APPENDIX 8-1

PEAT STABILITY ASSESSMENT REPORT: MEENBOG WIND FARM (EXISTING DEVELOPMENT) (FT, 2026) (RPSA (FT, 2026))

FEHILY TIMONEY

DESIGNING AND DELIVERING
A SUSTAINABLE FUTURE

MEENBOG WIND FARM (EXISTING DEVELOPMENT)

PEAT STABILITY ASSESSMENT REPORT

Prepared for: **MKO Ltd**

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PEAT STABILITY ASSESSMENT REPORT
MEENBOG WIND FARM (EXISTING DEVELOPMENT)

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Abstract: Fehily Timoney and Company (FT) were engaged by MKO Ltd to undertake a geotechnical assessment of the Meenbog Wind Farm Site with respect to peat stability, to cover the constructed works completed to the end of 2022 (the "Existing Development").

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1. NON-TECHNICAL SUMMARY

Fehily Timoney and Company (FT) was engaged by MKO Ltd to undertake a geotechnical and peat stability assessment of the Meenbog Wind Farm, located in Co. Donegal. In accordance with the 'Wind Energy Development Guidelines for Planning Authorities' (Department of the Environment, Heritage and Local Government (DoEHLG), 2006), (hereafter referred to as 'the Guidelines (DoEHLG, 2006)') and the 'Draft Revised Wind Energy Development Guidelines' (Department of Housing, Planning and Local Government (DoHPLG) (December 2019)), (hereafter referred to as the 'Draft Guidelines (DoHPLG, 2019), where peat >0.5m thickness is present on a proposed wind farm development, a peat stability assessment is required.

The findings, which involved a stability analysis of over 1300 locations, show that the Wind Farm Site has an acceptable margin of safety and a low to moderate risk of peat failure.

The Existing Development comprises 14 no. completed, 4 no. partially completed wind turbine foundations, and 18 no. completed or partially completed hardstand areas and associated infrastructure. A detailed description of the Existing Development is included in Chapter 4 of the rEIAR.

The elevation of the Wind Farm Site is between approximately 180 metres Ordnance Datum (OD) and 313 metres OD, with elevations on the Wind Farm Site generally decreasing and sloping in a north or northwesterly direction. A small section to the south of the Wind Farm Site slopes to the southeast. The Wind Farm Site is generally bordered on all sides by forestry plantations with the eastern and southern boundaries also being defined by the Northern Ireland border.

To date, over 3400 no. peat depth readings were taken within the Wind Farm Site. Peat depths recorded during the site walkovers and from the ground investigation ranged from 0.0 to 7.3m with an average peat depth of 1.8m. 65% of the probes recorded peat depths of less than 2.0m. A number of localised readings recorded peat depths from 3.0 to 7.3m. in addition, a series of trial pits and Russian peat samples were taken at various locations across the Wind Farm Site.

A site-wide qualitative assessment of the potential peat stability using a geomorphological approach taking into account the findings from previous failures, and relevant reports and records has been carried out, and is described in Section 5.

A quantitative peat stability assessment for the Existing Development has been undertaken. The purpose of the stability analysis was to determine the stability i.e. Overdesign Factor (ODF), of the peat slopes across the Wind Farm Site. An ODF of less than 1.0 indicates that a slope is unstable; a ODF of greater than 1.0 indicates a stable slope. The stability analysis for the Existing Development, which analysed the turbine locations, access roads and related infrastructure, is included in Section 8, resulted in ODF above the minimum acceptable value of 1.0 for load condition 1 (no loading), load condition 2 in sidecasting areas, and hence the Wind Farm Site has a satisfactory margin of safety in its current condition. An analysis of the floating roads under load condition 3 and 4 was undertaken using SlopeW software, all of which recorded ODF values of >1.0.

A qualitative peat stability risk assessment has also been undertaken for the turbine locations and the sections of floating road constructed across the Wind Farm Site. This assessment was initially undertaken for the baseline conditions that existing before construction started, and an additional risk assessment for the same areas following construction and the implementation of mitigation measures. The majority of locations are currently assessed as Low risk, with a slightly higher risk (Low to Medium) associated with the area around T7 and on the floating roads. These results show the effects of the construction mitigation measures over time. The results of the risk assessment are given in Appendix D.

The improvement in site conditions due to the improved drainage across the site and consolidation of the peat beneath the floating roads and sidecasting areas has resulted in a Low and Medium-Low overall risk rating for the Site. This is considered 'Acceptable with Monitoring' or 'Regular Attention', as per Table 5.9.

In summary, the Wind Farm Site has an acceptable margin of safety and therefore is considered to be at **low** risk of peat failure in its current condition.

2. INTRODUCTION

2.1 Fehily Timoney and Company

Fehily Timoney and Company (FT) is an Irish engineering, environmental science and planning consultancy with offices in Cork, Dublin and Carlow. The practice was established in 1990 and currently has c.100 members of staff, including engineers, scientists, planners and technical support staff. FT deliver projects in Ireland and internationally in our core competency areas of Waste Management, Environment and Energy, Civils Infrastructure, Planning and GIS and Data Management.

FT have been involved in over 100 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.

This Report was written by Ian Higgins (FT Technical Director, PGeo, MSc in Geotechnical Engineering) Ian is a Technical Director with Fehily Timoney and has 25 years' experience in geotechnical engineering.

2.2 Project Description

FT was engaged in October 2024 by MKO Ltd. to undertake a geotechnical and peat stability assessment of the Existing Development for Meenbog Wind Farm.

The Wind Farm Site is located approximately 8km southwest of the twin towns of Ballybofey and Stranorlar and 8km northeast of Donegal Town.

Current land-use at the Wind Farm Site is comprised of the partially constructed Meenbog Wind Farm and areas of commercial forestry and blanket bog. The surrounding landscape is rolling hillsides with land-use comprising forestry and blanket peatland.

Substitute consent is being sought for the Subject Development. The substitute consent application seeks to regularise the Existing Development and seek permission for the Prospective Development. The Existing Development is addressed within this rEIAR. The Prospective Development is addressed within the Environmental Impact Assessment Report (EIAR).

- The 'Wind Farm Site' refers to the area of the Site surrounding the wind turbines and associated infrastructure (including the onsite 110kV substation) from the wind farm site entrance off the N15 National Road.
- The 'Grid Connection Site' refers to the area of the Site surrounding the Grid Connection from the Wind Farm Site entrance off the N15 National Road to the Clogher 110kV substation.

For the purpose of this rEIAR, the Existing Development consists of the retention of the following:

(1) Upgrading of access junctions, tracks and roads, and construction of new site access roads;

(2) 18 no. wind turbine foundations and hardstand areas at various stages of development;

(3) A 110kV Electrical substation with 2 no. control buildings with welfare facilities, associated electrical plant and apparatus, security fencing and underground wastewater holding tank;

(4) 110kV underground grid connection cabling (including joint bays, communication chambers, earth sheath links, and ancillary works along the underground electrical cabling route) connecting the wind farm 110kV substation to the Clogher Substation in the townland of Cullionboy. This cabling route is primarily located within the public road corridor;

(5) Internal wind farm underground cabling at various stages of development;

(6) 2no. temporary construction compounds;

(7) 3no. borrow pits;

(8) Peat and spoil management;

(9) Forestry felling;

(10) Site drainage and sediment control measures; and

(11) All associated site development works.

2.3 Scope

The scope of this peat stability assessment for the Wind Farm Site includes the following:

(1) Review of the original ground conditions at the Wind Farm Site (baseline conditions).

(2) Review of construction works at the Wind Farm Site, namely but not limited to turbine bases, access roads, hardstands, borrow pit and peat cell areas.

(3) Identification of previous peat failures and instability at the Wind Farm Site.

(4) Qualitative assessment of peat stability at the Wind Farm Site pre and post construction.

(5) Findings and mitigation measures.

Previous site visits had been undertaken by AGEC as part of the assessment included in the 2017 EIAR submission for Meenbog Wind Farm.

In undertaking this assessment, FT carried out a number of key activities which included:

- Historical site visits to the Wind Farm Site in November and December 2020, and January and April 2021 along with a review of construction records and existing reports and published data.
- Site visits were also undertaken during construction works undertaken in 2022.
- Inspections of the current condition of the Wind Farm Site, undertaken in December 2024 and April 2025.

2.4 Peat Stability Assessment Methodology

The peat stability assessment of the Wind Farm Site follows the guidance in the Peat Landslide Hazard and Risk Assessments: Best Practice Guide for Proposed Electricity Generation Developments (Scottish Government, 2017) (the Guide).

The aforementioned 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.

It is recognised that the Wind Farm Site has been previously subject to a peat stability assessment as part of the planning application (AGEC, 2017) which also includes a hydrological assessment (MKO, 2017). Construction works have also been designed in accordance with the recognised standard for geotechnical works, I.S. EN 1997-1:2007 Eurocode 7 Geotechnical Design - Part 1: General Rules. The details included in these documents have been taken into consideration in the assessment included in this report. The assessment contained with this report also takes into account the findings of the report into the Meenbog failure and failures at Shass Mountain (2022) and Mount Eagle (2022), produced by FT on behalf of the GSI and NPWS in 2024.

The peat stability assessment includes the following key elements:

(1) Assessment of desk study data, ground conditions and character of the peat land at the Wind Farm Site, which includes relevant hydrology and geomorphological factors.

(2) An assessment of peat failures pre-construction and during construction together with evidence based on visual inspection and investigation of pre-failure indicators, such as tension cracks.

(3) A qualitative assessment of the potential peat stability using a geomorphological approach taking into account the findings from previous failures, and relevant reports and records (AGEC, 2017 and construction records).

(4) Identification of key receptors (such as water courses, human life) exposed to any peat instability.

(5) A quantitative stability assessment of the peat slopes across the Wind Farm Site, including areas where permanent loading has been applied to the peat, such as floating roads and sidecasting of peat (Section 7).

It is noted that whilst the Guide refers to a site-wide approach to particular ground investigation this is in relation to scoping of a site to identify the optimum location of the proposed infrastructure. As the infrastructure footprint at the Wind Farm Site has already been determined and is fixed then the site-wide approach is no longer relevant and as such there has been a focus in this report, and also within the Ionic Peat Stability Report (Ionic Consulting, 2021), on assessing the stability within a zone of influence of the Existing Development infrastructure.

Notwithstanding the above, the qualitative stability assessment included in this report is site-wide, as this provides an improved understanding of the geomorphological features at the Wind Farm Site and allows for better identification of areas where there is potential for an elevated risk from peat instability. A quantitative assessment of stability has also been undertaken, using an infinite slope method for the general site classification, with a slope stability assessment using SlopeW software undertaken for areas of floating road and where the infinite slope results indicate the potential for peat instability.

2.5 Sources of Information

The following sources were used to assess the peat stability at the Wind Farm Site:

(1) Published records (for example GSI and GSNI landslide databases, 2026)

(2) Historical aerial photography

(3) Observations from site inspection in November and December 2020, January 2021, December 2024 and April 2025

(4) Ground investigation data (peat strength and depth) at selected locations (2017-2025)

(5) Detailed site inspection of the November 2020 peatslide

(6) Planning and design reports

(7) Construction records

(8) Drone survey

3. SITE SUMMARY

3.1 General

The Existing Development comprises a partially built 19 turbine wind farm on Meenbog and adjacent townlands in Co. Donegal. The Wind Farm Site is located approximately 8km to the southwest Ballybofey and Stranorlar, Co. Donegal.

The developer for the wind farm is Planree Ltd, an associate company of Enerco Energy Ltd. The wind farm was granted planning permission in June 2018.

The contractor for the wind farm civil works was Mid Cork Electrical Limited (MCE). The designer for the civil works was Ionic Consulting (now AFRY), who also acted as the Project Supervisor for the Design Process (PSDP). For the wind farm project and project management, MCE was the Project Supervisor Construction Stage (PSCS). McCarthy Keville O'Sullivan (MKO) was the Ecological Clerk of Works (ECoW).

3.2 Layout

The Existing Development consists of the following:

(1) Upgrading of access junctions, tracks and roads, and construction of new site access roads;

(2) 18 no. wind turbine foundations and hardstand areas at various stages of development;

(3) A 110kV Electrical substation with 2 no. control buildings with welfare facilities, associated electrical plant and apparatus, security fencing and underground wastewater holding tank;

(4) 110kV underground grid connection cabling (including joint bays, communication chambers, earth sheath links, and ancillary works along the underground electrical cabling route) connecting the wind farm 110kV substation to the Clogher Substation in the townland of Cullionboy. This cabling route is primarily located within the public road corridor;

(5) Internal wind farm underground cabling at various stages of development;

(6) 2no. temporary construction compounds;

(7) 3no. borrow pits;

(8) Peat and spoil management;

(9) Forestry felling;

(10) Site drainage and sediment control measures; and

(11) All associated site development works.

3.3 Site Description

The Wind Farm Site measures approximately 892 hectares (ha), within the townlands of Meenbog and Croaghonagh. The Wind Farm Site borders County Tyrone in Northern Ireland, specifically the administrative division of Omagh West, Barony of Termonamongan and the townlands of Slievdoo, Meenakeeran, and Sixth Corgary or Second Croagh along the Southeast of the Wind Farm Site boundary. The Wind Farm Site lies within four Electoral Divisions (EDs); Goland, Dooish, Tawnawully and Clogher, in County Donegal. Current land-use at

the Wind Farm Site is comprised of the partially constructed Meenbog Wind Farm and areas of commercial forestry and blanket bog. The surrounding land-use predominantly comprises peat bogs, commercial forestry and other seminatural areas with limited residential use along local roads, as well as a quarry adjacent to the Wind Farm Site entrance off the N15 National Road.

The elevation of the Wind Farm Site is between approximately 180 metres Ordnance Datum (OD) and 313 metres OD, with elevations on the Wind Farm Site generally decreasing and sloping in a north or northwesterly direction. A small section to the south of the Wind Farm Site slopes to the southeast. The Wind Farm Site is generally bordered on all sides by forestry plantations with the southeastern boundary also being defined by the Northern Ireland border. The Wind Farm Site drains directly to the Bunadowen River, and the Shruhangarve stream, which flow to the north, each of which are tributaries of the larger Mourne Beg River that proceeds to flow downstream into the River Derg. The Wind Farm Site also drains into the Glendergan River to the south-southeast, which is also a tributary of the River Derg.

3.4 Wind Farm Construction

Construction works at the Wind Farm Site commenced in November 2019 by MCE. Most of the civil works, such as access roads, hardstands, turbine bases, borrow pits and peat cells at the Wind Farm Site were substantially complete at the time of the November 2020 peatslide. Table 3-1 provides a summary of the state of completion of the main civil works construction at the Wind Farm Site, and the layout is shown on Drawing P24-234-0600-0001.

With respect to access roads, these have all been substantially completed except the access road to T7 (which was involved in the November peat failure) and T18. Substantially completed refers to the road having been constructed, that is the main body of road material has been placed, and the road has been used for construction traffic. Typically to complete the road only minor elements of work are required such as for example grading, final road surfacing and testing.

Hardstands are similarly substantially complete except at T7 and T18. T7 has not been started. T18 is estimated at 50% complete. Hardstands comprise a suitable mass of crushed stone founded on a competent bearing stratum, such as competent mineral soil or bedrock below the peat.

Of the 19 no. turbines bases on the Wind Farm Site, all have been started except at T7. Of the 18 turbines bases that have been started all except T2, T16, T18 and T19 have been substantially completed, that is concrete has been poured. Turbine bases comprise gravity bases formed of reinforced concrete founded on a competent bearing stratum, such as typically bedrock. T2, T16, T18 and T19 are at various stages of completion ranging from exposure of formation, blinding, steel fixing and shuttering.

Table 3.1: Summary of civil works state of completion (from MCE)

Location	Access Road	Hardstand	Turbine Foundation
T1	Substantially complete	Substantially complete	Concrete pour completed
T2	Substantially complete	Substantially complete	Steel reinforcement in place. Concrete pour to be completed
T3	Substantially complete	Substantially complete	Concrete pour completed
T4	Substantially complete	Substantially complete	Concrete pour completed
T5	Substantially complete	Substantially complete	Concrete pour completed

Location	Access Road	Hardstand	Turbine Foundation
T6	Substantially complete	Substantially complete	Concrete pour completed
T7*	About 75% complete	No works completed	No works completed
T8	Substantially complete	Substantially complete	Concrete pour completed
T9	Substantially complete	Substantially complete	Concrete pour completed
T10	Substantially complete	Substantially complete	Concrete pour completed
T11	Substantially complete	Substantially complete	Concrete pour completed
T12	Substantially complete	Substantially complete	Concrete pour completed
T13	Substantially complete	Substantially complete	Concrete pour completed
T14	Substantially complete	Substantially complete	Concrete pour completed
T15	Substantially complete	Substantially complete	Concrete pour completed
T16	Substantially complete	Substantially complete	Foundation area excavated. Installation of steel reinforcement and concrete pour to be completed.
T17	Substantially complete	Substantially complete	Concrete pour completed
T18	Road upgrade 15% complete	50% complete	Foundation area excavated. Installation of steel reinforcement and concrete pour to be completed.
T19	Substantially complete	Substantially complete	Steel reinforcement in place. Concrete pour to be completed
Met mast	Not started	Not started	Not started

Notes:

(1) *Access road to T7 was under construction at time of the November 2020 peatslide.

(2) Turbine foundation construction comprises several stages, namely excavate to formation, blinding, steel fixing and shuttering, and pouring of concrete.

(3) Access road substantial completion refers to road having been constructed, that is main body of road material has been placed and road having been used for construction traffic but for example grading, final road surfacing and testing still to be carried out.

(4) Hard stand substantial completion refers to hard stand having been constructed, that is main body of hard stand material has been placed and hard stand has been used for construction traffic but for example blade finger construction, grading, final surfacing and testing still to be carried out.

4. GROUND CONDITIONS

4.1 Baseline Ground Conditions

4.1.1 Subsoils

A review of the GSI online mapping indicates that the Wind Farm Site is underlain by blanket peat (BkPt). Localised exposures of bedrock (Rck) are present in the south and east of the Wind Farm Site.

4.1.2 Peat

The majority of the Wind Farm Site is covered by blanket peat. The depth of peat across the Wind Farm Site is shown in Drawing P24-234-0600-0002. The depth of peat has been interpreted from the extensive number of peat probes that have been carried out across the Wind Farm Site.

During construction and for design purposes, ground investigation of particularly the peat strength and depth was carried out by Ionic. A total of approximately 3400 no. peat depth probes and in-situ hand shear vanes had been undertaken within the Wind Farm Site.

Peat depth recorded from the investigation both pre- and during construction ranged from 0 to very locally about 7m with an average depth of 1.8m. The majority of peat depths (about 65%) were less than 2m. Hand vane shear strength test results indicate undrained shear strengths in the range of 2 to 30kPa, with an average value of about 9kPa. This would equate to a description of extremely soft to soft, or extremely low to low strength.

In general, the depth of peat is proportional to the slope angles. The areas of deep peat up to 3-6 m deep, and locally >7.3m, correspond to the broad flat or gently sloping ground across the central and eastern sections of the Wind Farm Site. The slope angles in these areas are typically <2°.

Peat depths <2m are generally confined to the areas of steeper slopes up to 5.0-7.5°, with shallow peat <1.0 m on slopes typically up to 7.5-10.0°. Peat depths of 2-3 m typically occur on the intermediate slopes of 3-5°.

Based on gouge cores and window sampling, also carried out as part of the 2017 EIAR ground investigation, a thin mineral subsoil layer or intact bedrock was identified underlying the blanket peat. The mineral subsoil layer was typically recorded as 0.1 to 0.45m thick and described as soft to firm to stiff, to locally hard, grey sandy SILT/CLAY, occasionally cobbly or very gravelly. The mineral subsoil in most cases was likely weathered bedrock or a thin glacial till layer. The presence of recorded soft grey sandy SILT/CLAY at a few locations (T1, T9 and construction compound) suggests possible localised normally consolidated mineral subsoil.

4.1.3 Bedrock

The underlying bedrock was described by the Geological Survey of Ireland Memoir (GSI, 1999) and shown on sheet 3 and part of sheet 4 (Geology of South Donegal) of the memoir. In the area of the Wind Farm 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 Wind Farm Site include Barnesmore granite.

One mapped fault is shown running across the western area of the Wind Farm Site. The fault line has a north to south trend. No karst features were identified on the Wind Farm Site following a review of the GSI database.

4.1.4 Geological Heritage Sites

The nearest Geological Heritage Site shown on the Geological Survey of Ireland Spatial Resources interactive map viewer is located at the entrance to the Wind Farm Site. This is the Barnesmore Gap, described as a deep glacial channel running northeast-southwest between Croaghconnellagh and Barnesmore Mountain, formed in quaternary sediments that follows the line of the Barnesmore fault.

4.1.5 Topography

The southern part of the Wind Farm Site is dominated by a ridge line that extends northeast from Carrickaduff Hill. Most of the turbines for the wind farm are located along this ridge line. The top of the ridge line varies in elevation from 180 to 310mOD (Figure 4-1). The northern part of the Wind Farm Site is essentially within the Bunadaowen River valley, which runs parallel to the ridge line.

The top of the Carrickaduff Hill ridge line comprises in many places a broad level surface. The broad level surface has notable depths of peat up to locally in excess of 4m. Eastwards the ridge line declines in elevation and a number of broad level benches are present, again with notable depths of peat. Slope gradients along the ridge line are typically from 1 to about 10 degrees, with locally up to about 20 degrees.

Adjacent to the high point (at 313mOD) of the ridge line there is an elongated small water body, Carrickaduff Lough. The lough is located within a short steep-sided narrow valley aligned along the axis of the ridge line. This valley feature is possibly controlled by the structural geology control or is a relict glaciation feature.

The northern side of the ridge line comprises a relatively uniform slope which is drained by a number of tributary streams that flow into the Bunadaowen River. The southern side of the ridge line comprises a more varied slope profile with locally steeper sections as a result of rock near-surface. A limited number of streams are located on the southern slope and drain into the Glendergan River.

The peat cover on the ridge line comprises an almost continuous cover of blanket peat. Rock is exposed at the surface at a few locations. The peat cover shows little signs of erosion, though it has been heavily dissected due to forestry drainage and access roads.

The Bunadaowen River valley in the southern part of the Wind Farm Site is a high-level river valley with an elevation from about 150 to 230mOD. The valley floor comprises notably flatter ground running along the south side of the river. Peat depths of locally 6m have been recorded in the valley (AGEC, 2017). This indicates that the valley floor has been infilled with peat and that in the past the valley floor was at a lower level and was possibly a post-glacial lake. The extent of peat infilling in the valley floor is not known as there is limited construction in this area.

Geomorphological plans of the Wind Farm Site are included in Appendix B.

4.1.6 Hydrology

The vast majority of the Wind Farm Site is located in the Foyle River surface water catchment within Hydrometric Area No. 1. This river basin district is an international river basin district with ~3% of this district located in Northern Ireland. Meanwhile, a small area in the northwest of the Wind Farm Site is mapped in the Donegal Bay North regional surface water catchment, with Hydrometric Area No. 37 of the North Western River Basin District.

Within the Foyle River catchment, the Wind Farm Site is located in the Mourne Beg River sub-catchment (MourneBeg_SC_010). The Mourne Beg River, a tributary of the Mourne River, flows to the southeast from Lough Mourne, situated ~2km northeast of the Wind Farm Site entrance. The Mourne Beg River flows to the east, ~150m north of the Wind Farm Site before it crosses into Northern Ireland. Further downstream, this watercourse discharges into the River Derg, ~15km to the east. The River Derg continues to the east. The Mourne River is formed at the meeting of the River Derg and the River Strule, ~27km east of the Wind Farm Site. The Mourne River then flows to the north, through the town of Strabane, before it confluences with the Finn River to form the River Foyle.

In terms of WFD river sub-basins, the Wind Farm Site is located in a total of 5 no. WFD river sub-basins within the Mourne Beg River sub-catchment.

- The northwest of the Wind Farm Site is located in the Mourne Beg_010 WFD river sub-basin. This area is drained by the EPA mapped Croaghonagh Stream (EPA Code: 01C31). Note that this stream is referred to as the Mary Breen's Burn on local OSI mapping (note that the Mary Breen's Burn will be utilised for the remainder of this chapter). Mary Breen's Burn flows to the northeast and discharges into the Mourne Beg River (EPA Code: 01M01), ~1.8km northeast of the Wind Farm Site.
- A small area in the northeast of the Wind Farm Site is also mapped in the Mourne Beg_010 WFD river sub-basin. Here, the Mourne Beg River is located ~100m north of the Wind Farm Site.
- Much of the Wind Farm Site is located in the Bunadaowen_010 WFD river sub-basin. This area is drained by the Bunadowen River (EPA Code: 01B01) and several of its smaller tributaries. There is a high density of mapped watercourses in this area of the Wind Farm Site.
- A small area in the northeast of the Wind Farm Site is mapped in the Mourne Beg River (Derrygoonan) WFD river sub-basin. This area is drained by the Shruhanagarve Stream (EPA Code: 01S26) which flows to the northeast, before it discharges into the Mourne Beg River.
- The southeast of the Wind Farm Site is located in the Glendergan River WFD river sub-basin. An unnamed tributary of the Glendergan River flows to the south from the area of the Wind Farm Site. The Glendergan River itself forms the southeastern boundary of the Wind Farm Site. This watercourse discharges into the River Derg ~3.7km to the southeast.

Within the Donegal Bay North surface water catchment, the Wind Farm Site is mapped in the Eske River sub-catchment (Eske_SC_010). Within this area, a tributary of the Lowerymore River, referred to by the EPA as the Barrack Hill Stream (EPA Code: 37B16) flows to the southwest in the vicinity of the Wind Farm Site entrance. The Lowerymore River (EPA Code: 37L01) flows to the southwest, through Barnesmore Gap, before discharging into Lough Eske ~8.7km to the southwest.

A local hydrology map showing WFD river sub-basins is shown as Figure 9-5 in Chapter 9 of the rEIAR.

4.1.7 GSI Landslide Susceptibility Mapping

The Landslide Susceptibility Classification (GSI, 2026) provides an indication of the susceptibility of an area of land to landsliding. Based on the Landslide Susceptibility Classification the Wind Farm Site is classified by the GSI (2026) as 'low' to 'moderately low' and locally 'moderately high' susceptibility.

For the Wind Farm Site (Figure 4.2), the 'moderately high' susceptibility areas are generally located where there are steeper slope gradients. This would tend to be areas where rock is closer to the surface and peat depth is less, which would not necessarily be for all cases where peat failures would be anticipated. It is recognised that the Landslide Susceptibility Classification is indicative and is used for guidance only. The classification was not specifically developed for peatland environments and is weighted towards areas with steeper topography.

It is noted that the initiation site of the November 2020 peatslide is classified as 'Low' on the Landslide Susceptibility Classification. The initiation site comprises very gently sloping ground and as such would not generally be identified as having an elevated landslide susceptibility.

4.2 Summary of General Ground Conditions

From the above, the general sequence of ground conditions at the Wind Farm Site is summarised as follows:

(1) Blanket peat. Extensive covering of blanket peat, with peat depth typically in the range of 0.5 to 2m, though locally variable with areas of shallower and deeper peat (measured maximum depth of 5.8m).

(2) Mineral soil or weathered rock. Underlying the blanket peat was a thin mineral subsoil layer recorded as 0.1 to 0.45m thick of likely glacial till or weathered bedrock, or locally normally consolidated mineral subsoil, which may have been deposited in a lacustrine environment.

(3) Bedrock. Generally, bedrock at shallow depth either directly underlying the blanket peat or underlying the mineral soil/weathered rock layer.

4.3 Peat Ground Conditions

As part of the 2017 EIAR, an assessment of the peat condition at the Wind Farm Site was carried out (MKO, 2017 and AGEC, 2017). In addition, as part of detailed design for the works further investigation of the peat was carried out in advance and during the construction period by the designer (Ionic Consulting).

4.3.1 Ground Investigation Pre-Construction

As part of the 2017 EIAR assessment as prepared by AGEC, the peat at the Wind Farm Site was described as very soft to firm brown/black fibrous PEAT (in the shallow peat areas) and spongy and plastic black amorphous PEAT (in the deeper peat areas). The blanket peat comprised typically shallow peat areas with deeper peat deposits in the flatter areas on the Wind Farm Site. The identified deeper peat areas were located outside of the wind farm footprint to the southeast of T5, to the northwest of T10 and to the southeast of the substation location. The deeper peat deposits are locally present in the flatter areas on the Wind Farm Site were identified and highlighted on the construction buffer zone plan included in the AGEC Peat Stability Assessment Report (2017).

Peat strength testing was carried out for the 2017 EIAR assessment using an in-situ Geonor H-60 Hand-Field Vane Tester. Whilst it is recognised that this test gives indicative results for in-situ strength of peat it is generally considered best practice for the field assessment of peat strength. Strength testing was carried out at the selected locations across the Wind Farm Site, but most notably at turbine locations, to provide representative coverage of indicative peat strengths. The hand vane results indicated undrained shear strengths in the range of 5 to about 50kPa (extremely soft to firm), with an average value of about 15kPa. The lower bound strengths recorded would be typical for deep weak saturated peat and were recorded in the deeper peat areas in the flatter areas of the Wind Farm Site.

Typically, strengths less than about 4kPa would indicate a higher potential for instability. The shear vane strengths quoted in this report are unfactored based on the findings of site-specific trials and strict guidelines on their interpretation. Shear vanes results can be factored to allow for, as an example, possible entanglement of fibres in the shear vane. The factor used is typically shear vane x 0.5 (for example Edil (2001), Mesri & Ajlouni (2007), Boylan & Long (2014), Zwanenburg & Jardine (2015)).

4.3.2 Ground Investigations During Construction

During construction and for design purposes, ground investigation of particularly the peat strength and depth was carried out by Ionic. Approximately 3400 no. peat depth probes and in-situ hand shear vanes were undertaken within the wind farm footprint area.

Peat depth recorded from the investigation during construction ranged from 0 to very locally about 7m with an average depth of 1.8m. The majority of peat depths (about 65%) were less than 2m. Hand vane shear strength test results indicate undrained shear strengths in the range of 2 to 30kPa, with an average value of about 9kPa.

The results are shown in Figure 4-2 and are compared to the pre-construction results and for results obtained from the upper scar of the November 2020 peatslide. The results from the 12 November failure for the upper scar area are notably lower than those recorded from the other ground investigations, indicating the presence of a localised area of weaker peat.

4.3.3 Summary of Peat Ground Conditions

In general, the results of the pre-construction investigations showed higher vane shear strength test results when compared to during construction investigations with average results of 15 and 9kPa, respectively. The reason for this is that during construction investigation, particularly after the November 2020 peatslide, focused on critical areas of potentially weaker peat.

The pre-construction results show a more erratic distribution of peat strength, which is attributed to testing being carried out at essentially turbine bases, where there were notable variations in peat conditions (Figure 4-3). The majority of the investigation during construction was predominantly along access roads where there was a more uniform change in peat conditions The undrained peat strength with depth (Figure 4-4) also shows similar results for both investigations.

The vane shear strength test results for the November 2020 peatslide showed significantly lower results than the pre-construction and during construction investigations (Figure 4-3). The area close to the peat failure scar showed an undrained shear strength range from 2 to 9kPa, with an average of slightly less than about 5kPa. These values are notably low and are likely at the lower limit of what can be practically measured with the hand vane. The results show a reasonably consistent strength with depth and represent the lower bound strength profile with depth for all the test results.

The test results for the of the November 2020 peatslide failure scar show no appreciable strength gain with depth which would be typical of a saturated peat mass that has remained essentially water-logged over time. These results represent a body of very weak and saturated peat that was not identified in the previous investigations.

4.4 Ground Investigation (IDL, 2020)

A total of 9 no. rotary core boreholes were undertaken at various infrastructure locations (substation and 8 no. turbines) across the Wind Farm Site during May 2020 by Irish Drilling Ltd. (IDL). Bedrock was recorded in all locations at depths of between 1.1 to 5.0m bgl. Bedrock was described as strong to very strong foliated fine and medium grained Phyllite with medium spaced discontinuities.

4.5 Additional Ground Investigation (2021)

The further investigation was carried out during April 2021 principally due to the difficulties in testing peat to determine the operational peat strength. The Guide recognises the difficulties in determining peat strength and as such is intentionally non-prescriptive with respect to the testing carried out. Whilst the peat assessment uses vane testing in peat this is recognised as being an index tool (Boylan, Jennings & Long, 2008) though remains the most practical means of assessing peat strength and has been used extensively for testing peat on many wind farm sites.

A number of alternative peat strength testing methods have been carried out as part of the further ground investigation to provide a comparison between the alternative approaches, and the applicability of using an in-situ shear vane.

The further ground investigation has comprised the following:

(1) Trial pits

(2) Peat cores and peat humification

(3) Comparison of peat strength measurements

(4) Comparison of peat strength measurements and degree of humification

The location of the further ground investigation is included on the layout plan P24-234-0601-0001. The data obtained from the further ground investigation is included in Appendix A.

4.5.1 Trial Pits

A number of trial pits (4 nos.) were carried out at selected locations across the Wind Farm Site. The purpose of the trial pitting was to investigate in more detail the variation in peat classification and strength with depth and to retrieve peat samples for laboratory testing. For each trial pit the following was carried out:

(1) Detailed logging of peat with depth both before and during trial pitting

(2) Extraction of undisturbed block samples for laboratory (triaxial), shear vane testing and index testing

(3) Localised controlled failure of pit side wall, where safe to do so

(4) Back-analysis of localised failure of pit side wall

A number of trial pit locations were inspected prior to carrying out trial pitting, with many locations not being suitable due to presence of disturbed peat mainly due to tree roots left in-situ from cleared forestry and an unsuitable depth and strength of peat for testing. Trial pits (4 nos.) were located close to T4, T5, T7 and T18. In-situ shear vane testing of peat, including sampling of peat using a Russian Peat Sampler (RPS), which is a hand-held sampler which takes a 50mm diameter half core sample of 500mm length in peat, was carried out at each of the trial pit locations prior to excavation of the pit. In-situ shear vane testing was carried out at each corner and at the centre of the proposed pit. Peat sampling using the RPS was also carried out at the centre of the pit and logged to provide a detailed trial pit stratigraphy (this allowed for a more accurate log than could be obtained using excavated material from the trial pit).

Undisturbed (U100) samples were obtained of the in-situ peat. To limit sample disturbance the sampling tube was pushed at a slow rate into the in-situ peat within the pit excavations. In total 8 nos. undisturbed samples and 11 nos. disturbed samples were obtained from the trial pits.

Trial pit logs (T4-TP1, T7-TP1, T18-TP2 and T5-TP1) and the associated RPS logs are included in Appendix A.

The results of the in-situ shear vane testing of peat at the location of the trial pits are included in Figure 4-3 (a) to (d)**.** The results of the in-situ shear vane testing and a summary of the results of trial pits is included in Table 4-1.

Prior to excavating the trial pits the upper fibrous peat layer (acrotelm) was severed using a saw. Several saw-cuts were placed along the length of the pits at various distances from the trial pit edge. The purpose of the saw-cuts was to ensure that side wall failure was controlled by the underlying more humified layer (catotelm). Side wall failure occurred in 3 nos. of the trial pits (T4-TP1, T7-TP1 and T5- TP1), with failure typically occurring as slumping of the side wall with notable deformation of the surrounding ground surface and inward deformation of peat from the base and sides of the pit.

The theoretical limit for a vertical height for an undrained face to remain stable is determined from the following formula:

$$Hc = 4 \times c_u / \Upsilon - Zt \text{ (Potts, 2004)}$$

Where:

Hc height of vertical sidewall at failure (m)
c_u undrained strength (kPa)
Υ bulk unit weight of peat, taken as 10kN/m^3
Zt depth of tension crack (m), this is equivalent to the depth of the saw-cuts which is taken as 0.5m

Using the above formula and the average in-situ shear vane test results the theoretical failure height of the side wall (in m) was determined to assess the adequacy of using in-situ vane strength to measure the operational strength of the peat. The results from the trial pits are as follows:

(1) In general, there is a reasonably good correlation between the actual failure height of the side wall and the theoretical failure height of the side wall, particularly for the average in-situ shear vane strength of the full peat depth.

(2) Where the average in-situ shear vane strength within the depth of the failure height is used (that is within 2m below ground level), then the shear vane tends to underestimate the actual failure height. The in-situ shear vane strength underestimates the strength of the peat in this instance.

(3) The above results indicate that the in-situ shear vane strength provides a reasonable indication of the operational shear strength of peat, particularly at the lower shear strength peat encountered within the trial pits.

Table 4.1: Summary of trial pit results

Trial Pit	Depth of Peat (m)	Depth of Trial Pit (m)	Actual Failure Height of Side Wall (m)	Average In-situ Shear Vane Strength c_u of Peat (kPa)		Theoretical Failure Height of Side Wall (m)	
				Full Peat Depth	Within Failure Height	Full Peat Depth	Within Failure Height
T4-TP1	3.3	1.5	1.5	4.4	3.9	1.24	1.08
T7-TP1	3	1.5 to 1.7	1.6	5.1	4.8	1.55	1.41
T18- TP1	2.5	NA	NA	NA	NA	NA	NA
T18-TP2	1.5	1.5	DNF	13.3	13.3	4.83	4.83
T5-TP1	3.5	1.5	1.5	5.1	4.1	1.55	1.15

Notes
(1) T18-TP1 was not excavated as in-situ vane testing prior to pitting indicated that the peat was notably strong and that side wall collapse would not occur.
(2) T18-TP2 was excavated to base of peat at 1.5m and did not failure (DNF).
(3) Average in-situ shear vane strength c_u of peat is data that excludes all outliers and tests within the acrotelm. The average in-situ shear vane data was determined from data within the failure height to 2m below ground level.

4.5.2 Peat Cores and Peat Humification

Peat core samples were retrieved to confirm the general nature and characteristics of peat on the Wind Farm Site. Peat cores were retrieved using the RPS. Samples are obtained such as to provide a continuous log with depth. Retrieved samples were logged using the Von Post classification (Hobbs, 1986) to determine particularly the degree of peat humification. A shear vane test was also carried out at each RPS location to give strength data for the peat descriptions. All the samples were bagged and sealed for moisture content testing.

Humification of peat results in the decomposition of vegetative fibres resulting in a more amorphous peat which is generally encountered at greater depth within the peat mass. Amorphous peat tends to exhibit lower shear strength and permeability. A qualitative assessment of the humification was assessed using the Von Post classification ranks peat from H1 (no decomposition) to H10 (complete decomposition), see Table 4.2.

The purpose of the peat coring was to determine in particular the gradation of humification with depth. Fibres are dominant in humification classes H1 to H3, with H4 being transitional between fibre and amorphous dominated peat.

Peat sampling using the RPS was carried out at turbine locations with a summary included in Table 4.3 and logs included in Appendix A. The Von Post classification included in the RPS logs comprises essentially the fuller version of the classification and not just the degree of humification.

Table 4.2: Degree of humification based on Von Post Classification (Hobbs, 1986)

Degree of Humification	Decomposition	Plant Structure	Amorphous Material Present	Material Extruded on Squeezing	Nature of Residue
H_1	None	Easily identified	None	Clear, colourless water	Not pasty
H_2	Insignificant	Easily identified	None	Yellowish water	Not pasty
H_3	Very Slight	Still identifiable	Slight	Brown, muddy water; no peat	Not pasty
H_4	Slight	Not easily identified	Some	Dark brown, muddy water; no peat	Somewhat pasty
H_5	Moderate	Recognisable, but vague	Considerable	Muddy water and some peat	Strongly pasty

H_6	Moderately strong	Indistinct (more distinct after squeezing)	Considerable	About one third of peat squeezed out; water dark brown	Very strongly pasty
H_7	Strong	Faintly recognisable	High	About one half of peat squeezed out; any water very dark brown	
H_8	Very Strong	Very indistinct	High	About two thirds of peat squeezed out; also, some pasty water	
H_9	Nearly Complete	Almost unrecognisable	Very High	Nearly all peat squeezed out as fairly uniform paste	
H_{10}	Complete	Not discernible	Complete	All peat passes between fingers; no free water visible	

Table 4.3: Summary of RPS

Turbine	No.	Depth (m)
T1	RPS-T1-1 RPS-T1-2	2.50 1.60
T2	RPS-T2-1 RPS-T2-2	2.00 2.00
T3	RPS-T3-1 RPS-T3-2	3.50 2.50
T4	RPS-T4-1 RPS-T4-2 RPS-T4-3	4.00 2.00 2.00
T5	RPS-T5-1	2.90
T7	RPS-T7-1 RPS-T7-2 RPS-T7-3	2.00 3.00 3.20
T10	RPS-T10-1	2.50
T14	RPS-T14-1	1.70
T16	RPS-T16-1	2.70
T18	T18-TP1-RPS	2.50
T19	RPS-T19-1	2.70

The degree of humification as determined from the RPS ranged from no humification (H1) within about the upper 0.5m to H9 at depth, see Table 4.4. In general, there is an increase in humification with depth, which is to be expected, though the gradation in humification with depth will tend to vary at each location depending on the terrain, drainage, and the dominant peatland vegetation.

The typical range of humification ranges from H3 to H7. Below about 1.5m depth the humification is dominantly H5 or greater, which would signify a considerable amount of amorphous material is present.

About half the RPS results show humification of H8 to H9 at the lower depths. Complete decomposition (H10) is considered rare, as there is invariably some more resistant fibrous material present.

Table 4.4: Summary of peat humification from RPS

Depth (m)	RPS -T1-1	RPS -T1-2	RPS -T2-1	RPS -T2-2	RPS -T3-1	RPS -T3-2	RPS -T4-1	RPS -T4-2	RPS -T4-3
0.5 to 1	H2	H5	H4-H5	H3	H2-H3	H3	H3	H4	H3
1 to 1.5	H2-H3	H6-H7	H4	H5-H6	H4	H4-H5	H4-H5	H5	H4-H5
1.5 to 2	H3	H8-H9	H5	H7	H4-H5	H5-H6	H4-H5	H6	H6
2 to 2.5	H3-H4		H7	H8-H9	H5-H6	H7-H9	H5-H6	H8-H9	
2.5 to 3					H7-H8		H5-H6		
3 to 3.5					H8-H9		H4-H5		
3.5 to 4							H4-H6		

Depth (m)	RPS-T5-1	RPS -T7-1	RPS -T7-2	RPS-T7-3	RPS-T10-1	RPS-T14-1	RPS-T16-1	RPS-T19-1	RPS-T18-TP1
0.5 to 1	H3	H3-H4	H3	H3	H3	H3	H4	H3	H4-H5
1 to 1.5	H4	H4-H6	H4	H3-H4	H5	H5	H5-H6	H4	H4-H5
1.5 to 2	H5-H6	H7	H5	H5	H8-H9	H8-H9	H6-H7	H4-H5	H3
2 to 2.5	H6-H7		H6-H7	H6			H7	H6-H7	H4
2.5 to 3	H7		H7-H9	H7			H9	H8-H9	
3 to 3.5				H9					
3.5 to 4									

Humification Legend	Amorphous Material Present
H1-H2	None
H3-H4	Slight to some
H5-H6	Considerable
H7-H8	High
H9-H10	Very high to complete

4.5.3 Comparison of Peat Strength Measurement

A number of different methods were employed to determine the likely operational strength of in-situ peat at the location of the 4 nos. trial pits (T4-TP1, T7-TP1, T18-TP2 and T5-TP1). These methods comprised the following:

(1) In-situ shear vane

(2) Laboratory shear vane

(3) Laboratory unconsolidated undrained (UU) triaxial testing

(4) Back-analysis of failure of side wall of trial pits

For practical reasons it was not possible to carry out all the above testing at all trial pit locations, for example at T5-TP1 the retrieved samples were unsuitable for testing due to sample disturbance.

Laboratory test results are included in Appendix A.

A comparison of the results obtained for the above test methods is summarised in Table 4.5 with the results shown graphically in Figure 4-4 (a) to (d).

Table 4.5: Average undrained shear strength of peat using variety of test methods

Trial Pit	In-situ Shear Vane (Full Peat Depth) (kPa)	Laboratory Shear Vane (kPa)	Laboratory Unconsolidated Undrained (UU) Triaxial Testing (kPa)	Back-analysis of Failure of Side Wall of Trial Pits (kPa)
T4-TP1	4.4	3.2 (5.1)*	1.4	5
T7-TP1	5.1	2.8	1.8	5.3
T18- TP1(1)	NA	NA	NA	NA
T18-TP2	13.3	7.8	5.8	NA
T5-TP1	5.1	5.5	NS	5

Notes
(1) T18-TP1 was not excavated as in-situ vane testing prior to pitting indicated that the peat was notably strong and that side wall collapse would not occur.
(2) T18-TP2 was excavated to base of peat at 1.5m and did not fail (DNF).
(3) In-situ shear vane strength c_u of peat (kPa) is data that excludes all outliers and tests within the acrotelm. The average in-situ shear vane data within the failure height uses data to 2m below ground level.
(4) * Laboratory shear vane includes a notably higher value (11kPa) that skews results – the average value with higher results is shown in brackets.
(5) T5-TP1 peat sample was unsuitable for testing due to disturbance.

4.5.4 Comparison of Peat Strength Measurements and Degree of Humification

In addition to the above, the humification (fibre content) of the peat with depth was recorded at the trial pit locations to allow comparison of in-situ and laboratory shear strength with humification. The results (Figure 4-5) show humification increasing with depth. Where humification is H3 or less, which is typically in the upper 1m, then there is an increase in shear strength with the in-situ shear vane though the laboratory triaxial test results appear to be unaffected by the degree of humification. Laboratory triaxial test results are considered to have been affected by disturbance of the sample during retrieval and the difficulties in testing very weak peat samples in the laboratory. As such, laboratory test results are insensitive and do not reflect any notable strength change with the degree of humification. It would be expected that the more fibrous the peat (lower H values) the greater the relative shear strength.

Where humification is greater than about H4 to H5 then there is no appreciable change in measured vane strength. Note that when using the in-situ shear vane high readings are typically encountered in the less humified peat at shallow depth, and also possibly towards the base of the peat where more resilient relict plant matter (such as tree fragments) may be encountered. These higher readings should not be used in design, see below. In general, the shear strength test results for the vane only appear to be affected by say humification of H3 or less.

4.5.5 Summary of Comparison of Peat Strength Measurements

A summary of the results for the various test methods is given below:

(1) The laboratory test results give notably lower bound results. This is likely due to a number of factors such as disturbance of the sample during retrieval and the difficulties in testing very weak peat samples particularly in the laboratory unconsolidated undrained (UU) triaxial test.

(2) The laboratory unconsolidated undrained (UU) triaxial test results for T4-TP1 and T7-TP1 provide strength results which are unrealistic with respect to the observed performance of the peat within the trial pits and are less than 2kPa. The laboratory strength tests results of less than 2kPa would typically represent the undrained strength of remoulded peat. Laboratory test results in this case do not provide a practical means of determining undrained peat strength.

(3) The laboratory shear vane results give a lower test result than the in-situ shear vane, again this is likely due to disturbance of the sample. As such, the in-situ shear vane would be considered to provide a more realistic result as the in-situ peat is less disturbed.

(4) As mentioned above, in general there is a good correlation between the theoretical undrained strength at which failure of the side wall occurs, and the undrained strength measured by the in-situ shear vane over the full peat depth for the low range of peat strength present.

(5) The effect of peat humification (fibre content) on peat strength test results was assessed. It would be expected that the more fibrous the peat (lower H values) the greater the relative shear strength. The results show that the laboratory test results were insensitive to the degree of humification. The in-situ vane showed where humification is H3 or less, which is typically in the upper 1m, then the in-situ vane recorded an increase in shear strength.

(6) Based on the above results, the in-situ shear vane strength compared to the other tests provides the most reasonable indication of the operational shear strength of peat particularly at the lower shear strength peat encountered within the trial pits. Notwithstanding, the in-situ shear vane has limitations and its application for design needs to be used cautiously, see below.

The above shows that in-situ shear vane results provide a reasonable correlation with back-analysed results of operational undrained strength of peat based on the above. Application of a factor to in-situ vane results at this Wind Farm Site is therefore not considered necessary provided the use and interpretation of the shear vane is carried out cautiously following the guidelines below. Shear vane strengths have been applied without factoring in previous work on Irish peat (see for example Hanrahan, 1964, Piggott et al, 1992). Factoring of vane results is generally applied in the absence of site-specific correlation; these factors need to be applied judiciously as they can provide misleading results (Jardine, 1998).

Guidelines on the use and interpretation of in-situ shear vane with respect to this site based on the results of the further investigation at the site and general previous experience and empirical use are as follows:

(1) Careful scrutiny should be applied in interpreting vane results, particularly where anomalous higher results are obtained due to say high fibre content, presence of wood fragments, rod friction. Upper bound values which are outliers and would likely not control the operational strength of the peat should be discarded.

(2) Lower bound recorded vane strength should be adopted at any location for design purposes. A cautious estimate of the mean strength should not be used for design.

(3) The vane strength should be obtained for the full depth of the peat layer to ensure that zones of weaker peat within the profile have been identified. Notwithstanding, strength profiles with depth in weaker peat generally show that below the acrotelm layer there is a generally an increase in peat strength with depth, see Figure 4-6 which shows results for a number of blanket peat sites.

(4) There is generally notable variation in in-situ vane results. It is likely that the lower bound values will control the operating shear strength of peat and general previous experience indicates that consistent lower bound results of less than 4 to 5kPa in an area represent greater potential for undrained peat failure (Figure 4-6). The lower bound vane strengths in any area shall be considered when assessing peat stability.

Other alternative methods for assessing in-situ strength of peat such as cone penetration testing (CPT) using a variety of different shaped cone tips has been examined, for example Long et al (2014). Previous use of CPT on peat sites (such as at the Derrybrien Wind Farm site) have provided mixed results with a notable scatter of data, and it has proven difficult to establish reliable site-specific correlation factors.

4.6 Baseline Sensitivity of Receiving Environment for the Wind Farm Site

The significance of the effects of impacts on soils, geology and land on the Wind Farm Site has been assessed as a function of the sensitivity of the receiving environment. The sensitivity of the receiving environment is classified on a 7-point scale from Negligible to High as a function of the characteristics of the soils, geology and land that are directly impacted by the project or potentially impacted by a peat failure (EPA, 2022).

For this Site, the majority of the significant effects on soils, geology and land relate to the upland blanket bog that covers most of the Wind Farm Site and surrounding area. Therefore, the characteristics of the blanket bog in the area govern the classification of the sensitivity of the receiving environment for assessing the significance of effects on soils, geology and land on this project. For stability impacts, consideration has also been given to the sensitivity of the blanket bog outside the Wind Farm Site that could be directly impacted by a peat slide at the site. The potential impact of the Existing Development on Geological Heritage Sites has also been taken into account.

For this Wind Farm Site, the sensitivity of the receiving soils, geology and land has been classified as **MEDIUM** based on a combination of factors, i.e.:

- Geological Heritage Sites that could be impacted by the Existing Development;
- The ecological importance of the blanket bog;
- The significance of the peat for carbon sequestration; and
- The use and value of the land impacted by the project;

The habitat impacted by the Existing Development is predominately conifer plantation on upland blanket bog that had been degraded by drainage and by the planting of the trees and is therefore of low ecological value. Based on the relatively low ecological value of the land, the sensitivity of the receiving environment could be characterised as Medium to Low. However, when combined with the additional environmental value of the land as a carbon store and the relatively low commercial value of the land for forestry/agriculture, this is sufficient to raise the combined level of sensitivity of the peat to "**MEDIUM**".

For the assessment of stability impacts the sensitivity of the receiving soils, geology and land that could be impacted by a peat slide has also been classified as **MEDIUM** based on the scale of the November 2020 peatslide, and by the land that that was directly impacted by the slide, i.e.:

- The land that was disturbed by the peat slide covered an area of approximately 3.7 ha, and it was comprised of coniferous forests of low ecological and commercial value;
- Approximately 86,240m^3 of peat was displaced in the slide, but about 45,500m^3 of this is still present within the failure scar; and
- The agricultural land downslope from the main slide area that was impacted by peat from the slide was also of low ecological and commercial value;

To accurately assess stability impacts on soils, geology and land, consideration has also been given to the scale and characteristics of the smaller, more localised peat failures that occurred on site during construction. For example, around the perimeter of the open excavations for the turbine foundations, the risk of peat instability was limited to localised shear failure or very small-scale peat slides where the side slopes were not adequately supported, which had a significantly lower impact on the receiving soils, geology and land.

5. BASELINE PEAT STABILITY RISK ASSESSMENT (ORIGINAL SITE CONDITIONS)

This section of the report considers the stability of the peat based on the baseline conditions present prior to construction commencing on the Wind Farm Site and includes:

- The findings of a site-wide geomorphological assessment undertaken by FT in 2021.
- Quantitative peat stability calculations (infinite slope and SlopeW global stability) for various load conditions.
- Peat Stability Risk Assessment (Baseline conditions).

5.1 Geomorphology Hazard Assessment

As part of a previous stability report following the November 2020 peatslide (FT, 2021), a site-wide geomorphological plan was produced. The geomorphological plan (Appendix B) principally shows the morphology of the terrain which is presented as symbols and individual units. The individual units are intended to represent areas of similar character with respect to ground conditions.

The geomorphological plan provides a basis for zoning the site into areas of similar character, and where peat failures or indicators of instability are present, allows a determination of any local specific factors that control their spatial distribution, as noted in the Guide (Scottish Government, 2nd Edition, 2017).

Preparation of the geomorphological plan requires a level of subjectivity based on the knowledge and experience of the compiler as recognised by the Guide. This approach forms part of a qualitative assessment of the peat stability hazard.

The peat stability hazard assessment provides guidance only with respect to site-wide peat stability. A more detailed deterministic approach in identifying peat stability hazard has been carried out (Section 5.2) for areas where works are proposed (zone of influence). The deterministic approach requires a significant amount of specific ground data input to provide a meaningful result, and for this reason is adopted along the proposed infrastructure corridor. As there is only limited ground data beyond the infrastructure corridor, a qualitative assessment of the peat stability hazard has been adopted for the site-wide assessment.

The results of the peat stability hazard assessment are used to provide an assessment of the risk that may arise as a result of peat instability; this is covered below.

5.1.1 Peat Stability Hazard

The geomorphological plan has been compiled using LiDAR survey data for the site provided by MCE with a 1m contour that shows the layout of the wind farm works. The geomorphological plans of the Site are included in Appendix B. The following geomorphological information has typically been included, where present, on the plan:

(1) Position of major and minor slope breaks (e.g. convexities and concavities).

(2) Position and alignment of major and minor natural drainage features (e.g. rivers, streams, peat gullies).

(3) Location and extent of peat erosion complexes where present (e.g. haggs and groughs, areas of bare peat).

(4) Outlines of past peat landslides (including source areas and deposits).

(5) Location, extent and orientation of cracks, fissures, ridges and other pre-failure indicators.

Based on the association of particular geomorphological units to known failures the individual units have been qualitatively ranked with respect to their likelihood to contribute to peat instability.

An estimated probability using expert judgement, whereby general principles are used to assign probabilities to peat stability, has been adopted. This approach uses a ranking system that relates ground factors to the probability of the occurrence of peat instability, e.g. the presence or absence of instability features within certain geomorphological units.

The basis of the expert judgement is provided below (Table 5-1) which identifies the key considerations in determining the qualitative likelihood of peat failure based on the experience of the compiler but also taking into account the factors that contributed to peat failures that have occurred on the Site, including some examples of failures from other sites.

The hazard ranking in terms of probability given to the individual geomorphological units is shown in Table 5-2; this is based on that provided in the Guide. Note that the descriptive terms are relative and should be taken as guidance only. In assigning hazard ranking, it is assumed that inappropriate construction activity or extreme weather events do not occur.

Table 5.1: Geomorphological units and likelihood of peat instability

Key Geomorphological Unit	General Description	Hazard Description	Likelihood
Elevated plateaux areas	Typically, elevated level extensive areas. Associated with convex break in slope which is cited as potential location for initiation of peat failures. Location for deep and weaker peat. Elevated plateaux surrounded or partly surrounded with downslopes.	Source area of November 2020 peatslide. Similar terrain as Shass Mountain failure (June 2020). Presence of deep and notably weak peat increases likelihood of failure.	Probable
Potential headwaters of natural drainage features	Typically, location of possible spring line or concentrated focus of water. Very localised deep and weaker peat. Generally encountered at upper elevation on slopes. Possibly location of previous failures; though none are recorded on the site	Example of peat failures associated with this terrain are Garvagh Glebe (2008), Derrybrien (2003), Boleynagee (1931). Similar to the above, but more localised deep and notably weak peat increases likelihood of failure.	Probable
Elongate shallow depressions	Typically, location of relict or activate stream lines or concentrated focus of water. Very localised linear deep and weaker peat. Generally encountered running perpendicular downslope.	Example of peat failures associated with this terrain are Garvagh Glebe (2008), Derrybrien (2003). Larger failure at T5 partly followed path of elongate shallow depression. Localised deep and notably weak peat increases likelihood of particularly travel distance of failure.	Probable

Key Geomorphological Unit	General Description	Hazard Description	Likelihood
Elevated level ridges	Similar to elevated plateaux but comprises top of flat ridge lines or isolated level benches. Localised deep and weaker peat. Elevated benches surrounded or partly with downslopes.	Similar to source area of November 2020 peatslide. Similar terrain as Shass Mountain failure (June 2020). Presence of deep and notably weak peat increases likelihood of failure.	Probable
Elevated lobate level areas	Similar to elevated plateaux but comprises lobate level features. Localised deep and weaker peat. Elevated area with slope on downslope.	Similar but smaller than source area of November 2020 peatslide. Presence of deep and notably weak peat increases likelihood of failure.	Probable
Low-level lobate and level areas	Localised likely very deep and weaker peat in proximity to water course. Likely infilled hollows (relict lake) leading to deeper and weaker peat deposits. Proximity to watercourse with potential for erosion of slope toe.	Localised likely very deep and weaker peat in proximity to water increases likelihood of failure.	Probable
Upper slope	Undulating relief with variable slope angles. Peat depth variable. Proximity to areas of relatively greater likelihood of peat failure. Elevated position would increase potential for run-out of any failures. Potential for concentrated water within undulating relief. Undulating and rough relief could signify potential previous failures or areas of deeper peat.	Potential for some localised deep and weaker peat though not extensive.	Likely
Lower slope adjacent to water course	Undulating relief with variable slope angles. Peat depth variable but locally potential for notable depth. Proximity to watercourse with potential for erosion of slope toe. Lower position on slope increases potential for possible infilled hollows leading to deeper and weaker peat deposits. Potential for concentrated water within undulating relief. Undulating and rough relief could signify potential previous failures or areas of deeper peat.	Potential for some localised deep and weaker peat though not extensive.	Likely
Mid-slope	Relatively uniform slope with slope angles typically 3 to 5 degrees but locally steeper. Peat depth typically 1 to 2m. Relatively well drained slope. Relief has relatively few undulations and roughness that could signify previous failures or areas of deeper peat.	Reduced to limited potential for some localised deep and weaker peat.	Unlikely

Notes
(1) Likelihood description is for guidance only and assumes that no mitigation measures are in place.
(2) Hazard ranking assumes that inappropriate construction activity or extreme weather events do not occur.
(3) Only key geomorphological units are considered.

Table 5.2: Peat instability ranges for probability

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

Notes
(1) Likelihood description is for guidance only and assumes that no mitigation measures are in place.
(2) Probability of occurrence values are for guidance only and assumes that no mitigation measures are in place.

The geomorphological plan showing zonation of hazards for the Wind Farm Site is included in Appendix B. The hazard levels vary from 'Unlikely' to 'Probable'. The hazard levels have been used to determine the risk levels given below in accordance with the Guide and have also been incorporated into the qualitative risk assessment (Section 5.3).

5.2 Quantitative Peat Stability Analysis (Baseline)

The peat stability assessment includes an assessment of the stability of the natural peat slopes for individual parcels across the Wind Farm Site, including at the turbine locations and along the access roads (load condition 1). This analysis has been undertaken using EC7 partial factors. 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 (load condition 2). Where a floating road has been constructed, a surcharge load equivalent to the road has been applied, and an additional live load to represent the construction traffic has also been considered (load conditions 3 and 4).

5.2.1 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) analysis has been undertaken to determine the stability of the peat slopes on the Wind Farm 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 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 2003 Derrybrien failure and other failures in peat, 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 6.7 shows a summary of the published information on peat together with drained strength values.

From Table 6.3 the values for c' ranged from 1.1 to 8.74kPa and ø' ranged from 21.6 to 43°. The average c' and ø' values are 4.5kPa 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°

Table 5.3: List of Effective Cohesion and Friction Angle Values for Peat

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
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
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
Hendry et al (2012)	0	31	Remoulded test specimen
Komatsu et al (2011)	8	34	Remoulded test specimen
Zwanenburg et al (2012)	2.3	32.3	From DSS apparatus
Den Haan & Grognet (2014)	-	37.4	From large DSS apparatus
O'Kelly & Zhang (2013)	0	28.9 to 30.3	Tests carried out on reconstituted, undisturbed and blended peat samples

5.2.2 Analysis to Determine Factor of Safety (Deterministic Approach)

The purpose of the analysis was to determine the 'Overdesign' factor (ODF) of the peat slopes on the Wind Farm Site using infinite slope analysis. The analysis was carried out at the turbine locations, along the proposed access roads and at various locations across the Wind Farm Site.

The 'overdesign' factor is a measure of the stability of a particular slope, with higher values indicating greater stability; a minimum value of 1.0 is required to confirm stability, in accordance with Eurocode 7, allowing for the in-built partial material and load factors. While results of >1.0 are acceptable under EC7, due to the effect of minor changes in slope angle when dealing with low strength peat, an additional category has been included for ODF results of between 1 and 1.5, which would still carry a small degree of risk, and this is reflected within the PSRA in Section 5.3.

Table 5.4: ODF Limits for Slopes

Overdesign Factor (ODF)	Degree of Stability	Degree of Risk
Less than 1.0	Unstable (red)	High
1.0 to 1.5	Acceptable (yellow)	Medium
>1.5	Acceptable (green)	Low

The calculations are carried out in accordance with IS EN 1997-1 Design Approach 1 Combination 2, which is the governing case, with the applicable partial material reduction factor of $\gamma M = 1.4$ applied to the measured peat strengths, along with the applicable partial load factors for permanent loads ($\gamma G = 1.0$) and variable loads ($\gamma Q = 1.3$). Note that the calculations were also carried out for Design Approach 1 Combination 1, which does not govern in this particular scenario. Tables presenting the 'overdesign' factor (or factor of safety in excess of the required minimum of 1.0) are included below.

Table 5.5: Partial Factors for Material properties

Parameter	Partial Factor (DA1C1)	Partial Factor (DA1C2)
Soil Unit Weight	1.0	1.0
Soil cohesion	1.0	1.25
Soil phi angle	1.0	1.25
Undrained shear strength of soil	1.0	1.4

A conservative value for the undrained shear strength, c_u for the peat has been used. This has been determined based on shear strength testing undertaken by AGEC, FT and Ionic across the Wind Farm Site. The shear strength values used in the analysis are specific to the location being analysed, where available, rather than being sitewide values. Where location specific results are not available either the nearest available result or a sitewide value of 5kPa has been used.

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 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 surveys.

(2) The slope angles used in the peat stability assessment were obtained using a combination of readings taken during the site reconnaissance by FT using handheld equipment and from contour survey plans for the Wind Farm Site. It should be noted that 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.

(3) Slope angle at base of sliding assumed to be parallel to ground surface.

(4) A lower bound undrained shear strength, c_u for the peat has been used. This has been determined based on shear strength testing undertaken by FT and Ionic across the Wind Farm Site. The shear strength values used in the analysis are specific to the location being analysed, rather than being sitewide values.

For the stability analysis four load conditions were examined, namely:

Condition (1): no surcharge loading (general stability across Site)
Condition (2): surcharge of 10kPa, equivalent to 1m of stockpiled peat assumed as a worst case. In localised cases this has been increased to 15kPa or 20kPa where records indicate that 1.5 or 2m of peat was sidecast.
Condition (3): surcharge of 23kPa, equivalent to a 1.15m thick floating road. Applies to the access roads to T1-T4.
Condition (4): surcharge of 23kPa for the floating road locations plus an additional 10kPa live loading for construction traffic. Applies to the access roads to T1-T4.

The load included in Condition (2) is typically modelled as an additional 1m load of peat, with localised areas where 1.5m and 2m have been used based on site records. The loading for Condition (3) is a dead load (permanent). The dead load represents the load from the access road itself. The live loading for Load Condition (4) above is based on standard construction traffic loading.

Where ODF results of <1.0 have been recorded in the infinite slope analysis, a separate check of the stability of these areas has been undertaken using SlopeW slope stability software. This allows for an analysis of the potential for a circular slip failure while also allowing for an assessment of the effect of inclusion of geogrid reinforcement, where used in the construction of the floating roads across the Wind Farm Site.

5.2.3 Results of Analysis

5.2.3.1 Undrained Analysis for the Peat

The results of the undrained analysis for the natural peat slopes at all locations analysed are presented in Appendix C and the results of the undrained analysis for the most critical load case across the majority of the Site (load condition 2) are shown on Drawings P24-234-600-0003 to P24-234-600-0005. The undrained analysis for load condition 2 is considered the most critical load case for the site-wide assessment as most peat failures occur in the short term upon loading of the peat surface. This would have been the case immediately after construction of the infrastructure across the Site. Load condition 3 and 4 would apply directly below the floating roads (Load Condition 4 shown on Drawings P24-234-600-0006 to P24-234-600-0007). The results from the main infrastructure locations, including along access roads and in areas of peat placement, are summarised below.

The calculated ODF for load condition 1 is in excess of 1.0 for all of the 1320 locations analysed with a range of ODF of 1.03 to 223.21, indicating a low to medium risk of peat instability.

The calculated ODF for load condition 2 is in excess of 1.0 for 1307 of the 1320 locations analysed with a range of ODF of 1.00 to 123.15, again indicating a low to medium risk of peat instability. 13 locations (1% of all locations analysed) with results of between 0.89 and 0.99 were recorded. Four of these locations are in areas where no infrastructure was constructed. Another five locations were recorded along founded sections of access road, along with one location within the borrow pit, where the peat is not loaded and therefore is not at risk of failure. These results were areas where the slope was greater than 7 degrees, or on shallower slopes with deep peat (>3.5m), or a combination of both of these factors. The remaining three locations are located at T6 (0.95), upslope of T7 (0.84), and upslope of the founded road between T5 and T6 (0.88), all areas where no loading of the peat has occurred.

The calculated ODF for load condition 3 is in excess of 1.0 for 85 of the 88 locations analysed with results ranging from 0.85 to 13.51. Three results of less than 1.0 were recorded on the floating road to T4, two of them close

to the junction with the road to T1 and one 200m west of the hardstand at T4. While settlement has been recorded at the T1 junction, no peat failures have occurred in these areas. As a check, a stability analysis using SlopeW software was undertaken at both locations, with a result of 1.27 (DA1C2) close to T4 and 1.24 (DA1C2) at the junction to T1 and 1.05 along the floating road to T1.

The calculated ODF for load condition 4 is in excess of 1.0 for 78 of the 88 locations analysed, with results ranging from 0.77 to 11.77. Ten results of less than 1.0 were recorded on the floating road to T4, six of them close to the junction with the road to T1 and four close to the hardstand. While settlement has been recorded at the T1 junction, no peat failures have occurred in any of these areas. As a check, a stability analysis using SlopeW software was undertaken at both of these locations, with the results discussed below.

5.2.4 Floating Road Stability Analysis (Load Condition 4)

A global stability analysis was undertaken using data from the Ionic (2021) stability assessment as well as data from previous AGEC peat probes. A slope stability assessment using SlopeW software was undertaken at each location where a low ODF (<1.0) has been recorded in the undrained case, using Eurocode partial factors, and the results of these are included in Appendix E. This software allows for the assessment of the effect of the geogrid reinforcement within the floating roads, which is not possible in the infinite slope calculations. The peat strengths used in these stability analyses are typical values recorded in the areas where an ODF <1.0 was calculated in the infinite slope analyses.

While the undrained case would only apply for a short time after the floating road is constructed, it is considered to be the most critical case, as over time the placed peat will drain and the in-situ peat below this will consolidate slightly due to the applied load. Parameters for the materials recorded across the Site are summarised in the table below, with values based on recorded strengths from shear vanes and known soil correlations.

For this stability analysis, the live load from the crane is taken at the top of the road, which is the equivalent of a 20kPa load acting over a 3m wide section of the road. This is applied to the undrained case only, as the load is transient and as such does not apply to the drained (long-term) case.

Table 5.6: Material Parameters

Material	Unit Weight (kN/m^3)	Shear Strength (c_u)(kPa)	Friction Angle (ϕ)	Cohesion (c')
Road Fill	20	-	40	0
In-situ Peat	10.5	4-7.5*	25	4
Placed Peat	10.5	3	5	2
Cohesive Glacial	20	50	32	1

*Varies depending on location, as described below

The results for specific areas are summarised below, with outputs from the analyses included in Appendix E.

5.2.4.1 T1/T4 Junction

A slope stability analysis has been undertaken on the section of floating road at the T1-T4 junction (Figure 5-1). A variable live load of 20kPa has been applied to the surface of the floating road, to model the effect of construction traffic travelling across this section of road.

The ground model for this area is based on probes taken by both IONIC and FT. Peat depths of between 1.5 and 7.3m were recorded. For the purposes of this assessment, a peat depth of between 2.5m and 5m was used. A review of the peat depths indicate that the peat depth becomes shallower on the downslope side of the road, indicating that the base of the peat slope is shallower than the ground surface. As such, a slope angle of 3 degrees, reducing to 0 degrees, has been used in the analysis. Peat strengths recorded in this area ranged from 2 to 12 kPa and are shown on Figure 5.1.

For the undrained condition an ODF of 1.04 (DA1C2) was recorded for this analysis (Appendix E).

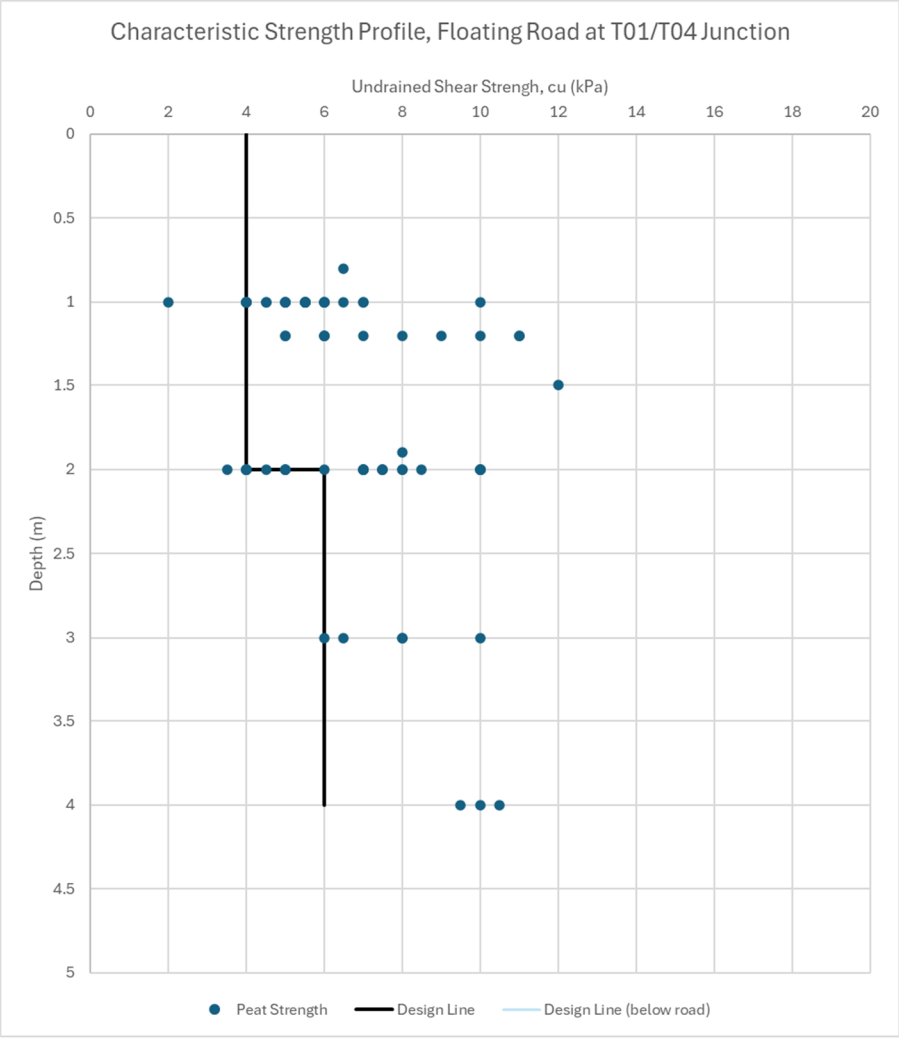


Figure 5.1: Peat Strength versus Depth, T1/T4 Junction

5.2.4.2 Access Road to T4

A slope stability analysis has been undertaken on the section of floating road towards the T4 hardstand. A variable live load of 20kPa has been applied to the surface of the floating road, to model the effect of construction traffic travelling across this section of road.

The ground model for this area is based on probes taken by both IONIC and FT. Peat depths of between 1.9 and 3.6m were recorded. For the purposes of this assessment, a peat depth of 3m was used, with a slope angle of 2 degrees. A review of the peat depths indicate that the peat depth is relatively consistent throughout this area, indicating that the base of the peat slope is similar to the ground surface. Peat strengths recorded in this area ranged from 3 to 17kPa and are shown on Figure 5.2. A design line for the peat below the road of 5kPa to 2m bgl and 7.5kPa from 2.0 to 3.0m bgl.

For the undrained condition an ODF of 1.06 (DA1C2) was recorded for this analysis (Appendix E).

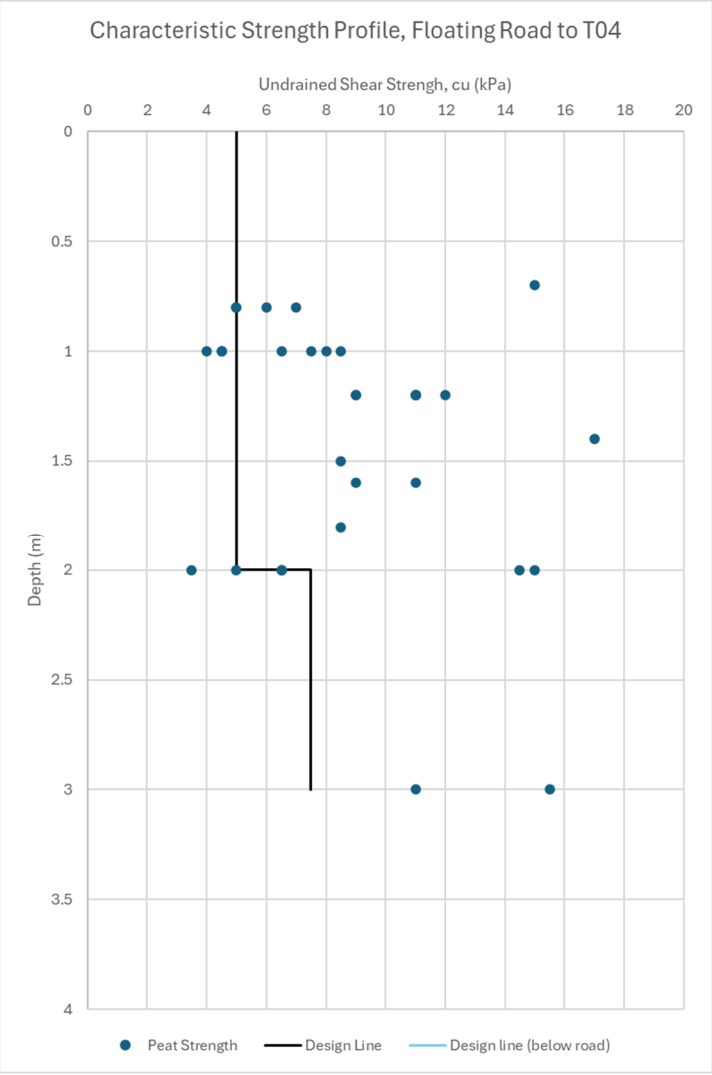


Figure 5.2: Peat Strength versus Depth, Floating Road to T4

5.3 Peat Stability Risk Assessment (Baseline)

A baseline Peat Stability Risk Assessment (PSRA) has been carried out for the Wind Farm Site to characterise the relative risk of peat instability in defined zones across the Wind Farm Site, relating to the area around each turbine, and to sections of floating roads, prior to construction of the wind farm. This assessment was undertaken for baseline conditions in 2019 and the current Wind Farm Site conditions in 2026. The purpose of the PSRA is to identify where there are elevated risk factors that determine where mitigation measures are required to ensure that the risk of peat instability can be reduced to an acceptable level for each site activity.

The PSRA has been carried out in accordance with the current best practice guidelines for peat landslide risk assessments for wind farms on upland blanket bogs (Scottish Government, Energy Consent Unit, 2017). The method of risk assessment is also consistent with the Institution of Civil Engineers' publication outlining UK best practice in "Managing Geotechnical Risk" (Clayton, 2001).

A qualitative risk assessment has been carried out for each zone to assess the Risk Rating (R) for a peat slide based on the interpreted Likelihood (L) (i.e. probability) of occurrence and Impact (I) of failure.

The **Likelihood (L)** of a peat slide in each zone has been interpreted by evaluating factors related to the peat and subsoil conditions, topography, site hydrology/hydrogeology and other significant contributory factors such as peat harvesting or slide history to determine where there are conditions that could lead to an elevated risk of a peat slide.

Zones of potential peat instability can be very localised, i.e. where there is a specific combination of factors on the Site that can lead to an elevated risk of a peat slide under uncontrolled conditions, e.g. at the head of a watercourse. Therefore, the factors assessed are generally specific to the proposed location of the work element, i.e. along the alignment of the access track, or at the location of the turbines, crane hardstandings, borrow pits or peat storage locations. In this way representative combinations of peat depth, shear strength and slope angles are used in the assessment.

The Likelihood of a peat slide occurring has been interpreted for each turbine location across the site using the worksheets in Appendix D. In addition to the site conditions summarised in Section 3 of this report, the following information has been used to complete the worksheets:

- Peat and subsoils condition
- Topography
- Infinite Slope (ODF) calculations
- Hydrology
- Other contributary factors

For the peat and subsoil conditions the depth, undrained shear strength, water content and degree of decomposition (humification) of the peat are considered, along with the characteristics of the subsoil and the interface with the peat.

Topographical characteristics that are significant to peat stability include relatively steep slope angles (e.g. >5°), or the location of the site activities or infrastructure relative to a convex break in slope, or to a broad flat area directly upstream from a watercourse, where there is a higher risk of concentrated subsurface groundwater flow within or at the base of the peat that could contribute to a peat slide.

Topography is particularly significant where it is combined with other risk factors such as areas of deep, low strength, peat. Therefore, this is assessed by calculating an Overdesign Factor (ODF) against shear failure at the base of the peat as an index of peat stability on the slopes. This is done by infinite slope analysis (Section 5.2),

which assesses the resistance to shear failure on the inclined plane at the base of the peat under the downslope component of the gravitational loading due to the self-weight of the peat.

Hydrology risk factors that are known to contribute to peat slides would include areas of poor drainage with ponded surface water, and areas where there is evidence of subsurface groundwater flow through open conduits called "pipes" within the peat, or along permeable layers of gravel or fractured rock at the base of the peat, which are typically identified in trial pits or exposures on site. The orientation of drains relative to the slope is also significant as drains that are cut across a peat slope in areas of deep peat have been known to contribute to peat instability by damaging the integrity of the vegetated crust of the peat and by restricting downslope surface runoff.

The PSRA also considers indirect contributory factors or site characteristics that can be used to identify sites or zones that could be particularly susceptible to peat slides, such as:

- Poor tree growth or wetlands vegetation and flushes associated with poor drainage;
- A history of previous slides on site or in the general area;
- Peat workings such as manual harvesting in turbary plots or mechanical harvesting with a saw-cutter or sausage cutter;
- Evidence of peat slides, subsurface drainage or general anomalies such as disturbed peat or drainage patterns from aerial photographs; and
- The stability of peat and groundwater ingress in trial pit excavations on the site.

The hazard likelihood is calculated by providing a hazard rating for each factor considered in the assessment, rated from Negligible (0) to Very High (20). The total hazard rating is the sum of each factor, from a total of 100. This is not a probability of occurrence of a peat slide. It is an index that takes into account the interaction between different risk factors to assess the relative risk of peat instability between zones across the site and to identify zones where there are compounding risk factors that could make them particularly susceptible to peat slides.

Table 5.7: Total Hazard rating and Likelihood (L)of a peat Slide

Total Hazard Rating	Likelihood (L)		Probability (Event/km.yr)
0	0	Not Applicable (<0.5m peat)	<1/100,000
1-19	1	Negligible	1/100,000 to 1/10.000
20-39	2	Low	1/10,000 to 1/1,000
40-59	3	Possible	1/1,000 to 1/100
60-79	4	Very Possible	1/100 to 1/10
80-100	5	Likely	>1/10

The probability ranges in Table 5-7 are intended as indicative frequencies of failure for comparative purposes in a Qualitative Risk Assessment. They are not precise probabilities of occurrence calculated from a recorded database of case histories of peat slides that have occurred under similar conditions. Therefore, they should not be used for a Quantitative Risk Assessment.

It should also be noted that the failure frequencies listed in Table 5-7 do not reflect the scale of peat failures, which could range from small, localised shear failures in areas of shallow peat on the site, to large scale peat

slides or bog bursts in deeper peat in high-risk zones. This is taken into account in the assessment of the Impact of a peat slide.

The potential **Impact (I)** of a peat slide in each zone has been interpreted by evaluating factors related to the potential volume of a peat slide, degree of contamination, sensitivity of the receiving environment, access for intervention, and land use and existing infrastructure within the potential run-out distance.

The volume of peat in a slide is assessed from the potential area that could be impacted by a slide and the depth of peat within that area. The following bands are proposed based on past experience with peat slides in Ireland:

- Localised (<100 m^3)
- Very small (100-1,000m^3)
- Small (1,000-5,000 m^3)
- Medium (5,000 - 25,000 m^3)
- Large (25,000 - 100,000 m^3)
- Very Large (>100,000 m^3)

The following characteristics of the Site are considered relevant in assessing the impact of a peat slide:

- Nearest SAC/SPA – the Site borders the Croaghonagh Bog SAC and is directly upstream of the Finn River SAC.
- Potential Impact on Mourne Beg River
- Existing Site infrastructure – as the Existing Development has been completed, the existing site access roads could be directly impacted by a peat slide.
- Volume of peat in potential slide
- Possible run-out distance
- Sensitivity of the receiving environment & habitat
- Potential degree of contamination
- Access for intervention (onsite/offsite)
- Public / private infrastructure in potential peat flow path & within run-out distance (e.g. Roads, buildings, overhead power lines or telephone lines)
- Existing site infrastructure in potential peat flow path & within run-out distance (Access tracks, turbines, cable trenches, substations etc.)
- Land usage in potential peat flow path & within run-out distance

A peat slide would have a significant commercial impact on the project. In addition to the costs of remedial works to mitigate the effect of the peat slide on the receiving environment, the commercial impact could include the loss of wind farm infrastructure, damage to local or regional public infrastructure (bridges, roads etc), and/or loss of commercial forestry and agricultural land. It could also lead to sustained periods of power outages where the wind farm is shut down or disconnected from the grid. During construction a peat slide would also cause significant delays to the programme.

The potential Impact of a peat slide on the Site has been qualitatively assessed on a scale of 1-5 based on the factors listed above. The upper limit of 5 on the Impact identifies zones where there are compounding risk factors which suggest that a peat slide would have a severe impact on cost and time aspects of the project and also on the surrounding environment.

The peat slide that occurred during construction on the Site involved approximately 86,000m^3 of peat, which would be classified as Large. The peat that was mobilised in the slide became fluidised and travelled a significant distance along the watercourses downstream from the Site. On the basis of these factors, the potential **Impact**

of a large peat slide similar in scale and nature to the November 2020 peatslide has been classified as **High (I=5)** for all zones on the Site.

A baseline Risk Rating (R=L x I, Table 5-10) has then been calculated for each zone prior to the implementation of risk mitigation measures to characterise the risk of peat instability across the site to identify where specific design, construction & operational mitigation measures are required to mitigate the risk of peat instability to an acceptable level.

Table 5.8: Risk Rating

Likelihood (L)	Impact (I)				
	1	2	3	4	5
1	1	2	3	4	5
2	2	4	6	8	10
3	3	6	9	12	15
4	4	8	12	16	20
5	5	10	15	20	25

Table 5.9: Risk Rating Levels and Response

Risk Rating (R = L x I)		Response
0 to 5	Low (Trivial)	Monitor
6 to 10	Low to Medium (Tolerable)	Regular Attention
11 to 15	Medium (Significant)	Early Attention
16 to 20	Medium to High (Substantial)	Unacceptable
21 to 25	High (Intolerable)	Unacceptable

The results of the baseline PSRA are presented in Table 5-10, with the individual assessments included in Appendix D. It should be noted that the Risk Ratings in these tables represent the interpreted risk of a peat slide based on site conditions prior to the implementation of risk mitigation measures. It identifies areas of the Site where there is an elevated risk of peat instability so that appropriate design and construction mitigation measures can be identified to reduce the risk of a peat slide to an acceptable level for site activities.

The assessment identifies several areas close to turbines/hardstands and along floating access roads where the Risk Rating, R, prior to mitigation is characterised as Medium to High (R=20), which is classified as unacceptable without mitigation. These zones are in areas across the Wind Farm Site where there are elevated risk factors in relation to peat stability, such as:

- Deposits of deep (>3m) peat, weak peat (<4kPa), with low infinite slope Overdesign factor (ODF) (<1.0)
- Area adjacent to the previous slides that have similar characteristics.
- Areas of floating road

In the remaining areas across the Wind Farm Site the Risk Rating, R, prior to mitigation measures would be characterised as Medium (R=15), which would require early attention with appropriate mitigation measures to

reduce the risk of peat instability or to manage the risk on the Wind Farm Site. These were in areas where there were mitigating conditions that reduced the baseline risk of peat instability. For example:

- Areas of shallow (<1.0 m) or relatively shallow (1-2 m) peat;
- Areas of gently sloping ground (<3°) set well back from any convex break in slope to slopes >5°.
- Areas of relatively high infinite slope FoS >1.0;
- Zones where there is well-developed drainage and which are not directly upslope from the rivers and streams outside the site boundary.

Although the baseline PSRA identifies that there are areas of the Wind Farm Site that had a high initial risk of peat instability prior to implementing appropriate mitigation measures, based on our current experience with managing peat stability under similar conditions it would not be considered an abnormal or exceptional risk for a wind farm project on an upland blanket bog in Ireland.

The qualitative risk assessment methodology is simply a tool that is used to identify where appropriate risk mitigation measures need to be implemented to reduce the risk of a peat slide to an acceptable level. This is consistent with the approach in the ICE Publication – Managing Geotechnical Risk (Clayton, 2001).

Table 5.10: Baseline Peat Stability Risk Assessment for Site in Original Condition Prior to Construction

							Baseline Risk Rating - 2019 (Original Condition Prior to Construction)				
Turbine No.	**Peat/Subsoil**	**Topography**	**ODF**	**Hydrology**	**Contributing Factors**	**Total Hazard Rating**	**Hazard Likelihood (L)**	**Impact (I)**	**Risk rating (R=LxI)**	**Risk Classification**	**Response**
T01	10	15	10	10	10	55	3	5	15	Medium	Early Attention
T02	10	10	15	10	10	55	3	5	15	Medium	Early Attention
T03	15	10	15	10	10	60	4	5	20	Medium to High	Unacceptable
T04	15	10	15	10	10	60	4	5	20	Medium to High	Unacceptable
T05	15	15	15	10	10	65	4	5	20	Medium to High	Unacceptable
T06	10	15	15	10	15	65	4	5	20	Medium to High	Unacceptable
T07	15	15	15	10	20	75	4	5	20	Medium to High	Unacceptable
T08	10	10	10	10	15	55	3	5	15	Medium	Early Attention
T09	10	10	10	15	15	60	4	5	20	Medium to High	Unacceptable
T10	10	10	10	15	10	55	3	5	15	Medium	Early Attention
T11	15	10	10	10	10	55	3	5	15	Medium	Early Attention
T12	10	10	10	15	20	65	4	5	20	Medium to High	Unacceptable
T13	10	10	5	10	10	45	3	5	15	Medium	Early Attention
T14	10	10	5	10	10	45	3	5	15	Medium	Early Attention
T15	10	10	5	10	10	45	3	5	15	Medium	Early Attention
T16	15	10	10	10	10	55	3	5	15	Medium	Early Attention
T17	10	10	5	10	10	45	3	5	15	Medium	Early Attention
T18	10	15	5	15	10	55	3	5	15	Medium	Early Attention
T19	15	10	10	15	10	60	4	5	20	Medium to High	Unacceptable
Floating Road to T01	15	15	15	10	15	70	4	5	20	Medium to High	Unacceptable
Floating Road to T02	15	15	15	10	15	70	4	5	20	Medium to High	Unacceptable
Floating Road to T03	15	15	15	10	15	70	4	5	20	Medium to High	Unacceptable
Floating Road to T04	15	15	15	10	15	70	4	5	20	Medium to High	Unacceptable
Floating Road to T07	15	15	10	10	20	70	4	5	20	Medium to High	Unacceptable
Floating Road to T18	10	15	10	15	15	65	4	5	20	Medium to High	Unacceptable

5.4 Design Construction Details and Mitigation Measures

Effective design, construction & operational risk mitigation measures and improvements in site conditions were used to reduce the Likelihood of a peat slide to a low or negligible level, even in higher-risk zones.

- Use of founded access roads across the majority of the Wind Farm Site (17.8km from a total of 20.4km) to reduce the area of peat loaded by construction works.
- Civil works undertaken by an experienced earthworks and civil contractor.
- Inspection of areas identified for sidecasting by a suitably qualified person to confirm the suitability of the areas for this use.
- A basal layer of brash and small trees and a layer of geogrid reinforcement were incorporated into the design of the floating roads to minimise the thickness of granular rockfill used to construct the roads, and to spread the dead load of the road evenly over the surface of the intact peat.
- Ground Investigation – Extensive peat probing, in-situ vane shear testing to characterise the depth, strength and material characteristics of the peat.
- Peat excavated from the turbine foundations sidecast on the intact peat slopes adjacent to the excavations was spread out over the surface of the peat, generally to a depth of 0.5-1.5m, to minimise the dead load surcharge and distribute it over a wide area.
- Where large peat cells were required, a granular bund was constructed to retain the placed peat, with appropriate drainage installed through the berms to allow the placed peat to drain and consolidate.
- Regular monitoring of deep peat areas.
- Restrictions on work during or after periods of heavy or sustained rainfall. Heavy intense rainfall can result in degradation of the works resulting in localised instability, and in extreme cases can trigger large-scale peat failure.

6. PEAT FAILURES DURING CONSTRUCTION

Prior to the November 2020 peatslide there were other minor peat failures on the site that occurred during construction of the wind farm on 3 June 2020 or before. Details of the peat failures based on site inspection observations, construction records and drone surveys are given in the FT 2021 "Meenbog Wind Farm – Assessment of Site with respect to Peat Stability" report (Appendix 8-2), and the likely causes of these failures are summarised in the table below. The failures essentially occurred within the forestry plantations that cover much of the Wind Farm Site and remained within the boundary of the Wind Farm Site. The locations of these are shown on Figure 6-1 and can also be seen on the geomorphological plans P23-234-0600-0008 to 0011.

A summary of the peat instability is given below.

(1) A number of peat failures (4 no.) occurred on the Wind Farm Site during construction. These failures comprised translational sliding of peat with the basal shear surface at or immediately above the base of the peat. These peat failures were recorded by MCE to range in failure volume from 2,000 to 27,000m^3 and extended downslope up to 750m.

(2) The failures essentially occurred within the forestry plantation and remained on the Wind Farm Site. Site inspection of these failures show that the failed material has come to rest and is not considered at risk of instability. Inspection of the failure scars shows no retrogression of the failure scars, for example collapse of the side wall of the failure scar.

(3) The mechanism of the failures (references 1, 3 and 4 in the table below) was placed excavated peat causing excessive loading that resulted in an undrained loading failure of the underlying peat which then led to progressive failure of in-situ peat downslope. In particular, placing of excavated peat on the downslope margin of access roads.

(4) The mechanism of the failure (reference 2) was failure debris from upslope (reference 1) loading in-situ peat downslope, which caused undrained loading of the in-situ peat and subsequent failure.

(5) Observations at the time of the failure refer to peat up to 3 to 4m being placed downslope of the road. The back-analysis of failure reference 3 (contained with the FT 2021 Report) is considered to provide a reasonable indication of the height of material placed and the likely operating strength of the in-situ peat, as determined by shear vane.

(6) Following these peat failures a range of mitigation measures were carried out by the contractor to limit further peat failures.

(7) A number of minor peat instabilities were identified on the Wind Farm Site, for example at T5, T16 and at S-bends. These generally comprised localised movement of peat with generally limited movement of peat. Such minor movements in peat would generally not be considered uncommon given the type of construction.

Based on the above, a summary of the likely causes of the identified peat failures at the site during construction are given in Table 6.1 below.

Table 6.1: Summary of likely causes of peat failures on site during construction

Location	Ground Conditions	Likely Cause of Failure
Peat failure reference 1 at borrow pit between T5 and T6	Based on MCE (2020), peat depth of 3m is quoted, though the area appears to have exposed mineral soil/rock at shallow depth.	The mechanism of the failure was triggered by excessive excavated arisings (peat) being placed on in-situ peat. The placed excavated peat caused excessive loading that resulted in an undrained loading failure of the in-situ peat which then due led to progressive failure of in-situ peat downslope. The failure initially travelled only a short distance.
Peat failure reference 2 at borrow pit between T5 and T6	Assumed similar to peat failure reference 3.	Taking into account the back-analysis at nearby peat failure reference 3, the likely cause of failure was excessive loading due to surcharging of failed debris from peat failure reference 1 causing undrained shear failure of the underlying peat leading to progressive downslope failure. Downslope run-out distance was controlled by forestry furrows with the failed material coming to rest as in-situ peat downslope shallowed/increased in strength.
Peat failure reference 3 at borrow pit between T5 and T6	Ionic recorded peat depth to the west of T6 varied from 0.2 to 1.9m. Peat strength varied from 3kPa to 20kPa with an average, which discounts outliers of about 6kPa.	Given the recorded peat strength in the area and taking into account the back-analysis at this location, the most likely cause of failure was excessive loading of arisings on the downslope side of the access road causing undrained shear failure of the underlying peat leading to progressive downslope failure. Initial downslope run-out distance was controlled by forestry furrows. Further downslope the failed debris entered a shallow elongate drainage feature with deeper and weaker peat, which caused the failure to change direction and follow the feature further downslope.
Failure at T12 (reference 4)	Ionic results are available for the area around T12. Peat depth varied from 1.5 to 2m. Peat strength varied from 8kPa to 15kPa.	Given the recorded peat strength in the area and taking into account the back-analysis from peat failure reference 3, the most likely cause of failure was excessive loading of arisings on the downslope side of the access road. Downslope run-out distance was controlled by forestry furrows with the failed material coming to rest as in-situ peat downslope shallowed/increased in strength.
Minor instability at T5	Nearby Ionic testing showed a strength of 4 to 7kPa with peat depth 2.6 to 3.7m.	The cause of the instability was inappropriate support to the excavation for T5. This resulted in the initiation of an incipient translational slide within the adjacent peat upslope with the onset of tension cracks. The construction of the turbine base and infilling of the excavation essentially stabilised the adjacent in-situ peat.
Minor instability at T16	In-situ shear testing of peat at this location by Ionic showed a strength of less than 4kPa with peat depth 1.4m.	The instability likely occurred during excavation of the access road into the turbine base for T16. The combination of loading from excavated peat placed onto the peat surface from a perimeter drain in combination with undercutting of the peat slope likely caused the instability.
Minor instability S-bends Roadworks	Ground conditions are not known but understand that stockpile of placed crushed rock caused a localised ground movement in the peat below the stockpile.	The likely cause of failure was excessive loading of placed material on peat causing undrained shear failure of the underlying peat leading to failure.

6.1 November 2020 Peatslide

A detailed description of the peat failure and the likely mechanism of the failure is provided in the FT report "Meenbog Wind Farm – Assessment of Site with respect to Peat Stability" (FT, 2021). A summary is provided below.

The failure site comprises the upper and lower scars, as shown on Figure 6-2. The primary source of the failed material, which was essentially peat, was the upper scar. The upper scar is located on a flat plateau area at an elevation of about 266mOD that extends northwards from the high point of the Wind Farm Site, which is at an elevation of 313mOD. The estimated total area of the upper scar is about 2.4ha. The lower scar is rectilinear and essentially follows the slope gradient. The lower scar was about 260m long by about 43m wide. The head of the lower scar is taken at the downslope mouth of the upper scar and essentially coincides with the upslope boundary of a recently felled forestry plantation. The lateral perimeter of the scar essentially follows the existing forestry furrows. The estimated total area of the lower scar is about 1.18ha. The total volume of the failure is estimated at 86,240m^3.

The sequence of ground conditions at the failure site, that is the upper and lower scars, based on site observations and some limited in-situ testing is given below.

(1) Blanket peat. Peat depth is typically in the range of 1.5 to greater than 3.5m. The upper scar has notably deeper peat with an average depth of 2.7m, though locally greater than 3 to 3.5m. The lower scar has an average peat depth of 1.8m.

(2) Mineral soil or weathered rock. Underlying the blanket peat a mineral subsoil layer was observed in the floor of the scars which is likely glacial till or weathered bedrock.

(3) Bedrock. Within the lower scar localised bedrock was observed below the peat layer. In situ testing around the upper scar also indicated possible bedrock directly underlying the peat.

As the primary source of the failed material, which was essentially peat, was the upper scar the results from this location are of most interest. The hand vane results indicate undrained shear strengths in the range 2 to 19kPa, with an average value of about 6kPa. The higher vane results in the upper scar are typically at the interface of the base of the peat with the underlying mineral soil, or where roots have caught the vane. If these higher results are ignored, then the undrained shear strength ranges from 2 to 9kPa, with average reducing to slightly less than about 5kPa.

6.1.1 Contributary Causes of Failure

The following are considered to be the key contributory causes of the November 2020 peatslide. For the peat failure to occur all or at least most of these key contributory factors were required to be present. One or a few of these factors only are highly unlikely to cause the scale of the peat failure that occurred.

(1) Construction of floating road. The construction works for the floating road triggered a localised initial peat failure within the underlying in-situ peat. It would not be uncommon for sections of floating road to undergo excessive movement due to localised weakening within the underlying peat, however at this location a number of other contributory factors caused an escalation of the initial localised failure.

