Parc Ynni Calon y Gwynt

APPENDIX 10C: PEAT LANDSLIDE HAZARD AND RISK ASSESSMENT

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EXECUTIVE SUMMARY

This Peat Landslide Hazard and Risk Assessment (PLHRA) has been prepared by WSP to inform the Environmental Statement for Parc Ynni Calon y Gwynt and assesses the potential for peat instability associated with the Proposed Development. The assessment draws on desk-based review, aerial imagery, on-site observations by a peat stability specialist, phased soil depth probing and targeted soil coring undertaken between November 2023 and April 2026, and has been prepared using Scottish Government PLHRA guidance1 in the absence of specific Welsh peat stability guidance. The assessment found that peat is limited in extent across the Site, with no evidence of historic peat instability identified. The assessment concludes that peat landslide risk can be appropriately managed through embedded design avoidance, further pre-construction ground investigation where required, careful construction planning, drainage control, monitoring, and implementation of the good practice and mitigation measures set out in this PLHRA and associated soil, peat and construction management documents. The assessment concludes that the Site is of Low Risk of peat instability as a result of the Proposed Development.

1 INTRODUCTION

1.1 BACKGROUND

1.1.1. This Peat Landslide Hazard Risk Assessment (PLHRA) has been prepared to inform the Environmental Statement (ES) associated with the construction and operation of Parc Ynni Calon y Gwynt ("The Proposed Development"). The PLHRA should be read in conjunction with the following documents;

- **Chapter 4: Description of the Proposed Development;**
- **Chapter 9: Hydrology, Hydrogeology, Geology and Soils;**
- **Outline Construction and Environmental Management Plan (CEMP);**
- **Appendix 10A: Baseline Soil Report;**
- **Appendix 10D: Outline Soil and Peat Management Plan;**
- **Appendix 9A: Flood Consequences Assessment (containing Outline Drainage Strategy).**

1.1.2. WSP were commissioned in 2023 to undertake a peat stability assessment for the Proposed Development, in conjunction with the soil and water elements of the ES.

1.1.3. This document presents WSP's method for a Peat Stability Risk Assessment, the analysis undertaken and the findings, which are based on peat and soil surveys undertaken by WSP in several phases between November 2023 and April 2026.

1.1.4. In the absence of any specific Welsh guidance on peat stability assessments this PLHRA has been prepared following Scottish Government Guidance on PLHRA[1].

1.1.5. As such, this document assesses the stability of soil strata within the Study Area, with the assumption that all observed soil depth data potentially contain peat - which is considered conservative for the purposes of this assessment. A description of the full model approach is included in **Section 6**.

1.1.6. For the avoidance of doubt, due to limited presence of peat onsite, **Section 7** presents peatslide risk where peat was identified from an extensive campaign of probing and coring, as detailed in **Appendix 10A Baseline Soil Report**.

1.2 SITE DESCRIPTION

1.2.1. The environmental baseline and existing conditions for the Proposed Development can be found in **Chapter 10: Geology and Soils**. The Proposed Development site is situated within the administrative area of Powys County Council (PCC), in mid Wales (hereafter referred to as the 'Site').

[1] The Scottish Government (2017) *Proposed electricity generation developments: Peat Landslide Hazard Best Practice Guide*, *Scottish Government*. Available at: https://www.gov.scot/publications/peat-landslide-hazard-risk-assessments-best-practice-guide-proposed-electricity/ [Accessed: June 2026].

1.3 OBJECTIVES OF THIS PLHRA

1.3.1. The broad aims of the PLHRA are to:

- provide a good level of understanding of site baseline (pre-development) peat stability conditions;
- aid the development design in order to reduce development activities that could cause an increased likelihood of peat instability, by careful consideration of infrastructure location and also construction techniques employed; and
- report peat stability risk assessment outcomes of the design following the principles of the Peat Landslide Hazard and Risk Assessments: Best Practice Guide for Proposed Electricity Generation Developments[1].

1.4 STUDY AREA

1.4.1. Desk based studies focused on a study area defined as the geographic region where direct impacts of the Proposed Development on Geology and Soils (including peat) are anticipated, hereafter referred to as "the Study Area", comprising of the Site and the surrounding 250 m. Field surveys were only conducted across the area associated with the energy park within the Site and two locations along the access road, and hereafter referred to as "the Survey Area".

1.4.2. The Study Area, Survey Area, and the Site are illustrated graphically in **Figures 10.5 - 10.15**.

1.4.3. Land use within the Study Area is dominated by sheep and livestock farming, comprising predominantly improved upland pasture and heathland, with occasional rocky outcrops. Part of the access route to the energy park is existing public highway and unnamed road.

1.5 REGULATORY CONTEXT

1.5.1. The regulatory context as well as peat policy and guidance is presented in **Chapter 10, Section 10.2** as well as **Appendix 10A: Baseline Soil Report** and **Appendix 10D: Outline Soil and Peat Management Plan**. The investigation and description of the baseline soil and peat conditions has been completed with reference to this policy and guidance.

1.5.2. Chapter 6 of Planning Policy Wales (PPW)[2] identifies peatlands as performing important ecosystem services including the storage and sequestration of carbon, reducing flood risk and supporting biodiversity. In accordance with PPW Chapter 6, the Proposed Development has been informed and evolved applying the Step-Wise approach, seeking to avoid areas Long Undisturbed Soils (LUS)[3] in the first instance. This approach then seeks the adoption of a mitigation hierarchy, to minimise impacts, mitigate / restore and then compensate, if required.

[2] (2021) Planning Policy Wales - edition 11. Available at: https://www.bridgend.gov.uk/media/zujbhiwb/planning-policy-wales-edition-11.pdf [Accessed: June 2026].

[3] Long Undisturbed Soils (LUS) - the term generally describes soils that have experienced minimal disturbance from agriculture, development, or intensive land use. In Wales, these are typically soils in upland or semi-natural landscapes, often rich in organic matter and slow-forming. For this Site, it is assumed that LUS is equal to peatland soils.

1.6 MODELLING APPROACH

1.6.1. No specific Welsh guidance on assessing the risk of peat landslide is currently available, therefore the Scottish guidance[1] is used in this PLHRA.

1.6.2. The methods adopted by WSP for the PLHRA of the Proposed Development have involved the following stages:

- desk study review of peat stability literature and available site data;
- aerial imagery review;
- site reconnaissance including peat depth survey to characterise the prevailing ground conditions and identify existing or potential peat instability;
- ground investigation (GI) at specific locations of concern to provide additional data;
- stability analysis to identify initial risk using a purposefully cautious factor of safety (FoS) method;
- summarising key findings, including appropriate recommendations for further investigations at later stages of the development, subject to planning consent.

1.6.3. The assessment applied a phased approach. This included gathering further site information as the design progressed and revising stability calculations using the best information available.

1.6.4. Further detail on each of these stages is provided in the following sections, with Geographical Information System (GIS) software employed to manage, analyse, and visualise spatial datasets.

1.6.5. **Figure 10.11** to **Figure 10.15** have been provided that demonstrate the data available and analysis undertaken within this assessment.

2 DESK STUDY

2.1 LITERATURE REVIEW OF PEAT STABILITY

2.1.1. Details and descriptions of the peat found within the Site can be found in **Appendix 10A Baseline Soil Report**.

2.1.2. Broadly, the peat found within the Site is contained within discrete areas in low angled basins formed around the Garreg-hir formation in the centre of the Proposed Development, forming the headwater reaches of a number of the small watercourse channels.

2.1.3. