**3.31**
90 - SS	5.6	4	10.0	10.0	1.9	1.9	25	2.9	**2.17**	**3.06**
91 - SS	5.2	4	10.0	10.0	1.8	1.8	25	2.8	**2.46**	**3.41**
92 - SS	4.9	4	10.0	10.0	1.5	1.5	25	2.5	**3.12**	**4.04**
93 - SS	3.9	4	10.0	10.0	1.5	1.5	25	2.5	**3.88**	**5.03**
94 - SS	3.8	4	10.0	10.0	1.8	1.8	25	2.8	**3.38**	**4.70**
95 - SS	4.2	4	10.0	10.0	1.2	1.2	25	2.2	**4.53**	**5.33**
96 - SS	No peat recorded at location									
97 - SS	3.1	4	10.0	10.0	2.0	2.0	25	3.0	**3.71**	**5.35**
98 - SS	3.2	4	10.0	10.0	1.4	1.4	25	2.4	**5.12**	**6.46**
99 - SS	4.7	4	10.0	10.0	1.0	1.0	25	2.0	**4.91**	**5.30**
100 - SS	5.5	4	10.0	10.0	1.8	1.8	25	2.8	**2.34**	**3.24**
101 - SS	4.3	4	10.0	10.0	1.6	1.6	25	2.6	**3.31**	**4.40**
102 - SS	4.2	4	10.0	10.0	1.6	1.6	25	2.6	**3.44**	**4.58**
103 - SS	4.3	4	10.0	10.0	1.7	1.7	25	2.7	**3.11**	**4.23**
104 - SS	4.7	4	10.0	10.0	0.9	0.9	25	1.9	**5.46**	**5.58**
105 - SS	7.7	4	10.0	10.0	0.9	0.9	25	1.9	**3.35**	**3.41**
106 - SS	8.6	4	10.0	10.0	1.4	1.4	25	2.4	**1.92**	**2.40**
108 - SS	5.4	4	10.0	10.0	1.2	1.2	25	2.2	**3.54**	**4.16**
109 - SS	4.9	4	10.0	10.0	1.3	1.3	25	2.3	**3.65**	**4.45**
110 - SS	5.4	4	10.0	10.0	0.6	0.6	25	1.6	**7.15**	**5.78**
111 - SS	7.1	4	10.0	10.0	0.9	0.9	25	1.9	**3.64**	**3.70**
112 - SS	5.3	4	10.0	10.0	0.8	0.8	25	1.8	**5.48**	**5.25**
113 - SS	5.4	4	10.0	10.0	1.2	1.2	25	2.2	**3.58**	**4.21**
114 - SS	5.7	4	10.0	10.0	1.0	1.0	25	2.0	**4.08**	**4.40**
115 - SS	3.1	4	10.0	10.0	0.3	0.3	25	1.3	**24.32**	**12.13**
116 - SS	7.8	4	10.0	10.0	0.4	0.4	25	1.4	**7.44**	**4.56**
117 - SS	4.4	4	10.0	10.0	1.0	1.0	25	2.0	**5.23**	**5.64**
118 - SS	3.3	4	10.0	10.0	2.2	2.2	25	3.2	**3.20**	**4.76**
119 - SS	5.6	4	10.0	10.0	0.3	0.3	25	1.3	**13.74**	**6.83**
120 - SS	5.3	4	10.0	10.0	1.0	1.0	25	2.0	**4.34**	**4.68**
121 - SS	7.3	4	10.0	10.0	1.0	1.0	25	2.0	**3.18**	**3.41**
122 - SS	6.2	4	10.0	10.0	1.2	1.2	25	2.2	**3.23**	**3.72**
123 - SS	5.9	4	10.0	10.0	0.5	0.5	25	1.5	**7.78**	**5.58**
124 - SS	4.7	4	10.0	10.0	0.5	0.5	25	1.5	**9.70**	**6.98**
125 - SS	3.8	4	10.0	10.0	1.6	1.6	25	2.6	**3.75**	**4.98**
126 - SS	2.6	4	10.0	10.0	1.2	1.2	25	2.2	**7.26**	**8.57**
127 - SS	3.7	4	10.0	10.0	1.6	1.6	25	2.6	**3.92**	**5.22**
128 - SS	4.3	4	10.0	10.0	1.8	1.8	25	2.8	**2.94**	**4.08**
129 - SS	3.9	4	10.0	10.0	1.4	1.4	25	2.4	**4.16**	**5.24**
130 - SS	3.6	4	10.0	10.0	1.5	1.5	25	2.5	**4.25**	**5.51**
131 - SS	3.3	4	10.0	10.0	1.6	1.6	25	2.6	**4.40**	**5.85**
132 - SS	9.1	4	10.0	10.0	0.5	0.5	25	1.5	**5.10**	**3.63**
133 - SS	7.5	4	10.0	10.0	1.6	1.6	25	2.6	**2.00**	**2.61**
134 - SS	6.8	4	10.0	10.0	0.4	0.4	25	1.4	**8.52**	**5.23**
135 - SS	5.2	4	10.0	10.0	1.0	1.0	25	2.0	**4.43**	**4.78**
136 - SS	7.1	4	10.0	10.0	1.2	1.2	25	2.2	**2.71**	**3.17**