(2) Body of very weak peat immediately upslope. Essentially immediately upslope of the floating road was a flat plateau area that was partly formed of essentially a large body of notably saturated and very weak peat. This body of saturated and very weak peat relied for lateral stability on the peat slope upon which the floating road was being constructed. Hand vane results by FT post-failure showed undrained shear strengths in the range 2 to 9kPa, with an average value of slightly less than about 5kPa. These low

recorded peat strengths are significantly lower than the site-wide results and would represent a body of very weak peat.

(3) Rainfall intensity and pattern. A combination of preceding heavy rainfall and the pattern of weather recorded over the preceding months likely contributed to the failure. The failure was not triggered by an intense rainfall event. Whilst there was no clear significant peak rainfall duration period immediately prior to the peat failure, the combination of a significant dry spell (April and May 2020) followed by relatively high daily rainfall amounts (from June 2020 onwards) likely contributed to the peat failure. The significant and sustained dry spell would have caused drying leading to shrinkage and cracking of the near surface acrotelm layer in the peat particularly along forestry furrows and drainage lines. Subsequent run-off from rainfall would have then gained ingress to the peat at depth via the cracking.

(4) Drainage and surface water ingress into peat. The existing forestry drainage pattern, which is present in the 1995 aerial photographs of the site, in the flat plateau area directed surface water from rainfall towards the body of very weak peat that ultimately failed, notably along a series of parallel drainage ditches aligned south-north which run for about 230m and flow towards the southern limit of the upper scar (Figure 6-1).

(5) Topography. The initiation of the failure occurred at a convex break in the peat slope, at the location of the floating road. A convex break in slope is commonly cited as the location for peat failures for a number of reasons. In this particular case, the convex break in slope marks the transition from a plateau area upslope containing deeper and very weak and saturated peat compared to downslope where the peat is not as deep and has relatively greater strength.

(6) Downslope felled forestry on peat. The area downslope of the floating road comprised a forestry plantation that had been felled a few years in advance of the wind farm construction. The area comprised forestry furrows and drains aligned downslope on peat slopes with a peat depth of about 1.8m. The failure through this area exploited the existing forestry furrows which are lines of weakness as they have severed the acrotelm layer.

(7) Existing drainage and extent of failure. The existing forestry drainage within the peat is considered to have directed and concentrated surface run-off to the upper scar located in the flat plateau area. To the south of the upper scar a series of parallel drainage ditches (less than about 1m deep) feed water northwards towards the failure scar (Figure 6-2). Following the failure, inspection of these ditches showed water feeding into the scar. Whilst not a direct cause of the peat failure the existing drainage ditches and forestry furrows significantly controlled the extent of the upper scar (Figure 6-2). The extent of the lower scar was essentially controlled by existing forestry furrows aligned downslope in the direction of peat failure movement. Adjacent to the scar the existing forestry furrows have generally acted as tension cracks with the furrows opening up.

7. INSPECTION OF EXISTING WORKS

7.1 Ionic Peat Stability Assessment (2021 and 2023)

A previous assessment of the Existing Development and the Prospective Development was undertaken by Ionic in August 2021 (Ionic Consulting, 2021). The Ionic assessment concluded that the Wind Farm Site was stable at the time of writing the report, but that prior to component deliveries to T1, T2 and T4 upgrade works should be undertaken and mitigation measures adopted. This data used for that report has been reviewed and updated as necessary.

A technical note was prepared by AFRY (formerly Ionic) in October 2023 summarising the findings of a site inspection of the Wind Farm Site undertaken in October 2023 (Appendix A). The purpose of this visit was to assess the overall site stability of the constructed works from a geotechnical perspective to check whether there has been any instability since the peat slide. No evidence of movement was recorded at turbine locations or along access roads. Inspection of the borrow pit berm walls indicated that they were in good condition with no visible signs of distress. Where previous signs of movement had been recorded at peat cells at T15 and T17, no recent movement was identified. The conclusion of the technical note was that the site was stable, at the time of writing the technical note.

7.2 Assessment of Existing Development (FT)

A detailed walk-over inspection with ground investigation in selected areas was carried out in January 2021 and repeated in December 2024 along all construction works (Appendix A). Given the nature of the construction, any instability or incipient instability of the peat at the Wind Farm Site would be associated with and local to the construction. Additionally, a site inspection was undertaken by AFRY (formerly IONIC) in 2023, and this is included in Appendix A and summarised above and updated as necessary based on the findings of the more recent FT site walkovers (2024/2025). Photographs from the 2024 and 2025 site walkovers are included in Appendix F.

The detailed assessment of the stability of the constructed works involved observations and at selected locations ground investigation by FT of peat using a Geonor H-60 Hand-Field Vane Tester. Detailed findings are included in Appendix A, with a summary of the findings given below.

7.2.1 Floating Roads

Based on visual observations the floating roads show no evidence of instability with no apparent localised signs of incipient peat failure. The access road to T18 is still to be completed. The access road to T18 is on sidelong ground.

The ground condition along several lengths of floating road were also examined as well as the condition of the floating roads. Ground conditions recorded along the floating roads were not dissimilar from that recorded during construction.

Given the nature of floating roads there is clear settlement of the roads during construction as would be expected, particularly around T1/T2 junction and along the section of floating road towards T7. Ongoing settlement of the roads will continue over time. This does not represent an increased risk of peat failure as the settlement of the road will result in consolidation of the underlying peat with a subsequent gain in strength over time. As such, the stability of the floating road has improved over time since they were constructed.

Secondary settlement (creep) of the peat would be expected to continue over the full life of the road, which will result in settlement continuing at a progressively slower rate for many years.

7.2.2 Turbines and Hardstands

No evidence of adverse stability was observed at and around turbines and hardstands. The 2021 site inspection noted a small peat slip between the T16 hardstand and the perimeter cut-off drain, resulting in water from the drain flowing into the hardstand, which has subsequently been repaired. Tension cracks are present upslope of T5 in an area of deep peat, which would have occurred as a result of movement of peat towards the open turbine and hardstand excavation; the excavation has been backfilled and the turbine base and hardstand completed. These tension cracks would not present a stability risk, as they are upslope from the turbine hardstanding and the granular rockfill for the hardstanding will act as a buttress to support the peat.

A minor slump was noted at to the hardstand at T19 during the 2021 site inspection, however this material has subsequently been removed and replaced with granular fill, and as such does not pose a stability risk.

7.2.3 Other Construction Works

Excavated peat has been backfilled into 3 no. borrow pits across the site. There is no evidence of adverse instability. Areas of sidecasting have revegetated over the years and show no signs of instability. Peat cells at T15 and T17 showed minor signs of movement/distress in 2021, however subsequent inspections by AFRY (2023) and FT (2024 and 2025) showed no further evidence of movement of these berms. These are considered to be stable in their current condition.

8. PEAT STABILITY RISK ASSESSMENT (EXISTING DEVELOPMENT)

8.1 Quantitative Stability Analysis of Constructed Works – Improvement in Stability Over Time

This section has taken the assessment undertaken by Ionic (AFRY) in 2021 and updated it to include locations where additional data had previously been gathered by AGEC, MKO and HES. The following should be noted: in terms of peat failures, the critical time is during construction. All of the constructed roads and hardstands have been subject to construction vehicle loading from equipment such as excavators, dozers, dumpers (such as Volvo A25D's) and concrete trucks. The undrained analysis applies during the construction period, for the current site conditions where no construction is ongoing, the drained assessment applies.

The analysis of the floating roads has been undertaken by applying a dead load equal to the thickness of the access roads as a surcharge to the in-situ peat (load condition 3). An additional construction traffic loading (20kPa) on the surface of the floating roads has also been considered for this condition (equivalent to load condition (4) from Section 5.2.2). The analysis of the peat side-cast areas has assessed a placed peat thickness of 1m (10kPa surcharge) on top of the in-situ peat thickness. It should be noted that all of the peat strengths used in the stability analyses were taken by MKO/AGEC prior to 2017 or by Ionic during the construction phase. Parameters for the materials recorded across the Site are summarised in the table below, with values based on recorded strengths from shear vanes and known soil correlations. For the peat below the existing access roads, an increase in undrained strength has been assumed based on the length of time the roads have been present, which will have led to a degree of consolidation of the underlying peat. For a road thickness of 1m, a load of 20kPa would be applied to the surface of the peat. A typical ratio for the increase in shear strength to applied load is 0.25 x applied load. Taking a worst case where the road is saturated/submerged, this would result in a 2.5kPa increase in strength in the peat. This would only apply directly below the loaded area (the road). Shear strength versus depth plots for each section of floating road analysed are included in the following sections.

Table 8.1: Material Parameters for Analyses

Material	Unit Weight (kN/m^3)	Shear Strength (c_u)(kPa)	Friction Angle (ϕ)	Cohesion (c')
Road Fill	20	-	40	0
In-situ Peat	10.5	4-7.5*	25	4
In-situ Peat (below road)	10.5	6-10*	25	4
Placed Peat	10.5	3	5	2
Cohesive Glacial	20	50	32	1

*Varies depending on location, as described below

The stability of the founded roads and hardstands has not been analysed, as all of the peat has been removed from below the footprint of these. The stability analysis of the berms has been undertaken assuming that the peat behind the berms is saturated, in a "fully buoyant" state. This would have been the case immediately after storing the peat, however over time the water level in the peat will have reduced, meaning that the berms are more stable than indicated below.

The calculations are carried out in accordance with IS EN 1997-1 Design Approach 1 Combination 2, which is the governing case, with the applicable partial material reduction factor of $\gamma M = 1.4$ applied to the measured peat strengths, along with the applicable partial load factors for permanent loads ($\gamma G = 1.0$) and variable loads ($\gamma Q = 1.3$). Note that the calculations were also carried out for Design Approach 1 Combination 1, which does

not govern in this particular scenario; these are tabulated for comparison purposes in Appendix C. Tables presenting the 'overdesign' factor (or factor of safety in excess of the required minimum of 1.0) are shown in the following sections.

In addition, for the floating roads a stability analysis using SlopeW software has been undertaken. This allows for the effect of the geogrid placed within the floating roads to be taken into account, which is not possible in the infinite slope calculation. For the purposes of this assessment, both undrained (short term) and drained (long term) stability analyses have been undertaken. The results of these analyses are shown in Appendix E. The undrained assessment effectively models the conditions when the floating roads were constructed/peat was placed in sidecast areas. The drained analysis provides an analysis of the current conditions at these locations, where undrained loading is no longer the controlling mechanism for any potential peat failure because any excess pore water pressures have dissipated over time. It is noted that no failures have occurred on the site since construction ceased, indicating that the drained stability is acceptable. However, should any abnormal loading event occur (either natural or man-made), the undrained case would again become the most relevant. Normal site traffic, such as maintenance vehicles, would not be considered abnormal loading.

8.1.1 Floating Roads T1-T4

8.1.1.1 T1/T4 Junction

The floating road at the T1/T4 junction has been in place since 2020. The analysis was undertaken on peat depths recorded below the floating road by MKO/AGEC for the 2017 EIAR and using the shear vane results from the Ionic assessment of 2021. Slope angles quoted by Ionic have been checked against the available survey information and used where relevant. Only the locations immediately adjacent to this section of floating road have been considered.

The ground model for this area is based on probes taken by both IONIC and FT. Peat depths of between 1.5 and 7.3m were recorded. For the purposes of this assessment, a peat depth of between 2.5m and 5m was used. A review of the peat depths indicate that the peat depth becomes shallower on the downslope side of the road, indicating that the base of the peat slope is shallower than the ground surface. As such, a slope angle of 3 degrees, reducing to 0 degrees, has been used in the analysis. Peat strengths recorded in this area ranged from 2 to 12 kPa and are shown on Figure 8.1. A design line (light blue line on Figure 8.1) for the peat below the road, to account for the increase in strength of the peat under the road since the road was constructed in 2020, of 6.5kPa to 2m bgl, increasing to 8.5kPa, and 4kPa to 2m bgl increasing to 6kPa for areas outside of the access road footprint (black line on Figure 8.1) has been used for analysis purposes.

A stability analysis using SlopeW software was undertaken, with an undrained result of 1.12 (DA1C2) and a drained result (DA1C2) of 2.09 (Appendix E).

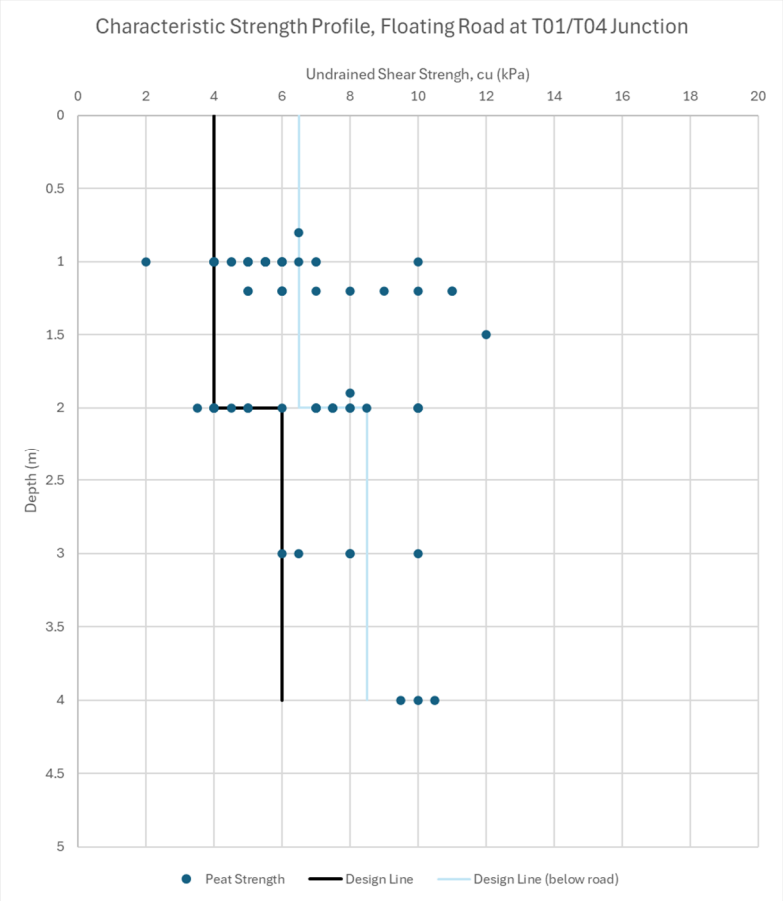


Figure 8.1: Peat Strength versus Depth, T1/T4 Junction

8.1.1.2 Floating Road T1

The floating road to T1 has been in place since 2020. The analysis was undertaken on peat depths recorded below the floating road by MKO/AGEC for the 2017 EIAR and using the shear vane results from the Ionic assessment of 2021. Slope angles quoted by Ionic have been checked against the available survey information and used where relevant. Only the locations immediately adjacent to this section of floating road have been considered.

The ground model for this area is based on probes taken by both IONIC and FT. Peat depths of between 0.5 and 3.5m were recorded. For the purposes of this assessment, a peat depth of 2.5m was used, with a slope angle of 3 degrees. A review of the peat depths indicate that the peat depth is relatively consistent throughout this area, indicating that the base of the peat slope is similar to the ground surface. Peat strengths recorded in this area ranged from 4 to 16 kPa and are shown on Figure 8.2. A design line (light blue line on Figure 8.2) for the peat below the road, to account for the increase in strength of the peat under the road since the road was constructed in 2020, of 7.5kPa to 3m bgl, and 5kPa for areas outside of this (black line on Figure 8.2), has been used for analysis purposes.

A stability analysis using SlopeW software was undertaken, with an undrained result of 1.05 (DA1C2) and a drained result of 2.38 (DA1C2) (Appendix E).

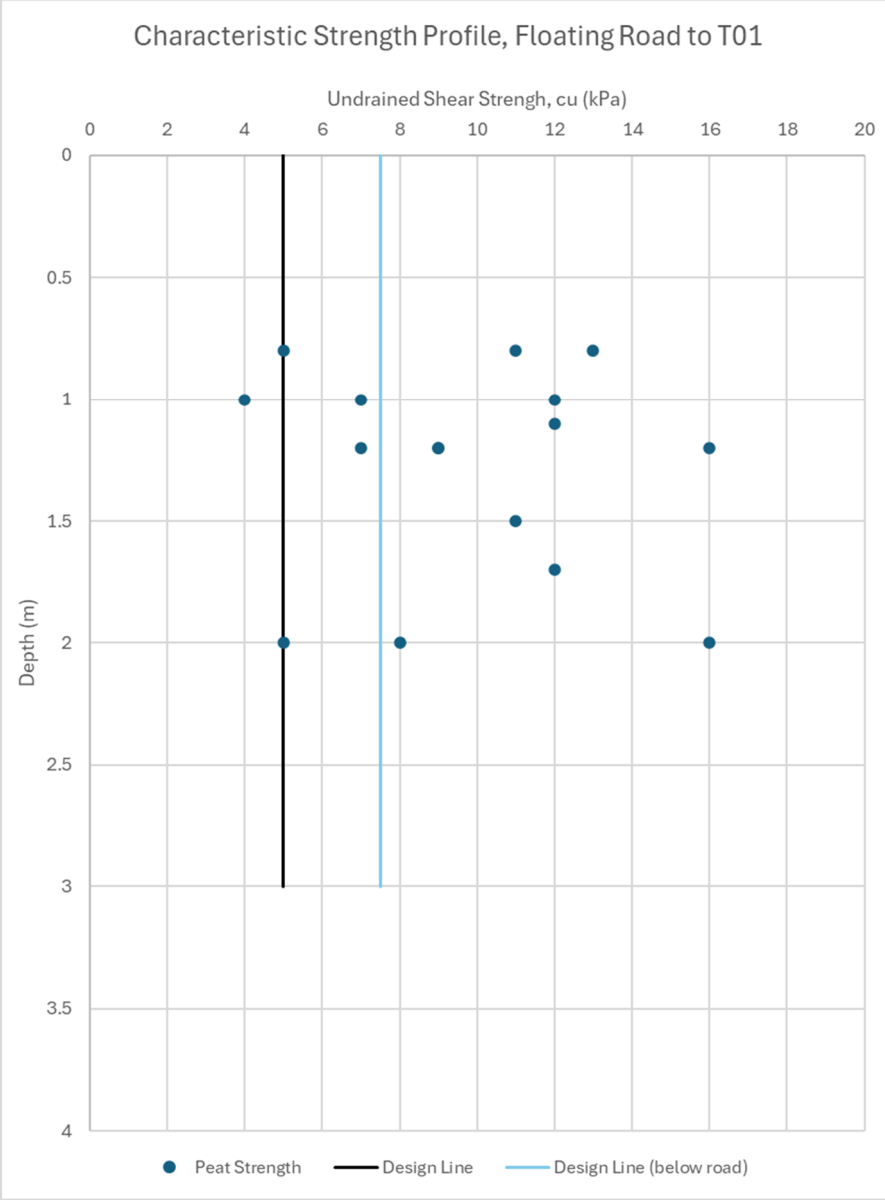


Figure 8.2: Peat Strength versus Depth, Floating Road to T1

8.1.1.3 Floating Road T2

The floating road to T2 has been in place since 2020. The analysis was undertaken on peat depths and shear vane results recorded either side of the floating road in the Ionic assessment of 2021. Slope angles quoted by Ionic have been checked against the available survey information and used where relevant. Only the locations immediately adjacent to this section of floating road have been considered.

The ground model for this area is based on probes taken by both IONIC and FT. Peat depths of between 0.7 and 3.2m were recorded. For the purposes of this assessment, a peat depth of 2.75m was used, with a slope angle of 3 degrees. A review of the peat depths indicate that the peat depth is relatively consistent throughout this area, indicating that the base of the peat slope is similar to the ground surface. Peat strengths recorded in this area ranged from 5 to 16kPa and are shown on Figure 8.3. A design line (light blue line on Figure 8.3) for the peat below the road, to account for the increase in strength of the peat under the road since the road was

constructed in 2020, of 7.5kPa to 2.5m bgl, and 5kPa for areas outside of this (black line on Figure 8.3), has been used for analysis purposes.

A stability analysis using SlopeW software was undertaken, with a result of 1.27 (DA1C2) in the undrained case and 2.55 (DA1C2) in the drained case (Appendix E).

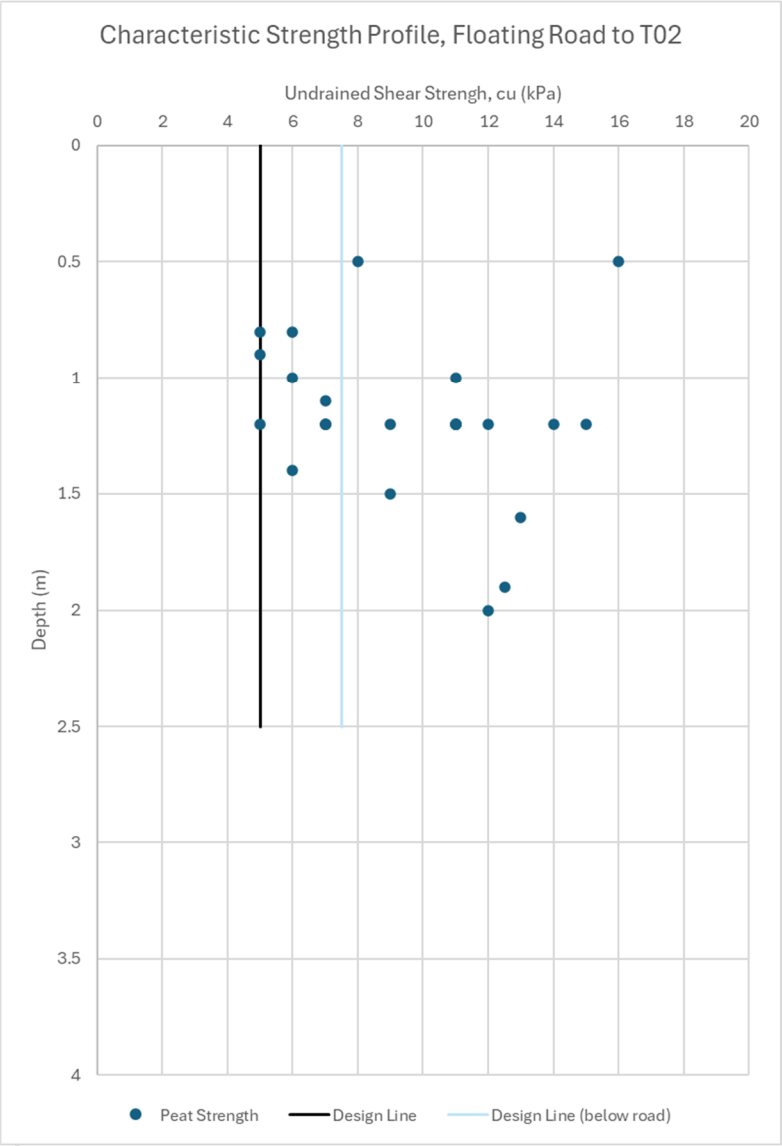


Figure 8.3: Peat Strength versus Depth, Floating Road to T2

8.1.1.4 Floating Road T3

The floating road to T3 has been in place since 2020. The analysis was undertaken on peat depths recorded below the floating road by MKO/AGEC for the 2017 EIAR and using the shear vane results from the Ionic assessment of 2021. Slope angles quoted by Ionic have been checked against the available survey information and used where relevant. Only the locations immediately adjacent to this section of floating road have been considered.

The ground model for this area is based on probes taken by both IONIC and FT. Peat depths of between 1.9 and 3.6m were recorded. For the purposes of this assessment, a peat depth of 3m was used, with a slope angle of

3 degrees. A review of the peat depths indicate that the peat depth is relatively consistent throughout this area, indicating that the base of the peat slope is similar to the ground surface. Peat strengths recorded in this area ranged from 3 to 16kPa and are shown on Figure 8.4. A design line (light blue line on Figure 8.4) for the peat below the road, to account for the increase in strength of the peat under the road since the road was constructed in 2020, of 7.5kPa to 1.0m bgl, 6kPa from 1.0-2.0m bgl, and 7.5kPa from 2.0 to 4.0m bgl has been used for analysis purposes. For areas outside of the road footprint, a design line of 5kPa to 1.0m bgl, 3.5kPa from 1.0-2.0m bgl and 5kPa from 2.0 to 4.0mbgl, has been used (black line on Figure 8.4).

A stability analysis using SlopeW software was undertaken, with a result of 1.31 (DA1C2) in the undrained case and 2.51 (DA1C2) in the drained case (Appendix E).

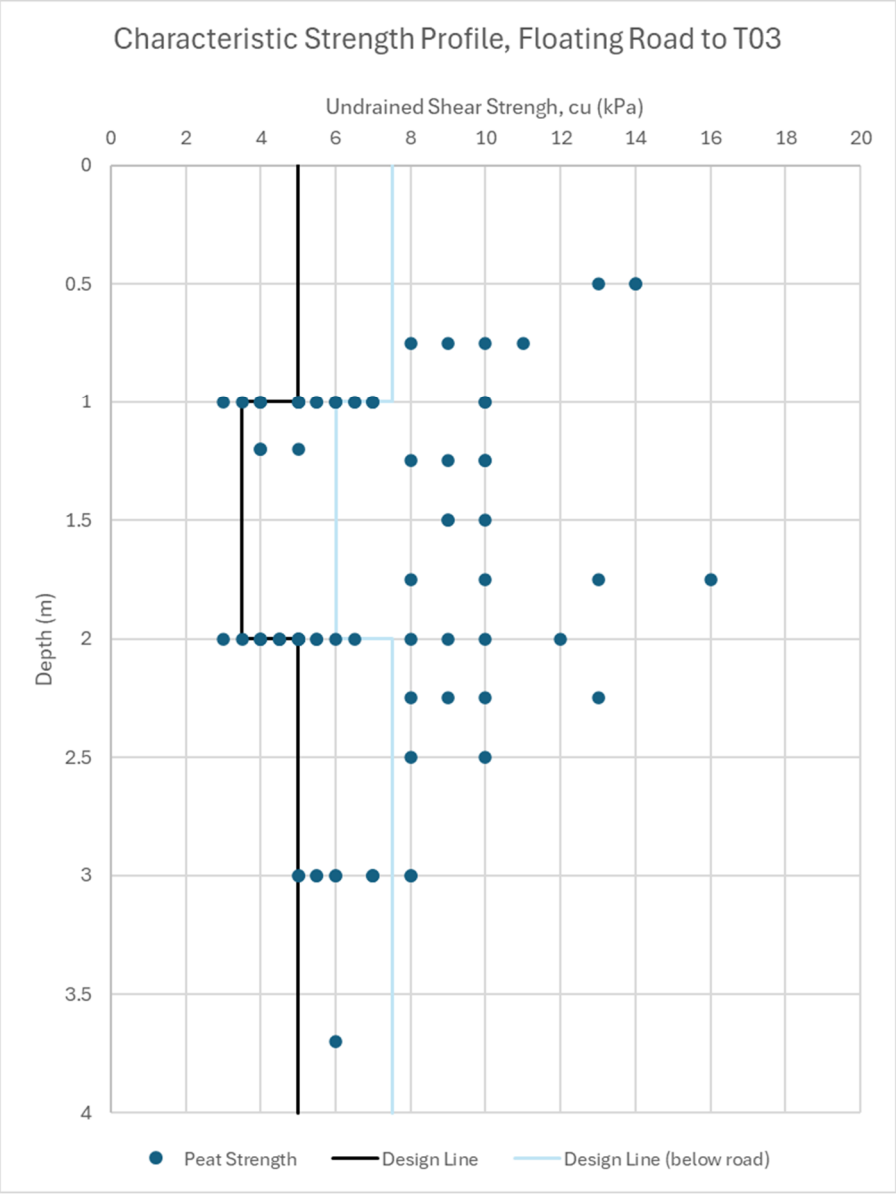


Figure 8.4: Peat Strength versus Depth, Floating Road to T3

8.1.1.5 Floating Road T4

The floating road to T4 has been in place since 2020. The analysis was undertaken on peat depths recorded below the floating road by MKO/AGEC for the 2017 EIAR and using the shear vane results from the Ionic assessment of 2021. Slope angles quoted by Ionic have been checked against the available survey information and used where relevant. Only the locations immediately adjacent to this section of floating road have been considered.

The ground model for this area is based on probes taken by both IONIC and FT. Peat depths of between 1.9 and 3.6m were recorded. For the purposes of this assessment, a peat depth of 3m was used, with a slope angle of 2 degrees. A review of the peat depths indicate that the peat depth is relatively consistent throughout this area, indicating that the base of the peat slope is similar to the ground surface. Peat strengths recorded in this area ranged from 3 to 17kPa and are shown on Figure 8.5. A design line (light blue line on Figure 8.5) for the peat below the road, to account for the increase in strength of the peat under the road since the road was constructed in 2020, of 7.5kPa to 2.0m bgl, and 10.0kPa from 2.0 to 3.0m bgl has been used for analysis purposes. For areas outside of the road footprint, a design line of 5kPa to 2.0m bgl and 7.5kPa from 2.0 to 3.0mbgl, has been used (black line on Figure 8.5).

A stability analysis using SlopeW software was undertaken, with a result of 1.18 (DA1C2) in the undrained case and 2.99 (DA1C2) in the drained case (Appendix E).

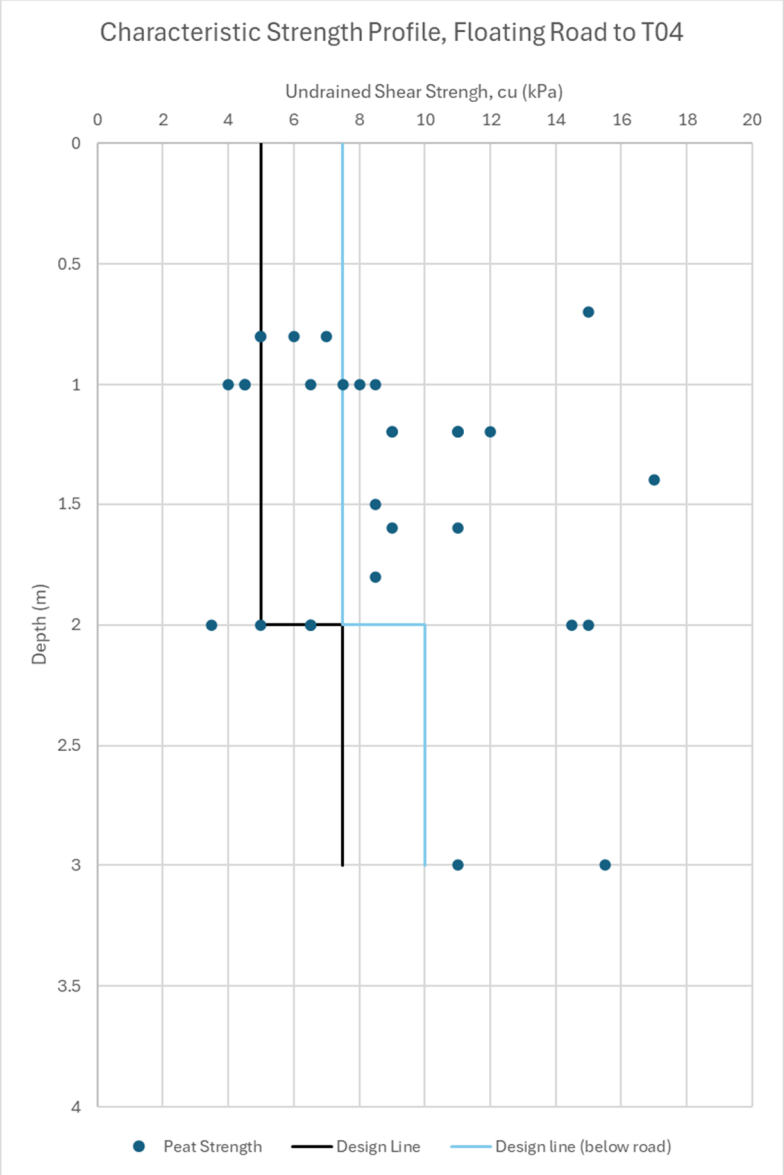


Figure 8.5: Peat Strength versus Depth, Floating Road to T4

8.1.2 Floating Road to T7

The floating road to T7 has been in place since 2020 and was under construction at the time of the failure. The analysis was undertaken on peat depths recorded below the completed section of floating road (185m in length) by MKO/AGEC for the 2017 EIAR and using the shear vane results from the Ionic assessment of 2021. Slope angles quoted by Ionic have been checked against the available survey information and used where relevant.

The ground model for this area is based on probes taken by both IONIC and FT. Peat depths of between 2.0 and 3.5m were recorded. For the purposes of this assessment, a peat depth of 3m was used, with a slope angle of 1 degree. A review of the peat depths indicate that the peat depth is relatively consistent throughout this area, indicating that the base of the peat slope is similar to the ground surface. Peat strengths recorded in this area ranged from 2 to 18kPa and are shown on Figure 8.6. A design line (light blue line on Figure 8.6) for the peat below the road, to account for the increase in strength of the peat under the road since the road was constructed in 2020, of 7.5kPa to 1.0m bgl, 5.5kPa to 2m bgl, and 6.5kPa from 2.0 to 3.0m bgl has been used

for analysis purposes. For areas outside of the road footprint, a design line of 5kPa to 1.0m bgl, 3kPa to 2.0m bgl and 4.0kPa from 2.0 to 3.0mbgl, has been used (black line on Figure 8.6).

A stability analysis using SlopeW software was undertaken, with a result of 1.04 (DA1C2) in the undrained case and 3.68 (DA1C2) in the drained case (Appendix E).

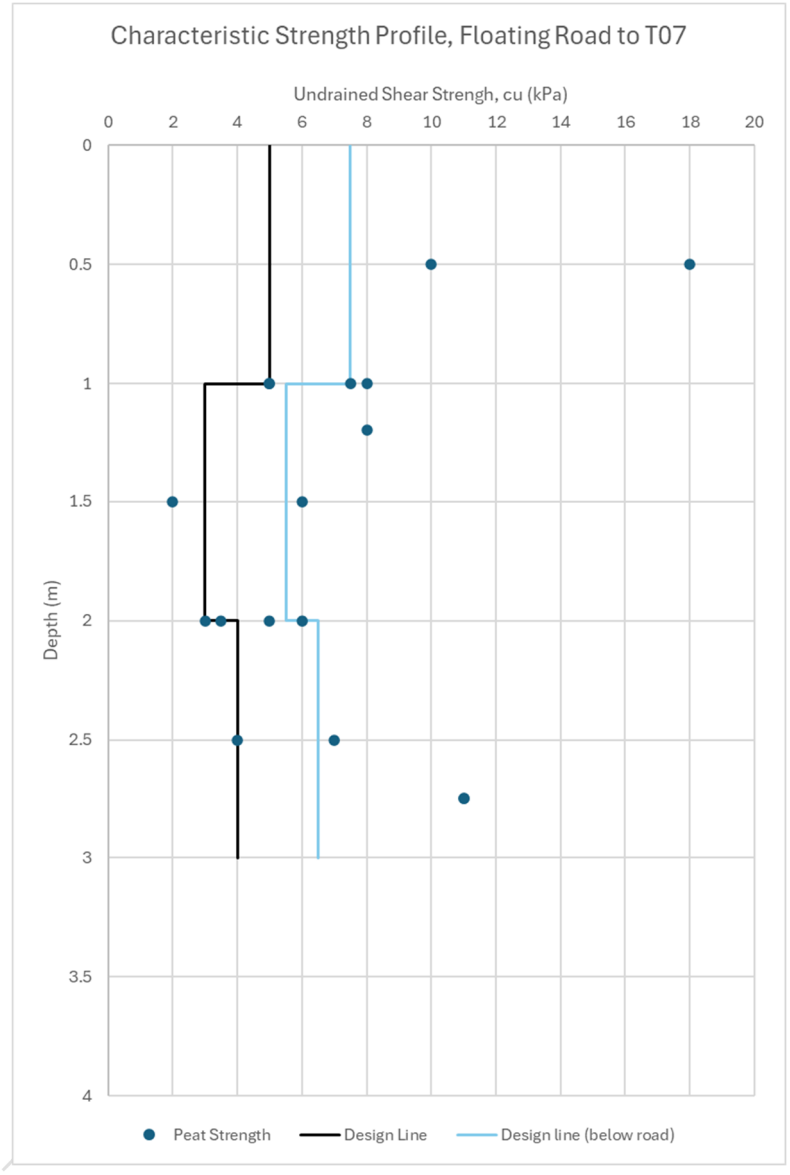


Figure 8.6: Peat Strength versus Depth, Floating Road to T7

8.1.3 Side Cast Areas Across the Site

Side casting of peat was undertaken at various locations across the Wind Farm Site during the first phase of construction. This assessment is based on the areas where peat has been side-cast as has been indicated on the as-built drawings produced by AFRY in 2025.

The analysis was undertaken using data from the Ionic (2021) stability assessment as well as data from previous AGEC peat probes and shear vane results. A slope stability assessment using SlopeW software was undertaken at each location, using Eurocode partial factors. While the undrained case would only apply for a short time

after the peat was placed, it is considered to be the most critical case, as over time the placed peat will drain and the in-situ peat below this will consolidate slightly due to the applied load. Parameters for the materials recorded across the site are summarised in the table below, with values based on recorded strengths from shear vanes and known soil correlations.

Table 8.2: Material Parameters

Material	Unit Weight	Shear Strength (c_u)	Effective Friction Angle (ϕ)	Effective Cohesion (c')
Road Fill	20	-	40	0
In-situ Peat	10.5	5*	25	4
Placed Peat	10.5	3	5	2
Cohesive Glacial	20	50	32	1

* Peat strength varies across the site, 5 is the typical value used for the sidecast areas.

The results for specific side casting areas are summarised in the tables below, with outputs from the undrained analyses included in Appendix C. The analyses have been undertaken on the downslope side of the access roads unless peat was only deposited on the upslope side of the road. A 1m height of sidecasting has been analysed, unless otherwise stated.

Peat depths and slope across these areas are summarised below.

Table 8.3: In-situ Peat Depths and Slope Angles for Side Cast Areas

Sidecast Area	In-situ Peat Depth (m)	Slope Angle (degrees)	Height of Placed Peat (m)
Main Spine Road	0.9-1.7	3	1.0
Sidecasting at T1	0.5-2.0	3	1.0
Sidecasting at T3	2.1-3.9	2	1.0
Sidecasting at T6	0.5-1.7	4	1.0
Sidecasting at T8	0.9-2.9	3	1.0
Sidecasting at T9	0.4-1.8	4	1.0
Sidecasting at T10	0.5-3.6	3	1.5
Sidecasting at T11	0.6-3.0	3	1.0
Sidecasting at T12	0.9-2.2	3	1.0
Sidecasting at T13	0.2-1.1	5	1.5
Sidecasting at T14	0.9-1.8	4	1.0
Sidecasting at T16	1.0-2.1	3	1.0
Sidecasting at T17	0.4-1.2	4	1.5
Sidecasting at T18	0.2-1.5	3	1.0
Sidecasting at T19	0.9-3.0	2	1.0

Table 8.4: ODF Results for Side Cast Areas (Undrained Condition)

Sidecast Area	Easting	Northing	ODF (Undrained)
			DA1C2
Main Spine Road	Varies		1.65
Sidecasting at T1	Varies		1.59
Sidecasting at T3	Varies		1.49
Sidecasting at T6	Varies		1.39
Sidecasting at T8	Varies		1.52
Sidecasting at T9	Varies		1.59
Sidecasting at T10*	Varies		1.19
Sidecasting at T11	Varies		1.49
Sidecasting at T12	Varies		1.53
Sidecasting at T13*	Varies		1.08
Sidecasting at T14	Varies		1.86
Sidecasting at T16	Varies		1.58
Sidecasting at T17*	Varies		1.08
Sidecasting at T18	Varies		1.60
Sidecasting at T19	Varies		1.12

*1.5m of sidecast peat analysed for these areas

8.1.4 Borrow Pit 1

Borrow Pit 1 is located east of T10 and adjacent to the site spine road. It is located at the site of an expanded existing borrow pit. This excavated area was subsequently used to create a large cell to store excavated peat, by constructing a berm along the downslope (north-west) edge of the area. The perimeter berm is 4m in height has external side slopes of 1(V):1.5(H) and was constructed using coarse permeable rock fill. The top of the berm is 0.5m above the top of the placed peat.

This area is bounded to the west and north by the site spine road which is constructed to solid formation. A berm calculation has been included in Appendix E to demonstrate the stability of the cell. Note that the overdesign factor for sliding is 1.18 for the most onerous case which is the Eurocode 7 uplift limit state under fully buoyant conditions.

A global stability analysis was undertaken using data from the Ionic (2021) stability assessment as well as data from previous AGEC peat probes. A slope stability assessment using SlopeW software was undertaken this location, using Eurocode partial factors. A drained analysis was undertaken to model the current condition of the peat, as the undrained case would only apply for a short time after the peat was placed. Characteristic effective strength parameters used were as per Table 8.1. For the undrained case, a groundwater level at the surface of the stored peat was used as a conservative worst case. A surcharge load of 10kPa was included in the stability analysis.

For the undrained case the ODF was 1.41 (DA1C2). For the drained case, which uses a slightly lower groundwater level, the ODF was 1.41 (DA1C2) (Appendix E).

8.1.5 Borrow Pit 2

Borrow Pit 2 is located south of T15 and adjacent to the site spine road. The borrow pit was excavated into existing ground, commencing at the southern end. This excavated area was subsequently used to create two cells to store peat, however the berm separating the two cells has been largely removed thereby creating one larger cell. The perimeter berm is 4m in height, has external side slopes of 1(V):1.5(H) and was constructed using coarse permeable rock fill. The top of the berm is 0.5m above the top of the placed peat. This area is bounded to the north by the site spine road which is constructed to solid formation. A berm calculation has been included in Appendix E to demonstrate the stability of the cell. Note that the overdesign factor for sliding is 1.03 for the most onerous case which is the Eurocode 7 uplift limit state under fully buoyant conditions.

A global stability analysis was undertaken using data from the Ionic (2021) stability assessment as well as data from previous AGEC peat probes. A slope stability assessment using SlopeW software was undertaken this location, using Eurocode partial factors. A drained analysis was undertaken to model the current condition of the peat, as the undrained case would only apply for a short time after the peat was placed. Characteristic effective strength parameters used were as per Table 8.1. For the undrained case, a groundwater level at the surface of the stored peat was used as a conservative worst case. A surcharge load of 10kPa was included in the stability analysis.

For the undrained case the ODF was 1.32 (DA1C2). For the drained case, which uses a slightly lower groundwater level, the ODF was 1.38 (DA1C2) (Appendix E).

8.1.6 Borrow Pit 3

Borrow Pit 3 is located between T13 and T16. Two cells were previously excavated into existing ground on the eastern side of the borrow pit area and these were subsequently backfilled with peat. The perimeter berm is up to 4m in height has external side slopes of 1(V):1.5(H) and was constructed using coarse permeable rock fill. The top of the berm is 0.5m above the top of the placed peat. The area to the south and west of the peat cells was used as a peat side-casting area.

A berm calculation has been included in Appendix E to demonstrate the stability of the cell. Note that the overdesign factor for sliding is 1.13 for the most onerous case which is the Eurocode 7 uplift limit state under fully buoyant conditions.

A global stability analysis was undertaken using data from the Ionic (2021) stability assessment as well as data from previous AGEC peat probes. A slope stability assessment using SlopeW software was undertaken this location, using Eurocode partial factors. A drained analysis was undertaken to model the current condition of the peat, as the undrained case would only apply for a short time after the peat was placed. Characteristic effective strength parameters used were as per Table 8.1. For the undrained case, a groundwater level at the surface of the stored peat was used as a conservative worst case. A surcharge load of 10kPa was included in the stability analysis.

For the undrained case the ODF was 1.25 (DA1C2). For the drained case, which uses a slightly lower groundwater level, the ODF was 1.25 (DA1C2) (Appendix E).

8.1.7 Peat Cell Southeast of Substation

Peat Cells are located south of the substation and adjacent to the Site spine road. They are located at the site of a pre-existing forestry borrow pit. This area was subsequently used to create two cells to store peat, by constructing berms along the open (south-west) sides of the cell areas. The perimeter berm is up to 5m in height, constructed of coarse rockfill, with side slopes of 1(V):1.5(H). The top of the berm is 0.5m above the top of the placed peat.

A berm calculation has been included in Appendix E to demonstrate the stability of the cell. Note that the overdesign factor for sliding is 1.08 for the most onerous case which is the Eurocode 7 uplift limit state under fully buoyant conditions.

A global stability analysis was undertaken using data from the Ionic (2021) stability assessment as well as data from previous AGEC peat probes. A slope stability assessment using SlopeW software was undertaken this location, using Eurocode partial factors. A drained analysis was undertaken to model the current condition of the peat, as the undrained case would only apply for a short time after the peat was placed. Characteristic effective strength parameters used were as per Table 8.1. For the undrained case, a groundwater level at the surface of the stored peat was used as a conservative worst case. A surcharge load of 10kPa was included in the stability analysis.

For the undrained case the ODF was 1.30 (DA1C2). For the drained case, which uses a slightly lower groundwater level, the ODF was 1.38 (DA1C2) (Appendix E).

8.1.8 Peat Cell at T15

This peat cell is located to the north and south of turbine T15. The cells were formed by constructing berms to contain areas of sloping ground to the west of the site spine road. Cell A is bounded on all sides by a berm and the site road to the east. Cell B is bounded on the north, east and west sides by berms. The berms, road and hardstand are constructed to solid formation (peat removed and replaced with crushed rock fill). The perimeter berm is up to 4.5m in height and has side slopes of 1(V):1.5(H) and were constructed using coarse permeable rock fill. The top of the berm is 0.5m above the top of the placed peat.

Minor settlement and some cracking of the berm material was noted on site along some sections of the berms. Monitoring posts were set up in these areas and no further signs of cracking were noted since monitoring began, and the berm is considered to be stable.

A berm calculation has been included in Appendix E to demonstrate the stability of the cell. Note that the overdesign factor for sliding is 1.18 for the most onerous case which is the Eurocode 7 uplift limit state under fully buoyant conditions.

A global stability analysis was undertaken using data from the Ionic (2021) stability assessment as well as data from previous AGEC peat probes. A slope stability assessment using SlopeW software was undertaken at this location, using Eurocode partial factors. A drained analysis was undertaken to model the current condition of the peat, as the undrained case would only apply for a short time after the peat was placed. Characteristic effective strength parameters used were as per Table 8.1. For the undrained case, a groundwater level at the surface of the stored peat was used as a conservative worst case. A surcharge load of 10kPa was included in the stability analysis.

For the undrained case the ODF was 1.25 (DA1C2). For the drained case, which uses a slightly lower groundwater level, the ODF was 1.25 (DA1C2) (Appendix E).

8.1.9 Peat Cell at T17

This peat cell is located to the west of T17 and adjacent to the site road. The cell was formed by constructing a berm to contain an area of sloping ground to the west of the road. The cell is bounded to the north, west and south by the berm and the site road to the east. The berm and road are constructed to solid formation (peat removed and replaced with crushed rock fill). The perimeter berm is up to 4.5m in height and has side slopes of 1(V):1.5(H) and was constructed using coarse permeable rock fill. The top of the berm is 0.5m above the top of the placed peat.

A berm calculation has been included in Appendix E to demonstrate the stability of the cell. Note that the overdesign factor for sliding is 1.05 for the most onerous case which is the Eurocode 7 uplift limit state under fully buoyant conditions.

A global stability analysis was undertaken using data from the Ionic (2021) stability assessment as well as data from previous AGEC peat probes. A slope stability assessment using SlopeW software was undertaken this location, using Eurocode partial factors. A drained analysis was undertaken to model the current condition of the peat, as the undrained case would only apply for a short time after the peat was placed. Characteristic effective strength parameters used were as per Table 8.1. For the undrained case, a groundwater level at the surface of the stored peat was used as a conservative worst case. A surcharge load of 10kPa was included in the stability analysis.

For the undrained case the ODF was 1.25 (DA1C2). For the drained case, which uses a slightly lower groundwater level, the ODF was 1.21 (DA1C2) (Appendix E).

8.1.10 T7 Spur Road Berm – Wall 3

Wall 3 is located along/adjacent to the T7 spur road. This berm stabilises the failure area uphill of the T7 spur road. The perimeter berm is up to 4m in height, has side slopes of 1(V):1.5(H) and the top of the berm is currently at least 1m above the existing ground level. The berm was constructed using coarse permeable rock fill.

A berm calculation has been included in Appendix E to demonstrate the stability of the berm. Note that the overdesign factor for sliding is 3.22 for the most onerous case which is the Eurocode 7 uplift limit state under fully buoyant conditions.

A global stability analysis was undertaken using data from the Ionic (2021) stability assessment as well as data from previous AGEC peat probes. A slope stability assessment using SlopeW software was undertaken this location, using Eurocode partial factors. A drained analysis was undertaken to model the current condition of the peat, as the undrained case would only apply for a short time after the peat was placed. Characteristic effective strength parameters used were as per Table 8.1. For the undrained case, a groundwater level at the surface of the stored peat was used as a conservative worst case. A surcharge load of 10kPa was included in the stability analysis.

For the undrained case the ODF was 1.43 (DA1C2). For the drained case, which uses a slightly lower groundwater level, the ODF was 1.41 (DA1C2) (Appendix E).

8.1.11 T8 Berm

This berm is located on the uphill side of T8 spur road, hardstand and foundation. This berm was constructed to stabilise a minor peat failure, as described in Section 6. The perimeter berm is up to 5m in height, has side slopes of 1(V):1.5(H) and the top of the berm is 0.5m above the existing ground level. The berm was constructed using coarse permeable rock fill.

A berm calculation has been included in Appendix E to demonstrate the stability of the cell. Note that the overdesign factor for sliding is 2.46 for the most onerous case which is the Eurocode 7 uplift limit state under fully buoyant conditions.

A global stability analysis was undertaken using data from the Ionic (2021) stability assessment as well as data from previous AGEC peat probes. A slope stability assessment using SlopeW software was undertaken this location, using Eurocode partial factors. A drained analysis was undertaken to model the current condition of the peat, as the undrained case would only apply for a short time after the peat was placed. Characteristic effective strength parameters used were as per Table 8.1. For the undrained case, a groundwater level at the surface of the stored peat was used as a conservative worst case. A surcharge load of 10kPa was included in the stability analysis.

For the undrained case the ODF was 1.28 (DA1C2). For the drained case, which uses a slightly lower groundwater level, the ODF was 1.28 (DA1C2) (Appendix E).

8.1.12 T9 Spur Road Berm – Wall 1

Wall 1 is located long the spur road to T9 and was constructed as a mitigation measure to retain peat with the site following the November 2020 peatslide. The perimeter berm is up to 4.5m in height, has side slopes of 1(V):1.5(H) and the top of the berm is a minimum of 0.5m above the existing ground level. The berm was constructed using coarse permeable rock fill.

The level of water and peat contained behind Wall 1 was at 220.3mOD following the failure. The top of the berm is at 221.0mOD. Original ground was approximately 216.3m OD on the upslope side of the berm and 215.5mOD on the downslope side. The berm is currently retaining (as of April 2025) a small volume of water, approximately 1.5m in depth, no peat is currently being retained by the berm.

A berm calculation has been included in Appendix E to demonstrate the stability of the berm. Note that the overdesign factor for sliding is 2.42 for the most onerous case which is the Eurocode 7 uplift limit state under fully buoyant conditions

A global stability analysis was undertaken using data from the Ionic (2021) stability assessment as well as data from previous AGEC peat probes. A slope stability assessment using SlopeW software was undertaken this location, using Eurocode partial factors. A drained analysis was undertaken to model the current condition of the peat, as the undrained case would only apply for a short time after the peat was impounded at this location. Characteristic effective strength parameters used were as per Table 8.1. For the undrained case, a groundwater level at the surface of the stored peat was used as a conservative worst case. A surcharge load of 10kPa was included in the stability analysis.

For the undrained case the ODF was 1.25 (DA1C2). For the drained case, which uses a slightly lower groundwater level, the ODF was 1.23 (DA1C2) (Appendix E).

8.2 Peat Stability Risk Assessment for Existing Development

The baseline Peat Stability Risk Assessment for the Wind Farm Site in its original conditions prior to construction in 2019 is presented in Section 5. Table 8-1 gives a summary of the interpreted risk of a peat slide for each zone across the Wind Farm Site in its current condition following the implementation of monitoring and mitigation measures after the peat failure (as detailed in the FT report "Meenbog Wind Farm – Assessment of Site with respect to Peat Stability" (FT, 2021)).

The following general principles have been followed in the assessment of the Likelihood and Impact of a peat slide after the implementation of the monitoring and risk mitigation measures:

- Effective design, construction & operational risk mitigation measures and improvements in site conditions can be used to reduce the Likelihood of a peat slide to a low or negligible level, even in high-risk zones.
- The Likelihood of a peat slide can also be reduced by an improvement in site conditions due to improved drainage or an increase in the strength of the peat under sustained surcharge loads over time.
- The potential Impact of a peat slide at a particular location cannot be reduced significantly unless positive measures are taken to effectively contain the peat or sediment along potential flow paths prior to construction.

With the appropriate monitoring and mitigation measures detailed in this report, and the improved site conditions due to an increase in peat strength below the floated roads, improved drainage, drying out of peat within peat storage cell and borrow pit areas, it was possible to reduce the Likelihood of Occurrence, L, of a peat slide to 1 (Negligible) or 2 (Low) across the site. The higher Likelihood of 2 (Low) was interpreted for zones where deeper peat is present, or areas adjacent to historical peat slides, and where the likelihood of a peat slide prior to the implementation of the mitigation measures was interpreted as High (L=4) or Very High (L=5). This is to reflect a slightly higher residual risk in these areas. The hazard likelihood for sections of floating road has been assessed as 2 in the current condition, which can be reduced further following full scale proof load testing of the roads prior to turbine delivery. The highest risk was at the time of construction, and this has reduced over time because of the increase in strength of the peat under the sustained loads from the access roads.

Due to the sensitivity of the receiving environment and the potential scale of a peat slide, we have conservatively assumed that the Impact of a peat slide remains the same even after the mitigation measures have been implemented. Therefore, with appropriate implementation of the monitoring and risk mitigation measures the Risk Rating across the Wind Farm Site reduces to Low (R = 5) or Low to Medium (R=10) as a function of the interpreted Likelihood of a slide.

Where the Risk Rating is Low it would be classified as Trivial (Clayton, 2001) which is acceptable with Monitoring during construction. Where the Risk Rating is Low to Medium, it would still be classified as Tolerable and can be addressed with Regular Attention during construction.

Table 8.5: Peat Stability Risk Rating (Current Condition following Mitigation Measures and Construction)

							Baseline Risk Rating - 2019 (Original Condition Prior to Construction)					Risk Rating After Mitigation Measures and Construction				
Turbine No.	Peat/Subsoil	Topography	ODF	Hydrology	Contributing Factors	Total Hazard Rating	Hazard Likelihood (L)	Impact (I)	Risk rating (R=LxI)	Risk Classification	Response	Hazard Likelihood (L)	Impact (I)	Risk rating (R=LxI)	Risk Classification	Response
T01	10	15	10	10	10	55	3	5	15	Medium	Early Attention	1	5	5	Low	Monitor
T02	10	10	15	10	10	55	3	5	15	Medium	Early Attention	1	5	5	Low	Monitor
T03	15	10	15	10	10	60	4	5	20	Medium to High	Unacceptable	1	5	5	Low	Monitor
T04	15	10	15	10	10	60	4	5	20	Medium to High	Unacceptable	1	5	5	Low	Monitor
T05	15	15	15	10	10	65	4	5	20	Medium to High	Unacceptable	1	5	5	Low	Monitor
T06	10	15	15	10	15	65	4	5	20	Medium to High	Unacceptable	1	5	5	Low	Monitor
T07	15	15	15	10	20	75	4	5	20	Medium to High	Unacceptable	2	5	10	Low to Medium	Regular Attention
T08	10	10	10	10	15	55	3	5	15	Medium	Early Attention	1	5	5	Low	Monitor
T09	10	10	10	15	15	60	4	5	20	Medium to High	Unacceptable	1	5	5	Low	Monitor
T10	10	10	10	15	10	55	3	5	15	Medium	Early Attention	1	5	5	Low	Monitor
T11	15	10	10	10	10	55	3	5	15	Medium	Early Attention	1	5	5	Low	Monitor
T12	10	10	10	15	20	65	4	5	20	Medium to High	Unacceptable	1	5	5	Low	Monitor
T13	10	10	5	10	10	45	3	5	15	Medium	Early Attention	1	5	5	Low	Monitor
T14	10	10	5	10	10	45	3	5	15	Medium	Early Attention	1	5	5	Low	Monitor
T15	10	10	5	10	10	45	3	5	15	Medium	Early Attention	1	5	5	Low	Monitor
T16	15	10	10	10	10	55	3	5	15	Medium	Early Attention	1	5	5	Low	Monitor
T17	10	10	5	10	10	45	3	5	15	Medium	Early Attention	1	5	5	Low	Monitor
T18	10	15	5	15	10	55	3	5	15	Medium	Early Attention	1	5	5	Low	Monitor
T19	15	10	10	15	10	60	4	5	20	Medium to High	Unacceptable	1	5	5	Low	Monitor
Floating Road to T01	15	15	15	10	15	70	4	5	20	Medium to High	Unacceptable	2	5	10	Low to Medium	Regular Attention
Floating Road to T02	15	15	15	10	15	70	4	5	20	Medium to High	Unacceptable	2	5	10	Low to Medium	Regular Attention
Floating Road to T03	15	15	15	10	15	70	4	5	20	Medium to High	Unacceptable	2	5	10	Low to Medium	Regular Attention
Floating Road to T04	15	15	15	10	15	70	4	5	20	Medium to High	Unacceptable	2	5	10	Low to Medium	Regular Attention
Floating Road to T07	15	15	10	10	20	70	4	5	20	Medium to High	Unacceptable	2	5	10	Low to Medium	Regular Attention
Floating Road to T18	10	15	10	15	15	65	4	5	20	Medium to High	Unacceptable	1	5	5	Low	Monitor

9. FINDINGS AND SUMMARY

9.1 Summary of Findings

Following summary of findings are given:

(1) A review of peat stability at the site shows that prior to wind farm construction the Wind Farm Site showed little to no signs of peat instability or recorded peat instability. The Landslide Susceptibility Classification (GSI, 2025) classified the site as dominantly 'low' to 'moderately low' susceptibility with localised areas 'moderately high'.

(2) To date, over 3400 no. peat depth readings were taken within the Wind Farm Site. Peat depths recorded during the site walkovers and from the ground investigation ranged from 0.0 to 7.3m with an average peat depth of 1.8m. 65% of the probes recorded peat depths of less than 2.0m. A number of localised readings recorded peat depths from 3.0 to 7.3m. In addition, a series of trial pits and Russian peat samples were taken at various locations across the Wind Farm Site.

(3) During construction, a number of peat failures (4 no.) and minor peat instabilities occurred. The peat failures occurred in early June 2020 or before and comprised translational slides of peat that were triggered by arisings (mostly peat), or failed peat, being placed on in-situ peat. Following these peat failures, a range of mitigation measures were carried out by the contractor to limit further peat failures (MCE, 2020).

(4) It is considered that a key contributory factor to these failures was excavated arisings being placed onto the in-situ peat surface, particularly on the downslope side of access roads on peat. The likely cause of failure was excessive loading causing undrained shear failure of the underlying peat leading to progressive downslope failure. Particular mitigation measures were put in place to ensure that this working practice was prevented from re-occurring.

(5) The cause of the November 2020 peatslide was as a result of notably different contributory factors to the earlier peat failures on the Wind Farm Site.

(6) A summary of the key contributory causes of the November 2020 peatslide is given below.

- (a) The peat failure occurred during the construction of a floating road to T7. The construction of the floating road likely triggered the peat failure as a result of increased loading causing a localised weakening within the underlying in-situ peat.
- (b) It is considered that a zone of unforeseen weaker peat was present below the floating road. Upslope of the floating road, within a flat plateau area, a large body of notably saturated and very weak peat was present.
- (c) The body of saturated and very weak peat relied for lateral stability on the peat slope upon which the floating road was being constructed.
- (d) In-situ hand vane test results in the body of saturated and very weak peat showed undrained shear strengths in the range 2 to 9kPa, which are significantly lower than the site-wide results.
- (e) Following the initial localised failure below the floating road this removed lateral support to the peat upslope which contained a large body of saturated and very weak peat which subsequently failed.

(7) A site-wide quantitative peat stability assessment has been undertaken, analysing 1,320 locations across the site. For the Undrained assessment, Load Condition 1 (no surcharge load), all of the results are in

excess of 1.0. For Load Condition 2 (10kPa surcharge on peat) a total of 13 results (1% of all results) were <1.0. Nine of these results are in areas where no construction has been undertaken or where founded roads were constructed, with no loading on the peat. A further Load Condition was analysed to assess the stability of the sections of floating roads across the Wind Farm Site (Load Condition 3 and 4).

(8) A quantitative assessment of the stability of the Existing Development (Section 8) shows that the works constructed to date have an adequate Overdesign Factor and are currently considered to be stable. A section of floating road to the west of T4 and at the junction to T1 recorded an ODF value of <1.0, however no evidence of instability has been recorded in this area since construction ceased. A SlopeW check on the stability of these areas, and other sections of floating roads, recorded an ODF of >1.0 at all locations.

(9) A qualitative peat stability risk assessment has also been undertaken for the turbine locations and the sections of floating road constructed across the Wind Farm Site. This assessment was initially undertaken for the baseline conditions that existing before construction started, and an additional risk assessment for the same areas following construction and the implementation of mitigation measures. The majority of locations are currently assessed as Low risk, with a slightly higher risk (Low to Medium) associated with the area around T7 and on the floating roads.

(10) The improvement in site conditions due to the improved drainage across the site and consolidation of the peat beneath the floating roads and sidecasting areas has resulted in a Low and Medium-Low overall risk rating for the Site. This is considered 'Acceptable with Monitoring' or 'Regular Attention', as per Table 5.9. With further mitigation, such as full-scale proof load testing of the roads it will be possible to reduce the risk rating to Low across the site at the end of construction.

9.2 Summary

Following an assessment of the Wind Farm Site with respect to peat stability as presented in this report and the Ionic peat stability report (Ionic Consulting, 2021) it is considered that the as constructed works associated with the Existing Development are currently stable. The highest risk was at the time of construction in 2019 and 2020, and recent inspections and investigations have confirmed that there is no apparent issue with peat instability for the existing development in its current condition. While the stability of the site may change due to natural processes (such as intense rainfall events) over time, there is not currently considered to be an ongoing risk of peat failure on the Wind Farm Site from the Existing Development.

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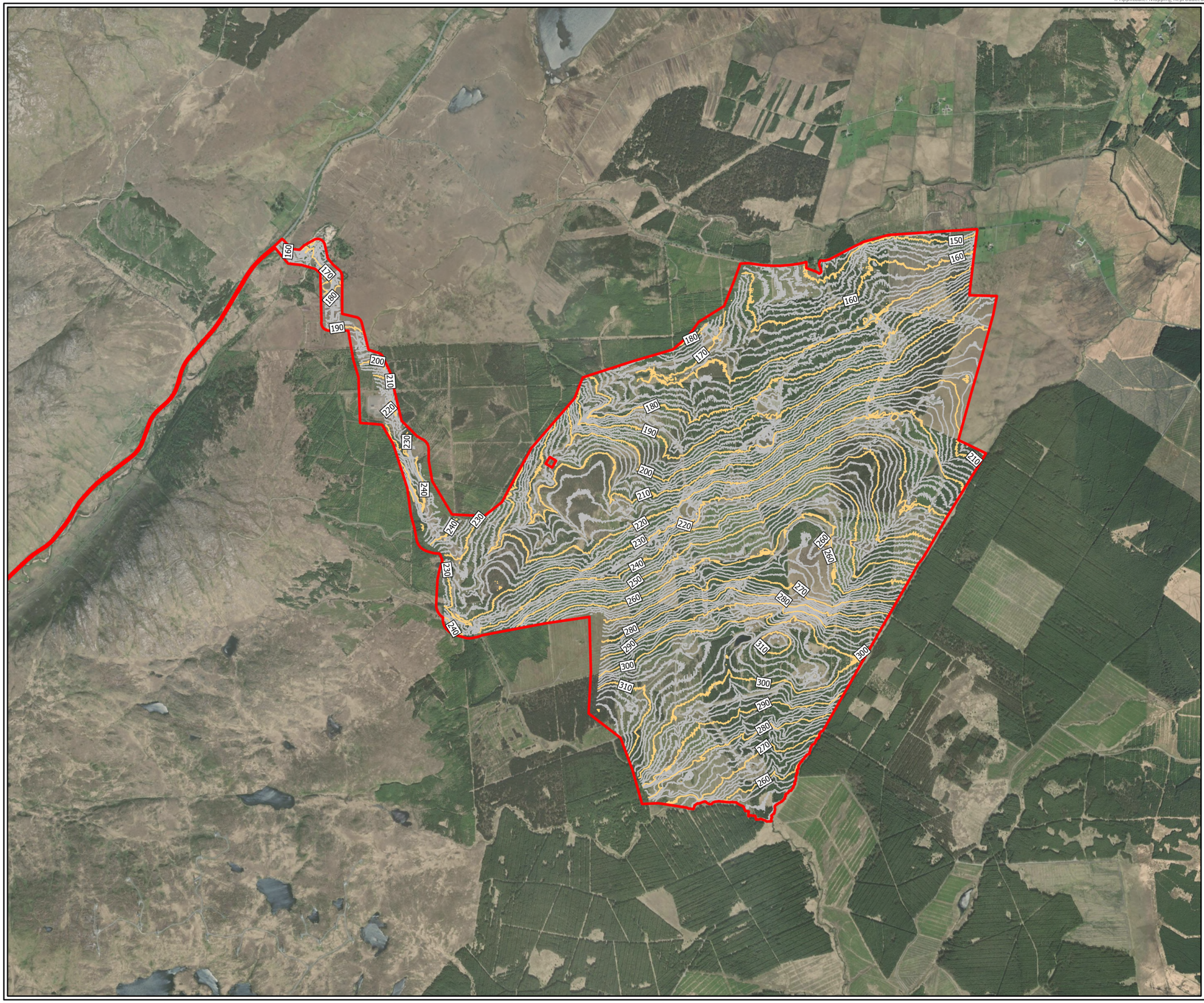
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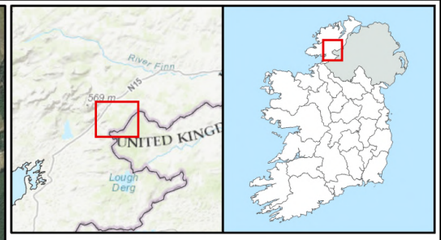
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FIGURES

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- 2m Contour

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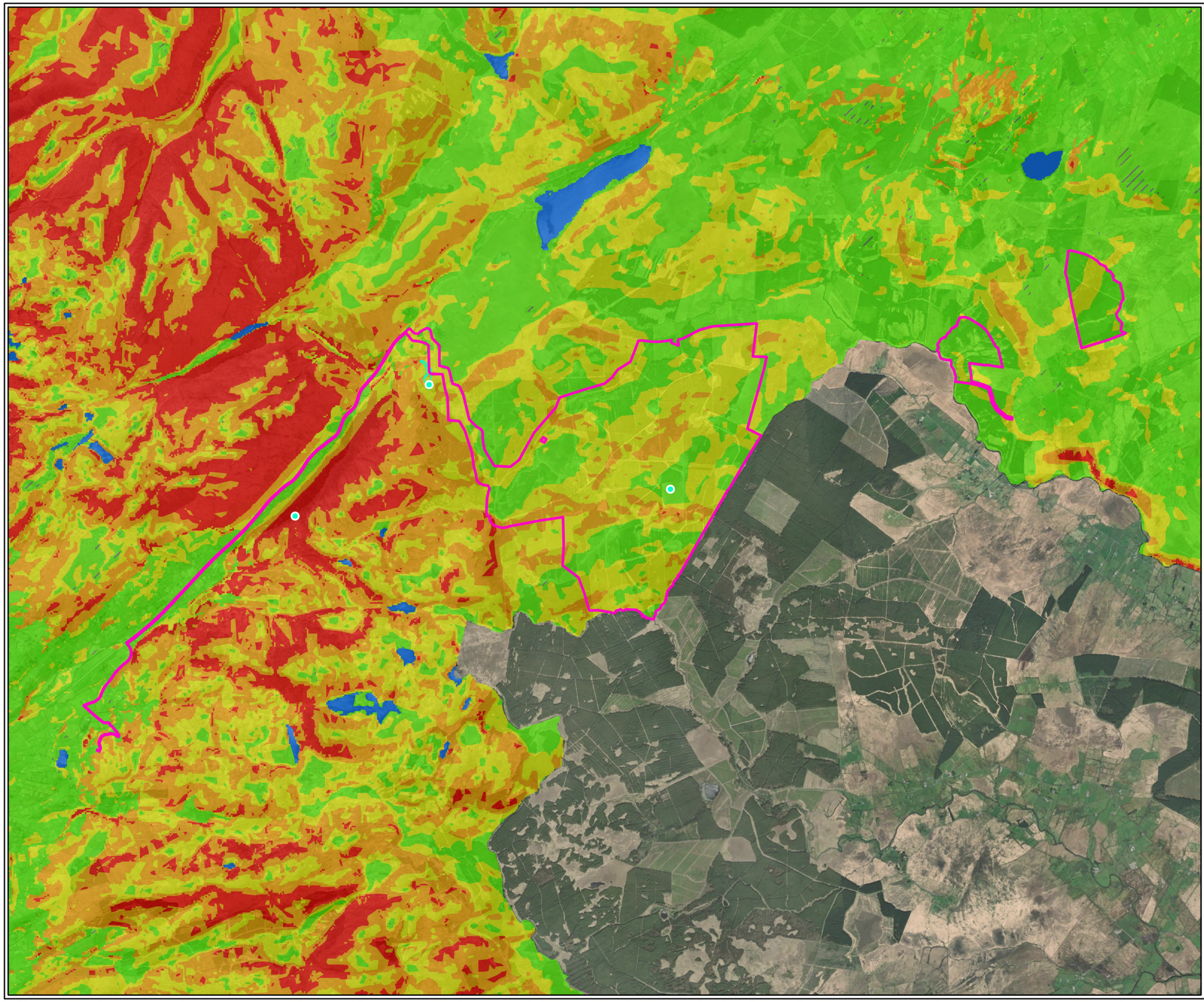
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Legend

- Site Boundary

GSI Landslide Susceptibility Classification

- Low
- Low (inferred)
- Moderately Low
- Moderately Low (inferred)
- Moderately High
- High
- Water
- GSI Landslide Extents
- GSI Landslide Locations

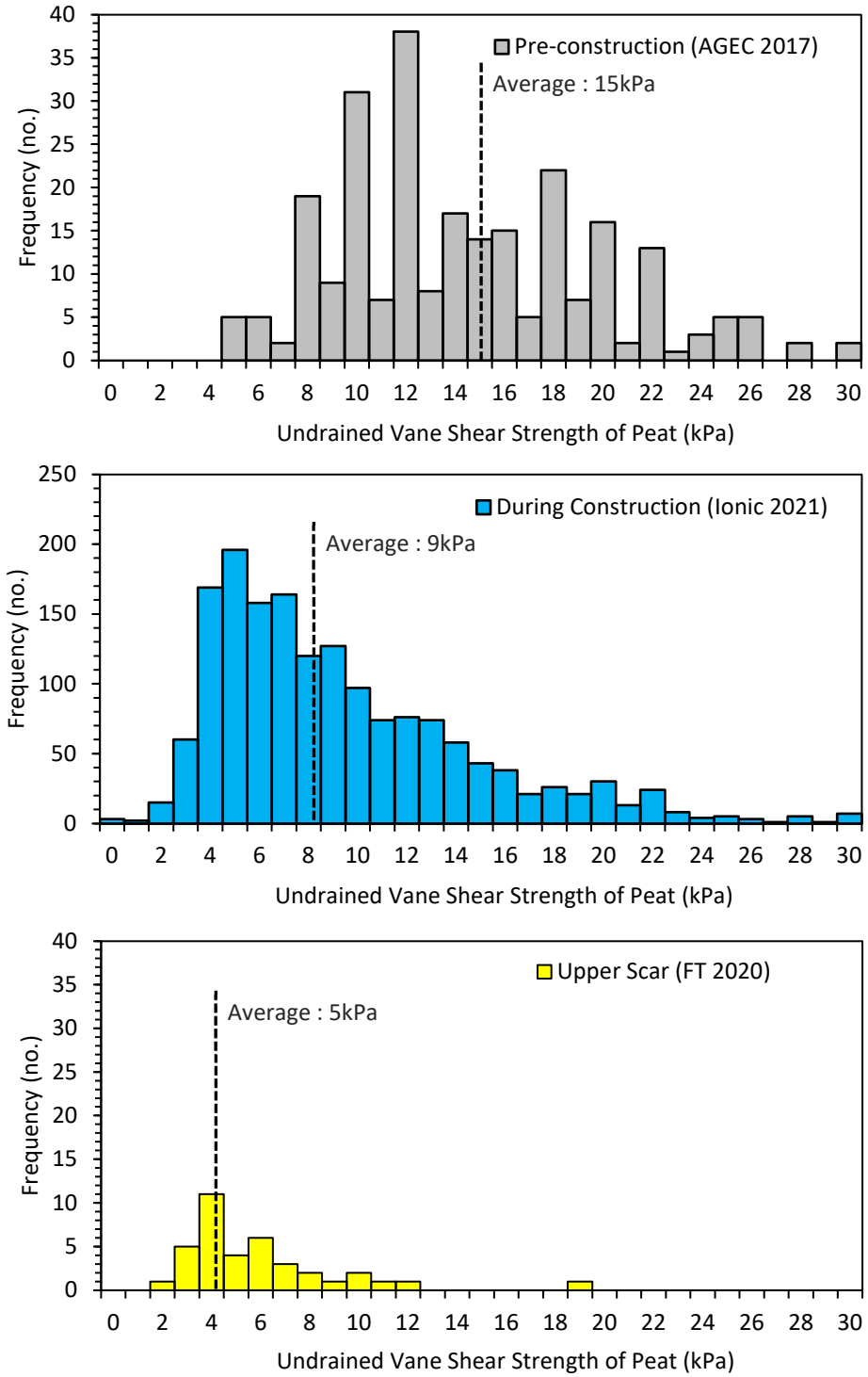
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Figure 4-3: Range of undrained peat strength



Source: AGEC (2017), Ionic (2021) and FT (2021)

Figure 4-4: Undrained peat strength with depth

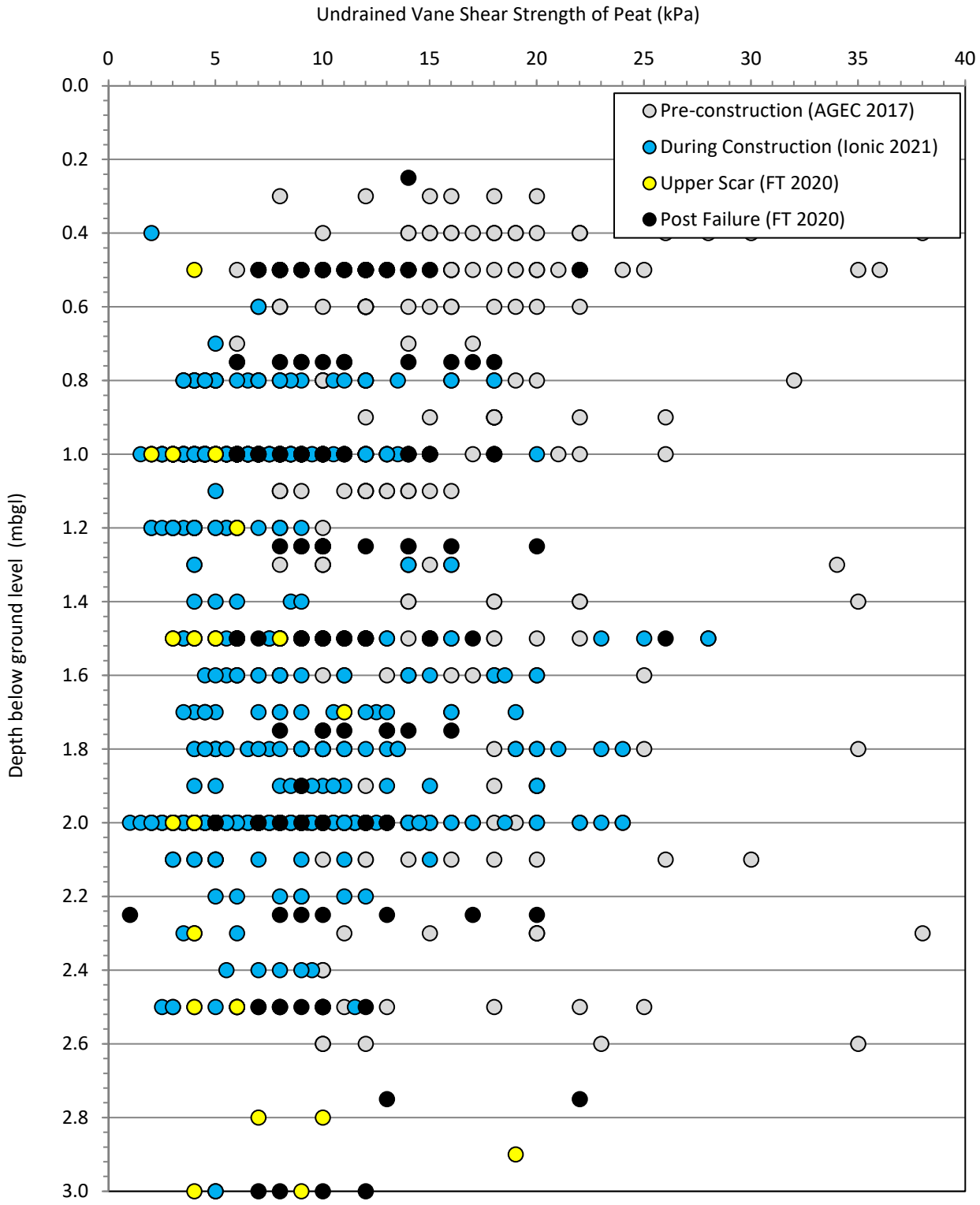
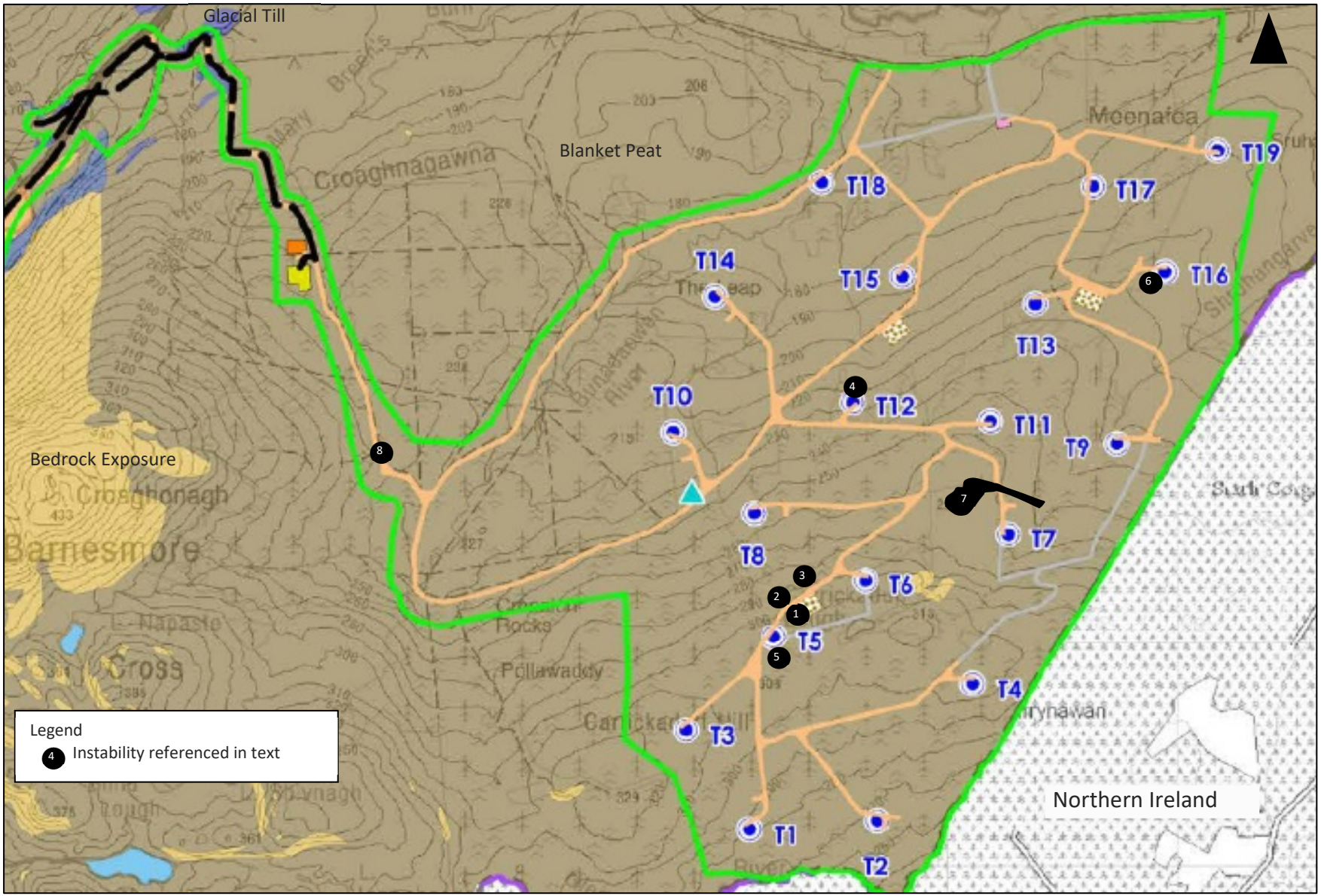


Figure 6-1: Peat failures recorded during construction



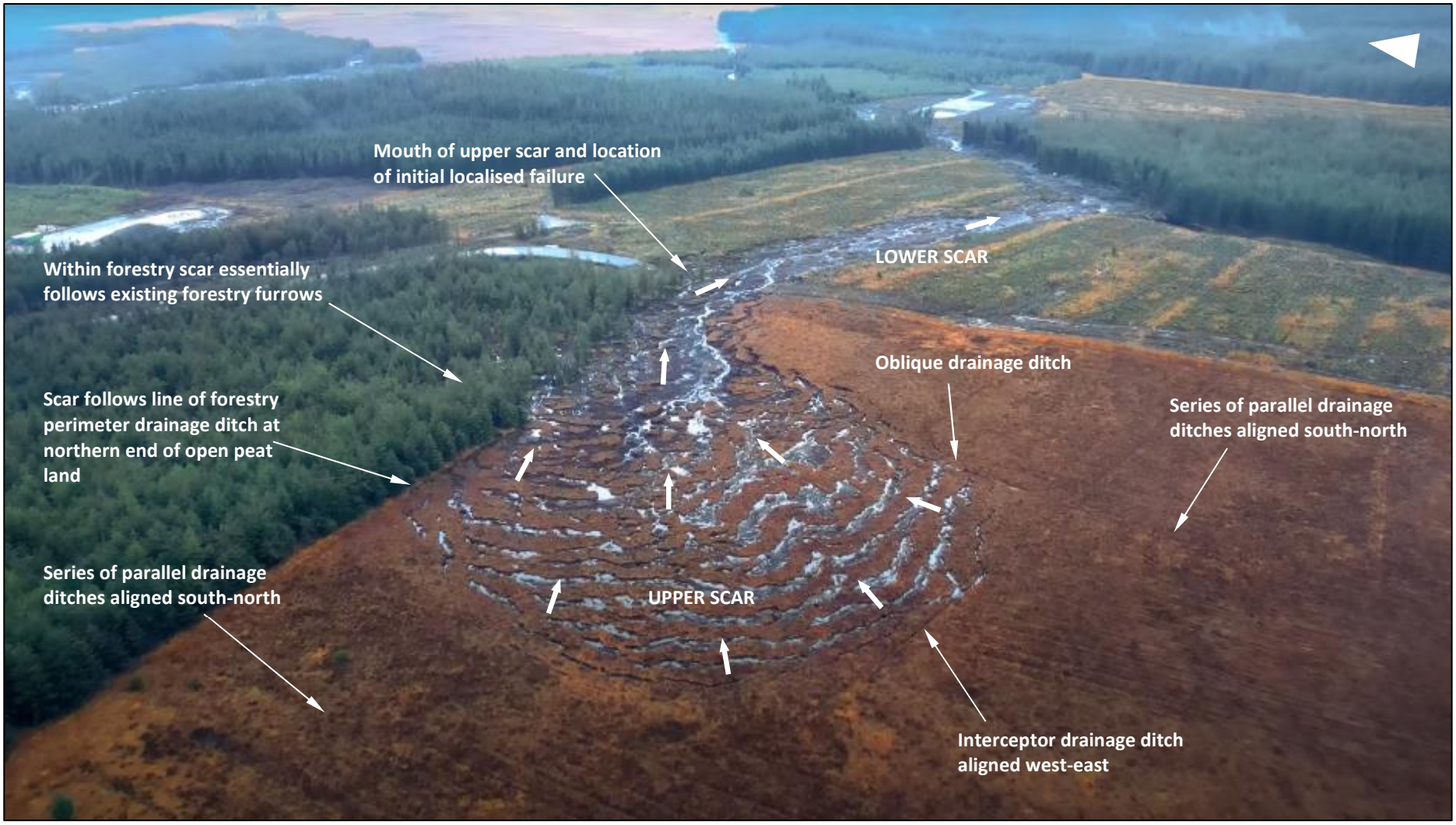
Source: MKO (2017)

Figure 6-2: Extent of November 2020 peatslide



Source: Google Earth Pro CNES/Airbus image from 20 September 2020. Copyright CNES/Airbus image

Figure 6-3: Aerial image of November 2020 peatslide



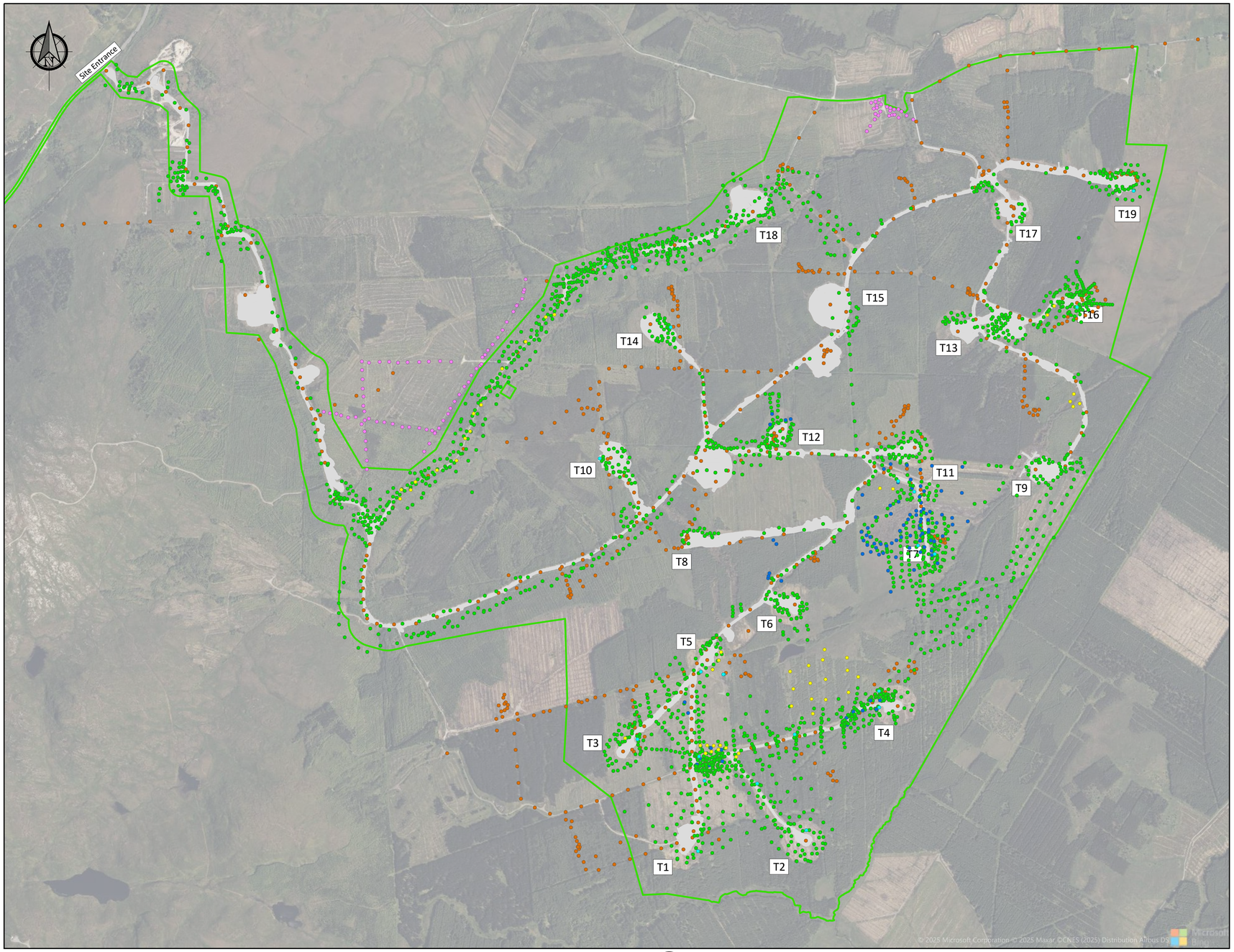
Source: Derg Media (2020)

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PLAN

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Plan Legend:

Existing Development

Wind Farm Site & Grid Connection Site Boundary

Peat Probe Legend:

- MKO AGEC Probes (pre 2020)
- Ionic Combined Probes
- Meenbog Probes (FT, 2020)
- Russian Core Peat Samples (FT, 2021)
- Meenbog Probes (FT, 2025)
- Enerco Additional (2025)

0m 100m 200m 300m 400m 500m 600m 700m 800m 900m 1000m

Scale 1:10000

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Rev.	Description	App By	Date
P01	FOR INFORMATION	BDH	20.11.25
P02	FOR INFORMATION	BDH	25.03.26
P03	FOR INFORMATION	BDH	18.06.26

PROJECT: MEENBOG WIND FARM (EXISTING DEVELOPMENT)

CLIENT: MKO

SHEET: PEAT PROBE LOCATIONS

Date: 18.06.26

Project number: P24-234

Scale (@ A1): As Shown

Drawn by: POR

Checked by: IH

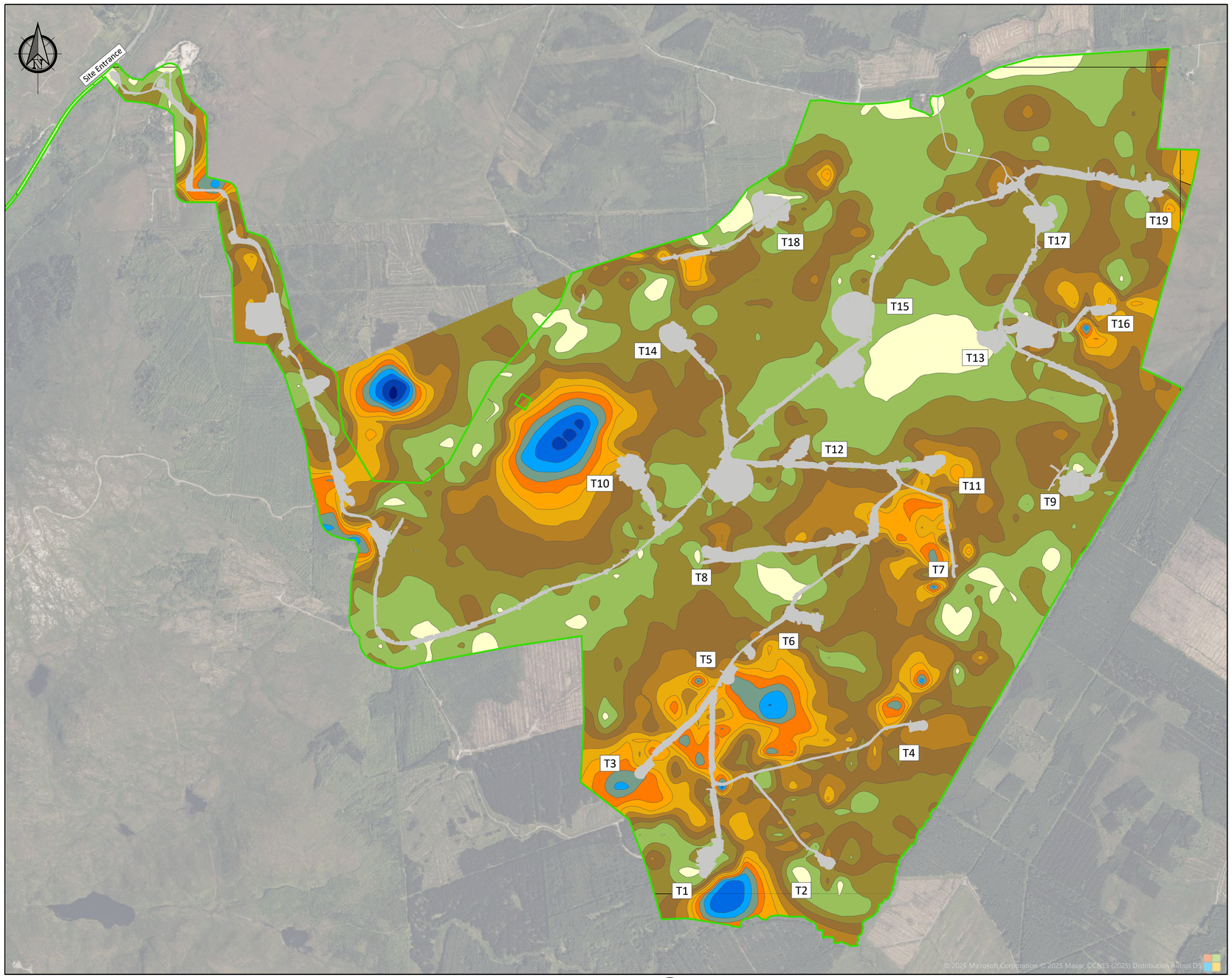
Drawing Number: P24-234-0600-0001 (Sheet set subset 0600)

Rev: P03

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18 June 2026 (O:\ACAD\2024\P24-234\P24-234-0600-0001)

.



PLAN 0001

1:10000 -

0m 100m 200m 300m 400m 500m 600m 700m 800m 900m 1000m

Scale 1:10000

Plan Legend:

Existing Development

Wind Farm Site & Grid Connection Site Boundary

Peat Depth Legend:

- ≥ 0 < 0.5
- ≥ 0.5 < 1
- ≥ 1 < 1.5
- ≥ 1.5 < 2
- ≥ 2 < 2.5
- ≥ 2.5 < 3
- ≥ 3 < 3.5
- ≥ 3.5 ≤ 4
- ≥ 4 ≤ 4.5
- ≥ 4.5 ≤ 5
- ≥ 5 ≤ 5.5
- ≥ 5.5 ≤ 6
- ≥ 6 ≤ 6.5

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Rev.	Description	App By	Date
P01	FOR INFORMATION	BDH	20.11.25
P02	FOR INFORMATION	BDH	25.03.26
P03	FOR INFORMATION	BDH	18.06.26

PROJECT

MEENBOG WIND FARM (EXISTING DEVELOPMENT)

CLIENT

MKO

SHEET

PEAT DEPTH CONTOUR PLAN

Date 18.06.26

Project number P24-234

Scale (@ A1) As Shown

Drawn by POR

Checked by IH

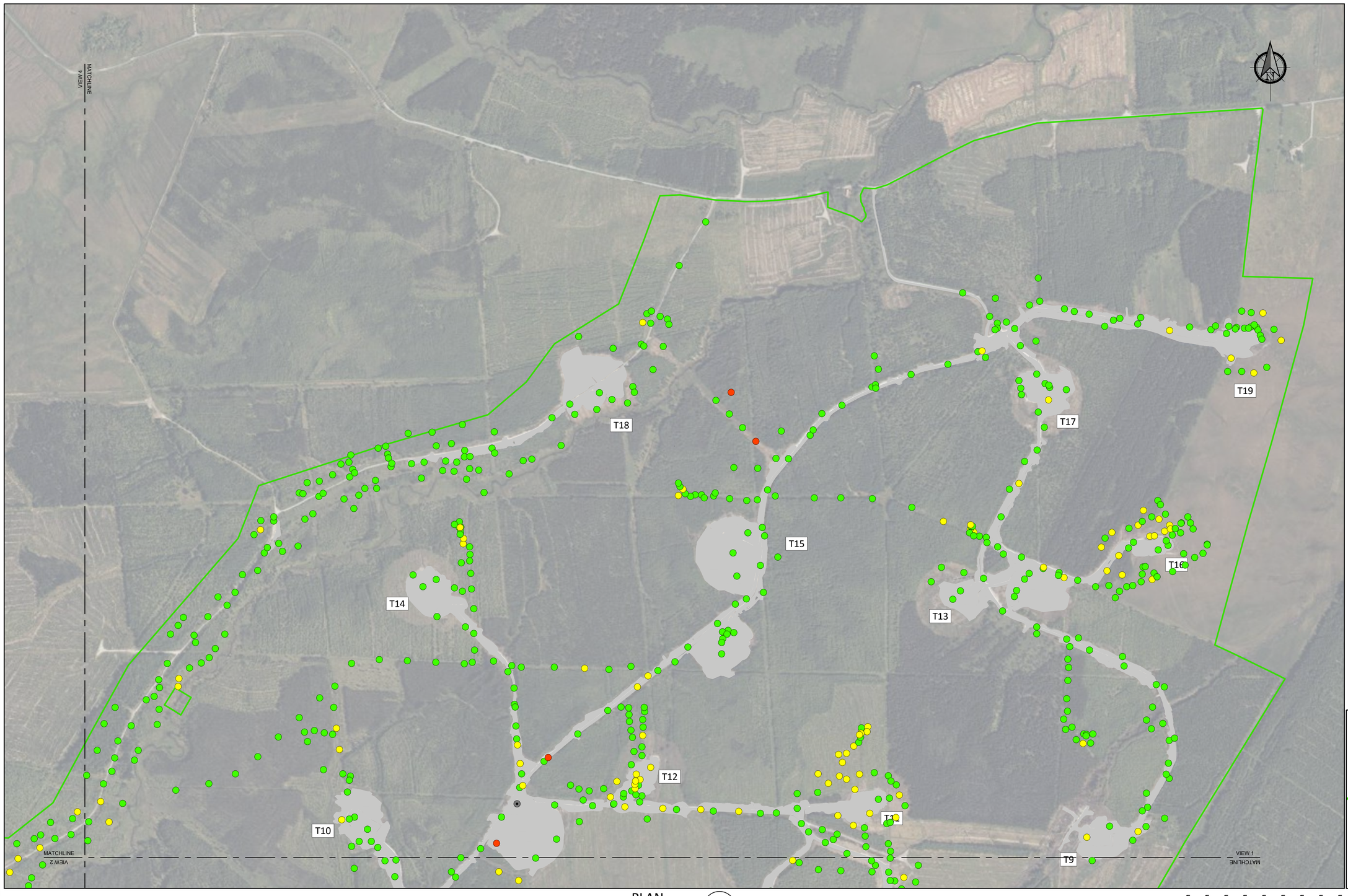
Drawing Number **P24-234-0600-0002**

(Sheet set subset 0600)

Rev **P03**

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18 June 2026 (O:\ACAD\2024\P24-234\P24-234-0600-0002)



PLAN
1:5000
0001
-

If Applicable : Tailte Éireann Licence No. CYAL50368274 © Ordnance Survey Ireland and Government of Ireland

Plan Legend:

Existing Development

Wind Farm Site & Grid Connection Site Boundary

ODF Legend:

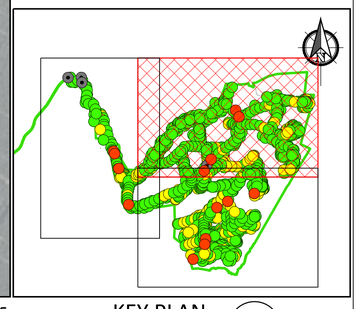
0 < 1.0

≥ 1.0 ≤ 1.5

> 1.5

Increasing Stability

No Peat Recorded
At This Location



KEY PLAN
1:60000
0001
-

0m 50m 100m 150m 200m 250m 300m 350m 400m 450m 500m

Scale 1:5000

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Rev.	Description	App By	Date
P01	FOR INFORMATION	BDH	02.12.25
P02	FOR INFORMATION	BDH	25.03.26
P03	FOR INFORMATION	BDH	18.06.26

PROJECT
MEENBOG WIND FARM (EXISTING DEVELOPMENT)

CLIENT
MKO

SHEET
ODF PLAN - UNDRAINED ANALYSIS LOAD CONDITION 2 (SHEET 1 OF 3)

Date 18.06.26
Drawn by POR
Checked by IH
Project number P24-234
Scale (@ A1) As Shown
Drawing Number P24-234-0600-0003 *(Sheet set subset 0600)*
Rev P03

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18 June 2026 (O:\ACAD\2024\P24-234\P24-234-0600-0003)

T10
T9
T8
T7
T6
T5
T4
T3
T2
T1
MATCHLINE VIEW 2
MATCHLINE VIEW 1
MATCHLINE VIEW 3
N

Plan Legend:

Existing Development

Wind Farm Site & Grid Connection Site Boundary

ODF Legend:

0 < 1.0

≥ 1.0 ≤ 1.5

> 1.5

Increasing Stability

No Peat Recorded
At This Location

PLAN
1:5000
0001
-

0m 50m 100m 150m 200m 250m 300m 350m 400m 450m 500m
Scale 1:5000

KEY PLAN
1:60000
0001
-

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Rev.	Description	App By	Date
P01	FOR INFORMATION	BDH	02.12.25
P02	FOR INFORMATION	BDH	25.03.26
P03	FOR INFORMATION	BDH	18.06.26

PROJECT
MEENBOG WIND FARM (EXISTING DEVELOPMENT)

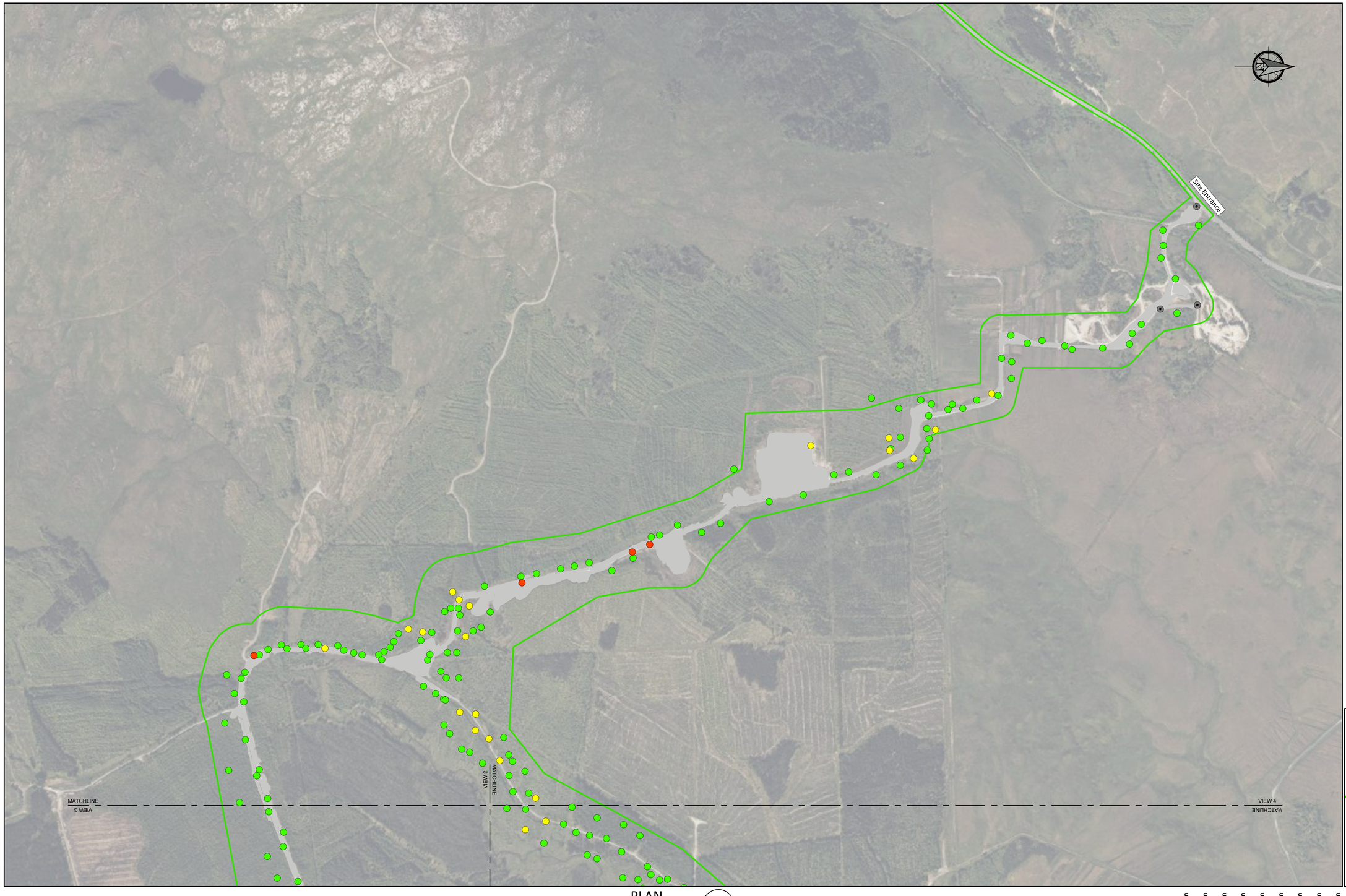
CLIENT
MKO

SHEET
ODF PLAN - UNDRAINED ANALYSIS LOAD CONDITION 2 (SHEET 2 OF 3)

Date 18.06.26
Drawn by POR
Checked by IH
Project number P24-234
Scale (@ A1) As Shown
Drawing Number **P24-234-0600-0004**
(Sheet set subset 0600)
Rev **P03**

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18 June 2026 [O:\ACAD\2024\P24-234\P24-234-0600-0004]



PLAN
1:5000
0001
-

0m 50m 100m 150m 200m 250m 300m 350m 400m 450m 500m
Scale 1:5000

Plan Legend:

Existing Development

Wind Farm Site & Grid Connection Site Boundary

ODF Legend:

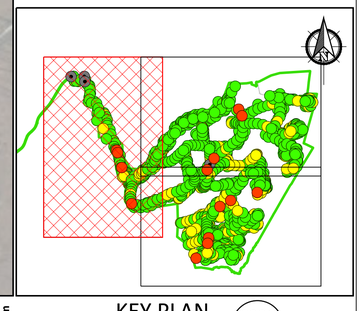
0 < 1.0

≥ 1.0 ≤ 1.5

> 1.5

Increasing Stability

No Peat Recorded
At This Location



KEY PLAN
1:60000
0001
-

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Rev.	Description	App By	Date
P01	FOR INFORMATION	BDH	02.12.25
P02	FOR INFORMATION	BDH	25.03.26
P03	FOR INFORMATION	BDH	18.06.26

PROJECT
MEENBOG WIND FARM (EXISTING DEVELOPMENT)

CLIENT
MKO

SHEET
ODF PLAN - UNDRAINED ANALYSIS LOAD CONDITION 2 (SHEET 3 OF 3)

Date 18.06.26
Drawn by POR
Checked by IH
Project number P24-234
Scale (@ A1) As Shown
Drawing Number **P24-234-0600-0005** (Sheet set subset 0600)
Rev **P03**

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18 June 2026 (O:\ACAD\2024\P24-234\P24-234-0600-0005)

T19
T18
T17
T15
T16
T14
T13
T12
T11
T10
T9
T8
T7
T6
T5

MATCHLINE VIEW 2

MATCHLINE VIEW 1

Plan Legend:

Existing Development

Wind Farm Site & Grid Connection Site Boundary

ODF Legend:

0 < 1.0

≥ 1.0 ≤ 1.5

> 1.5

Increasing Stability

No Peat Recorded
At This Location

PLAN 0001
1:5000 -

0m 50m 100m 150m 200m 250m 300m 350m 400m 450m 500m

Scale 1:5000

KEY PLAN 0001
1:60000 -

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Rev.	Description	App By	Date
P01	FOR INFORMATION	BDH	28.04.26
P02	FOR INFORMATION	BDH	18.06.26

PROJECT
MEENBOG WIND FARM (EXISTING DEVELOPMENT)

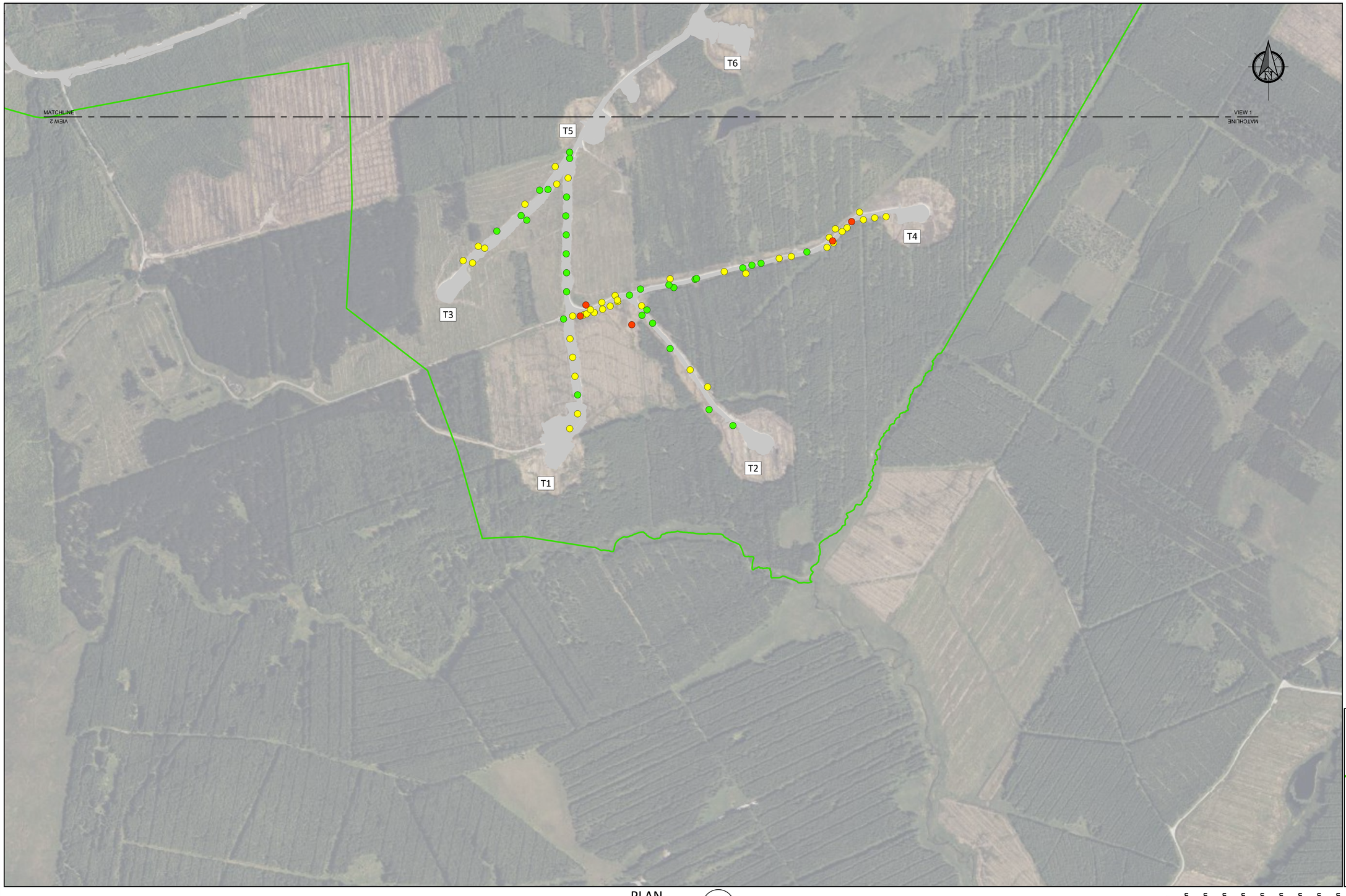
CLIENT
MKO

SHEET
ODF PLAN – UNDRAINED ANALYSIS LOAD CONDITION 4 (SHEET 1 OF 2)

Date 18.06.26
Drawn by POR
Checked by IH
Project number P24-234
Scale (@ A1) As Shown
Drawing Number P24-234-0600-0006 *(Sheet set subset 0600)*
Rev P02

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18 June 2026 (O:\ACAD\2024\P24-234\P24-234-0600-0006)



PLAN
1:5000
0001
-

Plan Legend:

Existing Development

Wind Farm Site & Grid Connection Site Boundary

ODF Legend:

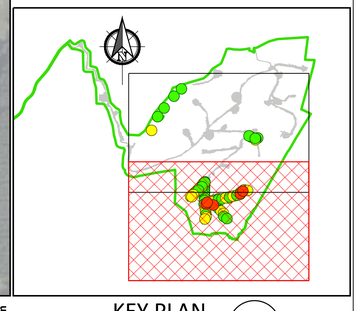
0 < 1.0

≥ 1.0 ≤ 1.5

> 1.5

Increasing Stability

No Peat Recorded
At This Location



KEY PLAN
1:60000
0001
-

0m 50m 100m 150m 200m 250m 300m 350m 400m 450m 500m

Scale 1:5000

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Rev.	Description	App By	Date
P01	FOR INFORMATION	BDH	28.04.26
P02	FOR INFORMATION	BDH	18.06.26

PROJECT
MEENBOG WIND FARM (EXISTING DEVELOPMENT)

CLIENT
MKO

SHEET
ODF PLAN – UNDRAINED ANALYSIS LOAD CONDITION 4 (SHEET 2 OF 2)

Date: 18.06.26
Project number: P24-234
Scale (@ A1): As Shown
Drawn by: POR
Checked by: IH
Drawing Number: P24-234-0600-0007
(Sheet set subset 0600)
Rev: P02

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18 June 2026 (O:\ACAD\2024\P24-234\P24-234-0600-0007)

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DESIGNING AND DELIVERING
A SUSTAINABLE FUTURE

APPENDIX A

Ground Investigation Information/Inspection Reports

Trial Pit Logs and Associated RPS Logs

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Russian Peat Sample Log

Russian Peat Sample No. T4 TP1 (RPS)

Sheet 1 of 1

Project Name: Meenbog Wind Farm	**Project No.** P20-328	**Co-ords: 08021, 84893** **Level:**	**Date:** 22/04/2021
Location: Co. Donegal		Dimensions (m):	**Scale:** N/A
Client: Planree Ltd.		Depth (m): 3.5	**Logged:** ML / AW

Water Strike	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description
	Depth	Type	Results				
							Acrotelm - not sampled
	0.50	SV (P) SV (R)	11.5 4	0.50			Very wet (much free water) very stringy very slightly decomposed, slightly amorphous very soft brown PEAT with many fine and course fibres. Von Post: H2 - H3, F3, R3, W0, Tv2, Th2, A1, P0
	1.00	SV (P) SV (R)	6 3	1.00			Very wet (free water) stringy slightly to moderately decomposed with some to considerable amorphous material very soft brown PEAT with many fine and coarse fibres. Von Post: H4 - H5, F3, R2 - R3, W0, Tv2, Th1, A1, P0
	1.50	SV (P) SV (R)	5 3	1.50			Very wet (free water) stringy slightly to moderately decomposed with some to considerable amorphous material very soft brown PEAT with many fine and some coarse fibres. Von Post: H4 - H5, F3, R2, W0, Tv2, Th1, A1, P0
	2.00	SV (P) SV (R)	5 3.5	2.00			Very wet (free water) moderately to moderately strongly decomposed with considerable amorphous material, very soft brown PEAT with some fine and occasional coarse fibres. Von Post:H5 - H6,F2 - F3,R1,W0,Tv1,Th1,A0 - A1,P0
	2.50	SV (P) SV (R)	7 3.5	2.50			Very wet (free water) strongly decomposed with highly amorphous, very soft dark brown PEAT with some fine fibres. Von Post: H7, F2, R0 - R1, W0, Tv0 - Tv1, Th0, A0 - A1, P0
	3.00	SV (P) SV (R)	10 6.5	3.00			Wet very strongly decomposed with highly amorphous, very soft dark brown PEAT with some fine fibres and occasional shrub fragments. Von Post: H8, F2, R0, W0 (n1), Tv0, Th0, A1, P1
				3.30			Almost completely decomposed with amorphous very soft black PEAT. Von Post: H9, F1, R0, W0 (N0), Tv0, Th0, A1, P1
	3.50	SV (P) SV (R)	8 6	3.50			End of sample at 3.50m
	4.00	SV (P) SV (R)	10 6				

Remarks: Russian Peat sample taken in centre of trial pit (T4-TP1) as log of the trial pit.

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Russian Peat Sample Log

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Russian Peat Sample No. T7 TP1 (RPS)

Sheet 1 of 1

Project Name: Meenbog Wind Farm	**Project No.** P20-328	**Co-ords:** O8198, 85554 **Level:**	**Date:** 22/04/2021
Location: Co. Donegal		Dimensions (m):	**Scale:** N/A
Client: Planree Ltd.		Depth (m): 3.5	**Logged:** ML / AW

Water Strike	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description
	Depth	Type	Results				
							Acrotelm - not sampled
	0.50	SV (P) SV (R)	9.5 2	0.50			Wet stringy very slightly decomposed, slightly amorphous very soft brown PEAT with many fine and course fibres. Von Post: H2 - H3, F3, R3, W0, Tv2, Th2, A1, P0
	1.00	SV (P) SV (R)	4 1	1.00			Slightly to moderately decomposed with some to considerable amorphous material very soft brown PEAT with many fine and coarse fibres. Von Post: H4, F3, R2, W0, Tv2, Th1, A1, P1
	1.50	SV (P) SV (R)	3.5 1	1.50			Slightly becoming moderately decomposed with some to considerable amorphous material very soft brown PEAT with some fine and occasional coarse fibres. Von Post: H4 - H5, F2, R1, W0, Tv1, Th1, A2, P0
	2.00	SV (P) SV (R)	5 3.5	2.00			Strongly decomposed highly amorphous very soft brown PEAT with some fine fibres. Von Post: H7, F2, R0, W0, Tv1, Th0, A2, P1
	2.50	SV (P) SV (R)	6 4.5	2.50			Very strongly to almost completely decomposed, highly amorphous, very soft dark brown PEAT with occasional fine fibres. Von Post: H8 - H9, F1, R0, W0, Tv0 - Tv1, Th0 - Th1, A1, P1
	3.00	SV (P) SV (R)	8.5 4.5	3.00			Almost completely decomposed, amorphous very soft black PEAT. Von Post: H9, F0, R0, W0, Tv0, Th0, A1, P1
	3.50	SV (P) SV (R)	11 7	3.50			End of sample at 3.50m

Remarks: Russian Peat sample taken in centre of trial pit (T7-TP1) as log of the trial pit.

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Russian Peat Sample Log

Russian Peat Sample No. T18 TP2 (RPS)

Sheet 1 of 1

Project Name: Meenbog Wind Farm	Meenbog Wind Farm	**Co-ords: 06901, 86820** **Level:**	**Date:** 22/04/2021
Location: Co. Donegal		Dimensions (m):	**Scale:** N/A
Client: Planree Ltd.		Depth (m): 1.5	**Logged:** ML / AW

Water Strike	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description
	Depth	Type	Results				
							Acrotelm - not sampled
				0.50			Dry, very soft brown moderately decomposed with considerable amorphous material PEAT with many fine and some coarse fibres. Von Post: H4, F3, R2, W0, Tv1, Th1, A1, P1
				0.80			Very soft brown Slightly decomposed with some amorphous material PEAT with many fine and occasional coarse fibres. Von Post: H3, F3, R1, W2, Tv1, Th1, A1, P1
				1.50			End of sample at 1.50m

Remarks: Russian Peat sample taken in centre of trial pit (T18-TP2) as log of the trial pit.

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Russian Peat Sample Log

Russian Peat Sample No. T5 TP1 (RPS)

Sheet 1 of 1

Project Name: Meenbog Wind Farm	**Project No.** P20-328	**Co-ords: 07317, 84969** **Level:**	**Date:** 22/04/2021
Location: Co. Donegal		Dimensions (m):	**Scale:** N/A
Client: Planree Ltd.		Depth (m): 3.5	**Logged:** ML / AW

Water Strike	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description
	Depth	Type	Results				
							Acrotelm - not sampled
	0.50	SV (P) SV (R)	6 3.5	0.50			Very soft brown very wet stringy insignificantly decomposed, PEAT with many fine and coarse fibres. Von Post: H2, F3, R3, W0, Tv3, Th1, A2, P0
	1.00	SV (P) SV (R)	6.5 4.5	1.00			Very soft brown very wet very slightly decomposed slightly amorphous PEAT with many fine and coarse fibres. Von Post: H2-H3, F3, R3, W0, Tv2, Th1, A1, P0
	1.50	SV (P) SV (R)	2.5 1	1.50			Very soft brown very Slightly to slightly decomposed with slight to some amorphous material PEAT with some fine and occasional coarse fibres . Von Post: H3 - H4, F2, R1, W0, Tv1, Th0, A1, P0
	2.00	SV (P) SV (R)	5 3	2.00			Very soft brown moderately decomposed with considerable amorphous material PEAT with some fine and occasional coarse fibres. Von Post: H5, F2, R1, W0, Tv0, Th0, A1, P1
	2.50	SV (P) SV (R)	4 4	2.50			Very soft dark brown moderately to moderately strongly decomposed, considerably amorphous, PEAT with some fine and occasional coarse fibres. Von Post: H5 - H6, F2, R1, W1, Tv1, Th0, A1, P1
	3.00	SV (P) SV (R)	5.5 4	3.00			Very soft brown moderately decomposed with some amorphous material PEAT with many fine and occasional coarse fibres. Von Post: H4, F3, R1, W0, Tv0, Th0, A0, P1
	3.50	SV (P) SV (R)	5.5 2.5	3.50			Very soft brown Moderately decomposed with some amorphous material PEAT with many fine and some coarse fibres. Von Post: H4, F3, R2, W0, Tv1, Th0, A0, P1
	4.00	SV (P) SV (R)	7 4.5	4.00			End of sample at 4.00m

Remarks: Russian Peat sample taken in centre of trial pit (T5-TP1) as log of the trial pit.

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Trial Pit Log

Trial Pit No. T4 - TP1

Sheet 1 of 1

Project Name: Meenbog Wind Farm	**Project No.** P20-328	**Co-ords: 08021, 84893** **Level:**	**Date:** 22/04/2021
Location: Co. Donegal		Dimensions (m): 1.0	**Scale:** N/A
Client: Planree Ltd.		Depth (m): 1.5 3.0	**Logged:** ML / AW

Water Strike	Samples and In Situ Testing: Depth	Type	Results	Depth (m)	Level (m)	Legend	Stratum Description
							Acrotelm - vegetation and roots, very wet very fibrous very soft brown PEAT.
	0.5 - 1	U100		0.50			Very wet, very fibrous (stringy), very soft brown PEAT.
	0.8 - 1.2	U100		1.00			
				1.50			End of pit at 1.50m

Remarks Pit located on a flat area, within a fire break, no trees or tree roots. Vegetation mainly grass and some heather. Likely the area has been previously tracked. Acrotelm cut parallel to pit at 1.0m and 2.0m distance from edge of pit. Movement approx. 200mm at 1.0m and 100mm at 2.0m. Notable movement of peat surface due to action of excavator. For detailed log of trial pit refer to Russian Peat Sample T4-TP1

Stability Pit partially failed at 1.50m. Material coming up from base (upwelling), no depth progress beyond 1.30 - 1.50m with continuing excavation. Side walls slumping. Ground level slumped approx. 400mm.

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Trial Pit Log

Trial Pit No. T7 - TP1

Sheet 1 of 1

Project Name: Meenbog Wind Farm	**Project No.** P20-328	**Co-ords: 07314, 84969** **Level:**	**Date:** 22/04/2021
Location: Co. Donegal		Dimensions (m): 1.0	**Scale:** N/A
Client: Planree Ltd.		Depth (m): 1.5 - 1.7 4.0	**Logged:** ML / AW

Water Strike	Samples and In Situ Testing Depth	Type	Results	Depth (m)	Level (m)	Legend	Stratum Description
	0.5 - 0.9	U100		0.50			Acrotelm - vegetation and roots, very wet very fibrous very soft wet brown PEAT.
	0.9 - 1.2	U100		1.00			Very soft fibrous/amphous PEAT.
	1.2 - 1.6	U100		1.50			End of pit at 1.50m - 1.70m

Remarks: Pit located greater 50m from T5 due the significant peat failure around/uphill of T5. Pit located in flattist area. No trees or tree roots. Vegetation mainly heather with some grass. Acrotelm cut parallel to pit at 0.5m and 1.0m and in an arc from the TP. For detailed log of trial pit refer to Russian Peat Sample T5-TP1

Stability: Pit partially failed at approx. 1.50m - 1.70m. Material coming up from base (upwelling), no depth progress much beyond 1.50m with continuing excavation. Side walls slumping. Ground Level slumped approx. 500mm.

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RPS Logs at Turbine Locations

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Russian Peat Sample Log

Russian Peat Sample No. RPS-T1-1

Sheet 1 of 1

Project Name: Meenbog Wind Farm	**Project No.** P20-328	**Co-ords: 07199, 84166** **Level:**	**Date:** 26/04/2021
Location: Co. Donegal		Dimensions (m):	**Scale:** N/A
Client: Planree Ltd.		Depth (m): 2.5	**Logged:** ML

Water Strike	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description
	Depth	Type	Results				
							Acrotelm - not sampled
	0.5	SV (P) SV (R)	14 3	0.50			Very soft brown very wet insignificantly decomposed fibrous PEAT with many fine and coarse fibres Von Post: H2, F3, R3, W0, Tv3, Th3, A1, P0
	1	SV (P) SV (R)	12 4	1.00			Very soft light brown very wet insignificantly to very slightly decomposed fibrous to slightly amorphous PEAT with many fine and coarse fibres . Von Post: H2-H3, F3, R3, W0, Tv3, Th2, A2, P0
	1.5	SV (P) SV (R)	11 5	1.50			Very soft light brown very wet very slightly decomposed slightly amorphous PEAT with many fine and coarse fibres and reeds . Von Post: H3, F3, R3, W1, Tv3, Th2, A0, P1
	2	SV (P) SV (R)	11 4	2.00			Very soft brown very wet very slightly to slightly decomposed slightly to some amorphous material PEAT with many fine and some coarse fibres and reeds and shrub fragments. Von Post: H3-H4, F2, R2, N1, Tv2, Th1, A1, P0
	2.5	SV (P) SV (R)	10 5	2.50			End of sample at 2.50m

Remarks: Disturbed ground - tree roots, base of sharp rise. Shear vane refused at 2.50m.

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Russian Peat Sample Log

Russian Peat Sample No. RPS-T1-2

Sheet 1 of 1

Project Name: Meenbog Wind Farm	**Project No.** P20-328	**Co-ords: 07229, 84486** **Level:**	**Date:** 26/04/2021
Location: Co. Donegal		Dimensions (m):	**Scale:** N/A
Client: Planree Ltd.		Depth (m): 1.6	**Logged:** ML

Water Strike	Samples and In Situ Testing Depth	Type	Results	Depth (m)	Level (m)	Legend	Stratum Description
							Acrotelm - not sampled
	0.5	SV (P) SV (R)	6 2	0.50			Very soft brown moderately decomposed with considerable amorphous material PEAT with many fine and some coarse fibres Von Post: H5, F3, R2, W0, Tv2, Th2, A1, P1
	1	SV (P) SV (R)	5 2	1.00			Very soft dark brown moderately strongly to strongly decomposed considerably to highly amorphous PEAT with some fine and occasional coarse fibres. Von Post: H6-H7, F3, R2, W0, Tv2, Th1, A0, P1
	1.5	SV (P) SV (R)	14 4	1.50			Very soft very dark brown to black very strongly to near completely decomposed very highly amorphous PEAT with some fine and occasional coarse fibres. Von Post: H8-H9, F2, R1, W0, Tv1, Th0, A0, P1
							End of sample at 1.60m

Remarks: Disturbed ground - tree roots, very wet underfoot. Shear vane refused at 1.6m.

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Russian Peat Sample Log

Russian Peat Sample No. RPS-T2-1

Sheet 1 of 1

Project Name: Meenbog Wind Farm	**Project No.** P20-328	**Co-ords: 07468, 84473** **Level:**	**Date:** 26/04/2021
Location: Co. Donegal		Dimensions (m):	**Scale:** N/A
Client: Planree Ltd.		Depth (m): 2.0	**Logged:** ML

Water Strike	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description
	Depth	Type	Results				
							Acrotelm - not sampled
	0.5	SV (P) SV (R)	8 3	0.50			Very soft brown slightly to moderately decomposed with some to considerable amorphous material PEAT with many fine and many coarse fibres Von Post: H4-H5, F3, R3, W0, Tv3, Th2, A2, P1
	1	SV (P) SV (R)	6 3.5	1.00			Very soft brown slightly decomposed with some amorphous material PEAT with many fine and many coarse fibres . Von Post: H4, F3, R3, W0, Tv2, Th1, A1, P1
	1.5	SV (P) SV (R)	9 4	1.50			Very soft light brown moderately strongly decomposed considerably amorphous PEAT with some fine and occasional coarse fibres. Von Post: H5, F2, R1, W0, Tv1, Th0, A1, P1
	2	SV (P) SV (R)	12.5 8	1.90 2			Very soft very dark brown strongly decomposed highly amorphous PEAT with some fine and occasional coarse fibres. Von Post: H7, F2, R1, W0, Tv1, Th0, A1, P1
							End of sample at 2.00m

Remarks: Disturbed ground - tree roots, between forestry and road side castings. Shear vane refused at 2.20m.

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Russian Peat Sample Log

Russian Peat Sample No. RPS-T2-2

Sheet 1 of 1

Project Name: Meenbog Wind Farm	**Project No.** P20-328	**Co-ords: 07691, 84261** **Level:**	**Date:** 26/04/2021
Location: Co. Donegal		Dimensions (m):	**Scale:** N/A
Client: Planree Ltd.		Depth (m): 2.0	**Logged:** ML

Water Strike	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description
	Depth	Type	Results				
							Acrotelm - not sampled
	0.5	SV (P) SV (R)	6 2.5	0.50			Very soft brown very slightly decomposed slightly amorphous PEAT with many fine and many coarse fibres. Von Post: H3, F3, R3, W0, Tv3, Th3, A1, P1
	1	SV (P) SV (R)	5 2.5	1.00			Very soft brown moderately to moderately strongly decomposed with considerable amorphous material PEAT with many fine and some coarse fibres. Von Post: H5-H6, F3, R2, W0, Tv2, Th1, A0, P1
	1.5	SV (P) SV (R)	7 3.5	1.50			Very soft very dark brown strongly decomposed highly amorphous PEAT with some fine and occasional wood fragments. Von Post: H7, F2, R0, W1, Tv0, Th0, A1, P1
	2	SV (P) SV (R)	14 6	1.80 2			Very soft very dark brown to black very strongly to near completely decomposed very highly amorphous PEAT with occasional fine fibres. Von Post: H8-H9, F2, R0, W0, Tv0, Th0, A1, P1
							End of sample at 2.00m

Remarks: Disturbed ground - tree roots. Shear vane refused at 2.05m.

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Russian Peat Sample Log

Russian Peat Sample No. RPS-T3-1

Sheet 1 of 1

Project Name: Meenbog Wind Farm	**Project No.** P20-328	**Co-ords: 06924, 84674** **Level:**	**Date:** 23/04/2021
Location: Co. Donegal		Dimensions (m):	**Scale:** N/A
Client: Planree Ltd.		Depth (m): 3.5	**Logged:** ML / AW

Water Strike	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description
	Depth	Type	Results				
							Acrotelm - not sampled
	0.5	SV (P) SV (R)	5 3.5	0.50			Very soft brown very slightly decomposed slightly amorphous PEAT with many fine and coarse fibres. Von Post: H2-H3, F3, R3, W0, Tv3, Th3, A0, P0
	1	SV (P) SV (R)	4 2.5	1.00			Very soft brown slightly decomposed with some amorphous material PEAT with many fine and some coarse fibres . Von Post: H4, F3, R2, W0, Tv1, Th1, A1, P0
	1.5	SV (P) SV (R)	4.5 3	1.50			Very soft brown slightly to moderately decomposed with some to considerable amorphous material PEAT with many fine and occasional coarse fibres . Von Post: H4-H5, F3, R1, W0, Tv1, Th0, A1, P1
	2	SV (P) SV (R)	9 4.5	2.00			Very soft brown moderately to moderately strongly decomposed with considerable amorphous material PEAT with many fine and occasional coarse fibres. Von Post: H5-H6, F3, R1, W0, Tv1, Th1, A1, P1
	2.5	SV (P) SV (R)	6.5 3.5	2.50			Very soft dark brown strongly to very strongly decomposed, considerably to highly amorphous, PEAT with some fine and occasional woody shrub fragments. . Von Post: H7-H8, F2, R0, N1, Tv0, Th0, A0, P1
	3	SV (P) SV (R)	9 6	3.00			Very soft brown Very strongly to near completely decomposed amorphous PEAT with some fine fibres. Von Post: H8-H9, F2, R0, W0, Tv0, Th0, A1, P1
	3.25	SV (P) SV (R)	10 7	3.50			End of sample at 3.50m

Remarks: Relatively undisturbed ground. Shear vane refused at 3.30m

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Russian Peat Sample Log

Russian Peat Sample No. RPS-T3-2

Sheet 1 of 1

Project Name: Meenbog Wind Farm	**Project No.** P20-328	**Co-ords: 07199, 84166** **Level:**	**Date:** 26/04/2021
Location: Co. Donegal		Dimensions (m):	**Scale:** N/A
Client: Planree Ltd.		Depth (m): 2.5	**Logged:** ML

Water Strike	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description
	Depth	Type	Results				
							Acrotelm - not sampled
	0.5	SV (P) SV (R)	10 4	0.50			Very soft brown very slightly decomposed slightly amorphous PEAT with many fine and coarse fibres. Von Post: H3, F3, R3, W0, Tv3, Th3, A0, P1
	1	SV (P) SV (R)	7.5 4	1.00			Very soft brown slightly to moderately decomposed with some to considerable amorphous material PEAT with many fine and some coarse fibres. Von Post: H4-H5, F3, R2, W0, Tv2, Th1, A1, P1
	1.5	SV (P) SV (R)	9 5	1.50			Very soft brown moderately to moderately strongly decomposed with considerable amorphous material PEAT with many fine and occasional coarse fibres. Von Post: H5-H6, F3, R1, W0, Tv1, Th0, A1, P1
	2	SV (P) SV (R)	10 6	2.00			Very soft dark brown strongly decomposed, highly amorphous, PEAT with occasional fine fibres. Von Post: H7, F1-2, R0, Tv1, Th0, A0, P1
	2.5	SV (P) SV (R)	9 5	2.25			Very soft very dark brown very strongly to near completely decomposed amorphous PEAT with occasional fine and coarse fibres Von Post: H8-H9, F1, R1, W0, Tv0, Th0, A1, P1
				2.50			End of sample at 2.50m

Remarks: Disturbed ground - tree roots. Shear vane refused at 2.65m.

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Russian Peat Sample Log

Russian Peat Sample No. RPS-T4-1

Sheet 1 of 1

Project Name: Meenbog Wind Farm	**Project No.** P20-328	**Co-ords: 07204, 84596** **Level:**	**Date:** 26/04/2021
Location: Co. Donegal		Dimensions (m):	**Scale:** N/A
Client: Planree Ltd.		Depth (m): 4.0	**Logged:** ML / AW

Water Strike	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description
	Depth	Type	Results				
							Acrotelm - not sampled
	0.5	SV (P) SV (R)	6.5 3	0.50			Very soft light brown very slightly decomposed slightly amorphous PEAT with many fine and some fibres and reeds. Von Post: H3, F3, R3, W0, Tv3, Th2, A1, P0
	1	SV (P) SV (R)	5.5 2.5	1.00			Very soft brown slightly to moderately decomposed with some to considerable amorphous material PEAT with some fine and occasional coarse fibres. Von Post: H4-H5, F3, R1, W0, Tv2, Th1, A1, P1
	1.5	SV (P) SV (R)	4.5 3	1.50			Very soft brown slightly to moderately decomposed with some to considerable amorphous material PEAT with many fine and occasional coarse fibres. Von Post: H4-H5, F2, R1, W0, Tv1, Th1, A0, P1
	2	SV (P) SV (R)	5 3	2.00			Very soft brown moderately to moderately strongly decomposed with considerable amorphous material PEAT with many fine and occasional coarse fibres. Von Post: H5-H6, F3, R1, W0, Tv1, Th1, A1, P1
	2.5	SV (P) SV (R)	5 2.5	2.50			Very soft brown very slightly decomposed slightly amorphous PEAT with many fine and many coarse fibres. Von Post: H5-H6, F2, R1, W0, Tv1, Th1, A1, P1
	3	SV (P) SV (R)	5.5 3	3.00			Very soft brown very wet slightly to moderately decomposed with some to considerable amorphous material PEAT with some fine and occasional coarse fibres. Von Post: H4-H5, F2, R1, W1, Tv1, Th1, A0, P1
	3.5	SV (P) SV (R)	9 6.5	3.50			Very soft brown slightly to moderately strongly decomposed with some to considerable amorphous material PEAT with some fine and occasional coarse fibres. Von Post: H4-H6, F2, R1, W1, Tv0, Th0, A1, P1
	4	SV (P) SV (R)	13 6.5	4.00			End of sample at 4.00m

Remarks: Relatively undisturbed ground. Shear vane refused at 4.30m

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Russian Peat Sample Log

Russian Peat Sample No. RPS-T4-2

Sheet 1 of 1

Project Name: Meenbog Wind Farm	**Project No.** P20-328	**Co-ords: 07638, 84696** **Level:**	**Date:** 26/04/2021
Location: Co. Donegal		Dimensions (m):	**Scale:** N/A
Client: Planree Ltd.		Depth (m): 2.0	**Logged:** ML

Water Strike	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description
	Depth	Type	Results				
							Acrotelm - not sampled
	0.5	SV (P) SV (R)	11.5 4	0.50			Very soft brown very wet slightly decomposed with some amorphous material PEAT with many fine and many coarse fibres. Von Post: H4, F3, R3, W0, Tv3, Th3, A0, P1
	1	SV (P) SV (R)	7 4	1.00			Very soft brown moderately decomposed with considerable amorphous material PEAT with many fine and some coarse fibres. Von Post: H5, F3, R2, W0, Tv2, Th2, A1, P1
	1.5	SV (P) SV (R)	6.6 3.5	1.50			Very soft light brown moderately strongly decomposed considerably amorphous PEAT with some fine and occasional coarse fibres. Von Post: H6, F2, R1, W0, Tv1, Th0, A1, P1
	2	SV (P) SV (R)	14 4	1.80			Very soft very dark brown to black very strongly to near completely decomposed very highly amorphous PEAT with occasional fine fibres. Von Post: H8-H9, F1, R0, W0, Tv0, Th0, A0, P1
				2			End of sample at 2.00m

Remarks: Relatively undisturbed ground. Shear vane refused at 2.05m

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Russian Peat Sample Log

Russian Peat Sample No. RPS-T4-3

Sheet 1 of 1

Project Name: Meenbog Wind Farm	**Project No.** P20-328	**Co-ords: 08022, 84819** **Level:**	**Date:** 26/04/2021
Location: Co. Donegal		Dimensions (m):	**Scale:** N/A
Client: Planree Ltd.		Depth (m): 2.0	**Logged:** ML

Water Strike	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description
	Depth	Type	Results				
							Acrotelm - not sampled
	0.5	SV (P) SV (R)	13 5	0.50			Very soft brown very slightly decomposed slightly amorphous PEAT with many fine and many coarse fibres. Von Post: H3, F3, R3, W0, Tv3, Th3, A0, P0
	1	SV (P) SV (R)	8 4	1.00			Very soft brown slightly to moderately decomposed with some to considerable amorphous material PEAT with many fine and occasional coarse fibres. Von Post: H4-H5, F3, R1, W0, Tv2, Th1, A1, P1
	1.5	SV (P) SV (R)	7 4.5	1.50			Very soft light brown moderately strongly decomposed considerably amorphous PEAT with some fine and occasional coarse fibres . Von Post: H6, F2, R1, W0, Tv1, Th0, A1, P1
	2	SV (P) SV (R)	8 4				End of sample at 2.00m

Remarks: Tree roots. Shear vane refused at 2.05m.

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Russian Peat Sample Log

Russian Peat Sample No. RPS-T5-1

Sheet 1 of 1

Project Name: Meenbog Wind Farm	**Project No.** P20-328	**Co-ords: 07212, 84981** **Level:**	**Date:** 27/04/2021
Location: Co. Donegal		Dimensions (m):	**Scale:** N/A
Client: Planree Ltd.		Depth (m): 2.9	**Logged:** ML / AW

Water Strike	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description
	Depth	Type	Results				
							Acrotelm - not sampled
	0.5	SV (P) SV (R)	20 7.5	0.50			Very soft wet brown very slightly decomposed slightly amorphous PEAT with many fine and many coarse fibres. Von Post: H3, F3, R3, W0, Tv3, Th2, A0, P0
	1	SV (P) SV (R)	6.5 3.5	1.00			Very soft wet brown slightly decomposed with some amorphous material PEAT with many fine and some coarse fibres. Von Post: H4, F3, R2, W0, Tv2, Th2, A0, P1
	1.5	SV (P) SV (R)	5 3	1.50			Very soft brown wet moderately to moderately strongly decomposed with considerable amorphous material PEAT with many fine and occasional coarse fibres and shrub fragments. Von Post: H5-H6, F3, R1, N1, Tv1, Th0, A0, P1
	2	SV (P) SV (R)	5 3	2.00			Very soft dark brown moderately strongly to strongly decomposed considerably to highly amorphous PEAT with some fine fibres. Von Post: H6-H7, F2, R0, W0, Tv0, Th0, A1, P1
	2.5	SV (P) SV (R)	5.5 4	2.50			Very soft very dark brown to black near completely decomposed amorphous PEAT. Von Post: H9, F0, R0, W0, Tv0, Th0, A0, P1
	2.95	SV (P) SV (R)	12.5 7	2.90			End of sample at 2.90m

Remarks: Tree stumps. Shear vane refused at 2.95m

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Russian Peat Sample Log

Russian Peat Sample No. RPS-T7-1

Sheet 1 of 1

Project Name: Meenbog Wind Farm	**Project No.** P20-328	**Co-ords: 08274, 08515** **Level:**	**Date:** 26/04/2021
Location: Co. Donegal		Dimensions (m):	**Scale:** N/A
Client: Planree Ltd.		Depth (m): 2.0	**Logged:** ML

Water Strike	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description
	Depth	Type	Results				
							Acrotelm - not sampled
	0.5	SV (P) SV (R)	13.5 4	0.50			Very soft brown very slightly to slightly decomposed slightly amorphous PEAT with many fine and many coarse fibres. Von Post: H3-H4, F3, R3, W0, Tv3, Th3, A1, P1
	1	SV (P) SV (R)	8.5 5	1.00			Very soft brown slightly to moderately strongly decomposed with some to considerable amorphous material PEAT with many fine and occasional coarse fibres. Von Post: H4-H6, F3, R1, W0, Tv1, Th1, A0, P1
	1.5	SV (P) SV (R)	10 5.5	1.50			Very soft very dark brown strongly decomposed highly amorphous PEAT with some fine and occasional coarse fibres. Von Post: H7, F3, R1, W0, Tv1, Th0, A1, P1
	2	SV (P) SV (R)	14 6				End of sample at 2.00m

Remarks: Tree roots. Shear vane refused at 2.05m.

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Russian Peat Sample Log

Russian Peat Sample No. RPS-T7-2

Sheet 1 of 1

Project Name: Meenbog Wind Farm	**Project No.** P20-328	**Co-ords:** 08181, 85798 **Level:**	**Date:** 26/04/2021
Location: Co. Donegal		Dimensions (m):	**Scale:** N/A
Client: Planree Ltd.		Depth (m): 3.0	**Logged:** ML / AW

Water Strike	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description
	Depth	Type	Results				
							Acrotelm - not sampled
	0.5	SV (P) SV (R)	18 8.5	0.50			Very soft brown very slightly decomposed slightly amorphous PEAT with many fine and many coarse fibres. Von Post: H3, F3, R3, W0, Tv3, Th3, A1, P0
	1	SV (P) SV (R)	7.5 4.5	1.00			Very soft brown slightly decomposed with some amorphous material PEAT with many fine and some coarse fibres Von Post: H4, F3, R2, W0, Tv2, Th1, A1, P1
	1.5	SV (P) SV (R)	6 4	1.50			Very soft brown moderately strongly decomposed considerably amorphous PEAT with some fine and occasional coarse fibres. Von Post: H5, F2, R1, W0, Tv1, Th0, A1, P1
	2	SV (P) SV (R)	6 4	2.00			Very soft dark brown moderately strongly to strongly decomposed considerably to highly amorphous PEAT with some fine fibres. Von Post: H6-H7, F2, R0, W0, Tv0, Th0, A1, P1
	2.5	SV (P) SV (R)	4 2	2.50			Very soft very dark brown strongly decomposed highly amorphous PEAT with some fine fibres. Very wet 2.75m Von Post: H7, F2, R0, W0, Tv1, Th0, A1, P1
	3	SV (P) SV (R)	11 6	2.75 3			Very soft very dark brown to black near completely decomposed amorphous PEAT with occasional fine fibres. Von Post: H9, F1, R0, W0, Tv0, Th0, A1, P1
							End of sample at 3.00m

Remarks: Shear vane refused at 3.00m

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Russian Peat Sample Log

Russian Peat Sample No. RPS-T7-3

Sheet 1 of 1

Project Name: Meenbog Wind Farm	**Project No.** P20-328	**Co-ords:** 08108, 85846 **Level:**	**Date:** 26/04/2021
Location: Co. Donegal		Dimensions (m):	**Scale:** N/A
Client: Planree Ltd.		Depth (m): 3.2	**Logged:** ML / AW

Water Strike	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description
	Depth	Type	Results				
							Acrotelm - not sampled
	0.5	SV (P) SV (R)	10 4	0.50			Very soft brown very slightly decomposed slightly amorphous PEAT with many fine and many coarse fibres. Von Post: H3, F3, R3, W0, Tv3, Th3, A1, P1
	1	SV (P) SV (R)	8 5	1.00			Very soft brown very slightly to slightly decomposed slightly amorphous PEAT with many fine and occasional coarse fibres. Von Post: H3-H4, F3, R1, W0, Tv2, Th1, A1, P1
	1.5	SV (P) SV (R)	2 1	1.50			Very soft brown moderately strongly decomposed considerably amorphous PEAT with many fine and occasional coarse fibres and some small wood fragments. Von Post: H5, F3, R1, W1, Tv1, Th1, A1, P1
	2	SV (P) SV (R)	3 1	2.00			Very soft brown moderately strongly decomposed considerably amorphous PEAT with some fine and occasional coarse fibres and some small wood/shrub fragments. Von Post: H6, F2, R1, W1 (N), Tv1, Th0, A0, P1
	2.5	SV (P) SV (R)	7 5	2.50			Very soft very dark brown strongly decomposed highly amorphous PEAT with some fine fibres. Von Post: H7, F2, R0, W0, Tv0, Th0, A1, P1
	3	SV (P) SV (R)	11 5	2.75			Very soft very dark brown to black near completely decomposed amorphous PEAT. Von Post: H9, F0, R0, W0, Tv0, Th0, A0, P1
	3.5	SV (P) SV (R)	27	3.20			End of sample at 3.20m

Remarks: Shear vane refused at 3.20m

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Russian Peat Sample Log

Russian Peat Sample No. RPS-T10-1

Sheet 1 of 1

Project Name: Meenbog Wind Farm	**Project No.** P20-328	**Co-ords: 06753, 85949** **Level:**	**Date:** 26/04/2021
Location: Co. Donegal		Dimensions (m):	**Scale:** N/A
Client: Planree Ltd.		Depth (m): 2.5	**Logged:** ML

Water Strike	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description
	Depth	Type	Results				
							Acrotelm - not sampled
	0.5	SV (P) SV (R)	4 2	0.50			Very soft dark brown slightly to moderately decomposed with some to considerable amorphous material PEAT with many fine and occasional coarse fibres. Von Post: H4-H5, F3, R1, W0, Tv2, Th1, A1, P1
	1	SV (P) SV (R)	4.5 3	1.00			Very soft dark brown moderately strongly to strongly decomposed considerably to highly amorphous PEAT with some fine fibres and occasional coarse fibres. . Von Post: H6-H7, F2, R1, W0, Tv1, Th0, A1, P1
	1.5	SV (P) SV (R)	7 4.5	1.50			Very soft very dark brown strongly decomposed highly amorphous woody PEAT with some fine fibres and occasional coarse fibres. Von Post: H7, F2, R1, W2, Tv1, Th0, A1, P1
	2	SV (P) SV (R)	17 5.5	2.00			Very soft very dark brown to black very strongly to near completely decomposed very highly amorphous woody PEAT with occasional fine fibres. . Von Post: H8-H9, F1, R0, W2, Tv0, Th0, A1, P1
							End of sample at 2.50m

Remarks: Disturbed ground. Shear vane refused at 2.10m.

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Russian Peat Sample Log

Russian Peat Sample No. RPS-T14-1

Sheet 1 of 1

Project Name: Meenbog Wind Farm	**Project No.** P20-328	**Co-ords: 07075, 86545** **Level:**	**Date:** 26/04/2021
Location: Co. Donegal		Dimensions (m):	**Scale:** N/A
Client: Planree Ltd.		Depth (m): 1.7	**Logged:** ML

Water Strike	Samples and In Situ Testing Depth	Type	Results	Depth (m)	Level (m)	Legend	Stratum Description
							Acrotelm - not sampled
	0.50	SV (P) SV (R)	11 3	0.50			Very soft brown very slightly decomposed slightly amorphous PEAT with many fine and many coarse fibres. Von Post: H3, F3, R3, W0, Tv3, Th3, A2, P0
	1.00	SV (P) SV (R)	13 5	1.20			Very soft brown moderately strongly decomposed considerably amorphous PEAT with many fine and some coarse fibres . Von Post: H5, F3, R2, W1, Tv2, Th1, A1, P1
	1.50	SV (P) SV (R)	12 4	1.50			Very soft very dark brown to black very strongly to near completely decomposed very highly amorphous PEAT with occasional fine fibres. Von Post: H8-H9, F1, R0, W0, Tv0, Th0, A1, P1
	2.00	SV (P) SV (R)	11 6	1.70			End of sample at 1.70m

Remarks: Disturbed ground, tree stumps. Shear vane refused at 1.70m

FEHILY TIMONEY

FEHILY TIMONEY

Russian Peat Sample Log

Russian Peat Sample No. RPS-T16-1

Sheet 1 of 1

Project Name: Meenbog Wind Farm	**Project No.** P20-328	**Co-ords: 08920, 86636** **Level:**	**Date:** 27/04/2021
Location: Co. Donegal		Dimensions (m):	**Scale:** N/A
Client: Planree Ltd.		Depth (m): 2.7	**Logged:** ML / AW

Water Strike	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description
	Depth	Type	Results				
							Acrotelm - not sampled
	0.5	SV (P) SV (R)	9 5	0.50			Very soft wet brown slightly decomposed with some amorphous material PEAT with many fine and many coarse fibres. Von Post:H4, F3, R3, W0, Tv3, Th3, A1, P1
	1	SV (P) SV (R)	5 2	1.00			Very soft brown wet moderately to moderately strongly decomposed with considerable amorphous material PEAT with many fine and some coarse fibres. Von Post: H5-H6, F3, R2, W0, Tv2, Th1, A0, P1
	1.5	SV (P) SV (R)	5 3	1.50			Very soft dark brown moderately strongly to strongly decomposed considerably to highly amorphous PEAT with some fine fibres and occasional coarse fibres. Von Post: H6-H7, F2, R1, W0, Tv1, Th0, A1, P1
	2	SV (P) SV (R)	5 3.5	2.00			Very soft very dark brown strongly decomposed highly amorphous PEAT with some fine fibres. Von Post: H7, F2, R0, W0, Tv2 Th0, A1, P1
	2.5	SV (P) SV (R)	7 4	2.50			Very soft very dark brown to black near completely decomposed amorphous PEAT with occasional fine fibres. Von Post: H9, F1, R0, W0, Tv0, Th0, A0, P1
				2.70			End of sample at 2.70m

Remarks: Undisturbed ground. Shear vane refused at 2.70m

FEHILY TIMONEY

FEHILY TIMONEY

Russian Peat Sample Log

Russian Peat Sample No. RPS-T19-1

Sheet 1 of 1

Project Name: Meenbog Wind Farm	**Project No.** P20-328	**Co-ords: 09177, 87164** **Level:**	**Date:** 27/04/2021
Location: Co. Donegal		Dimensions (m):	**Scale:** N/A
Client: Planree Ltd.		Depth (m): 2.7	**Logged:** ML / AW

Water Strike	Samples and In Situ Testing Depth	Type	Results	Depth (m)	Level (m)	Legend	Stratum Description
							Acrotelm - not sampled
	0.5	SV (P) SV (R)	11 3	0.50			Very soft brown very slightly decomposed slightly amorphous PEAT with many fine and many coarse fibres . Von Post: H3, F3, R3, W0, Tv3, Th3, A0, P0
	1	SV (P) SV (R)	9 4	1.00			Very soft wet brown slightly decomposed with some amorphous material PEAT with many fine and some coarse fibres. Von Post: H4, F3, R2, W0, Tv2, Th2, A0, P0
	1.5	SV (P) SV (R)	8 3.5	1.50			Very soft dark brown slightly to moderately decomposed with some to considerable amorphous material PEAT with many fine and occasional coarse fibres . Von Post: H4-H5, F3, R1, W0, Tv1, Th0, A1, P1
	2	SV (P) SV (R)	9.5 7	2.00			Very soft dark brown moderately strongly to strongly decomposed considerably to highly amorphous PEAT with some fine fibres and occasional coarse fibres. Von Post: H6-H7, F2, R1, W0, Tv0, Th0, A1, P1
	2.5	SV (P) SV (R)	16.5 6.5	2.50			Very soft very dark brown to black very strongly to near completely decomposed very highly amorphous PEAT with occasional fine fibres. Von Post: H8-H9, F1, R0, W2, Tv0, Th0, A1, P1
				2.70			End of sample at 2.70m

Remarks: Undisturbed ground. Shear vane refused at 2.70m

FEHILY TIMONEY

FEHILY TIMONEY

Russian Peat Sample Log

Russian Peat Sample No. T18-TP1 (RPS)

Sheet 1 of 1

Project Name: Meenbog Wind Farm	**Project No.** P20-328	**Co-ords: 06778, 86820** **Level:**	**Date:** 23/04/2021
Location: Co. Donegal		Dimensions (m):	**Scale:** N/A
Client: Planree Ltd.		Depth (m): 2.5	**Logged:** ML / AW

Water Strike	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description
	Depth	Type	Results				
							Acrotelm - not sampled
				0.50			Dry, very soft brown slightly to moderately decomposed with some to considerable amorphous material PEAT with many fine and coarse fibres Von Post: H4 - H5, F3, R3, W0, Tv3, Th2, A2, P1
				1.00			Very soft brown slightly to moderately decomposed with some to considerable amorphous material PEAT with many fine and coarse fibres and much reedy material. Von Post: H4 - H5, F3, R3, W0, Tv2, Th2, A2, P1
				1.50			Very wet, very soft brown very slightly decomposed slightly amorphous PEAT with many fine and coarse fibres and some reedy material. Von Post: H3, F3, R3, W0, Tv2, Th1, A2, P1
				2.00			Very soft brown moderately decomposed with considerable amorphous material PEAT with some fine and occasional coarse fibres. Von Post:H4, F2, R1, W0, Tv0, Th0, A3, P1
				2.50			End of sample at 2.50m

Remarks: Generally dry underfoot. Hard to push in peat sampler. 5m from road, 3m from road drainage ditch, 20-30m from stream .

FEHILY TIMONEY

irish drilling

DRILLHOLE LOG

Project	Location	DRILLHOLE No
Meenbog Wind Farm	Co Donegal	**BH SS-01**

Job No	Date	Ground Level (m OD)	Co-Ordinates ()
2020DL102	26-05-20 28-05-20		

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RUN DETAILS					STRATA				
Depth / Date	TCR (SCR) RQD	(SPT) Fracture Spacing	Red'cd Level	Legend	Depth (Thick-ness)	DESCRIPTION: Discontinuities / Detail	DESCRIPTION: Main	Geology	Instrument/ Backfill
0.00	0 (-) -	NA			(0.80)	0.00 - 3.60 : overburden.	Open hole drilling - no recovery. Drillers Comment: FILL.		
0.80					0.80				
1.80	80 (-) -	1.50 (25/0mm)					Subrounded to subangular fine to coarse schist quartz and phyllite GRAVEL with a little grey silt.		
26.05 2.70	89 (-) -	NA			(2.80)				
26.05 3.60	67 (-) -	3.00 (25/0mm)			3.60				
5.10	100 (75) 37	1 11				3.60 - 9.30 Discontinuities, medium spaced, locally closely and very closely spaced, dipping 28 to 30 and 58 to 60°, stepped, smooth, with 0.5 to 3mm thick brownish grey silt smear. 4.25 - 4.90 2 No perpendicular, subvertical dip, undulating, smooth, with 0.5 to 3mm thick light greenish grey silt smear, open to moderately wide. 5.15 - 5.25 Joint, vertical dip, undulating, rough, with 0.5 to 2mm thick greenish grey silt smear, open.	Very strong thinly foliated bluish grey fine and medium grained PHYLLITE.		
5.60	100 (94) 50	6							
27.05 6.70	100 (79) 48	8			(5.70)				
27.05 8.20	100 (95) 45	10							
28.05 9.30	100 (100) 100	1 0			9.30				
							BH terminated at 9.30m bgl on REs instruction.		

Drilling Progress and Water Observations

Date	Time	Depth	Casing Depth	Casing Dia	Core Dia mm	Water Strike	Water Standing
26-05-20	12.00	2.70	0.80	99	63		
27-05-20	17.30	6.70	0.80	99	63		
28-05-20	11.00	9.30	0.80	99	63		

Rotary Flush

From (m)	To (m)	Type	Return (%)
0	1.00	water	100
0	9.30	water	0

GENERAL REMARKS

BH backfilled with bentonite.

All dimensions in metres Scale 1:68.75	Client: MCEL	Method/ Plant Used: Hydreq	Bit: HQ Design	Driller: PMcG	Logged By: EAT

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irish drilling

DRILLHOLE LOG

Project	Location	DRILLHOLE No
Meenbog Wind Farm	Co Donegal	**BH SS-02**

Job No	Date	Ground Level (m OD)	Co-Ordinates ()
2020DL102	28-05-20 28-05-20		

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RUN DETAILS					STRATA				
Depth / Date	TCR (SCR) RQD	(SPT) Fracture Spacing	Red'cd Level	Legend	Depth (Thick-ness)	DESCRIPTION: Discontinuities / Detail	DESCRIPTION: Main	Geology	Instrument/ Backfill
0.00	0 (-) -	NA			(0.90)	0.00 - 5.00 : overburden.	Open hole drilling - no recovery. Drillers Comment: FILL.		
0.90					0.90				
1.50	83 (-) -	1.50 (25/0mm)					Very stiff light brown sandy gravelly SILT. Sand is fine to coarse. Gravel is subrounded to subangular fine to medium of assorted metamorphic clasts.		
2.60	46 (-) -								
3.60	70 (-) -	NA 3.00 (48/75mm)			(4.10)				
4.90	61 (-) -	4.70 (56/150mm)							
5.00	100 (-) -				5.00				
5.60	100 (68) 0	20				5.00 - 11.60 Discontinuities, closely, locally very closely spaced, dipping 30 to 32 and 58 to 60°, planar, smooth, with 0.5 to 6mm thick light greenish grey silt smear.	Very strong thinly foliated bluish grey fine and medium grained PHYLLITE.		
6.70	100 (82) 19	11							
7.60	100 (50) 0					7.00 - 10.10 Non-intact as fractured rock.			
8.30	100 (24) 0				(6.60)				
9.80	100 (58) 10	NI							
10.10	100 (23) 0								
	100 (67)								

Drilling Progress and Water Observations

Date	Time	Depth	Casing Depth	Casing Dia	Core Dia mm	Water Strike	Water Standing

Rotary Flush

From (m)	To (m)	Type	Return (%)
0	1.00	water	100
1	11.60	water	0

GENERAL REMARKS

BH backfilled with bentonite.

All dimensions in metres Scale 1:68.75	Client: MCEL	Method/ Plant Used: Hydreq	Bit: HQ Design	Driller: PMcG	Logged By: EAT

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irish drilling

DRILLHOLE LOG

Project	Location	DRILLHOLE No
Meenbog Wind Farm	Co Donegal	**BH SS-02**

Job No	Date	Ground Level (m OD)	Co-Ordinates ()
2020DL102	28-05-20 28-05-20		

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RUN DETAILS					STRATA				
Depth / Date	TCR (SCR) RQD	(SPT) Fracture Spacing	Red'cd Level	Legend	Depth (Thick-ness)	DESCRIPTION: Discontinuities	Detail	Main	Geology	Instrument/ Backfill
	29	16						Very strong thinly foliated bluish grey fine and medium grained PHYLLITE. *(continued)*		
28.05 11.60					11.60			BH terminated at 11.60m bgl on REs instruction.		

Drilling Progress and Water Observations							
Date	Time	Depth	Casing Depth	Casing Dia	Core Dia mm	Water Strike	Water Standing
28-05-20	17.30	11.60	0.90	99	63		

Rotary Flush			
From (m)	To (m)	Type	Return (%)

GENERAL REMARKS

BH backfilled with bentonite.

All dimensions in metres Scale 1:68.75	Client: MCEL	Method/ Plant Used: Hydreq	Bit: HQ Design	Driller: PMcG	Logged By: EAT

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irish drilling

DRILLHOLE LOG

Project	Location	DRILLHOLE No
Meenbog Wind Farm	Co Donegal	**BH T-05**

Job No	Date	Ground Level (m OD)	Co-Ordinates ()
2020DL102	25-05-20 25-05-20		

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RUN DETAILS					STRATA				
Depth / Date	TCR (SCR) RQD	(SPT) Fracture Spacing	Red'cd Level	Legend	Depth (Thick-ness)	DESCRIPTION: Discontinuities / Detail	DESCRIPTION: Main	Geology	Instrument/ Backfill
0.00						0.00 - 4.00 : overburden.	Open hole drilling - no recovery. Drillers Comment: PEAT.		
	0 (-) -	NA			(1.50)				
1.50		1.50 (2)			1.50				
	8 (-) -				(1.30)		Dark brown amorphous PEAT. (0.10m recovered).		
2.80		NA			2.80				
	10 (-) - 50	3.00 (7)			(1.00)		Loose angular fine and medium schist GRAVEL. (0.10m recovered).		
3.80					3.80				
4.00	(-)				4.00		Light green SILT. (0.10m recovered).		
	- 100 (94) 40	14				4.00 - 10.20 Discontinuities, medium spaced, locally closely and very closely spaced, dipping 18 to 20°, stepped, smooth, with 0.5 to 2mm thick light grey silt smear.	Strong thinly foliated light greenish grey fine and medium grained PHYLLITE.		
4.90						4.60 - 5.05 Joint, subvertical dip, stepped, smooth, with 0.5 to 1mm thick greyish brown silt smear, open.			
	100 (86) 41	11							
5.80							5.93m to 5.98m: light greenish brown silt.		
	100 (91) 41	9				6.30 - 6.60 Joint, subvertical dip, stepped, rough, with 0.5 to 2mm thick greenish brown silt smear, open.			
7.30					(6.20)				
	100 (95) 79	7							
8.80		6							
	100 (95) 65	8							
25.05 10.20					10.20				
							BH terminated at 10.20m bgl on REs instruction.		

Drilling Progress and Water Observations							
Date	Time	Depth	Casing Depth	Casing Dia	Core Dia mm	Water Strike	Water Standing
25-05-20	17.30	10.20	1.50	99	63		

Rotary Flush			
From (m)	To (m)	Type	Return (%)
0	10.20	water	100

GENERAL REMARKS

BH backfilled with bentonite.

All dimensions in metres Scale 1:68.75	Client: MCEL	Method/ Plant Used: Hydreq	Bit: HQ Design	Driller: PMcG	Logged By: EAT

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irish drilling

DRILLHOLE LOG

Project	Location	DRILLHOLE No
Meenbog Wind Farm	Co Donegal	**BH T-10**

Job No	Date	Ground Level (m OD)	Co-Ordinates ()
2020DL102	18-05-20 19-05-20		

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RUN DETAILS					STRATA				
Depth Date	TCR (SCR) RQD	(SPT) Fracture Spacing	Red'cd Level	Legend	Depth (Thick- ness)	DESCRIPTION Discontinuities Detail	Main	Geology	Instrument/ Backfill
0.00 18.05 1.40	0 (-) -	NA			(1.40) 1.40	0.00 - 2.00 : overburden.	Open hole drilling - no recovery.		
18.05 2.00	25 (-) -	1.50 (39) NA			(0.60) 2.00		Very dense angular medium grey phyllite GRAVEL.		
2.80	100 (84) 55	4				2.00 - 7.50 Discontinuities, medium spaced, locally closely and very closely spaced, dipping 16 to 18°, stepped, smooth, with 0.5 to 2mm thick grey silt smear.	Very strong thinly foliated grey fine and medium grained PHYLLITE.		
4.30	100 (87) 56	7				3.40 - 3.55 Joint, subvertical dip, stepped, smooth, with 0.5 to 2mm thick greenish grey silt smear, open. 3.70 - 3.85 Joint, subvertical dip, stepped, smooth, with 0.5 to 2mm thick greenish grey silt smear, open.	3.70m to 3.95m: medium strong.		
5.50	100 (97) 94	3			(5.50)				
7.00	100 (95) 91	2 1							
19.05 7.50	100 (82) 64	3			7.50				
							BH terminated at 7.50m bgl on REs instruction.		

Drilling Progress and Water Observations

Date	Time	Depth	Casing Depth	Casing Dia	Core Dia mm	Water Strike	Water Standing
18-05-20	17.00	1.40	1.40	99	63		
19-05-20	13.00	7.50	1.40	99	63		

Rotary Flush

From (m)	To (m)	Type	Return (%)
0	1.80	water	100
1.8	7.50	water	0

GENERAL REMARKS

BH backfilled with bentonite.

All dimensions in metres Scale 1:68.75	Client: MCEL	Method/ Plant Used: Hydreq	Bit: HQ Design	Driller: PMcG	Logged By: EAT

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irish drilling

DRILLHOLE LOG

Project	Location	DRILLHOLE No
Meenbog Wind Farm	Co Donegal	**BH T-11**

Job No	Date	Ground Level (m OD)	Co-Ordinates ()
2020DL102	22-05-20 25-05-20		

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RUN DETAILS					STRATA				
Depth Date	TCR (SCR) RQD	(SPT) Fracture Spacing	Red'cd Level	Legend	Depth (Thick- ness)	DESCRIPTION Discontinuities / Detail	Main	Geology	Instrument/ Backfill
0.00						0.00 - 2.80 : overburden.	Open hole drilling - no recovery. Drillers Comment: PEAT.		
	0 (-) -	NA			(1.50)				
1.50					1.50				
	0 (-) -				(0.70)		No recovery.		
2.20		NA			2.20				
	75 (-) -				2.40		Dark brown amorphous PEAT. (0.20m recovered).		
22.05 2.80					2.80		Subrounded to subangular fine to medium assorted metamorphic GRAVEL. (0.20m recovered).		
22.05						2.80 - 10.10 Discontinuities, medium spaced, locally closely and very closely spaced, dipping 20 to 22°, stepped, smooth, with 0.5 to 1mm thick grey silt smear.	Very strong thinly foliated bluish grey fine and medium grained PHYLLITE. 3.10m to 3.18m: quartz vein.		
	100 (93) 73	7							
4.30		9							
	100 (97) 70								
5.70		7							
	100 (97) 79	4			(7.30)				
7.20		5							
	100 (95) 79					7.30 - 7.60 Joint, subvertical dip, stepped, rough, with 0.5mm thick white calcitic smear, open.			
8.70		5							
	100 (97) 81	5							
25.05 10.10					10.10				
							BH terminated at 10.10m bgl on REs instruction.		

Drilling Progress and Water Observations

Date	Time	Depth	Casing Depth	Casing Dia	Core Dia mm	Water Strike	Water Standing
22-05-20	17.30	2.80	1.50	99	63		
25-05-20	12.00	10.10	1.50	99	63		

Rotary Flush

From (m)	To (m)	Type	Return (%)
0	10.10	water	100

GENERAL REMARKS

BH backfilled with bentonite.

All dimensions in metres Scale 1:68.75	Client: MCEL	Method/ Plant Used: Hydreq	Bit: HQ Design	Driller: PMcG	Logged By: EAT

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irish drilling

DRILLHOLE LOG

Project	Location	DRILLHOLE No
Meenbog Wind Farm	Co Donegal	**BH T-12**

Job No	Date	Ground Level (m OD)	Co-Ordinates ()
2020DL102	22-05-20 22-05-20		

Engineer	Sheet	Rev.
Ionic Consulting	1 of 1	DRAFT

RUN DETAILS					STRATA				
Depth / Date	TCR (SCR) RQD	(SPT) Fracture Spacing	Red'cd Level	Legend	Depth (Thick-ness)	DESCRIPTION: Discontinuities / Detail	DESCRIPTION: Main	Geology	Instrument/ Backfill
0.00	0 (-) -	NA			(1.50)	0.00 - 3.60 : overburden.	Open hole drilling - no recovery. Drillers Comment: PEAT.		
1.50					1.50				
2.00	80 (-) -	1.50 (5)			2.00		Dark brown amorphous PEAT. (0.40m recovered).		
2.80	25 (-) -	NA			(0.80) 2.80		Light grey speckled black fine to coarse quartz SAND. (0.20m recovered).		
3.60	25 (-) -	3.00(64/150mm)			(0.80) 3.60		Subrounded to subangular fine to medium assorted metamorphic GRAVEL. (0.20m recovered).		
4.80	100 (83) 38	2 8				3.60 - 9.80 Discontinuities, medium spaced, locally closely and very closely spaced, dipping 18 to 20°, stepped, smooth, with 0.5 to 8mm thick greenish grey silt smear. 4.00 - 4.25 Joint, subvertical dip, stepped, smooth, with 0.5 to 1mm thick grey silt smear, open. 4.30 - 4.55 2 No perpendicular, subvertical dip, stepped, smooth, with 0.5 to 1mm thick green silt smear, open.	Very strong thinly foliated grey fine and medium grained PHYLLITE.		
6.30	100 (86) 61	8					4.80m to 4.90m: light green silt.		
7.50	100 (95) 93	7 3			(6.20)				
9.00	100 (96) 93	3							
22.05 9.80	100 (96) 95	0			9.80				
							BH terminated at 9.80m bgl on REs instruction.		

Drilling Progress and Water Observations							
Date	Time	Depth	Casing Depth	Casing Dia	Core Dia mm	Water Strike	Water Standing
22-05-20	15.00	9.80	1.50	99	63		

Rotary Flush			
From (m)	To (m)	Type	Return (%)
0	9.80	water	100

GENERAL REMARKS

BH backfilled with bentonite.

All dimensions in metres Scale 1:68.75	Client: MCEL	Method/ Plant Used: Hydreq	Bit: HQ Design	Driller: PMcG	Logged By: EAT

IDL AGS UK DH (SPTS) MEENBOG WF RC ALL FILE JUNE 9 2020.GPJ IDL TP TEMPLATE.GDT 19/6/20

irish drilling

DRILLHOLE LOG

Project	Location	DRILLHOLE No
Meenbog Wind Farm	Co Donegal	**BH T-13**

Job No	Date	Ground Level (m OD)	Co-Ordinates ()
2020DL102	21-05-20 21-05-20		

Engineer	Sheet	Rev.
Ionic Consulting	1 of 1	DRAFT

RUN DETAILS					STRATA				
Depth Date	TCR (SCR) RQD	(SPT) Fracture Spacing	Red'cd Level	Legend	Depth (Thick- ness)	DESCRIPTION Discontinuities Detail	Main	Geology	Instrument/ Backfill
0.00	0 (-) -	NA			(0.90)	0.00 - 1.10 : overburden.	Open hole drilling - no recovery.		
0.90					0.90 1.10		No recovery.		
1.80	55 (50) 13	NA NI				1.10 - 7.70 Discontinuities, closely and very closely spaced, locally medium spaced, dipping 18 to 20°, undulating, smooth, with 0.5 to 1mm thick grey silt smear and a little mica. 1.11 - 2.00 Non-intact as fractured rock and silt. 1.20 - 1.40 Joint, subvertical dip, stepped, rough, with 0.5 to 1mm thick grey silt smear, open. 1.40 - 1.50 Non-intact as grey micaceous silt.	Strong thinly foliated grey fine and medium grained PHYLLITE. 1.40m to 1.50m: grey micaceous silt.		
3.00	100 (59) 0	26							
4.50	100 (76) 23	15 17			(6.60)				
6.00	100 (83) 16	15							
7.50	100 (75) 34	16							
21.05 7.70	100 (100) 100	9			7.70		BH terminated at 7.70m bgl on REs instruction.		

Drilling Progress and Water Observations

Date	Time	Depth	Casing Depth	Casing Dia	Core Dia mm	Water Strike	Water Standing
21-05-20	14.00	7.70	0.90	99	63		

Rotary Flush

From (m)	To (m)	Type	Return (%)
0	7.70	water	100

GENERAL REMARKS

BH backfilled with bentonite.

All dimensions in metres Scale 1:68.75	Client: MCEL	Method/ Plant Used: Hydreq	Bit: HQ Design	Driller: PMcG	Logged By: EAT

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irish drilling

DRILLHOLE LOG

Project	Location	DRILLHOLE No
Meenbog Wind Farm	Co Donegal	**BH T-15**

Job No	Date	Ground Level (m OD)	Co-Ordinates ()
2020DL102	19-05-20 20-05-20		

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RUN DETAILS					STRATA				
Depth Date	TCR (SCR) RQD	(SPT) Fracture Spacing	Red'cd Level	Legend	Depth (Thick- ness)	DESCRIPTION Discontinuities / Detail	Main	Geology	Instrument/ Backfill
0.00						0.00 - 3.00 : overburden.	Open hole drilling - no recovery.		
	0 (-) -	NA			(1.40)				
1.40					1.40				
	30 (-) -	1.50 (51)		× × ×			Firm brown micaceous SILT.		
2.00				× × ×					
	40 (-) -	NA		× × ×	(1.60)				
3.00				× × ×	3.00				
	80 (0) 0	3.00 (25/0mm)				3.00 - 4.50 Non-intact as weathered rock.	Weathered PHYLLITE rock. Recovered as angular fine to coarse gravel and cobble sized clasts of strong and medium strong thinly foliated grey fine and medium grained phyllite.		
3.90									
	90 (33) 0	NR/NI			(1.50)				
4.30					4.50				
	100 (67) 51	3				4.50 - 9.10 Discontinuities, closely and very closely spaced to 6.80m, then medium spaced, locally closely and very closely spaced, dipping 18 to 20°, undulating, smooth, with 0.5 to 2mm thick grey silt smear.	Strong thinly foliated grey fine and medium grained PHYLLITE.		
5.30		12							
	100 (81) 41								
19.05 6.80		10			(4.60)				
19.05	100 (94) 55	7							
8.30						8.15 - 8.35 Joint, subvertical dip, stepped, smooth, with 0.5 to 1mm thick grey silt smear, open.			
	100 (73) 29	13				8.80 - 9.00 Joint, subvertical dip, undulating, smooth, with 0.5 to 2mm thick grey silt smear, open.			
20.05 9.10					9.10		BH terminated at 9.10m bgl on REs instruction.		

Drilling Progress and Water Observations

Date	Time	Depth	Casing Depth	Casing Dia	Core Dia mm	Water Strike	Water Standing
19-05-20	17.30	6.80	1.40	99	63		
20-05-20	11.00	9.10	1.40	99	63		

Rotary Flush

From (m)	To (m)	Type	Return (%)
0	3.00	water	100
3	9.10	water	0

GENERAL REMARKS

BH backfilled with bentonite.

All dimensions in metres Scale 1:68.75	Client: MCEL	Method/ Plant Used: Hydreq	Bit: HQ Design	Driller: PMcG	Logged By: EAT

IDL AGS UK DH (SPTS) MEENBOG WF RC ALL FILE JUNE 9 2020.GPJ IDL TP TEMPLATE.GDT 19/6/20

irish drilling

DRILLHOLE LOG

Project	Location	DRILLHOLE No
Meenbog Wind Farm	Co Donegal	**BH T-17**

Job No	Date	Ground Level (m OD)	Co-Ordinates ()
2020DL102	20-05-20 20-05-20		

Engineer	Sheet	Rev.
Ionic Consulting	1 of 1	DRAFT

RUN DETAILS					STRATA			
Depth / Date	TCR (SCR) RQD	(SPT) Fracture Spacing	Red'cd Level	Legend	Depth (Thick-ness)	DESCRIPTION: Discontinuities / Detail	DESCRIPTION: Main	Geology / Instrument/ Backfill
0.00	0 (-) -	NA			(1.40)	0.00 - 2.80 : overburden.	Open hole drilling - no recovery.	
1.40					1.40			
2.00	16 (-) -	1.50 (53)		× × ×			Stiff dark grey micaceous SILT.	
	25 (-) -	NA		× × ×	(1.40)			
2.80					2.80			
4.20	80 (15) 9	NR/NI			(2.60)	2.80 - 5.40 Non-intact as weathered rock.	Weathered PHYLLITE rock. Recovered as angular fine to coarse gravel and cobble sized clasts of medium strong thinly foliated grey fine and medium grained phyllite with a little dark grey micaceous silt and surficial orangish brown iron stain. 3.20m: iron stain absent.	
	91 (10) 0							
5.40					5.40			
6.90	100 (96) 48	4 8			(4.60)	5.40 - 10.00 Discontinuities, closely spaced, locally very closely and medium spaced, dipping 18 to 20°, stepped, rough, with 0.5 to 1mm thick orangish brown silt smear. 5.60 - 5.85 Joint, subvertical dip, undulating, smooth, with 0.5 to 1mm thick grey silt smear and minor light orange iron stain and powder, open. 5.95 - 6.05 Joint, dipping 60°, undulating, smooth, with 0.5 to 1mm thick grey silt smear, open. 6.30 - 6.55 Joint, subvertical dip, undulating, smooth, with 0.5 to 1mm thick grey silt smear, open.	Strong thinly foliated grey fine and medium grained PHYLLITE.	
8.40	100 (94) 51	11 6						
20.05 10.00	100 (92) 63	5			10.00	9.50 - 9.65 Joint, subvertical dip, undulating, smooth, with 0.5 to 1mm thick grey silt smear, open.		
							BH terminated at 10.00m bgl on REs instruction.	

Drilling Progress and Water Observations							
Date	Time	Depth	Casing Depth	Casing Dia	Core Dia mm	Water Strike	Water Standing
20-05-20	17.00	10.00	1.40	99	63		

Rotary Flush			
From (m)	To (m)	Type	Return (%)
0	10.00	water	100

GENERAL REMARKS

BH backfilled with bentonite.

All dimensions in metres Scale 1:68.75	Client: MCEL	Method/ Plant Used: Hydreq	Bit: HQ Design	Driller: PMcG	Logged By: EAT

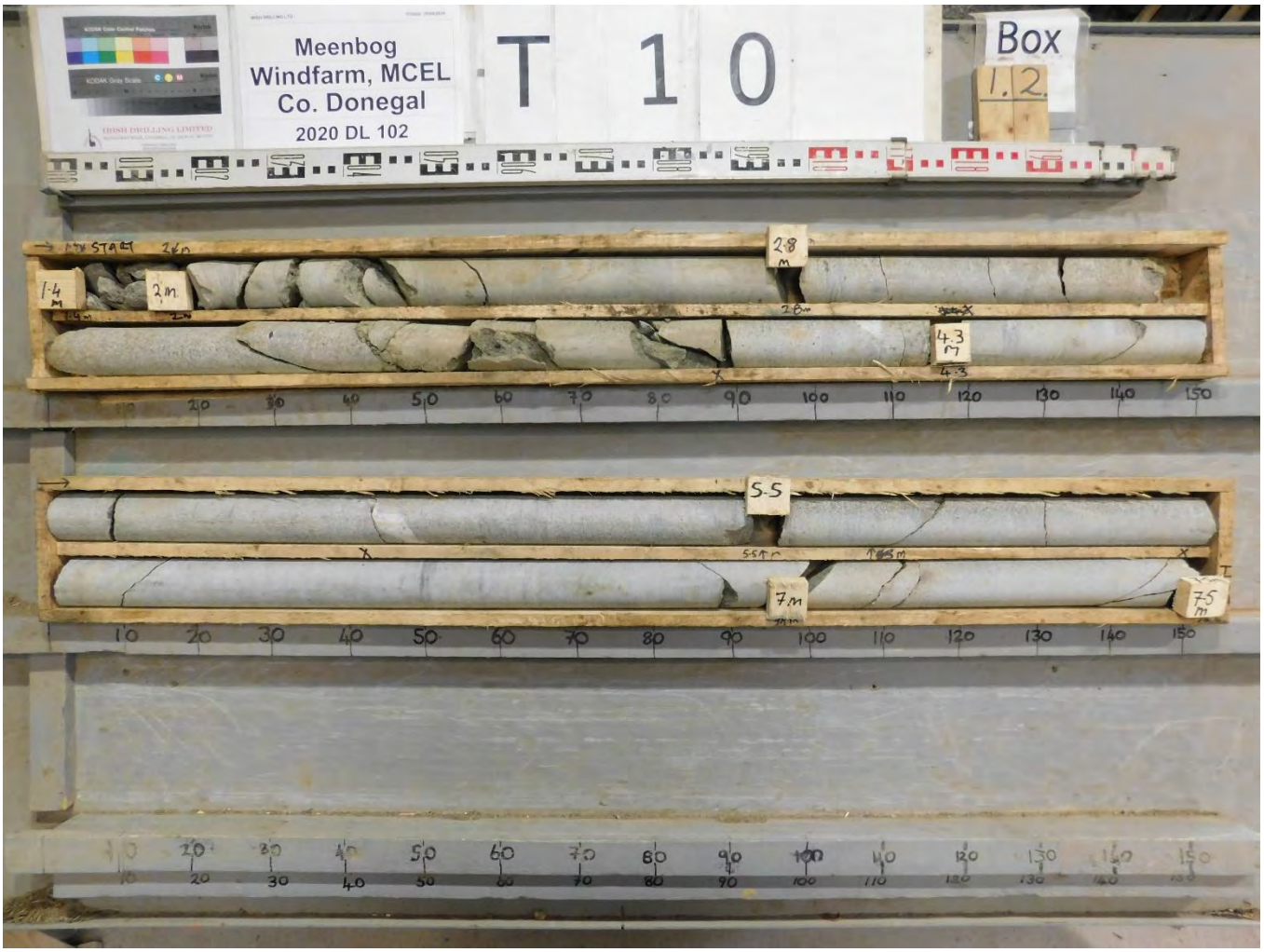
IDL AGS UK DH (SPTS) MEENBOG WF RC ALL FILE JUNE 9 2020.GPJ IDL TP TEMPLATE.GDT 19/6/20


Meenbog
Windfarm, MCEL
Co. Donegal
2020 DL 102
SUB 1-BH 1
Box
1. 2. 3.
START
0.8 m
1.80
2.7 m
3.6 m
S.1
S.6
6.7
8.2 m
9.3 m

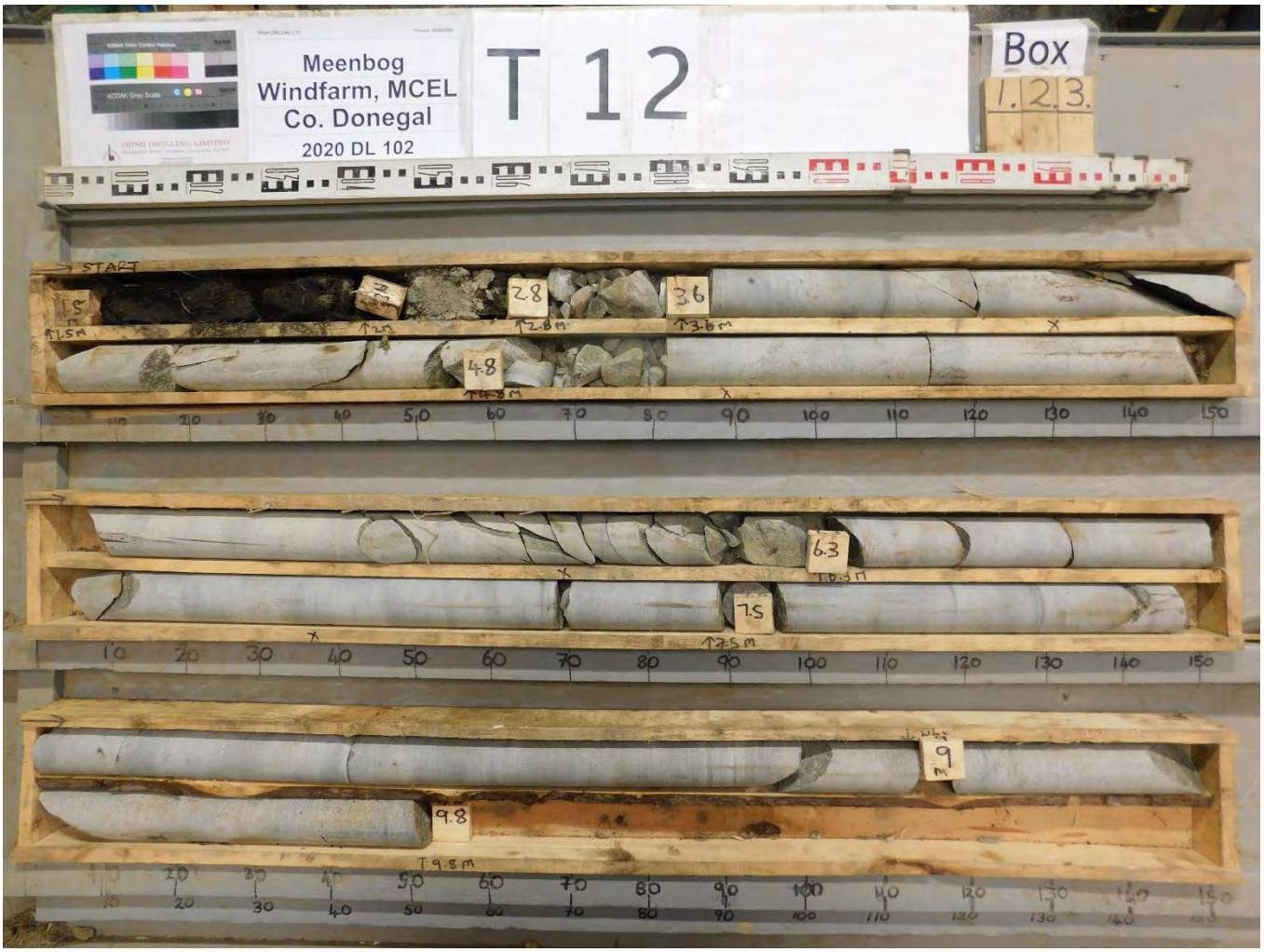

Meenbog
Windfarm, MCEL
Co. Donegal
2020 DL 102
SUB-BH 2
Box
1. 2.
START
0.9 m
1.5 m
2.6 m
4.9
SM
5.6 m


Meenbog
Windfarm, MCEL
Co. Donegal
2020 DL 102
SUB-BH2
Box
3.4

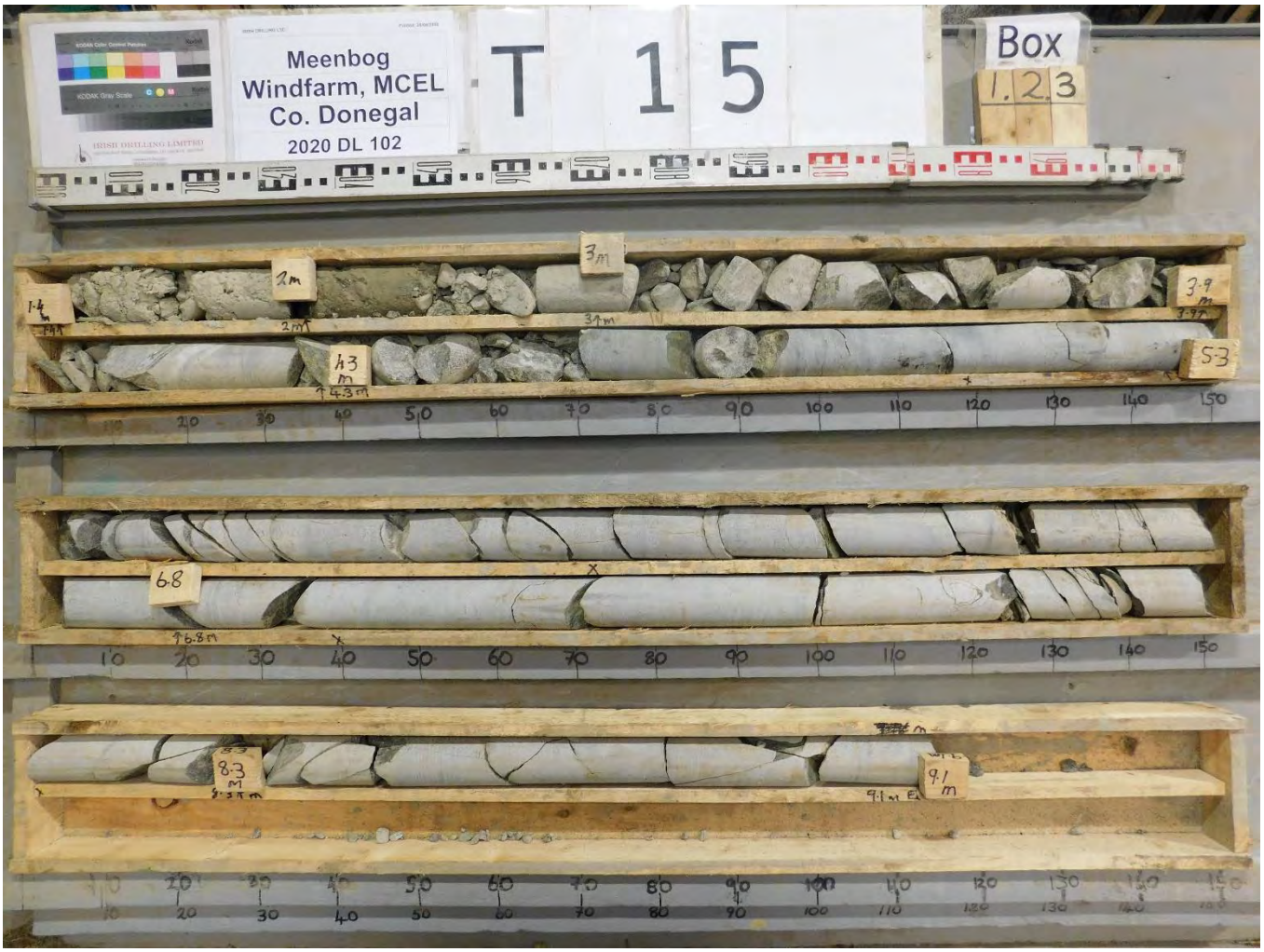

Meenbog
Windfarm, MCEL
Co. Donegal
2020 DL 102
T5
Box
1.2.3.


Meenbog
Windfarm, MCEL
Co. Donegal
2020 DL 102
T 1 0
Box
1.2.
START
1.4 m
2m
2.8 m
4.3 m
5.5
7m
7.5 m


Meenbog
Windfarm, MCEL
Co. Donegal
2020 DL 102
T 1 1
Box
1.2.3.
START
2.7 m
2.8 m
4.3 m
5.7 m
7.2
8.7m
10.1 m
EOH


Meenbog
Windfarm, MCEL
Co. Donegal
2020 DL 102
T 12
Box
1.2.3.
START
1.5
2.8
3.6
4.8
6.3
7.5
9
9.8


Meenbog
Windfarm, MCEL
Co. Donegal
2020 DL 102
T 13
Box
1.2.3
START
90
1.80
3.0
4.5
6m
7.5
7.7
7.71 m EOH


Meenbog
Windfarm, MCEL
Co. Donegal
2020 DL 102
T 15
Box
1.2.3


Meenbog
Windfarm, MCEL
Co. Donegal
2020 DL 102
T 17
Box
1.2.3



Meenbog Wind Farm Site Inspection Technical Note

This ‘Site Inspection Technical Note’ is issued following the visit to the partially constructed Meenbog Wind Farm site. The purpose of the visit was to inspect and comment on the current status of the site in relation to peat stability at the site.

20 October 2023

3

Person responsible	Liam Power
Company	AFRY Ireland Limited
Address	The Hyde Building, The Park, Carrickmines, Dublin 18, Ireland
E-mail	Liam.power@afry.com
Date	20 October 2023

3

Introduction

Following a request from Planree Limited, a site visit was carried out on 19th October 2023, at the Meenbog Windfarm, located in Co Donegal. Construction works at the site of the Meenbog Windfarm were nearing completion when they were suspended following a peat slide in November 2020.

The purpose of this visit was to assess the overall site stability of the Windfarm from a geotechnical perspective to check whether there has been any instability since the peat slide.

Liam Power, Principal Civil Engineer from 'AFRY Ireland Limited' (AFRY) and James O Brien Principal Geotechnical Engineer from 'Tara Engineering Consultants' (Tara) together with Christopher O'Mahony from Mid Cork Electrical Limited (MCE) attended at the site on Thursday 19th October 2023 to carry out the inspection.

Afry (previously Ionic) have been involved in the Meenbog Windfarm since its inception. Afry acted as both Civil Designer and also Project Manager of the windfarm on behalf of Planree Limited. Following the 2020 peat slide at the windfarm, Ionic prepared a substantive report entitled 'Peat Stability Quantitative Assessment Report' (Ionic 2021 Report) which provided detailed information on the potential for future peat instability at the site. Liam Power and James O'Brien were not contributors to the Ionic 2021 Report and we therefore carried out our own independent investigation of the site. In advance of the site visit we reviewed the Ionic 2021 Report which informed the focus of the visit. The Ionic 2021 Report confirmed that:

"*the overall site is currently stable based upon this detailed assessment carried out along all roads, hardstandings, borrow pits, peat storage areas and peat stabilisation areas*".

We confirm that our observations on the site visit did not result in us reconsidering the conclusion that was reached in the Ionic 2021 Report.

It was observed that since the Ionic 2021 Report was issued that the standard of revegetation on site is to a very high standard and no signs of new or recent instability or peat movement were observed.

Site visit observations

During the site visit, the AFRY and Tara engineers inspected the overall site including the turbine locations, site access roads, peat storage areas and borrow pits.

Turbine Locations

The proposed turbine locations were inspected. There were no indicators of active or recent movements including tension cracking or recently disturbed peat.

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Movement monitoring locations which included string line posts (installed after the 2020 movement) were inspected and signs of recent movement were not observed. Please see attached photographs showing the string line posts attached at Appendix A.

Access Roads

The access roads to the turbine locations were visually inspected. It was evident that the majority of the works have been completed on the access roads and we did not observe any issues.

Peat Storage Areas

Photographs from these locations are included in Appendix B.

At two of the peat depository areas located at T15 and T17, cracks parallel to the embankment crest were recorded in the Ionic 2021 Report. The Tara and AFRY engineers inspected the cracks during the site visit. We did not observe any additional or recent movement at these areas which appear to have settled. This was confirmed by the inspection of monitoring posts which were installed at both depository areas in 2021. We observed that there is considerable vegetation growth within both depository areas which would further indicate that the areas have settled and are stable. Please see photographs included at Appendix [ ].

Borrow Pits

Borow Pit A

The berm walls are in good condition with no visible sign of distress or displacement. The peat is approximately 1 metre below the top of the berm.

Borrow Pit B

The berm walls are in good condition with no visible sign of distress or displacement. A single storage call remains in place within the overall borrow pit area.

Conclusion of Site Inspection

On 19th October 2023, Principal Engineers from AFRY and Tara visited the Meenbog Windfarm site in order to make visual observation of the peat stability within the site. All access roads, turbine foundations and hardstands, borrow pits and peat cells were inspected. Locations of previous peat movement as well as peat depository embankment movements were inspected. During the site visit visual indicators of active movement/instability were not observed, and evidence of recent movements were not identified.

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We confirm that the overall site is currently stable based upon our assessment of the roads, hardstanding's, borrow pits, peat storage areas and peat stabilisation areas.

Liam Power

Senior Project Manager

Afry Ireland Ltd.