137 - SS	5.7	4	10.0	10.0	0.3	0.3	25	1.3	**13.47**	**6.69**
146 - SS	2.3	4	10.0	10.0	2.6	2.6	25	3.6	**3.85**	**6.02**
147 - SS	3.4	4	10.0	10.0	1.0	1.0	25	2.0	**6.80**	**7.35**
148 - SS	3.7	4	10.0	10.0	2.1	2.1	25	3.1	**2.99**	**4.37**
149 - SS	3.7	4	10.0	10.0	1.8	1.8	25	2.8	**3.49**	**4.84**
150 - SS	3.6	4	10.0	10.0	1.2	1.2	25	2.2	**5.31**	**6.26**
151 - SS	2.6	4	10.0	10.0	1.8	1.8	25	2.8	**4.95**	**6.88**
152 - SS	3.0	4	10.0	10.0	2.1	2.1	25	3.1	**3.60**	**5.28**
153 - SS	5.0	4	10.0	10.0	1.0	1.0	25	2.0	**4.63**	**5.00**
154 - SS	1.8	4	10.0	10.0	2.6	2.6	25	3.6	**4.97**	**7.77**
155 - SS	3.3	4	10.0	10.0	1.3	1.3	25	2.3	**5.32**	**6.50**
156 - SS	4.6	4	10.0	10.0	1.1	1.1	25	2.1	**4.57**	**5.17**
157 - SS	4.6	4	10.0	10.0	0.6	0.6	25	1.6	**8.39**	**6.79**
158 - SS	3.2	4	10.0	10.0	0.7	0.7	25	1.7	**10.24**	**9.11**
159 - SS	1.8	4	10.0	10.0	1.1	1.1	25	2.1	**11.74**	**13.31**
160 - SS	3.2	4	10.0	10.0	0.8	0.8	25	1.8	**8.96**	**8.61**
161 - SS	3.0	4	10.0	10.0	1.3	1.3	25	2.3	**5.93**	**7.25**
162 - SS	3.7	4	10.0	10.0	0.4	0.4	25	1.4	**15.69**	**9.69**
163 - SS	3.3	4	10.0	10.0	0.8	0.8	25	1.8	**8.80**	**8.46**
164 - SS	3.7	4	10.0	10.0	0.4	0.4	25	1.4	**15.69**	**9.69**
165 - SS	3.9	4	10.0	10.0	1.1	1.1	25	2.1	**5.30**	**5.99**
166 - SS	3.7	4	10.0	10.0	1.2	1.2	25	2.2	**5.23**	**6.16**
167 - SS	3.1	4	10.0	10.0	3.5	3.5	25	4.5	**2.08**	**3.51**
168 - SS	3.2	4	10.0	10.0	2.7	2.7	25	3.7	**2.65**	**4.19**
170 - SS	3.9	4	10.0	10.0	1.0	1.0	25	2.0	**5.82**	**6.29**
171 - SS	4.6	4	10.0	10.0	1.6	1.6	25	2.6	**3.11**	**4.13**
172 - SS	4.7	4	10.0	10.0	1.2	1.2	25	2.2	**4.04**	**4.76**
173 - SS	5.3	4	10.0	10.0	1.6	1.6	25	2.6	**2.74**	**3.64**
174 - SS	4.1	4	10.0	10.0	1.3	1.3	25	2.3	**4.36**	**5.32**
175 - SS	5.4	4	10.0	10.0	1.0	1.0	25	2.0	**4.29**	**4.63**
185 - SS	5.0	4	10.0	10.0	1.4	1.4	25	2.4	**3.31**	**4.16**
186 - SS	4.2	4	10.0	10.0	0.7	0.7	25	1.7	**7.87**	**7.00**
187 - SS	4.5	4	10.0	10.0	1.0	1.0	25	2.0	**5.16**	**5.57**
188 - SS	3.2	4	10.0	10.0	1.2	1.2	25	2.2	**5.97**	**7.04**
189 - SS	3.3	4	10.0	10.0	1.6	1.6	25	2.6	**4.32**	**5.75**
193 - SS	3.3	4	10.0	10.0	1.6	1.6	25	2.6	**4.40**	**5.85**
196 - SS	4.2	4	10.0	10.0	1.2	1.2	25	2.2	**4.53**	**5.33**
198 - SS	3.9	4	10.0	10.0	2.7	2.7	25	3.7	**2.16**	**3.40**
200 - SS	4.0	4	10.0	10.0	2.1	2.1	25	3.1	**2.73**	**4.00**
205 - SS	3.4	4	10.0	10.0	1.6	1.6	25	2.6	**4.25**	**5.66**
601	0.3	4	10.0	10.0	5.2	5.2	25	6.2	**15.39**	**27.95**
602	1.4	4	10.0	10.0	5.7	5.7	25	6.7	**2.93**	**5.39**
603	1.8	4	10.0	10.0	5.6	5.6	25	6.6	**2.31**	**4.24**
604	1.4	4	10.0	10.0	5.8	5.8	25	6.8	**2.76**	**5.10**
605	1.0	4	10.0	10.0	4.3	4.3	25	5.3	**5.47**	**9.62**
606	1.1	4	10.0	10.0	3.6	3.6	25	4.6	**5.85**	**9.91**