20 October 2023

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Appendix A – Photographs from previous peat movement areas

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Figure no.: P23023AA-AA-A01
Project: Meenbog Windfarm
Client: AFRY Ireland Limited
Title: T5 Peat movement

TARA Engineering Consultants

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Figure no.: P23023AA-AA-A02
Project: Meenbog Windfarm
Client: AFRY Ireland Limited
Title: T5 Peat movement

TARA Engineering Consultants

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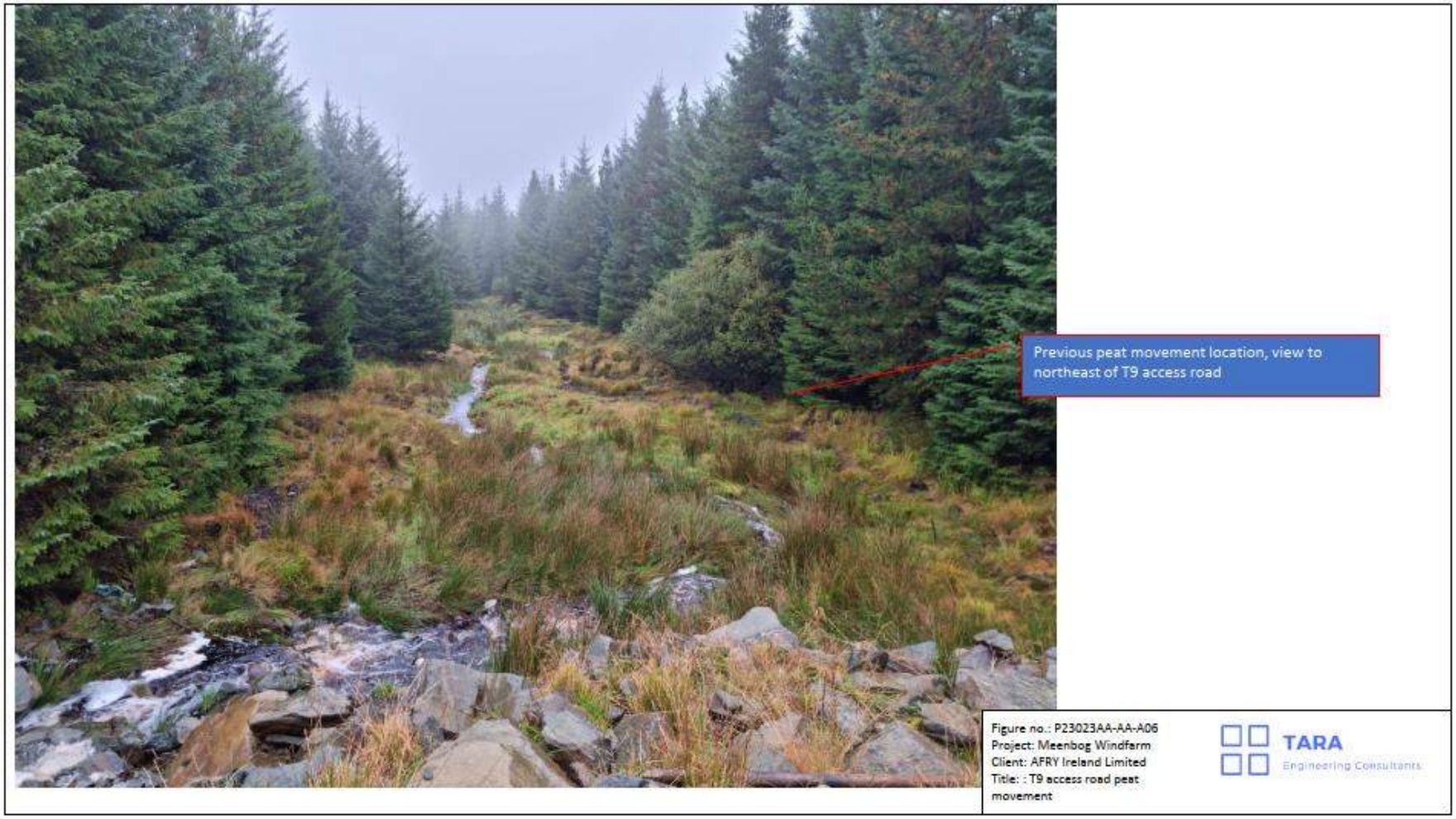
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Appendix B – Photographs from previous peat depository embankment crack locations

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Figure no.: P23023AA-AA-B01
Project: Meenbog Windfarm
Client: AFRY Ireland Limited
Title: T17 Peat depository area

TARA
Engineering Consultants

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FT (2021) SITE INSPECTION

Site Location: **Date: 19/01/2021** Weather: Wet.

Location ID	General Notes	Photos		
Track to T1	Floating track to T1. Side casting of peat both sides. No evidence of stability issues.			
Track to T2	Floating track to T2. Side casting of peat both sides. No evidence of stability issues.			
Track to T3	Floating track. Peat side cast (approx 1m deep) on both sides of access track. 4 degree slope.			

Track to T4	Floating track. No side casting. 4 degree slope.			
Junction between T1 and T2/4	Floating road, evidence of settlement of underlying peat.			
Track T6-T8	5 degree slope, no side casting, no evidence of stability issues.			

Track to T8	3 degree slope, side casting both sides. Not evidence of stability issues.			
Track to T9	View towards T9. Slope 2-4 degrees, side casting both sides, <1m. No evidence of stability issues.			
T10-T14	Minor area of side casting downslope			

Track near T12	6 degree slope. Minor area of side casting downslope. No evidence of stability issues.			
T14 access track	Side casting both sides, 6 degree slope, <1m side cast. No evidence of stability issues.			
T15-T19	Founded section of track, rock visible in drain on upslope side. No evidence of stability issues.			

T16-T17	View towards T17, no evidence of stability issues.			
Upgrade of existing to T18	Existing track appears to be floated on sidelong ground, upslope of stream.	 View W from closer to main access track	 Condition of existing track	 Upgraded section close to T18
T19	Side casting alongside track. 2-3 degree slope, peat up to 2m in height, not sealed.			

Site Location: **Date: 19/01/2021** Weather: Wet.

Location ID	General Notes	Photos		
T1	Upslope of H/S - 3 degree slope. H/S side slopes 40 degrees. Flat, saturated area downslope of H/S. No evidence of stability issues.	 T1 Turbine	 T1 hardstand	 Downslope of T1 hardstand
T2	3 degree slope around hardstand. Turbine excavation flooded, pump turned off. No evidence of stability issues.	 T2 Turbine	 T2 Hardstand	
T3	Relatively flat, 1-2 degree slopes around hardstand. No evidence of stability issues.	 Looking S	 Looking N	

T4	Relatively flat, 1-2 degree slopes around hardstand. Peat 1-2m in thickness. No evidence of stability issues.	 T4 Turbine	 T4 Hardstand	
T5	3 degree slope around hardstand. Evidence of instability around hardstand - tension cracks visible to 25-30m away from hardstand.	 T5 Turbine	 T5 Hardstand	 Tension cracks around hardstand
T6	5 degree slope around hardstand. Minor side casting of peat (<0.5m). No evidence of stability issues.	 T6 Turbine	 T6 Hardstand	

T8	5 degree slope upslope for hardstand. Minor side casting around hardstand. Barrage close to hardstand to retain material that failed upslope.	 T8 Turbine	 T8 hardstand	 Barrage
T9	2 degree slope around hardstand. Peat side cast upslope of hardstand, <1m thick. No evidence of stability issues.	 T9 Turbine	 T9 Hardstand	
T10	1-2 degree slope around hardstand. Shallow side casting of peat around hardstand and access track. No evidence of stability issues.	 T10 Turbine	 T10 Hardstand	

T11	2-3 degree slopes around hardstand. Small area of side casting upslope from hardstand. No evidence of stability issues.	 T11 Turbine	 T11 Hardstand	
T12	4 degree slope around hardstand. Small peat slide downslope of hardstand	 T12 Turbine	 T12 Hardstand	 Downslope Failure
T13	3-4 degree slopes around hardstand. Small area of side casting upslope from hardstand. No evidence of stability issues.	 T13 Turbine	 T13 Hardstand	

T14	2-3 degree slope around hardstand. Peat side cast around hardstand and access track. No evidence of stability issues.	 T14 Turbine	 T14 Hardstand	
T15	2-4 degree slope around hardstand. Peat stored both north and west of the hardstand. Area to the north shows signs of movement in perimeter berm.	 Turbine T15	 T15 Hardstand	 Peat Repository
T16	3 degree slope around hardstand. Small failure between cut-off drain and hardstand in peat. Water from drain now draining into hardstand.	 Turbine T16	 T16 Hardstand	 Failure between drain and hardstand

T17	3 degree slope around turbine and hardstand. Peat side cast upslope and hardstand. Peat storage area downslope, berm shows evidence of minor movement.	 Turbine T17	 T17 Hardstand	
T18	3 degrees slope around hardstand. Peat side cast both upslope and downslope, towards stream.	 Turbine T18	 Side cast Peat	
T19	2-3 degree slope around hardstand. Rock at surface at turbine location, 1.5-2m of peat adjacent to hardstand. Minor slump between cut-off drain and hardstand.	 T19 Turbine	 T19 Hardstand	 Minor failure along edge of drain

Site Location: **Date: 19/01/2021** Weather: Wet.

Location ID	General Notes	Photos		
T15 Peat Repository	2-4 degree slope around hardstand. Peat stored both north and west of the hardstand. Area to the north shows signs of movement in perimeter berm.	 Peat Repository	 Peat Repository	 Surface of stored peat
T17 Peat Repository	3 degree slope around turbine and hardstand. Peat side cast upslope and hardstand. Peat storage area downslope, berm shows evidence of minor movement.	 Peat Repository	 Peat Repository	
Backfilled BP (Main)	Peat backfilled into borrow pit. Berm alongside access track, around 4m in height. No evidence of stability issues.			

Backfilled BP (near T15)	Peat backfilled into borrow pit. Berm alongside access track, around 4m in height. No evidence of stability issues.			
Backfilled BP (near T16)	Peat backfilled into borrow pit. Berm alongside section of access track, around 4m in height. No evidence of stability issues.			
Drain crossing of track to T18	Narrow drain crossed by existing track. Shallow (<0.5m) peat.			

Side casting upslope of track close to T18	General view			
Failure T6-T8	General views of peat failures - see report text for details	 Downslope at head of failure	 View close to T8	

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A SUSTAINABLE FUTURE

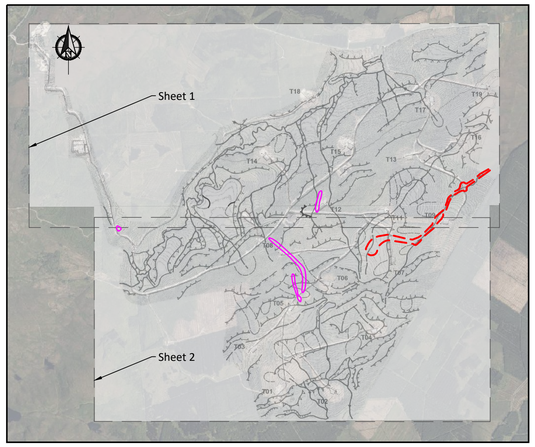
APPENDIX B

Geomorphology Plans

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KEY PLAN

Scale 1:30000

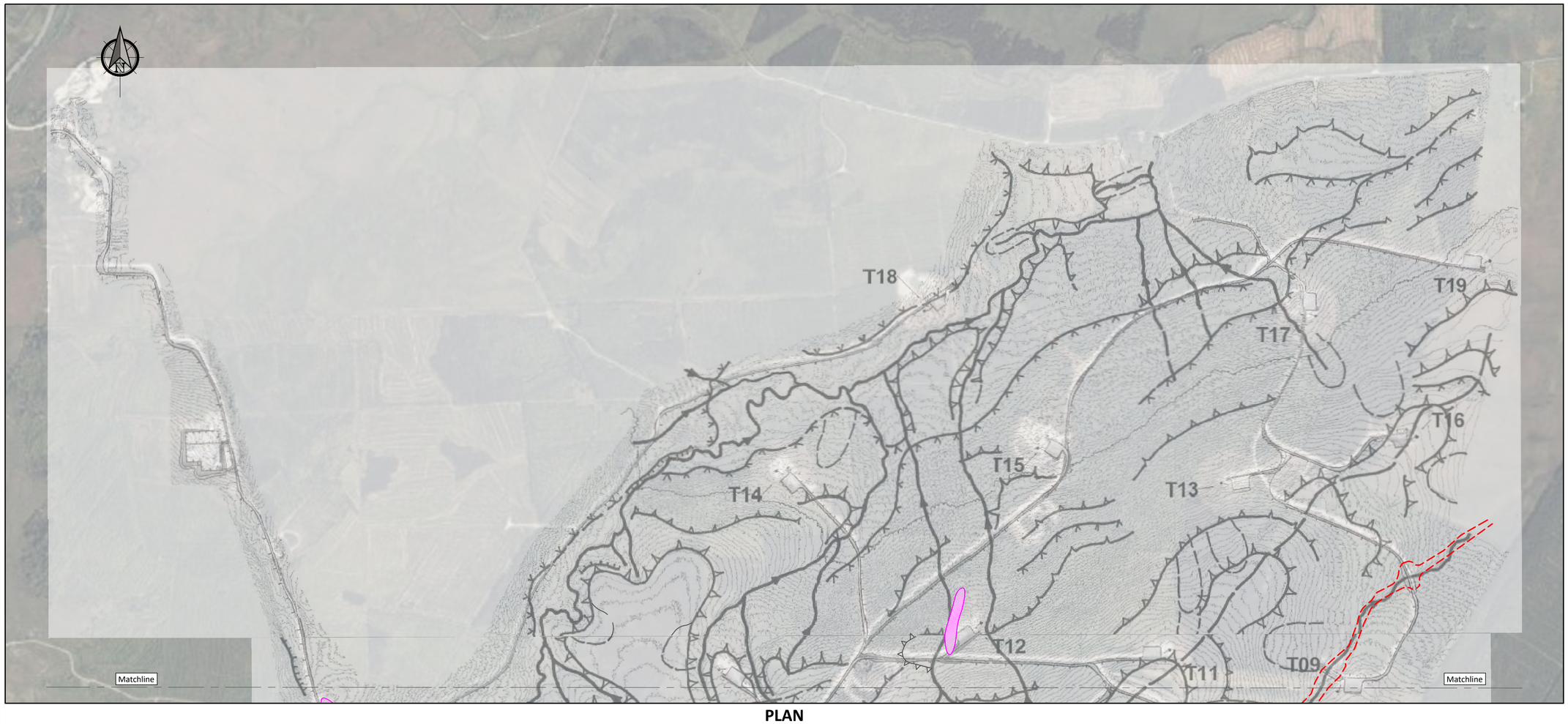


Symbol Legend -

- Major ridge line
- Scarp (sharp convex change in slope)
- Convex break in slope (major)
- Convex break in slope (minor)
- Concave break in slope
- Shallow concave depression (possible headwaters of stream)
- Water course
- 12 November 2020 peat failure extent (approximate)
- Previous peat failure extent (approximate)

Notes -

1. Preparation of the geomorphological plan requires a level of subjectivity based on the knowledge and experience of the compiler. This approach is a qualitative assessment of the peat stability and is for use as guidance only.
2. The geomorphological plan principally shows the morphology of the terrain which is presented as symbols and individual units. The individual units are intended to represent areas of similar character with respect to ground conditions. These ground conditions need to be confirmed by appropriate ground investigation.
3. The geomorphological plan should be read in conjunction with any previous stability assessment for the site.
4. For any construction works, detailed design is required to be carried out. The geomorphological plan is not to be used as a substitute for ground investigation.
5. For derivation of the geomorphological plan refer to the accompanying report.
6. Base plan comprises LiDAR topographic survey showing 1m contour lines and wind farm layout.



PLAN

Scale 1:7000

0m 70m 140m 210m 280m 350m 420m 490m 560m 630m 700m

Scale 1:7000

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Rev.	Description	App By	Date
P01	FOR INFORMATION	BDH	28.04.26
P02	FOR INFORMATION	BDH	18.06.26

PROJECT: MEENBOG WIND FARM (EXISTING DEVELOPMENT)

CLIENT: MKO

SHEET: GEOMORPHOLOGICAL PLAN (SHEET 1 OF 2)

Date: 18.06.26 | Project number: P24-234 | Scale (@ A1): | Drawn by: POR | Checked by: IH | Drawing Number: P24-234-0600-0008 (Sheet set subset 0600) | Rev: P02

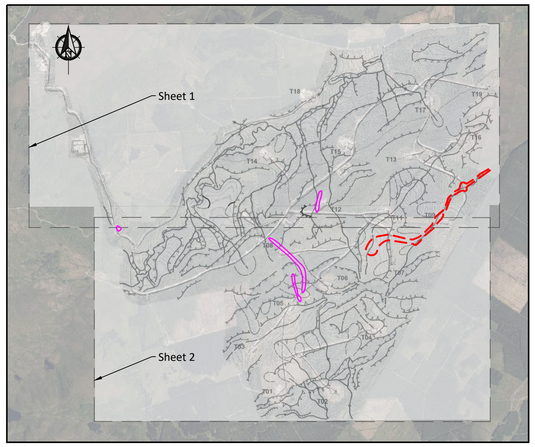
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18 June 2026 (O:\ACAD\2024\P24-234\P24-234-0600-0008)

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KEY PLAN

Scale 1:30000

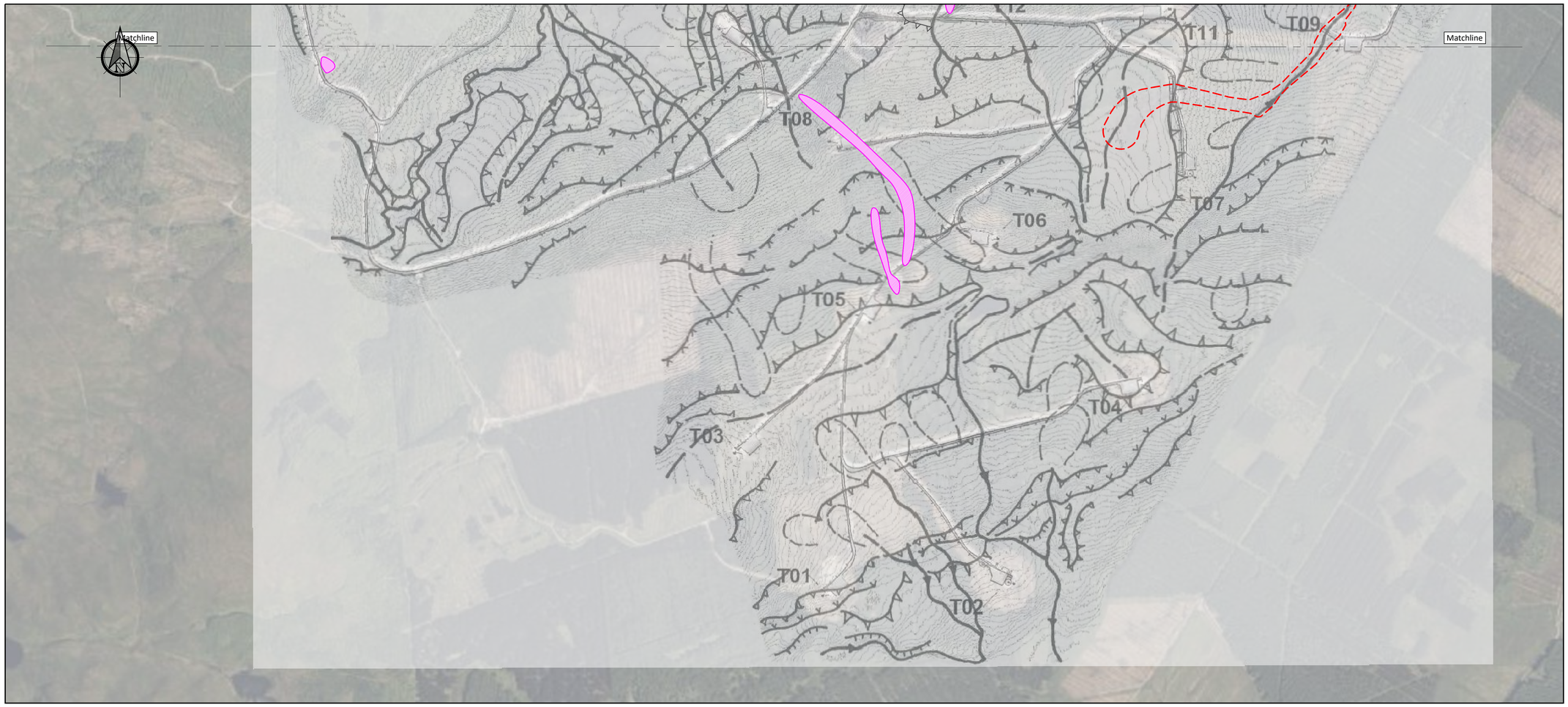


Symbol Legend -

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- 12 November 2020 peat failure extent (approximate)
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6. Base plan comprises LiDAR topographic survey showing 1m contour lines and wind farm layout.



PLAN

Scale 1:7000

0m 70m 140m 210m 280m 350m 420m 490m 560m 630m 700m

Scale 1:7000

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P01	FOR INFORMATION	BDH	28.04.26
P02	FOR INFORMATION	BDH	18.06.26

PROJECT	MEENBOG WIND FARM (EXISTING DEVELOPMENT)
CLIENT	MKO
SHEET	GEOMORPHOLOGICAL PLAN (SHEET 2 OF 2)
Date	18.06.26
Project number	P24-234
Scale (@ A1)	
Drawn by	POR
Checked by	IH
Drawing Number	P24-234-0600-0009 (Sheet set subset 0600)
Rev	P02

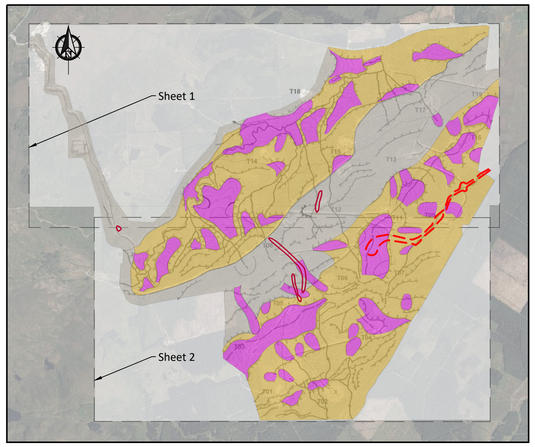
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18 June 2026 (O:\ACAD\2024\P24-234\P24-234-0600-0009)

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KEY PLAN

Scale 1:30000

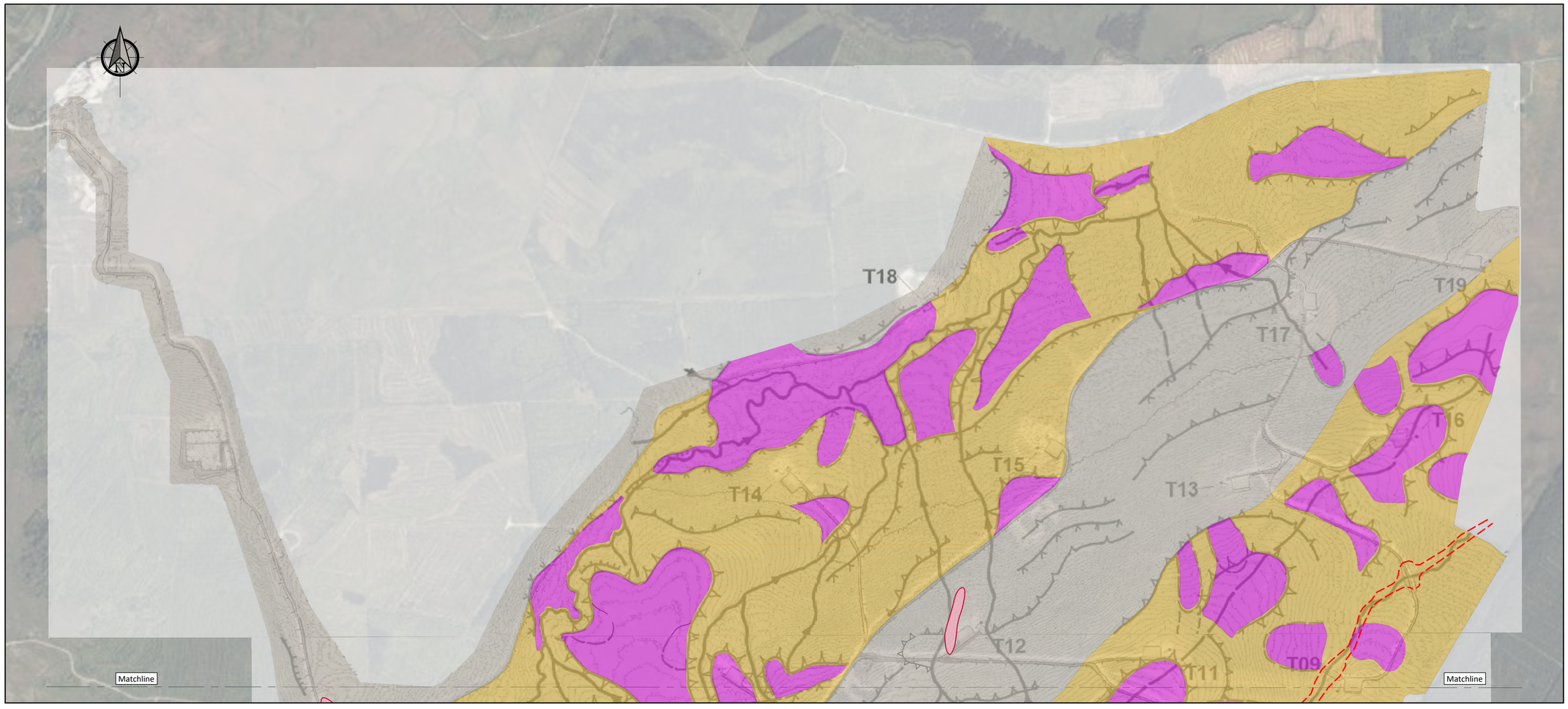


Symbol Legend -

- Major ridge line
- Scarp (sharp convex change in slope)
- Convex break in slope (major)
- Convex break in slope (minor)
- Concave break in slope
- Shallow concave depression (possible headwaters of stream)
- Water course
- 12 November 2020 peat failure extent (approximate)
- Previous peat failure extent (approximate)

Notes -

1. Preparation of the geomorphological plan requires a level of subjectivity based on the knowledge and experience of the compiler. This approach is a qualitative assessment of the peat stability and is for use as guidance only.
2. The geomorphological plan principally shows the morphology of the terrain which is presented as symbols and individual units. The individual units are intended to represent areas of similar character with respect to ground conditions. These ground conditions need to be confirmed by appropriate ground investigation.
3. The geomorphological plan should be read in conjunction with any previous stability assessment for the site.
4. For any construction works, detailed design is required to be carried out. The geomorphological plan is not to be used as a substitute for ground investigation.
5. For derivation of the geomorphological plan refer to the accompanying report.
6. Base plan comprises LiDAR topographic survey showing 1m contour lines and wind farm layout.



PLAN

Scale 1:7000

Legend - Relative Potential Peat Stability Hazard

- Probable
- Likely
- Unlikely

Note - For explanation of legend refer to report text.

0m 70m 140m 210m 280m 350m 420m 490m 560m 630m 700m

Scale 1:7000

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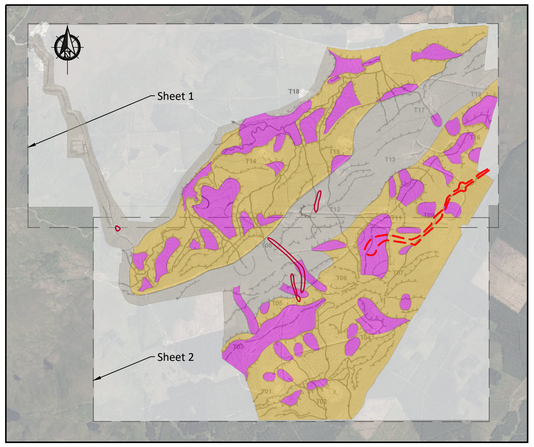
Rev.	Description	App By	Date
P01	FOR INFORMATION	BDH	25.03.26
P02	FOR INFORMATION	BDH	18.06.26

PROJECT	MEENBOG WIND FARM (EXISTING DEVELOPMENT)
CLIENT	MKO
SHEET	GEOMORPHOLOGICAL PLAN SHOWING ZONATION OF PEAT STABILITY RISK (SHEET 1 OF 2)
Date	18.06.26
Project number	P24-234
Scale (@ A1)	
Drawn by	POR
Checked by	IH
Drawing Number	P24-234-0600-0010 (Sheet set subset 0600)
Rev	P02

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18 June 2026 (O:\ACAD\2024\P24-234\P24-234-0600-0010)

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KEY PLAN

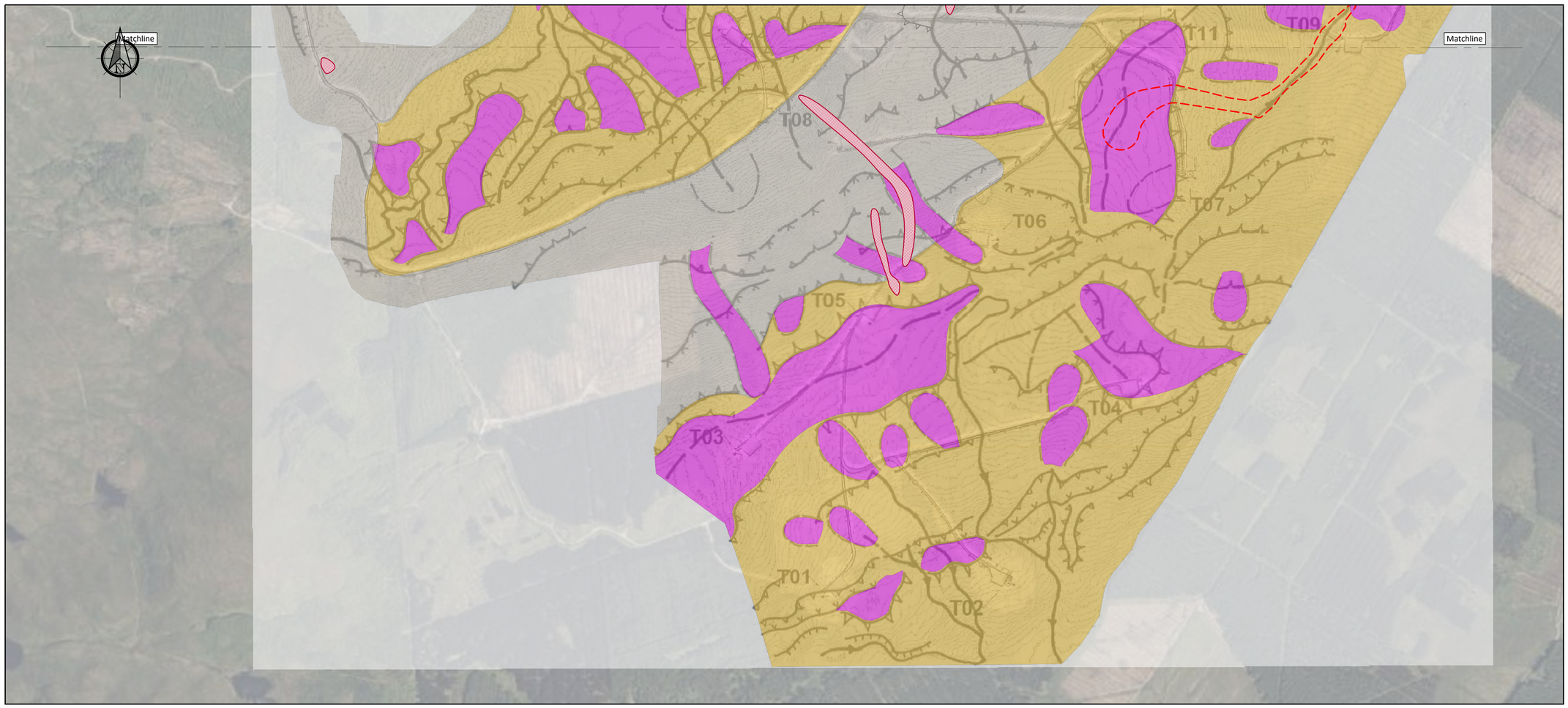
Scale 1:30000

Symbol Legend -

- Major ridge line
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- Convex break in slope (major)
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- Shallow concave depression (possible headwaters of stream)
- Water course
- 12 November 2020 peat failure extent (approximate)
- Previous peat failure extent (approximate)

Notes -

1. Preparation of the geomorphological plan requires a level of subjectivity based on the knowledge and experience of the compiler. This approach is a qualitative assessment of the peat stability and is for use as guidance only.
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3. The geomorphological plan should be read in conjunction with any previous stability assessment for the site.
4. For any construction works, detailed design is required to be carried out. The geomorphological plan is not to be used as a substitute for ground investigation.
5. For derivation of the geomorphological plan refer to the accompanying report.
6. Base plan comprises LiDAR topographic survey showing 1m contour lines and wind farm layout.



PLAN

Scale 1:7000

Legend - Relative Potential Peat Stability Hazard

- Probable
- Likely
- Unlikely

Note - For explanation of legend refer to report text.

0m 70m 140m 210m 280m 350m 420m 490m 560m 630m 700m

Scale 1:7000

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Rev.	Description	App By	Date
P01	FOR INFORMATION	BDH	25.03.26
P02	FOR INFORMATION	BDH	18.06.26

PROJECT: MEENBOG WIND FARM (EXISTING DEVELOPMENT)

CLIENT: MKO

SHEET: GEOMORPHOLOGICAL PLAN SHOWING ZONATION OF PEAT STABILITY RISK (SHEET 2 OF 2)

Date: 18.06.26

Project number: P24-234

Scale (@ A1):

Drawn by: POR

Checked by: IH

Drawing Number: P24-234-0600-0011 (Sheet set subset 0600)

Rev: P02

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18 June 2026 (O:\ACAD\2024\P24-234\P24-234-0600-0011)

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APPENDIX C

Calculated ODF for Peat Slopes on Site

Infinite Slope – Load Condition 1 and 2 Undrained

Location			Material Properties				Surcharge	EC7	
								Condition (1)	Condition (2), 1.0m Surcharge
								DA1.C2	DA1.C2
ID	Easting	Northing	Slope	Undrained shear strength	Weight density of Peat	Peat Depth	Surcharge Equivalent Placed Fill Depth (m)	Equivalent FOS	Equivalent FOS
			β (deg)	c_u (kPa)	γ (kN/m^3)	(m)	Condition (2)		
SUB-1	204562	387715	7.4	16	10.5	1.4	1.0	6.09	3.16
SUB-2	204794	387658	2.8	8.5	10.5	1.7	1.0	6.97	3.95
SUB-3	204575	387621	5.4	9	10.5	1.2	1.0	5.45	2.61
SUB-4	204648	387616	7.5	14	10.5	1.4	1.0	5.26	2.73
SUB-5	204823	387564	4.1	12	10.5	1.0	1.0	11.45	4.98
SUB-6	204875	387533	1.5	13.5	10.5	2.2	1.0	15.95	10.03
SUB-7	204889	387381	3.7	11	10.5	2.2	1.0	5.28	3.32
SUB-8	204866	387302	3.4	14	10.5	2.3	1.0	6.99	4.47
SUB-9	204922	387222	2.3	5	10.5	4.2	1.0	2.02	1.54
SUB-10	204966	387221	1.5	6	10.5	5.0	1.0	3.12	2.48
SUB-11	204852	387220	2.4	13.5	10.5	2.0	1.0	10.98	6.65
SUB-12	205006	387169	3.9	5	10.5	2.5	1.0	2.00	1.32
SUB-13	205023	387130	4.8	10	10.5	1.8	1.0	4.53	2.63
SUB-14	205034	387065	2.4	5.5	10.5	0.8	1.0	11.18	4.26
SUB-15	205048	387054	2.4	17	10.5	1.5	1.0	18.43	9.87
SUB-16	205101	387021	4.8	5.1	10.5	2.5	1.0	1.66	1.09
SUB-17	205033	387010	6.5	10.5	10.5	1.4	1.0	4.54	2.35
SUB-18	205125	387004	4.2	6	10.5	1.2	1.0	4.66	2.24
SUB-19	205155	386999	4.1	11	10.5	0.9	1.0	11.66	4.77
SUB-20	205098	386998	3.1	11	10.5	2.6	1.0	5.33	3.55
SUB-21	205023	386982	2.9	7	10.5	2.0	1.0	4.71	2.86
SUB-22	205177	386963	7.4	8	10.5	1.7	1.0	2.51	1.42
SUB-23	205121	386928	4.4	10.5	10.5	2.1	1.0	4.45	2.75
SUB-24	205195	386928	4.8	11.5	10.5	0.7	1.0	13.40	4.69
SUB-25	205045	386924	3.8	12	10.5	1.7	1.0	7.26	4.11
SUB-26	205151	386903	5.8	11	10.5	2.7	1.0	2.76	1.86
SUB-27	205156	386900	5.8	8.5	10.5	3.0	1.0	1.92	1.34
SUB-28	205123	386898	4.7	6.5	10.5	3.5	1.0	1.55	1.13
SUB-29	205220	386864	9.4	14.5	10.5	1.4	1.0	4.37	2.27
SUB-30	205018	386852	2.8	7	10.5	2.0	1.0	4.88	2.96
SUB-31	205213	386792	5.7	9.5	10.5	1.5	1.0	4.36	2.34
SUB-32	205220	386753	4.9	12	10.5	2.5	1.0	3.84	2.52
SUB-33	205273	386672	7.9	10	10.5	0.8	1.0	6.25	2.38
SUB-34	205291	386582	4.5	9	10.5	1.5	1.0	5.22	2.80
SUB-35	205348	386454	7.1	11.5	10.5	3.0	1.0	2.13	1.48
SUB-36	205372	386404	5.2	17	10.5	1.1	1.0	11.65	5.34
SUB-37	205353	386340	7.4	28	10.5	0.3	1.0	49.71	9.32
SUB-38	205379	386293	5.2	9	10.5	1.0	1.0	6.78	2.95
SUB-39	205384	386271	8.9	8	10.5	0.9	1.0	3.96	1.62
SUB-40	205440	386223	8.4	18	10.5	0.8	1.0	10.59	4.03
SUB-41	205473	386167	5.8	10	10.5	0.9	1.0	7.52	3.08
SUB-42	205452	386107	6.5	11	10.5	1.7	1.0	3.91	2.22
SUB-43	205461	386068	3.4	11	10.5	2.0	1.0	6.32	3.83
SUB-44	205468	386032	2.8	10	10.5	1.4	1.0	9.96	5.16
SUB-45	205481	385968	5.6	8	10.5	1.3	1.0	4.31	2.16
SUB-46	205488	385927	2.5	8.5	10.5	5.0	1.0	2.65	2.11
SUB-47	205582	385846	2.9	7	10.5	1.8	1.0	5.24	3.04
SUB-48	205514	385831	3.8	9.5	10.5	2.4	1.0	4.07	2.64
SUB-49	205622	385822	2.9	9	10.5	2.5	1.0	4.85	3.19
SUB-50	205632	385801	4.6	7.5	10.5	2.0	1.0	3.19	1.93
SUB-51	205566	385791	3.3	4	10.5	3.0	1.0	1.58	1.10
SUB-52	205647	385781	3.1	3	10.5	2.2	1.0	1.72	1.08
SUB-53	205590	385766	5.2	8	10.5	2.9	1.0	2.08	1.44
SUB-54	205572	385762	6.1	13	10.5	1.0	1.0	8.37	3.64
SUB-55	205632	385760	3.6	16	10.5	1.7	1.0	10.22	5.79
SUB-56	205689	385758	2.8	6	10.5	2.3	1.0	3.64	2.32
SUB-57	205529	385747	3.7	7	10.5	4.2	1.0	1.76	1.34
SUB-58	205572	385742	6.2	14	10.5	1.4	1.0	6.34	3.29
SUB-59	205689	385733	2.6	11	10.5	2.7	1.0	6.12	4.13
SUB-60	205581	385726	4.6	8	10.5	1.9	1.0	3.58	2.13
SUB-61	205636	385692	3.5	8	10.5	2.3	1.0	3.88	2.48
SUB-62	205709	385681	4.4	7.5	10.5	2.2	1.0	3.03	1.91
SUB-63	205635	385668	3.3	7.5	10.5	5.1	1.0	1.74	1.39
SUB-64	205657	385663	3.2	9	10.5	2.7	1.0	4.07	2.75
SUB-65	205627	385630	3.4	6	10.5	5.3	1.0	1.30	1.04
SUB-66	205639	385604	4.4	9	10.5	3.5	1.0	2.29	1.67
SUB-67	205660	385592	4.3	9	10.5	4.2	1.0	1.95	1.49
SUB-68	205675	385582	4.3	9	10.5	3.0	1.0	2.73	1.90

Location			Material Properties				Surcharge	EC7	
								Condition (1)	Condition (2), 1.0m Surcharge
								DA1.C2	DA1.C2
ID	Easting	Northing	Slope	Undrained shear strength	Weight density of Peat	Peat Depth	Surcharge Equivalent Placed Fill Depth (m)	Equivalent FOS	Equivalent FOS
SUB-69	205687	385566	4.1	7	10.5	1.8	1.0	3.71	2.15
SR-1	205668	385347	4.8	14	10.5	1.0	1.0	11.42	4.97
SR-2	205668	385392	5.7	13	10.5	0.5	1.0	17.90	4.97
SR-3	205669	385295	7.4	12	10.5	0.5	1.0	12.78	3.55
SR-4	205671	385444	6.3	17	10.5	1.7	1.0	6.24	3.53
SR-5	205690	385486	4.4	12	10.5	0.8	1.0	13.34	5.08
SR-6	205695	385552	2.3	14	10.5	1.0	1.0	23.75	10.33
SR-7	205695	385237	4.9	20	10.5	0.5	1.0	31.97	8.88
SR-8	205748	385151	6.9	12	10.5	0.8	1.0	8.56	3.26
SR-9	205757	385189	4.9	13	10.5	1.7	1.0	6.11	3.46
SR-10	205797	385171	6.1	25	10.5	1.8	1.0	8.94	5.19
SR-11	205875	385146	5.2	13	10.5	1.2	1.0	8.16	3.92
SR-12	205998	385237	4.4	14	10.5	0.5	1.0	24.90	6.92
SR-13	206000	385156	5.7	12	10.5	1.0	1.0	8.26	3.59
SR-14	206074	385259	2.9	20	10.5	1.0	1.0	26.93	11.71
SR-15	206085	385185	3.8	7	10.5	1.0	1.0	7.20	3.13
SR-16	206163	385301	6.6	14	10.5	2.0	1.0	4.17	2.53
SR-17	206227	385258	7.1	8	10.5	1.5	1.0	2.96	1.58
SR-18	206284	385284	5.3	14	10.5	1.0	1.0	10.35	4.50
SR-19	206326	385352	5.8	17.5	10.5	1.0	1.0	11.84	5.15
SR-20	206428	385410	7.4	14	10.5	0.3	1.0	24.86	4.66
SR-21	206434	385354	5.7	7	10.5	1.0	1.0	4.82	2.09
SR-22	206493	385392	5.8	10	10.5	1.0	1.0	6.77	2.94
SR-23	206559	385402	5.9	7	10.5	0.6	1.0	7.76	2.45
SR-24	206634	385471	9.6	17.5	10.5	0.8	1.0	9.65	3.53
SR-25	206715	385514	7.4	15	10.5	0.9	1.0	8.88	3.63
SR-26	206825	385591	4.4	12	10.5	0.6	1.0	17.79	5.62
SR-27	206840	385515	5.2	8.5	10.5	1.1	1.0	5.82	2.67
SR-28	206889	385624	5.1	16	10.5	0.8	1.0	15.37	5.85
SR-29	206914	385588	3.3	8	10.5	1.1	1.0	8.61	3.95
SR-30	206965	385691	8	20	10.5	0.8	1.0	12.34	4.70
SR-31	206986	385653	6.1	11	10.5	1.2	1.0	5.90	2.83
SR-32	207058	385808	7.4	15	10.5	0.8	1.0	9.99	3.80
SR-33	207066	385745	3.3	10.5	10.5	1.7	1.0	7.31	4.14
SR-34	207083	385845	3.9	23	10.5	1.0	1.0	23.06	10.02
SR-35	207238	386030	6.2	15	10.5	1.5	1.0	6.34	3.39
SR-36	207302	386099	5.7	9	10.5	0.7	1.0	8.85	3.10
SR-37	207505	386242	9.1	10	10.5	0.8	1.0	5.45	2.07
SR-38	207647	386361	6.2	17	10.5	0.8	1.0	13.46	5.13
SR-39	207802	386873	3.6	10	10.5	1.1	1.0	9.87	4.52
SR-40	207806	386513	4.5	16	10.5	0.6	1.0	23.19	7.32
SR-41	207865	386871	3.1	16	10.5	0.5	2.0	40.31	6.50
SR-42	207880	386544	3.6	19	10.5	1.2	1.0	17.19	8.25
SR-43	207883	386693	4.1	22	10.5	1.0	1.0	20.99	9.12
SR-44	207913	386897	4.8	22	10.5	0.8	1.0	22.44	8.55
SR-45	207918	386637	7.2	25	10.5	1.0	1.0	13.68	5.95
SR-46	207927	386969	4.8	10	10.5	0.6	1.0	13.60	4.29
SR-47	208003	386958	5.2	9	10.5	1.8	1.0	3.77	2.19
SR-48	208034	387015	4.9	15	10.5	1.7	1.0	7.05	4.00
SR-49	208166	387085	6.5	15	10.5	0.6	1.0	15.12	4.77
SR-50	208445	387178	2.7	17	10.5	2.8	1.0	8.78	5.99
SR-51	208465	387163	3.3	8.5	10.5	1.7	1.5	5.92	2.76
T1-1	207202	384974	1.5	6	10.5	3.3	1.0	4.73	3.39
T1-2	207240	384964	1.6	6	10.5	4.1	1.0	3.57	2.71
T1-3	207207	384932	1.8	4	10.5	2.6	1.0	3.33	2.22
T1-4	207226	384913	1.4	4	10.5	2.5	1.0	4.46	2.93
T1-5	207191	384890	1.9	5	10.5	3.0	1.0	3.42	2.39
T1-6	207195	384867	1.7	5	10.5	2.4	1.0	4.78	3.10
T1-7	207197	384841	1.7	4.5	10.5	1.9	1.0	5.43	3.23
T1-8	207136	384836	1.9	4	10.5	2.4	1.0	3.42	2.22
T1-9	207224	384831	1.5	3	10.5	3.7	1.0	2.11	1.56
T1-10	207201	384810	1.5	4	10.5	3.5	1.0	2.97	2.17
T1-11	207110	384804	2	4	10.5	3.0	1.0	2.60	1.81
T1-12	207185	384800	1.7	14	10.5	3.0	1.0	10.71	7.47
T1-13	207223	384797	1.5	3	10.5	4.9	1.0	1.59	1.26
T1-14	207132	384787	2.1	4	10.5	4.5	1.0	1.65	1.28
T1-15	207202	384785	1.5	4	10.5	4.4	1.0	2.36	1.82
T1-16	207106	384771	1.9	4	10.5	3.0	1.0	2.74	1.91
T1-17	207200	384758	1.6	5	10.5	4.9	1.0	2.49	1.97
T1-18	207216	384756	1.7	5	10.5	3.0	1.0	3.82	2.67
T1-19	207122	384751	1.8	3	10.5	3.0	1.0	2.17	1.51

Location			Material Properties				Surcharge	EC7	
								Condition (1)	Condition (2), 1.0m Surcharge
								DA1.C2	DA1.C2
ID	Easting	Northing	Slope	Undrained shear strength	Weight density of Peat	Peat Depth	Surcharge Equivalent Placed Fill Depth (m)	Equivalent FOS	Equivalent FOS
T1-20	207202	384732	2.9	4.5	10.5	3.2	1.0	1.89	1.35
T1-21	207220	384718	2.5	3	10.5	2.4	1.0	1.95	1.27
T1-22	207204	384707	2.5	6	10.5	3.5	1.0	2.68	1.95
T1-23	207119	384704	2	3	10.5	4.2	1.0	1.39	1.06
T1-24	207182	384703	2	11	10.5	3.0	1.0	7.15	4.99
T1-25	207205	384683	2.6	4	10.5	3.4	1.0	1.77	1.28
T1-26	207082	384676	2.3	4.5	10.5	3.3	1.0	2.31	1.66
T1-27	207125	384663	2.5	6	10.5	5.0	1.0	1.87	1.49
T1-28	207207	384662	2.7	3.5	10.5	2.7	1.0	1.87	1.27
T1-29	207109	384655	1.8	4	10.5	4.2	1.0	2.06	1.58
T1-30	207130	384632	2.4	5	10.5	4.7	1.0	1.73	1.35
T1-31	207218	384626	2.1	6	10.5	2.9	1.0	3.84	2.65
T1-32	207219	384619	2.2	5	10.5	3.0	1.0	2.96	2.06
T1-33	207097	384618	2.4	3	10.5	3.0	1.0	1.63	1.13
T1-34	207151	384616	3.3	5	10.5	3.3	1.0	1.79	1.29
T1-35	207199	384588	1.8	5	10.5	4.0	1.0	2.71	2.04
T1-36	207187	384555	1.5	3	10.5	4.5	1.0	1.73	1.34
T1-37	207189	384540	2.2	4	10.5	5.0	1.0	1.42	1.13
T1-38	207220	384537	5.2	7.5	10.5	2.9	1.0	1.95	1.35
T1-39	207149	384527	3	12	10.5	1.1	1.0	14.20	6.51
T1-40	207219	384527	7.9	11	10.5	1.8	1.0	3.05	1.77
T1-41	207228	384512	9.2	9	10.5	1.3	1.0	2.98	1.49
T1-42	207157	384491	5	11	10.5	0.8	1.0	10.77	4.10
T1-43	207251	384480	2.3	6	10.5	3.0	1.0	3.39	2.37
T1-44	207233	384470	2.1	3	10.5	2.0	1.0	2.79	1.69
T1-45	207238	384432	3.3	3	10.5	1.9	1.0	1.87	1.11
T1-46	207123	384429	4	7	10.5	3.1	1.0	2.21	1.56
T1-47	207065	384428	4.1	5	10.5	2.5	1.0	1.91	1.26
T1-48	207153	384424	2.4	4	10.5	1.8	1.0	3.61	2.10
T1-49	207291	384421	2.2	3	10.5	2.5	1.0	2.13	1.40
T1-50	207209	384406	2.7	8	10.5	2.1	1.0	5.51	3.40
T1-51	207098	384384	2.7	7	10.5	3.0	1.0	3.37	2.35
T1-52	207172	384374	2.5	9	10.5	2.0	1.0	7.02	4.26
T1-53	207242	384374	2.9	7	10.5	2.8	1.0	3.37	2.30
T1-54	207134	384349	3.6	5	10.5	1.7	1.0	3.19	1.81
T1-55	207312	384345	3.8	10.5	10.5	3.0	1.0	3.60	2.51
T1-56	207171	384338	4	9	10.5	1.2	1.0	7.33	3.52
T1-57	207078	384329	3.3	6	10.5	1.5	1.0	4.73	2.54
T1-58	207247	384317	4.2	5	10.5	2.0	1.0	2.33	1.41
T1-59	207103	384288	4.2	5	10.5	0.8	1.0	5.82	2.22
T1-60	207225	384287	2.3	5	10.5	1.6	1.0	5.30	2.92
T1-61	207316	384260	3	9	10.5	2.5	1.0	4.69	3.08
T1-62	207095	384243	3.5	7	10.5	1.9	1.0	4.11	2.44
T1-63	207183	384236	3.7	7	10.5	1.8	1.0	4.11	2.39
T1-64	207183	384236	3.7	7	10.5	1.8	1.0	4.11	2.39
T1-65	207348	384218	1.7	8	10.5	3.3	1.0	5.56	3.99
T1-66	207053	384209	3.3	9	10.5	1.0	1.0	10.65	4.63
T1-67	207312	384183	1.5	5	10.5	4.4	1.0	2.95	2.28
T1-68	207213	384163	1.8	5	10.5	4.0	1.0	2.71	2.04
T1-69	207264	384158	0.7	4.5	10.5	5.0	1.0	5.01	3.98
T1-70	207179	384135	2.1	4	10.5	3.4	1.0	2.19	1.58
T1-71	207148	384114	2.7	10	10.5	3.9	1.0	3.71	2.78
T2-1	207290	384664	2.8	4	10.5	2.0	1.0	2.79	1.69
T2-2	207482	384581	2.7	6	10.5	2.5	1.0	3.47	2.28
T2-3	207369	384581	3.2	5	10.5	1.7	1.0	3.59	2.03
T2-4	207383	384570	7.6	15	10.5	0.7	1.0	11.12	3.89
T2-5	207493	384559	1.5	4.5	10.5	2.7	1.0	4.33	2.92
T2-6	207370	384556	5.2	14	10.5	1.5	1.0	7.03	3.77
T2-7	207353	384553	4.7	8.5	10.5	2.0	1.0	3.54	2.15
T2-8	207523	384551	1.8	2.5	10.5	3.0	1.0	1.81	1.26
T2-9	207371	384539	3.3	5	10.5	1.9	1.0	3.12	1.85
T2-10	207398	384535	3.8	7	10.5	1.1	1.0	6.55	3.00
T2-11	207343	384531	3.8	5	10.5	2.3	1.0	2.24	1.43
T2-12	207451	384515	3.5	4	10.5	2.1	1.0	2.13	1.31
T2-13	207372	384511	3.1	6	10.5	2.5	1.0	3.02	1.99
T2-14	207555	384473	3.8	7	10.5	1.8	1.0	4.00	2.32
T2-15	207406	384470	3.1	6	10.5	2.2	1.0	3.44	2.16
T2-16	207444	384468	2.4	11	10.5	2.4	1.0	7.45	4.83
T2-17	207478	384468	3.5	6	10.5	1.4	1.0	4.78	2.48
T2-18	207431	384430	4	7	10.5	1.7	1.0	4.03	2.28
T2-19	207531	384419	4.5	5	10.5	2.1	1.0	2.07	1.28

Location			Material Properties				Surcharge	EC7	
								Condition (1)	Condition (2), 1.0m Surcharge
								DA1.C2	DA1.C2
ID	Easting	Northing	Slope	Undrained shear strength	Weight density of Peat	Peat Depth	Surcharge Equivalent Placed Fill Depth (m)	Equivalent FOS	Equivalent FOS
T2-20	207363	384416	2.6	10	10.5	2.2	1.0	6.82	4.29
T2-21	207497	384412	5.2	11	10.5	2.6	1.0	3.19	2.13
T2-22	207640	384394	4.8	6.5	10.5	1.6	1.0	3.31	1.83
T2-23	207470	384390	4.4	11	10.5	2.0	1.0	4.89	2.96
T2-24	207574	384390	3.7	9	10.5	1.1	1.0	8.64	3.96
T2-25	207495	384380	5.2	15	10.5	2.7	1.0	4.19	2.83
T2-26	207392	384375	4.1	10	10.5	1.7	1.0	5.61	3.18
T2-27	207543	384367	5.2	8	10.5	0.9	1.0	6.70	2.74
T2-28	207659	384323	2.1	6	10.5	1.5	1.0	7.43	3.98
T2-29	207512.9	384322	2.7	15	10.5	1.3	1.0	16.68	8.34
T2-30	207614	384320	2.6	11	10.5	2.2	1.0	7.51	4.72
T2-31	207710	384311	2.8	5	10.5	2.8	1.0	2.49	1.70
T2-32	207547	384307	4.6	22	10.5	3.0	1.0	6.24	4.35
T2-33	207455	384302	1.9	13	10.5	2.3	1.0	11.60	7.41
T2-34	207488	384267	1.6	10.5	10.5	2.3	1.0	11.13	7.11
T2-35	207610	384265	4.4	15	10.5	1.0	1.0	13.34	5.80
T2-36	207809	384265	2.5	8	10.5	1.7	1.0	7.35	4.16
T2-37	207754	384252	5	8	10.5	0.6	1.0	10.45	3.30
T2-38	207754	384252	3.1	8	10.5	0.6	1.0	16.80	5.30
T2-39	207421	384249	2.6	7.5	10.5	1.7	1.0	6.62	3.75
T2-40	207777	384200	3.8	4	10.5	2.1	1.0	1.96	1.21
T2-41	207726	384198	4.4	5	10.5	1.5	1.0	2.96	1.59
T2-42	207739	384193	4	5	10.5	1.5	1.0	3.26	1.75
T2-43	207610	384192	3.7	11	10.5	0.9	1.0	12.91	5.28
T2-44	207699	384122	4.8	11	10.5	0.5	1.0	17.95	4.99
T2-45	207647	384120	4	10	10.5	1.4	1.0	6.98	3.62
T2-46	207647	384120	3.8	10	10.5	1.4	1.0	7.35	3.81
T3-1	207072	385013	4.5	6	10.5	3.1	1.0	1.68	1.19
T3-2	207179	384986	1.8	6	10.5	3.7	1.0	3.51	2.60
T3-3	207010	384971	5.1	7	10.5	2.8	1.0	1.92	1.31
T3-4	207024	384950	3.8	5	10.5	2.1	1.0	2.45	1.51
T3-5	207141	384948	2.7	4.5	10.5	2.5	1.0	2.60	1.71
T3-6	207108	384926	2.1	7	10.5	3.1	1.0	4.19	2.96
T3-7	207145	384902	1.5	4	10.5	3.3	1.0	3.15	2.26
T3-8	207065	384898	1.7	4.5	10.5	3.0	1.0	3.44	2.40
T3-9	207005	384892	2.1	5	10.5	5.0	1.0	1.86	1.47
T3-10	207100	384886	1.7	5	10.5	3.6	1.0	3.19	2.34
T3-11	206970	384863	2.5	6	10.5	2.7	1.0	3.47	2.34
T3-12	207061	384849	1.7	4	10.5	2.7	1.0	3.40	2.29
T3-13	206973	384841	2.9	3.5	10.5	2.6	1.0	1.81	1.21
T3-14	206936	384829	4.4	8	10.5	2.4	1.0	2.96	1.92
T3-15	206918	384821	2.9	5.5	10.5	1.8	1.0	4.11	2.39
T3-16	207066	384807	1.5	5	10.5	3.8	1.0	3.42	2.55
T3-17	206921	384798	2.7	5.5	10.5	2.4	1.0	3.31	2.15
T3-18	206912	384786	3.3	4	10.5	2.5	1.0	1.89	1.25
T3-19	206977	384780	2.1	9	10.5	3.0	1.0	5.57	3.89
T3-20	206987	384778	2.1	5.5	10.5	3.0	1.0	3.41	2.38
T3-21	206932	384777	2.3	5	10.5	3.4	1.0	2.49	1.80
T3-22	207076	384775	2.2	3	10.5	3.5	1.0	1.52	1.11
T3-23	206912	384751	1.8	7.4	10.5	3.2	1.0	5.01	3.56
T3-24	207046	384750	1.7	3	10.5	5.0	1.0	1.38	1.09
T3-25	206939	384749	1.6	4	10.5	3.0	1.0	3.25	2.27
T3-26	207020	384744	1.9	3.5	10.5	4.5	1.0	1.60	1.24
T3-27	206841	384742	3.3	5	10.5	3.7	1.0	1.60	1.18
T3-28	206888	384741	2.8	4	10.5	3.5	1.0	1.59	1.16
T3-29	206938	384738	1.6	3	10.5	3.4	1.0	2.15	1.56
T3-30	206898	384700	1.4	3.5	10.5	4.0	1.0	2.44	1.84
T3-31	206988	384696	1.9	2	10.5	2.0	1.0	2.05	1.24
T3-32	206933	384684	1.9	4	10.5	3.8	1.0	2.16	1.61
T3-33	207150	384679	1.7	4	10.5	4.0	1.0	2.29	1.73
T3-34	206825	384674	2.6	4	10.5	2.0	1.0	3.00	1.82
T3-35	206951	384669	2.4	4	10.5	3.1	1.0	2.10	1.48
T3-36	206928	384665	2.1	3	10.5	3.7	1.0	1.51	1.11
T3-37	206843	384652	3.1	4	10.5	3.2	1.0	1.57	1.12
T3-38	206927	384649	2.1	5.5	10.5	2.4	1.0	4.26	2.76
T3-39	206794	384640	2.2	5	10.5	5.0	1.0	1.77	1.41
T3-40	206963	384633	2.3	6	10.5	3.1	1.0	3.28	2.31
T3-41	206934	384632	2.1	4	10.5	2.6	1.0	2.86	1.91
T3-42	206940	384618	3	4	10.5	3.2	1.0	1.63	1.16
T3-43	206780	384586	2.3	5	10.5	4.2	1.0	2.02	1.54
T3-44	206879	384563	1.7	4	10.5	4.5	1.0	2.04	1.58

Location			Material Properties				Surcharge	EC7	
								Condition (1)	Condition (2), 1.0m Surcharge
								DA1.C2	DA1.C2
ID	Easting	Northing	Slope	Undrained shear strength	Weight density of Peat	Peat Depth	Surcharge Equivalent Placed Fill Depth (m)	Equivalent FOS	Equivalent FOS
T3-45	207117	385017	3.2	5.5	10.5	5.0	1.0	1.34	1.07
T4-1	207187	384554	1.2	3	10.5	4.5	1.0	2.17	1.68
T4-2	207200	384557	1	2	10.5	5.9	1.0	1.32	1.08
T4-3	207207	384554	1.7	3.5	10.5	5.7	1.0	1.41	1.15
T4-4	207216	384557	1.7	5.5	10.5	7.3	1.0	1.73	1.47
T4-5	207222	384583	1.8	3.5	10.5	5.2	1.0	1.46	1.17
T4-6	207224	384560	2	6	10.5	5.0	1.0	2.34	1.86
T4-7	207244	384563	1.9	4	10.5	4.8	1.0	1.71	1.35
T4-8	207245	384554	3.1	4.5	10.5	4.1	1.0	1.38	1.05
T4-9	207264	384590	3.2	7	10.5	3.0	1.0	2.85	1.99
T4-10	207266	384572	4.4	7	10.5	3.0	1.0	2.08	1.45
T4-11	207286	384580	3.8	7	10.5	2.2	1.0	3.27	2.06
T4-12	207299	384608	3.6	5	10.5	2.0	1.0	2.71	1.64
T4-13	207306	384592	3.8	6	10.5	3.0	1.0	2.06	1.44
T4-14	207337	384609	3	8	10.5	3.0	1.0	3.47	2.42
T4-15	207358	384695	1.5	3.5	10.5	4.9	1.0	1.86	1.47
T4-16	207363	384670	2	4	10.5	3.6	1.0	2.17	1.59
T4-17	207366	384625	3	9	10.5	1.0	1.0	11.71	5.09
T4-18	207395	384623	2.2	15	10.5	0.7	1.0	38.00	13.30
T4-19	207408	384688	1.5	3	10.5	4.0	1.0	1.95	1.47
T4-20	207431	384669	2.3	7	10.5	1.1	1.0	10.80	4.95
T4-21	207444	384652	3	5	10.5	1.6	1.0	4.07	2.24
T4-22	207454	384629	3	9	10.5	1.4	1.0	8.37	4.34
T4-23	207457	384693	2.2	4	10.5	3.5	1.0	2.03	1.48
T4-24	207459	384614	3	5	10.5	1.8	1.0	3.62	2.10
T4-25	207492	384744	1.8	4	10.5	4.3	1.0	2.02	1.55
T4-26	207510	384651	3	12	10.5	2.8	1.0	5.58	3.81
T4-27	207512	384717	1.7	2.5	10.5	3.4	1.0	1.69	1.22
T4-28	207523	384550	1.4	2.5	10.5	3.0	1.0	2.32	1.62
T4-29	207527	384694	2.4	4.5	10.5	3.6	1.0	2.03	1.49
T4-30	207537	384701	1.7	3.5	10.5	4.1	1.0	1.96	1.49
T4-31	207550	384677	3	4	10.5	1.9	1.0	2.74	1.63
T4-32	207560	384642	5.7	7	10.5	1.5	1.0	3.21	1.72
T4-33	207561	384689	2.4	4	10.5	4.0	1.0	1.63	1.23
T4-34	207564	384610	2.3	3.5	10.5	3.3	1.0	1.80	1.29
T4-35	207568	384589	1.9	3.5	10.5	3.3	1.0	2.18	1.56
T4-36	207600	384619	3.9	8	10.5	0.8	1.0	10.02	3.82
T4-37	207616	384718	3.4	6	10.5	3.6	1.0	1.92	1.41
T4-38	207630	384735	2.5	4	10.5	2.3	1.0	2.71	1.73
T4-39	207636	384681	3.5	9	10.5	1.4	1.0	7.18	3.72
T4-40	207644	384666	3.8	5	10.5	1.7	1.0	3.03	1.71
T4-41	207658	384724	1.8	2	10.5	2.7	1.0	1.61	1.08
T4-42	207665	384748	1.1	2	10.5	3.7	1.0	1.92	1.42
T4-43	207671	384770	1.2	1.5	10.5	3.0	1.0	1.62	1.13
T4-44	207684	384693	4.6	11	10.5	1.5	1.0	6.24	3.34
T4-45	207725	384747	1.9	3.5	10.5	2.9	1.0	2.48	1.71
T4-46	207726	384654	3.9	6	10.5	2.7	1.0	2.23	1.50
T4-47	207756	384686	3	4.5	10.5	2.3	1.0	2.55	1.63
T4-48	207757	384729	3.8	4	10.5	1.9	1.0	2.17	1.29
T4-49	207759	384749	2.7	4	10.5	2.3	1.0	2.51	1.61
T4-50	207764	384711	5.7	11	10.5	1.5	1.0	5.05	2.70
T4-51	207766	384811	4.1	4.5	10.5	1.8	1.0	2.38	1.38
T4-52	207767	384786	4.1	4	10.5	1.7	1.0	2.24	1.27
T4-53	207792	384764	2.9	4	10.5	2.9	1.0	1.86	1.28
T4-54	207829	384789	3.75	6	10.5	2.2	1.0	2.84	1.79
T4-55	207837	384857	3.8	6	10.5	1.8	1.0	3.43	1.99
T4-56	207855	384820	2.3	2	10.5	1.7	1.0	2.00	1.13
T4-57	207858	384735	5.7	6	10.5	0.6	1.0	6.88	2.17
T4-58	207861	384686	3.2	4	10.5	1.9	1.0	2.57	1.53
T4-59	207862	384715	3	4	10.5	1.9	1.0	2.74	1.63
T4-60	207864	384761	4.8	6	10.5	1.5	1.0	3.26	1.75
T4-61	207873	384752	3.1	4	10.5	3.1	1.0	1.63	1.15
T4-62	207880	384784	3.5	5	10.5	2.0	1.0	2.79	1.69
T4-63	207881	384744	4	7	10.5	2.5	1.0	2.74	1.80
T4-64	207893	384726	3.8	6	10.5	3.0	1.0	2.06	1.44
T4-65	207898	384777	5.6	9	10.5	2.5	1.0	2.52	1.66
T4-66	207901	384802	5.7	5	10.5	1.7	1.0	2.02	1.15
T4-67	207907	384818	3.4	4	10.5	2.8	1.0	1.64	1.12
T4-68	207910	384765	4	5	10.5	3.0	1.0	1.63	1.14
T4-69	207911	384787	4.8	9	10.5	3.0	1.0	2.45	1.71
T4-70	207913	384841	3.6	9	10.5	2.3	1.0	4.25	2.71

Location			Material Properties				Surcharge	EC7	
								Condition (1)	Condition (2), 1.0m Surcharge
								DA1.C2	DA1.C2
ID	Easting	Northing	Slope	Undrained shear strength	Weight density of Peat	Peat Depth	Surcharge Equivalent Placed Fill Depth (m)	Equivalent FOS	Equivalent FOS
T4-71	207919	384859	3.4	5.5	10.5	2.6	1.0	2.43	1.62
T4-72	207921	384881	1.9	3.5	10.5	3.7	1.0	1.94	1.44
T4-73	207923	384803	5.6	7	10.5	3.0	1.0	1.63	1.14
T4-74	207924	384907	1.9	3	10.5	4.3	1.0	1.43	1.10
T4-75	207939	384840	3.4	5	10.5	3.3	1.0	1.74	1.25
T4-76	207944	384828	3.8	7	10.5	2.8	1.0	2.57	1.76
T4-77	207949	384761	8.2	8	10.5	1.7	1.0	2.27	1.29
T4-78	207954	384808	5.7	9	10.5	2.9	1.0	2.14	1.48
T4-79	207960	384880	1.7	4	10.5	3.9	1.0	2.35	1.76
T4-80	207974	384852	2.4	3.5	10.5	3.6	1.0	1.58	1.16
T4-81	207979	384783	5.2	8	10.5	2.1	1.0	2.87	1.77
T4-82	207984	384813	3	6	10.5	2.0	1.0	3.90	2.37
T4-83	207986	384866	1.7	3.5	10.5	4.8	1.0	1.67	1.32
T4-84	207987	384759	5	7	10.5	1.9	1.0	2.89	1.71
T4-85	207988	384855	2.4	5	10.5	3.2	1.0	2.54	1.81
T4-86	207996	384782	3.4	7	10.5	2.0	1.0	4.02	2.44
T4-87	208005	384864	1.6	5.5	10.5	2.9	1.0	4.62	3.19
T4-88	208010	384805	4.3	7	10.5	2.1	1.0	3.03	1.87
T4-89	208013	384897	1.9	3.5	10.5	4.1	1.0	1.75	1.33
T4-90	208013	384870	1.6	3.5	10.5	2.7	1.0	3.16	2.13
T4-91	208014	384816	2.1	3.5	10.5	2.3	1.0	2.83	1.81
T4-92	208020	384790	2.1	5	10.5	2.4	1.0	3.87	2.51
T4-93	208022	384859	1.7	7.5	10.5	2.2	1.0	7.82	4.92
T4-94	208025	384880	3.5	6	10.5	2.0	1.0	3.35	2.03
T4-95	208032	384848	1.7	5	10.5	2.0	1.0	5.74	3.48
T4-96	208035	384899	1.7	6	10.5	2.2	1.0	6.26	3.93
T4-97	208054	384879	1.6	5	10.5	1.9	1.0	6.41	3.81
T4-98	208056	384864	2.1	6.5	10.5	1.7	1.0	7.10	4.03
T4-99	208064	384901	2.3	7	10.5	2.1	1.0	5.65	3.49
T4-100	208082	384800	3	5.5	10.5	2.0	1.0	3.58	2.17
T4-101	208088	384878	3	10	10.5	1.9	1.0	6.85	4.07
T4-102	208089	384782	3	4.5	10.5	3.3	1.0	1.77	1.27
T4-103	208089	384772	3.8	5	10.5	2.4	1.0	2.14	1.39
T4-104	208092	384762	3.8	5	10.5	2.3	1.0	2.24	1.43
T4-105	208096	384746	4.4	5	10.5	2.0	1.0	2.22	1.35
T4-106	208097	384890	3.2	7	10.5	0.7	1.0	12.21	4.27
T4-107	208150	384887	2.1	16	10.5	1.6	1.0	18.58	10.25
T4-108	208167	384806	3	4	10.5	2.2	1.0	2.37	1.49
T4-109	208174	384830	3.4	4	10.5	2.8	1.0	1.64	1.12
T5-1	207980	385935	3.8	12	10.5	1.5	1.0	8.23	4.41
T5-2	207974	385832	3.8	9	10.5	2.0	1.0	4.63	2.81
T5-3	207899	385731	2.5	9	10.5	1.7	1.0	8.26	4.68
T5-4	207844	385623	5.2	9	10.5	1.5	1.0	4.52	2.42
T5-5	207720	385520	6	9	10.5	2.1	1.0	2.80	1.73
T5-6	207535	385405	5.7	5	10.5	1.6	1.0	2.15	1.19
T5-7	207511	385330	6	8	10.5	2.4	1.0	2.18	1.41
T5-8	207397	385258	8.7	20	10.5	1.2	1.0	7.58	3.64
T5-9	207356	385232	4.8	8	10.5	2.2	1.0	2.97	1.86
T5-10	207266	385133	5.44	9.5	10.5	2.0	1.0	3.42	2.08
T6-1	207699	385172	2.6	8	10.5	1.0	1.0	12.01	5.22
T6-2	207556	385306	5.2	4	10.5	1.3	1.0	2.32	1.16
T6-3	207560	385288	4.4	5	10.5	2.0	1.0	2.22	1.35
T6-4	207566	385256	3.8	6.5	10.5	2.3	1.0	2.91	1.86
T6-5	207586	385149	3.5	9	10.5	2.5	1.0	4.02	2.64
T6-6	207589	385318	4.8	7	10.5	1.7	1.0	3.36	1.90
T6-7	207606	385248	5.7	7	10.5	2.3	1.0	2.09	1.34
T6-8	207609	385127	1.5	5	10.5	1.8	1.0	7.22	4.19
T6-9	207637	385328	7.6	9	10.5	2.0	1.0	2.34	1.42
T6-10	207647	385226	4.2	4	10.5	2.0	1.0	1.86	1.13
T6-11	207649	385330	7.6	7	10.5	1.7	1.0	2.14	1.21
T6-12	207655	385318	7.6	7	10.5	0.5	1.0	7.26	2.02
T6-13	207690	385199	3.8	4.5	10.5	2.8	1.0	1.65	1.13
T7-1	208035	385919	4.7	7	10.5	1.2	1.0	4.86	2.33
T7-2	208064	385893	2.9	7	10.5	2.4	1.0	3.93	2.55
T7-3	208150	385874	2.1	13	10.5	2.1	1.0	11.50	7.10
T7-4	208100	385856	1.9	8	10.5	2.9	1.0	5.66	3.91
T7-5	208214	385844	3.5	10	10.5	2.0	1.0	5.58	3.38
T7-6	208175	385825	2.4	8	10.5	2.8	1.0	4.65	3.17
T7-7	208288	385825	3.5	5	10.5	1.0	1.0	5.58	2.43
T7-8	208166	385808	2.8	5	10.5	3.5	1.0	1.99	1.45
T7-9	208250	385793	3.5	4.5	10.5	2.4	1.0	2.09	1.36

Location			Material Properties				Surcharge	EC7	
								Condition (1)	Condition (2), 1.0m Surcharge
								DA1.C2	DA1.C2
ID	Easting	Northing	Slope	Undrained shear strength	Weight density of Peat	Peat Depth	Surcharge Equivalent Placed Fill Depth (m)	Equivalent FOS	Equivalent FOS
T7-10	208226	385784	2.4	7	10.5	2.9	1.0	3.92	2.71
T7-11	208281	385781	4.1	6	10.5	2.0	1.0	2.86	1.73
T7-12	208244	385763	4.1	5	10.5	1.8	1.0	2.65	1.54
T7-13	208261	385702	4	5.5	10.5	2.0	1.0	2.69	1.63
T7-14	208213	385692	3.2	7	10.5	3.4	1.0	2.51	1.82
T7-15	208171	385683	2.6	5	10.5	3.5	1.0	2.14	1.56
T7-16	208317	385680	3.8	4	10.5	2.1	1.0	1.96	1.21
T7-17	208262	385677	4	9	10.5	1.2	1.0	7.33	3.52
T7-18	208244	385654	3.9	8	10.5	2.0	1.0	4.01	2.43
T7-19	208318	385653	2.7	4	10.5	2.2	1.0	2.63	1.65
T7-20	208278	385637	3.3	7	10.5	1.6	1.0	5.18	2.86
T7-21	208323	385627	2.3	5.5	10.5	2.5	1.0	3.73	2.46
T7-22	208248	385623	2.7	4.5	10.5	2.0	1.0	3.25	1.97
T7-23	208324	385608	4.1	5	10.5	1.7	1.0	2.81	1.59
T7-24	208247	385599	4.8	6	10.5	1.5	1.0	3.26	1.75
T7-25	208120	385597	1.1	3	10.5	4.8	1.0	2.22	1.74
T7-26	208218	385592	4.9	9	10.5	3.0	1.0	2.40	1.67
T7-27	208248	385586	5.1	5	10.5	2.1	1.0	1.83	1.13
T7-28	208334	385583	2.4	3.5	10.5	2.4	1.0	2.37	1.54
T7-29	208256	385566	3.9	4	10.5	2.2	1.0	1.82	1.15
T7-30	208273	385556	4.1	9	10.5	1.6	1.0	5.37	2.96
T7-31	208325	385547	3.7	5	10.5	1.4	1.0	3.77	1.96
T7-32	208272	385537	3.8	16	10.5	2.2	1.0	7.48	4.70
T7-33	208355	385537	3.1	5	10.5	0.5	1.0	12.60	3.50
T7-34	208265	385529	3.7	4	10.5	2.5	1.0	1.69	1.11
T7-35	208332	385521	4.2	4	10.5	1.2	1.0	3.10	1.49
T7-36	208322	385521	5.2	4	10.5	1.2	1.0	2.51	1.21
T7-37	208153	385518	1.7	3.5	10.5	3.5	1.0	2.29	1.67
T7-38	208246	385515	2.6	7	10.5	3.0	1.0	3.50	2.44
T7-39	208284	385509	3.3	5	10.5	1.5	1.0	3.95	2.11
T7-40	208159	385442	1.8	2.5	10.5	5.5	1.0	0.98	0.80
T7-41	208235	385429	3.1	3	10.5	2.0	1.0	1.89	1.15
T7-42	208165	385395	3	4	10.5	3.0	1.0	1.74	1.21
T8-1	207767	385652	1.3	6.5	10.5	2.7	1.0	7.22	4.87
T8-2	207681	385625	5.8	23	10.5	0.9	1.0	17.29	7.07
T8-3	207589	385627	3.3	6	10.5	3.0	1.0	2.37	1.65
T8-4	207499	385610	3.1	11	10.5	1.8	1.0	7.70	4.47
T8-5	207264	385591	5.7	10	10.5	1.7	1.0	4.05	2.29
T8-6	207254	385610.4	5.2	11	10.5	0.6	1.0	13.82	4.36
T8-7	207129	385573.6	6.8	21	10.5	1.2	1.0	10.13	4.86
T8-8	207125	385603	6.7	16	10.5	1.0	1.0	9.39	4.08
T9-1	208541	386533	6.3	7	10.5	1.0	1.0	4.37	1.90
T9-2	208600	386435	6.4	7	10.5	1.0	1.0	4.30	1.87
T9-3	208710	386424	3.8	6	10.5	1.4	1.0	4.41	2.29
T9-4	208746	385837.5	2.7	20	10.5	0.8	1.0	36.14	13.77
T9-5	208792	385928	3.3	12	10.5	1.0	1.0	14.20	6.18
T9-6	208826	386375	2.4	8	10.5	0.9	1.0	14.45	5.91
T9-7	208853	385891	2.7	6.5	10.5	1.9	1.0	4.95	2.94
T9-8	208878	385968.5	2.9	10	10.5	0.9	1.0	14.96	6.12
T9-9	208888	385927	2.9	10	10.5	2.4	1.0	5.61	3.64
T9-10	208889	386015	1.5	7	10.5	1.8	1.0	10.11	5.87
T9-11	208936	386295	6.4	7	10.5	1.0	1.0	4.30	1.87
T9-12	208937	385949	3.7	8.5	10.5	1.8	1.0	4.99	2.90
T9-13	208947	386094	3.3	8	10.5	1.9	1.0	4.98	2.96
T9-14	208949	386154	3.1	6	10.5	2.1	1.0	3.60	2.22
T9-15	208949	386054	3.3	6	10.5	1.7	1.0	4.18	2.37
T10-1	206779	385519	2.4	3	10.5	1.7	1.0	2.87	1.63
T10-2	206950	385674	2.9	9	10.5	1.8	1.0	6.73	3.91
T10-3	206908	385730	4.1	11	10.5	1.2	1.5	8.74	3.33
T10-4	206912	385839	5	12	10.5	1.2	1.5	7.84	2.98
T10-5	206847	385888	1.9	3	10.5	1.8	1.5	3.42	1.64
T10-6	206815	385888	2.1	3	10.5	1.9	1.5	2.93	1.45
T10-7	206837	385920	3.2	9	10.5	1.9	1.0	5.78	3.43
T10-8	206769	385945	1.7	2	10.5	2.0	1.5	2.29	1.16
T11-1	207485	385986	3.8	9	10.5	1.9	1.0	4.87	2.89
T11-2	207574	385947	5.2	12	10.5	1.9	1.0	4.76	2.83
T11-3	207651	385972	2.6	11	10.5	1.8	1.0	9.17	5.33
T11-4	207748	385968	2.6	14	10.5	1.5	1.0	14.01	7.51
T11-5	207872	385962	2.6	10	10.5	1.5	1.0	10.01	5.36
T11-6	208076	385956	4.1	5	10.5	2.9	1.0	1.64	1.14
T11-7	208099	386052	3.1	3.5	10.5	2.1	1.0	2.10	1.30

Location			Material Properties				Surcharge	EC7	
								Condition (1)	Condition (2), 1.0m Surcharge
								DA1.C2	DA1.C2
ID	Easting	Northing	Slope	Undrained shear strength	Weight density of Peat	Peat Depth	Surcharge Equivalent Placed Fill Depth (m)	Equivalent FOS	Equivalent FOS
T11-8	208117	385930	2.4	4	10.5	3.4	1.0	1.91	1.38
T11-9	208121	386025	3.6	5	10.5	2.5	1.0	2.17	1.43
T11-10	208133	386065	4.1	5	10.5	2.9	1.0	1.64	1.14
T11-11	208146	385924	1.5	3.5	10.5	4.0	1.0	2.27	1.72
T11-12	208160	385962	4	5.5	10.5	3.1	1.0	1.73	1.22
T11-13	208172	386069	2.9	6	10.5	1.7	1.0	4.75	2.69
T11-14	208205	385935	2.6	4	10.5	2.7	1.0	2.22	1.50
T11-15	208209	386061	3	6	10.5	2.6	1.0	3.00	2.00
T11-16	208229	385951	2.6	4	10.5	3.2	1.0	1.88	1.33
T11-17	208230	386037	3.8	6	10.5	2.0	1.0	3.09	1.87
T11-18	208238	386010	3.1	4	10.5	2.3	1.0	2.19	1.40
T11-19	208253	385982	2.1	5	10.5	3.7	1.0	2.51	1.86
T12-1	207486	385987	4.6	9	10.5	1.9	1.0	4.03	2.39
T12-2	207405	385997	5.7	5	10.5	1.0	1.0	3.44	1.50
T12-3	207511	386005	3.7	13	10.5	1.4	1.0	9.81	5.09
T12-4	207477	386005	4.8	5.5	10.5	2.2	1.0	2.04	1.28
T12-5	207560	386008	5.8	10.5	10.5	0.9	1.0	7.89	3.23
T12-6	207533	386021	4.9	13	10.5	1.9	1.0	5.47	3.25
T12-7	207421	386021	4.1	8.5	10.5	1.7	1.0	4.77	2.70
T12-8	207394	386026	4.1	6	10.5	1.6	1.0	3.58	1.97
T12-9	207459	386027	3.8	11	10.5	0.8	1.0	14.14	5.39
T12-10	207551	386036	5.1	8	10.5	1.5	1.0	4.10	2.20
T12-11	207372	386036	7.9	20	10.5	0.5	1.0	19.99	5.55
T12-12	207494	386046	3.4	2.4	10.5	1.1	1.0	2.51	1.15
T12-13	207532	386090	3.9	6	10.5	1.8	1.0	3.34	1.94
T12-14	207560	386114	7.4	11.5	10.5	1.9	1.0	3.22	1.91
T12-15	207539	386125	5.8	22	10.5	1.1	1.0	13.53	6.20
T12-16	207560	386137	4.7	5	10.5	1.4	1.0	2.98	1.54
T12-17	207535	386162	5.7	7	10.5	1.4	1.0	3.44	1.78
T12-18	207562	386167	4.8	5	10.5	1.6	1.0	2.55	1.41
T12-19	207531	386181	4.6	8	10.5	2.0	1.0	3.40	2.06
T12-20	207563	386189	3.1	7	10.5	1.8	1.0	4.90	2.84
T12-21	207527	386204	3.6	4.5	10.5	1.9	1.0	2.57	1.53
T12-22	207562	386209	3.8	24	10.5	0.7	1.0	35.27	12.34
T12-23	207526	386222	3.8	6	10.5	2.1	1.0	2.94	1.82
T12-24	207567	386230	4.4	19	10.5	1.1	1.0	15.36	7.04
T12-25	207525	386240	11.3	30	10.5	1.0	1.0	10.62	4.62
T12-26	207566	386241	7.8	18	10.5	0.4	1.0	22.77	5.36
T13-1	208620	386979	4.4	18	10.5	2.0	1.0	8.00	4.85
T13-2	208568	386889	3.8	10	10.5	1.0	1.0	10.29	4.47
T13-3	208528	386816	5	8	10.5	1.6	1.0	3.92	2.16
T13-4	208512	386645	7.8	8	10.5	0.5	1.0	8.09	2.25
T13-5	208349	386610	3.2	16	10.5	0.8	1.0	24.41	9.30
T13-6	208408	386596	3.8	7.5	10.5	0.9	1.0	8.57	3.51
T13-7	208568	386579	2.2	9	10.5	1.2	1.0	13.30	6.38
T13-8	208322	386572	3.3	10	10.5	1.1	1.0	10.76	4.93
T13-9	208547	386549	4.8	7	10.5	1.3	1.0	4.39	2.20
T13-10	208399	386548	5	25	10.5	0.8	1.0	24.48	9.33
T14-1	207243	386066	5.6	14	10.5	1.6	1.0	6.13	3.38
T14-2	207230	386158	3.5	9	10.5	2.0	1.0	5.02	3.04
T14-3	207224	386249	7.7	12	10.5	1.0	1.0	6.15	2.67
T14-4	207207	386335	2.9	13	10.5	2.7	1.0	6.48	4.38
T14-5	207095	386453	2.3	8.5	10.5	1.6	1.0	9.01	4.97
T14-6	207020	386480	4.1	16	10.5	0.8	1.0	19.08	7.27
T14-7	207066	386556	2.6	21	10.5	1.5	1.0	21.02	11.26
T14-8	207018	386578	4	26	10.5	1.1	1.0	23.11	10.59
T14-9	206957	386590	3.5	16	10.5	1.2	1.0	14.89	7.14
T15-1	207810	386587	3.8	22	10.5	0.5	1.0	45.26	12.57
T15-2	207839	386701	2	21	10.5	0.8	1.0	51.20	19.50
T16-1	208580	386594	4.3	7	10.5	1.0	1.0	6.37	2.77
T16-2	208617	386607	3.7	6.5	10.5	1.6	1.0	4.29	2.37
T16-3	208672	386583	4.4	6	10.5	2.6	1.0	2.05	1.37
T16-4	208770	386663	2.3	3	10.5	3.1	1.0	1.64	1.16
T16-5	208780	386687	3	5	10.5	3.0	1.0	2.17	1.51
T16-6	208790	386562	2	4	10.5	2.5	1.0	3.12	2.05
T16-7	208798	386702	2.5	3.5	10.5	3.0	1.0	1.82	1.27
T16-8	208807	386530	2	6	10.5	3.8	1.0	3.08	2.29
T16-9	208825	386590	2.3	4	10.5	5.0	1.0	1.36	1.08
T16-10	208837	386559	1.3	5	10.5	5.1	1.0	2.94	2.34
T16-11	208842	386661	2.2	3.5	10.5	1.4	1.0	4.43	2.30
T16-12	208843	386713	3.4	4	10.5	1.8	1.0	2.55	1.48

Location			Material Properties				Surcharge	EC7	
								Condition (1)	Condition (2), 1.0m Surcharge
								DA1.C2	DA1.C2
ID	Easting	Northing	Slope	Undrained shear strength	Weight density of Peat	Peat Depth	Surcharge Equivalent Placed Fill Depth (m)	Equivalent FOS	Equivalent FOS
T16-13	208867	386721	2.9	4	10.5	3.2	1.0	1.68	1.20
T16-14	208867	386721	3.1	4	10.5	3.2	1.0	1.57	1.12
T16-15	208878	386731	2.5	5	10.5	2.7	1.0	2.89	1.95
T16-16	208880	386611	2.7	5	10.5	2.0	1.0	3.61	2.19
T16-17	208881	386760	2.3	3.5	10.5	3.3	1.0	1.80	1.29
T16-18	208898	386692	2.4	4.5	10.5	4.0	1.0	1.83	1.38
T16-19	208903	386743	1.8	5	10.5	5.1	1.0	2.12	1.69
T16-20	208904	386578	2.6	3	10.5	2.8	1.0	1.61	1.10
T16-21	208909	386595	2	5	10.5	1.6	1.0	6.10	3.36
T16-22	208910	386693	2.4	5	10.5	5.2	1.0	1.56	1.25
T16-23	208919	386786	3	5	10.5	2.2	1.0	2.96	1.86
T16-24	208922	386737	1.7	3	10.5	4.9	1.0	1.40	1.11
T16-25	208926	386775	3	4	10.5	1.8	1.0	2.89	1.68
T16-26	208937	386705	1.7	3	10.5	4.9	1.0	1.40	1.11
T16-27	208939	386750	2.5	5	10.5	1.6	1.0	4.88	2.69
T16-28	208950	386721	1.5	2	10.5	2.6	1.0	2.00	1.33
T16-29	208952	386711	1.9	3	10.5	3.0	1.0	2.05	1.43
T16-30	208965	386712	2.2	5	10.5	2.1	1.0	4.22	2.61
T16-31	208981	386727	1.5	4.5	10.5	1.8	1.0	6.50	3.77
T16-32	208987	386646	2.3	4	10.5	2.9	1.0	2.34	1.62
T17-1	208557	387194	5.7	13	10.5	1.7	2.0	5.26	2.08
T17-2	208553	387102	4.1	19	10.5	1.2	1.0	15.10	7.25
T17-3	208558	387082	5.7	23	10.5	1.0	1.0	15.83	6.88
T17-4	208678	387078	5.2	20	10.5	1.5	1.5	10.05	4.37
T17-5	208560	387065	7.6	22	10.5	1.4	1.0	8.15	4.23
T18-1	205739	385716	3.8	4	10.5	1.2	1.0	3.43	1.65
T18-2	205756	385730	3.4	6	10.5	2.0	1.0	3.45	2.09
T18-3	205756	385763	4.9	8	10.5	1.2	1.0	5.33	2.56
T18-4	205778	385670	3.2	8	10.5	1.2	1.0	8.14	3.91
T18-5	205797	385702	2.7	12	10.5	2.0	1.0	8.67	5.26
T18-6	205812	385723	3.1	13	10.5	3.0	1.0	5.46	3.81
T18-7	205812	385723	2.5	13	10.5	3.0	1.0	6.76	4.72
T18-8	205880	385724	2.8	4.5	10.5	1.4	1.0	4.48	2.32
T18-9	205903	385739	2.9	5	10.5	2.5	1.0	2.69	1.77
T18-10	205913	385882	5.2	6	10.5	1.0	1.0	4.52	1.97
T18-11	205944	385771	2.2	2.5	10.5	1.2	1.0	3.69	1.77
T18-12	205952	385792	3	4	10.5	1.2	1.0	4.34	2.08
T18-13	205959	385895	5.2	5	10.5	1.0	1.0	3.77	1.64
T18-14	205976	385905	4.1	6	10.5	1.5	1.0	3.82	2.04
T18-15	205981	385826	3	3	10.5	1.4	1.0	2.79	1.45
T18-16	206002	385938	4.2	7.5	10.5	1.4	1.0	4.99	2.59
T18-17	206056	385906	4.9	12	10.5	1.5	1.0	6.39	3.43
T18-18	206060	385948	4.3	5	10.5	1.2	1.0	3.79	1.82
T18-19	206073	385966	3.9	3	10.5	1.2	1.0	2.51	1.20
T18-20	206097	386062	2.9	13	10.5	1.0	1.0	17.50	7.61
T18-21	206100	385890	2	4	10.5	2.5	1.0	3.12	2.05
T18-22	206125	386128	4.4	8	10.5	1.0	1.0	7.11	3.09
T18-23	206143	386198	5.6	9	10.5	0.8	1.0	7.88	3.00
T18-24	206156	385939	4.4	4	10.5	1.4	1.0	2.54	1.32
T18-25	206171	386108	6.4	12	10.5	1.3	1.0	5.67	2.83
T18-26	206172	386241	4.8	10	10.5	0.7	1.0	11.65	4.08
T18-27	206192	385988	4.1	8	10.5	2.2	1.0	3.47	2.18
T18-28	206223	386102	5.7	6	10.5	1.3	1.0	3.18	1.59
T18-29	206233	386128	4.2	9	10.5	1.0	1.0	8.38	3.64
T18-30	206275	386270	2.5	11	10.5	1.5	1.0	11.45	6.13
T18-31	206283	386196	1.9	4	10.5	3.1	1.0	2.65	1.87
T18-32	206287	386314	3.7	14	10.5	1.0	1.0	14.79	6.43
T18-33	206288	386236	3.2	5	10.5	1.3	1.0	4.69	2.35
T18-34	206289	386293	3	6	10.5	1.9	1.0	4.11	2.44
T18-35	206318	386434	8.1	9	10.5	1.0	1.0	4.39	1.91
T18-36	206338	386457	4.1	12	10.5	1.8	1.0	6.36	3.69
T18-37	206338	386296	6.2	5.5	10.5	1.5	1.0	2.32	1.24
T18-38	206340	386317	7.6	8	10.5	1.6	1.0	2.59	1.43
T18-39	206352	386478	7.6	16	10.5	1.0	1.0	8.30	3.61
T18-40	206368	386345	5.2	7	10.5	1.4	1.0	3.77	1.95
T18-41	206384	386412	3	15	10.5	1.9	1.0	10.28	6.10
T18-42	206399	386358	2.3	4.5	10.5	1.4	1.0	5.45	2.83
T18-43	206420	386372	3.7	5	10.5	1.9	1.0	2.78	1.65
T18-44	206436	386396	1.8	3	10.5	3.0	1.0	2.17	1.51
T18-45	206443	386532	4.3	8	10.5	1.6	1.0	4.55	2.51
T18-46	206461	386434	4.8	9	10.5	1.2	1.0	6.12	2.94

Location			Material Properties				Surcharge	EC7	
								Condition (1)	Condition (2), 1.0m Surcharge
								DA1.C2	DA1.C2
ID	Easting	Northing	Slope	Undrained shear strength	Weight density of Peat	Peat Depth	Surcharge Equivalent Placed Fill Depth (m)	Equivalent FOS	Equivalent FOS
T18-47	206467	386510	4.6	9	10.5	1.6	1.0	4.79	2.64
T18-48	206488	386544	5.1	12	10.5	1.0	1.0	9.22	4.01
T18-49	206538	386696	4.8	11	10.5	0.6	1.0	14.96	4.72
T18-50	206555	386709	5.6	5	10.5	1.5	1.0	2.33	1.25
T18-51	206556	386733	4.4	10	10.5	1.4	1.0	6.35	3.29
T18-52	206565	386648	4.7	16	10.5	1.5	1.0	8.89	4.76
T18-53	206590	386732	4.6	13	10.5	1.5	1.0	7.38	3.95
T18-54	206590	386743	4.3	10	10.5	2.4	1.0	3.79	2.46
T18-55	206603	386673	4.9	10	10.5	1.5	1.0	5.33	2.85
T18-56	206613	386652	3.7	14	10.5	0.8	1.0	18.49	7.04
T18-57	206654	386666	5.9	16	10.5	1.8	1.0	5.91	3.43
T18-58	206657	386806	3.3	6	10.5	1.6	1.0	4.44	2.45
T18-59	206667	386804	3.3	5	10.5	2.7	1.0	2.19	1.48
T18-60	206672	386737	4.8	8	10.5	1.5	1.0	4.35	2.33
T18-61	206678	386833	3.2	7	10.5	1.7	1.0	5.03	2.85
T18-62	206693	386751	3	7	10.5	1.3	1.0	7.01	3.50
T18-63	206709	386797	3.2	7	10.5	2.4	1.0	3.56	2.31
T18-64	206710	386837	2.9	7	10.5	2.5	1.0	3.77	2.48
T18-65	206745	386854	4.4	8	10.5	1.8	1.0	3.95	2.30
T18-66	206767	386882	3.5	7	10.5	2.0	1.0	3.91	2.37
T18-67	206775	386790	2.3	6.5	10.5	2.0	1.0	5.51	3.34
T18-68	206788	386887	3	9.5	10.5	2.8	1.0	4.42	3.02
T18-69	206790	386848	3.2	15	10.5	1.7	1.0	10.77	6.10
T18-70	206793	386906	2.4	7	10.5	2.4	1.0	4.74	3.08
T18-71	206798	386868	2.5	9.5	10.5	2.0	1.0	7.41	4.49
T18-72	206801	386765	2.2	9	10.5	1.8	1.0	8.87	5.15
T18-73	206803	386859	4.8	9	10.5	1.5	1.0	4.89	2.62
T18-74	206814	386800	2.2	6	10.5	2.5	1.0	4.26	2.80
T18-75	206830	386818	3.8	8	10.5	1.5	1.0	5.49	2.94
T18-76	206858	386839	1.7	10	10.5	1.2	1.0	19.12	9.18
T18-77	206861	386818	3.8	10	10.5	1.8	1.0	5.72	3.32
T18-78	206865	386924	2.6	7	10.5	1.2	1.0	8.76	4.20
T18-79	206885	386929	3.1	7	10.5	1.9	1.0	4.64	2.76
T18-80	206890	386908	2.7	7	10.5	3.4	1.0	2.98	2.15
T18-81	206892	386898	2.9	4.5	10.5	2.5	1.0	2.42	1.59
T18-82	206899	386875	2.9	8	10.5	3.1	1.0	3.47	2.45
T18-83	206944	386963	3.3	6	10.5	1.8	1.0	3.95	2.29
T18-84	206953	386883	2.6	13	10.5	2.1	1.0	9.29	5.74
T18-85	206979	386845	1.9	11	10.5	2.7	1.0	8.36	5.65
T18-86	206986	386887	2	13	10.5	2.0	1.0	12.68	7.68
T18-87	207007	386966	2.5	11	10.5	0.6	1.0	28.62	9.04
T18-88	207018	386930	3.3	5	10.5	2.4	1.0	2.47	1.60
T18-89	207035	386865	5.2	10.5	10.5	3.2	1.0	2.47	1.76
T18-90	207043	386890	1.8	10	10.5	3.5	1.0	6.19	4.51
T18-91	207058	386936	1.8	6	10.5	2.9	1.0	4.48	3.10
T18-92	207065	386863	4.2	19	10.5	5.0	1.0	3.54	2.81
T18-93	207072	386887	2.1	8	10.5	4.0	1.0	3.72	2.80
T18-94	207087	386986	3	13	10.5	0.6	1.0	28.20	8.91
T18-95	207092	386901	3	7	10.5	3.0	1.0	3.04	2.12
T18-96	207098	386842	4.6	10	10.5	3.7	1.0	2.30	1.70
T18-97	207106	386870	2.3	5	10.5	4.4	1.0	1.93	1.49
T18-98	207107	386902	2.9	13	10.5	3.7	1.0	4.73	3.50
T18-99	207130	386866	2.1	8	10.5	3.1	1.0	4.79	3.38
T18-100	207144	386807	2.6	21	10.5	3.0	1.0	10.51	7.33
T18-101	207165	386924	1.5	11	10.5	1.2	1.0	23.83	11.44
T18-102	207171	386967	3.1	10	10.5	1.2	1.0	10.50	5.04
T18-103	207172	386911	1.5	13	10.5	2.3	1.0	14.69	9.39
T18-104	207210	386856	3.5	8	10.5	2.1	1.0	4.25	2.63
T18-105	207247	386891	2.7	8	10.5	1.8	1.0	6.43	3.73
T18-106	207270	386895	3.1	6	10.5	1.7	1.0	4.45	2.52
T18-107	207347	386931	2.6	14	10.5	2.0	1.0	10.51	6.37
T18-108	207370	387040	3.4	16	10.5	1.5	1.0	12.26	6.57
T18-109	207383	387013	3.1	12	10.5	2.0	1.0	7.56	4.58
T18-110	207393	387218	4.7	7	10.5	1.5	1.0	3.89	2.08
T18-111	207441	387026	4	13	10.5	1.5	1.0	8.47	4.54
T18-112	207481	387052	3.6	11	10.5	2.0	1.0	5.97	3.62
T18-113	207484	387187	3.9	12	10.5	0.7	1.0	17.19	6.01
T18-114	207522	387043	2.7	6	10.5	2.0	1.0	4.34	2.63
T18-115	207536	387086	2.1	7	10.5	1.6	1.0	8.13	4.48
T18-116	207540	387071	2.3	8	10.5	1.3	1.0	10.44	5.22
T18-117	207558	387198	3.5	4.5	10.5	2.0	1.0	2.51	1.52

Location			Material Properties				Surcharge	EC7	
								Condition (1)	Condition (2), 1.0m Surcharge
								DA1.C2	DA1.C2
ID	Easting	Northing	Slope	Undrained shear strength	Weight density of Peat	Peat Depth	Surcharge Equivalent Placed Fill Depth (m)	Equivalent FOS	Equivalent FOS
T18-118	207589	387131	1.8	6	10.5	1.9	1.0	6.84	4.06
T19-1	208542	387239	2	12	10.5	2.2	1.0	10.64	6.69
T19-2	208779	387245	4.4	7.5	10.5	1.2	1.5	5.56	2.12
T19-3	208874	387268	3.6	5.5	10.5	1.8	1.5	3.32	1.59
T19-4	209059	387236	3.8	9	10.5	1.7	1.0	5.45	3.09
T19-5	209103	387126	3.8	21	10.5	0.5	1.0	43.21	12.00
T19-6	209112	387161	3.5	4	10.5	2.9	1.0	1.54	1.06
T19-7	209126	387242	2.7	6.5	10.5	1.9	1.0	4.95	2.94
T19-8	209140	387285	3.1	4	10.5	1.8	1.0	2.80	1.63
T19-9	209140	387126	3.4	10	10.5	1.0	1.0	11.49	5.00
T19-10	209165	387281	2.9	8	10.5	2.0	1.0	5.39	3.26
T19-11	209172	387122	2.5	3.5	10.5	3.8	1.0	1.44	1.07
T19-12	209179	387242	2.2	4.5	10.5	1.5	1.0	5.32	2.85
T19-13	209196	387280	4.1	4	10.5	2.1	1.0	1.82	1.12
T19-14	209206	387137	2.1	4	10.5	3.5	1.0	2.12	1.55
T19-15	209225	387237	1.6	3	10.5	3.4	1.0	2.15	1.56
T19-16	209244	387208	4	4	10.5	1.9	1.0	2.06	1.22
MM-1	206918	385685	4.5	11	10.5	1.5	1.0	6.38	3.42
MM-2	206891	385743	4.1	9	10.5	0.7	1.0	12.26	4.29
MM-3	206853	385708	4.3	3.5	10.5	1.5	1.0	2.12	1.14
MM-4	206861	385641	4	7	10.5	1.0	1.0	6.84	2.98
MM-5	206815	385590	4.3	4.5	10.5	1.8	1.0	2.27	1.32
T1	207133	384174	1.0	5	10.5	1.0	1.0	19.49	8.47
T2	207689	384214	1.0	5	10.5	2.7	1.0	7.22	4.87
T3	206859	384619	1.0	5	10.5	4.5	1.0	4.33	3.36
T4	208106	384825	1.0	5	10.5	2.7	1.0	7.22	4.87
T5	207241	385034	1.0	5	10.5	4.7	1.0	4.15	3.25
T6	207639	385286	15.0	5	10.5	0.2	1.0	6.80	0.91
T7	208261	385494	5.0	5	10.5	1.7	1.0	2.30	1.31
T8	207155	385589	5.0	5	10.5	2.0	1.0	1.96	1.19
T9	208732	385899	9.0	5	10.5	0.5	1.0	4.40	1.22
T10	206803	385952	2.0	5	10.5	2.5	1.0	3.90	2.57
T11	208183	385999	3.0	5	10.5	2.1	1.0	3.10	1.91
T12	207583	386083	6.0	5	10.5	1.7	1.0	1.92	1.09
T13	208379	386526	2.0	5	10.5	0.3	1.0	32.51	6.10
T14	206983	386559	1.0	5	10.5	1.3	1.0	14.99	7.50
T15	207800	386648	2.0	5	10.5	0.2	1.0	48.76	6.50
T16	208946	386668	3.0	5	10.5	1.0	1.0	6.51	2.83
T17	208631	387051	6.0	5	10.5	1.5	1.0	2.18	1.17
T18	207448	387070	3.0	5	10.5	1.0	1.0	6.51	2.83
T19	209193	387211	3.0	5	10.5	0.3	1.0	21.69	4.07
Substation 1	205143	386692	4.0	5	10.5	2.6	1.0	1.88	1.25
Met Mast 1	206885	385678	3.0	5	10.5	1.5	1.0	4.34	2.32
BP 1	205205	386489	3.0	5	10.5	2.1	1.0	3.10	1.91
BP 2	207770	386382	3.0	5	10.5	1.1	1.0	5.92	2.71
BP 3	207428	385166	5.0	5	10.5	3.4	1.0	1.15	0.83
CC1	207795	387071	6.0	5	10.5	2.2	1.0	1.49	0.93
MCCKOS 15	206918	384235	4.6	5	10.5	2.6	1.0	1.63	1.08
MCCKOS 16	207829	384485	4.5	5	10.5	0.4	1.0	10.83	2.55
MCCKOS 17	207812	384487	4.5	5	10.5	0.5	1.0	8.66	2.41
MCCKOS 18	207812	384529	3.9	5	10.5	0.9	1.0	5.50	2.25
MCCKOS 19	208002	384876	1.9	5	10.5	3.4	1.0	3.03	2.20
MCCKOS 20	208000	384923	1.7	5	10.5	4.4	1.0	2.67	2.06
MCCKOS 21	208064	384985	2.9	5	10.5	1.8	1.0	3.79	2.20
MCCKOS 22	208091	384995	1.9	5	10.5	3.6	1.0	2.78	2.04
MCCKOS 23	208102	385018	2.4	5	10.5	5.0	1.0	1.62	1.29
MCCKOS 24	208155	385005	3.3	5	10.5	2.5	1.0	2.39	1.58
MCCKOS 25	208181	385025	3.2	5	10.5	2.6	1.0	2.34	1.56
MCCKOS 26	208191	384993	2.3	5	10.5	1.9	1.0	4.37	2.60
MCCKOS 27	208183	384975	0.1	5	10.5	2.5	1.0	136.05	89.51
MCCKOS 42	206657	384846	5.7	5	10.5	1.7	1.0	2.02	1.15
MCCKOS 43	206696	384852	6.8	5	10.5	0.1	1.0	28.75	2.05
MCCKOS 44	206733	384864	6.7	5	10.5	0.5	1.0	5.89	1.64
MCCKOS 45	206906	384898	4.0	5	10.5	1.9	1.0	2.57	1.53
MCCKOS 46	206901	384851	4.1	5	10.5	1.9	1.0	2.50	1.48
MCCKOS 47	206906	384821	3.7	5	10.5	1.1	1.0	4.78	2.19
MCCKOS 48	206920	384787	3.1	5	10.5	2.2	1.0	2.82	1.77
MCCKOS 49	206904	384742	3.0	5	10.5	3.5	1.0	1.84	1.34
MCCKOS 50	206912	384727	1.8	5	10.5	3.6	1.0	2.96	2.17

Location			Material Properties				Surcharge	EC7	
								Condition (1)	Condition (2), 1.0m Surcharge
								DA1.C2	DA1.C2
ID	Easting	Northing	Slope	Undrained shear strength	Weight density of Peat	Peat Depth	Surcharge Equivalent Placed Fill Depth (m)	Equivalent FOS	Equivalent FOS
MCCKOS 51	206923	384694	1.7	5	10.5	3.6	1.0	3.26	2.40
MCCKOS 52	206957	384686	1.8	5	10.5	3.6	1.0	3.05	2.24
MCCKOS 53	206937	384636	1.8	5	10.5	2.3	1.0	4.63	2.96
MCCKOS 54	206908	384618	1.9	5	10.5	2.3	1.0	4.49	2.87
MCCKOS 55	206900	384627	1.8	5	10.5	3.3	1.0	3.22	2.31
MCCKOS 56	206876	384902	4.2	5	10.5	2.7	1.0	1.71	1.16
MCCKOS 57	207395	384960	0.1	5	10.5	4.0	1.0	48.72	36.77
MCCKOS 58	207413	384971	0.1	5	10.5	4.4	1.0	77.30	59.67
MCCKOS 59	207415	384973	0.1	5	10.5	4.4	1.0	77.30	59.67
MCCKOS 60	207430	384966	0.1	5	10.5	4.6	1.0	73.94	57.65
MCCKOS 61	207412	385026	0.3	5	10.5	3.5	1.0	16.20	11.81
MCCKOS 62	207392	385055	1.5	5	10.5	2.4	1.0	5.45	3.54
MCCKOS 63	207366	385056	1.8	5	10.5	3.8	1.0	2.80	2.09
MCCKOS 64	207342	385022	0.1	5	10.5	4.2	1.0	46.40	35.43
MCCKOS 65	207326	384976	0.1	5	10.5	4.4	1.0	44.29	34.19
MCCKOS 66	207725	385485	3.8	5	10.5	1.6	1.0	3.19	1.76
MCCKOS 67	207744	385486	3.8	5	10.5	1.1	1.0	4.71	2.16
MCCKOS 68	207742	385491	3.8	5	10.5	1.5	1.0	3.45	1.85
MCCKOS 69	207728	385500	3.8	5	10.5	1.8	1.0	2.83	1.64
MCCKOS 70	207732	385518	3.4	5	10.5	1.0	1.0	5.79	2.52
MCCKOS 71	207711	385496	4.0	5	10.5	1.7	1.0	2.87	1.63
MCCKOS 72	207969	385975	4.5	5	10.5	1.4	1.0	3.13	1.62
MCCKOS 73	208023	386017	5.5	5	10.5	1.0	1.0	3.58	1.55
MCCKOS 74	208051	386041	5.1	5	10.5	1.8	1.0	2.12	1.23
MCCKOS 75	208080	386060	4.9	5	10.5	2.5	1.0	1.61	1.06
MCCKOS 76	208088	386096	5.3	5	10.5	2.3	1.0	1.62	1.04
MCCKOS 77	208099	386120	5.5	5	10.5	1.6	1.0	2.23	1.23
MCCKOS 78	208118	386139	5.8	5	10.5	1.1	1.0	3.09	1.42
MCCKOS 79	208131	386149	5.4	5	10.5	0.4	1.0	9.13	2.15
MCCKOS 80	208136	386162	5.4	5	10.5	0.5	1.0	7.30	2.03
MCCKOS 81	208139	386176	5.5	5	10.5	1.8	1.0	1.97	1.14
MCCKOS 82	208138	386187	5.6	5	10.5	1.1	1.0	3.19	1.46
MCCKOS 83	208155	386190	5.1	5	10.5	1.7	1.0	2.27	1.28
MCCKOS 84	208153	386177	5.1	5	10.5	1.6	1.0	2.41	1.33
MCCKOS 85	208216	386047	2.6	5	10.5	2.6	1.0	2.85	1.90
MCCKOS 86	208212	386002	2.6	5	10.5	2.7	1.0	2.81	1.89
MCCKOS 87	208214	385938	2.5	5	10.5	3.0	1.0	2.64	1.84
MCCKOS 88	208215	385862	1.9	5	10.5	1.4	1.0	7.37	3.82
MCCKOS 89	208214	385785	1.5	5	10.5	3.0	1.0	4.20	2.93
MCCKOS 90	208214	385699	2.9	5	10.5	3.4	1.0	2.01	1.45
MCCKOS 91	208212	385639	3.0	5	10.5	1.1	1.0	5.85	2.68
MCCKOS 92	208219	385589	3.1	5	10.5	2.5	1.0	2.53	1.66
MCCKOS 93	208257	385597	3.3	5	10.5	1.8	1.0	3.27	1.90
MCCKOS 94	208274	385596	3.8	5	10.5	0.9	1.0	5.67	2.32
MCCKOS 95	208287	385588	3.8	5	10.5	0.7	1.0	7.28	2.55
MCCKOS 96	208298	385575	4.0	5	10.5	1.3	1.0	3.76	1.88
MCCKOS 97	208311	385585	4.0	5	10.5	0.9	1.0	5.43	2.22
MCCKOS 98	208325	385583	3.5	5	10.5	1.2	1.0	4.66	2.24
MCCKOS 99	208321	385566	3.9	5	10.5	2.0	1.0	2.48	1.50
MCCKOS 100	208309	385571	3.9	5	10.5	2.1	1.0	2.36	1.46
MCCKOS 101	207554	385992	4.6	5	10.5	1.5	1.0	2.85	1.53
MCCKOS 102	207544	386011	4.3	5	10.5	1.2	1.0	3.75	1.80
MCCKOS 103	207542	386027	4.7	5	10.5	1.8	1.0	2.29	1.33
MCCKOS 104	207541	386038	4.7	5	10.5	1.8	1.0	2.29	1.33
MCCKOS 105	207544	386049	5.0	5	10.5	1.9	1.0	2.07	1.23
MCCKOS 106	207555	386051	5.3	5	10.5	1.9	1.0	1.94	1.15
MCCKOS 107	207545	386065	5.4	5	10.5	1.7	1.0	2.13	1.20
MCCKOS 108	206962	385661	4.6	5	10.5	0.9	1.0	4.70	1.92
MCCKOS 109	206981	385631	5.0	5	10.5	1.0	1.0	3.94	1.71
MCCKOS 110	207007	385613	5.0	5	10.5	1.2	1.0	3.25	1.56
MCCKOS 111	207023	385574	5.5	5	10.5	1.0	1.0	3.58	1.55
MCCKOS 112	207054	385534	5.1	5	10.5	1.5	1.0	2.54	1.36
MCCKOS 113	207091	385543	5.9	5	10.5	0.5	1.0	6.67	1.85
MCCKOS 114	207109	385541	4.7	5	10.5	0.1	1.0	41.76	2.98
MCCKOS 115	207126	385547	4.3	5	10.5	1.6	1.0	2.81	1.55
MCCKOS 116	207137	385564	4.2	5	10.5	1.7	1.0	2.76	1.56
MCCKOS 117	207144	385580	4.5	5	10.5	1.9	1.0	2.31	1.37
MCCKOS 118	207149	385593	4.3	5	10.5	1.6	1.0	2.85	1.57
MCCKOS 119	207148	385595	4.3	5	10.5	1.7	1.0	2.68	1.52
MCCKOS 120	206573	385447	6.4	5	10.5	1.5	1.0	2.05	1.10
MCCKOS 121	206583	385425	6.7	5	10.5	0.3	1.0	9.74	1.83

Location			Material Properties				Surcharge	EC7	
								Condition (1)	Condition (2), 1.0m Surcharge
								DA1.C2	DA1.C2
ID	Easting	Northing	Slope	Undrained shear strength	Weight density of Peat	Peat Depth	Surcharge Equivalent Placed Fill Depth (m)	Equivalent FOS	Equivalent FOS
MCCKOS 122	206601	385395	6.6	5	10.5	0.4	1.0	7.43	1.75
MCCKOS 123	206607	385375	5.1	5	10.5	1.2	1.0	3.17	1.52
MCCKOS 124	206616	385356	4.4	5	10.5	1.1	1.0	4.04	1.85
MCCKOS 125	206620	385345	4.9	5	10.5	0.9	1.0	4.43	1.81
MCCKOS 126	206621	385332	7.9	5	10.5	1.0	1.0	2.51	1.09
MCCKOS 127	206610	385324	7.4	5	10.5	0.4	1.0	6.70	1.58
MCCKOS 128	206618	385317	8.7	5	10.5	0.3	1.0	7.58	1.42
MCCKOS 129	206721	386077	2.4	5	10.5	2.7	1.0	3.00	2.03
MCCKOS 130	206679	386151	0.2	5	10.5	4.0	1.0	28.34	21.39
MCCKOS 131	206671	386176	1.0	5	10.5	4.4	1.0	4.30	3.32
MCCKOS 132	206697	386180	1.2	5	10.5	4.4	1.0	3.68	2.84
MCCKOS 133	206723	386174	2.1	5	10.5	3.3	1.0	2.79	2.00
MCCKOS 134	206745	386170	2.4	5	10.5	2.7	1.0	3.00	2.03
MCCKOS 135	206755	386186	3.1	5	10.5	4.2	1.0	1.48	1.13
MCCKOS 136	206763	386130	4.2	5	10.5	2.7	1.0	1.73	1.17
MCCKOS 137	206772	386066	2.9	5	10.5	1.8	1.0	3.79	2.20
MCCKOS 138	206792	386060	2.9	5	10.5	1.6	1.0	4.18	2.31
MCCKOS 139	206789	386049	2.9	5	10.5	1.8	1.0	3.79	2.20
MCCKOS 140	206784	386018	2.6	5	10.5	3.2	1.0	2.32	1.65
MCCKOS 141	206789	385947	2.2	5	10.5	1.5	1.0	5.98	3.20
MCCKOS 142	206795	385875	2.0	5	10.5	1.9	1.0	5.12	3.04
MCCKOS 143	206802	385817	2.8	5	10.5	1.9	1.0	3.66	2.17
MCCKOS 144	206816	385696	4.1	5	10.5	0.5	1.0	9.63	2.67
MCCKOS 145	207717	386801	3.9	5	10.5	0.9	1.0	5.58	2.28
MCCKOS 146	207700	386801	3.8	5	10.5	0.9	1.0	5.67	2.32
MCCKOS 147	207688	386797	3.8	5	10.5	1.0	1.0	5.10	2.22
MCCKOS 148	207674	386804	3.9	5	10.5	1.9	1.0	2.61	1.55
MCCKOS 149	207668	386816	3.9	5	10.5	2.5	1.0	2.01	1.32
MCCKOS 150	207660	386823	3.9	5	10.5	2.0	1.0	2.48	1.50
MCCKOS 151	207656	386832	3.9	5	10.5	1.8	1.0	2.75	1.60
MCCKOS 152	207656	386799	4.1	5	10.5	2.6	1.0	1.85	1.23
MCCKOS 153	207724	386793	3.9	5	10.5	0.4	1.0	12.56	2.96
MCCKOS 154	207749	386798	3.4	5	10.5	0.3	1.0	18.96	3.56
MCCKOS 155	207753	386806	3.3	5	10.5	0.3	1.0	19.96	3.74
MCCKOS 156	207791	386791	3.8	5	10.5	1.2	1.0	4.25	2.04
MCCKOS 157	207836	386786	1.7	5	10.5	1.8	1.0	6.52	3.79
MCCKOS 158	207864	386788	1.7	5	10.5	1.4	1.0	8.38	4.35
MCCKOS 159	208175	387091	3.4	5	10.5	1.0	1.0	5.79	2.52
MCCKOS 160	208183	387132	3.2	5	10.5	2.9	1.0	2.10	1.45
MCCKOS 161	208172	387167	3.1	5	10.5	1.3	1.0	4.86	2.43
MCCKOS 168	208496	387253	3.0	5	10.5	2.0	1.0	3.22	1.95
MCCKOS 169	208520	387256	3.1	5	10.5	1.8	1.0	3.51	2.04
MCCKOS 170	208496	387240	3.0	5	10.5	2.1	1.0	3.06	1.89
MCCKOS 171	208490	387236	3.0	5	10.5	2.0	1.0	3.22	1.95
MCCKOS 172	208608	387311	3.5	5	10.5	1.8	1.0	3.06	1.78
MCCKOS 173	208604	387372	2.9	5	10.5	0.9	1.0	7.43	3.04
MCCKOS 182	208673	387291	4.1	5	10.5	1.0	1.0	4.81	2.09
MCCKOS 183	208738	387277	4.5	5	10.5	1.2	1.0	3.66	1.75
MCCKOS 184	208819	387266	4.2	5	10.5	1.1	1.0	4.20	1.93
MCCKOS 185	208866	387251	3.9	5	10.5	1.9	1.0	2.61	1.55
MCCKOS 186	209003	387243	3.9	5	10.5	1.7	1.0	2.91	1.65
MCCKOS 187	209071	387246	4.1	5	10.5	1.7	1.0	2.79	1.58
MCCKOS 188	209106	387245	4.1	5	10.5	1.9	1.0	2.50	1.48
MCCKOS 189	209123	387238	3.7	5	10.5	2.0	1.0	2.67	1.62
MCCKOS 190	209147	387240	2.6	5	10.5	1.4	1.0	5.41	2.81
MCCKOS 191	209163	387243	2.7	5	10.5	1.8	1.0	4.03	2.34
MCCKOS 192	209173	387249	2.8	5	10.5	2.1	1.0	3.31	2.05
MCCKOS 193	209183	387235	4.2	5	10.5	1.3	1.0	3.60	1.80
MCCKOS 194	209189	387221	3.5	5	10.5	0.1	1.0	55.07	3.93
MCCKOS 195	208467	386689	5.3	5	10.5	1.0	1.0	3.73	1.62
MCCKOS 196	208449	386692	5.0	5	10.5	0.6	1.0	6.49	2.05
MCCKOS 197	208434	386703	4.9	5	10.5	1.5	1.0	2.66	1.42
MCCKOS 198	208425	386711	4.9	5	10.5	1.8	1.0	2.24	1.30
MCCKOS 199	208427	386718	4.9	5	10.5	0.9	1.0	4.48	1.83
MCCKOS 200	208431	386718	4.9	5	10.5	1.0	1.0	4.03	1.75
MCCKOS 201	208423	386701	4.9	5	10.5	1.2	1.0	3.36	1.61
MCCKOS 202	208497	386664	5.5	5	10.5	0.4	1.0	8.94	2.10
MCCKOS 203	208560	386637	4.7	5	10.5	0.1	1.0	41.76	2.98
MCCKOS 204	208618	386610	3.9	5	10.5	2.6	1.0	1.93	1.29
MCCKOS 205	208659	386596	3.5	5	10.5	1.8	1.0	3.11	1.81
MCCKOS 206	208755	386559	2.3	5	10.5	0.6	1.0	13.85	4.37

Location			Material Properties				Surcharge	EC7	
								Condition (1)	Condition (2), 1.0m Surcharge
								DA1.C2	DA1.C2
ID	Easting	Northing	Slope	Undrained shear strength	Weight density of Peat	Peat Depth	Surcharge Equivalent Placed Fill Depth (m)	Equivalent FOS	Equivalent FOS
MCCKOS 207	208818	386547	2.0	5	10.5	2.4	1.0	4.05	2.63
MCCKOS 208	208853	386562	1.7	5	10.5	3.6	1.0	3.15	2.32
MCCKOS 209	208875	386572	0.5	5	10.5	3.6	1.0	11.81	8.68
MCCKOS 210	208917	386585	2.7	5	10.5	1.9	1.0	3.74	2.22
MCCKOS 211	208958	386599	1.8	5	10.5	2.0	1.0	5.49	3.33
MCCKOS 212	208991	386616	1.7	5	10.5	2.3	1.0	5.10	3.26
MCCKOS 213	209016	386636	1.8	5	10.5	2.7	1.0	3.94	2.66
MCCKOS 214	209038	386647	2.3	5	10.5	1.9	1.0	4.48	2.66
MCCKOS 215	209049	386671	1.9	5	10.5	4.0	1.0	2.58	1.95
MCCKOS 216	209012	386711	2.0	5	10.5	2.7	1.0	3.60	2.43
MCCKOS 217	209005	386727	2.8	5	10.5	1.9	1.0	3.66	2.17
MCCKOS 218	208998	386743	0.3	5	10.5	0.3	1.0	188.97	35.43
MCCKOS 219	208980	386726	0.2	5	10.5	2.0	1.0	42.52	25.77
MCCKOS 220	208957	386695	1.9	5	10.5	2.6	1.0	3.97	2.65
MCCKOS 221	208941	386680	1.7	5	10.5	0.5	1.0	23.48	6.52
MCCKOS 222	208920	386656	1.8	5	10.5	2.5	1.0	4.39	2.89
MCCKOS 223	208886	386612	3.0	5	10.5	1.6	1.0	4.10	2.26
MCCKOS 224	208878	386592	3.0	5	10.5	1.7	1.0	3.86	2.19
MCCKOS 225	208687	386401	3.0	5	10.5	1.2	1.0	5.36	2.57
MCCKOS 226	208682	386368	3.5	5	10.5	1.2	1.0	4.66	2.24
MCCKOS 227	208682	386312	3.5	5	10.5	1.2	1.0	4.59	2.20
MCCKOS 228	208679	386264	3.5	5	10.5	0.2	1.0	27.54	3.67
MCCKOS 229	208681	386231	3.7	5	10.5	1.1	1.0	4.78	2.19
MCCKOS 230	208671	386210	3.8	5	10.5	1.4	1.0	3.64	1.89
MCCKOS 231	208676	386183	3.9	5	10.5	1.3	1.0	3.87	1.93
MCCKOS 232	208693	386189	3.9	5	10.5	1.3	1.0	3.87	1.93
MCCKOS 233	208704	386156	3.7	5	10.5	1.9	1.0	2.81	1.67
MCCKOS 234	208724	386171	3.7	5	10.5	1.5	1.0	3.50	1.88
MCCKOS 235	208731	386170	3.7	5	10.5	1.0	1.0	5.25	2.28
MCCKOS 236	208748	386171	3.6	5	10.5	0.7	1.0	7.74	2.71
MCCKOS 237	208742	386147	3.3	5	10.5	2.2	1.0	2.67	1.68
MCCKOS 238	208722	386146	3.7	5	10.5	2.5	1.0	2.13	1.40
MCCKOS 239	208622	387094	4.3	5	10.5	1.1	1.0	4.09	1.88
MCCKOS 240	208634	387084	4.6	5	10.5	0.9	1.0	4.75	1.94
MCCKOS 241	207787	386444	4.9	5	10.5	1.0	1.0	4.03	1.75
MCCKOS 242	207772	386440	4.9	5	10.5	0.5	1.0	8.06	2.24
MCCKOS 243	207773	386422	5.1	5	10.5	0.7	1.0	5.44	1.90
MCCKOS 244	207770	386412	5.1	5	10.5	0.5	1.0	7.62	2.12
MCCKOS 245	207802	386438	5.2	5	10.5	0.8	1.0	4.71	1.79
MCCKOS 246	207583	387253	3.1	5	10.5	2.0	1.0	3.16	1.91
MCCKOS 247	207562	387255	5.0	5	10.5	1.7	1.0	2.29	1.30
MCCKOS 248	207573	387278	3.8	5	10.5	1.9	1.0	2.68	1.59
MCCKOS 249	207585	387285	3.8	5	10.5	1.6	1.0	3.19	1.76
MCCKOS 250	207608	387271	2.9	5	10.5	1.2	1.0	5.57	2.67
MCCKOS 251	207627	387264	2.7	5	10.5	2.5	1.0	2.84	1.87
MCCKOS 252	207631	387250	2.5	5	10.5	2.5	1.0	3.10	2.04
MCCKOS 253	207576	386324	6.1	5	10.5	1.1	1.0	2.95	1.35
MCCKOS 254	207531	386349	3.5	5	10.5	0.9	1.0	6.22	2.54
MCCKOS 255	207473	386341	3.7	5	10.5	0.5	1.0	10.51	2.92
MCCKOS 256	207409	386344	6.4	5	10.5	0.9	1.0	3.42	1.40
MCCKOS 257	207329	386347	3.9	5	10.5	1.1	1.0	4.50	2.06
MCCKOS 258	207242	386347	2.7	5	10.5	1.5	1.0	4.84	2.59
MCCKOS 259	207217	386351	2.9	5	10.5	1.8	1.0	3.71	2.16
MCCKOS 260	207169	386363	0.3	5	10.5	0.9	1.0	62.99	25.77
MCCKOS 261	207113	386360	3.4	5	10.5	1.9	1.0	2.99	1.78
MCCKOS 262	207119	386392	3.6	5	10.5	1.7	1.0	3.19	1.81
MCCKOS 263	207117	386436	2.3	5	10.5	1.7	1.0	5.01	2.84
MCCKOS 264	207117	386501	2.5	5	10.5	1.9	1.0	4.17	2.48
MCCKOS 265	207111	386553	2.1	5	10.5	1.8	1.0	5.11	2.97
MCCKOS 266	207109	386594	4.1	5	10.5	0.9	1.0	5.35	2.19
MCCKOS 267	207106	386627	3.3	5	10.5	0.8	1.0	7.48	2.85
MCCKOS 268	207107	386644	5.5	5	10.5	0.8	1.0	4.47	1.70
MCCKOS 269	207106	386664	6.3	5	10.5	0.4	1.0	7.82	1.84
MCCKOS 270	207089	386672	5.7	5	10.5	1.6	1.0	2.15	1.18
MCCKOS 271	207090	386686	5.7	5	10.5	1.2	1.0	2.86	1.37
MCCKOS 272	207082	386703	3.7	5	10.5	1.8	1.0	2.96	1.72
MCCKOS 273	207078	386716	4.1	5	10.5	1.9	1.0	2.50	1.48
MCCKOS 274	207083	386716	3.7	5	10.5	2.4	1.0	2.22	1.44
MCCKOS 275	207079	386730	2.9	5	10.5	1.3	1.0	5.25	2.62
MCCKOS 276	207066	386723	2.9	5	10.5	2.2	1.0	3.04	1.91
T1 - SS	209193	387211	4.4	5	10.5	0.4	1.0	11.11	2.61

Location			Material Properties				Surcharge	EC7	
								Condition (1)	Condition (2), 1.0m Surcharge
								DA1.C2	DA1.C2
ID	Easting	Northing	Slope	Undrained shear strength	Weight density of Peat	Peat Depth	Surcharge Equivalent Placed Fill Depth (m)	Equivalent FOS	Equivalent FOS
T2 - SS	208426	386722	4.9	5	10.5	1.8	1.0	2.24	1.30
T3 - SS	208979	386701	2.1	5	10.5	2.7	1.0	3.50	2.37
T5 -SS	207081	386715	4.1	5	10.5	3.7	1.0	1.28	0.95
T7 - SS	206748	386241	0.3	5	10.5	2.7	1.0	25.20	17.01
T8 - SS	208137	386173	5.5	5	10.5	2.4	1.0	1.49	0.97
T9 - SS	208730	386166	3.7	5	10.5	1.4	1.0	3.75	1.95
T10 - SS	206332	386023	0.1	5	10.5	4.7	1.0	72.37	56.69
T11 - SS	207543	386047	5.0	5	10.5	2.3	1.0	1.71	1.09
T12 - SS	205814	385728	2.6	5	10.5	2.9	1.0	2.56	1.76
T13 - SS	207151	385600	4.3	5	10.5	1.7	1.0	2.65	1.50
T14 - SS	207728	385484	3.8	5	10.5	1.7	1.0	3.00	1.70
T15 - SS	208310	385580	4.0	5	10.5	1.8	1.0	2.71	1.58
T16 - SS	206624	385330	7.9	5	10.5	1.2	1.0	2.09	1.00
T17 - SS	206696	384852	6.8	5	10.5	0.3	1.0	9.58	1.80
T18 - SS	207437	384961	2.3	5	10.5	5.2	1.0	1.60	1.28
T19 - SS	208191	384993	2.3	5	10.5	2.8	1.0	2.97	2.03
T21 - SS	207294	384219	2.9	5	10.5	3.8	1.0	1.76	1.31
T22 - SS	207801	384510	4.2	5	10.5	0.5	1.0	9.24	2.57
Met Mast 1 - SS	206376	385361	7.1	5	10.5	0.4	1.0	6.91	1.63
CC 1 - SS	208632	387090	4.3	5	10.5	1.0	1.0	4.50	1.96
B2	207532	385384	5.7	5	10.5	0.1	1.0	34.35	2.45
B3	208657	386589	3.5	5	10.5	2.0	1.0	2.80	1.70
T1 ALT - SS	209158	387240	2.7	5	10.5	1.8	1.0	4.03	2.34
T3 - SS	209049	386669	1.9	5	10.5	3.9	1.0	2.65	1.98
CT1_1	208491	387319	3.1	5	10.5	1.6	1.0	3.88	2.14
CT1_3	208699	387284	4.3	5	10.5	1.7	1.0	2.73	1.53
CT1_4	208598	387206	3.4	5	10.5	1.4	1.0	4.06	2.11
SUB1 - SS	206675	385515	5.1	5	10.5	1.6	1.0	2.41	1.33
SUB2 - SS	207784	386434	5.2	5	10.5	0.5	1.0	7.54	2.09
WP063	205505	385930	4.5	5	10.5	3.6	1.0	1.21	0.89
WP064	205550	385764	4.3	5	10.5	2.0	1.0	2.28	1.38
WP065	205694	385687	2.3	5	10.5	2.0	1.0	4.26	2.58
WP066	205708	385560	1.9	5	10.5	1.4	1.0	7.37	3.82
WP068	205741	385199	2.1	5	10.5	1.0	1.0	9.46	4.11
WP069	205974	385871	4.6	5	10.5	1.9	1.0	2.22	1.32
WP070	206134	385993	6.3	5	10.5	1.6	1.0	1.96	1.08
WP071	206254	386261	2.5	5	10.5	1.9	1.0	4.08	2.42
WP072	206380	386431	3.2	5	10.5	0.8	1.0	7.62	2.90
WP073	206573	386662	0.2	5	10.5	1.0	1.0	113.38	49.30
WP076	206720	386805	3.1	5	10.5	1.8	1.0	3.51	2.04
WP077	206901	386884	0.1	5	10.5	2.6	1.0	130.82	87.21
WP078	207093	386918	2.9	5	10.5	2.6	1.0	2.62	1.75
WP079	207323	387004	0.1	5	10.5	1.6	1.0	212.59	117.29
WP080	207565	387193	4.3	5	10.5	1.4	1.0	3.26	1.69
WP081	207658	387405	3.7	5	10.5	1.1	1.0	4.78	2.19
WP082	207728	387520	1.8	5	10.5	0.7	1.0	15.69	5.49
1 - SS	207294	384219	2.9	5	10.5	3.4	1.0	1.97	1.42
2 - SS	207245	384252	5.3	5	10.5	0.6	1.0	6.15	1.94
3 - SS	207174	384228	5.4	5	10.5	1.2	1.0	3.01	1.45
4 - SS	207103	384203	6.3	5	10.5	0.4	1.0	7.76	1.82
5 - SS	207032	384179	6.5	5	10.5	0.5	1.0	6.04	1.68
6 - SS	206961	384154	8.5	5	10.5	1.5	1.0	1.56	0.83
17 - SS	206810	384420	3.2	5	10.5	1.6	1.0	3.81	2.10
18 - SS	206881	384445	3.9	5	10.5	3.2	1.0	1.57	1.12
19 - SS	206951	384470	3.5	5	10.5	3.5	1.0	1.60	1.17
20 - SS	207022	384495	3.5	5	10.5	2.7	1.0	2.04	1.38
21 - SS	207093	384520	3.2	5	10.5	2.6	1.0	2.39	1.58
22 - SS	207163	384546	1.8	5	10.5	1.3	1.0	8.45	4.22
23 - SS	207234	384571	2.9	5	10.5	4.6	1.0	1.45	1.13
24 - SS	207305	384596	3.2	5	10.5	1.8	1.0	3.48	2.00
26 - SS	207450	384629	2.7	5	10.5	1.6	1.0	4.53	2.50
27 - SS	207524	384639	2.8	5	10.5	2.6	1.0	2.68	1.78
28 - SS	207599	384634	2.6	5	10.5	1.6	1.0	4.63	2.56
29 - SS	207669	384608	3.2	5	10.5	2.1	1.0	2.90	1.79
30 - SS	207730	384565	4.0	5	10.5	2.4	1.0	2.08	1.34
31 - SS	207789	384519	3.9	5	10.5	1.8	1.0	2.79	1.62
32 - SS	207441	384636	2.7	5	10.5	1.2	1.0	5.92	2.84
33 - SS	207514	384653	2.5	5	10.5	3.2	1.0	2.48	1.76
34 - SS	207587	384671	3.0	5	10.5	1.7	1.0	3.79	2.15
35 - SS	207660	384688	3.2	5	10.5	1.0	1.0	6.09	2.65
36 - SS	207732	384706	3.3	5	10.5	2.5	1.0	2.35	1.55

Location			Material Properties				Surcharge	EC7	
								Condition (1)	Condition (2), 1.0m Surcharge
								DA1.C2	DA1.C2
ID	Easting	Northing	Slope	Undrained shear strength	Weight density of Peat	Peat Depth	Surcharge Equivalent Placed Fill Depth (m)	Equivalent FOS	Equivalent FOS
37 - SS	207805	384723	4.5	5	10.5	1.3	1.0	3.37	1.69
38 - SS	207875	384747	3.3	5	10.5	1.1	1.0	5.70	2.55
39 - SS	207933	384794	3.8	5	10.5	2.7	1.0	1.89	1.27
40 - SS	207991	384842	3.0	5	10.5	1.5	1.0	4.37	2.34
41 - SS	208050	384889	1.5	5	10.5	1.8	1.0	7.00	4.07
42 - SS	208108	384936	2.1	5	10.5	1.3	1.0	7.36	3.61
43 - SS	208166	384984	0.1	5	10.5	2.5	1.0	136.05	89.51
55 - SS	206671	384842	6.7	5	10.5	0.5	1.0	5.85	1.62
56 - SS	206775	384873	5.6	5	10.5	1.5	1.0	2.34	1.25
57 - SS	206847	384894	4.2	5	10.5	2.2	1.0	2.10	1.32
58 - SS	206919	384916	4.0	5	10.5	1.8	1.0	2.71	1.58
59 - SS	206991	384938	2.7	5	10.5	3.8	1.0	1.91	1.42
60 - SS	207063	384959	2.6	5	10.5	2.1	1.0	3.61	2.23
61 - SS	207135	384980	0.1	5	10.5	1.8	1.0	188.96	109.72
62 - SS	207194	385019	1.4	5	10.5	2.5	1.0	5.67	3.73
63 - SS	207236	385081	3.4	5	10.5	3.4	1.0	1.70	1.23
64 - SS	207284	385138	5.4	5	10.5	1.6	1.0	2.26	1.25
65 - SS	207338	385190	5.5	5	10.5	0.8	1.0	4.42	1.69
66 - SS	207436	385263	6.7	5	10.5	1.2	1.0	2.46	1.18
67 - SS	207511	385328	5.6	5	10.5	2.0	1.0	1.75	1.06
68 - SS	207562	385415	7.0	5	10.5	1.2	1.0	2.36	1.13
69 - SS	207647	385467	5.9	5	10.5	0.9	1.0	3.67	1.50
70 - SS	207730	385525	3.5	5	10.5	1.6	1.0	3.44	1.90
71 - SS	207809	385587	2.6	5	10.5	0.8	1.0	9.26	3.53
72 - SS	207876	385660	2.3	5	10.5	2.5	1.0	3.32	2.19
73 - SS	207899	385757	2.1	5	10.5	3.7	1.0	2.56	1.89
74 - SS	207957	385838	4.2	5	10.5	2.1	1.0	2.23	1.38
75 - SS	207999	385913	3.6	5	10.5	1.1	1.0	4.93	2.26
76 - SS	208074	385907	2.7	5	10.5	3.0	1.0	2.37	1.65
77 - SS	208148	385902	2.2	5	10.5	2.5	1.0	3.59	2.36
78 - SS	208209	385882	1.9	5	10.5	3.3	1.0	3.04	2.18
79 - SS	208210	385807	1.5	5	10.5	3.4	1.0	3.85	2.79
80 - SS	208212	385732	2.1	5	10.5	2.7	1.0	3.50	2.37
81 - SS	208212	385657	2.7	5	10.5	2.2	1.0	3.30	2.07
82 - SS	208212	385582	2.8	5	10.5	2.9	1.0	2.40	1.66
84 - SS	207914	385963	4.5	5	10.5	1.2	1.0	3.61	1.73
85 - SS	207969	386014	5.0	5	10.5	1.2	1.0	3.28	1.58
86 - SS	208024	386066	5.4	5	10.5	1.3	1.0	2.78	1.39
87 - SS	208078	386117	5.8	5	10.5	2.0	1.0	1.68	1.02
88 - SS	208133	386169	5.5	5	10.5	1.4	1.0	2.55	1.32
89 - SS	207815	385967	5.8	5	10.5	1.6	1.0	2.13	1.17
90 - SS	207715	385972	5.6	5	10.5	1.9	1.0	1.84	1.10
91 - SS	207615	385975	5.2	5	10.5	1.8	1.0	2.09	1.22
92 - SS	207515	385979	4.9	5	10.5	1.5	1.0	2.66	1.42
93 - SS	207512	386014	3.9	5	10.5	1.5	1.0	3.30	1.77
94 - SS	207430	385982	3.8	5	10.5	1.8	1.0	2.88	1.67
95 - SS	207330	385984	4.2	5	10.5	1.2	1.0	3.85	1.85
96 - SS	207231	385987	No peat recorded at location						
97 - SS	207395	385940	3.1	5	10.5	2.0	1.0	3.16	1.91
98 - SS	207335	385894	3.2	5	10.5	1.4	1.0	4.35	2.26
99 - SS	207280	385844	4.7	5	10.5	1.0	1.0	4.18	1.82
100 - SS	207235	385785	5.5	5	10.5	1.8	1.0	1.99	1.15
101 - SS	207198	385719	4.3	5	10.5	1.6	1.0	2.81	1.55
102 - SS	207173	385650	4.2	5	10.5	1.6	1.0	2.93	1.62
103 - SS	207161	385660	4.3	5	10.5	1.7	1.0	2.65	1.50
104 - SS	207173	385734	4.7	5	10.5	0.9	1.0	4.64	1.90
105 - SS	207183	385808	7.7	5	10.5	0.9	1.0	2.85	1.17
106 - SS	207177	385883	8.6	5	10.5	1.4	1.0	1.64	0.85
108 - SS	206881	385586	5.4	5	10.5	1.2	1.0	3.01	1.45
109 - SS	206833	385529	4.9	5	10.5	1.3	1.0	3.10	1.55
110 - SS	206786	385472	5.4	5	10.5	0.6	1.0	6.08	1.92
111 - SS	206733	385418	7.1	5	10.5	0.9	1.0	3.09	1.27
112 - SS	206677	385368	5.3	5	10.5	0.8	1.0	4.66	1.78
113 - SS	206663	385394	5.4	5	10.5	1.2	1.0	3.04	1.46
114 - SS	206694	385463	5.7	5	10.5	1.0	1.0	3.47	1.51
115 - SS	205819	385196	3.1	5	10.5	0.3	1.0	20.68	3.88
116 - SS	205919	385200	7.8	5	10.5	0.4	1.0	6.32	1.49
117 - SS	206014	385230	4.4	5	10.5	1.0	1.0	4.44	1.93
118 - SS	206109	385262	3.3	5	10.5	2.2	1.0	2.72	1.71
119 - SS	206201	385300	5.6	5	10.5	0.3	1.0	11.68	2.19
120 - SS	206293	385339	5.3	5	10.5	1.0	1.0	3.69	1.60

Location			Material Properties				Surcharge	EC7	
								Condition (1)	Condition (2), 1.0m Surcharge
								DA1.C2	DA1.C2
ID	Easting	Northing	Slope	Undrained shear strength	Weight density of Peat	Peat Depth	Surcharge Equivalent Placed Fill Depth (m)	Equivalent FOS	Equivalent FOS
121 - SS	206393	385392	7.3	5	10.5	1.0	1.0	2.70	1.17
122 - SS	206484	385433	6.2	5	10.5	1.2	1.0	2.75	1.29
123 - SS	206581	385457	5.9	5	10.5	0.5	1.0	6.61	1.84
124 - SS	206676	385489	4.7	5	10.5	0.5	1.0	8.25	2.29
125 - SS	206762	385540	3.8	5	10.5	1.6	1.0	3.19	1.76
126 - SS	206845	385596	2.6	5	10.5	1.2	1.0	6.17	2.96
127 - SS	206921	385660	3.7	5	10.5	1.6	1.0	3.34	1.84
128 - SS	206996	385726	4.3	5	10.5	1.8	1.0	2.50	1.45
129 - SS	207069	385794	3.9	5	10.5	1.4	1.0	3.54	1.83
130 - SS	207135	385869	3.6	5	10.5	1.5	1.0	3.61	1.94
131 - SS	207190	385952	3.3	5	10.5	1.6	1.0	3.74	2.06
132 - SS	207246	386035	9.1	5	10.5	0.5	1.0	4.33	1.20
133 - SS	207313	386109	7.5	5	10.5	1.6	1.0	1.70	0.93
134 - SS	207391	386171	6.8	5	10.5	0.4	1.0	7.25	1.71
135 - SS	207470	386233	5.2	5	10.5	1.0	1.0	3.77	1.64
136 - SS	207548	386295	7.1	5	10.5	1.2	1.0	2.30	1.11
137 - SS	207602	386338	5.7	5	10.5	0.3	1.0	11.45	2.15
146 - SS	207087	386547	2.3	5	10.5	2.6	1.0	3.28	2.18
147 - SS	207084	386622	3.4	5	10.5	1.0	1.0	5.79	2.52
148 - SS	207081	386697	3.7	5	10.5	2.1	1.0	2.54	1.57
149 - SS	207092	386356	3.7	5	10.5	1.8	1.0	2.96	1.72
150 - SS	207017	386360	3.6	5	10.5	1.2	1.0	4.52	2.17
151 - SS	206942	386364	2.6	5	10.5	1.8	1.0	4.21	2.44
152 - SS	206868	386367	3.0	5	10.5	2.1	1.0	3.06	1.89
153 - SS	206795	386357	5.0	5	10.5	1.0	1.0	3.94	1.71
154 - SS	206751	386297	1.8	5	10.5	2.6	1.0	4.22	2.82
155 - SS	207681	386400	3.3	5	10.5	1.3	1.0	4.53	2.26
156 - SS	207759	386462	4.6	5	10.5	1.1	1.0	3.89	1.78
157 - SS	207835	386527	4.6	5	10.5	0.6	1.0	7.13	2.25
158 - SS	207872	386615	3.2	5	10.5	0.7	1.0	8.70	3.05
159 - SS	207877	386715	1.8	5	10.5	1.1	1.0	9.98	4.58
160 - SS	207891	386814	3.2	5	10.5	0.8	1.0	7.62	2.90
161 - SS	207946	386896	3.0	5	10.5	1.3	1.0	5.05	2.52
162 - SS	208011	386972	3.7	5	10.5	0.4	1.0	13.34	3.14
163 - SS	208087	387037	3.3	5	10.5	0.8	1.0	7.48	2.85
164 - SS	208176	387082	3.7	5	10.5	0.4	1.0	13.34	3.14
165 - SS	208269	387118	3.9	5	10.5	1.1	1.0	4.50	2.06
166 - SS	208366	387145	3.7	5	10.5	1.2	1.0	4.45	2.13
167 - SS	208456	387180	3.1	5	10.5	3.5	1.0	1.77	1.29
168 - SS	208476	387271	3.2	5	10.5	2.7	1.0	2.26	1.52
170 - SS	208600	387119	3.9	5	10.5	1.0	1.0	4.95	2.15
171 - SS	208604	387019	4.6	5	10.5	1.6	1.0	2.64	1.46
172 - SS	208601	386919	4.7	5	10.5	1.2	1.0	3.44	1.65
173 - SS	208553	386831	5.3	5	10.5	1.6	1.0	2.33	1.29
174 - SS	208506	386743	4.1	5	10.5	1.3	1.0	3.70	1.85
175 - SS	208469	386675	5.4	5	10.5	1.0	1.0	3.65	1.59
185 - SS	208460	386581	5.0	5	10.5	1.4	1.0	2.81	1.46
186 - SS	208510	386495	4.2	5	10.5	0.7	1.0	6.69	2.34
187 - SS	208600	386453	4.5	5	10.5	1.0	1.0	4.39	1.91
188 - SS	208679	386421	3.2	5	10.5	1.2	1.0	5.08	2.44
189 - SS	208684	386346	3.3	5	10.5	1.6	1.0	3.68	2.03
193 - SS	208581	387301	3.3	5	10.5	1.6	1.0	3.74	2.06
196 - SS	208802	387261	4.2	5	10.5	1.2	1.0	3.85	1.85
198 - SS	208950	387234	3.9	5	10.5	2.7	1.0	1.83	1.24
200 - SS	209100	387226	4.0	5	10.5	2.1	1.0	2.33	1.44
205 - SS	208405	387333	3.4	5	10.5	1.6	1.0	3.62	1.99
601	206419	386040	0.3	5	10.5	5.2	1.0	13.08	10.47
602	206489	386066	1.4	5	10.5	5.7	1.0	2.49	2.03
603	206548	386111	1.8	5	10.5	5.6	1.0	1.96	1.59
604	206602	386163	1.4	5	10.5	5.8	1.0	2.35	1.92
605	206657	386214	1.0	5	10.5	4.3	1.0	4.65	3.57
606	206711	386266	1.1	5	10.5	3.6	1.0	4.97	3.65
MCC1b	207911	386798	3.0	5	10.5	1.8	1.0	3.64	2.12
MCC2b	208014	386793	4.0	5	10.5	0.9	1.0	5.43	2.22
MCC3b	208084	386793	4.5	5	10.5	1.0	1.0	4.39	1.91
MCC4b	208167	386791	5.5	5	10.5	1.1	1.0	3.25	1.49
MCC5b	208271	386768	5.5	5	10.5	0.9	1.0	3.97	1.63
MCC6b	208354	386731	5.8	5	10.5	1.2	1.0	2.81	1.35
MCC7b	208434	386693	5.0	5	10.5	1.0	1.0	3.90	1.69
1	204512	387710	No peat recorded at location						
4	204615	387622	4.0	5	10.5	1.5	1.0	3.26	1.75

Location			Material Properties				Surcharge	EC7	
								Condition (1)	Condition (2), 1.0m Surcharge
								DA1.C2	DA1.C2
ID	Easting	Northing	Slope	Undrained shear strength	Weight density of Peat	Peat Depth	Surcharge Equivalent Placed Fill Depth (m)	Equivalent FOS	Equivalent FOS
6	204703	387654	3.0	5	10.5	1.4	1.0	4.65	2.41
8	204772	387712	No peat recorded at location						
10	204783	387614	No peat recorded at location						
12	204847	387540	1.0	5	10.5	0.3	1.0	64.97	12.18
14	204886	387462	2.0	5	10.5	2.0	1.0	4.88	2.96
16	204880	387362	5.0	5	10.5	1.1	1.0	3.56	1.63
18	204873	387263	1.0	5	10.5	3.0	1.0	6.50	4.53
20	204913	387195	2.0	5	10.5	3.5	1.0	2.79	2.03
22	205011	387186	2.0	5	10.5	3.6	1.0	2.71	1.99
24	205045	387093	3.0	5	10.5	1.7	1.0	3.83	2.17
26	205064	387003	3.0	5	10.5	1.6	1.0	4.07	2.24
27	205404	386267	10.0	5	10.5	0.9	1.0	2.21	0.90
28	205424	386221	9.0	5	10.5	1.3	1.0	1.69	0.85
35	205695	385508	0.1	5	10.5	1.7	1.0	200.08	113.38
36	205683	385460	3.1	5	10.5	2.0	1.0	3.10	1.88
37	205678	385410	5.7	5	10.5	1.2	1.0	2.86	1.37
38	205678	385360	5.3	5	10.5	0.9	1.0	4.10	1.68
39	205679	385310	4.9	5	10.5	0.5	1.0	7.97	2.21
40	205681	385260	2.5	5	10.5	1.4	1.0	5.53	2.87
41	205697	385223	6.9	5	10.5	1.8	1.0	1.58	0.92
42	206933	385699	3.0	5	10.5	1.3	1.0	5.01	2.50
43	206929	385749	3.0	5	10.5	1.8	1.0	3.62	2.10
44	206909	385795	4.0	5	10.5	0.4	1.0	12.22	2.88
45	206883	385837	3.0	5	10.5	0.9	1.0	7.23	2.96
46	206864	385872	2.0	5	10.5	1.3	1.0	7.50	3.75
47	207239	386093	9.0	5	10.5	0.8	1.0	2.75	1.05
48	207232	386142	5.0	5	10.5	1.6	1.0	2.45	1.35
49	207228	386192	4.0	5	10.5	0.8	1.0	6.11	2.33
50	207226	386242	4.0	5	10.5	1.1	1.0	4.44	2.04
51	207223	386292	4.0	5	10.5	1.9	1.0	2.57	1.53
54	207860	386942	15.0	5	10.5	0.4	1.0	3.40	0.80
55	207825	386978	1.0	5	10.5	2.5	1.0	7.80	5.13
56	207790	387014	0.1	5	10.5	1.6	1.0	121.80	67.20
57	207755	387050	1.0	5	10.5	1.7	1.0	11.47	6.50
61	207616	387192	1.0	5	10.5	0.7	1.0	27.85	9.75
62	208708	386576	4.0	5	10.5	1.6	1.0	3.05	1.69
66	208855	386676	0.1	5	10.5	3.0	1.0	64.96	45.32
67	208739	386392	1.0	5	10.5	1.6	1.0	12.18	6.72
69	208830	386350	2.0	5	10.5	1.6	1.0	6.10	3.36
71	208915	386301	3.0	5	10.5	1.5	1.0	4.34	2.32
74	208963	386160	5.0	5	10.5	1.4	1.0	2.80	1.45
76	208941	386065	4.0	5	10.5	1.9	1.0	2.57	1.53
78	208892	385978	4.0	5	10.5	1.3	1.0	3.76	1.88
80	208867	385914	6.0	5	10.5	1.7	1.0	1.92	1.09
81	208043	385885	2.0	5	10.5	2.0	1.0	4.88	2.96
84	208165	385837	1.0	5	10.5	2.3	1.0	8.47	5.41
88	207589	385605	1.0	5	10.5	0.8	1.0	24.37	9.28
90	207490	385589	5.0	5	10.5	0.8	1.0	4.90	1.87
92	207392	385571	5.0	5	10.5	0.8	1.0	4.90	1.87
93	207342	385564	1.0	5	10.5	0.3	1.0	64.97	12.18
96	207179	384970	1.0	5	10.5	3.6	1.0	5.41	3.98
98	207122	384888	1.0	5	10.5	3.7	1.0	5.27	3.90
100	207051	384819	1.0	5	10.5	3.4	1.0	5.73	4.15
103	206955	384733	1.0	5	10.5	2.7	1.0	7.22	4.87
104	207175	384918	1.0	5	10.5	3.5	1.0	5.57	4.06
105	207171	384868	2.0	5	10.5	2.1	1.0	4.64	2.87
106	207169	384818	1.0	5	10.5	3.6	1.0	5.41	3.98
107	207170	384768	1.0	5	10.5	4.3	1.0	4.53	3.48
108	207170	384718	1.0	5	10.5	4.0	1.0	4.87	3.68
109	207171	384668	1.0	5	10.5	3.0	1.0	6.50	4.53
110	207171	384618	2.0	5	10.5	3.5	1.0	2.79	2.03
112	207180	384494	3.0	5	10.5	0.7	1.0	9.30	3.25
113	207187	384445	4.0	5	10.5	1.7	1.0	2.88	1.63
114	207193	384395	1.0	5	10.5	2.7	1.0	7.22	4.87
115	207200	384346	3.0	5	10.5	1.6	1.0	4.07	2.24
116	207200	384296	2.0	5	10.5	0.8	1.0	12.19	4.64
117	207179	384257	3.0	5	10.5	0.9	1.0	7.23	2.96
FT PP001	607574	884819	2	4	10.5	3.0	1.0	2.60	1.81
FT PP002	607582	884897	2	4	10.5	2.0	1.0	3.90	2.36

Location			Material Properties				Surcharge	EC7	
								Condition (1)	Condition (2), 1.0m Surcharge
								DA1.C2	DA1.C2
ID	Easting	Northing	Slope	Undrained shear strength	Weight density of Peat	Peat Depth	Surcharge Equivalent Placed Fill Depth (m)	Equivalent FOS	Equivalent FOS
FT PP003	607567	884976	2	4	10.5	2.8	1.0	2.79	1.90
FT PP004	607652	885003	2	4	10.5	2.0	1.0	3.90	2.36
FT PP005	607659	884923	2	10	10.5	1.8	1.0	10.84	6.29
FT PP006	607665	884852	2	10	10.5	2.8	1.0	6.97	4.76
FT PP007	607671	884785	3	10	10.5	1.1	1.0	11.83	5.42
FT PP008	607729	884849	2	10	10.5	2.0	1.0	9.75	5.91
FT PP009	607728	884941	2	4	10.5	1.3	1.0	6.00	3.00
FT PP010	607715	885029	3	4	10.5	1.6	1.0	3.25	1.80
FT PP011	607827	884982	2	8	10.5	1.4	1.0	11.15	5.78
FT PP012	607833	884882	3	8	10.5	1.9	1.0	5.48	3.25
FT PP013	607877	884952	2	8	10.5	1.8	1.0	8.67	5.03
FT PP014	607825	885039	2	4	10.5	0.9	1.0	8.67	3.55
FT PP015	607724	885076	7	4	10.5	0.9	1.0	2.50	1.02
FT PP016	607276	884630	3	6	10.5	1.8	1.0	4.34	2.52
FT PP017	607242	884622	3	8	10.5	2.6	1.0	4.00	2.67
FT PP018	607210	884612	3	6	10.5	2.7	1.0	2.89	1.95
FT PP019	607183	884605	2	6	10.5	2.7	1.0	4.33	2.93
FT PP020	607251	884641	3	8	10.5	1.9	1.0	5.48	3.25
FT PP021	607221	884640	3	6	10.5	1.5	1.0	5.21	2.79
FT PP022	607191	884641	3	6	10.5	1.1	1.0	7.10	3.25
FT PP023	607159	884641	3	12	10.5	2.0	1.0	7.81	4.73
FT PP024	607323	884589	1	5	10.5	1.0	1.0	19.49	8.47
FT PP025	607334	884604	1	5	10.5	0.8	1.0	24.37	9.28
FT PP026	606819	884673	4	4	10.5	1.8	1.0	2.17	1.26
FT PP027	607215	884985	2	8	10.5	3.8	1.0	4.11	3.06
FT PP028	607244	885027	2	8	10.5	3.8	1.0	4.11	3.06
FT PP029	607254	885064	2	8	10.5	3.5	1.0	4.46	3.25
FT PP030	607975	885808	1	6	10.5	4.0	1.0	5.85	4.41
FT PP031	608034	885805	1	6	10.5	4.2	1.0	5.57	4.25
FT PP032	608855	886236	2	5	10.5	0.6	1.0	16.25	5.13
FT PP033	608839	886202	4	5	10.5	1.0	1.0	4.89	2.13
FT PP034	608882	886193	1	5	10.5	3.2	1.0	6.09	4.33
FT PP035	608852	886179	4	5	10.5	1.0	1.0	4.89	2.13
FT PP036	605797	885760	4	2.5	10.5	0.6	1.0	4.07	1.29
FT PP037	605802	885802	3	2.5	10.5	1.5	1.0	2.17	1.16
FT PP038	605845	885801	3	2.5	10.5	1.3	1.0	2.50	1.25
FT PP039	605867	885837	3	2.5	10.5	1.5	1.0	2.17	1.16
FT PP040	605964	885890	3	6	10.5	1.5	1.0	5.21	2.79
FT PP041	606053	885934	4	6	10.5	1.4	1.0	4.19	2.17
FT PP042	606092	886034	4	12	10.5	0.5	1.0	23.46	6.52
FT PP043	606114	886067	5	12	10.5	0.3	1.0	31.34	5.88
FT PP044	606130	886147	6	12	10.5	0.3	1.0	26.18	4.91
FT PP045	606165	886187	4	9	10.5	1.0	1.0	8.80	3.83
FT PP046	606260	886351	2	14	10.5	1.3	1.0	21.00	10.50
FT PP047	606367	886474	3	9	10.5	1.5	1.0	7.81	4.18
FT PP048	606458	886585	4	9	10.5	1.1	1.0	8.00	3.67
FT PP049	606498	886596	4	9	10.5	0.5	1.0	17.60	4.89
FT PP050	608735	886595	3	3.5	10.5	3.0	1.0	1.52	1.06
FT PP051	608766	886635	4	3.5	10.5	1.5	1.0	2.28	1.22

Undrained Infinite Slope Analysis Results for Sliding Failure in Peat and Peat Interface (Cu values based on Hand Vane Results)

Notes:

(1) Assuming a bulk unit weight for peat of 10.5kN/m^3

(2) Assuming a surcharge equivalent to fill depth of 1.0 m (Condition 2).

(3) β angles are based on contours and field measurements.

(4) c_u are based on actual undrained strengths recorded using hand vane.

Infinite Slope – Load Condition 3 Undrained

	M1	M2
$\gamma_{\phi'}$	1.00	1.25
$\gamma_{c'}$	1.00	1.25

Location			Material Properties				Loading	Condition (3), Road Loading	
								DA1.C1 A1 & M1 & R1	DA1.C2 A2 & M2 & R1
ID	Easting	Northing	Slope	Undrained shear strength	Weight density of Peat	Peat Depth	Road Loading	Equivalent FOS	Equivalent FOS
			β (deg)	c_u (kPa)	γ (kN/m^3)	(m)	Condition (2)		
AGEC_MKO104	207175	384918	2.4	5	10.5	3.5	23.0	1.42	1.28
AGEC_MKO105	207171	384868	1.2	5	10.5	2.1	23.0	3.71	3.28
AGEC_MKO106	207169	384818	1.5	14	10.5	3.6	23.0	6.07	5.47
AGEC_MKO107	207170	384768	0.9	5	10.5	4.3	23.0	3.27	2.97
AGEC_MKO108	207170	384718	0.9	11	10.5	4.0	23.0	7.54	6.83
AGEC_MKO109	207171	384668	0.9	4	10.5	3.0	23.0	3.25	2.91
AGEC_MKO110	207171	384618	1.1	5	10.5	3.5	23.0	2.97	2.68
AGEC_MKO22-SS	207163	384546	2.0	4	10.5	1.3	23.0	2.17	1.88
AGEC_MKO112	207180	384494	5.0	8	10.5	0.7	23.0	2.07	1.77
AGEC_MKO113	207187	384445	3.5	5	10.5	1.7	23.0	1.40	1.23
AGEC_MKO114	207193	384395	3.5	8	10.5	2.7	23.0	1.81	1.61
AGEC_MKO115	207200	384346	3.5	9	10.5	1.6	23.0	2.59	2.27
AGEC_MKO116	207200	384296	4.0	5	10.5	0.8	23.0	1.57	1.34
AGEC_MKO117	207179	384257	4.7	7	10.5	0.9	23.0	1.80	1.54
T2-3	207369	384581	3.2	5	10.5	1.7	23.0	1.53	1.34
T2-4	207383	384570	5.6	15	10.5	0.7	23.0	3.48	2.96
T2-6	207370	384556	5.2	14	10.5	1.5	23.0	2.78	2.43
T2-10	207398	384535	3.8	7	10.5	1.1	23.0	2.11	1.82
T2-16	207444	384468	2.4	11	10.5	2.4	23.0	3.84	3.41
T2-21	207497	384412	5.2	11	10.5	2.6	23.0	1.71	1.52
T2-27	207543	384367	5.2	8	10.5	0.9	23.0	1.88	1.61
T2-32	207547	384307	4.6	22	10.5	3.0	23.0	3.57	3.20
T2-35	207610	384265	4.4	15	10.5	1.0	23.0	4.03	3.47
T3-2	207179	384986	1.8	6	10.5	3.7	23.0	2.20	1.99
T3-5	207141	384948	2.7	4.5	10.5	2.5	23.0	1.37	1.22
T3-7	207145	384902	1.5	4	10.5	3.3	23.0	1.88	1.69
T3-10	207100	384886	1.7	5	10.5	3.6	23.0	1.97	1.78
T3-12	207061	384849	1.7	4	10.5	2.7	23.0	1.85	1.65
T3-16	207066	384807	1.5	5	10.5	3.8	23.0	2.16	1.96
T3-20	206987	384778	2.1	5.5	10.5	3.0	23.0	1.95	1.75
T3-29	206938	384738	1.6	3	10.5	3.4	23.0	1.30	1.17
T3-30	206898	384700	1.4	3.5	10.5	4.0	23.0	1.57	1.42
AGEC_MKO96	207179	384970	1.8	6	10.5	3.6	23.0	2.23	2.02
AGEC_MKO98	207122	384888	1.7	5	10.5	3.7	23.0	1.94	1.75
AGEC_MKO100	207051	384819	1.5	5	10.5	3.4	23.0	2.31	2.08
AGEC_MKO103	206955	384733	1.6	3	10.5	2.7	23.0	1.48	1.32
MCCKOS51	206923	384694	1.4	3.5	10.5	3.6	23.0	1.68	1.51
T4-1	207187	384554	1.2	3	10.5	4.5	23.0	1.46	1.33
T4-3	207207	384554	1.7	3.5	10.5	5.7	23.0	1.02	0.94
T4-4	207216	384557	1.7	5.5	10.5	7.3	23.0	1.34	1.24
T4-5	207222	384583	1.8	3.5	10.5	5.2	23.0	1.03	0.94
T4-6	207224	384560	2	6	10.5	5.0	23.0	1.63	1.49
T4-7	207244	384563	1.9	4	10.5	4.8	23.0	1.18	1.07
T4-9	207264	384590	3.2	7	10.5	3.0	23.0	1.63	1.46
T4-10	207266	384572	4.4	7	10.5	3.0	23.0	1.19	1.06
T4-11	207286	384580	3.8	7	10.5	2.2	23.0	1.61	1.43
T4-12	207299	384608	3.6	5	10.5	2.0	23.0	1.27	1.12
T4-13	207306	384592	3.8	6	10.5	3.0	23.0	1.18	1.06
T4-14	207337	384609	3	8	10.5	3.0	23.0	1.99	1.78
T4-17	207366	384625	3	9	10.5	1.0	23.0	3.54	3.04
T4-21	207444	384652	3	5	10.5	1.6	23.0	1.67	1.46
T4-22	207454	384629	3	9	10.5	1.4	23.0	3.17	2.76
T4-26	207510	384651	3	12	10.5	2.8	23.0	3.09	2.77
T4-31	207550	384677	3	4	10.5	1.9	23.0	1.25	1.10
T4-39	207636	384681	3.5	9	10.5	1.4	23.0	2.72	2.37
T4-40	207644	384666	3.8	5	10.5	1.7	23.0	1.29	1.13
T4-44	207684	384693	4.6	11	10.5	1.5	23.0	2.47	2.15
T4-50	207764	384711	5.7	11	10.5	1.5	23.0	2.00	1.74
T4-57	207858	384735	5.7	6	10.5	0.6	23.0	1.41	1.20
T4-60	207864	384761	4.8	6	10.5	1.5	23.0	1.29	1.13
T4-61	207873	384752	3.1	4	10.5	3.1	23.0	0.94	0.85
T4-65	207898	384777	5.6	9	10.5	2.5	23.0	1.33	1.18
T4-69	207911	384787	4.8	9	10.5	3.0	23.0	1.40	1.26
T4-73	207923	384803	4.5	7	10.5	3.0	23.0	1.16	1.04

	M1	M2							
$\gamma_{\phi'}$	1.00	1.25							
$\gamma_{c'}$	1.00	1.25							
T4-76	207944	384828	3.8	7	10.5	2.8	23.0	1.43	1.28
T4-78	207954	384808	5.7	9	10.5	2.9	23.0	1.20	1.08
T4-82	207984	384813	3	6	10.5	2.0	23.0	1.83	1.61
T4-91	208014	384816	2.1	3.5	10.5	2.3	23.0	1.42	1.26
AGEC_MKO23SS	207234	384571	2	6	10.5	4.6	23.0	1.73	1.57
AGEC_MKO24SS	207305	384596	3.8	6	10.5	1.8	23.0	1.53	1.34
AGEC_MKO32SS	207441	384636	3	9	10.5	1.2	23.0	3.34	2.89
AGEC_MKO33SS	207514	384653	3	12	10.5	3.2	23.0	2.88	2.58
AGEC_MKO34SS	207587	384671	3	4	10.5	1.7	23.0	1.31	1.14
AGEC_MKO35SS	207660	384688	4.6	11	10.5	1.0	23.0	2.83	2.43
AGEC_MKO36SS	207732	384706	5.7	11	10.5	2.5	23.0	1.59	1.42
AGEC_MKO37SS	207805	384723	5.7	11	10.5	1.3	23.0	2.10	1.83
AGEC_MKO38SS	207875	384747	3.1	4	10.5	1.1	23.0	1.50	1.29
T7-2	208064	385893	2.9	7	10.5	2.4	23.0	2.02	1.80
T7-4	208100	385856	1.9	8	10.5	2.9	23.0	3.19	2.86
T7-5	208214	385844	3.5	10	10.5	2.0	23.0	2.61	2.30
T7-6	208175	385825	2.4	8	10.5	2.8	23.0	2.58	2.30
AGEC_MKO81	208043	385885	1.7	7	10.5	2.0	23.0	3.76	3.31
AGEC_MKO84	208165	385837	1.5	8	10.5	2.3	23.0	4.56	4.04
AGEC_MKOWP070	206134	385993	6.3	8	10.5	1.6	23.0	1.29	1.13
AGEC_MKOWP071	206254	386261	2.5	11	10.5	1.9	23.0	4.08	3.59
AGEC_MKOWP072	206380	386431	3.2	15	10.5	0.8	23.0	5.86	5.01
AGEC_MKOWP073	206573	386662	1.2	16	10.5	1.0	23.0	15.70	13.51
AGEC_MKOWP076	206720	386805	3.1	7	10.5	1.8	23.0	2.17	1.90

Undrained Infinite Slope Analysis Results for Sliding Failure in Peat and Peat Interface (Cu values based on Hand Vane Results)

Notes:

(1) Assuming a bulk unit weight for peat of 10.5kN/m^3

(2) Assuming a surcharge equivalent to road fill depth of 1.15 m (Condition 3).

(3) β angles are based on contours and field measurements.

(4) c_u are based on actual undrained strengths recorded using hand vane.

Infinite Slope – Load Condition 4 Undrained

	M1	M2
$\gamma_{\phi'}$	1.00	1.25
$\gamma_{c'}$	1.00	1.25

Location			Material Properties				Loading	Loading	Condition (4), Road and Traffic Loading	
									DA1.C1 A1 & M1 & R1	DA1.C2 A2 & M2 & R1
ID	Easting	Northing	Slope	Undrained shear strength	Weight density of Peat	Peat Depth	Road Loading	Traffic Loading	Equivalent FOS	Equivalent FOS
			β (deg)	c_u (kPa)	γ (kN/m^3)	(m)	Condition (2)			
AGEC_MKO104	207175	384918	2.4	5	10.5	3.5	23.0	10.0	1.25	1.17
AGEC_MKO105	207171	384868	1.2	5	10.5	2.1	23.0	10.0	3.14	2.93
AGEC_MKO106	207169	384818	1.5	14	10.5	3.6	23.0	10.0	5.35	5.02
AGEC_MKO107	207170	384768	0.9	5	10.5	4.3	23.0	10.0	2.92	2.75
AGEC_MKO108	207170	384718	0.9	11	10.5	4.0	23.0	10.0	6.69	6.30
AGEC_MKO109	207171	384668	0.9	4	10.5	3.0	23.0	10.0	2.82	2.65
AGEC_MKO110	207171	384618	1.1	5	10.5	3.5	23.0	10.0	2.61	2.46
AGEC_MKO22-SS	207163	384546	2.0	4	10.5	1.3	23.0	10.0	1.78	1.65
AGEC_MKO112	207180	384494	5.0	8	10.5	0.7	23.0	10.0	1.65	1.52
AGEC_MKO113	207187	384445	3.5	5	10.5	1.7	23.0	10.0	1.17	1.09
AGEC_MKO114	207193	384395	3.5	8	10.5	2.7	23.0	10.0	1.56	1.46
AGEC_MKO115	207200	384346	3.5	9	10.5	1.6	23.0	10.0	2.15	2.00
AGEC_MKO116	207200	384296	4.0	5	10.5	0.8	23.0	10.0	1.25	1.15
AGEC_MKO117	207179	384257	4.7	7	10.5	0.9	23.0	10.0	1.44	1.33
T2-3	207369	384581	3.2	5	10.5	1.7	23.0	10.0	1.28	1.19
T2-4	207383	384570	5.6	15	10.5	0.7	23.0	10.0	2.76	2.54
T2-6	207370	384556	5.2	14	10.5	1.5	23.0	10.0	2.30	2.14
T2-10	207398	384535	3.8	7	10.5	1.1	23.0	10.0	1.72	1.59
T2-16	207444	384468	2.4	11	10.5	2.4	23.0	10.0	3.28	3.07
T2-21	207497	384412	5.2	11	10.5	2.6	23.0	10.0	1.47	1.38
T2-27	207543	384367	5.2	8	10.5	0.9	23.0	10.0	1.51	1.39
T2-32	207547	384307	4.6	22	10.5	3.0	23.0	10.0	3.11	2.91
T2-35	207610	384265	4.4	15	10.5	1.0	23.0	10.0	3.26	3.01
T3-2	207179	384986	1.8	6	10.5	3.7	23.0	10.0	1.94	1.82
T3-5	207141	384948	2.7	4.5	10.5	2.5	23.0	10.0	1.17	1.10
T3-7	207145	384902	1.5	4	10.5	3.3	23.0	10.0	1.65	1.55
T3-10	207100	384886	1.7	5	10.5	3.6	23.0	10.0	1.74	1.63
T3-12	207061	384849	1.7	4	10.5	2.7	23.0	10.0	1.60	1.50
T3-16	207066	384807	1.5	5	10.5	3.8	23.0	10.0	1.91	1.80
T3-20	206987	384778	2.1	5.5	10.5	3.0	23.0	10.0	1.70	1.59
T3-29	206938	384738	1.6	3	10.5	3.4	23.0	10.0	1.14	1.07
T3-30	206898	384700	1.4	3.5	10.5	4.0	23.0	10.0	1.39	1.31
AGEC_MKO96	207179	384970	1.8	6	10.5	3.6	23.0	10.0	1.97	1.85
AGEC_MKO98	207122	384888	1.7	5	10.5	3.7	23.0	10.0	1.71	1.61
AGEC_MKO100	207051	384819	1.5	5	10.5	3.4	23.0	10.0	2.03	1.90
AGEC_MKO103	206955	384733	1.6	3	10.5	2.7	23.0	10.0	1.27	1.19
MCCKOS51	206923	384694	1.4	3.5	10.5	3.6	23.0	10.0	1.48	1.39
T4-1	207187	384554	1.2	3	10.5	4.5	23.0	10.0	1.30	1.23
T4-3	207207	384554	1.7	3.5	10.5	5.7	23.0	10.0	0.93	0.88
T4-4	207216	384557	1.7	5.5	10.5	7.3	23.0	10.0	1.24	1.18
T4-5	207222	384583	1.8	3.5	10.5	5.2	23.0	10.0	0.93	0.88
T4-6	207224	384560	2	6	10.5	5.0	23.0	10.0	1.47	1.39
T4-7	207244	384563	1.9	4	10.5	4.8	23.0	10.0	1.06	1.00
T4-9	207264	384590	3.2	7	10.5	3.0	23.0	10.0	1.42	1.33
T4-10	207266	384572	4.4	7	10.5	3.0	23.0	10.0	1.03	0.97
T4-11	207286	384580	3.8	7	10.5	2.2	23.0	10.0	1.37	1.28
T4-12	207299	384608	3.6	5	10.5	2.0	23.0	10.0	1.07	1.00
T4-13	207306	384592	3.8	6	10.5	3.0	23.0	10.0	1.02	0.96
T4-14	207337	384609	3	8	10.5	3.0	23.0	10.0	1.73	1.62
T4-17	207366	384625	3	9	10.5	1.0	23.0	10.0	2.86	2.65
T4-21	207444	384652	3	5	10.5	1.6	23.0	10.0	1.39	1.29
T4-22	207454	384629	3	9	10.5	1.4	23.0	10.0	2.61	2.43
T4-26	207510	384651	3	12	10.5	2.8	23.0	10.0	2.68	2.51
T4-39	207636	384681	3.5	9	10.5	1.4	23.0	10.0	2.24	2.08
T4-40	207644	384666	3.8	5	10.5	1.7	23.0	10.0	1.08	1.00
T4-44	207684	384693	4.6	11	10.5	1.5	23.0	10.0	2.04	1.90
T4-50	207764	384711	5.7	11	10.5	1.5	23.0	10.0	1.65	1.54
T4-57	207858	384735	5.7	6	10.5	0.6	23.0	10.0	1.11	1.03
T4-60	207864	384761	4.8	6	10.5	1.5	23.0	10.0	1.07	0.99
T4-61	207873	384752	3.1	4	10.5	3.1	23.0	10.0	0.82	0.77
T4-62	207880	384784	3.5	5	10.5	2.0	23.0	10.0	1.10	1.03
T4-65	207898	384777	5.6	9	10.5	2.5	23.0	10.0	1.14	1.06
T4-69	207911	384787	4.8	9	10.5	3.0	23.0	10.0	1.22	1.14
T4-73	207923	384803	4.5	7	10.5	3.0	23.0	10.0	1.01	0.95
T4-76	207944	384828	3.8	7	10.5	2.8	23.0	10.0	1.23	1.16
T4-78	207954	384808	5.7	9	10.5	2.9	23.0	10.0	1.04	0.98
T4-82	207984	384813	3	6	10.5	2.0	23.0	10.0	1.54	1.44
T4-91	208014	384816	2.1	3.5	10.5	2.3	23.0	10.0	1.22	1.14
AGEC_MKO23SS	207234	384571	2	6	10.5	4.6	23.0	10.0	1.55	1.46
AGEC_MKO24SS	207305	384596	3.8	6	10.5	1.8	23.0	10.0	1.28	1.19
AGEC_MKO32SS	207441	384636	3	9	10.5	1.2	23.0	10.0	2.73	2.53

	M1	M2								
$\gamma_{\Phi'}$	1.00	1.25								
$\gamma_{c'}$	1.00	1.25								
AGEC_MKO33SS	207514	384653	3	12	10.5	3.2	23.0	10.0	2.51	2.36
AGEC_MKO34SS	207587	384671	3	4	10.5	1.7	23.0	10.0	1.09	1.02
AGEC_MKO35SS	207660	384688	4.6	11	10.5	1.0	23.0	10.0	2.28	2.11
AGEC_MKO36SS	207732	384706	5.7	11	10.5	2.5	23.0	10.0	1.37	1.28
AGEC_MKO37SS	207805	384723	5.7	11	10.5	1.3	23.0	10.0	1.73	1.60
AGEC_MKO38SS	207875	384747	3.1	4	10.5	1.1	23.0	10.0	1.22	1.13
T7-2	208064	385893	2.9	7	10.5	2.4	23.0	10.0	1.73	1.62
T7-4	208100	385856	1.9	8	10.5	2.9	23.0	10.0	2.77	2.60
T7-5	208214	385844	3.5	10	10.5	2.0	23.0	10.0	2.21	2.06
T7-6	208175	385825	2.4	8	10.5	2.8	23.0	10.0	2.23	2.09
AGEC_MKO81	208043	385885	1.7	7	10.5	2.0	23.0	10.0	3.17	2.96
AGEC_MKO84	208165	385837	1.5	8	10.0	2.3	23.0	10.3	3.94	3.68
AGEC_MKOWP070	206134	385993	6.3	8	10.0	1.6	23.0	10.3	1.08	1.00
AGEC_MKOWP071	206254	386261	2.5	11	10.0	1.9	23.0	10.3	3.47	3.23
AGEC_MKOWP072	206380	386431	3.2	15	10.0	0.8	23.0	10.3	4.69	4.32
AGEC_MKOWP073	206573	386662	1.2	16	10.0	1.0	23.0	10.3	12.74	11.77
AGEC_MKOWP076	206720	386805	3.1	7	10.0	1.8	23.0	10.3	1.84	1.71

Undrained Infinite Slope Analysis Results for Sliding Failure in Peat and Peat Interface (Cu values based on Hand Vane Results)

Notes:

(1) Assuming a bulk unit weight for peat of 10.5kN/m^{3}

(2) Assuming a surcharge equivalent to road fill depth of 1.15 m (Condition 2).

(3) β angles are based on contours and field measurements.

(4) c_u are based on actual undrained strengths recorded using hand vane.

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APPENDIX D

Peat Stability Risk Assessment

TABLE 1: PEAT/SUBSOIL CONDITIONS	Rating			
	Negligible	Low	Medium	High
Peat				
Peat Depth	**<0.5 m**	**0.5 - 1.0**	**1.0 - 2.0**	**>2.0**
Water Content	**0-500%**	**500-1000%**	**1000-1500%**	**>1500%**
Min Peak Undrained Shear Strength	**>20 kPa**	**10-20 kPa**	**5-10 kPa**	**<=5 kPa**
Peat Classification at c_u min	**Very Fibrous**	**Fibrous**	**Pseudo-Fibrous/Slightly Fibrous**	**Amorphous/ Clayey**
Stability of peat in trial pits	**Stable**	**Slight spalling**	**Collapse @ >3 m Depth**	**Collapse/squeezing <3 m Depth**
Very Soft Clay Layer Below Peat [applies to uniform clay of high plasticity, & excludes well-graded gravelly Cohesive Glacial Till or decomposed rock]				
Very soft clay layer at base of peat	**No**			**Yes**
Sensitivity Coefficient ($c_{u\ peak}/c_{u\ residual}$)	**1.0**	**1.0-1.5**	**1.5 - 2.0**	**>2**
Peak Undrained Shear Strength	**>20 kPa**	**10-20 kPa**	**5-10 kPa**	**<=5 kPa**
Residual Undrained Shear Strength	**>20 kPa**	**10-20 kPa**	**5-10 kPa**	**<=5 kPa**
Transition - Peat to Mineral Soil				
Sharp discontinuity (possible or potential shear plane) identified in peat or at base of peat in trial pits, probes or piston samples	**No**			**Yes**
Underlying Mineral Soil/Rock				
Granular soil/Fractured rock at base of peat	**No**			**Yes**
Nested Flat Boulders	**No**			**Yes**
Rock below Peat - Interface Characteristics	**Rough/ Weathered**	**Rough/Fractured**	**Smooth Undulating**	**Smooth Planar**

TABLE 2: TOPOGRAPHY	Rating			
	Negligible	Low	Medium	High
Slope Angle	**Flat**	**Shallow**	**Intermediate**	**High**
Slope Angle - Ground Surface	**<1º**	**1-3º**	**3º-5º**	**>5º**
Slope Angle - Base of Peat	**<1º**	**1-3º**	**3º-5º**	**>5º**
In broad valley upslope from defined watercourses	**No**	**Yes, slopes <3º**	**Yes, slopes 3-5º**	**Yes, slopes > 5º**
Distance from topographical low-point upslope from defined watercourses	**>250 m**	**100-250 m**	**50-100 m**	**<50 m**
General slope characteristics downslope from road/turbine	**Concave**	**Planar to Concave**	**Planar to Convex**	**Convex**
Distance from break in convex slope	**>100 m**	**50-100 m**	**10-50 m**	**<10 m**

TABLE 3: FACTOR OF SAFETY CALCULATIONS	Rating			
	Negligible	Low	Medium	High
FOS Infinite Slope - No Surcharge (Existing Condition)				
c_u = 5kPa (or minimum)	**>3**	**2.0 - 3.0**	**1.5 - 2.0**	**<1.5**
c_u = 2.5kPa (Worst Case)	**>2**	**1.5 - 2.0**	**1.0 - 1.5**	**<1.0**
FOS Infinite Slope - Surcharge of 1.0m Peat with Partial Factor = 1.3				
c_u = 5kPa (or minimum)	**>3**	**2.0 - 3.0**	**1.5 - 2.0**	**<1.5**
c_u = 2.5kPa (Worst Case)	**>2**	**1.5 - 2.0**	**1.0 - 1.5**	**<1.0**
FOS - Floating Road				
Planar Sliding (c_u = 5kPa)	**>2**	**1.4 - 2.0**	**1.0 - 1.4**	**<1.0**
Bearing Capacity	**>2**	**1.4 - 2.0**	**1.0 - 1.4**	**<1.0**
Extrusion	**>2**	**1.4 - 2.0**	**1.0 - 1.4**	**<1.0**

TABLE 4: HYDROLOGY/HYDROGEOLOGY	Rating			
	Negligible	Low	Medium	High
Surface water	**Dry**	**Localised/ Flowing in Drains**	**Ponded in drains**	**Springs/Surface Water**
Existing drainage ditches	**None/ Downslope**	**Varied (Gen. Downslope)**	**Varied (Gen. Across Slope)**	**Across slope**
Groundwater observations in peat in trial pits.	**Dry**	**Slight Seepage**	**Moderate Seepage**	**Strong Flow**
Piping observed in trial pits	**No**	**Slight Flow/Small Dia. (<25 mm)**	**Moderate Flow/Medium Dia. (25-50 mm)**	**Strong Flow/Large Dia. (>50 mm)**
Seepage at Base of Peat	**No**			**Yes**
Evidence of piping from walkover survey	**No**	**Possibly**	**Probably**	**Yes**

TABLE 5: OTHER CONTRIBUTORY FACTORS	Rating			
	Negligible	Low	Medium	High
Slide History				
Evidence of historic slides		**General Area**	**On Site**	**<1 km**
Tension Cracks in Peat				**Yes**
Aerial Photography				
Evidence of historic slides in area		**Possibly**	**Probably**	**Yes**
Evidence of subterranean drainage/piping		**Possibly**	**Probably**	**Yes**
Other notable contributory features		**Possibly**	**Probably**	**Yes**
Vegetation				
Tree Growth (Coniferous Forestry)	**Good**		**Fair**	**Poor**
Vegetation (no trees)	**Grass/Crops**	**Improved Grass/Dry Heather**	**Wet grassland/juncus**	**Wetlands Sphagnum/ sedge**
Land Use				
Peat Workings	**None/Cutaway to <0.5 m Peat**	**Forestry**	**Turbury Plots**	**Sausage Cutter**

	Meenbog Wind Farm **Peat Stability Assessment Worksheet (Hazard Likelihood)** **Turbine No. T01**		
Factor	**Characteristic properties:**	**Hazard Rating**	
Peat/Subsoil Conditions	• **Peat depth:** Generally 0.2-1.8m, locally 3-4m southeast of H/S • **C_u (Geonor H-10) in Peat:** 3-5kPa • **Water Content:** 1000-1500% • **Max degree of humification:** H2-H9 • **Stability of peat in trial pits:** Slight spalling* • **Soft Clay layer at base of peat?:** No • **Subsoil conditions:** Glacial Till	M	10
Topography	• **Slope angles:** Generally 2-3°; locally 1-2° • **General slope characteristics:** On gently sloping ground, ground slopes down to southeast, slight concave break southeast of H/S, • **In broad flat or buried valley directly upslope from a watercourse?:** No	H	15
Factors of Safety (Infinite Slope) [assuming turbine constructed on flat slope at crest of ridge]	**No surcharge:** • ***cu = 3-5kPa:** > 1.0 **Surcharge (10kPa):** • ***cu = 3-5kPa:** > 1.0 **Undrained shear strength at base of Peat*	M	10
Hydrology/ Hydrogeology	• **Surface Water:** Possible small amount of surface water on flat ground to the southeast • **Drainage:** Water course to the south; Forestry Furrows to the east • **Seepage in trial pits:** Not known • **Evidence of piping/subsurface flow:** No	M	10
Significant Contributory Factors	• **Slide History:** On Site • **Tension Cracks:** No. • **Piping:** No • **Vegetation:** Forestry north & west; cut forest to southeast • **Peat Harvesting:** No	M	10
Notes: **1. Max hazard rating for each factor = 20 and ratings are assigned on the basis of interpreted significance, as follows: Negligible = 0, Low = 5, Medium = 10, High = 15, Very High = 20.** **2. Hazard Likelihood (L) prior to mitigation measures is interpreted from Total Hazard Rating as follows: 0-19: L=1 (Negligible); 20-39: L = 2 (Low); 40-59 L = 3 (Possible); 60-79: L = 4 (Very Possible); 80-100: L = 5 (Likely without appropriate mitigation measures).** **H/S = Hardstanding at turbine locations**		**Total Hazard Rating**	55
***Assumed, no information available, therefore, data conservatively assumed based on general on site experience**		**Hazard Likelihood (L)**	3

	Meenbog Wind Farm **Peat Stability Assessment Worksheet (Hazard Likelihood)** **Turbine No. T02**		
Factor	**Characteristic properties:**	**Hazard Rating**	
Peat/Subsoil Conditions	• **Peat depth:** Generally 0.4-2.2m • **C_u (Geonor H-10) in Peat:** 2.5-11kPa • **Water Content:** 1000-1500%* • **Max degree of humification:** H3-H9 • **Stability of peat in trial pits:** Slight spalling* • **Soft Clay layer at base of peat?:** No • **Subsoil conditions:** Glacial Till	M	10
Topography	• **Slope angles:** Generally 2-3°; locally 1-2° • **General slope characteristics:** On gently sloping ground, ground slopes down to south-southeast, • **In broad flat or buried valley directly upslope from a watercourse?:** No	M	10
Factors of Safety (Infinite Slope) [assuming turbine constructed on flat slope at crest of ridge]	**No surcharge:** • ***cu = 2.5-11kPa:** > 1.0 <1.5 **Surcharge (10kPa):** • ***cu = 2.5-11kPa:** > 1.0 <1.5 **Undrained shear strength at base of Peat*	H	15
Hydrology/ Hydrogeology	• **Surface Water:** Possible small amount of surface water on flat ground to the south • **Drainage:** Water course to the east and west; Forestry Furrows running south • **Seepage in trial pits:** Not known • **Evidence of piping/subsurface flow:** No	M	10
Significant Contributory Factors	• **Slide History:** On Site • **Tension Cracks:** No. • **Piping:** No • **Vegetation:** Forestry north, east & south; cut forest to west • **Peat Harvesting:** No	M	10
Notes: **1. Max hazard rating for each factor = 20 and ratings are assigned on the basis of interpreted significance, as follows: Negligible = 0, Low = 5, Medium = 10, High = 15, Very High = 20.** **2. Hazard Likelihood (L) prior to mitigation measures is interpreted from Total Hazard Rating as follows: 0-19: L=1 (Negligible); 20-39: L = 2 (Low); 40-59 L = 3 (Possible); 60-79: L = 4 (Very Possible); 80-100: L = 5 (Likely without appropriate mitigation measures).** **H/S = Hardstanding at turbine locations** ***Assumed, no information available, therefore, data conservatively assumed based on general on site experience**		**Total Hazard Rating**	55
		Hazard Likelihood (L)	3

	Meenbog Wind Farm **Peat Stability Assessment Worksheet (Hazard Likelihood)** **Turbine No. T03**		
Factor	**Characteristic properties:**	**Hazard Rating**	
Peat/Subsoil Conditions	• **Peat depth:** Generally 1.0-3.8m • **C_u (Geonor H-10) in Peat:** 2-7.5kPa • **Water Content:** 1000-1500%* • **Max degree of humification:** H2-H9 • **Stability of peat in trial pits:** Slight spalling* • **Soft Clay layer at base of peat?:** No • **Subsoil conditions:** Glacial Till	H	15
Topography	• **Slope angles:** Generally 2-3°; locally 1-2° • **General slope characteristics:** On gently sloping ground, ground slopes down to southwest • **In broad flat or buried valley directly upslope from a watercourse?:** No	M	10
Factors of Safety (Infinite Slope) [assuming turbine constructed on flat slope at crest of ridge]	**No surcharge:** • ***cu = 2-7.5kPa:** > 1.0 < 1.5 **Surcharge (10kPa):** • ***cu = 2-7.5kPa:** > 1.0 < 1.5 **Undrained shear strength at base of Peat*	H	15
Hydrology/ Hydrogeology	• **Surface Water:** Ponded in drains • **Drainage: No w**ater course within 150m; Forestry Furrows running south • **Seepage in trial pits:** Not known • **Evidence of piping/subsurface flow:** No	M	10
Significant Contributory Factors	• **Slide History:** On Site • **Tension Cracks:** No. • **Piping:** No • **Vegetation:** Forestry north, east & south; cut forest to west • **Peat Harvesting:** No	M	10
Notes: **1. Max hazard rating for each factor = 20 and ratings are assigned on the basis of interpreted significance, as follows: Negligible = 0, Low = 5, Medium = 10, High = 15, Very High = 20.** **2. Hazard Likelihood (L) prior to mitigation measures is interpreted from Total Hazard Rating as follows: 0-19: L=1 (Negligible); 20-39: L = 2 (Low); 40-59 L = 3 (Possible); 60-79: L = 4 (Very Possible); 80-100: L = 5 (Likely without appropriate mitigation measures).** **H/S = Hardstanding at turbine locations** ***Assumed, no information available, therefore, data conservatively assumed based on general on site experience**		**Total Hazard Rating**	60
		Hazard Likelihood (L)	4

	Meenbog Wind Farm **Peat Stability Assessment Worksheet (Hazard Likelihood)** **Turbine No. T04**		
Factor	**Characteristic properties:**	**Hazard Rating**	
Peat/Subsoil Conditions	• **Peat depth:** Generally 0.5-3.3m • **C_u (Geonor H-10) in Peat:** 3.5-12kPa • **Water Content:** 1000-1500% • **Max degree of humification:** H3-H9 • **Stability of peat in trial pits:** Slight spalling/instability below 1.5m • **Soft Clay layer at base of peat?:** No • **Subsoil conditions:** Glacial Till	H	15
Topography	• **Slope angles:** Generally 2-3°; locally 1-2° • **General slope characteristics:** On elevated ground, ground slopes down to south, east and west • **In broad flat or buried valley directly upslope from a watercourse?:** No	M	10
Factors of Safety (Infinite Slope) [assuming turbine constructed on flat slope at crest of ridge]	**No surcharge:** • ***cu = 3.5-12kPa:** > 1.0 <1.5 **Surcharge (10kPa):** • ***cu = 3.5-12kPa:** > 1.0 <1.5 **Undrained shear strength at base of Peat*	H	15
Hydrology/ Hydrogeology	• **Surface Water:** Ponded in drains • **Drainage:** No water course within 150m; Forestry Furrows running south and north • **Seepage in trial pits:** None recorded • **Evidence of piping/subsurface flow:** No	M	10
Significant Contributory Factors	• **Slide History:** On Site • **Tension Cracks:** No. • **Piping:** No • **Vegetation:** Forestry surrounds location • **Peat Harvesting:** No	M	10
Notes: **1. Max hazard rating for each factor = 20 and ratings are assigned on the basis of interpreted significance, as follows: Negligible = 0, Low = 5, Medium = 10, High = 15, Very High = 20.** **2. Hazard Likelihood (L) prior to mitigation measures is interpreted from Total Hazard Rating as follows: 0-19: L=1 (Negligible); 20-39: L = 2 (Low); 40-59 L = 3 (Possible); 60-79: L = 4 (Very Possible); 80-100: L = 5 (Likely without appropriate mitigation measures).** **H/S = Hardstanding at turbine locations**		**Total Hazard Rating**	60
***Assumed, no information available, therefore, data conservatively assumed based on general on site experience**		**Hazard Likelihood (L)**	4

	Meenbog Wind Farm Peat Stability Assessment Worksheet (Hazard Likelihood) Turbine No. T05		
Factor	**Characteristic properties:**	**Hazard Rating**	
Peat/Subsoil Conditions	• **Peat depth:** Generally 1.6-4.6m • **C_u (Geonor H-10) in Peat:** 5-20kPa • **Water Content:** 1000-1500%* • **Max degree of humification:** H3-H7 • **Stability of peat in trial pits:** Partial collapse at 1.5m • **Soft Clay layer at base of peat?:** No • **Subsoil conditions:** Glacial Till	H	15
Topography	• **Slope angles:** Generally 2-3°; locally 5-9° to north • **General slope characteristics:** On gently sloping ground, convex slope to north of hardstand. • **In broad flat or buried valley directly upslope from a watercourse?:** No	H	15
Factors of Safety (Infinite Slope) [assuming turbine constructed on flat slope at crest of ridge]	**No surcharge:** • ***cu = 5-20kPa:** > 1.0 <1.5 **Surcharge (10kPa):** • ***cu = 5-20kPa:** > 1.0 <1.5 **Undrained shear strength at base of Peat*	H	15
Hydrology/ Hydrogeology	• **Surface Water:** Ponded in drains • **Drainage: No w**ater course within 150m; Forestry Furrows running south • **Seepage in trial pits:** None recorded • **Evidence of piping/subsurface flow:** No	M	10
Significant Contributory Factors	• **Slide History:** On Site • **Tension Cracks:** Yes. • **Piping:** No • **Vegetation:** Forestry north, east & west; unplanted area to southeast of hardstand • **Peat Harvesting:** No	M	10
Notes: **1. Max hazard rating for each factor = 20 and ratings are assigned on the basis of interpreted significance, as follows: Negligible = 0, Low = 5, Medium = 10, High = 15, Very High = 20.** **2. Hazard Likelihood (L) prior to mitigation measures is interpreted from Total Hazard Rating as follows: 0-19: L=1 (Negligible); 20-39: L = 2 (Low); 40-59 L = 3 (Possible); 60-79: L = 4 (Very Possible); 80-100: L = 5 (Likely without appropriate mitigation measures).** **H/S = Hardstanding at turbine locations**		**Total Hazard Rating**	65
***Assumed, no information available, therefore, data conservatively assumed based on general on site experience**		**Hazard Likelihood (L)**	4