Calculated FoS of Natural Peat Slopes for Meenbog Wind Farm (Drained Analysis)

Turbine No./Waypoint	Slope	Design c'	Bulk unit weight of Peat	Unit weight of Water	100% Water to height of Peat	Depth of In situ Peat	Friction Angle	Equivalent Total Depth of Peat (m)	Factor of Safety for Load Condition	
	α (deg)	c' (kPa)	γ (kN/m^3)	γ_w (kN/m^3)	(m)	(m)	ø' (deg)	Condition (2)	Condition (1)	Condition (2)
									100% Water	100% Water
MCC1b	3.0	4	10.0	10.0	1.8	1.8	25	2.8	**4.29**	**5.96**
MCC2b	4.0	4	10.0	10.0	0.9	0.9	25	1.9	**6.38**	**6.53**
MCC3b	4.5	4	10.0	10.0	1.0	1.0	25	2.0	**5.16**	**5.57**
MCC4b	5.5	4	10.0	10.0	1.1	1.1	25	2.1	**3.82**	**4.32**
MCC5b	5.5	4	10.0	10.0	0.9	0.9	25	1.9	**4.67**	**4.77**
MCC6b	5.8	4	10.0	10.0	1.2	1.2	25	2.2	**3.30**	**3.88**
MCC7b	5.0	4	10.0	10.0	1.0	1.0	25	2.0	**4.58**	**4.94**
1	No peat recorded at location									
4	4.0	4	10.0	10.0	1.5	1.5	25	2.5	**3.83**	**4.97**
6	3.0	4	10.0	10.0	1.4	1.4	25	2.4	**5.47**	**6.90**
8	No peat recorded at location									
10	No peat recorded at location									
12	1.0	4	10.0	10.0	0.3	0.3	25	1.3	**76.41**	**38.18**
14	2.0	4	10.0	10.0	2.0	2.0	25	3.0	**5.73**	**8.27**
16	5.0	4	10.0	10.0	1.1	1.1	25	2.1	**4.19**	**4.73**
18	1.0	4	10.0	10.0	3.0	3.0	25	4.0	**7.64**	**12.41**
20	2.0	4	10.0	10.0	3.5	3.5	25	4.5	**3.28**	**5.52**
22	2.0	4	10.0	10.0	3.6	3.6	25	4.6	**3.19**	**5.40**
24	3.0	4	10.0	10.0	1.7	1.7	25	2.7	**4.50**	**6.13**
26	3.0	4	10.0	10.0	1.6	1.6	25	2.6	**4.78**	**6.37**
27	10.0	4	10.0	10.0	0.9	0.9	25	1.9	**2.60**	**2.62**
28	9.0	4	10.0	10.0	1.3	1.3	25	2.3	**1.99**	**2.41**
35	0.1	4	10.0	10.0	1.7	1.7	25	2.7	**235.29**	**320.85**
36	3.1	4	10.0	10.0	2.0	2.0	25	3.0	**3.65**	**5.26**
37	5.7	4	10.0	10.0	1.2	1.2	25	2.2	**3.37**	**3.96**
38	5.3	4	10.0	10.0	0.9	0.9	25	1.9	**4.82**	**4.92**
39	4.9	4	10.0	10.0	0.5	0.5	25	1.5	**9.37**	**6.74**
40	2.5	4	10.0	10.0	1.4	1.4	25	2.4	**6.51**	**8.21**
41	6.9	4	10.0	10.0	1.8	1.8	25	2.8	**1.86**	**2.57**
42	3.0	4	10.0	10.0	1.3	1.3	25	2.3	**5.89**	**7.20**
43	3.0	4	10.0	10.0	1.8	1.8	25	2.8	**4.25**	**5.91**
44	4.0	4	10.0	10.0	0.4	0.4	25	1.4	**14.37**	**8.87**
45	3.0	4	10.0	10.0	0.9	0.9	25	1.9	**8.50**	**8.71**
46	2.0	4	10.0	10.0	1.3	1.3	25	2.3	**8.82**	**10.79**
47	9.0	4	10.0	10.0	0.8	0.8	25	1.8	**3.24**	**3.07**