	Meenbog Wind Farm **Peat Stability Assessment Worksheet (Hazard Likelihood)** **Turbine No. T06**		
Factor	**Characteristic properties:**	**Hazard Rating**	
Peat/Subsoil Conditions	• **Peat depth:** Generally 0.8-2.4m • **C_u (Geonor H-10) in Peat:** 4-9kPa • **Water Content:** 1000-1500%* • **Max degree of humification:** H7-H10* • **Stability of peat in trial pits:** Slight spalling* • **Soft Clay layer at base of peat?:** No • **Subsoil conditions:** Glacial Till	M	10
Topography	• **Slope angles:** Generally 2-7° • **General slope characteristics:** On gently sloping ground, convex slope to northwest of hardstand. • **In broad flat or buried valley directly upslope from a watercourse?:** No	H	15
Factors of Safety (Infinite Slope) [assuming turbine constructed on flat slope at crest of ridge]	**No surcharge:** • ***cu = 4-9kPa:** > 1.0 < 1.5 **Surcharge (10kPa):** • ***cu = 4-9kPa:** > 1.0 < 1.5 **Undrained shear strength at base of Peat*	H	15
Hydrology/ Hydrogeology	• **Surface Water:** Flowing in drains • **Drainage:** No water course within 150m; Forestry Furrows running north • **Seepage in trial pits:** Not known • **Evidence of piping/subsurface flow:** No	M	10
Significant Contributory Factors	• **Slide History: A**djacent to slide • **Tension Cracks:** No. • **Piping:** No • **Vegetation:** Forestry north, south & west; cut forestry to east • **Peat Harvesting:** No	H	15
Notes: **1. Max hazard rating for each factor = 20 and ratings are assigned on the basis of interpreted significance, as follows: Negligible = 0, Low = 5, Medium = 10, High = 15, Very High = 20.** **2. Hazard Likelihood (L) prior to mitigation measures is interpreted from Total Hazard Rating as follows: 0-19: L=1 (Negligible); 20-39: L = 2 (Low); 40-59 L = 3 (Possible); 60-79: L = 4 (Very Possible); 80-100: L = 5 (Likely without appropriate mitigation measures).** **H/S = Hardstanding at turbine locations** ***Assumed, no information available, therefore, data conservatively assumed based on general on site experience**		**Total Hazard Rating**	65
		Hazard Likelihood (L)	4

	Meenbog Wind Farm **Peat Stability Assessment Worksheet (Hazard Likelihood)** **Turbine No. T07**		
Factor	**Characteristic properties:**	**Hazard Rating**	
Peat/Subsoil Conditions	• **Peat depth:** Generally 0.3-2.2m, locally 2.5-4.5m west of H/S • **C_u (Geonor H-10) in Peat:** 2.5-13kPa • **Water Content:** 1000-1500% • **Max degree of humification:** H3-H9 • **Stability of peat in trial pits:** Partial collapse at 1.5m • **Soft Clay layer at base of peat?:** No • **Subsoil conditions:** Glacial Till	H	15
Topography	• **Slope angles:** Generally 2-7° • **General slope characteristics:** On gently sloping ground, convex slope to east of hardstand. • **In broad flat or buried valley directly upslope from a watercourse?:** No	H	15
Factors of Safety (Infinite Slope) [assuming turbine constructed on flat slope at crest of ridge]	**No surcharge:** • ***cu = 2.5-13kPa:** > 1.0 < 1.5 **Surcharge (10kPa):** • ***cu = 2.5-13kPa:** > 1.0 < 1.5 **Undrained shear strength at base of Peat*	H	15
Hydrology/ Hydrogeology	• **Surface Water:** Potentially ponded water in localised areas to west of hardstand • **Drainage: W**ater course to east; Forestry Furrows running east • **Seepage in trial pits:** Not known • **Evidence of piping/subsurface flow:** No	M	10
Significant Contributory Factors	• **Slide History: A**djacent to slide • **Tension Cracks:** No. • **Piping:** No • **Vegetation:** Forestry north, south & east; large unplanted area to west • **Peat Harvesting:** No	VH	20
Notes: **1. Max hazard rating for each factor = 20 and ratings are assigned on the basis of interpreted significance, as follows: Negligible = 0, Low = 5, Medium = 10, High = 15, Very High = 20.** **2. Hazard Likelihood (L) prior to mitigation measures is interpreted from Total Hazard Rating as follows: 0-19: L=1 (Negligible); 20-39: L = 2 (Low); 40-59 L = 3 (Possible); 60-79: L = 4 (Very Possible); 80-100: L = 5 (Likely without appropriate mitigation measures).** **H/S = Hardstanding at turbine locations**		**Total Hazard Rating**	75
***Assumed, no information available, therefore, data conservatively assumed based on general on site experience**		**Hazard Likelihood (L)**	4

	Meenbog Wind Farm **Peat Stability Assessment Worksheet (Hazard Likelihood)** **Turbine No. T08**		
Factor	**Characteristic properties:**	**Hazard Rating**	
Peat/Subsoil Conditions	• **Peat depth:** Generally 0.9-3.3m • **C_u (Geonor H-10) in Peat:** 6-21kPa • **Water Content:** 1000-1500%* • **Max degree of humification:** H7-H10* • **Stability of peat in trial pits:** Slight spalling* • **Soft Clay layer at base of peat?:** No • **Subsoil conditions:** Glacial Till	M	10
Topography	• **Slope angles:** Generally 2-7° • **General slope characteristics:** On gently sloping ground, ground slopes to north. • **In broad flat or buried valley directly upslope from a watercourse?:** No	M	10
Factors of Safety (Infinite Slope) [assuming turbine constructed on flat slope at crest of ridge]	**No surcharge:** • ***cu = 6-21kPa:** > 1.0 **Surcharge (10kPa):** • ***cu = 6-21kPa:** > 1.0 **Undrained shear strength at base of Peat*	L	5
Hydrology/ Hydrogeology	• **Surface Water:** Flowing in drains • **Drainage: W**ater course to northwest; Forestry Furrows running north-northwest • **Seepage in trial pits:** Not known • **Evidence of piping/subsurface flow:** No	M	10
Significant Contributory Factors	• **Slide History: A**djacent to slide • **Tension Cracks:** No. • **Piping:** No • **Vegetation:** Forestry surrounding area • **Peat Harvesting:** No	H	15
Notes: **1. Max hazard rating for each factor = 20 and ratings are assigned on the basis of interpreted significance, as follows: Negligible = 0, Low = 5, Medium = 10, High = 15, Very High = 20.** **2. Hazard Likelihood (L) prior to mitigation measures is interpreted from Total Hazard Rating as follows: 0-19: L=1 (Negligible); 20-39: L = 2 (Low); 40-59 L = 3 (Possible); 60-79: L = 4 (Very Possible); 80-100: L = 5 (Likely without appropriate mitigation measures).** **H/S = Hardstanding at turbine locations**		**Total Hazard Rating**	50
***Assumed, no information available, therefore, data conservatively assumed based on general on site experience**		**Hazard Likelihood (L)**	3

	Meenbog Wind Farm **Peat Stability Assessment Worksheet (Hazard Likelihood)** **Turbine No. T09**		
Factor	**Characteristic properties:**	**Hazard Rating**	
Peat/Subsoil Conditions	• **Peat depth:** Generally 0.4-1.8m • **C_u (Geonor H-10) in Peat:** 6.5-20kPa • **Water Content:** 1000-1500%* • **Max degree of humification:** H7-H10* • **Stability of peat in trial pits:** Slight spalling* • **Soft Clay layer at base of peat?:** No • **Subsoil conditions:** Glacial Till	M	10
Topography	• **Slope angles:** Generally 2-6° • **General slope characteristics:** On gently sloping ground, ground slopes to northeast. • **In broad flat or buried valley directly upslope from a watercourse?:** No	M	10
Factors of Safety (Infinite Slope) [assuming turbine constructed on flat slope at crest of ridge]	**No surcharge:** • ***cu = 6.5-20kPa:** > 1.0 **Surcharge (10kPa):** • ***cu = 6.5-20kPa:** > 1.0 **Undrained shear strength at base of Peat*	M	10
Hydrology/ Hydrogeology	• **Surface Water:** Flowing in drains • **Drainage:** Water course to northwest of hardstand; Forestry Furrows running north-northwest • **Seepage in trial pits:** Not known • **Evidence of piping/subsurface flow:** No	H	15
Significant Contributory Factors	• **Slide History:** Downslope of slide • **Tension Cracks:** No. • **Piping:** No • **Vegetation:** Forestry surrounding area • **Peat Harvesting:** No	H	15
Notes: **1. Max hazard rating for each factor = 20 and ratings are assigned on the basis of interpreted significance, as follows: Negligible = 0, Low = 5, Medium = 10, High = 15, Very High = 20.** **2. Hazard Likelihood (L) prior to mitigation measures is interpreted from Total Hazard Rating as follows: 0-19: L=1 (Negligible); 20-39: L = 2 (Low); 40-59 L = 3 (Possible); 60-79: L = 4 (Very Possible); 80-100: L = 5 (Likely without appropriate mitigation measures).** **H/S = Hardstanding at turbine locations**		**Total Hazard Rating**	60
***Assumed, no information available, therefore, data conservatively assumed based on general on site experience**		**Hazard Likelihood (L)**	3

	Meenbog Wind Farm **Peat Stability Assessment Worksheet (Hazard Likelihood)** **Turbine No. T10**		
Factor	**Characteristic properties:**	**Hazard Rating**	
Peat/Subsoil Conditions	• **Peat depth:** Generally 0.5-3.6m • **C_u (Geonor H-10) in Peat:** 3-12kPa • **Water Content:** 1000-1500%* • **Max degree of humification:** H3-H9 • **Stability of peat in trial pits:** Slight spalling* • **Soft Clay layer at base of peat?:** No • **Subsoil conditions:** Glacial Till	M	10
Topography	• **Slope angles:** Generally 2-5° • **General slope characteristics:** On gently sloping ground, concave break in slope downslope of hardstand, ground slopes to northwest. • **In broad flat or buried valley directly upslope from a watercourse?:** No	M	10
Factors of Safety (Infinite Slope) [assuming turbine constructed on flat slope at crest of ridge]	**No surcharge:** • ***cu = 3-12kPa:** > 1.0 **Surcharge (10kPa):** • ***cu = 3-12kPa:** > 1.0 **Undrained shear strength at base of Peat*	M	10
Hydrology/ Hydrogeology	• **Surface Water:** Flowing in drains • **Drainage: W**ater course to west of hardstand; Forestry Furrows running north • **Seepage in trial pits:** Not known • **Evidence of piping/subsurface flow:** No	H	15
Significant Contributory Factors	• **Slide History:** On site • **Tension Cracks:** No. • **Piping:** No • **Vegetation:** Forestry surrounding area • **Peat Harvesting:** No	M	10
Notes: **1. Max hazard rating for each factor = 20 and ratings are assigned on the basis of interpreted significance, as follows: Negligible = 0, Low = 5, Medium = 10, High = 15, Very High = 20.** **2. Hazard Likelihood (L) prior to mitigation measures is interpreted from Total Hazard Rating as follows: 0-19: L=1 (Negligible); 20-39: L = 2 (Low); 40-59 L = 3 (Possible); 60-79: L = 4 (Very Possible); 80-100: L = 5 (Likely without appropriate mitigation measures).** **H/S = Hardstanding at turbine locations**		**Total Hazard Rating**	55
***Assumed, no information available, therefore, data conservatively assumed based on general on site experience**		**Hazard Likelihood (L)**	3

	Meenbog Wind Farm **Peat Stability Assessment Worksheet (Hazard Likelihood)** **Turbine No. T11**		
Factor	**Characteristic properties:**	**Hazard Rating**	
Peat/Subsoil Conditions	• **Peat depth:** Generally 0.8-3.3m • **C_u (Geonor H-10) in Peat:** 3.5-12kPa • **Water Content:** 1000-1500%* • **Max degree of humification:** H7-H10* • **Stability of peat in trial pits:** Slight spalling* • **Soft Clay layer at base of peat?:** No • **Subsoil conditions:** Glacial Till	H	15
Topography	• **Slope angles:** Generally 2-5° • **General slope characteristics:** On gently sloping ground, ground slopes to north. • **In broad flat or buried valley directly upslope from a watercourse?:** No	M	10
Factors of Safety (Infinite Slope) [assuming turbine constructed on flat slope at crest of ridge]	**No surcharge:** · ***cu = 3.5-12kPa:** > 1.0 < 1.5 **Surcharge (10kPa):** · ***cu = 3.5-12kPa:** 1.0 < 1.5 **Undrained shear strength at base of Peat*	M	10
Hydrology/ Hydrogeology	• **Surface Water:** None noted • **Drainage:** No water course within 150m of hardstand; Forestry Furrows running north • **Seepage in trial pits:** Not known • **Evidence of piping/subsurface flow:** No	M	10
Significant Contributory Factors	• **Slide History:** On site • **Tension Cracks:** No. • **Piping:** No • **Vegetation:** Forestry surrounding area • **Peat Harvesting:** No	M	10
Notes: **1. Max hazard rating for each factor = 20 and ratings are assigned on the basis of interpreted significance, as follows: Negligible = 0, Low = 5, Medium = 10, High = 15, Very High = 20.** **2. Hazard Likelihood (L) prior to mitigation measures is interpreted from Total Hazard Rating as follows: 0-19: L=1 (Negligible); 20-39: L = 2 (Low); 40-59 L = 3 (Possible); 60-79: L = 4 (Very Possible); 80-100: L = 5 (Likely without appropriate mitigation measures).** **H/S = Hardstanding at turbine locations**		**Total Hazard Rating**	55
***Assumed, no information available, therefore, data conservatively assumed based on general on site experience**		**Hazard Likelihood (L)**	3

	Meenbog Wind Farm **Peat Stability Assessment Worksheet (Hazard Likelihood)** **Turbine No. T12**		
Factor	**Characteristic properties:**	**Hazard Rating**	
Peat/Subsoil Conditions	• **Peat depth:** Generally 0.5-2.2m • **C_u (Geonor H-10) in Peat: 4**.5-30kPa • **Water Content:** 1000-1500%* • **Max degree of humification:** H7-H10* • **Stability of peat in trial pits:** Slight spalling* • **Soft Clay layer at base of peat?:** No • **Subsoil conditions:** Glacial Till	M	10
Topography	• **Slope angles:** Generally 2-6° • **General slope characteristics:** On gently sloping ground, ground slopes to north. • **In broad flat or buried valley directly upslope from a watercourse?:** No	M	10
Factors of Safety (Infinite Slope) [assuming turbine constructed on flat slope at crest of ridge]	**No surcharge:** • ***cu = 4.5-30kPa:** > 1.0 < 1.5 **Surcharge (10kPa):** • ***cu = 4.5-30kPa:** > 1.0 < 1.5 **Undrained shear strength at base of Peat*	M	10
Hydrology/ Hydrogeology	• **Surface Water:** Flowing in drains • **Drainage:** Water course to west of hardstand; Forestry Furrows running north • **Seepage in trial pits:** Not known • **Evidence of piping/subsurface flow:** No	H	15
Significant Contributory Factors	• **Slide History:** Adjacent to minor slide • **Tension Cracks:** No. • **Piping:** No • **Vegetation:** Forestry surrounding area • **Peat Harvesting:** No	VH	20
Notes: **1. Max hazard rating for each factor = 20 and ratings are assigned on the basis of interpreted significance, as follows: Negligible = 0, Low = 5, Medium = 10, High = 15, Very High = 20.** **2. Hazard Likelihood (L) prior to mitigation measures is interpreted from Total Hazard Rating as follows: 0-19: L=1 (Negligible); 20-39: L = 2 (Low); 40-59 L = 3 (Possible); 60-79: L = 4 (Very Possible); 80-100: L = 5 (Likely without appropriate mitigation measures).** **H/S = Hardstanding at turbine locations**		**Total Hazard Rating**	65
***Assumed, no information available, therefore, data conservatively assumed based on general on site experience**		**Hazard Likelihood (L)**	4

	Meenbog Wind Farm **Peat Stability Assessment Worksheet (Hazard Likelihood)** **Turbine No. T13**		
Factor	**Characteristic properties:**	**Hazard Rating**	
Peat/Subsoil Conditions	• **Peat depth:** Generally 0.5-1.0m • **C_u (Geonor H-10) in Peat:** 7.5-30kPa • **Water Content:** 1000-1500%* • **Max degree of humification:** H7-H10* • **Stability of peat in trial pits:** Slight spalling* • **Soft Clay layer at base of peat?:** No • **Subsoil conditions:** Glacial Till	M	10
Topography	• **Slope angles:** Generally 4-8^{o} • **General slope characteristics:** On gently sloping ground, ground slopes to north. • **In broad flat or buried valley directly upslope from a watercourse?:** No	M	10
Factors of Safety (Infinite Slope) [assuming turbine constructed on flat slope at crest of ridge]	**No surcharge:** • ***cu = 3.5-12kPa:** > 1.5 **Surcharge (10kPa):** • ***cu = 3.5-12kPa:** > 1.5 **Undrained shear strength at base of Peat*	L	5
Hydrology/ Hydrogeology	• **Surface Water:** Flowing in drains • **Drainage:** No water course within 150m of hardstand; Forestry Furrows running north • **Seepage in trial pits:** Not known • **Evidence of piping/subsurface flow:** No	M	10
Significant Contributory Factors	• **Slide History:** On site • **Tension Cracks:** No. • **Piping:** No • **Vegetation:** Forestry surrounding area • **Peat Harvesting:** No	M	10
Notes: **1. Max hazard rating for each factor = 20 and ratings are assigned on the basis of interpreted significance, as follows: Negligible = 0, Low = 5, Medium = 10, High = 15, Very High = 20.** **2. Hazard Likelihood (L) prior to mitigation measures is interpreted from Total Hazard Rating as follows: 0-19: L=1 (Negligible); 20-39: L = 2 (Low); 40-59 L = 3 (Possible); 60-79: L = 4 (Very Possible); 80-100: L = 5 (Likely without appropriate mitigation measures).** **H/S = Hardstanding at turbine locations**		**Total Hazard Rating**	45
***Assumed, no information available, therefore, data conservatively assumed based on general on site experience**		**Hazard Likelihood (L)**	3

	Meenbog Wind Farm Peat Stability Assessment Worksheet (Hazard Likelihood) Turbine No. T14		
Factor	**Characteristic properties:**	**Hazard Rating**	
Peat/Subsoil Conditions	• **Peat depth:** Generally 0.9-2.4m • **C_u (Geonor H-10) in Peat:** 8.5-26kPa • **Water Content:** 1000-1500%* • **Max degree of humification:** H3-H9 • **Stability of peat in trial pits:** Slight spalling* • **Soft Clay layer at base of peat?:** No • **Subsoil conditions:** Glacial Till	M	10
Topography	• **Slope angles:** Generally 3-7° • **General slope characteristics:** On gently sloping ground, ground slopes to north. • **In broad flat or buried valley directly upslope from a watercourse?:** No	M	10
Factors of Safety (Infinite Slope) [assuming turbine constructed on flat slope at crest of ridge]	**No surcharge:** • ***cu = 8.5-26kPa:** > 1.0 **Surcharge (10kPa):** • ***cu = 8.5-26kPa:** > 1.0 **Undrained shear strength at base of Peat*	L	5
Hydrology/ Hydrogeology	• **Surface Water:** Flowing in drains • **Drainage:** Water course to east and north of hardstand; Forestry Furrows running north • **Seepage in trial pits:** Not known • **Evidence of piping/subsurface flow:** No	M	10
Significant Contributory Factors	• **Slide History:** On site • **Tension Cracks:** No. • **Piping:** No • **Vegetation:** Forestry surrounding area • **Peat Harvesting:** No	M	10
Notes: **1. Max hazard rating for each factor = 20 and ratings are assigned on the basis of interpreted significance, as follows: Negligible = 0, Low = 5, Medium = 10, High = 15, Very High = 20.** **2. Hazard Likelihood (L) prior to mitigation measures is interpreted from Total Hazard Rating as follows: 0-19: L=1 (Negligible); 20-39: L = 2 (Low); 40-59 L = 3 (Possible); 60-79: L = 4 (Very Possible); 80-100: L = 5 (Likely without appropriate mitigation measures).** **H/S = Hardstanding at turbine locations**		**Total Hazard Rating**	45
***Assumed, no information available, therefore, data conservatively assumed based on general on site experience**		**Hazard Likelihood (L)**	3

	Meenbog Wind Farm **Peat Stability Assessment Worksheet (Hazard Likelihood)** **Turbine No. T15**		
Factor	**Characteristic properties:**	**Hazard Rating**	
Peat/Subsoil Conditions	• **Peat depth:** Generally 0.5-1.0m • **C_u (Geonor H-10) in Peat:** 10-15kPa • **Water Content:** 1000-1500%* • **Max degree of humification:** H7-H10* • **Stability of peat in trial pits:** Slight spalling* • **Soft Clay layer at base of peat?:** No • **Subsoil conditions:** Glacial Till	M	10
Topography	• **Slope angles:** Generally 3-4° • **General slope characteristics:** On gently sloping ground, ground slopes to north. • **In broad flat or buried valley directly upslope from a watercourse?:** No	M	10
Factors of Safety (Infinite Slope) [assuming turbine constructed on flat slope at crest of ridge]	**No surcharge:** • ***cu = 10-15kPa:** > 1.5 **Surcharge (10kPa):** • ***cu = 10-15kPa:** > 1.5 **Undrained shear strength at base of Peat*	L	5
Hydrology/ Hydrogeology	• **Surface Water:** None noted • **Drainage:** Water course to east and north of hardstand; Forestry Furrows running north • **Seepage in trial pits:** Not known • **Evidence of piping/subsurface flow:** No	M	10
Significant Contributory Factors	• **Slide History:** On site • **Tension Cracks:** No. • **Piping:** No • **Vegetation:** Forestry surrounding area • **Peat Harvesting:** No	M	10
Notes: **1. Max hazard rating for each factor = 20 and ratings are assigned on the basis of interpreted significance, as follows: Negligible = 0, Low = 5, Medium = 10, High = 15, Very High = 20.** **2. Hazard Likelihood (L) prior to mitigation measures is interpreted from Total Hazard Rating as follows: 0-19: L=1 (Negligible); 20-39: L = 2 (Low); 40-59 L = 3 (Possible); 60-79: L = 4 (Very Possible); 80-100: L = 5 (Likely without appropriate mitigation measures).** **H/S = Hardstanding at turbine locations**		**Total Hazard Rating**	45
***Assumed, no information available, therefore, data conservatively assumed based on general on site experience**		**Hazard Likelihood (L)**	3

	Meenbog Wind Farm **Peat Stability Assessment Worksheet (Hazard Likelihood)** **Turbine No. T16**		
Factor	**Characteristic properties:**	**Hazard Rating**	
Peat/Subsoil Conditions	• **Peat depth:** Generally 1.5-4.0m • **C_u (Geonor H-10) in Peat:** 2-7kPa • **Water Content:** 1000-1500%* • **Max degree of humification:** H4-H9 • **Stability of peat in trial pits:** Slight spalling* • **Soft Clay layer at base of peat?:** No • **Subsoil conditions:** Glacial Till	H	15
Topography	• **Slope angles:** Generally 2-4° • **General slope characteristics:** On gently sloping ground, ground slopes to north. • **In broad flat or buried valley directly upslope from a watercourse?:** No	M	10
Factors of Safety (Infinite Slope) [assuming turbine constructed on flat slope at crest of ridge]	**No surcharge:** • ***cu = 2-7kPa:** > 1.0 < 1.5 **Surcharge (10kPa):** • ***cu = 2-7kPa:** > 1.0 < 1.5 **Undrained shear strength at base of Peat*	M	10
Hydrology/ Hydrogeology	• **Surface Water:** Ponded in drains • **Drainage: No w**ater course within 150m of hardstand; Forestry Furrows running north • **Seepage in trial pits:** Not known • **Evidence of piping/subsurface flow:** No	M	10
Significant Contributory Factors	• **Slide History:** On site • **Tension Cracks:** No. • **Piping:** No • **Vegetation:** Forestry to west, open peatland to east • **Peat Harvesting:** No	M	10
Notes: **1. Max hazard rating for each factor = 20 and ratings are assigned on the basis of interpreted significance, as follows: Negligible = 0, Low = 5, Medium = 10, High = 15, Very High = 20.** **2. Hazard Likelihood (L) prior to mitigation measures is interpreted from Total Hazard Rating as follows: 0-19: L=1 (Negligible); 20-39: L = 2 (Low); 40-59 L = 3 (Possible); 60-79: L = 4 (Very Possible); 80-100: L = 5 (Likely without appropriate mitigation measures).** **H/S = Hardstanding at turbine locations**		**Total Hazard Rating**	55
***Assumed, no information available, therefore, data conservatively assumed based on general on site experience**		**Hazard Likelihood (L)**	3

	Meenbog Wind Farm **Peat Stability Assessment Worksheet (Hazard Likelihood)** **Turbine No. T17**		
Factor	**Characteristic properties:**	**Hazard Rating**	
Peat/Subsoil Conditions	• **Peat depth:** Generally 0.7-1.5m • **C_u (Geonor H-10) in Peat:** 4-8kPa • **Water Content:** 1000-1500%* • **Max degree of humification:** H7-H10* • **Stability of peat in trial pits:** Slight spalling* • **Soft Clay layer at base of peat?:** No • **Subsoil conditions:** Glacial Till	M	10
Topography	• **Slope angles:** Generally 4-8^{o} • **General slope characteristics:** On gently sloping ground, ground slopes to north. • **In broad flat or buried valley directly upslope from a watercourse?:** No	M	10
Factors of Safety (Infinite Slope) [assuming turbine constructed on flat slope at crest of ridge]	**No surcharge:** • ***cu = 4-8kPa:** > 1.5 **Surcharge (10kPa):** • ***cu = 4-8kPa:** > 1.5 **Undrained shear strength at base of Peat*	L	5
Hydrology/ Hydrogeology	• **Surface Water:** Flowing in drains • **Drainage: No w**ater course within 150m of hardstand; Forestry Furrows running north • **Seepage in trial pits:** Not known • **Evidence of piping/subsurface flow:** No	M	10
Significant Contributory Factors	• **Slide History:** On site • **Tension Cracks:** No. • **Piping:** No • **Vegetation:** Forestry surrounding area • **Peat Harvesting:** No	M	10
Notes: **1. Max hazard rating for each factor = 20 and ratings are assigned on the basis of interpreted significance, as follows: Negligible = 0, Low = 5, Medium = 10, High = 15, Very High = 20.** **2. Hazard Likelihood (L) prior to mitigation measures is interpreted from Total Hazard Rating as follows: 0-19: L=1 (Negligible); 20-39: L = 2 (Low); 40-59 L = 3 (Possible); 60-79: L = 4 (Very Possible); 80-100: L = 5 (Likely without appropriate mitigation measures).** **H/S = Hardstanding at turbine locations**		**Total Hazard Rating**	45
***Assumed, no information available, therefore, data conservatively assumed based on general on site experience**		**Hazard Likelihood (L)**	3

	Meenbog Wind Farm **Peat Stability Assessment Worksheet (Hazard Likelihood)** **Turbine No. T18**		
Factor	**Characteristic properties:**	**Hazard Rating**	
Peat/Subsoil Conditions	• **Peat depth:** Generally 0.2-2.0m • **C_u (Geonor H-10) in Peat:** 6-14Pa • **Water Content:** 1000-1500%* • **Max degree of humification:** H3-H4 • **Stability of peat in trial pits:** Stable • **Soft Clay layer at base of peat?:** No • **Subsoil conditions:** Glacial Till	M	10
Topography	• **Slope angles:** Generally 2-5° • **General slope characteristics:** On gently sloping ground, ground slopes to southeast. • **In broad flat or buried valley directly upslope from a watercourse?:** Yes	H	15
Factors of Safety (Infinite Slope) [assuming turbine constructed on flat slope at crest of ridge]	**No surcharge:** • ***cu = 6-14kPa:** > 1.5 **Surcharge (10kPa):** • ***cu = 6-14kPa:** > 1.5 **Undrained shear strength at base of Peat*	L	5
Hydrology/ Hydrogeology	• **Surface Water:** None noted • **Drainage:** Watercourse southeast of hardstand; Forestry Furrows running east • **Seepage in trial pits:** Not known • **Evidence of piping/subsurface flow:** No	H	15
Significant Contributory Factors	• **Slide History:** On site • **Tension Cracks:** No. • **Piping:** No • **Vegetation:** Forestry surrounding area • **Peat Harvesting:** No	M	10
Notes: **1. Max hazard rating for each factor = 20 and ratings are assigned on the basis of interpreted significance, as follows: Negligible = 0, Low = 5, Medium = 10, High = 15, Very High = 20.** **2. Hazard Likelihood (L) prior to mitigation measures is interpreted from Total Hazard Rating as follows: 0-19: L=1 (Negligible); 20-39: L = 2 (Low); 40-59 L = 3 (Possible); 60-79: L = 4 (Very Possible); 80-100: L = 5 (Likely without appropriate mitigation measures).** **H/S = Hardstanding at turbine locations**		**Total Hazard Rating**	55
***Assumed, no information available, therefore, data conservatively assumed based on general on site experience**		**Hazard Likelihood (L)**	3

	Meenbog Wind Farm Peat Stability Assessment Worksheet (Hazard Likelihood) Turbine No. T19		
Factor	**Characteristic properties:**	**Hazard Rating**	
Peat/Subsoil Conditions	• **Peat depth:** Generally 0.4-2.5m • **C_u (Geonor H-10) in Peat: 3.5**-10Pa • **Water Content:** 1000-1500% • **Max degree of humification:** H3-H9 • **Stability of peat in trial pits:** Slight spalling* • **Soft Clay layer at base of peat?:** No • **Subsoil conditions:** Glacial Till	H	15
Topography	• **Slope angles:** Generally 2-4^{o} • **General slope characteristics:** On gently sloping ground, ground slopes to northwest. • **In broad flat or buried valley directly upslope from a watercourse?:** No	M	10
Factors of Safety (Infinite Slope) [assuming turbine constructed on flat slope at crest of ridge]	**No surcharge:** • ***cu = 3.5-10kPa:** > 1.0 < 1.5 **Surcharge (10kPa):** • ***cu = 3.5-10kPa:** > 1.0 < 1.5 **Undrained shear strength at base of Peat*	M	10
Hydrology/ Hydrogeology	• **Surface Water:** Ponded in drains • **Drainage: No w**ater course within 150m of hardstand; Forestry Furrows running north • **Seepage in trial pits:** Not known • **Evidence of piping/subsurface flow:** No	H	15
Significant Contributory Factors	• **Slide History:** On site • **Tension Cracks:** No. • **Piping:** No • **Vegetation:** Forestry to west of hardstand, open peatland to east. • **Peat Harvesting:** No	M	10
Notes: **1. Max hazard rating for each factor = 20 and ratings are assigned on the basis of interpreted significance, as follows: Negligible = 0, Low = 5, Medium = 10, High = 15, Very High = 20.** **2. Hazard Likelihood (L) prior to mitigation measures is interpreted from Total Hazard Rating as follows: 0-19: L=1 (Negligible); 20-39: L = 2 (Low); 40-59 L = 3 (Possible); 60-79: L = 4 (Very Possible); 80-100: L = 5 (Likely without appropriate mitigation measures).** **H/S = Hardstanding at turbine locations**		**Total Hazard Rating**	60
***Assumed, no information available, therefore, data conservatively assumed based on general on site experience**		**Hazard Likelihood (L)**	3

	Meenbog Wind Farm **Peat Stability Assessment Worksheet (Hazard Likelihood)** **Floating Road to T01**		
Factor	**Characteristic properties:**	**Hazard Rating**	
Peat/Subsoil Conditions	• **Peat depth:** Generally 0.7-3.5m • **C_u (Geonor H-10) in Peat:** 3-14kPa • **Water Content:** 1000-1500% • **Max degree of humification:** H2-H9 • **Stability of peat in trial pits:** Slight spalling* • **Soft Clay layer at base of peat?:** No • **Subsoil conditions:** Glacial Till	H	15
Topography	• **Slope angles:** Generally 2-3°; locally 1-2° • **General slope characteristics:** On gently sloping ground, ground slopes down to southeast, slight concave break southeast of H/S, • **In broad flat or buried valley directly upslope from a watercourse?:** No	H	15
Factors of Safety (Infinite Slope) [assuming turbine constructed on flat slope at crest of ridge]	**No surcharge:** • ***cu = 3-14kPa:** > 1.0 **Floating Road Surcharge (23kPa):** • ***cu = 3-14kPa:** 0.98 to > 1.0 **Undrained shear strength at base of Peat*	H	15
Hydrology/ Hydrogeology	• **Surface Water:** Possible small amount of surface water on flat ground to the southeast • **Drainage:** Water course to the south; Forestry Furrows to the east ανδ ωεστ • **Seepage in trial pits:** Not known • **Evidence of piping/subsurface flow:** No	M	10
Significant Contributory Factors	• **Slide History:** On Site • **Tension Cracks:** No. • **Piping:** No • **Vegetation:** Forestry north & west; cut forest to southeast • **Peat Harvesting:** No	H	15
Notes: **1. Max hazard rating for each factor = 20 and ratings are assigned on the basis of interpreted significance, as follows: Negligible = 0, Low = 5, Medium = 10, High = 15, Very High = 20.** **2. Hazard Likelihood (L) prior to mitigation measures is interpreted from Total Hazard Rating as follows: 0-19: L=1 (Negligible); 20-39: L = 2 (Low); 40-59 L = 3 (Possible); 60-79: L = 4 (Very Possible); 80-100: L = 5 (Likely without appropriate mitigation measures).** **H/S = Hardstanding at turbine locations** ***Assumed, no information available, therefore, data conservatively assumed based on general on site experience**		**Total Hazard Rating**	70
		Hazard Likelihood (L)	4

	Meenbog Wind Farm **Peat Stability Assessment Worksheet (Hazard Likelihood)** **Floating Road to T02**		
Factor	**Characteristic properties:**	**Hazard Rating**	
Peat/Subsoil Conditions	• **Peat depth:** Generally 0.7-3.2m • **C_u (Geonor H-10) in Peat:** 2.5-22kPa • **Water Content:** 1000-1500%* • **Max degree of humification:** H3-H9 • **Stability of peat in trial pits:** Slight spalling* • **Soft Clay layer at base of peat?:** No • **Subsoil conditions:** Glacial Till	H	15
Topography	• **Slope angles:** Generally 2-3°; locally 1-2° • **General slope characteristics:** On gently sloping ground, ground slopes down to south-southeast, • **In broad flat or buried valley directly upslope from a watercourse?:** No	H	15
Factors of Safety (Infinite Slope) [assuming turbine constructed on flat slope at crest of ridge]	**No surcharge:** • ***cu = 2.5-22kPa:** > 1.0 < 1.5 **Floating Road Surcharge (23kPa):** • ***cu = 2.5-11kPa:** > 1.0 < 1.5 **Undrained shear strength at base of Peat*	H	15
Hydrology/ Hydrogeology	• **Surface Water:** Possible small amount of surface water on flat ground to the south • **Drainage:** Water course to the east and west; Forestry Furrows running south • **Seepage in trial pits:** Not known • **Evidence of piping/subsurface flow:** No	M	10
Significant Contributory Factors	• **Slide History:** On Site • **Tension Cracks:** No. • **Piping:** No • **Vegetation:** Forestry north, east & south; cut forest to west • **Peat Harvesting:** No	H	15
Notes: **1. Max hazard rating for each factor = 20 and ratings are assigned on the basis of interpreted significance, as follows: Negligible = 0, Low = 5, Medium = 10, High = 15, Very High = 20.** **2. Hazard Likelihood (L) prior to mitigation measures is interpreted from Total Hazard Rating as follows: 0-19: L=1 (Negligible); 20-39: L = 2 (Low); 40-59 L = 3 (Possible); 60-79: L = 4 (Very Possible); 80-100: L = 5 (Likely without appropriate mitigation measures).** **H/S = Hardstanding at turbine locations** ***Assumed, no information available, therefore, data conservatively assumed based on general on site experience**		**Total Hazard Rating**	70
		Hazard Likelihood (L)	3

	Meenbog Wind Farm **Peat Stability Assessment Worksheet (Hazard Likelihood)** **Floating Road to T03**		
Factor	**Characteristic properties:**	**Hazard Rating**	
Peat/Subsoil Conditions	• **Peat depth:** Generally 2.1-4.0m • **C_u (Geonor H-10) in Peat:** 2-9kPa • **Water Content:** 1000-1500%* • **Max degree of humification:** H2-H9 • **Stability of peat in trial pits:** Slight spalling* • **Soft Clay layer at base of peat?:** No • **Subsoil conditions:** Glacial Till	H	15
Topography	• **Slope angles:** Generally 2-3°; locally 1-2° • **General slope characteristics:** On gently sloping ground, ground slopes down to southwest • **In broad flat or buried valley directly upslope from a watercourse?:** No	H	15
Factors of Safety (Infinite Slope) [assuming turbine constructed on flat slope at crest of ridge]	**No surcharge:** • ***cu = 2-9kPa:** > 1.0 < 1.5 **Floating Road Surcharge (23kPa):** • ***cu = 2-9kPa:** > 1.0 < 1.5 **Undrained shear strength at base of Peat*	H	15
Hydrology/ Hydrogeology	• **Surface Water:** Ponded in drains • **Drainage: No w**ater course within 150m; Forestry Furrows running south • **Seepage in trial pits:** Not known • **Evidence of piping/subsurface flow:** No	M	10
Significant Contributory Factors	• **Slide History:** On Site • **Tension Cracks:** No. • **Piping:** No • **Vegetation:** Forestry north, east & south; cut forest to west • **Peat Harvesting:** No	H	15
Notes: **1. Max hazard rating for each factor = 20 and ratings are assigned on the basis of interpreted significance, as follows: Negligible = 0, Low = 5, Medium = 10, High = 15, Very High = 20.** **2. Hazard Likelihood (L) prior to mitigation measures is interpreted from Total Hazard Rating as follows: 0-19: L=1 (Negligible); 20-39: L = 2 (Low); 40-59 L = 3 (Possible); 60-79: L = 4 (Very Possible); 80-100: L = 5 (Likely without appropriate mitigation measures).** **H/S = Hardstanding at turbine locations** ***Assumed, no information available, therefore, data conservatively assumed based on general on site experience**		**Total Hazard Rating**	70
		Hazard Likelihood (L)	3

	Meenbog Wind Farm **Peat Stability Assessment Worksheet (Hazard Likelihood)** **Floating Road to T04**		
Factor	**Characteristic properties:**	**Hazard Rating**	
Peat/Subsoil Conditions	• **Peat depth:** Generally 0.7-7.0m • **C_u (Geonor H-10) in Peat: 2**-15kPa • **Water Content:** 1000-1500% • **Max degree of humification:** H3-H9 • **Stability of peat in trial pits:** Slight spalling/instability below 1.5m • **Soft Clay layer at base of peat?:** No • **Subsoil conditions:** Glacial Till	H	15
Topography	• **Slope angles:** Generally 2-3°; locally 1-2° • **General slope characteristics:** Ground slopes down to south • **In broad flat or buried valley directly upslope from a watercourse?:** No	H	15
Factors of Safety (Infinite Slope) [assuming turbine constructed on flat slope at crest of ridge]	**No surcharge:** • ***cu = 2-15kPa:** 0.97 to > 1.0 **Floating Road Surcharge (23kPa):** • ***cu = 2-15kPa:** 0.87 to > 1.0 **Undrained shear strength at base of Peat*	H	15
Hydrology/ Hydrogeology	• **Surface Water:** Ponded in drains • **Drainage:** No water course within 150m; Forestry Furrows running south and north • **Seepage in trial pits:** None recorded • **Evidence of piping/subsurface flow:** No	M	10
Significant Contributory Factors	• **Slide History:** On Site • **Tension Cracks:** No. • **Piping:** No • **Vegetation:** Forestry surrounds location • **Peat Harvesting:** No	H	15
Notes: **1. Max hazard rating for each factor = 20 and ratings are assigned on the basis of interpreted significance, as follows: Negligible = 0, Low = 5, Medium = 10, High = 15, Very High = 20.** **2. Hazard Likelihood (L) prior to mitigation measures is interpreted from Total Hazard Rating as follows: 0-19: L=1 (Negligible); 20-39: L = 2 (Low); 40-59 L = 3 (Possible); 60-79: L = 4 (Very Possible); 80-100: L = 5 (Likely without appropriate mitigation measures).** **H/S = Hardstanding at turbine locations**		**Total Hazard Rating**	70
***Assumed, no information available, therefore, data conservatively assumed based on general on site experience**		**Hazard Likelihood (L)**	4

	Meenbog Wind Farm **Peat Stability Assessment Worksheet (Hazard Likelihood)** **Floating Road to T07**		
Factor	**Characteristic properties:**	**Hazard Rating**	
Peat/Subsoil Conditions	• **Peat depth:** Generally 1.0-3.4m, locally 2.5-4.7m west of H/S • **C_u (Geonor H-10) in Peat: 4**.5-13kPa • **Water Content:** 1000-1500% • **Max degree of humification:** H3-H9 • **Stability of peat in trial pits:** Partial collapse at 1.5m • **Soft Clay layer at base of peat?:** No • **Subsoil conditions:** Glacial Till	H	15
Topography	• **Slope angles:** Generally 2-3^{o} • **General slope characteristics:** On gently sloping ground, convex slope to east of road. • **In broad flat or buried valley directly upslope from a watercourse?:** No	H	15
Factors of Safety (Infinite Slope) [assuming turbine constructed on flat slope at crest of ridge]	**No surcharge:** • ***cu = 4.5-13kPa:** Generally > 1.0 **Floating Road Surcharge (23kPa):** • ***cu = 4.5-13kPa:** Generally > 1.0 **Undrained shear strength at base of Peat*	M	10
Hydrology/ Hydrogeology	• **Surface Water:** Potentially ponded water in localised areas to west of road • **Drainage: W**ater course to east; Forestry Furrows running east • **Seepage in trial pits:** Not known • **Evidence of piping/subsurface flow:** No	M	10
Significant Contributory Factors	• **Slide History: A**djacent to slide • **Tension Cracks:** No. • **Piping:** No • **Vegetation:** Forestry north, south & east; large unplanted area to west • **Peat Harvesting:** No	VH	20
Notes: **1. Max hazard rating for each factor = 20 and ratings are assigned on the basis of interpreted significance, as follows: Negligible = 0, Low = 5, Medium = 10, High = 15, Very High = 20.** **2. Hazard Likelihood (L) prior to mitigation measures is interpreted from Total Hazard Rating as follows: 0-19: L=1 (Negligible); 20-39: L = 2 (Low); 40-59 L = 3 (Possible); 60-79: L = 4 (Very Possible); 80-100: L = 5 (Likely without appropriate mitigation measures).** **H/S = Hardstanding at turbine locations**		**Total Hazard Rating**	70
***Assumed, no information available, therefore, data conservatively assumed based on general on site experience**		**Hazard Likelihood (L)**	4

	Meenbog Wind Farm Peat Stability Assessment Worksheet (Hazard Likelihood) Upgraded Floating Road to T18		
Factor	**Characteristic properties:**	**Hazard Rating**	
Peat/Subsoil Conditions	• **Peat depth:** Generally 0.5-2.6m • **C_u (Geonor H-10) in Peat: 4**-21Pa • **Water Content:** 1000-1500%* • **Max degree of humification:** H3-H4 • **Stability of peat in trial pits:** Stable • **Soft Clay layer at base of peat?:** No • **Subsoil conditions:** Glacial Till	M	10
Topography	• **Slope angles:** Generally 2-5° • **General slope characteristics:** On gently sloping ground, ground slopes to southeast. Sidelong ground along the majority of the road. • **In broad flat or buried valley directly upslope from a watercourse?:** Yes	H	15
Factors of Safety (Infinite Slope) [assuming turbine constructed on flat slope at crest of ridge]	**No surcharge:** • ***cu = 4-21kPa:** > 1.0 **Surcharge (10kPa):** • ***cu = 4-21kPa:** > 1.0 **Undrained shear strength at base of Peat*	M	10
Hydrology/ Hydrogeology	• **Surface Water:** Flowing in drains • **Drainage:** Water course southeast of road; Forestry Furrows running east • **Seepage in trial pits:** Not known • **Evidence of piping/subsurface flow:** No	H	15
Significant Contributory Factors	• **Slide History:** On site • **Tension Cracks:** No. • **Piping:** No • **Vegetation:** Forestry surrounding area • **Peat Harvesting:** No	H	15
Notes: **1. Max hazard rating for each factor = 20 and ratings are assigned on the basis of interpreted significance, as follows: Negligible = 0, Low = 5, Medium = 10, High = 15, Very High = 20.** **2. Hazard Likelihood (L) prior to mitigation measures is interpreted from Total Hazard Rating as follows: 0-19: L=1 (Negligible); 20-39: L = 2 (Low); 40-59 L = 3 (Possible); 60-79: L = 4 (Very Possible); 80-100: L = 5 (Likely without appropriate mitigation measures).** **H/S = Hardstanding at turbine locations**		**Total Hazard Rating**	65
***Assumed, no information available, therefore, data conservatively assumed based on general on site experience**		**Hazard Likelihood (L)**	3

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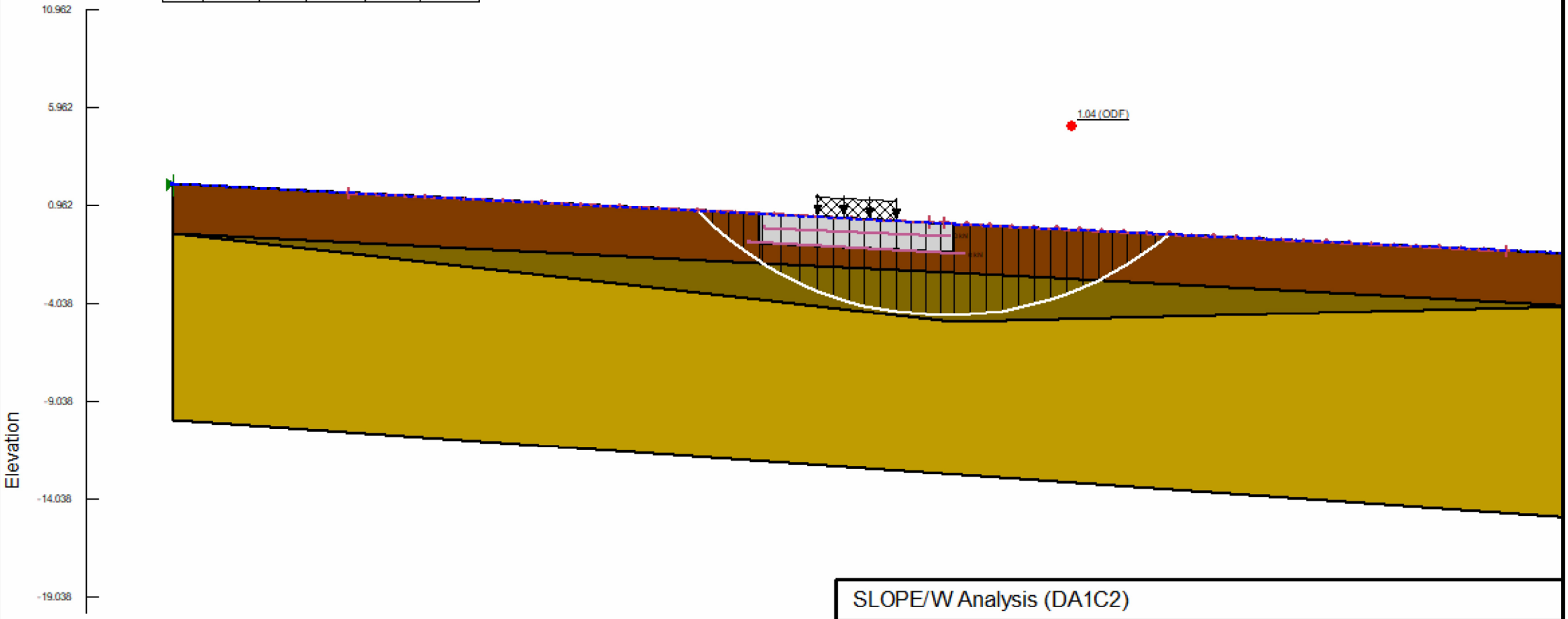
DESIGNING AND DELIVERING
A SUSTAINABLE FUTURE

APPENDIX E

Floating roads, Sidecast Areas and Retaining Berm Stability Checks (SlopeW outputs)

SlopeW Outputs – Floating Roads (Baseline)

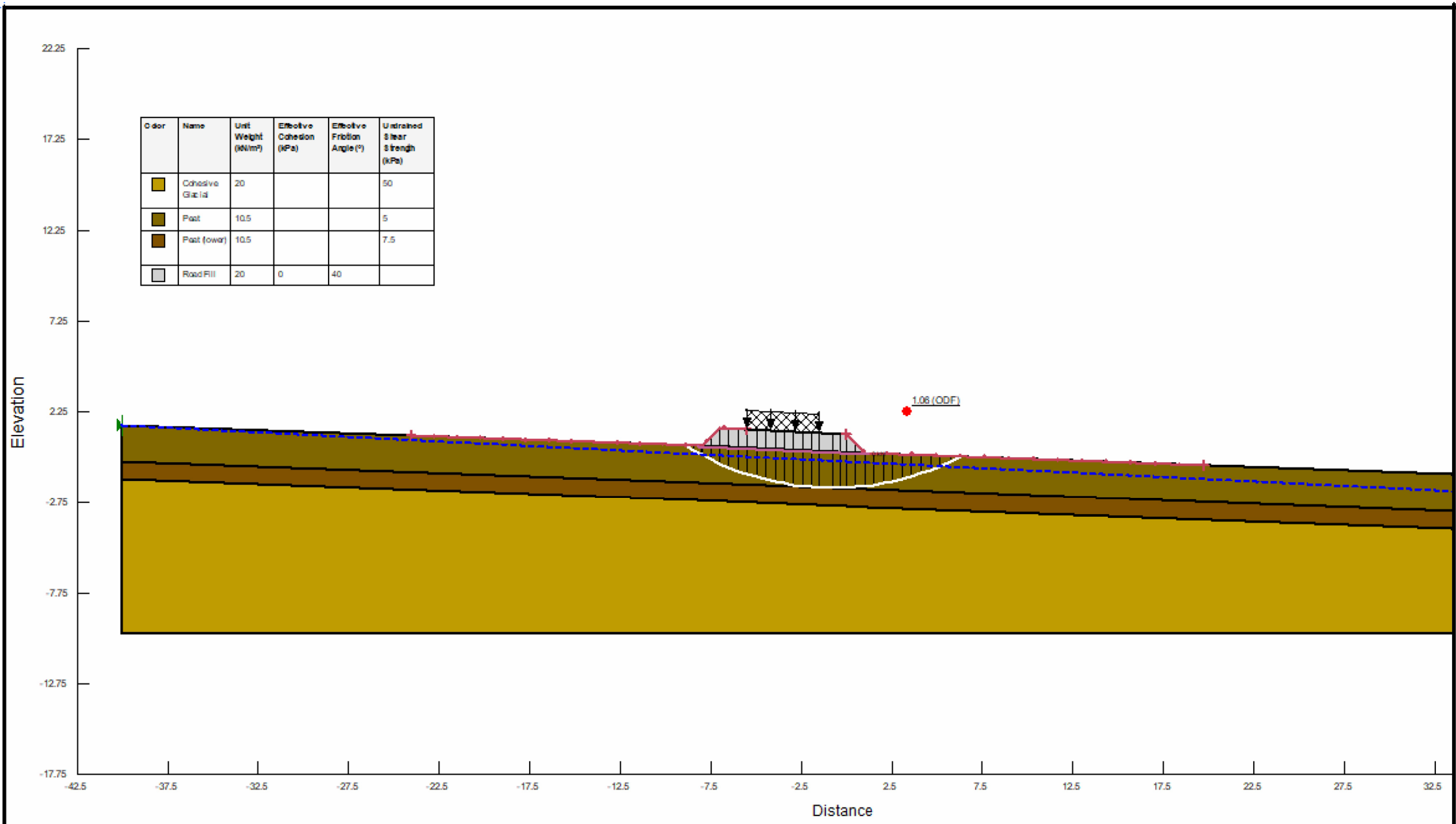
Color	Name	Unit Weight (kN/m³)	Effective Cohesion (kPa)	Effective Friction Angle (°)	Undrained Shear Strength (kPa)
	Cohesive Glacial	20			40
	Peat	10.5			4
	Peat (owar)	10.5			6
	RoadFill	20	0	38	



SLOPE/W Analysis (DA1C2)

T01_T04 Junction floating road (UD)(Existing Development).gsz

28/04/2026 1:300



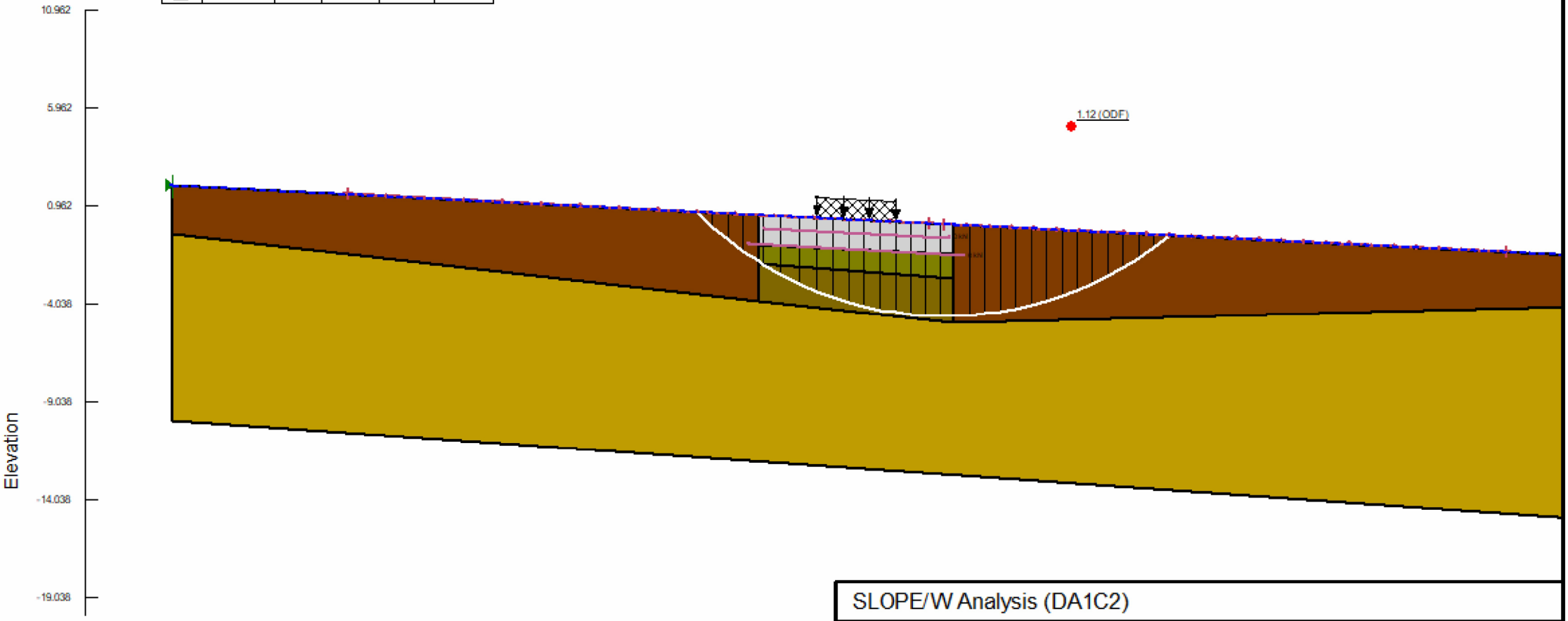
SLOPE/W Analysis (DA1C2)

floating road T04 (ud) (Exisiting Development).gsz

28/04/2026 1:300

SlopeW Outputs – Floating Roads (Current Condition 2026)

Color	Name	Unit Weight (kN/m³)	Effective Cohesion (kPa)	Effective Friction Angle (°)	Undrained Shear Strength (kPa)
	Cohesive Glacial	20			40
	Peat	10.5			4
	Peat (below road lower)	10.5			8.5
	Peat (below road upper)	10.5			6.5
	RoadFill	20	0	38	



SLOPE/W Analysis (DA1C2)

T01_T04 Junction floating road (UD).gsz

28/04/2026 1:300

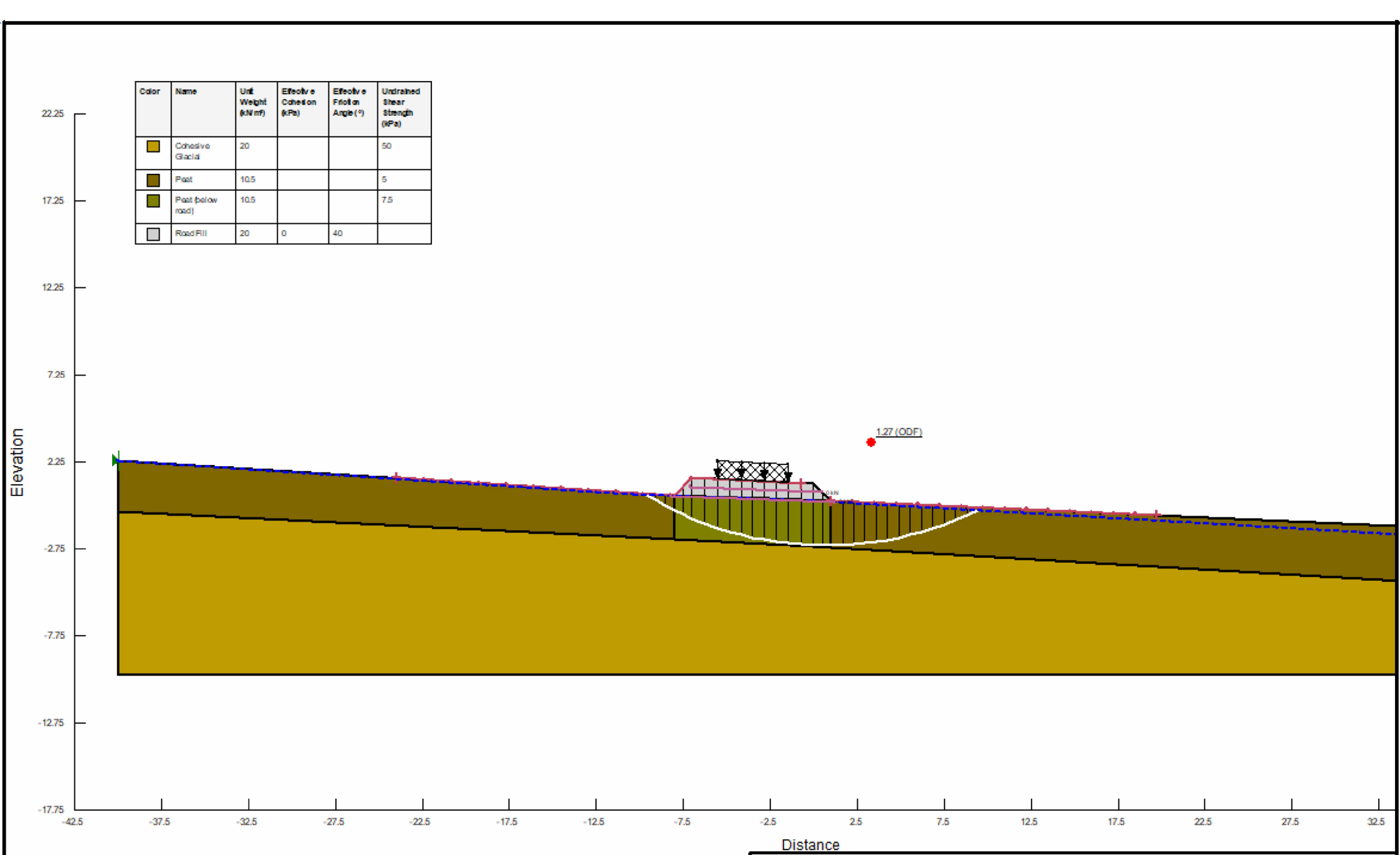
Color	Name	Unit Weight (kN/m³)	Effective Cohesion (kPa)	Effective Friction Angle (°)	Undrained Shear Strength (kPa)
	Cohesive Glacial	20			50
	Peat	10.5			5
	Peat (below road)	10.5			7.5
	RoadFill	20	0	40	

SLOPE/W Analysis (DA1C2)

floating road to T01 (UD).gsz

28/04/2026 1:300

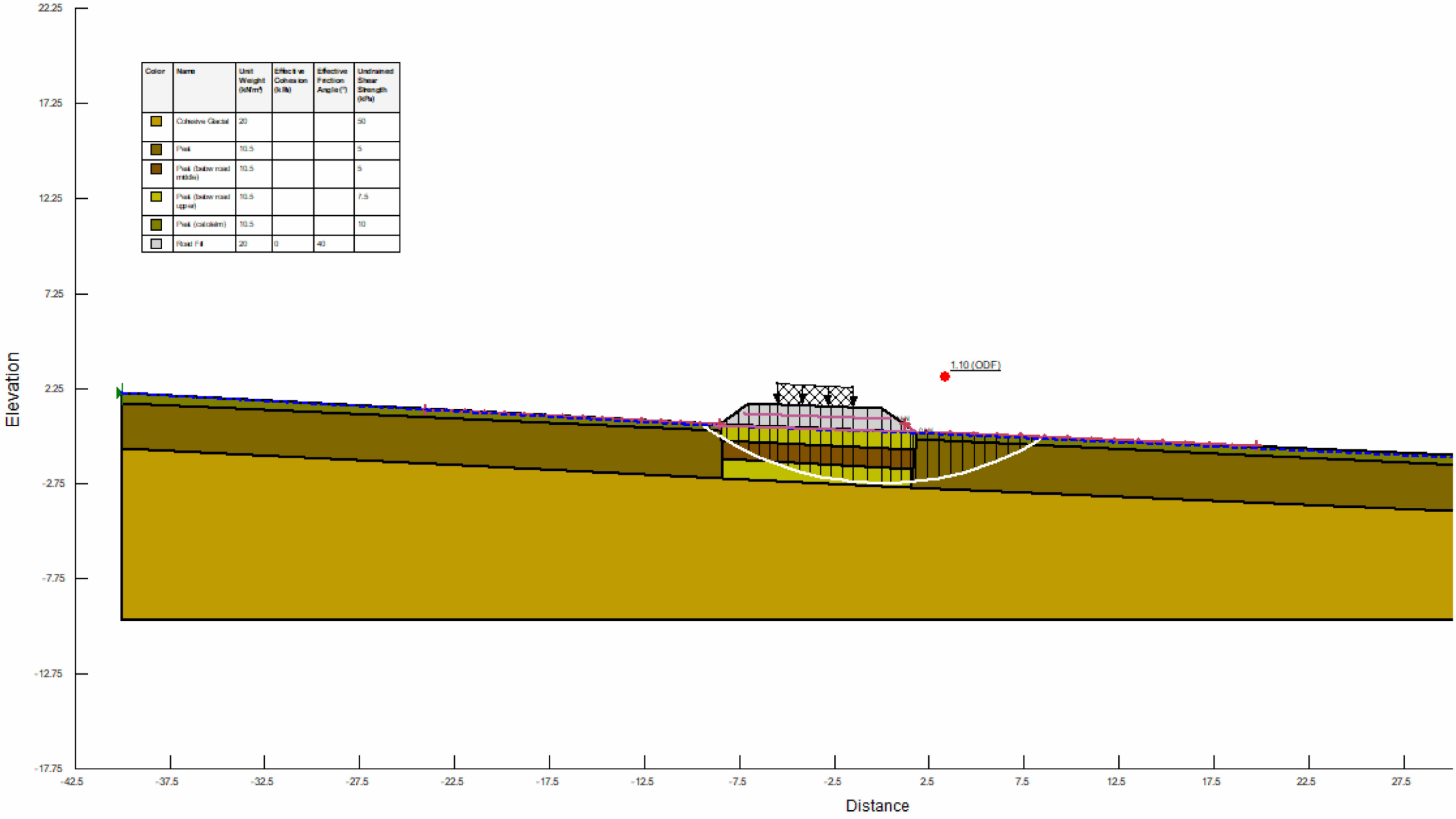
Color	Name	Unit Weight (kN/m³)	Effective Cohesion (kPa)	Effective Friction Angle (°)	Undrained Shear Strength (kPa)
	Cohesive Glacial	20			50
	Peat	10.5			5
	Peat (below road)	10.5			7.5
	Road Fill	20	0	40	



SLOPE/W Analysis (DA1C2)

floating road T02 (ud).gsz

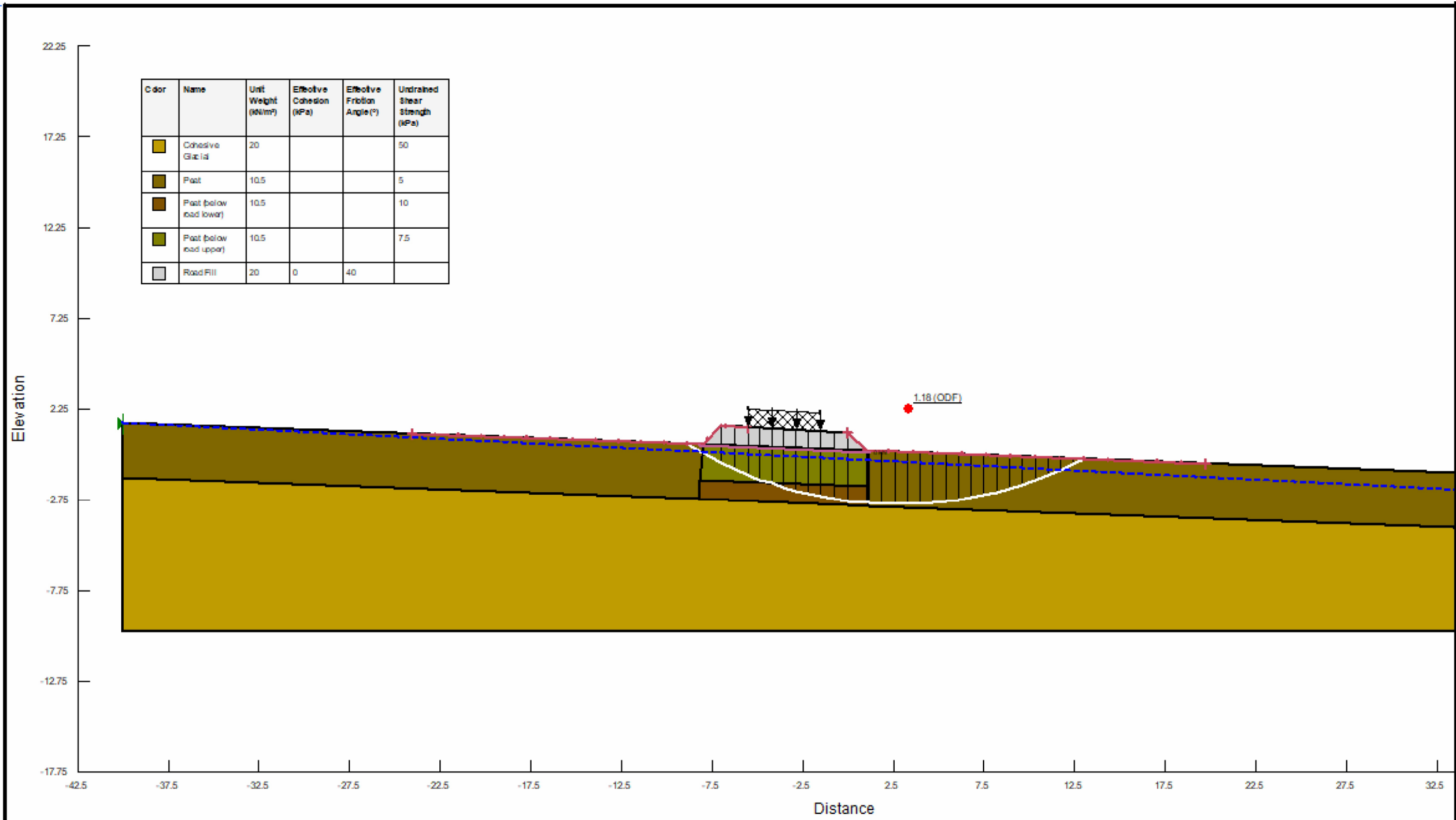
28/04/2026 1:300



SLOPE/W Analysis (DA1C2)

floating road to T03 (UD).gsz

28/04/2026 1:300

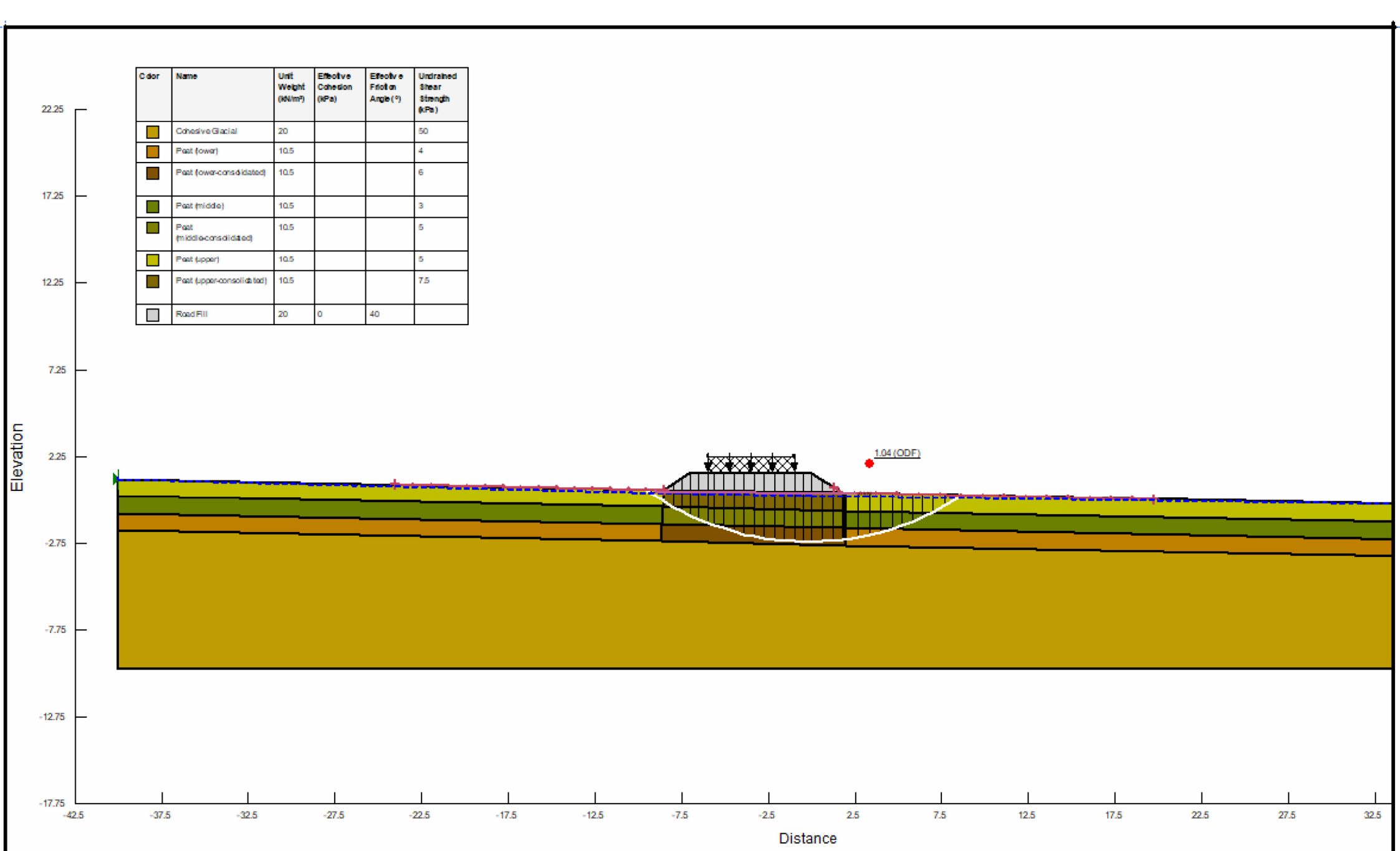


SLOPE/W Analysis (DA1C2)

floating road T04 (ud).gsz

28/04/2026 1:300

Color	Name	Unit Weight (kN/m³)	Effective Cohesion (kPa)	Effective Friction Angle (°)	Undrained Shear Strength (kPa)
	Cohesive Glacial	20			50
	Peat (lower)	10.5			4
	Peat (lower-consolidated)	10.5			6
	Peat (middle)	10.5			3
	Peat (middle-consolidated)	10.5			5
	Peat (upper)	10.5			5
	Peat (upper-consolidated)	10.5			7.5
	Road Fill	20	0	40	



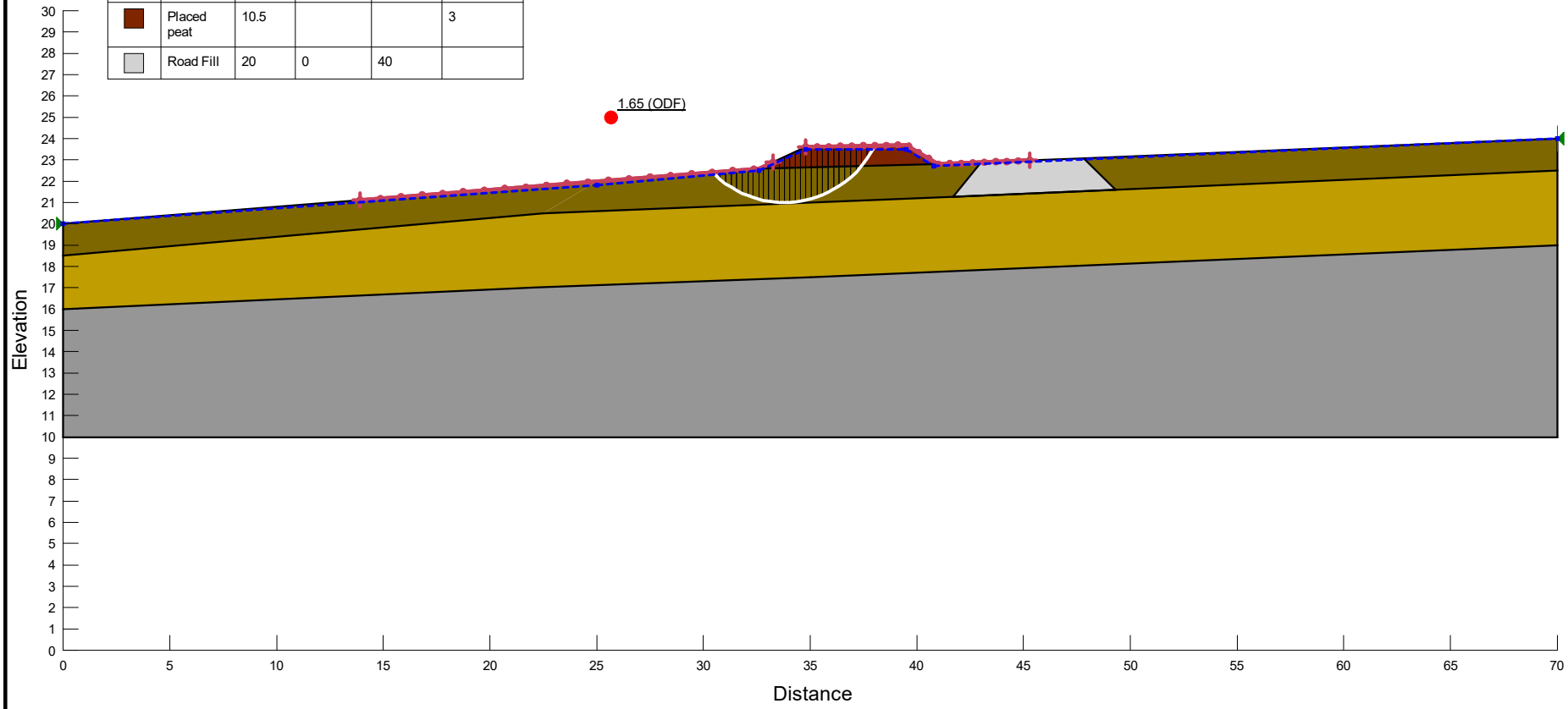
SLOPE/W Analysis (DA1C2)

floating road to T07 (UD).gsz

28/04/2026 1:300

SlopeW Outputs – Peat sidecast areas

Color	Name	Unit Weight (kN/m³)	Effective Cohesion (kPa)	Effective Friction Angle (°)	Undrained Shear Strength (kPa)
	Bedrock				
	Cohesive Glacial	20			50
	Peat	10.5			5
	Placed peat	10.5			3
	Road Fill	20	0	40	

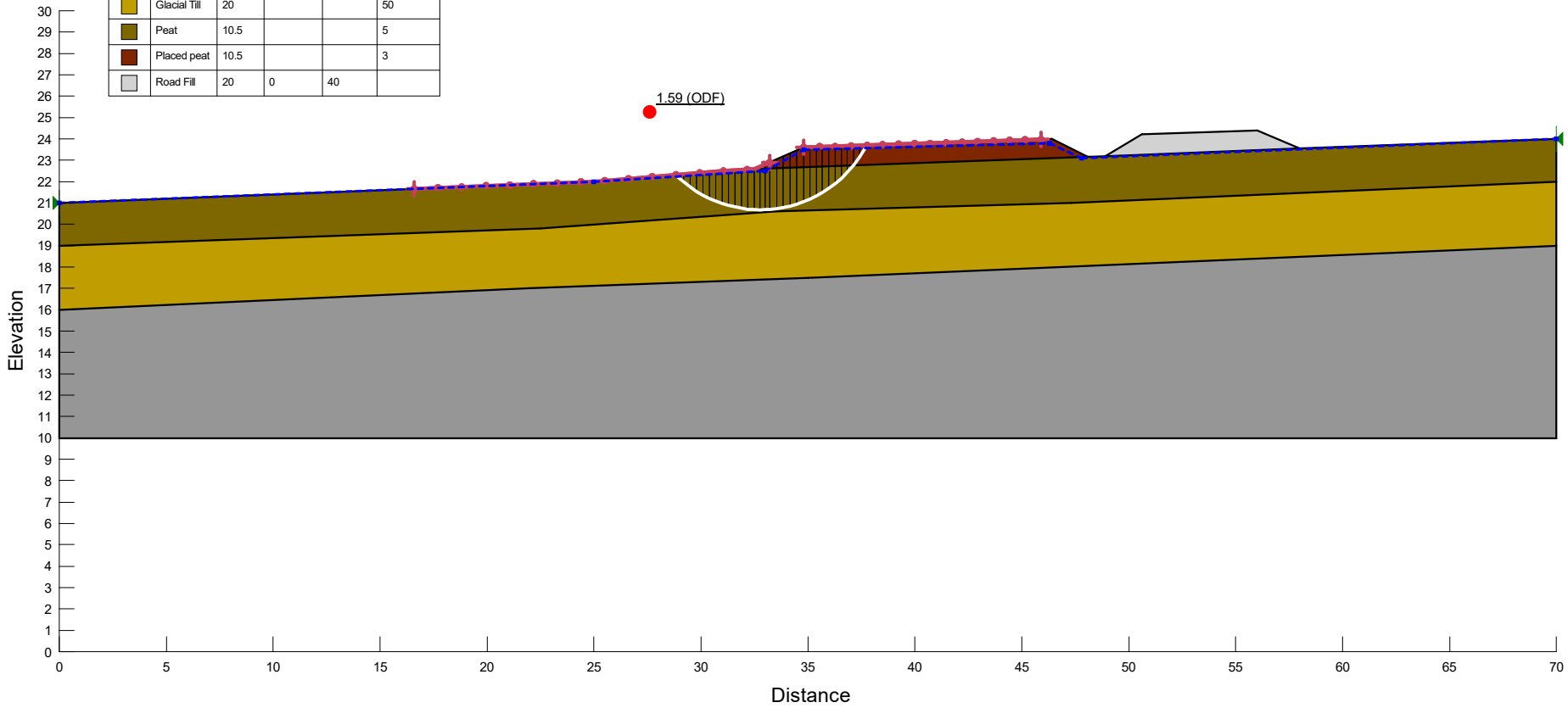


DA1C2 (peat)

sidecasting main spine road (UD).gsz

24/03/2026 1:300

Color	Name	Unit Weight (kN/m³)	Effective Cohesion (kPa)	Effective Friction Angle (°)	Undrained Shear Strength (kPa)
	Bedrock				
	Glacial Till	20			50
	Peat	10.5			5
	Placed peat	10.5			3
	Road Fill	20	0	40	

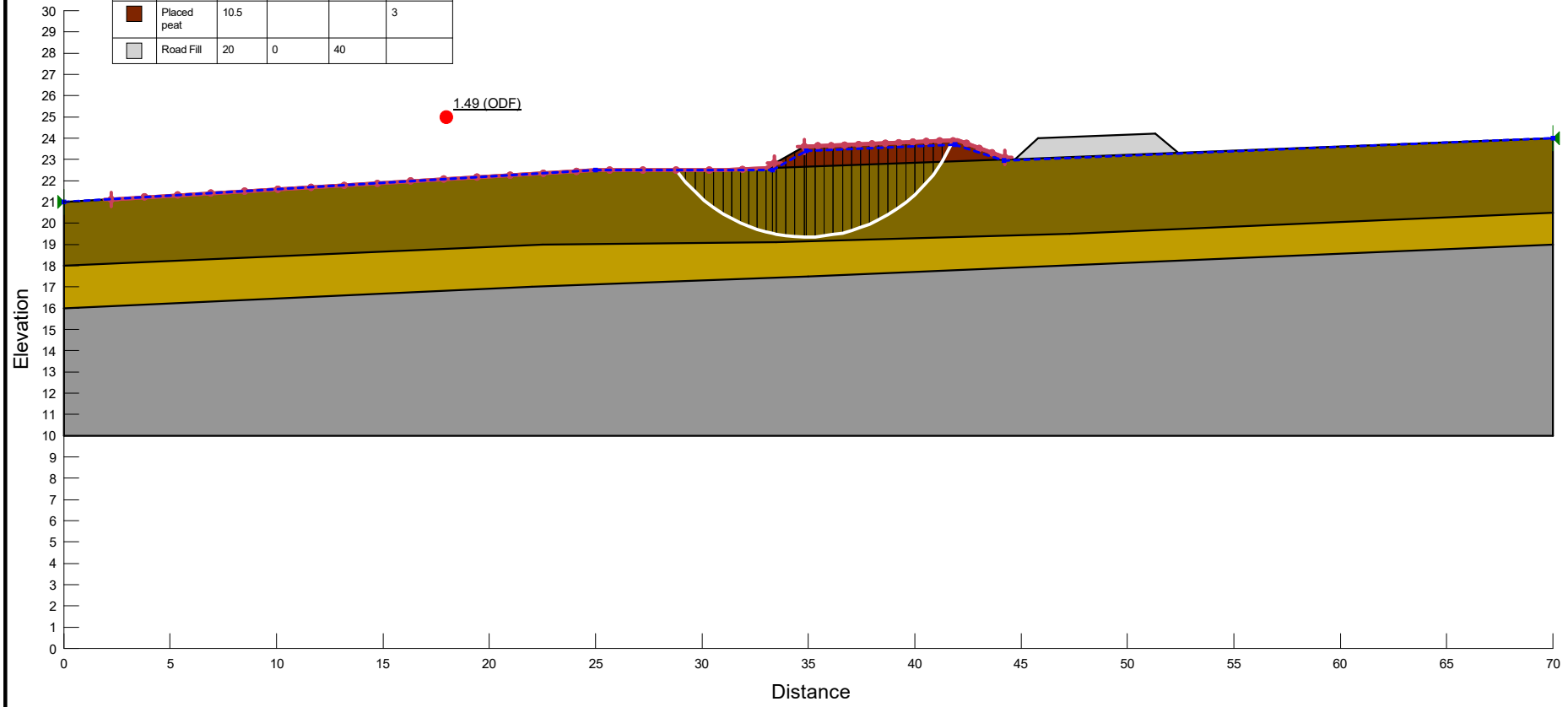


DA1C2 (peat)

sidecasting T01 (UD).gsz

24/03/2026 1:300

Color	Name	Unit Weight (kN/m³)	Effective Cohesion (kPa)	Effective Friction Angle (°)	Undrained Shear Strength (kPa)
	Bedrock				
	Cohesive Glacial	20			50
	Peat	10.5			5
	Placed peat	10.5			3
	Road Fill	20	0	40	

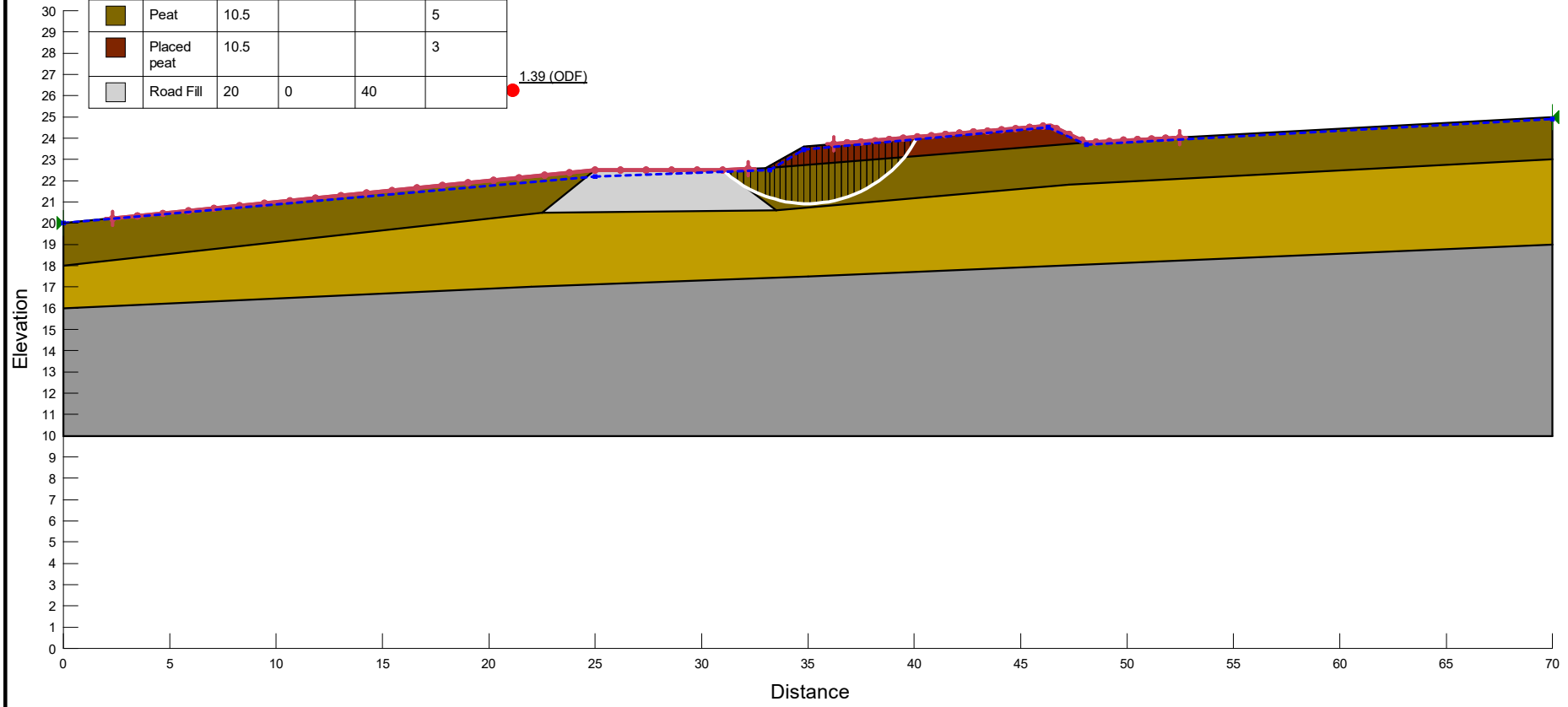


DA1C2 (peat)

sidecasting T03 (UD).gsz

24/03/2026 1:300

Color	Name	Unit Weight (kN/m³)	Effective Cohesion (kPa)	Effective Friction Angle (°)	Undrained Shear Strength (kPa)
	Bedrock				
	Cohesive Glacial	20			50
	Peat	10.5			5
	Placed peat	10.5			3
	Road Fill	20	0	40	

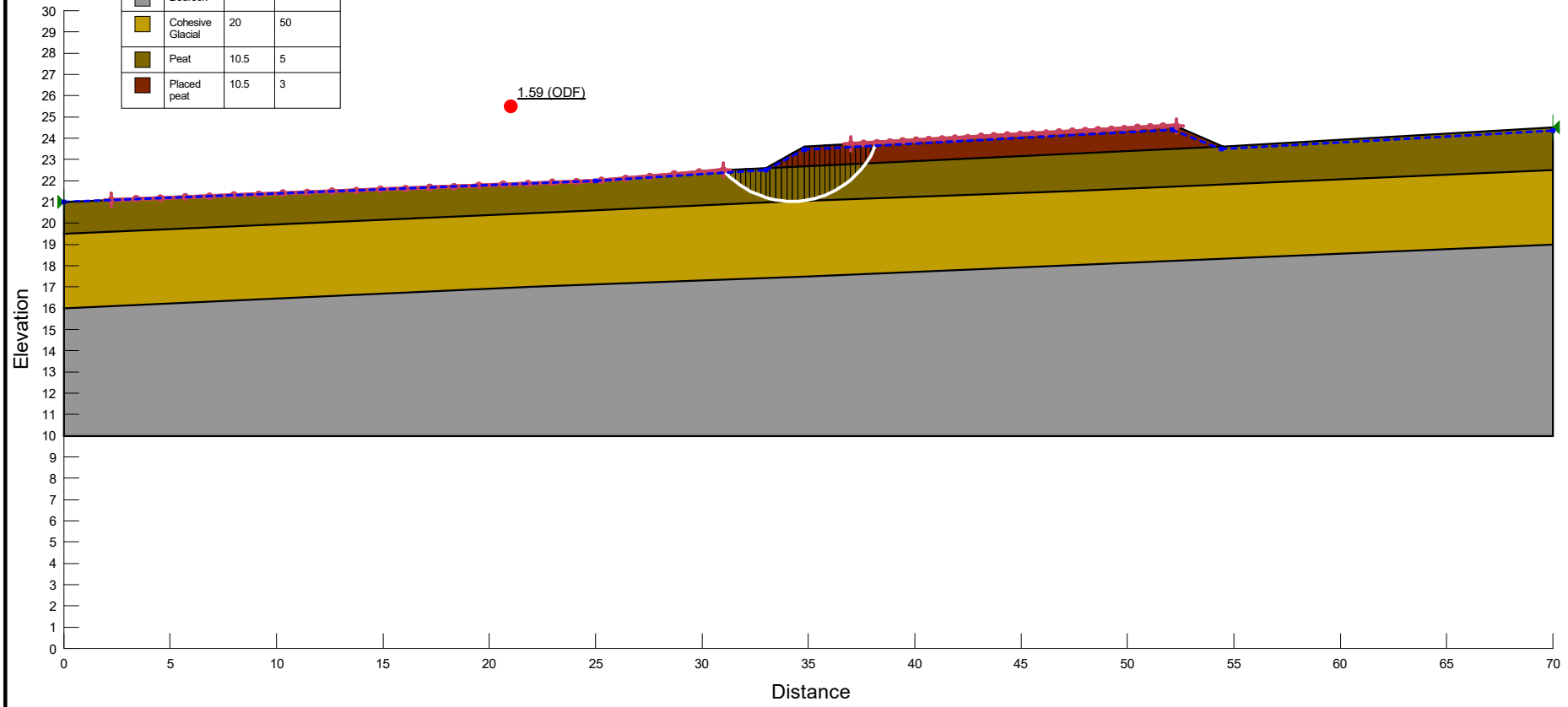


DA1C2 (peat)

sidecasting T06 (UD).gsz

24/03/2026 1:300

Color	Name	Unit Weight (kN/m³)	Undrained Shear Strength (kPa)
	Bedrock		
	Cohesive Glacial	20	50
	Peat	10.5	5
	Placed peat	10.5	3

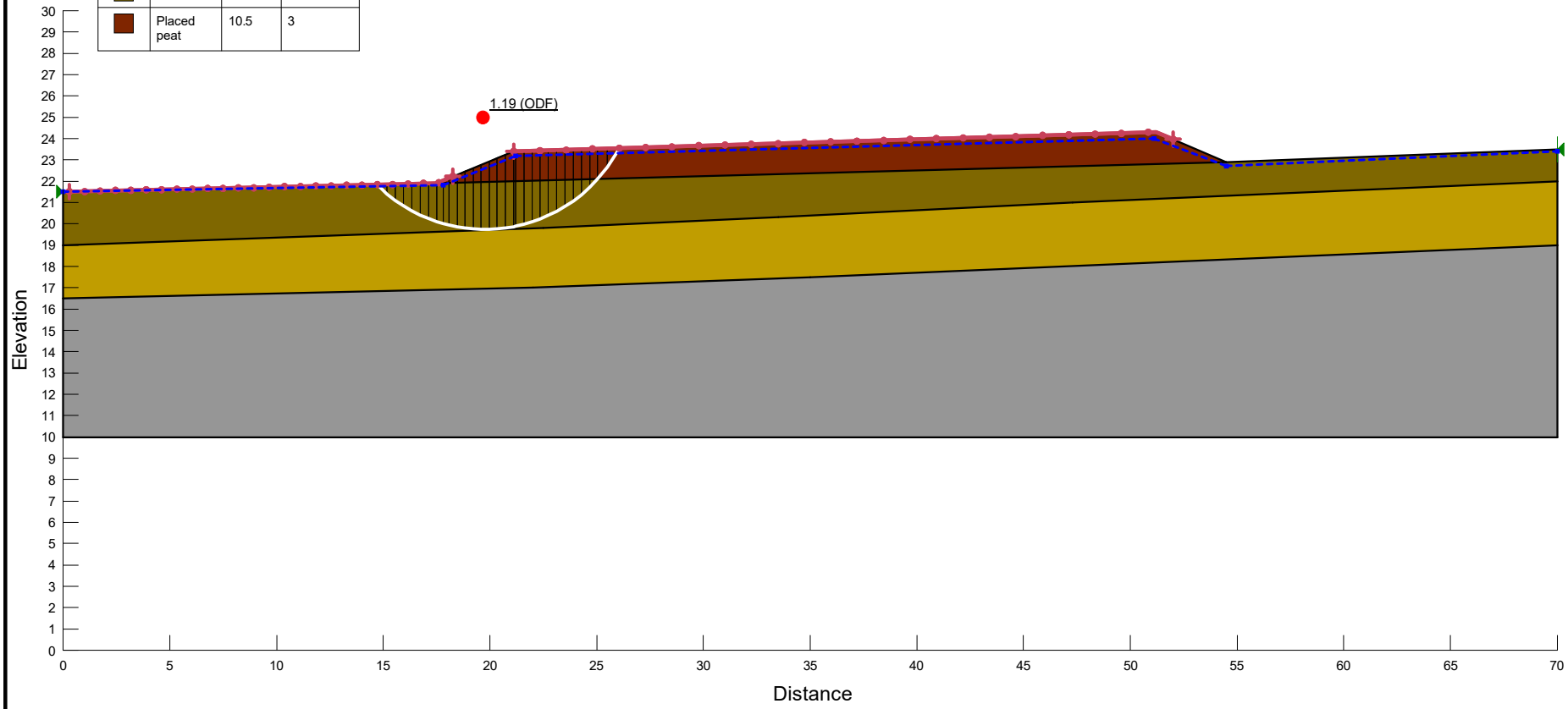


DA1C2 (peat)

sidecasting T09 (UD).gsz

24/03/2026 1:300

Color	Name	Unit Weight (kN/m³)	Undrained Shear Strength (kPa)
	Bedrock		
	Cohesive Glacial	20	50
	Peat	10.5	5
	Placed peat	10.5	3

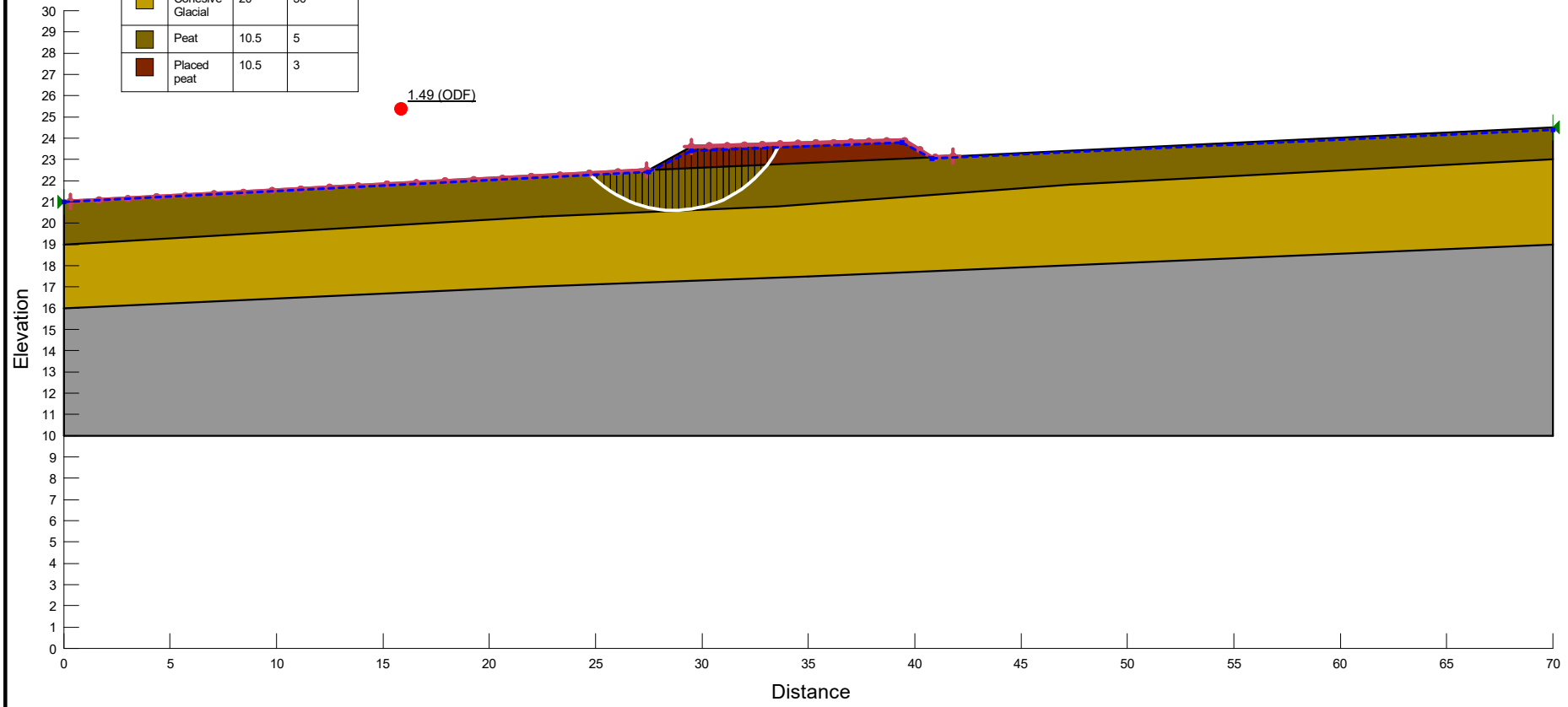


DA1C2 (peat)

sidecasting T10 (UD).gsz

24/03/2026 1:300

Color	Name	Unit Weight (kN/m³)	Undrained Shear Strength (kPa)
	Bedrock		
	Cohesive Glacial	20	50
	Peat	10.5	5
	Placed peat	10.5	3