48	5.0	4	10.0	10.0	1.6	1.6	25	2.6	**2.88**	**3.82**
49	4.0	4	10.0	10.0	0.8	0.8	25	1.8	**7.19**	**6.90**
50	4.0	4	10.0	10.0	1.1	1.1	25	2.1	**5.23**	**5.91**
51	4.0	4	10.0	10.0	1.9	1.9	25	2.9	**3.03**	**4.28**
54	15.0	4	10.0	10.0	0.4	0.4	25	1.4	**4.00**	**2.39**
55	1.0	4	10.0	10.0	2.5	2.5	25	3.5	**9.17**	**14.18**
56	0.1	4	10.0	10.0	1.6	1.6	25	2.6	**143.24**	**190.91**
57	1.0	4	10.0	10.0	1.7	1.7	25	2.7	**13.48**	**18.38**
61	1.0	4	10.0	10.0	0.7	0.7	25	1.7	**32.75**	**29.20**
62	4.0	4	10.0	10.0	1.6	1.6	25	2.6	**3.59**	**4.78**
66	0.1	4	10.0	10.0	3.0	3.0	25	4.0	**76.39**	**124.09**
67	1.0	4	10.0	10.0	1.6	1.6	25	2.6	**14.33**	**19.09**
69	2.0	4	10.0	10.0	1.6	1.6	25	2.6	**7.17**	**9.55**
71	3.0	4	10.0	10.0	1.5	1.5	25	2.5	**5.10**	**6.62**
74	5.0	4	10.0	10.0	1.4	1.4	25	2.4	**3.29**	**4.14**
76	4.0	4	10.0	10.0	1.9	1.9	25	2.9	**3.03**	**4.28**
78	4.0	4	10.0	10.0	1.3	1.3	25	2.3	**4.42**	**5.40**
80	6.0	4	10.0	10.0	1.7	1.7	25	2.7	**2.26**	**3.07**
81	2.0	4	10.0	10.0	2.0	2.0	25	3.0	**5.73**	**8.27**
84	1.0	4	10.0	10.0	2.3	2.3	25	3.3	**9.97**	**15.04**
88	1.0	4	10.0	10.0	0.8	0.8	25	1.8	**28.65**	**27.58**
90	5.0	4	10.0	10.0	0.8	0.8	25	1.8	**5.76**	**5.52**
92	5.0	4	10.0	10.0	0.8	0.8	25	1.8	**5.76**	**5.52**
93	1.0	4	10.0	10.0	0.3	0.3	25	1.3	**76.41**	**38.18**
96	1.0	4	10.0	10.0	3.6	3.6	25	4.6	**6.37**	**10.79**
98	1.0	4	10.0	10.0	3.7	3.7	25	4.7	**6.20**	**10.56**
100	1.0	4	10.0	10.0	3.4	3.4	25	4.4	**6.74**	**11.28**
103	1.0	4	10.0	10.0	2.7	2.7	25	3.7	**8.49**	**13.42**
104	1.0	4	10.0	10.0	3.5	3.5	25	4.5	**6.55**	**11.03**
105	2.0	4	10.0	10.0	2.1	2.1	25	3.1	**5.46**	**8.01**
106	1.0	4	10.0	10.0	3.6	3.6	25	4.6	**6.37**	**10.79**
107	1.0	4	10.0	10.0	4.3	4.3	25	5.3	**5.33**	**9.37**
108	1.0	4	10.0	10.0	4.0	4.0	25	5.0	**5.73**	**9.93**
109	1.0	4	10.0	10.0	3.0	3.0	25	4.0	**7.64**	**12.41**
110	2.0	4	10.0	10.0	3.5	3.5	25	4.5	**3.28**	**5.52**
112	3.0	4	10.0	10.0	0.7	0.7	25	1.7	**10.93**	**9.74**
113	4.0	4	10.0	10.0	1.7	1.7	25	2.7	**3.38**	**4.60**
114	1.0	4	10.0	10.0	2.7	2.7	25	3.7	**8.49**	**13.42**
115	3.0	4	10.0	10.0	1.6	1.6	25	2.6	**4.78**	**6.37**
116	2.0	4	10.0	10.0	0.8	0.8	25	1.8	**14.34**	**13.79**
117	3.0	4	10.0	10.0	0.9	0.9	25	1.9	**8.50**	**8.71**
								Minimum =	**1.36**	**2.26**
								Maximum =	**250.00**	**333.20**
								Average =	**10.59**	**12.59**