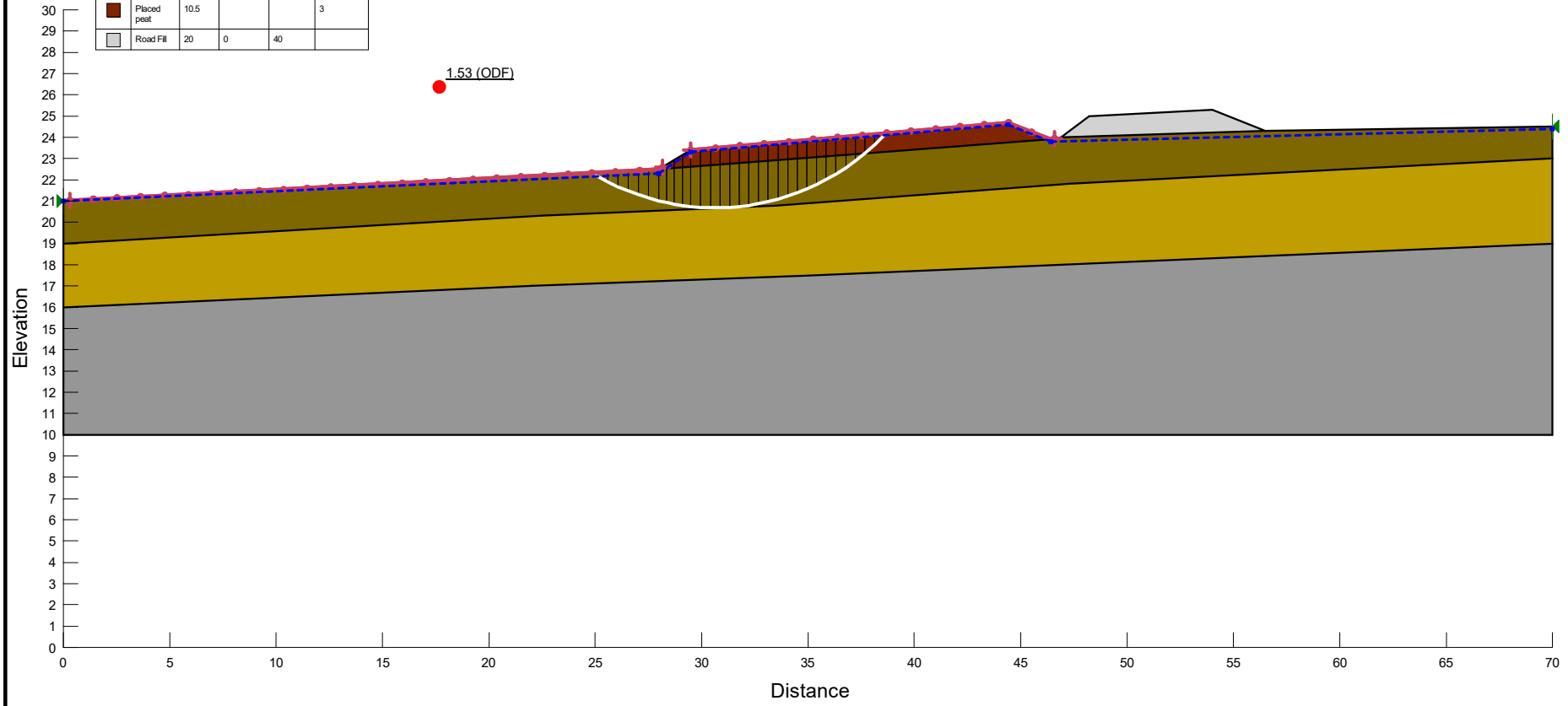


DA1C2 (peat)

sidecasting T11 (UD).gsz

24/03/2026 1:300

Color	Name	Unit Weight (kN/m³)	Effective Cohesion (kPa)	Effective Friction Angle (°)	Undrained Shear Strength (kPa)
	Bedrock				
	Cohesive Glacial	20			50
	Peat	10.5			5
	Placed peat	10.5			3
	Road Fill	20	0	40	

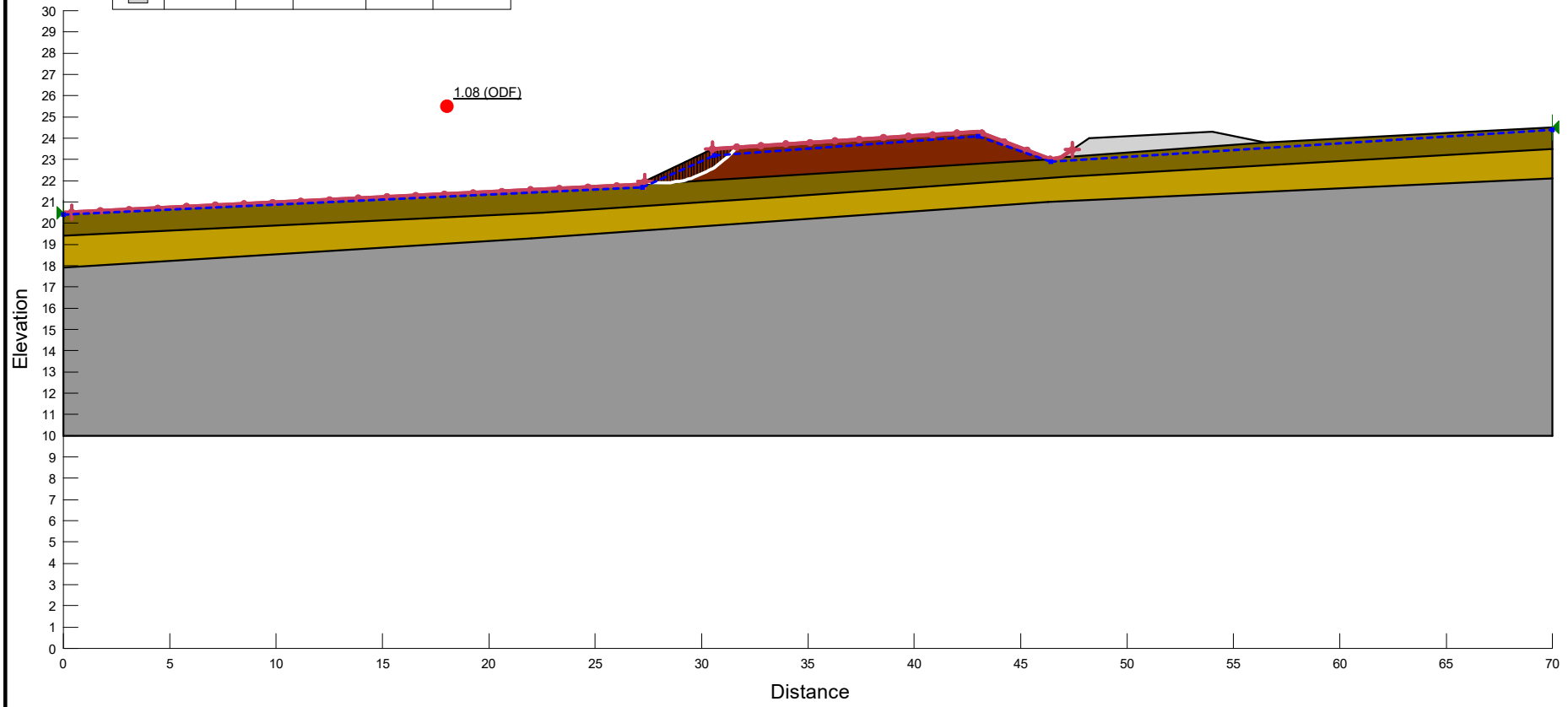


DA1C2 (peat)

sidecasting T12 (UD).gsz

24/03/2026 1:300

Color	Name	Unit Weight (kN/m³)	Effective Cohesion (kPa)	Effective Friction Angle (°)	Undrained Shear Strength (kPa)
	Bedrock				
	Cohesive Glacial	20			50
	Peat	10.5			5
	Placed peat	10.5			3
	Road Fill	20	0	40	

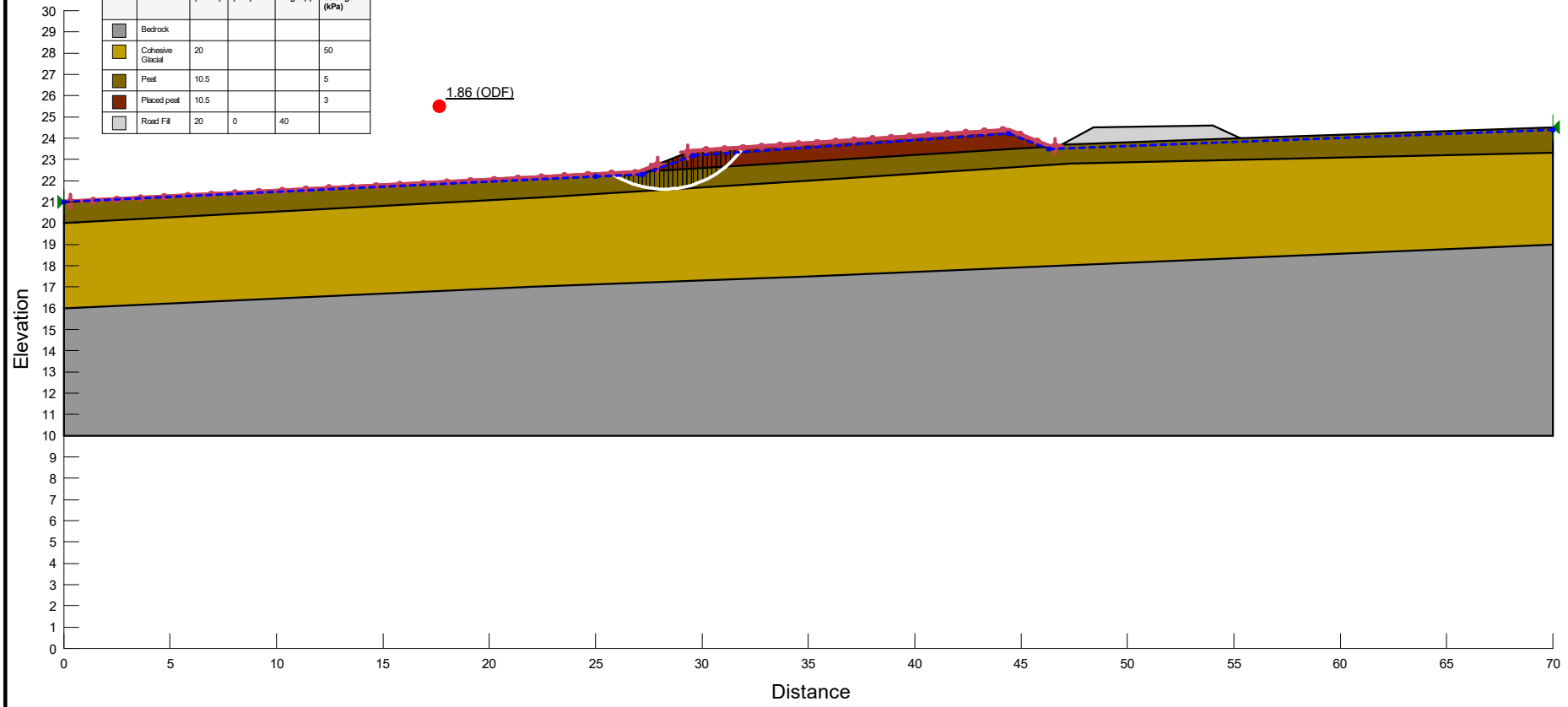


DA1C2 (peat)

sidecasting T13 (UD).gsz

24/03/2026 1:300

Color	Name	Unit Weight (kN/m³)	Effective Cohesion (kPa)	Effective Friction Angle (°)	Undrained Shear Strength (kPa)
	Bedrock				
	Cohesive Glacial	20			50
	Peat	10.5			5
	Placed peat	10.5			3
	Road Fill	20	0	40	

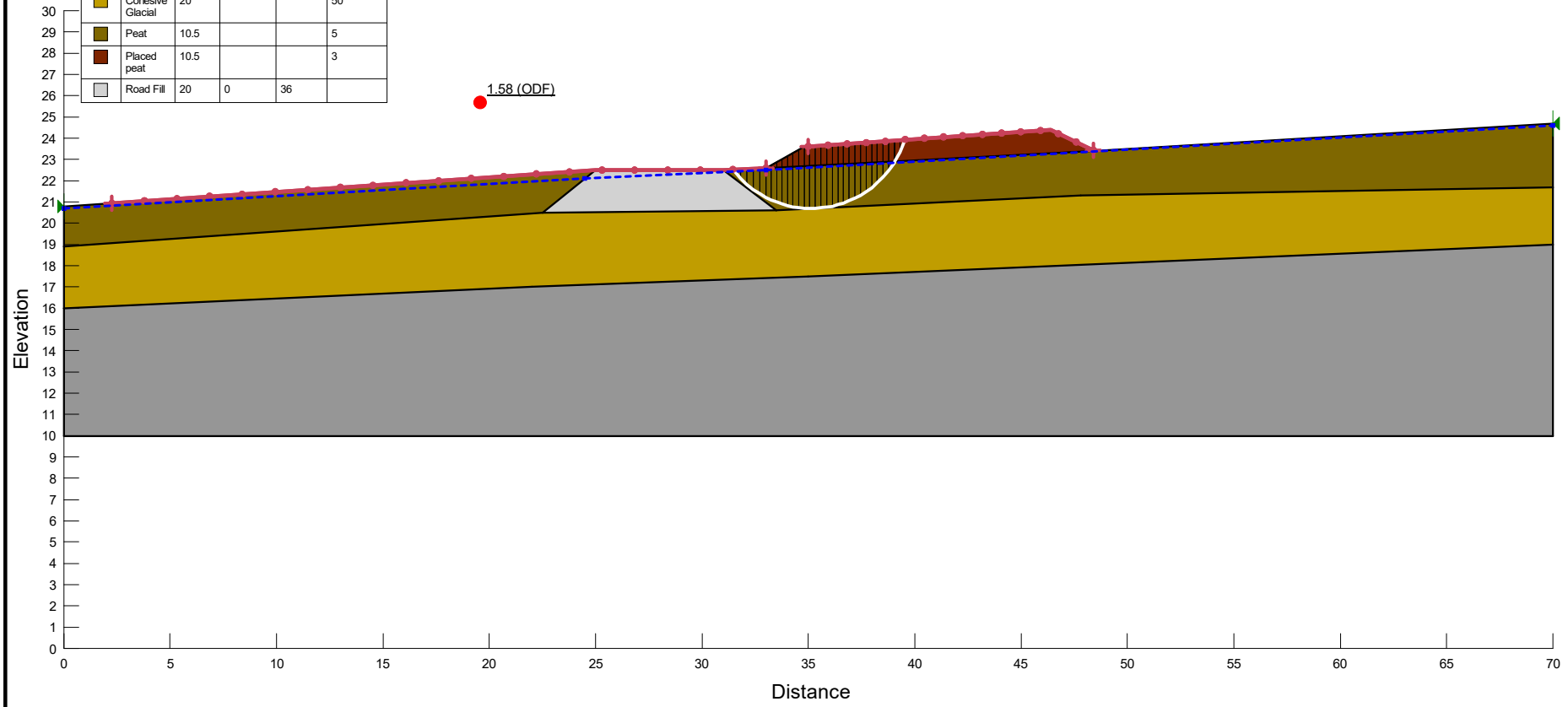


DA1C2 (peat)

sidecasting T14 (UD).gsz

24/03/2026 1:300

Color	Name	Unit Weight (kN/m³)	Effective Cohesion (kPa)	Effective Friction Angle (°)	Undrained Shear Strength (kPa)
	Bedrock				
	Cohesive Glacial	20			50
	Peat	10.5			5
	Placed peat	10.5			3
	Road Fill	20	0	36	

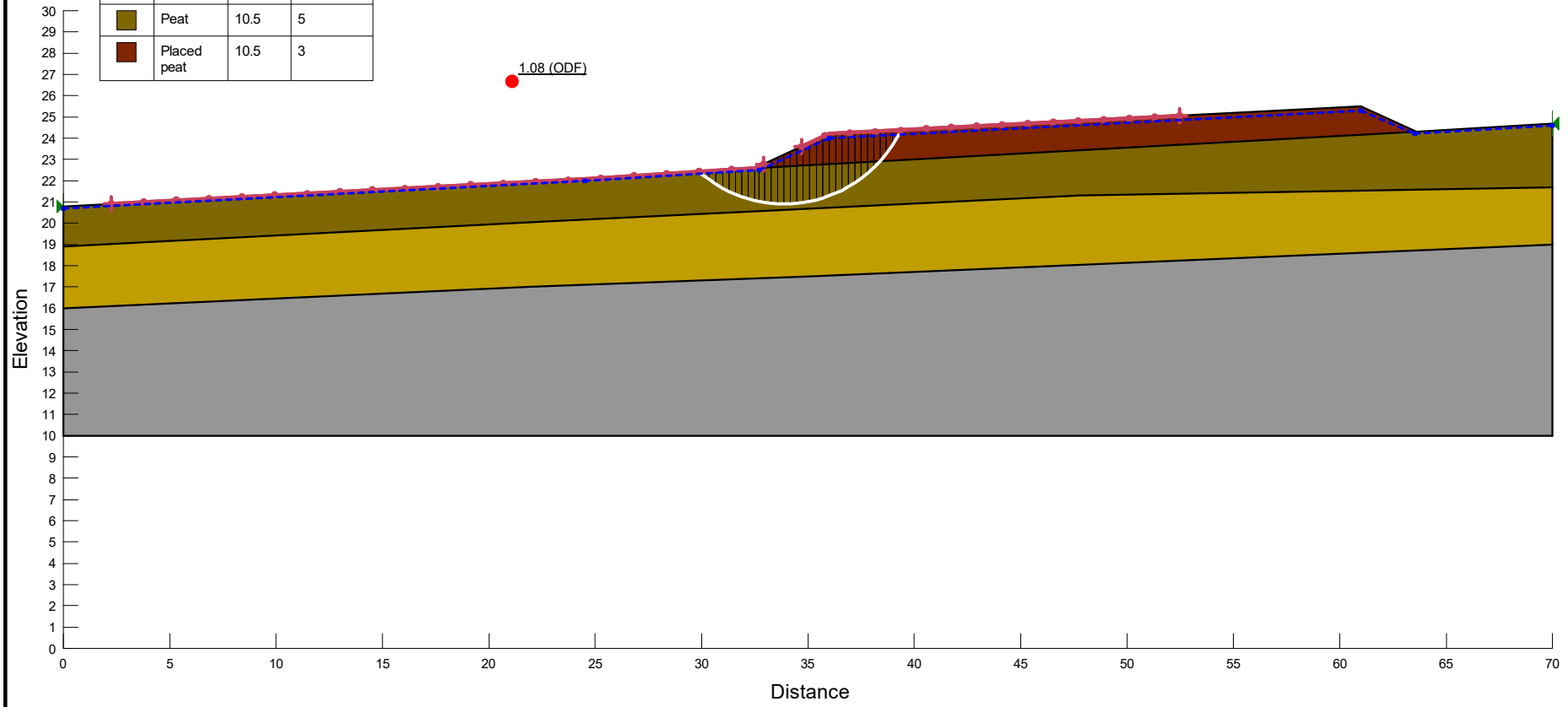


DA1C2 (peat)

sidecasting T16 (UD).gsz

24/03/2026 1:300

Color	Name	Unit Weight (kN/m³)	Undrained Shear Strength (kPa)
	Bedrock		
	Cohesive Glacial	20	50
	Peat	10.5	5
	Placed peat	10.5	3

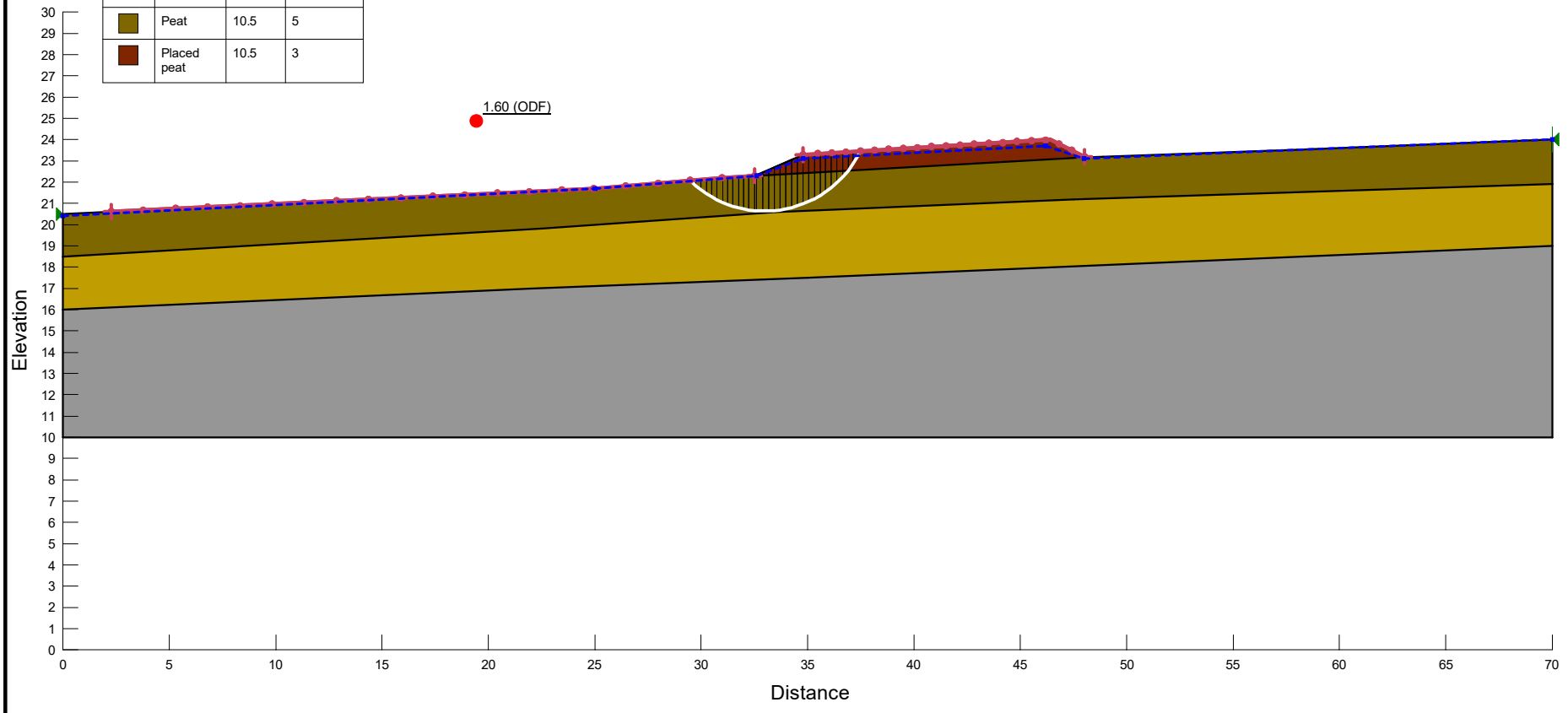


DA1C2 (peat)

sidecasting T17 (UD).gsz

24/03/2026 1:300

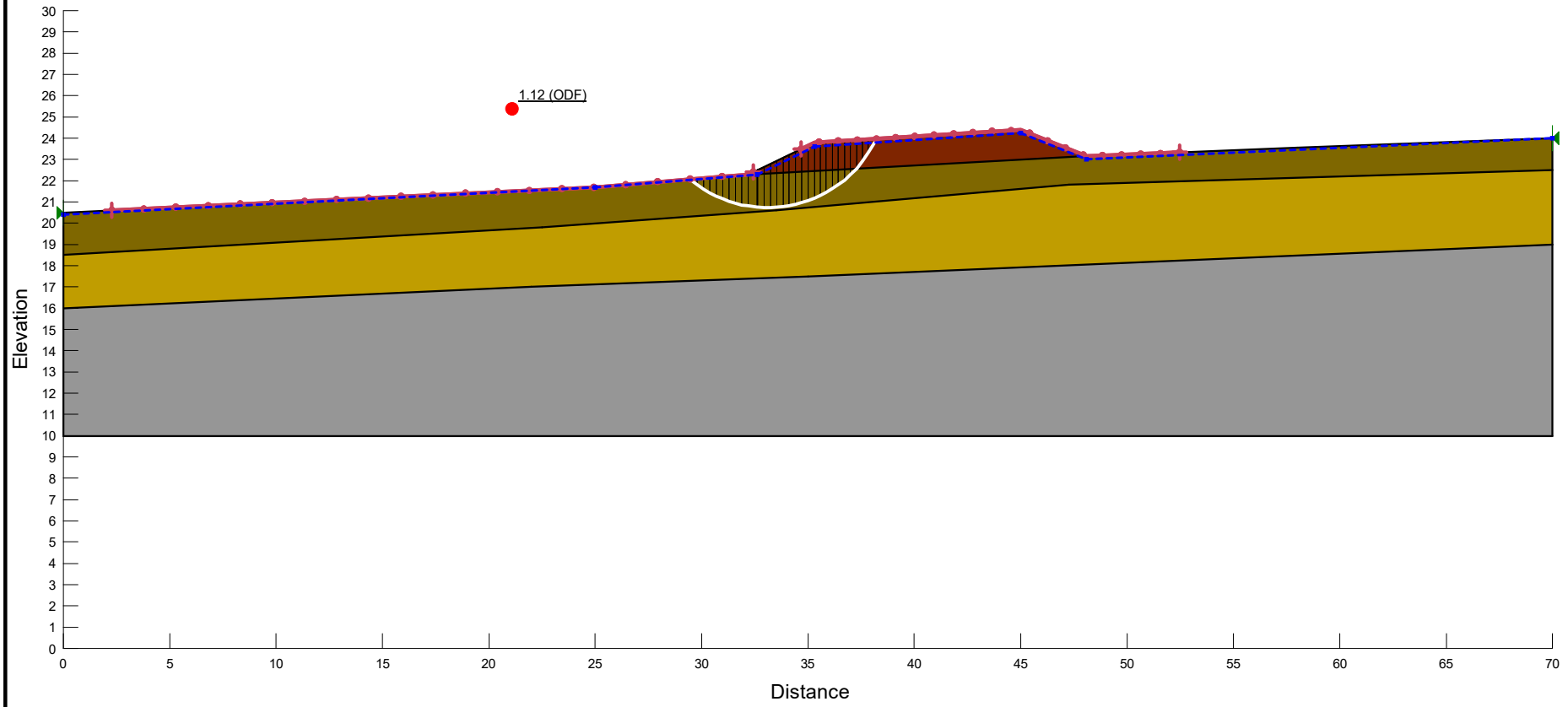
Color	Name	Unit Weight (kN/m³)	Undrained Shear Strength (kPa)
	Bedrock		
	Cohesive Glacial	20	50
	Peat	10.5	5
	Placed peat	10.5	3



DA1C2 (peat)

sidecasting T18 (UD).gsz

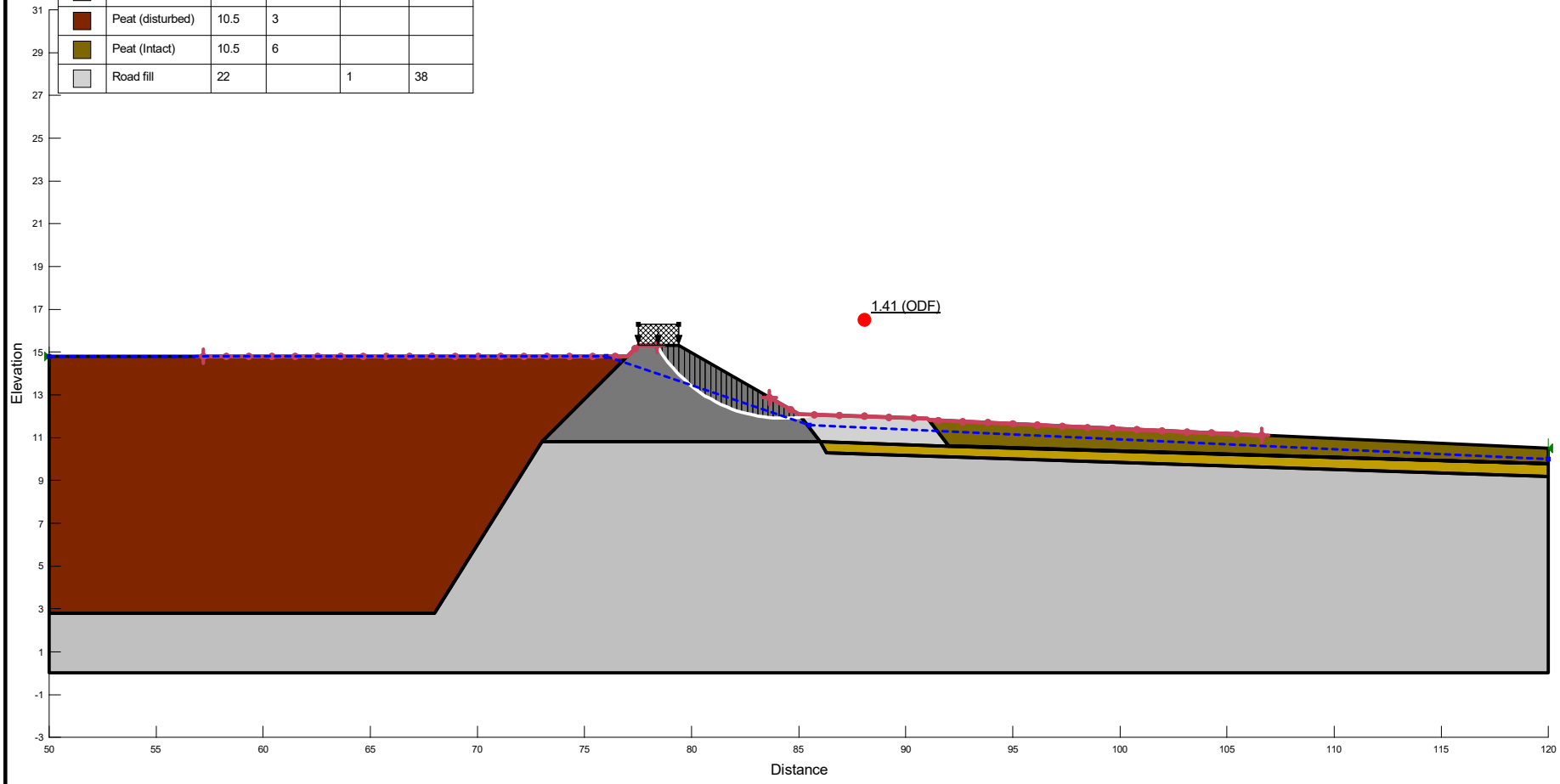
24/03/2026 1:300



DA1C2 (peat)
sidecasting T19 (UD).gsz
24/03/2026 1:300

SlopeW Outputs – Borrow Pits, Peat Cells and Stone berms

Color	Name	Unit Weight (kN/m³)	Undrained Shear Strength (kPa)	Effective Cohesion (kPa)	Effective Friction Angle (°)
	Bedrock	22		2	45
	Cohesive Glacial	20	50		
	Granular Berm	22		1	40
	Peat (disturbed)	10.5	3		
	Peat (Intact)	10.5	6		
	Road fill	22		1	38

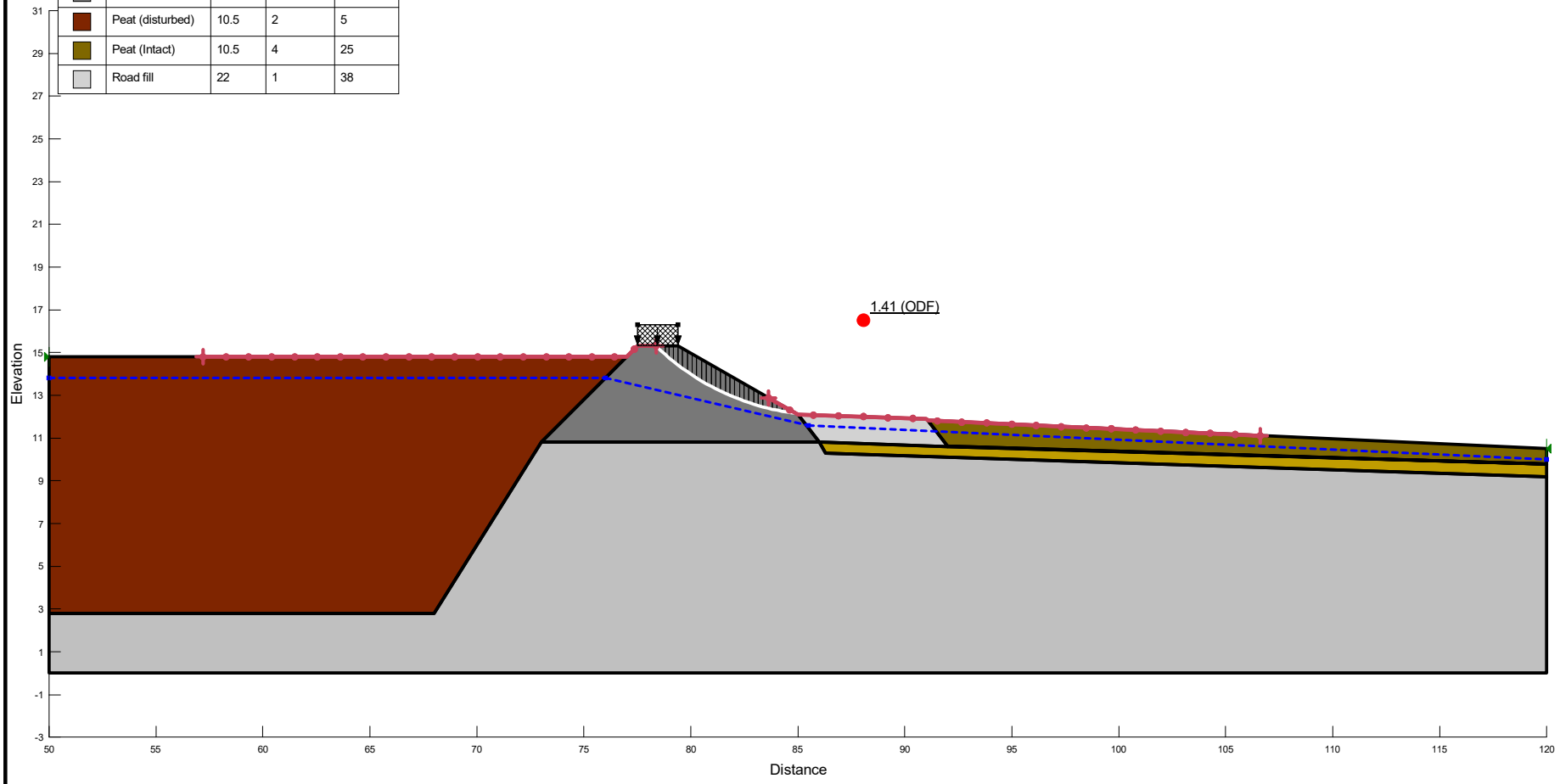


Slope Stability (DA1C2)

Borrow Pit 1 (undrained).gsz

24/03/2026 1:300

Color	Name	Unit Weight (kN/m³)	Effective Cohesion (kPa)	Effective Friction Angle (°)
	Bedrock	22	2	45
	Cohesive Glacial	20	1	32
	Granular Berm	22	1	40
	Peat (disturbed)	10.5	2	5
	Peat (Intact)	10.5	4	25
	Road fill	22	1	38

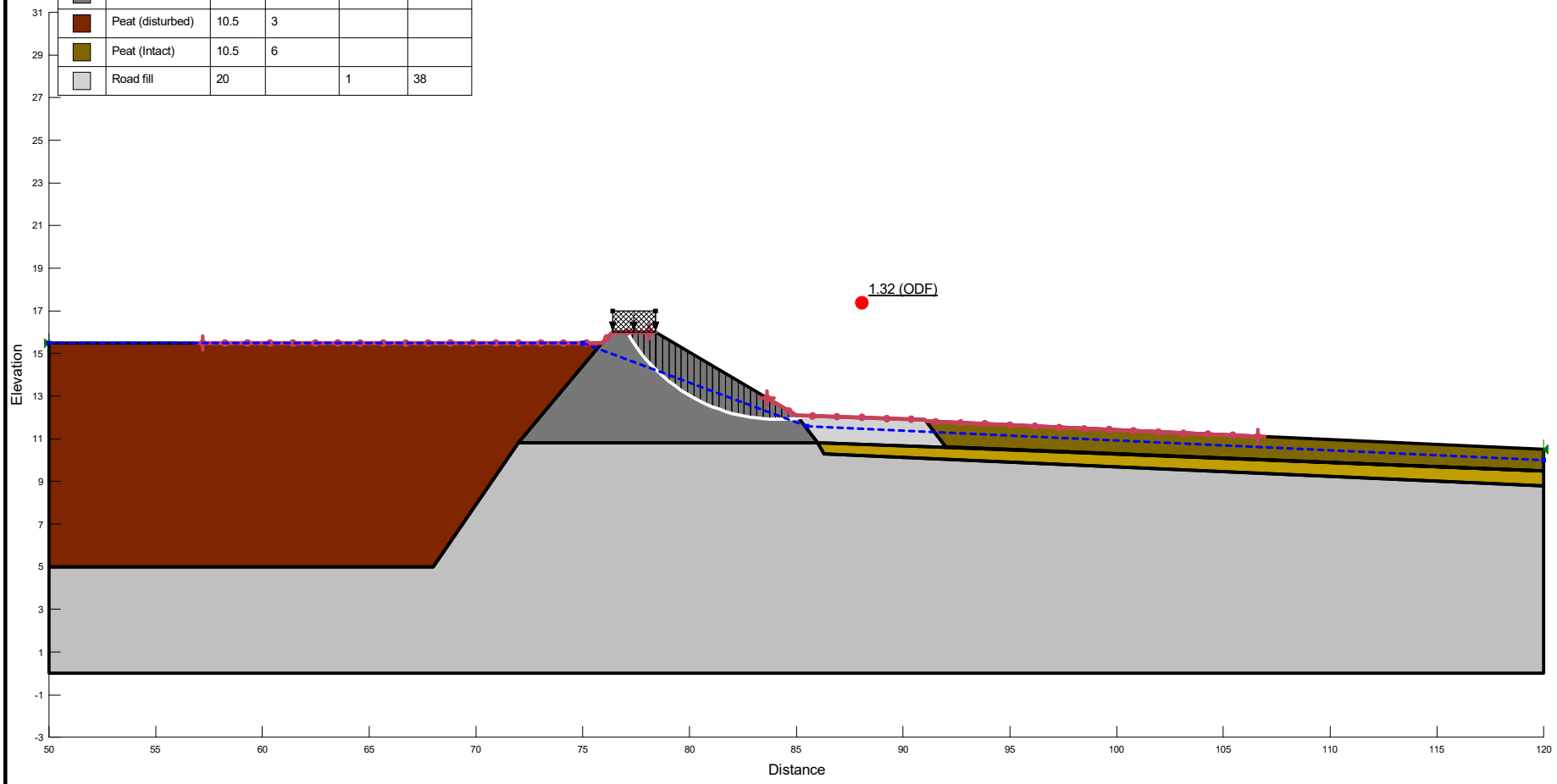


Slope Stability (DA1C2)

Borrow Pit 1 (drained).gsz

21/03/2026 1:300

Color	Name	Unit Weight (kN/m³)	Undrained Shear Strength (kPa)	Effective Cohesion (kPa)	Effective Friction Angle (°)
	Bedrock	22		2	45
	Cohesive Glacial	20	50		
	Granular Berm	22		1	40
	Peat (disturbed)	10.5	3		
	Peat (Intact)	10.5	6		
	Road fill	20		1	38

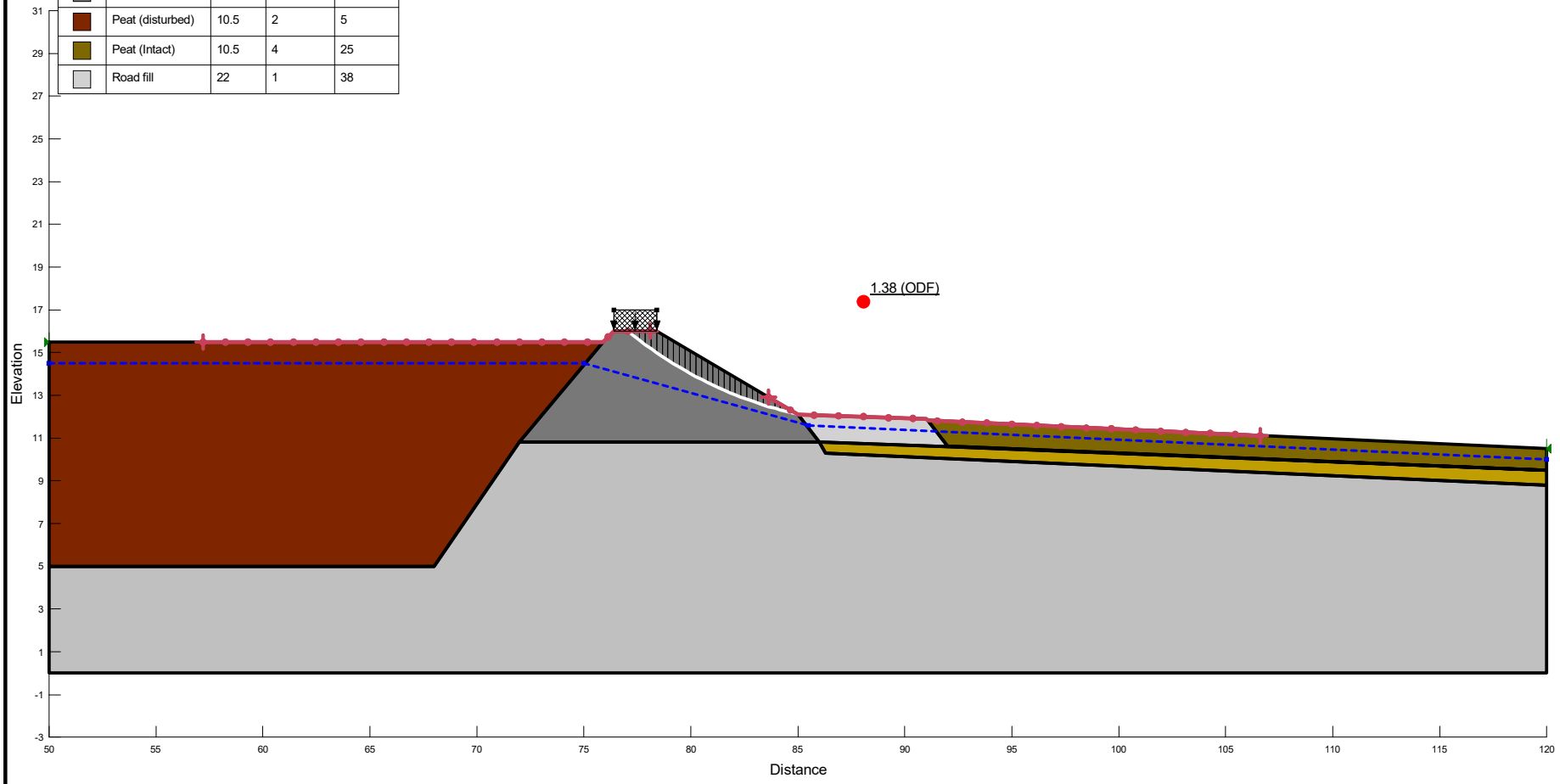


Slope Stability (DA1C2)

Borrow Pit 2 (undrained).gsz

30/04/2026 1:300

Color	Name	Unit Weight (kN/m³)	Effective Cohesion (kPa)	Effective Friction Angle (°)
	Bedrock	22	2	45
	Cohesive Glacial	20	1	32
	Granular Berm	22	1	40
	Peat (disturbed)	10.5	2	5
	Peat (Intact)	10.5	4	25
	Road fill	22	1	38

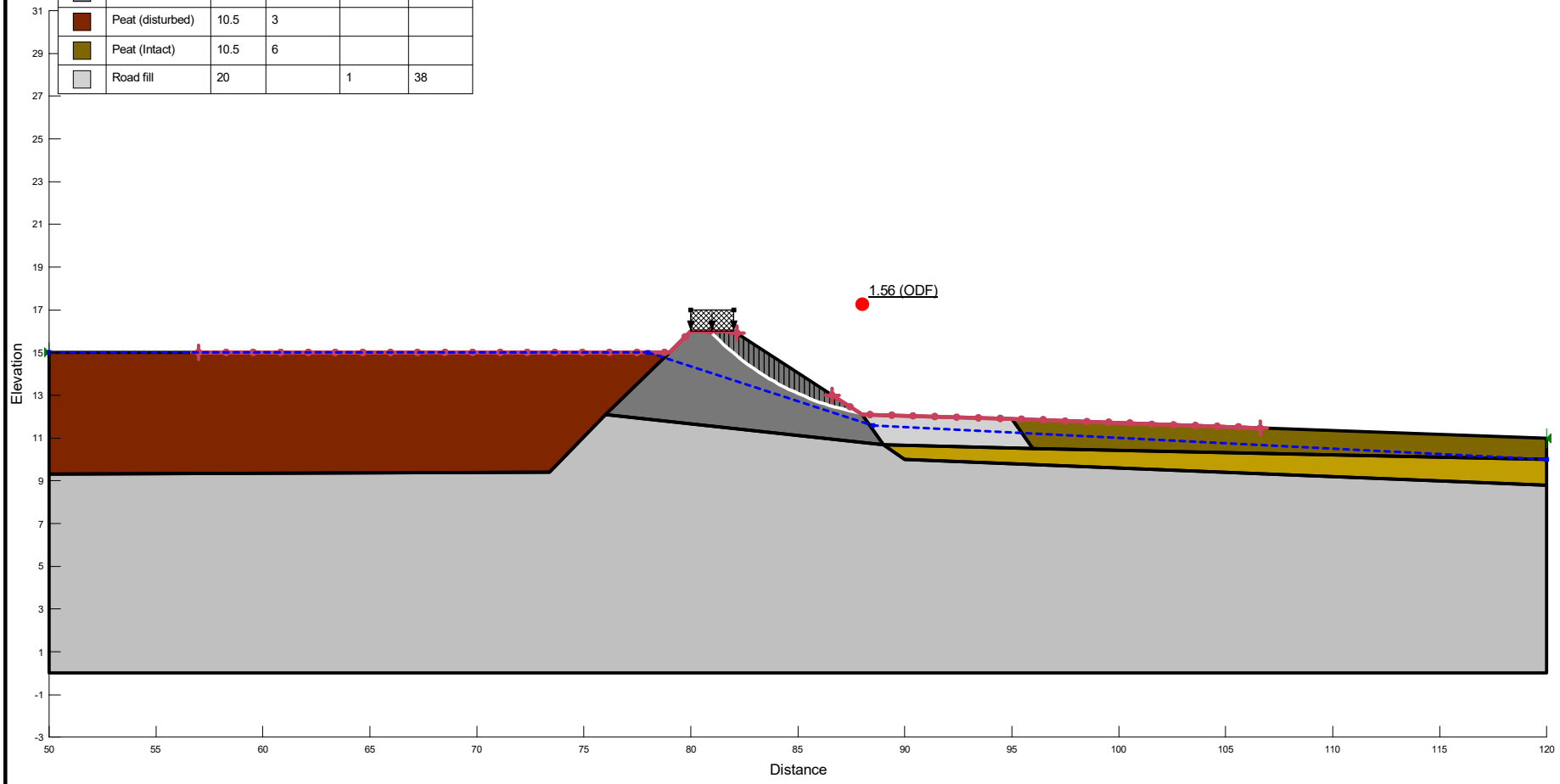


Slope Stability (DA1C2)

Borrow Pit 2 (drained).gsz

30/04/2026 1:300

Color	Name	Unit Weight (kN/m³)	Undrained Shear Strength (kPa)	Effective Cohesion (kPa)	Effective Friction Angle (°)
	Bedrock	22		2	45
	Cohesive Glacial	20	50		
	Granular Berm	22		1	40
	Peat (disturbed)	10.5	3		
	Peat (Intact)	10.5	6		
	Road fill	20		1	38

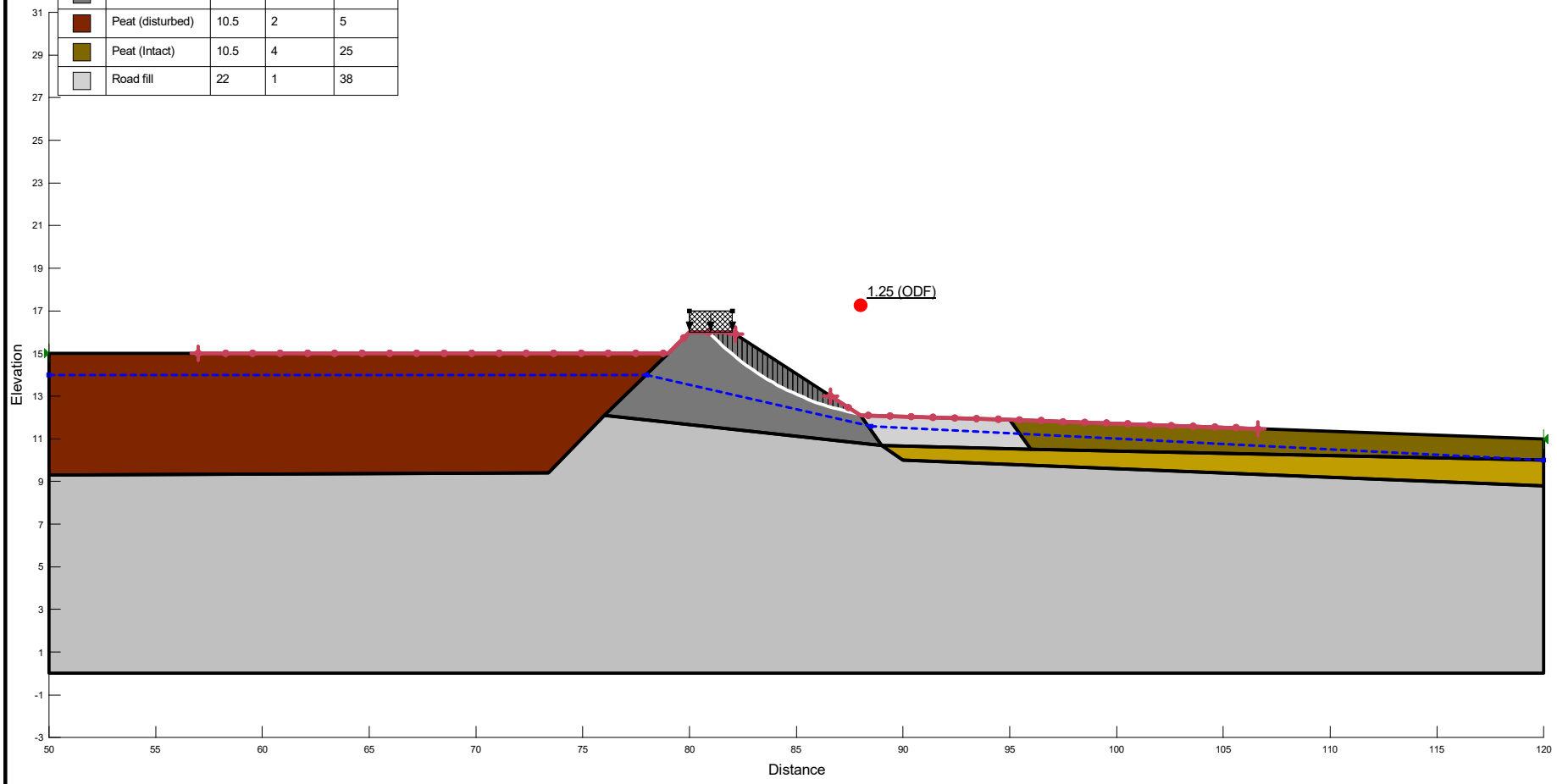


Slope Stability (DA1C1)

Borrow Pit 3 (undrained).gsz

24/03/2026 1:300

Color	Name	Unit Weight (kN/m³)	Effective Cohesion (kPa)	Effective Friction Angle (°)
	Bedrock	22	2	45
	Cohesive Glacial	20	1	32
	Granular Berm	22	1	40
	Peat (disturbed)	10.5	2	5
	Peat (Intact)	10.5	4	25
	Road fill	22	1	38

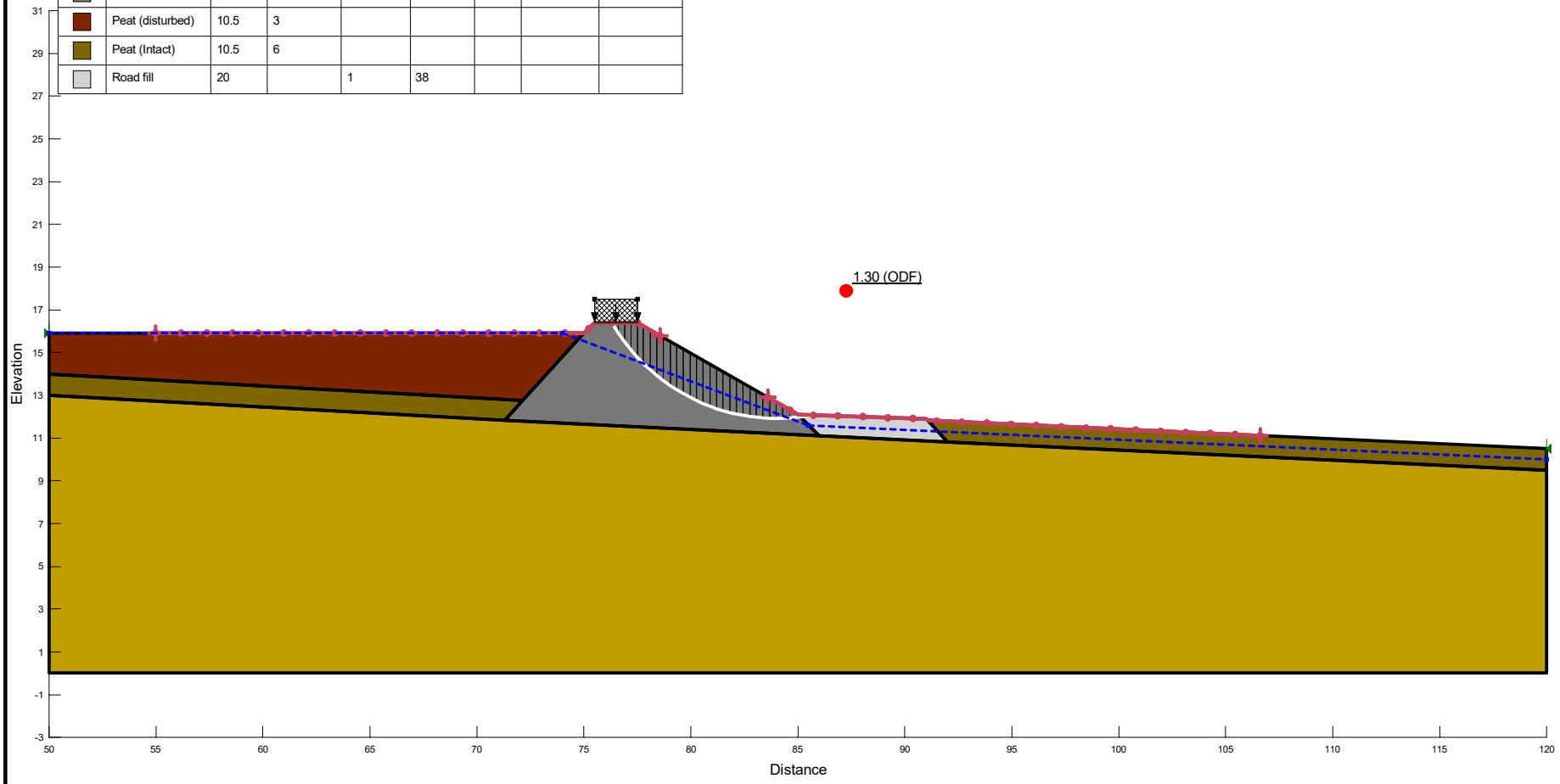


Slope Stability (DA1C2)

Borrow Pit 3 (drained).gsz

21/03/2026 1:300

Color	Name	Unit Weight (kN/m³)	Undrained Shear Strength (kPa)	Effective Cohesion (kPa)	Effective Friction Angle (°)	C-Top of Layer (kPa)	C-Rate of Change ((kN/m²)/m)	C-Maximum (kPa)
	Cohesive Glacial	20				50	5	80
	Granular Berm	22		1	40			
	Peat (disturbed)	10.5	3					
	Peat (Intact)	10.5	6					
	Road fill	20		1	38			

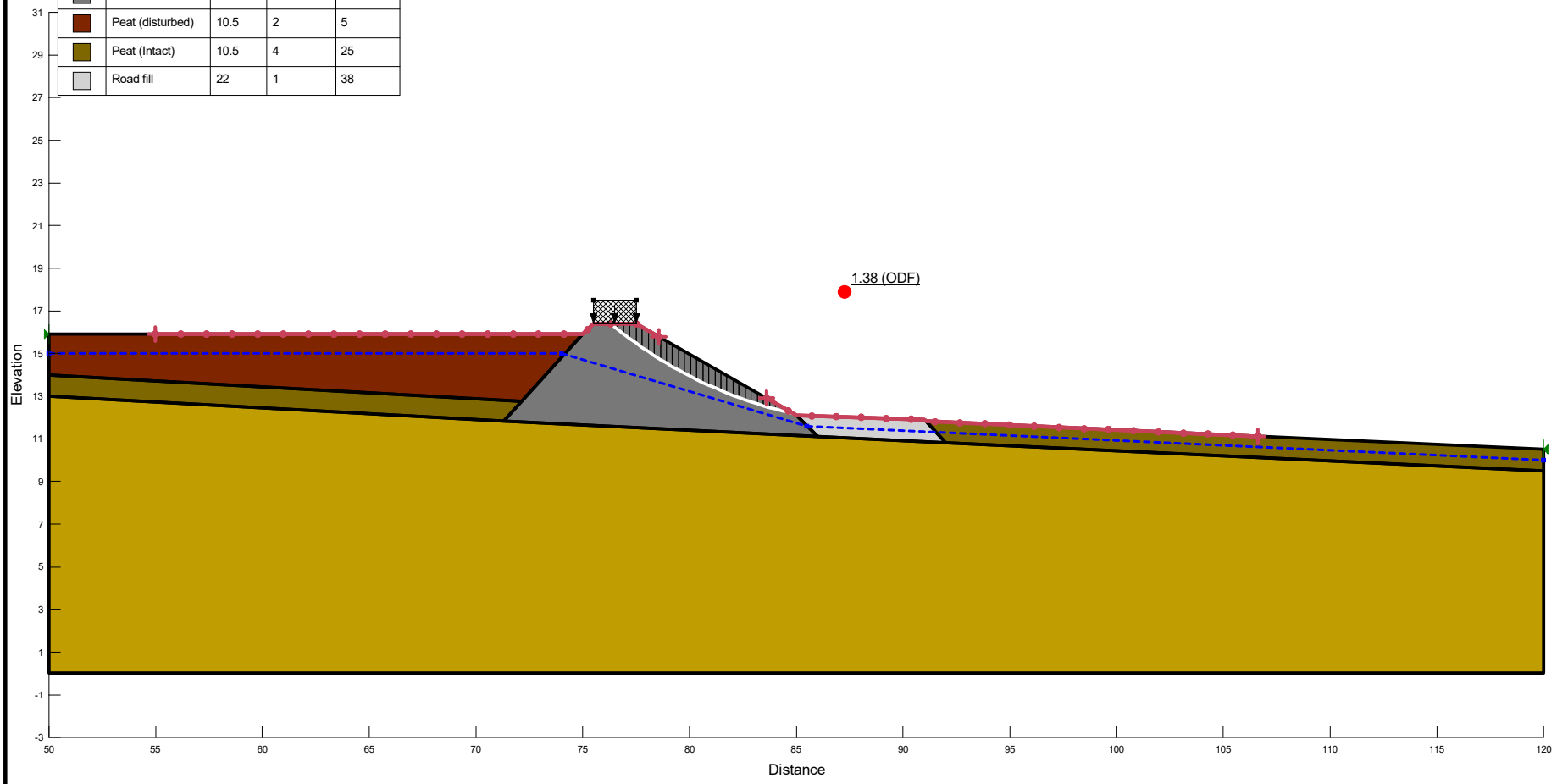


Slope Stability (DA1C2)

peat cells at substation.gsz

24/03/2026 1:300

Color	Name	Unit Weight (kN/m³)	Effective Cohesion (kPa)	Effective Friction Angle (°)
	Cohesive Glacial	20	1	32
	Granular Berm	22	1	40
	Peat (disturbed)	10.5	2	5
	Peat (Intact)	10.5	4	25
	Road fill	22	1	38

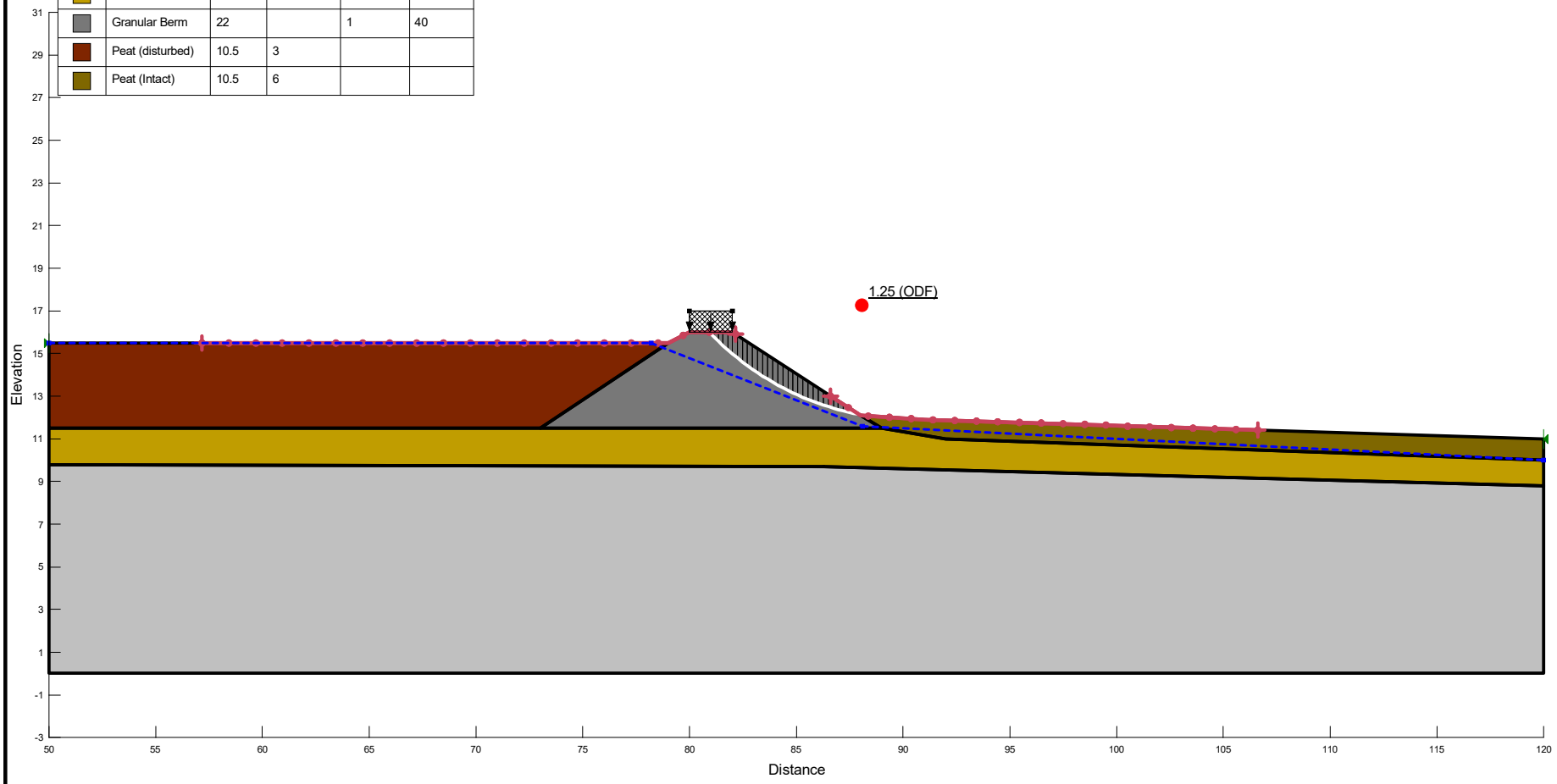


Slope Stability (DA1C2)

peat cells at substation (drained).gsz

20/03/2026 1:300

Color	Name	Unit Weight (kN/m³)	Undrained Shear Strength (kPa)	Effective Cohesion (kPa)	Effective Friction Angle (°)
	Bedrock	22		2	45
	Cohesive Glacial	20	50		
	Granular Berm	22		1	40
	Peat (disturbed)	10.5	3		
	Peat (Intact)	10.5	6		

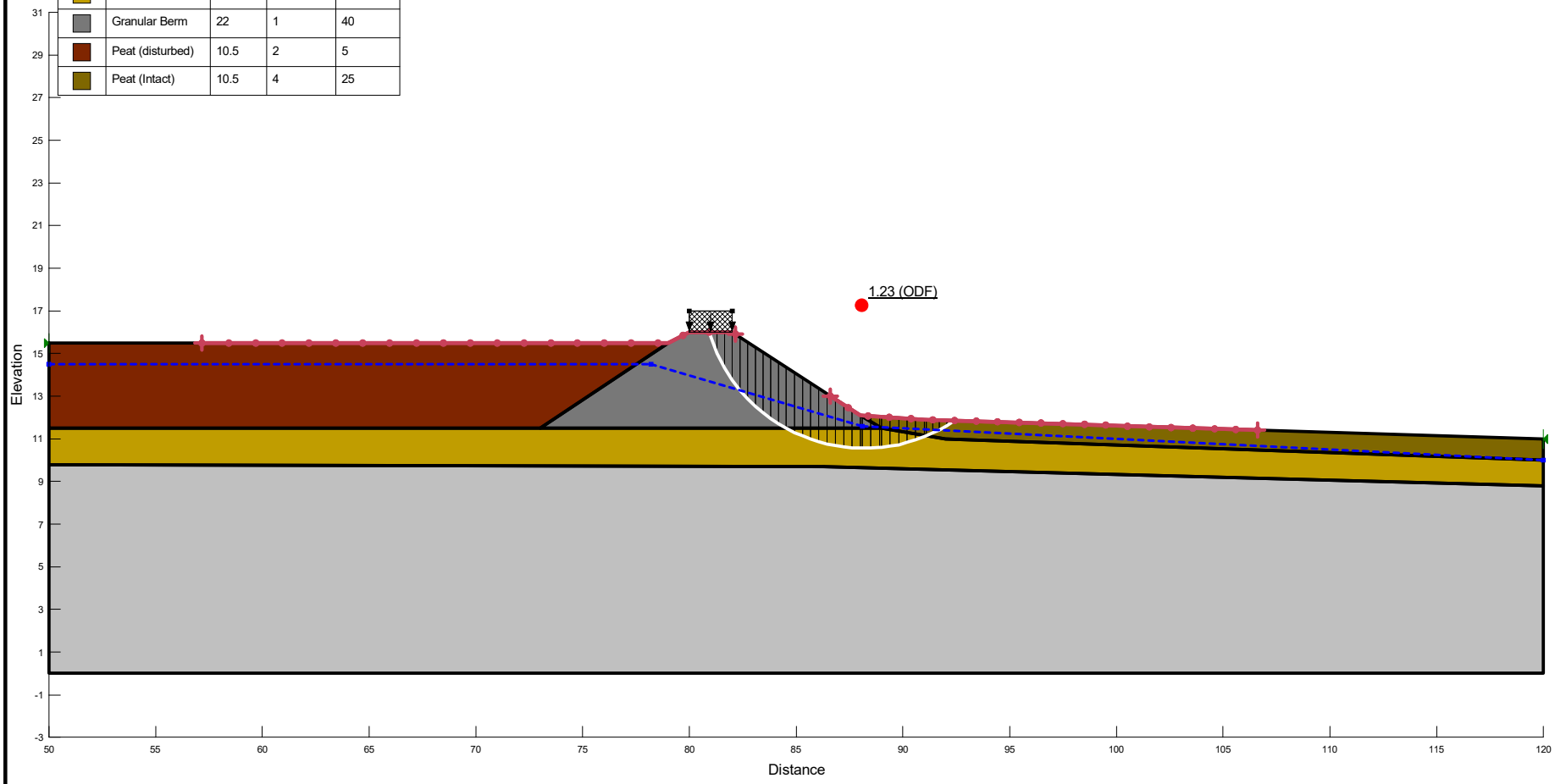


Slope Stability (DA1C2)

Peat Cells at T15 (undrained).gsz

24/03/2026 1:300

Color	Name	Unit Weight (kN/m³)	Effective Cohesion (kPa)	Effective Friction Angle (°)
	Bedrock	22	2	45
	Cohesive Glacial	20	1	32
	Granular Berm	22	1	40
	Peat (disturbed)	10.5	2	5
	Peat (Intact)	10.5	4	25

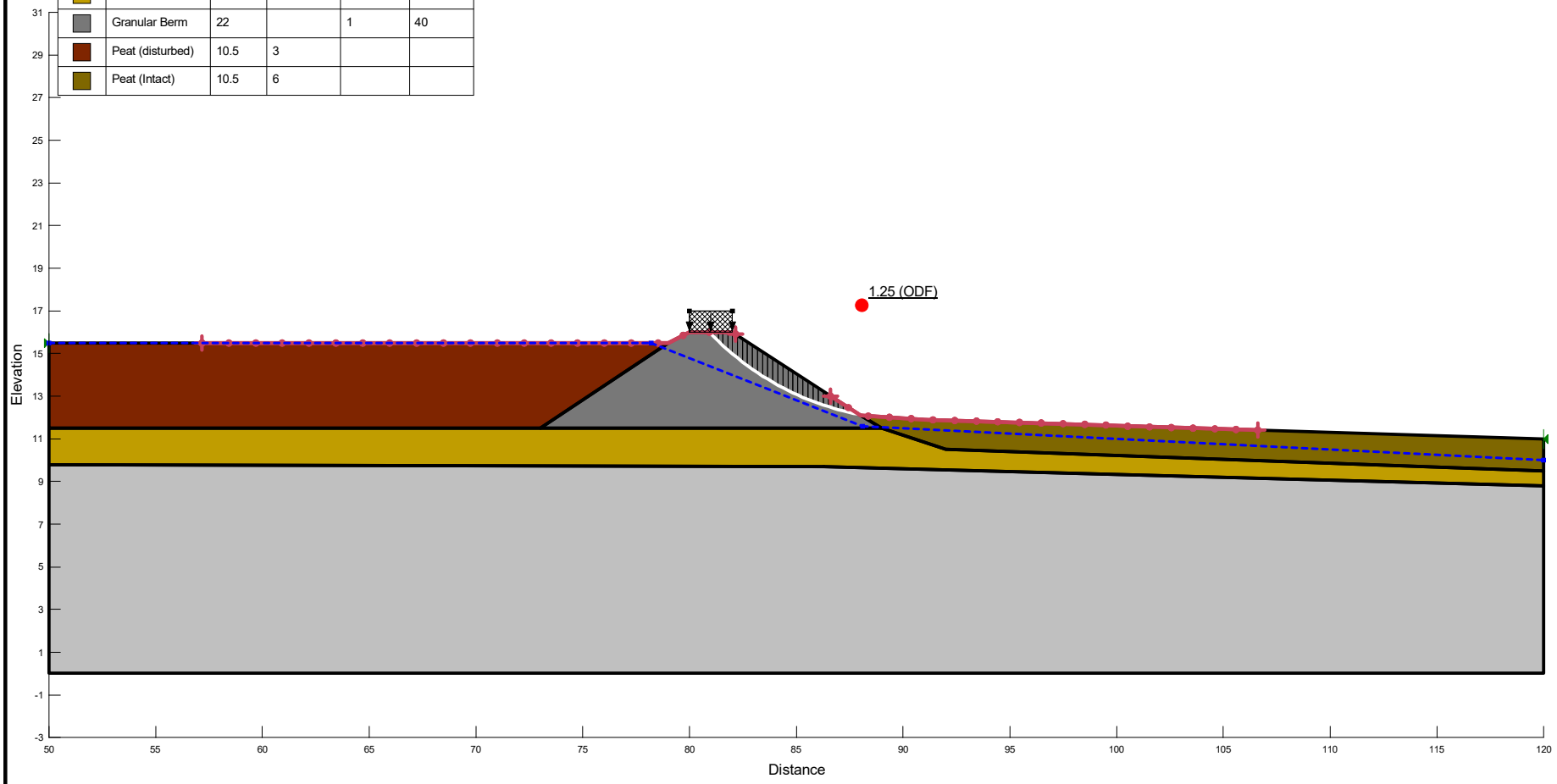


Slope Stability (DA1C2)

Peat Cells at T15 (drained).gsz

21/03/2026 1:300

Color	Name	Unit Weight (kN/m³)	Undrained Shear Strength (kPa)	Effective Cohesion (kPa)	Effective Friction Angle (°)
	Bedrock	22		2	45
	Cohesive Glacial	20	50		
	Granular Berm	22		1	40
	Peat (disturbed)	10.5	3		
	Peat (Intact)	10.5	6		

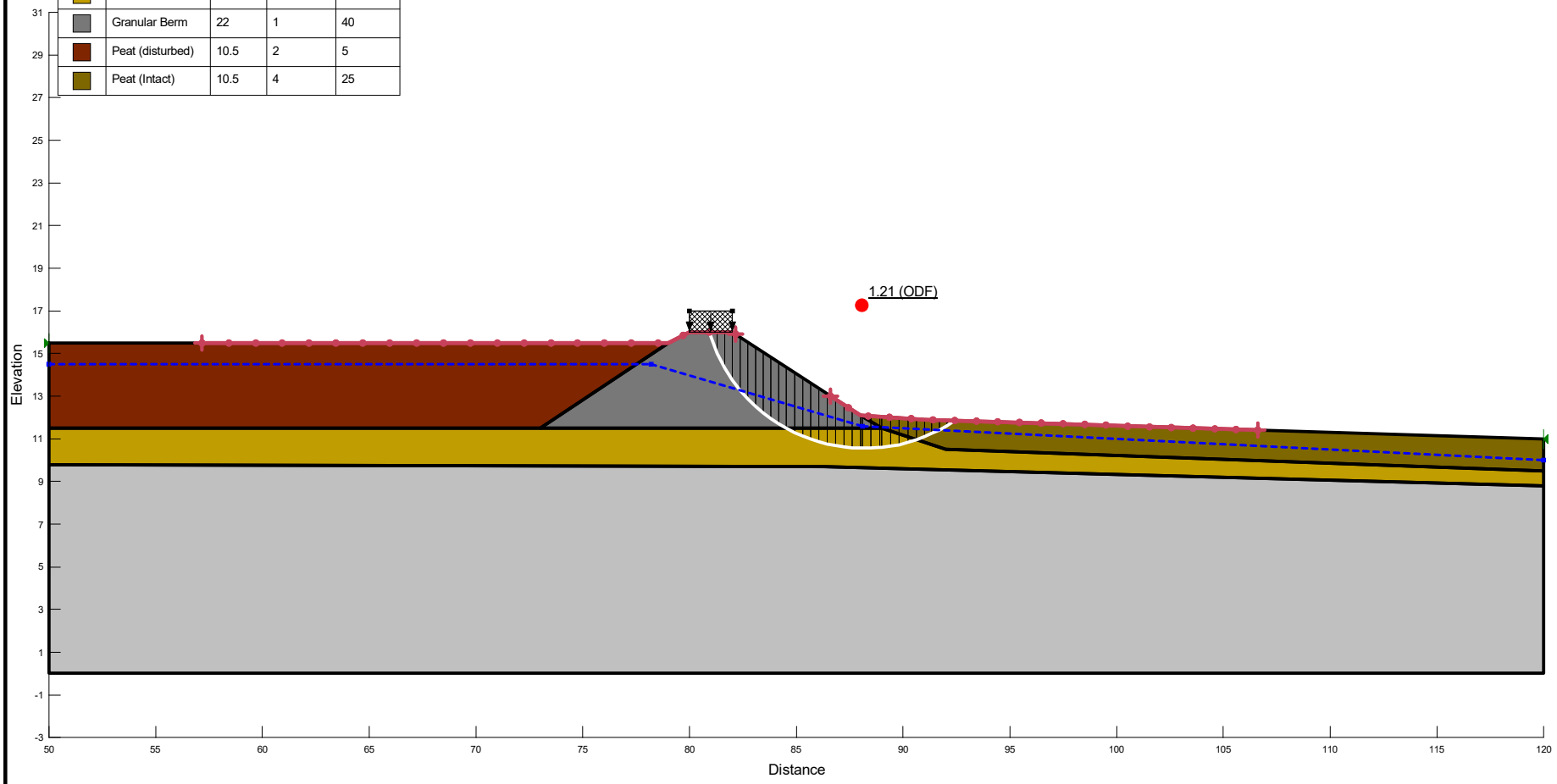


Slope Stability (DA1C2)

Peat Cells at T17 (undrained).gsz

24/03/2026 1:300

Color	Name	Unit Weight (kN/m³)	Effective Cohesion (kPa)	Effective Friction Angle (°)
	Bedrock	22	2	45
	Cohesive Glacial	20	1	32
	Granular Berm	22	1	40
	Peat (disturbed)	10.5	2	5
	Peat (Intact)	10.5	4	25

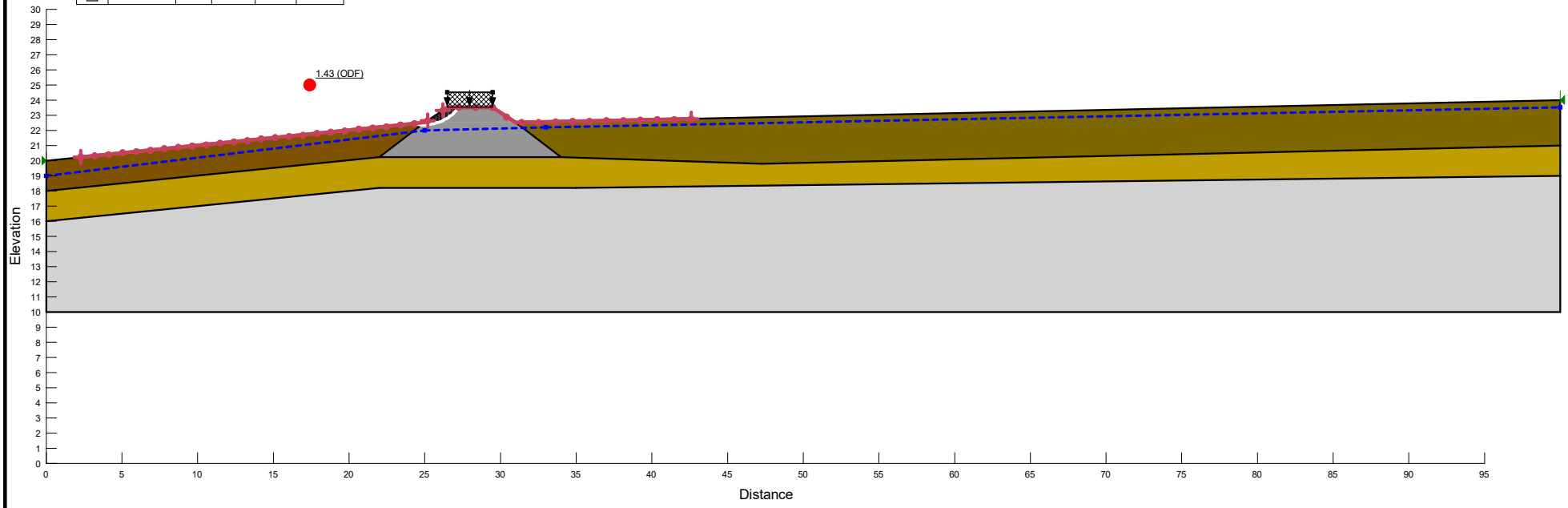


Slope Stability (DA1C2)

Peat Cells at T17 (drained).gsz

21/03/2026 1:300

Color	Name	Unit Weight (kN/m³)	Effective Cohesion (kPa)	Effective Friction Angle (°)	Undrained Shear Strength (kPa)
	Bedrock				
	Cohesive Glacial	20			50
	Peat (Disturbed)	10.5			3
	Peat (Intact)	10.5			6
	Road Fill	22	0	40	

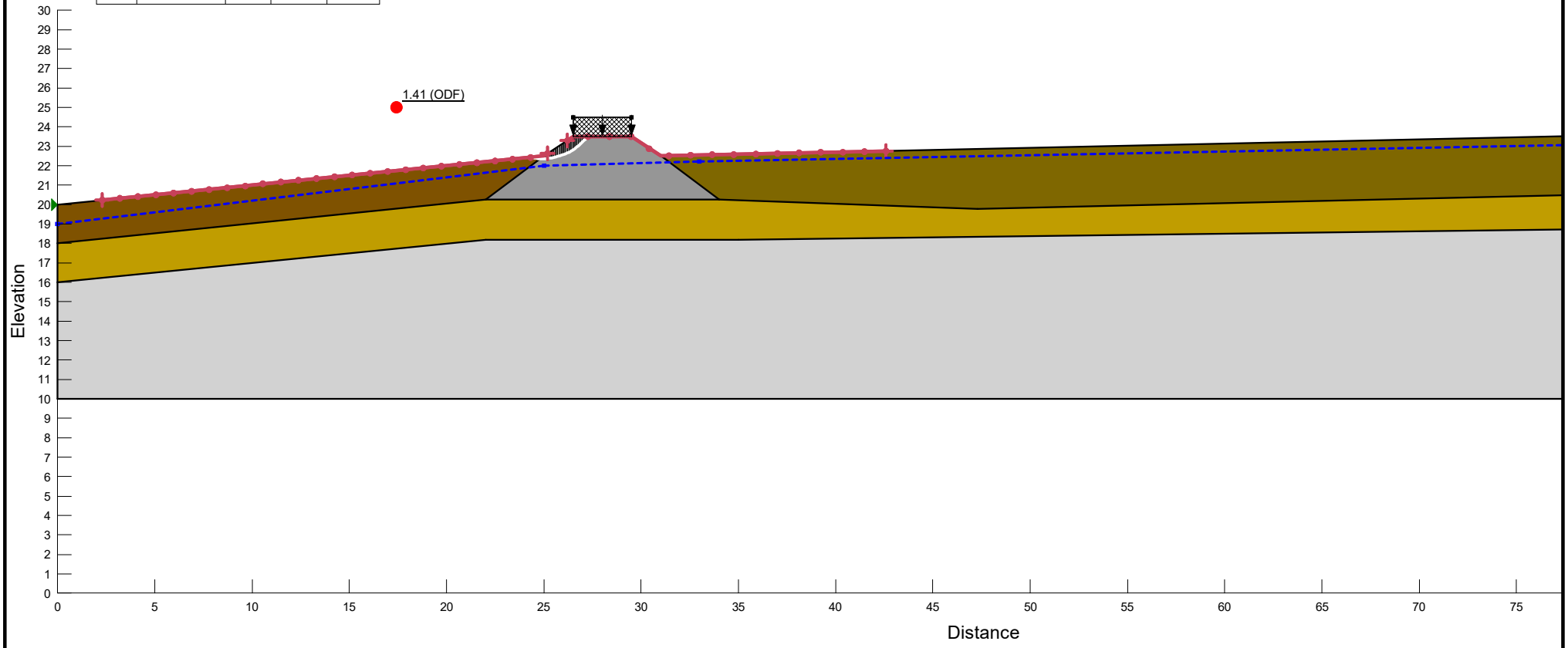


Slope Stability (DA1C2)

T07 spur road berm (undrained).gsz

24/03/2026 1:400

Color	Name	Unit Weight (kN/m³)	Effective Cohesion (kPa)	Effective Friction Angle (°)
	Bedrock			
	Cohesive Glacial	20	1	32
	Granular Berm	22	0	40
	Peat (Distrurbed)	10.5	2	5
	Peat (Intact)	10.5	4	25

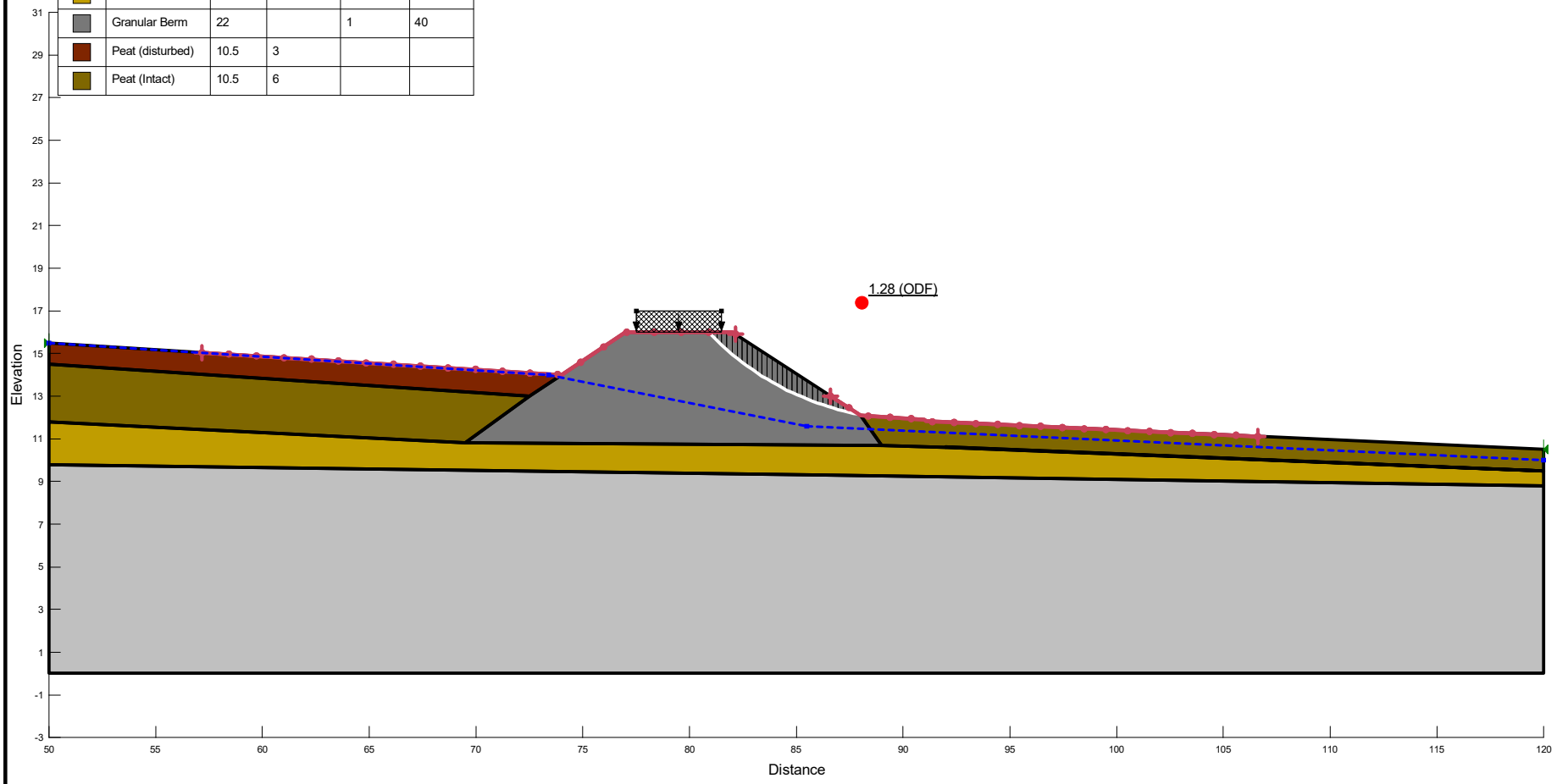


Slope Stability (DA1C2)

T07 spur road berm (dr).gsz

24/03/2026 1:300

Color	Name	Unit Weight (kN/m³)	Undrained Shear Strength (kPa)	Effective Cohesion (kPa)	Effective Friction Angle (°)
	Bedrock	22		2	45
	Cohesive Glacial	20	50		
	Granular Berm	22		1	40
	Peat (disturbed)	10.5	3		
	Peat (Intact)	10.5	6		

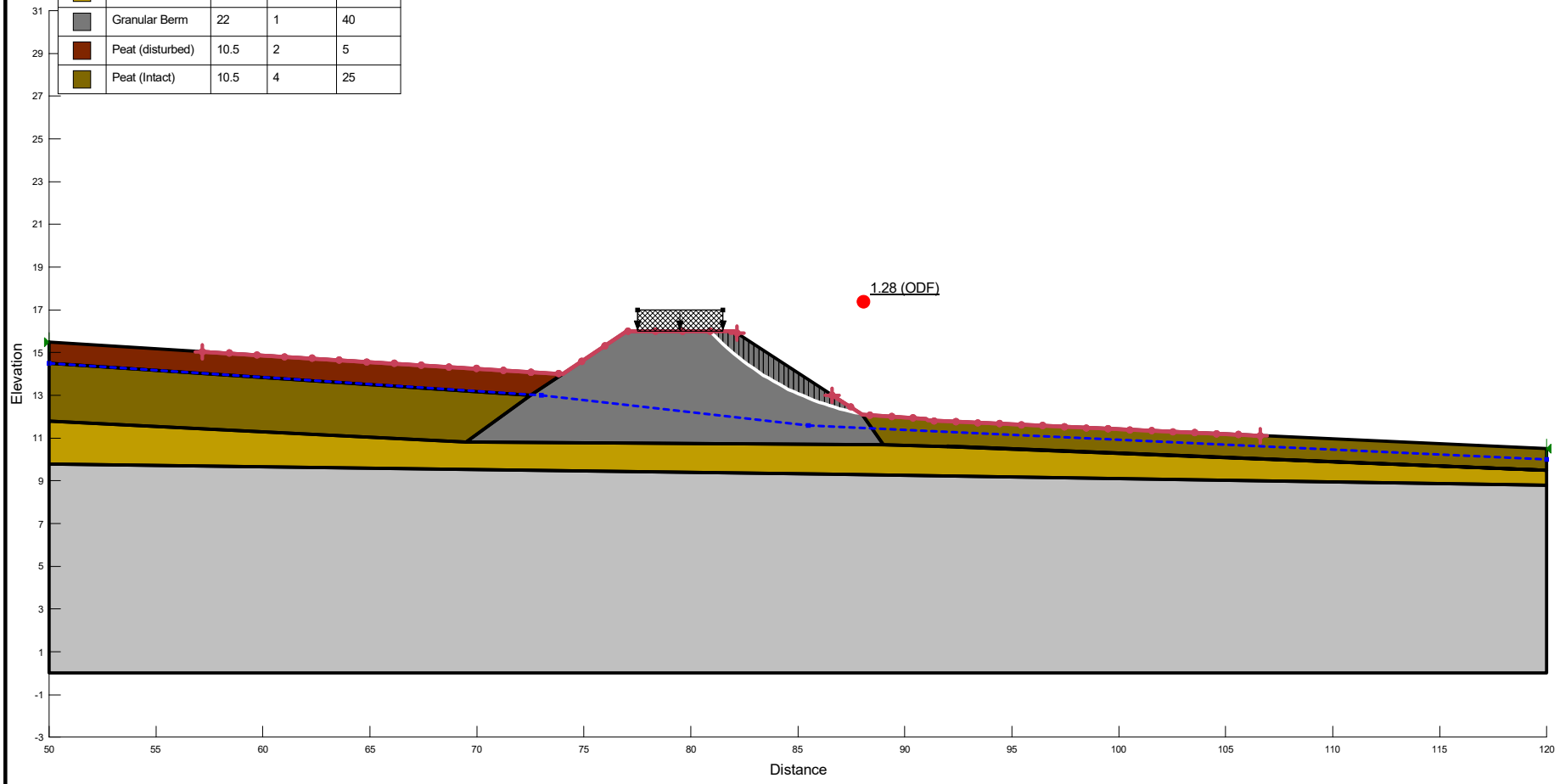


Slope Stability (DA1C2)

T08 Berm (undrained).gsz

24/03/2026 1:300

Color	Name	Unit Weight (kN/m³)	Effective Cohesion (kPa)	Effective Friction Angle (°)
	Bedrock	22	2	45
	Cohesive Glacial	20	1	32
	Granular Berm	22	1	40
	Peat (disturbed)	10.5	2	5
	Peat (Intact)	10.5	4	25

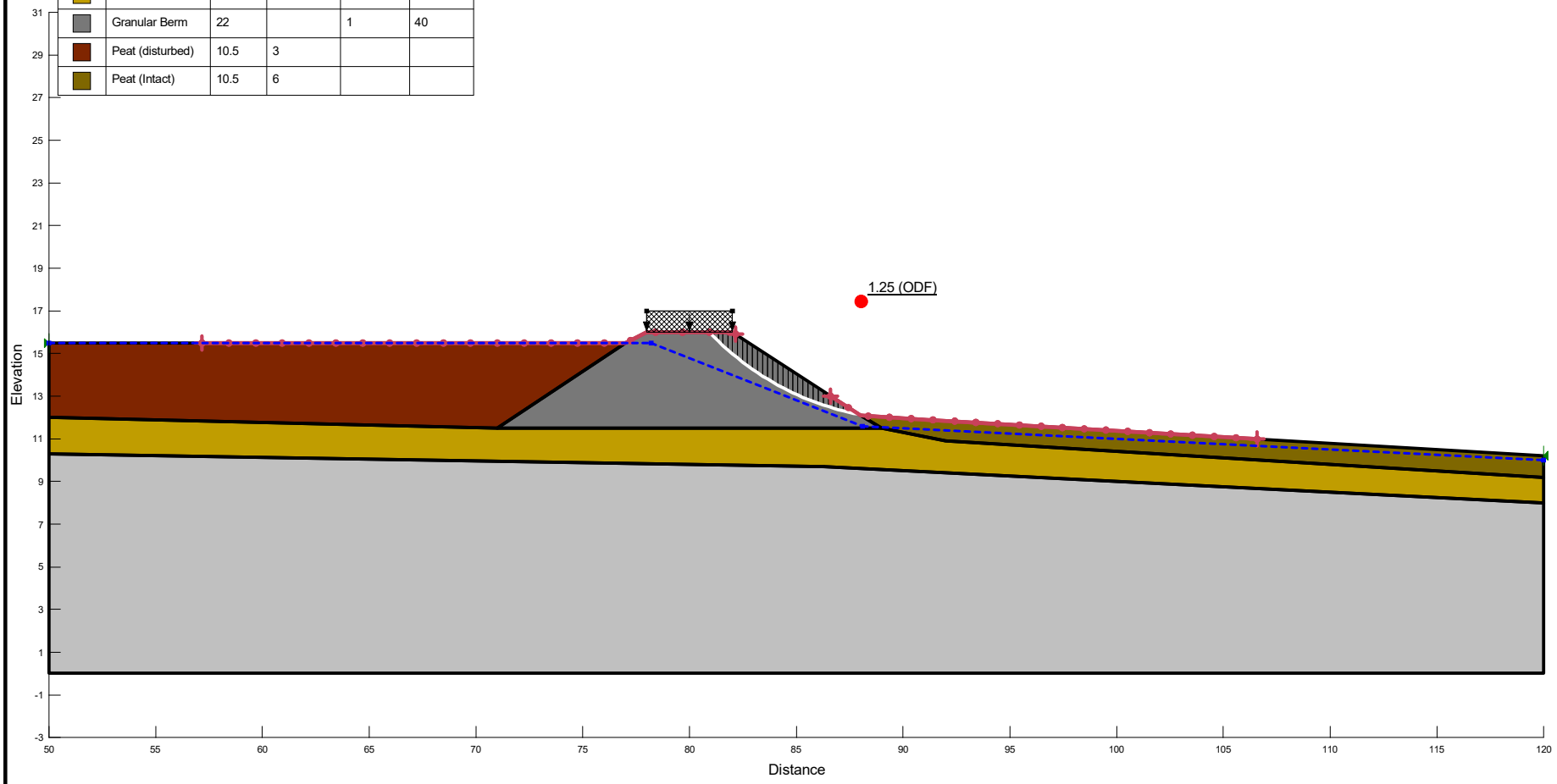


Slope Stability (DA1C2)

T08 Berm (drained).gsz

21/03/2026 1:300

Color	Name	Unit Weight (kN/m³)	Undrained Shear Strength (kPa)	Effective Cohesion (kPa)	Effective Friction Angle (°)
	Bedrock	22		2	45
	Cohesive Glacial	20	50		
	Granular Berm	22		1	40
	Peat (disturbed)	10.5	3		
	Peat (Intact)	10.5	6		

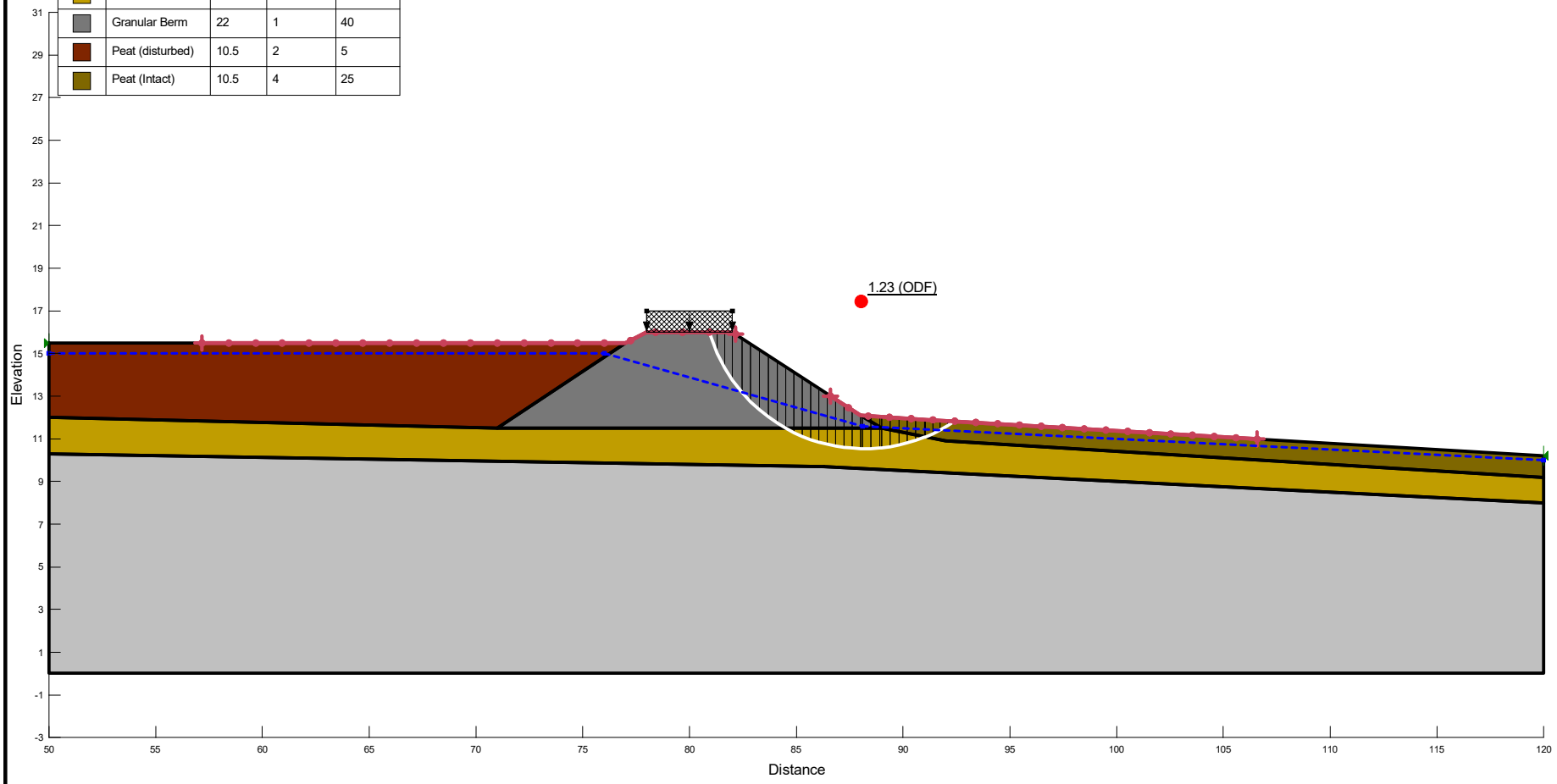


Slope Stability (DA1C2)

T09 Spur Road Berm - Wall 1 (undrained).gsz

24/03/2026 1:300

Color	Name	Unit Weight (kN/m³)	Effective Cohesion (kPa)	Effective Friction Angle (°)
	Bedrock	22	2	45
	Cohesive Glacial	20	1	32
	Granular Berm	22	1	40
	Peat (disturbed)	10.5	2	5
	Peat (Intact)	10.5	4	25



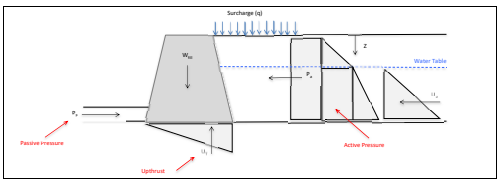
Slope Stability (DA1C2)

T09 Spur Road Berm - Wall 1 (drained).gsz

21/03/2026 1:300

Sliding and Overturning Calculations

Mass Gravity Retaining Structure Design Calculation (Peat Cell at Substation)



A - Information Provided

Soil Properties - Behind Wall

Layer	Thickness	Unit Weight	Friction Angle	Depth to Water table	Water Height
Layer 1	5	10.5	2	0	5
Layer 2					0
Layer 3					0
Layer 4					0

Soil Properties - Front of Wall

Layer	Thickness	Unit Weight	Friction Angle	Depth to Water table	Water Height
Layer 1	0	18	33	0	0
Layer 2					0
Layer 3					0
Layer 4					0

Wall Details

Wall Height =	5	m
Wall Width - Top (w1) =	2	m
Wall Width - Bottom (w2) =	17	m
Wall Unit Weight (γ_c) =	18	kN/m³
Total Wall Weight (W) =	855	kN/m

Additional Info

Surcharge (q) =	0	kN/m²
ϕ base =	33	degrees
Unit Weight of water (γ_w) =	9.81	kN/m³
ϕ base =	26.4	Factored

Note: Base phi is the value for the layer at the base of the wall.