Notes:

(1) Assuming a bulk unit weight of peat of 10 (kN/m^3)
(2) Assuming a surcharge equivalent to fill depth of 1.0 (m)
(3) Slope inclination (β) based on site readings and contour survey plans of site.
(4) FoS is based on slope inclination and shear test results obtained from published data.
(5) Peat depths based on probes carried out by AGEC and McCarthy Keville O'Sullivan.
(6) For load conditions see report text.
(7) Minimum acceptable factor of safety required of 1.3 for first-time failures based on BS: 6031:1981 Code of practice for Earthworks.

APPENDIX D

METHODOLOGY FOR RISK ASSESSMENT

Methodology for Risk Assessment

A risk assessment is carried out for the main infrastructure elements at the proposed wind farm development. This approach follows the guidelines for geotechnical risk management as given in Clayton (2001), as referenced in PHRAG, and takes into account the approach of MacCulloch (2005).

The risk assessment uses the results of the stability analysis (deterministic approach) in combination with qualitative factors (Table A), which cannot be reasonably included in a stability calculation but nevertheless may affect the occurrence of peat instability to assess the risk for each infrastructure element.

The stability analysis takes into account the peat depth, slope angle and shear strength properties of the peat (see section 7 of report). The qualitative factors used in the risk assessment have been compiled based on AGEC's experience of assessments and construction in peat land sites and peat failures throughout Ireland and the UK.

It should be noted that the presence of one of the qualitative factors alone from Table A is unlikely to lead to peat instability/failure. Peat instability/failure at a site is generally the combination of a number of these factors occurring at a particular location.

Table A Qualitative Factors used to Assess Potential for Peat Failure

Qualitative Factor	Type of Feature/Indicator for each Qualitative Factor (1)	Explanation/Description of Qualitative Factor
Evidence of sub peat water flow	No	Based on site walkover observations. Sub peat water flow generally occurs in the form of natural piping at the base of peat. Where there is a constriction or blockage in natural pipes a build-up of water can occur at the base of the peat causing a reduction in effective stress at the base of the peat resulting in failure; this is particularly critical during periods of intense rainfall.
	Possibly	
	Probably	
	Yes	
Evidence of surface water flow	Dry	Based on site walkover observations. The presence of surface water flow indicates if peat in an area is well drained or saturated and if any additional loading from the ponding of surface water onto the peat is likely.
	Localised/Flowing in drains	
	Ponded in drains	
	Springs/surface water	
Evidence of previous failures/slips	No	Based on site walkover observations. The presence of clustering of relict failures may indicate that particular pre-existing site conditions predispose a site to failure.
	In general area	
	On site	