B - EuroCode Information

Partial Factors on Actions

Action		A1	A2
Permanent	Unfavourable	1.35	1
	Favourable	1	1
Variable	Unfavourable	1.5	1.3
	Favourable	0	0

Partial Resistance Factors

Resistance	R1	R2	R3
Bearing	1	1.4	1
Sliding	1	1.1	1

Partial Factors for Soil Parameters

Soil Parameter	M1	M2
Angle of Shearing Resistance	1	1.25
Effective Cohesion	1	1.25
Undrained Shear Strength	1	1.4
Weight Density	1	1

Design Approaches

	Factors
Design Approach 1 - Combination 1 =	A1 + M1 + R1
Design Approach 1 - Combination 2 =	A2 + M2 + R1
Design Approach 2 =	A1 + M1 + R2
Design Approach 3 =	(A1 + A2) + M2 + R3

C - Data For Calculations

ACTIVE DATA FOR CALCULATION

Layer	Thickness - h	Unit Weight of soil (γ)	Water (m)	Depth of Unsaturated Soil within layer	Unit Weight of Water (γ_w)	Effective Stress (σ)	ϕ	Ka	
	(m)	(kN/m3)	(m)	(m)	(kN/m3)	(kN/m²)	(deg)	Factored by M1	Factored by M2
Layer 1	5	10.5	5	0	9.81	3.45	2	0.93	0.95
Layer 2	0	0	0	0	0	0	0	1.00	1.00
Layer 3	0	0	0	0	0	0	0	1.00	1.00
Layer 4	0	0	0	0	0	0	0	1.00	1.00

See figure C.1.1 of BS EN 1997-1: 2004

PASSIVE DATA FOR CALCULATION

Layer	Thickness - h	Unit Weight of soil (γ)	Water (m)	Depth of Unsaturated Soil within layer	Unit Weight of Water (γ_w)	Effective Unit Weight (γ)	ϕ	Kp	
	(m)	(kN/m3)	(m)	(m)	(kN/m3)	(kN/m3)	(deg)	Factored by M1	Factored by M2
Layer 1	0	18	0	0	0	0	33	3.39	2.60
Layer 2	0	0	0	0	0	0	0	1.00	1.00
Layer 3	0	0	0	0	0	0	0	1.00	1.00
Layer 4	0	0	0	0	0	0	0	1.00	1.00

D - Calculation of active/passive Pressures and Forces

Partial Factor M1 (Friction Angle)

Calculation of Active Pressure Behind Wall

	Surcharge (kN/m²)	Active pressure from soil (kN/m²)	Active Pressure from Upper soil layers (kN/m²)	Total Water Pressure (kN/m²)
Layer 1	0.0	3.2		
Layer 2	0.0	0.0	3.5	
Layer 3	0.0	0.0	3.5	
Layer 4	0.0	0.0	3.5	49.1

Calculation of Passive Pressure in Front of Wall

	Active pressure from soil (kN/m²)	Active Pressure from soil layers Above (kN/m²)	Total Water Pressure (kN/m²)
Layer 1	0.0		
Layer 2	0.0	0.0	
Layer 3	0.0	0.0	
Layer 4	0.0	0.0	0.0

Calculation of Active Forces Behind Wall

	Surcharge (kN/m)	Active Force from Soil (kN/m)	Active Force from Upper Soil layers (kN/m)	Water force (kN/m)	Total (kN/m)
Layer 1	0.0	8.0			
Layer 2	0.0	0.0	0.0		
Layer 3	0.0	0.0	0.0		
Layer 4	0.0	0.0	0.0	122.6	
Sum of Active Forces	0.0	8.0	0.0	122.6	130.7

Calculation of Passive Forces in Front of Wall

	Active Force from Soil (kN/m)	Active Force from Soil layer Above (kN/m)	Water force (kN/m)	Total (kN/m)
Layer 1	0.0			
Layer 2	0.0	0.0		
Layer 3	0.0	0.0		
Layer 4	0.0	0.0	0.0	
Sum of Passive Forces	0.0	0.0	0.0	0.0

Partial Factor M2 (Friction Angle)

Calculation of Active Pressure Behind Wall

	Surcharge (kN/m²)	Active pressure from soil (kN/m²)	Active Pressure from Upper soil layers (kN/m²)	Total Water Pressure (kN/m²)
Layer 1	0.0	3.3		
Layer 2	0.0	0.0	3.5	
Layer 3	0.0	0.0	3.5	
Layer 4	0.0	0.0	3.5	49.1

Calculation of Passive Pressure in Front of Wall

	Active pressure from soil (kN/m²)	Active Pressure from soil layers Above (kN/m²)	Total Water Pressure (kN/m²)
Layer 1	0.0		
Layer 2	0.0	0.0	
Layer 3	0.0	0.0	
Layer 4	0.0	0.0	0.0

Calculation of Active Forces Behind Wall

	Surcharge (kN/m)	Active Force from Soil (kN/m)	Active Force from Upper Soil layers (kN/m)	Water force (kN/m)	Total
Layer 1	0.0	8.2			
Layer 2	0.0	0.0	0.0		
Layer 3	0.0	0.0	0.0		
Layer 4	0.0	0.0	0.0	122.6	
Sum of Active Forces	0.0	8.2	0.0	122.6	130.8

Calculation of Passive Forces in Front of Wall

	Active Force from Soil (kN/m)	Active Force from Soil layer Above (kN/m)	Water force (kN/m)	Total
Layer 1	0.0			
Layer 2	0.0	0.0		
Layer 3	0.0	0.0		
Layer 4	0.0	0.0	0.0	
Sum of Passive Forces	0.0	0.0	0.0	0.0

E -Sliding at base of Wall

S = Sliding Resistance = W * tan ϕ_{base}
W = Weight of Wall
tan ϕbase = Fiction Angle between wall and soil

Weight of wall (W) =	855.0	kN
tan ϕ_{base} =	0.65	degrees (Factored M1)
	0.50	degrees (Factored M2)

F - Upthrust Water Force

Upthrust Force from Water Pressure

F_{UT}	416.925	kN/m

F - Overturning of Wall around Toe

Stabilising Moments

Moment from Structure

Wall Moment = Wall weight (W) * (Wall base width (w) / 2)	(W*(w/2)) =	7268

Destabilising Moments

1 - Uptrust Moment from Water Pressure

Upthrust Moment = U_2 moment	U_2 moment (kN/m)	4677.9

Moment Heights For Each Layer - Behind Wall

Layer	Surcharge	Soil	Surcharge from Upper Soil Layer	Water
Layer 1	2.5	1.7		
Layer 2	0.0	0.0	0.0	
Layer 3	0.0	0.0	0.0	
Layer 4	0.0	0.0	0.0	1.67

Moment Heights for Each Layer - Front of Wall

Layer Height from Base	Soil	Surcharge from Upper Soil Layer	Water
Layer 1	0.0		
Layer 2	0.0	0.0	
Layer 3	0.0	0.0	
Layer 4	0.0	0.0	0.00

2 - Soil Overturning Moment - Partial Factor M1 (Frictin Angle)

Calculation of Overturning Moment = F (active)*(H/3)

Layer Height from Base	Surcharge	Soil	Surcharge from Upper Soil Layer	Water	Total Overturning Moment
Layer 1	0.0	13.4			
Layer 2	0.0	0.0	0.0		
Layer 3	0.0	0.0	0.0		
Layer 4	0.0	0.0	0.0	204.4	
Total Overturning	0.0	13.4	0.0	204.4	217.8

Calculation of Restoring Moment = F (passive)*(H/3)

Layer Height from Base	Soil	Surcharge from Upper Soil Layer	Water	Total Restoring Moment
Layer 1	0.0			
Layer 2	0.0	0.0		
Layer 3	0.0	0.0		
Layer 4	0.0	0.0	0.0	
Total Restoring	0.0	0.0	0.0	0.0

3 - Soil Overturning Moment - Partial Factor M2 (Friction Angle)

Calculation of Overturning Moment = F (active)*(H/3)

Layer Height from Base	Surcharge	Soil	Surcharge from Upper Soil Layer	Water	Total Overturning Moment
Layer 1	0.0	13.6			
Layer 2	0.0	0.0	0.0		
Layer 3	0.0	0.0	0.0		
Layer 4	0.0	0.0	0.0	204.4	
Total Overturning	0.0	13.6	0.0	204.4	218.0

Calculation of Restoring Moment = F (passive)*(H/3)

Layer Height from Base	Soil	Surcharge from Upper Soil Layer	Water	Total Restoring Moment
Layer 1	0.0			
Layer 2	0.0	0.0		
Layer 3	0.0	0.0		
Layer 4	0.0	0.0	0.0	
Total Restoring	0.0	0.0	0.0	0.0

G - Results

A - Sliding

Disturbing ≤ Resisting

γ_{Gunfav} * Active Force + γ_{Gunfav} * Surcharge ≤ (((γ_{Gfav} * W) - (U_3 * γ_{Gunfav}))/1/γ_{Rsl}) + (Passive Force * (γ_{Gunfav}/γ_{Rsl}))

		Disturbing	Restoring	F.O.S	
Design Approach 1	Combination 1	176.40	189.7	1.08	Pass
	Combination 2	130.78	217.5	1.66	Pass

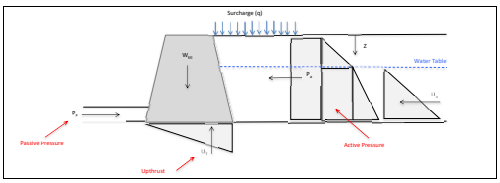
B - Overturning

Disturbing ≤ Resisting

γ_{Gunfav} * (Overturning Moment + U_2) ≤ [(γ_{Gfav} * W (w/2)) + (Passive Moment * γ_{Gunfav})]

		Disturbing	Restoring	F.O.S	
Design Approach 1	Combination 1	6609	7268	1.10	Pass
	Combination 2	4896	7268	1.48	Pass

Mass Gravity Retaining Structure Design Calculation (Borrow Pit 1)



A - Information Provided

Soil Properties - Behind Wall

Layer	Thickness	Unit Weight	Friction Angle	Depth to Water table	Water Height
Layer 1	4	10.5	2	0	4
Layer 2					0
Layer 3					0
Layer 4					0

Soil Properties - Front of Wall

Layer	Thickness	Unit Weight	Friction Angle	Depth to Water table	Water Height
Layer 1	0	18	33	0	0
Layer 2					0
Layer 3					0
Layer 4					0

Wall Details

Wall Height =	4	m
Wall Width - Top (w1) =	2	m
Wall Width - Bottom (w2) =	14	m
Wall Unit Weight (γ_c) =	18	kN/m³
Total Wall Weight (W) =	576	kN/m

Additional Info

Surcharge (q) =	0	kN/m²
ϕ base =	33	degrees
Unit Weight of water (γ_w) =	9.81	kN/m³
ϕ base =	26.4	Factored

Note: Base phi is the value for the layer at the base of the wall.

B - EuroCode Information

Partial Factors on Actions

Action		A1	A2
Permanent	Unfavourable	1.35	1
	Favourable	1	1
Variable	Unfavourable	1.5	1.3
	Favourable	0	0

Partial Resistance Factors

Resistance	R1	R2	R3
Bearing	1	1.4	1
Sliding	1	1.1	1

Partial Factors for Soil Parameters

Soil Parameter	M1	M2
Angle of Shearing Resistance	1	1.25
Effective Cohesion	1	1.25
Undrained Shear Strength	1	1.4
Weight Density	1	1

Design Approaches

	Factors
Design Approach 1 - Combination 1 =	A1 + M1 + R1
Design Approach 1 - Combination 2 =	A2 + M2 + R1
Design Approach 2 =	A1 + M1 + R2
Design Approach 3 =	(A1 + A2) + M2 + R3

C - Data For Calculations

ACTIVE DATA FOR CALCULATION

Layer	Thickness - h	Unit Weight of soil (γ)	Water (m)	Depth of Unsaturated Soil within layer	Unit Weight of Water (γ_w)	Effective Stress (γ)	ϕ	Ka	
	(m)	(kN/m3)	(m)	(m)	(kN/m3)	(kN/m²)	(ϕdeg)	Factored by M1	Factored by M2
Layer 1	4	10.5	4	0	9.81	2.76	2	0.93	0.95
Layer 2	0	0	0	0	0	0	0	1.00	1.00
Layer 3	0	0	0	0	0	0	0	1.00	1.00
Layer 4	0	0	0	0	0	0	0	1.00	1.00

See figure C.1.1 of BS EN 1997-1: 2004

PASSIVE DATA FOR CALCULATION

Layer	Thickness - h	Unit Weight of soil (γ)	Water (m)	Depth of Unsaturated Soil within layer	Unit Weight of Water (γ_w)	Effective Unit Weight (γ)	ϕ	Kp	
	(m)	(kN/m3)	(m)	(m)	(kN/m3)	(kN/m3)	(ϕdeg)	Factored by M1	Factored by M2
Layer 1	0	18	0	0	0	0	33	3.39	2.60
Layer 2	0	0	0	0	0	0	0	1.00	1.00
Layer 3	0	0	0	0	0	0	0	1.00	1.00
Layer 4	0	0	0	0	0	0	0	1.00	1.00

D - Calculation of active/passive Pressures and Forces

Partial Factor M1 (Friction Angle)

Calculation of Active Pressure Behind Wall

	Surcharge (kN/m²)	Active pressure from soil (kN/m²)	Active Pressure from Upper soil layers (kN/m²)	Total Water Pressure (kN/m²)
Layer 1	0.0	2.6		
Layer 2	0.0	0.0	2.8	
Layer 3	0.0	0.0	2.8	
Layer 4	0.0	0.0	2.8	39.2

Calculation of Passive Pressure in Front of Wall

	Active pressure from soil (kN/m²)	Active Pressure from soil layers Above (kN/m²)	Total Water Pressure (kN/m²)
Layer 1	0.0		
Layer 2	0.0	0.0	
Layer 3	0.0	0.0	
Layer 4	0.0	0.0	0.0

Calculation of Active Forces Behind Wall

	Surcharge (kN/m)	Active Force from Soil (kN/m)	Active Force from Upper Soil layers (kN/m)	Water force (kN/m)	Total (kN/m)
Layer 1	0.0	5.1			
Layer 2	0.0	0.0	0.0		
Layer 3	0.0	0.0	0.0		
Layer 4	0.0	0.0	0.0	78.5	
Sum of Active Forces	0.0	5.1	0.0	78.5	83.6

Calculation of Passive Forces in Front of Wall

	Active Force from Soil (kN/m)	Active Force from Soil layer Above (kN/m)	Water force (kN/m)	Total (kN/m)
Layer 1	0.0			
Layer 2	0.0	0.0		
Layer 3	0.0	0.0		
Layer 4	0.0	0.0	0.0	
Sum of Passive Forces	0.0	0.0	0.0	0.0

Partial Factor M2 (Friction Angle)

Calculation of Active Pressure Behind Wall

	Surcharge (kN/m²)	Active pressure from soil (kN/m²)	Active Pressure from Upper soil layers (kN/m²)	Total Water Pressure (kN/m²)
Layer 1	0.0	2.6		
Layer 2	0.0	0.0	2.8	
Layer 3	0.0	0.0	2.8	
Layer 4	0.0	0.0	2.8	39.2

Calculation of Passive Pressure in Front of Wall

	Active pressure from soil (kN/m²)	Active Pressure from soil layers Above (kN/m²)	Total Water Pressure (kN/m²)
Layer 1	0.0		
Layer 2	0.0	0.0	
Layer 3	0.0	0.0	
Layer 4	0.0	0.0	0.0

Calculation of Active Forces Behind Wall

	Surcharge (kN/m)	Active Force from Soil (kN/m)	Active Force from Upper Soil layers (kN/m)	Water force (kN/m)	Total
Layer 1	0.0	5.2			
Layer 2	0.0	0.0	0.0		
Layer 3	0.0	0.0	0.0		
Layer 4	0.0	0.0	0.0	78.5	
Sum of Active Forces	0.0	5.2	0.0	78.5	83.7

Calculation of Passive Forces in Front of Wall

	Active Force from Soil (kN/m)	Active Force from Soil layer Above (kN/m)	Water force (kN/m)	Total
Layer 1	0.0			
Layer 2	0.0	0.0		
Layer 3	0.0	0.0		
Layer 4	0.0	0.0	0.0	
Sum of Passive Forces	0.0	0.0	0.0	0.0

E -Sliding at base of Wall

S = Sliding Resistance = $W * \tan \phi_{base}$
W = Weight of Wall
$\tan \phi$base = Fiction Angle between wall and soil

Weight of wall (W) =	576.0	kN
$\tan \phi_{base}$ =	0.65	degrees (Factored M1)
	0.50	degrees (Factored M2)

F - Upthrust Water Force

Upthrust Force from Water Pressure

F_{UT}	274.68	kN/m

F - Overturning of Wall around Toe

Stabilising Moments

Moment from Structure

Wall Moment = Wall weight (W) * (Wall base width (w) / 2)	(W*(w/2)) =	4032

Destabilising Moments

1 - Uptrust Moment from Water Pressure

Upthrust Moment = U_T moment	U_T moment (kN/m)	2588.0

Moment Heights For Each Layer - Behind Wall

Layer	Surcharge	Soil	Surcharge from Upper Soil Layer	Water
Layer 1	2.0	1.3		
Layer 2	0.0	0.0	0.0	
Layer 3	0.0	0.0	0.0	
Layer 4	0.0	0.0	0.0	1.33

Moment Heights for Each Layer - Front of Wall

Layer Height from Base	Soil	Surcharge from Upper Soil Layer	Water
Layer 1	0.0		
Layer 2	0.0	0.0	
Layer 3	0.0	0.0	
Layer 4	0.0	0.0	0.00

2 - Soil Overturning Moment - Partial Factor M1 (Frictin Angle)

Calculation of Overturning Moment = F (active)*(H/3)

Layer Height from Base	Surcharge	Soil	Surcharge from Upper Soil Layer	Water	Total Overturning Moment
Layer 1	0.0	6.9			
Layer 2	0.0	0.0	0.0		
Layer 3	0.0	0.0	0.0		
Layer 4	0.0	0.0	0.0	104.6	
Total Overturning	0.0	6.9	0.0	104.6	111.5

Calculation of Restoring Moment = F (passive)*(H/3)

Layer Height from Base	Soil	Surcharge from Upper Soil Layer	Water	Total Restoring Moment
Layer 1	0.0			
Layer 2	0.0	0.0		
Layer 3	0.0	0.0		
Layer 4	0.0	0.0	0.0	
Total Restoring	0.0	0.0	0.0	0.0

3 - Soil Overturning Moment - Partial Factor M2 (Friction Angle)

Calculation of Overturning Moment = F (active)*(H/3)

Layer Height from Base	Surcharge	Soil	Surcharge from Upper Soil Layer	Water	Total Overturning Moment
Layer 1	0.0	7.0			
Layer 2	0.0	0.0	0.0		
Layer 3	0.0	0.0	0.0		
Layer 4	0.0	0.0	0.0	104.6	
Total Overturning	0.0	7.0	0.0	104.6	111.6

Calculation of Restoring Moment = F (passive)*(H/3)

Layer Height from Base	Soil	Surcharge from Upper Soil Layer	Water	Total Restoring Moment
Layer 1	0.0			
Layer 2	0.0	0.0		
Layer 3	0.0	0.0		
Layer 4	0.0	0.0	0.0	
Total Restoring	0.0	0.0	0.0	0.0

G - Results

A - Sliding

Disturbing ≤ Resisting

γ_{Gunfav} * Active Force + γ_{Gunfav} * Surcharge ≤ (((γ_{Gfav} * W) - (U_T * γ_{Gunfav}))/1/γ_{Rsl}) + (Passive Force * (γ_{Gunfav}/γ_{Rsl}))

		Disturbing	Restoring	F.O.S	
Design Approach 1	Combination 1	112.90	133.2	1.18	Pass
	Combination 2	83.70	149.6	1.79	Pass

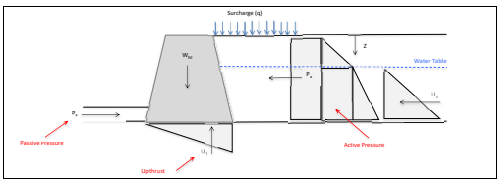
B - Overturning

Disturbing ≤ Resisting

γ_{Gunfav} * (Overturning Moment + U_T) ≤ [(γ_{Gfav} * W (w/2)) + (Passive Moment * γ_{Gunfav})]

		Disturbing	Restoring	F.O.S	
Design Approach 1	Combination 1	3577	4032	1.13	Pass
	Combination 2	2650	4032	1.52	Pass

Mass Gravity Retaining Structure Design Calculation (Borrow Pit 2)



A - Information Provided

Soil Properties - Behind Wall

Layer	Thickness	Unit Weight	Friction Angle	Depth to Water table	Water Height
Layer 1	5	10.5	2	0	5
Layer 2					0
Layer 3					0
Layer 4					0

Soil Properties - Front of Wall

Layer	Thickness	Unit Weight	Friction Angle	Depth to Water table	Water Height
Layer 1	0	18	33	0	0
Layer 2					0
Layer 3					0
Layer 4					0

Wall Details

Wall Height =	5	m
Wall Width - Top (w1) =	2	m
Wall Width - Bottom (w2) =	16	m
Wall Unit Weight (γ_c) =	18	kN/m³
Total Wall Weight (W) =	810	kN/m

Additional Info

Surcharge (q) =	0	kN/m²
ϕ base =	33	degrees
Unit Weight of water (γ_w) =	9.81	kN/m³
ϕ base =	26.4	Factored

Note: Base phi is the value for the layer at the base of the wall.

B - EuroCode Information

Partial Factors on Actions

Action		A1	A2
Permanent	Unfavourable	1.35	1
	Favourable	1	1
Variable	Unfavourable	1.5	1.3
	Favourable	0	0

Partial Resistance Factors

Resistance	R1	R2	R3
Bearing	1	1.4	1
Sliding	1	1.1	1

Partial Factors for Soil Parameters

Soil Parameter	M1	M2
Angle of Shearing Resistance	1	1.25
Effective Cohesion	1	1.25
Undrained Shear Strength	1	1.4
Weight Density	1	1

Design Approaches

	Factors
Design Approach 1 - Combination 1 =	A1 + M1 + R1
Design Approach 1 - Combination 2 =	A2 + M2 + R1
Design Approach 2 =	A1 + M1 + R2
Design Approach 3 =	(A1 + A2) + M2 + R3

C - Data For Calculations

ACTIVE DATA FOR CALCULATION

Layer	Thickness - h	Unit Weight of soil (γ)	Water (m)	Depth of Unsaturated Soil within layer	Unit Weight of Water (γ_w)	Effective Stress (σ')	ϕ	Ka	
	(m)	(kN/m3)	(m)	(m)	(kN/m3)	(kN/m²)	(deg)	Factored by M1	Factored by M2
Layer 1	5	10.5	5	0	9.81	3.45	2	0.93	0.95
Layer 2	0	0	0	0	0	0	0	1.00	1.00
Layer 3	0	0	0	0	0	0	0	1.00	1.00
Layer 4	0	0	0	0	0	0	0	1.00	1.00

See figure C.1.1 of BS EN 1997-1: 2004

PASSIVE DATA FOR CALCULATION

Layer	Thickness - h	Unit Weight of soil (γ)	Water (m)	Depth of Unsaturated Soil within layer	Unit Weight of Water (γ_w)	Effective Unit Weight (γ')	ϕ	Kp	
	(m)	(kN/m3)	(m)	(m)	(kN/m3)	(kN/m3)	(deg)	Factored by M1	Factored by M2
Layer 1	0	18	0	0	0	0	33	3.39	2.60
Layer 2	0	0	0	0	0	0	0	1.00	1.00
Layer 3	0	0	0	0	0	0	0	1.00	1.00
Layer 4	0	0	0	0	0	0	0	1.00	1.00

D - Calculation of active/passive Pressures and Forces

Partial Factor M1 (Friction Angle)

Calculation of Active Pressure Behind Wall

	Surcharge (kN/m²)	Active pressure from soil (kN/m²)	Active Pressure from Upper soil layers (kN/m²)	Total Water Pressure (kN/m²)
Layer 1	0.0	3.2		
Layer 2	0.0	0.0	3.5	
Layer 3	0.0	0.0	3.5	
Layer 4	0.0	0.0	3.5	49.1

Calculation of Passive Pressure in Front of Wall

	Active pressure from soil (kN/m²)	Active Pressure from soil layers Above (kN/m²)	Total Water Pressure (kN/m²)
Layer 1	0.0		
Layer 2	0.0	0.0	
Layer 3	0.0	0.0	
Layer 4	0.0	0.0	0.0

Calculation of Active Forces Behind Wall

	Surcharge (kN/m)	Active Force from Soil (kN/m)	Active Force from Upper Soil layers (kN/m)	Water force (kN/m)	Total (kN/m)
Layer 1	0.0	8.0			
Layer 2	0.0	0.0	0.0		
Layer 3	0.0	0.0	0.0		
Layer 4	0.0	0.0	0.0	122.6	
Sum of Active Forces	0.0	8.0	0.0	122.6	130.7

Calculation of Passive Forces in Front of Wall

	Active Force from Soil (kN/m)	Active Force from Soil layer Above (kN/m)	Water force (kN/m)	Total (kN/m)
Layer 1	0.0			
Layer 2	0.0	0.0		
Layer 3	0.0	0.0		
Layer 4	0.0	0.0	0.0	
Sum of Passive Forces	0.0	0.0	0.0	0.0

Partial Factor M2 (Friction Angle)

Calculation of Active Pressure Behind Wall

	Surcharge (kN/m²)	Active pressure from soil (kN/m²)	Active Pressure from Upper soil layers (kN/m²)	Total Water Pressure (kN/m²)
Layer 1	0.0	3.3		
Layer 2	0.0	0.0	3.5	
Layer 3	0.0	0.0	3.5	
Layer 4	0.0	0.0	3.5	49.1

Calculation of Passive Pressure in Front of Wall

	Active pressure from soil (kN/m²)	Active Pressure from soil layers Above (kN/m²)	Total Water Pressure (kN/m²)
Layer 1	0.0		
Layer 2	0.0	0.0	
Layer 3	0.0	0.0	
Layer 4	0.0	0.0	0.0

Calculation of Active Forces Behind Wall

	Surcharge (kN/m)	Active Force from Soil (kN/m)	Active Force from Upper Soil layers (kN/m)	Water force (kN/m)	Total
Layer 1	0.0	8.2			
Layer 2	0.0	0.0	0.0		
Layer 3	0.0	0.0	0.0		
Layer 4	0.0	0.0	0.0	122.6	
Sum of Active Forces	0.0	8.2	0.0	122.6	130.8

Calculation of Passive Forces in Front of Wall

	Active Force from Soil (kN/m)	Active Force from Soil layer Above (kN/m)	Water force (kN/m)	Total
Layer 1	0.0			
Layer 2	0.0	0.0		
Layer 3	0.0	0.0		
Layer 4	0.0	0.0	0.0	
Sum of Passive Forces	0.0	0.0	0.0	0.0

E -Sliding at base of Wall

S = Sliding Resistance = W * tan ϕ_{base}
W = Weight of Wall
tan ϕbase = Fiction Angle between wall and soil

Weight of wall (W) =	810.0	kN
tan ϕ_{base} =	0.65	degrees (Factored M1)
	0.50	degrees (Factored M2)

F - Upthrust Water Force

Upthrust Force from Water Pressure

F_{UT}	392.4	kN/m

F - Overturning of Wall around Toe

Stabilising Moments

Moment from Structure

Wall Moment = Wall weight (W) * (Wall base width (w) / 2)	(W*(w/2)) =	6480

Destabilising Moments

1 - Uptrust Moment from Water Pressure

Upthrust Moment = U_2 moment	U_2 moment (kN/m)	4143.7

Moment Heights For Each Layer - Behind Wall

Layer	Surcharge	Soil	Surcharge from Upper Soil Layer	Water
Layer 1	2.5	1.7		
Layer 2	0.0	0.0	0.0	
Layer 3	0.0	0.0	0.0	
Layer 4	0.0	0.0	0.0	1.67

Moment Heights for Each Layer - Front of Wall

Layer Height from Base	Soil	Surcharge from Upper Soil Layer	Water
Layer 1	0.0		
Layer 2	0.0	0.0	
Layer 3	0.0	0.0	
Layer 4	0.0	0.0	0.00

2 - Soil Overturning Moment - Partial Factor M1 (Fricton Angle)

Calculation of Overturning Moment = F (active)*(H/3)

Layer Height from Base	Surcharge	Soil	Surcharge from Upper Soil Layer	Water	Total Overturning Moment
Layer 1	0.0	13.4			
Layer 2	0.0	0.0	0.0		
Layer 3	0.0	0.0	0.0		
Layer 4	0.0	0.0	0.0	204.4	
Total Overturning	0.0	13.4	0.0	204.4	217.8

Calculation of Restoring Moment = F (passive)*(H/3)

Layer Height from Base	Soil	Surcharge from Upper Soil Layer	Water	Total Restoring Moment
Layer 1	0.0			
Layer 2	0.0	0.0		
Layer 3	0.0	0.0		
Layer 4	0.0	0.0	0.0	
Total Restoring	0.0	0.0	0.0	0.0

3 - Soil Overturning Moment - Partial Factor M2 (Friction Angle)

Calculation of Overturning Moment = F (active)*(H/3)

Layer Height from Base	Surcharge	Soil	Surcharge from Upper Soil Layer	Water	Total Overturning Moment
Layer 1	0.0	13.6			
Layer 2	0.0	0.0	0.0		
Layer 3	0.0	0.0	0.0		
Layer 4	0.0	0.0	0.0	204.4	
Total Overturning	0.0	13.6	0.0	204.4	218.0

Calculation of Restoring Moment = F (passive)*(H/3)

Layer Height from Base	Soil	Surcharge from Upper Soil Layer	Water	Total Restoring Moment
Layer 1	0.0			
Layer 2	0.0	0.0		
Layer 3	0.0	0.0		
Layer 4	0.0	0.0	0.0	
Total Restoring	0.0	0.0	0.0	0.0

G - Results

A - Sliding

Disturbing ≤ Resisting

γ_{Gunfav} * Active Force + γ_{Gunfav} * Surcharge ≤ (((γ_{Gfav} * W) - (U_3 * γ_{Gunfav}))/1/γ_{Rsl}) + (Passive Force * (γ_{Gunfav}/γ_{Rsl}))

		Disturbing	Restoring	F.O.S	
Design Approach 1	Combination 1	176.40	182.0	1.03	Pass
	Combination 2	130.78	207.3	1.59	Pass

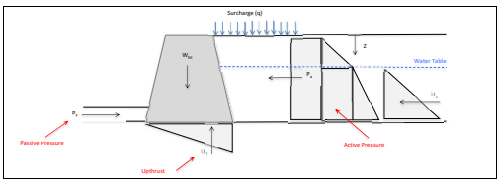
B - Overturning

Disturbing ≤ Resisting

γ_{Gunfav} * (Overturning Moment + U_2) ≤ [(γ_{Gfav} * W (w/2)) + (Passive Moment * γ_{Gunfav})]

		Disturbing	Restoring	F.O.S	
Design Approach 1	Combination 1	5888	6480	1.10	Pass
	Combination 2	4362	6480	1.49	Pass

Mass Gravity Retaining Structure Design Calculation (Borrow Pit 3)



A - Information Provided

Soil Properties - Behind Wall

Layer	Thickness	Unit Weight	Friction Angle	Depth to Water table	Water Height
Layer 1	4	10.5	2	0	4
Layer 2					0
Layer 3					0
Layer 4					0

Soil Properties - Front of Wall

Layer	Thickness	Unit Weight	Friction Angle	Depth to Water table	Water Height
Layer 1	0	18	33	0	0
Layer 2					0
Layer 3					0
Layer 4					0

Wall Details

Wall Height =	4	m
Wall Width - Top (w1) =	2	m
Wall Width - Bottom (w2) =	13	m
Wall Unit Weight (γ_c) =	18	kN/m³
Total Wall Weight (W) =	540	kN/m

Additional Info

Surcharge (q) =	0	kN/m²
ϕ base =	33	degrees
Unit Weight of water (γ_w) =	9.81	kN/m³
ϕ base =	26.4	Factored

Note: Base phi is the value for the layer at the base of the wall.

B - EuroCode Information

Partial Factors on Actions

Action		A1	A2
Permanent	Unfavourable	1.35	1
	Favourable	1	1
Variable	Unfavourable	1.5	1.3
	Favourable	0	0

Partial Resistance Factors

Resistance	R1	R2	R3
Bearing	1	1.4	1
Sliding	1	1.1	1

Partial Factors for Soil Parameters

Soil Parameter	M1	M2
Angle of Shearing Resistance	1	1.25
Effective Cohesion	1	1.25
Undrained Shear Strength	1	1.4
Weight Density	1	1

Design Approaches

	Factors
Design Approach 1 - Combination 1 =	A1 + M1 + R1
Design Approach 1 - Combination 2 =	A2 + M2 + R1
Design Approach 2 =	A1 + M1 + R2
Design Approach 3 =	(A1 + A2) + M2 + R3

C - Data For Calculations

ACTIVE DATA FOR CALCULATION

Layer	Thickness - h	Unit Weight of soil (γ)	Water (m)	Depth of Unsaturated Soil within layer	Unit Weight of Water (γ_w)	Effective Stress (γ)	ϕ	Ka	
	(m)	(kN/m3)	(m)	(m)	(kN/m3)	(kN/m²)	(ϕdeg)	Factored by M1	Factored by M2
Layer 1	4	10.5	4	0	9.81	2.76	2	0.93	0.95
Layer 2	0	0	0	0	0	0	0	1.00	1.00
Layer 3	0	0	0	0	0	0	0	1.00	1.00
Layer 4	0	0	0	0	0	0	0	1.00	1.00

See figure C.1.1 of BS EN 1997-1: 2004

PASSIVE DATA FOR CALCULATION

Layer	Thickness - h	Unit Weight of soil (γ)	Water (m)	Depth of Unsaturated Soil within layer	Unit Weight of Water (γ_w)	Effective Unit Weight (γ)	ϕ	Kp	
	(m)	(kN/m3)	(m)	(m)	(kN/m3)	(kN/m3)	(ϕdeg)	Factored by M1	Factored by M2
Layer 1	0	18	0	0	0	0	33	3.39	2.60
Layer 2	0	0	0	0	0	0	0	1.00	1.00
Layer 3	0	0	0	0	0	0	0	1.00	1.00
Layer 4	0	0	0	0	0	0	0	1.00	1.00

D - Calculation of active/passive Pressures and Forces

Partial Factor M1 (Friction Angle)

Calculation of Active Pressure Behind Wall

	Surcharge (kN/m²)	Active pressure from soil (kN/m²)	Active Pressure from Upper soil layers (kN/m²)	Total Water Pressure (kN/m²)
Layer 1	0.0	2.6		
Layer 2	0.0	0.0	2.8	
Layer 3	0.0	0.0	2.8	
Layer 4	0.0	0.0	2.8	39.2

Calculation of Passive Pressure in Front of Wall

	Active pressure from soil (kN/m²)	Active Pressure from soil layers Above (kN/m²)	Total Water Pressure (kN/m²)
Layer 1	0.0		
Layer 2	0.0	0.0	
Layer 3	0.0	0.0	
Layer 4	0.0	0.0	0.0

Calculation of Active Forces Behind Wall

	Surcharge (kN/m)	Active Force from Soil (kN/m)	Active Force from Upper Soil layers (kN/m)	Water force (kN/m)	Total (kN/m)
Layer 1	0.0	5.1			
Layer 2	0.0	0.0	0.0		
Layer 3	0.0	0.0	0.0		
Layer 4	0.0	0.0	0.0	78.5	
Sum of Active Forces	0.0	5.1	0.0	78.5	83.6

Calculation of Passive Forces in Front of Wall

	Active Force from Soil (kN/m)	Active Force from Soil layer Above (kN/m)	Water force (kN/m)	Total (kN/m)
Layer 1	0.0			
Layer 2	0.0	0.0		
Layer 3	0.0	0.0		
Layer 4	0.0	0.0	0.0	
Sum of Passive Forces	0.0	0.0	0.0	0.0

Partial Factor M2 (Friction Angle)

Calculation of Active Pressure Behind Wall

	Surcharge (kN/m²)	Active pressure from soil (kN/m²)	Active Pressure from Upper soil layers (kN/m²)	Total Water Pressure (kN/m²)
Layer 1	0.0	2.6		
Layer 2	0.0	0.0	2.8	
Layer 3	0.0	0.0	2.8	
Layer 4	0.0	0.0	2.8	39.2

Calculation of Passive Pressure in Front of Wall

	Active pressure from soil (kN/m²)	Active Pressure from soil layers Above (kN/m²)	Total Water Pressure (kN/m²)
Layer 1	0.0		
Layer 2	0.0	0.0	
Layer 3	0.0	0.0	
Layer 4	0.0	0.0	0.0

Calculation of Active Forces Behind Wall

	Surcharge (kN/m)	Active Force from Soil (kN/m)	Active Force from Upper Soil layers (kN/m)	Water force (kN/m)	Total
Layer 1	0.0	5.2			
Layer 2	0.0	0.0	0.0		
Layer 3	0.0	0.0	0.0		
Layer 4	0.0	0.0	0.0	78.5	
Sum of Active Forces	0.0	5.2	0.0	78.5	83.7

Calculation of Passive Forces in Front of Wall

	Active Force from Soil (kN/m)	Active Force from Soil layer Above (kN/m)	Water force (kN/m)	Total
Layer 1	0.0			
Layer 2	0.0	0.0		
Layer 3	0.0	0.0		
Layer 4	0.0	0.0	0.0	
Sum of Passive Forces	0.0	0.0	0.0	0.0

E -Sliding at base of Wall

S = Sliding Resistance = W * tan ϕ_{base}
W = Weight of Wall
tan ϕbase = Fiction Angle between wall and soil

Weight of wall (W) =	540.0	kN
tan ϕ_{base} =	0.65	degrees (Factored M1)
	0.50	degrees (Factored M2)

F - Upthrust Water Force

Upthrust Force from Water Pressure

F_{UT}	255.06	kN/m

F - Overturning of Wall around Toe

Stabilising Moments

Moment from Structure

Wall Moment = Wall weight (W) * (Wall base width (w) / 2)	(W*(w/2)) =	3510

Destabilising Moments

1 - Uptrust Moment from Water Pressure

Upthrust Moment = U_T moment	U_T moment (kN/m)	2188.4

Moment Heights For Each Layer - Behind Wall

Layer	Surcharge	Soil	Surcharge from Upper Soil Layer	Water
Layer 1	2.0	1.3		
Layer 2	0.0	0.0	0.0	
Layer 3	0.0	0.0	0.0	
Layer 4	0.0	0.0	0.0	1.33

Moment Heights for Each Layer - Front of Wall

Layer Height from Base	Soil	Surcharge from Upper Soil Layer	Water
Layer 1	0.0		
Layer 2	0.0	0.0	
Layer 3	0.0	0.0	
Layer 4	0.0	0.0	0.00

2 - Soil Overturning Moment - Partial Factor M1 (Fricti n Angle)

Calculation of Overturning Moment = F (active)*(H/3)

Layer Height from Base	Surcharge	Soil	Surcharge from Upper Soil Layer	Water	Total Overturning Moment
Layer 1	0.0	6.9			
Layer 2	0.0	0.0	0.0		
Layer 3	0.0	0.0	0.0		
Layer 4	0.0	0.0	0.0	104.6	
Total Overturning	0.0	6.9	0.0	104.6	111.5

Calculation of Restoring Moment = F (passive)*(H/3)

Layer Height from Base	Soil	Surcharge from Upper Soil Layer	Water	Total Restoring Moment
Layer 1	0.0			
Layer 2	0.0	0.0		
Layer 3	0.0	0.0		
Layer 4	0.0	0.0	0.0	
Total Restoring	0.0	0.0	0.0	0.0

3 - Soil Overturning Moment - Partial Factor M2 (Friction Angle)

Calculation of Overturning Moment = F (active)*(H/3)

Layer Height from Base	Surcharge	Soil	Surcharge from Upper Soil Layer	Water	Total Overturning Moment
Layer 1	0.0	7.0			
Layer 2	0.0	0.0	0.0		
Layer 3	0.0	0.0	0.0		
Layer 4	0.0	0.0	0.0	104.6	
Total Overturning	0.0	7.0	0.0	104.6	111.6

Calculation of Restoring Moment = F (passive)*(H/3)

Layer Height from Base	Soil	Surcharge from Upper Soil Layer	Water	Total Restoring Moment
Layer 1	0.0			
Layer 2	0.0	0.0		
Layer 3	0.0	0.0		
Layer 4	0.0	0.0	0.0	
Total Restoring	0.0	0.0	0.0	0.0

G - Results

A - Sliding

Disturbing ≤ Resisting

γ_{Gunfav} * Active Force + γ_{Gunfav} * Surcharge ≤ (((γ_{Gfav} * W) - (U_T * γ_{Gunfav}))/1/γ_{Rsl}) + (Passive Force * (γ_{Gunfav}/γ_{Rsl}))

		Disturbing	Restoring	F.O.S	
Design Approach 1	Combination 1	112.90	127.1	1.13	Pass
	Combination 2	83.70	141.4	1.69	Pass

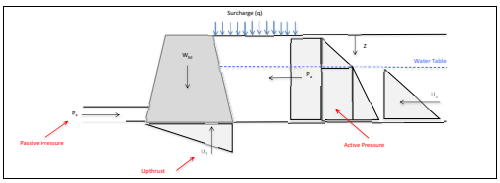
B - Overturning

Disturbing ≤ Resisting

γ_{Gunfav} * (Overturning Moment + U_T) ≤ [(γ_{Gfav} * W (w/2)) + (Passive Moment * γ_{Gunfav})]

		Disturbing	Restoring	F.O.S	
Design Approach 1	Combination 1	3105	3510	1.13	Pass
	Combination 2	2300	3510	1.53	Pass

Mass Gravity Retaining Structure Design Calculation (T8 Berm)



A - Information Provided

Soil Properties - Behind Wall

Layer	Thickness	Unit Weight	Friction Angle	Depth to Water table	Water Height
Layer 1	4	10.5	2	0	4
Layer 2					0
Layer 3					0
Layer 4					0

Soil Properties - Front of Wall

Layer	Thickness	Unit Weight	Friction Angle	Depth to Water table	Water Height
Layer 1	0	18	33	0	0
Layer 2					0
Layer 3					0
Layer 4					0

Wall Details

Wall Height =	5	m
Wall Width - Top (w1) =	5	m
Wall Width - Bottom (w2) =	17	m
Wall Unit Weight (γ_c) =	18	kN/m³
Total Wall Weight (W) =	990	kN/m

Additional Info

Surcharge (q) =	0	kN/m²
ϕ base =	33	degrees
Unit Weight of water (γ_w) =	9.81	kN/m³
ϕ base =	26.4	Factored

Note: Base phi is the value for the layer at the base of the wall.

B - EuroCode Information

Partial Factors on Actions

Action		A1	A2
Permanent	Unfavourable	1.35	1
	Favourable	1	1
Variable	Unfavourable	1.5	1.3
	Favourable	0	0

Partial Resistance Factors

Resistance	R1	R2	R3
Bearing	1	1.4	1
Sliding	1	1.1	1

Partial Factors for Soil Parameters

Soil Parameter	M1	M2
Angle of Shearing Resistance	1	1.25
Effective Cohesion	1	1.25
Undrained Shear Strength	1	1.4
Weight Density	1	1

Design Approaches

	Factors
Design Approach 1 - Combination 1 =	A1 + M1 + R1
Design Approach 1 - Combination 2 =	A2 + M2 + R1
Design Approach 2 =	A1 + M1 + R2
Design Approach 3 =	(A1 + A2) + M2 + R3

C - Data For Calculations

ACTIVE DATA FOR CALCULATION

Layer	Thickness - h	Unit Weight of soil (γ)	Water (m)	Depth of Unsaturated Soil within layer	Unit Weight of Water (γ_w)	Effective Stress (γ)	ϕ	Ka	
	(m)	(kN/m3)	(m)	(m)	(kN/m3)	(kN/m²)	(deg)	Factored by M1	Factored by M2
Layer 1	4	10.5	4	0	9.81	2.76	2	0.93	0.95
Layer 2	0	0	0	0	0	0	0	1.00	1.00
Layer 3	0	0	0	0	0	0	0	1.00	1.00
Layer 4	0	0	0	0	0	0	0	1.00	1.00

See figure C.1.1 of BS EN 1997-1: 2004

PASSIVE DATA FOR CALCULATION

Layer	Thickness - h	Unit Weight of soil (γ)	Water (m)	Depth of Unsaturated Soil within layer	Unit Weight of Water (γ_w)	Effective Unit Weight (γ)	ϕ	Kp	
	(m)	(kN/m3)	(m)	(m)	(kN/m3)	(kN/m3)	(deg)	Factored by M1	Factored by M2
Layer 1	0	18	0	0	0	0	33	3.39	2.60
Layer 2	0	0	0	0	0	0	0	1.00	1.00
Layer 3	0	0	0	0	0	0	0	1.00	1.00
Layer 4	0	0	0	0	0	0	0	1.00	1.00

D - Calculation of active/passive Pressures and Forces

Partial Factor M1 (Friction Angle)

Calculation of Active Pressure Behind Wall

	Surcharge (kN/m²)	Active pressure from soil (kN/m²)	Active Pressure from Upper soil layers (kN/m²)	Total Water Pressure (kN/m²)
Layer 1	0.0	2.6		
Layer 2	0.0	0.0	2.8	
Layer 3	0.0	0.0	2.8	
Layer 4	0.0	0.0	2.8	39.2

Calculation of Passive Pressure in Front of Wall

	Active pressure from soil (kN/m²)	Active Pressure from soil layers Above (kN/m²)	Total Water Pressure (kN/m²)
Layer 1	0.0		
Layer 2	0.0	0.0	
Layer 3	0.0	0.0	
Layer 4	0.0	0.0	0.0

Calculation of Active Forces Behind Wall

	Surcharge (kN/m)	Active Force from Soil (kN/m)	Active Force from Upper Soil layers (kN/m)	Water force (kN/m)	Total (kN/m)
Layer 1	0.0	5.1			
Layer 2	0.0	0.0	0.0		
Layer 3	0.0	0.0	0.0		
Layer 4	0.0	0.0	0.0	78.5	
Sum of Active Forces	0.0	5.1	0.0	78.5	83.6

Calculation of Passive Forces in Front of Wall

	Active Force from Soil (kN/m)	Active Force from Soil layer Above (kN/m)	Water force (kN/m)	Total (kN/m)
Layer 1	0.0			
Layer 2	0.0	0.0		
Layer 3	0.0	0.0		
Layer 4	0.0	0.0	0.0	
Sum of Passive Forces	0.0	0.0	0.0	0.0

Partial Factor M2 (Friction Angle)

Calculation of Active Pressure Behind Wall

	Surcharge (kN/m²)	Active pressure from soil (kN/m²)	Active Pressure from Upper soil layers (kN/m²)	Total Water Pressure (kN/m²)
Layer 1	0.0	2.6		
Layer 2	0.0	0.0	2.8	
Layer 3	0.0	0.0	2.8	
Layer 4	0.0	0.0	2.8	39.2

Calculation of Passive Pressure in Front of Wall

	Active pressure from soil (kN/m²)	Active Pressure from soil layers Above (kN/m²)	Total Water Pressure (kN/m²)
Layer 1	0.0		
Layer 2	0.0	0.0	
Layer 3	0.0	0.0	
Layer 4	0.0	0.0	0.0

Calculation of Active Forces Behind Wall

	Surcharge (kN/m)	Active Force from Soil (kN/m)	Active Force from Upper Soil layers (kN/m)	Water force (kN/m)	Total
Layer 1	0.0	5.2			
Layer 2	0.0	0.0	0.0		
Layer 3	0.0	0.0	0.0		
Layer 4	0.0	0.0	0.0	78.5	
Sum of Active Forces	0.0	5.2	0.0	78.5	83.7

Calculation of Passive Forces in Front of Wall

	Active Force from Soil (kN/m)	Active Force from Soil layer Above (kN/m)	Water force (kN/m)	Total
Layer 1	0.0			
Layer 2	0.0	0.0		
Layer 3	0.0	0.0		
Layer 4	0.0	0.0	0.0	
Sum of Passive Forces	0.0	0.0	0.0	0.0

E -Sliding at base of Wall

S = Sliding Resistance = W * tan ϕ_{base}
W = Weight of Wall
tan ϕbase = Fiction Angle between wall and soil

Weight of wall (W) =	990.0	kN
tan ϕ_{base} =	0.65	degrees (Factored M1)
	0.50	degrees (Factored M2)

F - Upthrust Water Force

Upthrust Force from Water Pressure

F_{UT}	416.925	kN/m

F - Overturning of Wall around Toe

Stabilising Moments

Moment from Structure

Wall Moment = Wall weight (W) * (Wall base width (w) / 2)	(W*(w/2)) =	8415

Destabilising Moments

1 - Uptrust Moment from Water Pressure

Upthrust Moment = U_T moment	U_T moment (kN/m)	4677.9

Moment Heights For Each Layer - Behind Wall

Layer	Surcharge	Soil	Surcharge from Upper Soil Layer	Water
Layer 1	2.0	1.3		
Layer 2	0.0	0.0	0.0	
Layer 3	0.0	0.0	0.0	
Layer 4	0.0	0.0	0.0	1.33

Moment Heights for Each Layer - Front of Wall

Layer Height from Base	Soil	Surcharge from Upper Soil Layer	Water
Layer 1	0.0		
Layer 2	0.0	0.0	
Layer 3	0.0	0.0	
Layer 4	0.0	0.0	0.00

2 - Soil Overturning Moment - Partial Factor M1 (Fricitn Angle)

Calculation of Overturning Moment = F (active)*(H/3)

Layer Height from Base	Surcharge	Soil	Surcharge from Upper Soil Layer	Water	Total Overturning Moment
Layer 1	0.0	6.9			
Layer 2	0.0	0.0	0.0		
Layer 3	0.0	0.0	0.0		
Layer 4	0.0	0.0	0.0	104.6	
Total Overturning	0.0	6.9	0.0	104.6	111.5

Calculation of Restoring Moment = F (passive)*(H/3)

Layer Height from Base	Soil	Surcharge from Upper Soil Layer	Water	Total Restoring Moment
Layer 1	0.0			
Layer 2	0.0	0.0		
Layer 3	0.0	0.0		
Layer 4	0.0	0.0	0.0	
Total Restoring	0.0	0.0	0.0	0.0

3 - Soil Overturning Moment - Partial Factor M2 (Friction Angle)

Calculation of Overturning Moment = F (active)*(H/3)

Layer Height from Base	Surcharge	Soil	Surcharge from Upper Soil Layer	Water	Total Overturning Moment
Layer 1	0.0	7.0			
Layer 2	0.0	0.0	0.0		
Layer 3	0.0	0.0	0.0		
Layer 4	0.0	0.0	0.0	104.6	
Total Overturning	0.0	7.0	0.0	104.6	111.6

Calculation of Restoring Moment = F (passive)*(H/3)

Layer Height from Base	Soil	Surcharge from Upper Soil Layer	Water	Total Restoring Moment
Layer 1	0.0			
Layer 2	0.0	0.0		
Layer 3	0.0	0.0		
Layer 4	0.0	0.0	0.0	
Total Restoring	0.0	0.0	0.0	0.0

G - Results

A - Sliding

Disturbing ≤ Resisting

γ_{Gunfav} * Active Force + γ_{Gunfav} * Surcharge ≤ (((γ_{Gfav} * W) - (U_T * γ_{Gunfav}))/1/γ_{Rsl}) + (Passive Force * (γ_{Gunfav}/γ_{Rsl}))

		Disturbing	Restoring	F.O.S	
Design Approach 1	Combination 1	112.90	277.4	2.46	Pass
	Combination 2	83.70	284.5	3.40	Pass

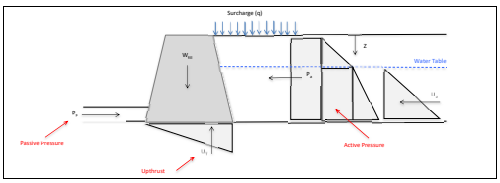
B - Overturning

Disturbing ≤ Resisting

γ_{Gunfav} * (Overturning Moment + U_T) ≤ [(γ_{Gfav} * W (w/2)) + (Passive Moment * γ_{Gunfav})]

		Disturbing	Restoring	F.O.S	
Design Approach 1	Combination 1	6466	8415	1.30	Pass
	Combination 2	4789	8415	1.76	Pass

Mass Gravity Retaining Structure Design Calculation (Peat Cell at T15)



A - Information Provided

Soil Properties - Behind Wall

Layer	Thickness	Unit Weight	Friction Angle	Depth to Water table	Water Height
Layer 1	4	10.5	2	0	4
Layer 2					0
Layer 3					0
Layer 4					0

Soil Properties - Front of Wall

Layer	Thickness	Unit Weight	Friction Angle	Depth to Water table	Water Height
Layer 1	0	18	33	0	0
Layer 2					0
Layer 3					0
Layer 4					0

Wall Details

Wall Height =	4	m
Wall Width - Top (w1) =	2	m
Wall Width - Bottom (w2) =	14	m
Wall Unit Weight (γ_c) =	18	kN/m³
Total Wall Weight (W) =	576	kN/m

Additional Info

Surcharge (q) =	0	kN/m²
ϕ base =	33	degrees
Unit Weight of water (γ_w) =	9.81	kN/m³
ϕ base =	26.4	Factored

Note: Base phi is the value for the layer at the base of the wall.

B - EuroCode Information

Partial Factors on Actions

Action		A1	A2
Permanent	Unfavourable	1.35	1
	Favourable	1	1
Variable	Unfavourable	1.5	1.3
	Favourable	0	0

Partial Resistance Factors

Resistance	R1	R2	R3
Bearing	1	1.4	1
Sliding	1	1.1	1

Partial Factors for Soil Parameters

Soil Parameter	M1	M2
Angle of Shearing Resistance	1	1.25
Effective Cohesion	1	1.25
Undrained Shear Strength	1	1.4
Weight Density	1	1

Design Approaches

	Factors
Design Approach 1 - Combination 1 =	A1 + M1 + R1
Design Approach 1 - Combination 2 =	A2 + M2 + R1
Design Approach 2 =	A1 + M1 + R2
Design Approach 3 =	(A1 + A2) + M2 + R3

C - Data For Calculations

ACTIVE DATA FOR CALCULATION

Layer	Thickness - h	Unit Weight of soil (γ)	Water (m)	Depth of Unsaturated Soil within layer	Unit Weight of Water (γ_w)	Effective Stress (γ)	ϕ	Ka	
	(m)	(kN/m3)	(m)	(m)	(kN/m3)	(kN/m²)	(ϕdeg)	Factored by M1	Factored by M2
Layer 1	4	10.5	4	0	9.81	2.76	2	0.93	0.95
Layer 2	0	0	0	0	0	0	0	1.00	1.00
Layer 3	0	0	0	0	0	0	0	1.00	1.00
Layer 4	0	0	0	0	0	0	0	1.00	1.00

See figure C.1.1 of BS EN 1997-1: 2004

PASSIVE DATA FOR CALCULATION

Layer	Thickness - h	Unit Weight of soil (γ)	Water (m)	Depth of Unsaturated Soil within layer	Unit Weight of Water (γ_w)	Effective Unit Weight (γ)	ϕ	Kp	
	(m)	(kN/m3)	(m)	(m)	(kN/m3)	(kN/m3)	(ϕdeg)	Factored by M1	Factored by M2
Layer 1	0	18	0	0	0	0	33	3.39	2.60
Layer 2	0	0	0	0	0	0	0	1.00	1.00
Layer 3	0	0	0	0	0	0	0	1.00	1.00
Layer 4	0	0	0	0	0	0	0	1.00	1.00

D - Calculation of active/passive Pressures and Forces

Partial Factor M1 (Friction Angle)

Calculation of Active Pressure Behind Wall

	Surcharge (kN/m²)	Active pressure from soil (kN/m²)	Active Pressure from Upper soil layers (kN/m²)	Total Water Pressure (kN/m²)
Layer 1	0.0	2.6		
Layer 2	0.0	0.0	2.8	
Layer 3	0.0	0.0	2.8	
Layer 4	0.0	0.0	2.8	39.2

Calculation of Passive Pressure in Front of Wall

	Active pressure from soil (kN/m²)	Active Pressure from soil layers Above (kN/m²)	Total Water Pressure (kN/m²)
Layer 1	0.0		
Layer 2	0.0	0.0	
Layer 3	0.0	0.0	
Layer 4	0.0	0.0	0.0

Calculation of Active Forces Behind Wall

	Surcharge (kN/m)	Active Force from Soil (kN/m)	Active Force from Upper Soil layers (kN/m)	Water force (kN/m)	Total (kN/m)
Layer 1	0.0	5.1			
Layer 2	0.0	0.0	0.0		
Layer 3	0.0	0.0	0.0		
Layer 4	0.0	0.0	0.0	78.5	
Sum of Active Forces	0.0	5.1	0.0	78.5	83.6

Calculation of Passive Forces in Front of Wall

	Active Force from Soil (kN/m)	Active Force from Soil layer Above (kN/m)	Water force (kN/m)	Total (kN/m)
Layer 1	0.0			
Layer 2	0.0	0.0		
Layer 3	0.0	0.0		
Layer 4	0.0	0.0	0.0	
Sum of Passive Forces	0.0	0.0	0.0	0.0

Partial Factor M2 (Friction Angle)

Calculation of Active Pressure Behind Wall

	Surcharge (kN/m²)	Active pressure from soil (kN/m²)	Active Pressure from Upper soil layers (kN/m²)	Total Water Pressure (kN/m²)
Layer 1	0.0	2.6		
Layer 2	0.0	0.0	2.8	
Layer 3	0.0	0.0	2.8	
Layer 4	0.0	0.0	2.8	39.2

Calculation of Passive Pressure in Front of Wall

	Active pressure from soil (kN/m²)	Active Pressure from soil layers Above (kN/m²)	Total Water Pressure (kN/m²)
Layer 1	0.0		
Layer 2	0.0	0.0	
Layer 3	0.0	0.0	
Layer 4	0.0	0.0	0.0

Calculation of Active Forces Behind Wall

	Surcharge (kN/m)	Active Force from Soil (kN/m)	Active Force from Upper Soil layers (kN/m)	Water force (kN/m)	Total
Layer 1	0.0	5.2			
Layer 2	0.0	0.0	0.0		
Layer 3	0.0	0.0	0.0		
Layer 4	0.0	0.0	0.0	78.5	
Sum of Active Forces	0.0	5.2	0.0	78.5	83.7

Calculation of Passive Forces in Front of Wall

	Active Force from Soil (kN/m)	Active Force from Soil layer Above (kN/m)	Water force (kN/m)	Total
Layer 1	0.0			
Layer 2	0.0	0.0		
Layer 3	0.0	0.0		
Layer 4	0.0	0.0	0.0	
Sum of Passive Forces	0.0	0.0	0.0	0.0

E -Sliding at base of Wall

S = Sliding Resistance = $W * \tan \phi_{base}$
W = Weight of Wall
$\tan \phi$base = Fiction Angle between wall and soil

Weight of wall (W) =	576.0	kN
$\tan \phi_{base}$ =	0.65	degrees (Factored M1)
	0.50	degrees (Factored M2)

F - Upthrust Water Force

Upthrust Force from Water Pressure

F_{UT}	274.68	kN/m

F - Overturning of Wall around Toe

Stabilising Moments

Moment from Structure

Wall Moment = Wall weight (W) * (Wall base width (w) / 2)	(W*(w/2)) =	4032

Destabilising Moments

1 - Uptrust Moment from Water Pressure

Upthrust Moment = U_T moment	U_T moment (kN/m)	2588.0

Moment Heights For Each Layer - Behind Wall

Layer	Surcharge	Soil	Surcharge from Upper Soil Layer	Water
Layer 1	2.0	1.3		
Layer 2	0.0	0.0	0.0	
Layer 3	0.0	0.0	0.0	
Layer 4	0.0	0.0	0.0	1.33

Moment Heights for Each Layer - Front of Wall

Layer Height from Base	Soil	Surcharge from Upper Soil Layer	Water
Layer 1	0.0		
Layer 2	0.0	0.0	
Layer 3	0.0	0.0	
Layer 4	0.0	0.0	0.00

2 - Soil Overturning Moment - Partial Factor M1 (Frictin Angle)

Calculation of Overturning Moment = F (active)*(H/3)

Layer Height from Base	Surcharge	Soil	Surcharge from Upper Soil Layer	Water	Total Overturning Moment
Layer 1	0.0	6.9			
Layer 2	0.0	0.0	0.0		
Layer 3	0.0	0.0	0.0		
Layer 4	0.0	0.0	0.0	104.6	
Total Overturning	0.0	6.9	0.0	104.6	111.5

Calculation of Restoring Moment = F (passive)*(H/3)

Layer Height from Base	Soil	Surcharge from Upper Soil Layer	Water	Total Restoring Moment
Layer 1	0.0			
Layer 2	0.0	0.0		
Layer 3	0.0	0.0		
Layer 4	0.0	0.0	0.0	
Total Restoring	0.0	0.0	0.0	0.0

3 - Soil Overturning Moment - Partial Factor M2 (Friction Angle)

Calculation of Overturning Moment = F (active)*(H/3)

Layer Height from Base	Surcharge	Soil	Surcharge from Upper Soil Layer	Water	Total Overturning Moment
Layer 1	0.0	7.0			
Layer 2	0.0	0.0	0.0		
Layer 3	0.0	0.0	0.0		
Layer 4	0.0	0.0	0.0	104.6	
Total Overturning	0.0	7.0	0.0	104.6	111.6

Calculation of Restoring Moment = F (passive)*(H/3)

Layer Height from Base	Soil	Surcharge from Upper Soil Layer	Water	Total Restoring Moment
Layer 1	0.0			
Layer 2	0.0	0.0		
Layer 3	0.0	0.0		
Layer 4	0.0	0.0	0.0	
Total Restoring	0.0	0.0	0.0	0.0

G - Results

A - Sliding

Disturbing ≤ Resisting

γ_{Gunfav} * Active Force + γ_{Gunfav} * Surcharge ≤ (((γ_{Gfav} * W) - (U_T * γ_{Gunfav}))/1/γ_{Rsl}) + (Passive Force * (γ_{Gunfav}/γ_{Rsl}))

		Disturbing	Restoring	F.O.S	
Design Approach 1	Combination 1	112.90	133.2	1.18	Pass
	Combination 2	83.70	149.6	1.79	Pass

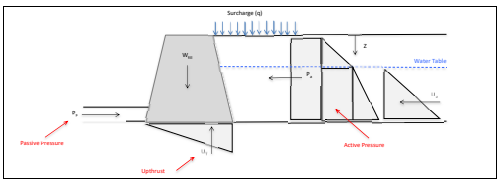
B - Overturning

Disturbing ≤ Resisting

γ_{Gunfav} * (Overturning Moment + U_T) ≤ [(γ_{Gfav} * W (w/2)) + (Passive Moment * γ_{Gunfav})]

		Disturbing	Restoring	F.O.S	
Design Approach 1	Combination 1	3577	4032	1.13	Pass
	Combination 2	2650	4032	1.52	Pass

Mass Gravity Retaining Structure Design Calculation (Peat Cell at T17)



A - Information Provided

Soil Properties - Behind Wall					
Layer	Thickness	Unit Weight	Friction Angle	Depth to Water table	Water Height
Layer 1	4.5	10.5	2	0	4.5
Layer 2					0
Layer 3					0
Layer 4					0

Soil Properties - Front of Wall					
Layer	Thickness	Unit Weight	Friction Angle	Depth to Water table	Water Height
Layer 1	0	18	33	0	0
Layer 2					0
Layer 3					0
Layer 4					0

Wall Details		
Wall Height =	4.5	m
Wall Width - Top (w1) =	2	m
Wall Width - Bottom (w2) =	14	m
Wall Unit Weight (γ) =	18	kN/m³
Total Wall Weight (W) =	648	kN/m

Additional Info		
Surcharge (q) =	0	kN/m²
ϕ base =	33	degrees
Unit Weight of water (γ_w) =	9.81	kN/m³
ϕ base =	26.4	Factored

Note: Base phi is the value for the layer at the base of the wall.

B - EuroCode Information

Partial Factors on Actions			
Action		A1	A2
Permanent	Unfavourable	1.35	1
	Favourable	1	1
Variable	Unfavourable	1.5	1.3
	Favourable	0	0

Partial Resistance Factors			
Resistance	R1	R2	R3
Bearing	1	1.4	1
Sliding	1	1.1	1

Partial Factors for Soil Parameters		
Soil Parameter	M1	M2
Angle of Shearing Resistance	1	1.25
Effective Cohesion	1	1.25
Undrained Shear Strength	1	1.4
Weight Density	1	1

Design Approaches	Factors
Design Approach 1 - Combination 1 =	A1 + M1 + R1
Design Approach 1 - Combination 2 =	A2 + M2 + R1
Design Approach 2 =	A1 + M1 + R2
Design Approach 3 =	(A1 + A2) + M2 + R3

C - Data For Calculations

ACTIVE DATA FOR CALCULATION

Layer	Thickness - h	Unit Weight of soil (γ)	Water (m)	Depth of Unsaturated Soil within layer	Unit Weight of Water (γ)	Effective Stress (γ)	ϕ	Ka	
	(m)	(kN/m3)	(m)	(m)	(kN/m3)	(kN/m²)	(deg)	Factored by M1	Factored by M2
Layer 1	4.5	10.5	4.5	0	9.81	3.105	2	0.93	0.95
Layer 2	0	0	0	0	0	0	0	1.00	1.00
Layer 3	0	0	0	0	0	0	0	1.00	1.00
Layer 4	0	0	0	0	0	0	0	1.00	1.00

See figure C.1.1 of BS EN 1997-1: 2004

PASSIVE DATA FOR CALCULATION

Layer	Thickness - h	Unit Weight of soil (γ)	Water (m)	Depth of Unsaturated Soil within layer	Unit Weight of Water (γ)	Effective Unit Weight (γ)	ϕ	Kp	
	(m)	(kN/m3)	(m)	(m)	(kN/m3)	(kN/m3)	(deg)	Factored by M1	Factored by M2
Layer 1	0	18	0	0	0	0	33	3.39	2.60
Layer 2	0	0	0	0	0	0	0	1.00	1.00
Layer 3	0	0	0	0	0	0	0	1.00	1.00
Layer 4	0	0	0	0	0	0	0	1.00	1.00

D - Calculation of active/passive Pressures and Forces

Partial Factor M1 (Friction Angle)

Calculation of Active Pressure Behind Wall

	Surcharge (kN/m²)	Active pressure from soil (kN/m²)	Active Pressure from Upper soil layers (kN/m²)	Total Water Pressure (kN/m²)
Layer 1	0.0	2.9		
Layer 2	0.0	0.0	3.1	
Layer 3	0.0	0.0	3.1	
Layer 4	0.0	0.0	3.1	44.1

Calculation of Passive Pressure in Front of Wall

	Active pressure from soil (kN/m²)	Active Pressure from soil layers Above (kN/m²)	Total Water Pressure (kN/m²)
Layer 1	0.0		
Layer 2	0.0	0.0	
Layer 3	0.0	0.0	
Layer 4	0.0	0.0	0.0

Calculation of Active Forces Behind Wall

	Surcharge (kN/m)	Active Force from Soil (kN/m)	Active Force from Upper Soil layers (kN/m)	Water force (kN/m)	Total (kN/m)
Layer 1	0.0	6.5			
Layer 2	0.0	0.0	0.0		
Layer 3	0.0	0.0	0.0		
Layer 4	0.0	0.0	0.0	99.3	
Sum of Active Forces	0.0	6.5	0.0	99.3	105.8

Calculation of Passive Forces in Front of Wall

	Active Force from Soil (kN/m)	Active Force from Soil layer Above (kN/m)	Water force (kN/m)	Total (kN/m)
Layer 1	0.0			
Layer 2	0.0	0.0		
Layer 3	0.0	0.0		
Layer 4	0.0	0.0	0.0	
Sum of Passive Forces	0.0	0.0	0.0	0.0

Partial Factor M2 (Friction Angle)

Calculation of Active Pressure Behind Wall

	Surcharge (kN/m²)	Active pressure from soil (kN/m²)	Active Pressure from Upper soil layers (kN/m²)	Total Water Pressure (kN/m²)
Layer 1	0.0	2.9		
Layer 2	0.0	0.0	3.1	
Layer 3	0.0	0.0	3.1	
Layer 4	0.0	0.0	3.1	44.1

Calculation of Passive Pressure in Front of Wall

	Active pressure from soil (kN/m²)	Active Pressure from soil layers Above (kN/m²)	Total Water Pressure (kN/m²)
Layer 1	0.0		
Layer 2	0.0	0.0	
Layer 3	0.0	0.0	
Layer 4	0.0	0.0	0.0

Calculation of Active Forces Behind Wall

	Surcharge (kN/m)	Active Force from Soil (kN/m)	Active Force from Upper Soil layers (kN/m)	Water force (kN/m)	Total
Layer 1	0.0	6.6			
Layer 2	0.0	0.0	0.0		
Layer 3	0.0	0.0	0.0		
Layer 4	0.0	0.0	0.0	99.3	
Sum of Active Forces	0.0	6.6	0.0	99.3	105.9

Calculation of Passive Forces in Front of Wall

	Active Force from Soil (kN/m)	Active Force from Soil layer Above (kN/m)	Water force (kN/m)	Total
Layer 1	0.0			
Layer 2	0.0	0.0		
Layer 3	0.0	0.0		
Layer 4	0.0	0.0	0.0	
Sum of Passive Forces	0.0	0.0	0.0	0.0

E -Sliding at base of Wall

S = Sliding Resistance = W * tan ϕ_{base}
W = Weight of Wall
tan ϕbase = Fiction Angle between wall and soil

Weight of wall (W) =	648.0	kN
tan ϕ_{base} =	0.65	degrees (Factored M1)
	0.50	degrees (Factored M2)

F - Upthrust Water Force

Upthrust Force from Water Pressure

F_{UT}	309.015	kN/m

F - Overturning of Wall around Toe

Stabilising Moments

Moment from Structure

Wall Moment = Wall weight (W) * (Wall base width (w) / 2)	(W*(w/2)) =	4536

Destabilising Moments

1 - Uptrust Moment from Water Pressure

Upthrust Moment = U_T moment	U_T moment (kN/m)	2855.3

Moment Heights For Each Layer - Behind Wall

Layer	Surcharge	Soil	Surcharge from Upper Soil Layer	Water
Layer 1	2.3	1.5		
Layer 2	0.0	0.0	0.0	
Layer 3	0.0	0.0	0.0	
Layer 4	0.0	0.0	0.0	1.50

Moment Heights for Each Layer - Front of Wall

Layer Height from Base	Soil	Surcharge from Upper Soil Layer	Water
Layer 1	0.0		
Layer 2	0.0	0.0	
Layer 3	0.0	0.0	
Layer 4	0.0	0.0	0.00

2 - Soil Overturning Moment - Partial Factor M1 (Frictin Angle)

Calculation of Overturning Moment = F (active)*(H/3)

Layer Height from Base	Surcharge	Soil	Surcharge from Upper Soil Layer	Water	Total Overturning Moment
Layer 1	0.0	9.8			
Layer 2	0.0	0.0	0.0		
Layer 3	0.0	0.0	0.0		
Layer 4	0.0	0.0	0.0	149.0	
Total Overturning	0.0	9.8	0.0	149.0	158.8

Calculation of Restoring Moment = F (passive)*(H/3)

Layer Height from Base	Soil	Surcharge from Upper Soil Layer	Water	Total Restoring Moment
Layer 1	0.0			
Layer 2	0.0	0.0		
Layer 3	0.0	0.0		
Layer 4	0.0	0.0	0.0	
Total Restoring	0.0	0.0	0.0	0.0

3 - Soil Overturning Moment - Partial Factor M2 (Friction Angle)

Calculation of Overturning Moment = F (active)*(H/3)

Layer Height from Base	Surcharge	Soil	Surcharge from Upper Soil Layer	Water	Total Overturning Moment
Layer 1	0.0	9.9			
Layer 2	0.0	0.0	0.0		
Layer 3	0.0	0.0	0.0		
Layer 4	0.0	0.0	0.0	149.0	
Total Overturning	0.0	9.9	0.0	149.0	158.9

Calculation of Restoring Moment = F (passive)*(H/3)

Layer Height from Base	Soil	Surcharge from Upper Soil Layer	Water	Total Restoring Moment
Layer 1	0.0			
Layer 2	0.0	0.0		
Layer 3	0.0	0.0		
Layer 4	0.0	0.0	0.0	
Total Restoring	0.0	0.0	0.0	0.0

G - Results

A - Sliding

Disturbing ≤ Resisting

γ_{Gunfav} * Active Force + γ_{Gunfav} * Surcharge ≤ (((γ_{Gfav} * W) - (U_T * γ_{Gunfav}))/1/$\gamma_{R,h}$) + (Passive Force * (γ_{Gunfav}/$\gamma_{R,h}$))

		Disturbing	Restoring	F.O.S	
Design Approach 1	Combination 1	142.89	149.9	1.05	Pass
	Combination 2	105.93	168.3	1.59	Pass

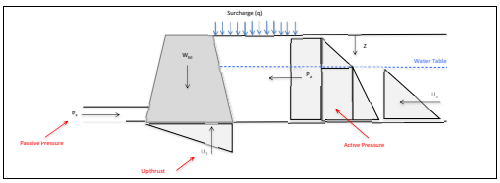
B - Overturning

Disturbing ≤ Resisting

γ_{Gunfav} * (Overturning Moment + U_T) ≤ [(γ_{Gfav} * W (w/2)) + (Passive Moment * γ_{Gunfav})]

		Disturbing	Restoring	F.O.S	
Design Approach 1	Combination 1	4069	4536	1.11	Pass
	Combination 2	3014	4536	1.50	Pass

Mass Gravity Retaining Structure Design Calculation (T7 - Wall 3)



A - Information Provided

Soil Properties - Behind Wall

Layer	Thickness	Unit Weight	Friction Angle	Depth to Water table	Water Height
Layer 1	3.5	10.5	2	0	3.5
Layer 2					0
Layer 3					0
Layer 4					0

Soil Properties - Front of Wall

Layer	Thickness	Unit Weight	Friction Angle	Depth to Water table	Water Height
Layer 1	0	18	33	0	0
Layer 2					0
Layer 3					0
Layer 4					0

Wall Details

Wall Height =	4	m
Wall Width - Top (w1) =	6	m
Wall Width - Bottom (w2) =	14	m
Wall Unit Weight (γ_c) =	20	kN/m³
Total Wall Weight (W) =	800	kN/m

Additional Info

Surcharge (q) =	0	kN/m²
ϕ base =	33	degrees
Unit Weight of water (γ_w) =	9.81	kN/m³
ϕ base =	26.4	Factored

Note: Base phi is the value for the layer at the base of the wall.

B - EuroCode Information

Partial Factors on Actions

Action		A1	A2
Permanent	Unfavourable	1.35	1
	Favourable	1	1
Variable	Unfavourable	1.5	1.3
	Favourable	0	0

Partial Resistance Factors

Resistance	R1	R2	R3
Bearing	1	1.4	1
Sliding	1	1.1	1

Partial Factors for Soil Parameters

Soil Parameter	M1	M2
Angle of Shearing Resistance	1	1.25
Effective Cohesion	1	1.25
Undrained Shear Strength	1	1.4
Weight Density	1	1

Design Approaches

	Factors
Design Approach 1 - Combination 1 =	A1 + M1 + R1
Design Approach 1 - Combination 2 =	A2 + M2 + R1
Design Approach 2 =	A1 + M1 + R2
Design Approach 3 =	(A1 + A2) + M2 + R3

C - Data For Calculations

ACTIVE DATA FOR CALCULATION

Layer	Thickness - h	Unit Weight of soil (γ)	Water (m)	Depth of Unsaturated Soil within layer	Unit Weight of Water (γ_w)	Effective Stress (γ)	ϕ	Ka	
	(m)	(kN/m3)	(m)	(m)	(kN/m3)	(kN/m²)	(ϕdeg)	Factored by M1	Factored by M2
Layer 1	3.5	10.5	3.5	0	9.81	2.415	2	0.93	0.95
Layer 2	0	0	0	0	0	0	0	1.00	1.00
Layer 3	0	0	0	0	0	0	0	1.00	1.00
Layer 4	0	0	0	0	0	0	0	1.00	1.00

See figure C.1.1 of BS EN 1997-1: 2004

PASSIVE DATA FOR CALCULATION

Layer	Thickness - h	Unit Weight of soil (γ)	Water (m)	Depth of Unsaturated Soil within layer	Unit Weight of Water (γ_w)	Effective Unit Weight (γ)	ϕ	Kp	
	(m)	(kN/m3)	(m)	(m)	(kN/m3)	(kN/m3)	(ϕdeg)	Factored by M1	Factored by M2
Layer 1	0	18	0	0	0	0	33	3.39	2.60
Layer 2	0	0	0	0	0	0	0	1.00	1.00
Layer 3	0	0	0	0	0	0	0	1.00	1.00
Layer 4	0	0	0	0	0	0	0	1.00	1.00

D - Calculation of active/passive Pressures and Forces

Partial Factor M1 (Friction Angle)

Calculation of Active Pressure Behind Wall

	Surcharge (kN/m²)	Active pressure from soil (kN/m²)	Active Pressure from Upper soil layers (kN/m²)	Total Water Pressure (kN/m²)
Layer 1	0.0	2.3		
Layer 2	0.0	0.0	2.4	
Layer 3	0.0	0.0	2.4	
Layer 4	0.0	0.0	2.4	34.3

Calculation of Passive Pressure in Front of Wall

	Active pressure from soil (kN/m²)	Active Pressure from soil layers Above (kN/m²)	Total Water Pressure (kN/m²)
Layer 1	0.0		
Layer 2	0.0	0.0	
Layer 3	0.0	0.0	
Layer 4	0.0	0.0	0.0

Calculation of Active Forces Behind Wall

	Surcharge (kN/m)	Active Force from Soil (kN/m)	Active Force from Upper Soil layers (kN/m)	Water force (kN/m)	Total (kN/m)
Layer 1	0.0	3.9			
Layer 2	0.0	0.0	0.0		
Layer 3	0.0	0.0	0.0		
Layer 4	0.0	0.0	0.0	60.1	
Sum of Active Forces	0.0	3.9	0.0	60.1	64.0

Calculation of Passive Forces in Front of Wall

	Active Force from Soil (kN/m)	Active Force from Soil layer Above (kN/m)	Water force (kN/m)	Total (kN/m)
Layer 1	0.0			
Layer 2	0.0	0.0		
Layer 3	0.0	0.0		
Layer 4	0.0	0.0	0.0	
Sum of Passive Forces	0.0	0.0	0.0	0.0

Partial Factor M2 (Friction Angle)

Calculation of Active Pressure Behind Wall

	Surcharge (kN/m²)	Active pressure from soil (kN/m²)	Active Pressure from Upper soil layers (kN/m²)	Total Water Pressure (kN/m²)
Layer 1	0.0	2.3		
Layer 2	0.0	0.0	2.4	
Layer 3	0.0	0.0	2.4	
Layer 4	0.0	0.0	2.4	34.3

Calculation of Passive Pressure in Front of Wall

	Active pressure from soil (kN/m²)	Active Pressure from soil layers Above (kN/m²)	Total Water Pressure (kN/m²)
Layer 1	0.0		
Layer 2	0.0	0.0	
Layer 3	0.0	0.0	
Layer 4	0.0	0.0	0.0

Calculation of Active Forces Behind Wall

	Surcharge (kN/m)	Active Force from Soil (kN/m)	Active Force from Upper Soil layers (kN/m)	Water force (kN/m)	Total
Layer 1	0.0	4.0			
Layer 2	0.0	0.0	0.0		
Layer 3	0.0	0.0	0.0		
Layer 4	0.0	0.0	0.0	60.1	
Sum of Active Forces	0.0	4.0	0.0	60.1	64.1

Calculation of Passive Forces in Front of Wall

	Active Force from Soil (kN/m)	Active Force from Soil layer Above (kN/m)	Water force (kN/m)	Total
Layer 1	0.0			
Layer 2	0.0	0.0		
Layer 3	0.0	0.0		
Layer 4	0.0	0.0	0.0	
Sum of Passive Forces	0.0	0.0	0.0	0.0

E -Sliding at base of Wall

S = Sliding Resistance = W * tan ϕ_{base}
W = Weight of Wall
tan ϕbase = Fiction Angle between wall and soil

Weight of wall (W) =	800.0	kN
tan ϕ_{base} =	0.65	degrees (Factored M1)
	0.50	degrees (Factored M2)

F - Upthrust Water Force

Upthrust Force from Water Pressure

F_{UT}	274.68	kN/m

F - Overturning of Wall around Toe

Stabilising Moments

Moment from Structure

Wall Moment = Wall weight (W) * (Wall base width (w) / 2)	(W*(w/2)) =	5600

Destabilising Moments

1 - Uptrust Moment from Water Pressure

Upthrust Moment = U_T moment	U_T moment (kN/m)	2538.0

Moment Heights For Each Layer - Behind Wall

Layer	Surcharge	Soil	Surcharge from Upper Soil Layer	Water
Layer 1	1.8	1.2		
Layer 2	0.0	0.0	0.0	
Layer 3	0.0	0.0	0.0	
Layer 4	0.0	0.0	0.0	1.17

Moment Heights for Each Layer - Front of Wall

Layer Height from Base	Soil	Surcharge from Upper Soil Layer	Water
Layer 1	0.0		
Layer 2	0.0	0.0	
Layer 3	0.0	0.0	
Layer 4	0.0	0.0	0.00

2 - Soil Overturning Moment - Partial Factor M1 (Fricton Angle)

Calculation of Overturning Moment = F (active)*(H/3)

Layer Height from Base	Surcharge	Soil	Surcharge from Upper Soil Layer	Water	Total Overturning Moment
Layer 1	0.0	4.6			
Layer 2	0.0	0.0	0.0		
Layer 3	0.0	0.0	0.0		
Layer 4	0.0	0.0	0.0	70.1	
Total Overturning	0.0	4.6	0.0	70.1	74.7

Calculation of Restoring Moment = F (passive)*(H/3)

Layer Height from Base	Soil	Surcharge from Upper Soil Layer	Water	Total Restoring Moment
Layer 1	0.0			
Layer 2	0.0	0.0		
Layer 3	0.0	0.0		
Layer 4	0.0	0.0	0.0	
Total Restoring	0.0	0.0	0.0	0.0

3 - Soil Overturning Moment - Partial Factor M2 (Friction Angle)

Calculation of Overturning Moment = F (active)*(H/3)

Layer Height from Base	Surcharge	Soil	Surcharge from Upper Soil Layer	Water	Total Overturning Moment
Layer 1	0.0	4.7			
Layer 2	0.0	0.0	0.0		
Layer 3	0.0	0.0	0.0		
Layer 4	0.0	0.0	0.0	70.1	
Total Overturning	0.0	4.7	0.0	70.1	74.8

Calculation of Restoring Moment = F (passive)*(H/3)

Layer Height from Base	Soil	Surcharge from Upper Soil Layer	Water	Total Restoring Moment
Layer 1	0.0			
Layer 2	0.0	0.0		
Layer 3	0.0	0.0		
Layer 4	0.0	0.0	0.0	
Total Restoring	0.0	0.0	0.0	0.0

G - Results

A - Sliding

Disturbing ≤ Resisting

γ_{Gunfav} * Active Force + γ_{Gunfav} * Surcharge ≤ (((γ_{Gfav} * W) - (U_T * γ_{Gunfav}))/1/γ_{Rsl}) + (Passive Force * (γ_{Gunfav}/γ_{Rsl}))

		Disturbing	Restoring	F.O.S	
Design Approach 1	Combination 1	86.44	278.7	3.22	Pass
	Combination 2	64.08	260.8	4.07	Pass

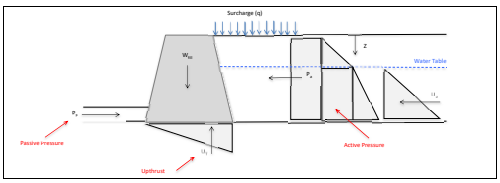
B - Overturning

Disturbing ≤ Resisting

γ_{Gunfav} * (Overturning Moment + U_T) ≤ [(γ_{Gfav} * W (w/2)) + (Passive Moment * γ_{Gunfav})]

		Disturbing	Restoring	F.O.S	
Design Approach 1	Combination 1	3527	5600	1.59	Pass
	Combination 2	2613	5600	2.14	Pass

Mass Gravity Retaining Structure Design Calculation (T9 Wall 1)



A - Information Provided

Soil Properties - Behind Wall

Layer	Thickness	Unit Weight	Friction Angle	Depth to Water table	Water Height
Layer 1	4	10.5	0	0	4
Layer 2					0
Layer 3					0
Layer 4					0

Soil Properties - Front of Wall

Layer	Thickness	Unit Weight	Friction Angle	Depth to Water table	Water Height
Layer 1	0	18	33	0	0
Layer 2					0
Layer 3					0
Layer 4					0

Wall Details

Wall Height =	4.5	m
Wall Width - Top (w1) =	4	m
Wall Width - Bottom (w2) =	16	m
Wall Unit Weight (γ_c) =	20	kN/m³
Total Wall Weight (W) =	900	kN/m

Additional Info

Surcharge (q) =	0	kN/m²
ϕ base =	33	degrees
Unit Weight of water (γ_w) =	9.81	kN/m³
ϕ base =	26.4	Factored

Note: Base phi is the value for the layer at the base of the wall.

B - EuroCode Information

Partial Factors on Actions

Action		A1	A2
Permanent	Unfavourable	1.35	1
	Favourable	1	1
Variable	Unfavourable	1.5	1.3
	Favourable	0	0

Partial Resistance Factors

Resistance	R1	R2	R3
Bearing	1	1.4	1
Sliding	1	1.1	1

Partial Factors for Soil Parameters

Soil Parameter	M1	M2
Angle of Shearing Resistance	1	1.25
Effective Cohesion	1	1.25
Undrained Shear Strength	1	1.4
Weight Density	1	1

Design Approaches

	Factors
Design Approach 1 - Combination 1 =	A1 + M1 + R1
Design Approach 1 - Combination 2 =	A2 + M2 + R1
Design Approach 2 =	A1 + M1 + R2
Design Approach 3 =	(A1 + A2) + M2 + R3

C - Data For Calculations

ACTIVE DATA FOR CALCULATION

Layer	Thickness - h	Unit Weight of soil (γ)	Water (m)	Depth of Unsaturated Soil within layer	Unit Weight of Water (γ)	Effective Stress (γ)	ϕ	Ka	
	(m)	(kN/m3)	(m)	(m)	(kN/m3)	(kN/m²)	(deg)	Factored by M1	Factored by M2
Layer 1	4	10.5	4	0	9.81	2.76	0	1.00	1.00
Layer 2	0	0	0	0	0	0	0	1.00	1.00
Layer 3	0	0	0	0	0	0	0	1.00	1.00
Layer 4	0	0	0	0	0	0	0	1.00	1.00

See figure C.1.1 of BS EN 1997-1: 2004

PASSIVE DATA FOR CALCULATION

Layer	Thickness - h	Unit Weight of soil (γ)	Water (m)	Depth of Unsaturated Soil within layer	Unit Weight of Water (γ)	Effective Unit Weight (γ)	ϕ	Kp	
	(m)	(kN/m3)	(m)	(m)	(kN/m3)	(kN/m3)	(deg)	Factored by M1	Factored by M2
Layer 1	0	18	0	0	0	0	33	3.39	2.60
Layer 2	0	0	0	0	0	0	0	1.00	1.00
Layer 3	0	0	0	0	0	0	0	1.00	1.00
Layer 4	0	0	0	0	0	0	0	1.00	1.00

D - Calculation of active/passive Pressures and Forces

Partial Factor M1 (Friction Angle)

Calculation of Active Pressure Behind Wall

	Surcharge (kN/m²)	Active pressure from soil (kN/m²)	Active Pressure from Upper soil layers (kN/m²)	Total Water Pressure (kN/m²)
Layer 1	0.0	2.8		
Layer 2	0.0	0.0	2.8	
Layer 3	0.0	0.0	2.8	
Layer 4	0.0	0.0	2.8	39.2

Calculation of Passive Pressure in Front of Wall

	Active pressure from soil (kN/m²)	Active Pressure from soil layers Above (kN/m²)	Total Water Pressure (kN/m²)
Layer 1	0.0		
Layer 2	0.0	0.0	
Layer 3	0.0	0.0	
Layer 4	0.0	0.0	0.0

Calculation of Active Forces Behind Wall

	Surcharge (kN/m)	Active Force from Soil (kN/m)	Active Force from Upper Soil layers (kN/m)	Water force (kN/m)	Total (kN/m)
Layer 1	0.0	5.5			
Layer 2	0.0	0.0	0.0		
Layer 3	0.0	0.0	0.0		
Layer 4	0.0	0.0	0.0	78.5	
Sum of Active Forces	0.0	5.5	0.0	78.5	84.0

Calculation of Passive Forces in Front of Wall

	Active Force from Soil (kN/m)	Active Force from Soil layer Above (kN/m)	Water force (kN/m)	Total (kN/m)
Layer 1	0.0			
Layer 2	0.0	0.0		
Layer 3	0.0	0.0		
Layer 4	0.0	0.0	0.0	
Sum of Passive Forces	0.0	0.0	0.0	0.0

Partial Factor M2 (Friction Angle)

Calculation of Active Pressure Behind Wall

	Surcharge (kN/m²)	Active pressure from soil (kN/m²)	Active Pressure from Upper soil layers (kN/m²)	Total Water Pressure (kN/m²)
Layer 1	0.0	2.8		
Layer 2	0.0	0.0	2.8	
Layer 3	0.0	0.0	2.8	
Layer 4	0.0	0.0	2.8	39.2

Calculation of Passive Pressure in Front of Wall

	Active pressure from soil (kN/m²)	Active Pressure from soil layers Above (kN/m²)	Total Water Pressure (kN/m²)
Layer 1	0.0		
Layer 2	0.0	0.0	
Layer 3	0.0	0.0	
Layer 4	0.0	0.0	0.0

Calculation of Active Forces Behind Wall

	Surcharge (kN/m)	Active Force from Soil (kN/m)	Active Force from Upper Soil layers (kN/m)	Water force (kN/m)	Total
Layer 1	0.0	5.5			
Layer 2	0.0	0.0	0.0		
Layer 3	0.0	0.0	0.0		
Layer 4	0.0	0.0	0.0	78.5	
Sum of Active Forces	0.0	5.5	0.0	78.5	84.0

Calculation of Passive Forces in Front of Wall

	Active Force from Soil (kN/m)	Active Force from Soil layer Above (kN/m)	Water force (kN/m)	Total
Layer 1	0.0			
Layer 2	0.0	0.0		
Layer 3	0.0	0.0		
Layer 4	0.0	0.0	0.0	
Sum of Passive Forces	0.0	0.0	0.0	0.0

E -Sliding at base of Wall

S = Sliding Resistance = W * tan ϕ_{base}
W = Weight of Wall
tan ϕbase = Fiction Angle between wall and soil

Weight of wall (W) =	900.0	kN
tan ϕ_{base} =	0.65	degrees (Factored M1)
	0.50	degrees (Factored M2)

F - Upthrust Water Force

Upthrust Force from Water Pressure

F_{UT}	353.16	kN/m

F - Overturning of Wall around Toe

Stabilising Moments

Moment from Structure

Wall Moment = Wall weight (W) * (Wall base width (w) / 2)	(W*(w/2)) =	7200

Destabilising Moments

1 - Uptrust Moment from Water Pressure

Upthrust Moment = U_2 moment	U_2 moment (kN/m)	3729.4

Moment Heights For Each Layer - Behind Wall

Layer	Surcharge	Soil	Surcharge from Upper Soil Layer	Water
Layer 1	2.0	1.3		
Layer 2	0.0	0.0	0.0	
Layer 3	0.0	0.0	0.0	
Layer 4	0.0	0.0	0.0	1.33

Moment Heights for Each Layer - Front of Wall

Layer Height from Base	Soil	Surcharge from Upper Soil Layer	Water
Layer 1	0.0		
Layer 2	0.0	0.0	
Layer 3	0.0	0.0	
Layer 4	0.0	0.0	0.00

2 - Soil Overturning Moment - Partial Factor M1 (Fricitn Angle)

Calculation of Overturning Moment = F (active)*(H/3)

Layer Height from Base	Surcharge	Soil	Surcharge from Upper Soil Layer	Water	Total Overturning Moment
Layer 1	0.0	7.4			
Layer 2	0.0	0.0	0.0		
Layer 3	0.0	0.0	0.0		
Layer 4	0.0	0.0	0.0	104.6	
Total Overturning	0.0	7.4	0.0	104.6	112.0

Calculation of Restoring Moment = F (passive)*(H/3)

Layer Height from Base	Soil	Surcharge from Upper Soil Layer	Water	Total Restoring Moment
Layer 1	0.0			
Layer 2	0.0	0.0		
Layer 3	0.0	0.0		
Layer 4	0.0	0.0	0.0	
Total Restoring	0.0	0.0	0.0	0.0

3 - Soil Overturning Moment - Partial Factor M2 (Friction Angle)

Calculation of Overturning Moment = F (active)*(H/3)

Layer Height from Base	Surcharge	Soil	Surcharge from Upper Soil Layer	Water	Total Overturning Moment
Layer 1	0.0	7.4			
Layer 2	0.0	0.0	0.0		
Layer 3	0.0	0.0	0.0		
Layer 4	0.0	0.0	0.0	104.6	
Total Overturning	0.0	7.4	0.0	104.6	112.0

Calculation of Restoring Moment = F (passive)*(H/3)

Layer Height from Base	Soil	Surcharge from Upper Soil Layer	Water	Total Restoring Moment
Layer 1	0.0			
Layer 2	0.0	0.0		
Layer 3	0.0	0.0		
Layer 4	0.0	0.0	0.0	
Total Restoring	0.0	0.0	0.0	0.0

G - Results

A - Sliding

Disturbing ≤ Resisting

γ_{Gunfav} * Active Force + γ_{Gunfav} * Surcharge ≤ (((γ_{Gfav} * W) - (U_3 * γ_{Gunfav}))/1/$\gamma_{R,h}$) + (Passive Force * (γ_{Gunfav}/$\gamma_{R,h}$))

		Disturbing	Restoring	F.O.S	
Design Approach 1	Combination 1	113.40	274.9	2.42	Pass
	Combination 2	84.00	271.5	3.23	Pass

B - Overturning

Disturbing ≤ Resisting

γ_{Gunfav} * (Overturning Moment + U_2) ≤ [(γ_{Gfav} * W (w/2)) + (Passive Moment * γ_{Gunfav})]

		Disturbing	Restoring	F.O.S	
Design Approach 1	Combination 1	5186	7200	1.39	Pass
	Combination 2	3841	7200	1.87	Pass

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APPENDIX F

Site Visit Photos 2024/2025



View North along Main Spine Road



View West along founded access road between T11 and T12



Looking south at section of floating road at Junction to T01 and T04



Section of Floating Road to T04



Founded Road between T05 and T06



View North along access road to T10



View of hardstand at T11



Turbine base and hardstand, T14



View of berm at Peat Cell at Substation



Berm and Peat Cell at Borrow Pit 1



Borrow Pit 1, looking west



Borrow Pit 2



Peat Cell at T15, with berm on RHS



Peat Cell and Berm at T17



View of head of peat failure along access road to T7 and stabilising berm

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