Qualitative Factor	Type of Feature/Indicator for each Qualitative Factor (1)	Explanation/Description of Qualitative Factor
	Within 500m of location	
Type of vegetation	Grass/Crops	Based on site walkover observations. The type of vegetation present indicates if peat in an area is well drained, saturated, etc. Vegetation that indicates wetter ground may also indicate softer underlying peat deposits.
	Improved Grass/Dry Heather	
	Wet Grassland/Juncus (Rushes)	
	Wetlands Sphagnum (Peat moss)	
General slope characteristics upslope/downslope from infrastructure location	Concave	Based on site walkover observations. Slope morphology in the area of the infrastructure location is an important factor. A number of recorded peat failures have occurred in close proximity to a convex break in slope.
	Planar to concave	
	Planar to convex	
	Convex	
Evidence of very soft/soft clay at base of peat	No	Based on inspection of exposures in general area from site walkover. Several reported peat failures identify the presence of a weak layer at the base of the peat along which shear failure has occurred.
	Yes	
Evidence of mechanically cut peat	No	Based on site walkover observations. Mechanically cut peat typically cut using a 'sausage' machine to extract peat for harvesting. Areas which have been cut in this manner have been linked to peat instability. The mechanical cuts can notably reduce the intrinsic strength of the peat and also allow ingress of rainfall/surface water.
	Yes	
Evidence of quaking or buoyant peat	No	Based on site walkover observations. Quaking/buoyant peat is indicative of highly saturated peat, which would generally be considered to have a low strength. Quaking peat is a feature on sites that have been previously linked with peat instability.
	Yes	
Evidence of bog pools	No	Based on site walkover observations. Bog pools are generally an indicator of areas of weak, saturated peat. Commonly where there are open areas of water within peat these can be

Qualitative Factor	Type of Feature/Indicator for each Qualitative Factor (1)	Explanation/Description of Qualitative Factor
	Yes	interconnected, with the result that there may be sub-surface bodies of water. The presence of bog pools have been previously linked with peat instability.
Other	Varies	In addition to the above features/ indicators and based on site recordings the following are some of the features which may be identified: Excessively deep peat, weak peat, overly steep slope angles, etc.

Note (1) The list of features/indicators for each qualitative factor are given in increasing order of probability of leading to peat instability/failure.

Probability

The likelihood of a hazard (peat failure) occurring has been based on the results of the stability calculation FoS and qualitative factors from Table B, where present.

The probability assigned to the FoS and qualitative factors is judged on a qualitative scale (Table B).

Table B Probability Scale

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

Scale	Likelihood of Qualitative Factor leading to Peat Failure	Probability of Failure
1	Negligible/None	Least
2	Unlikely	
3	Probable	
4	Likely	
5	Very Likely	Greatest

Impact

The severity of the risk is also assessed qualitatively in terms of impact. The impact of a peat failure on the environment within and beyond the immediate wind farm site is assessed based on the potential travel distance of a peat failure. Where a peat failure enters a water course it can travel a considerable distance downstream. Therefore, the

proximity of a potential peat failure to a drainage course is a significant indicator of the likely potential impact.

The risk is determined based on the combination of hazard and impact. A qualitative scale has been derived for the impact of the hazard based on distance of infrastructure element to a watercourse (Table C).

The location of watercourses is based on topographic maps and supplemented by site observations from walkover survey. Note that not all watercourses are shown on maps.

Table C Impact Scale

Scale	Criteria	Impact
1	Proposed infrastructure element greater than 150m of watercourse	Negligible/None
2	Proposed infrastructure element within 150 to 101m of watercourse	Low
3	Proposed infrastructure element within 100 to 51m of watercourse	Medium
4	Proposed infrastructure element within 50 m of watercourse	High

Risk Rating

The degree of risk is determined as the product of probability (P) and impact (I), which gives the Risk Rating (R) as follows:

The Risk Rating is calculated from: R = P x I

The Risk Rating can range from 1 to 20 as shown in Table D.

Table D Qualitative Risk Rating

Impact \ Probability	1	2	3	4	5
4	4	8	12	16	20
3	3	6	9	12	15
2	2	4	6	8	10
1	1	2	3	4	5

Risk Rating & Control Measures	
10 to 20	Unacceptable: re-location or significant control measures required
5 to 9	Substantial: notable control measures required
3 to 4	Tolerable: only routine control measures required
1 to 2	Trivial: none or only routine control measures required

Note. Where any individual contributory factor is given a probability of 5 then this defaults to an 'Unacceptable' risk rating irrespective of the impact.

In many cases a simple 4- to 5-level scale is considered sufficient (Clayton, 2001); in this case a 4-level scale is used. The control measures in response to the qualitative risk ratings are included in the Geotechnical Risk Register for each turbine in Appendix B.

The risk rating is calculated individually for each contributory factor. Control measures are required to reduce the risk to at least a 'Tolerable' risk rating.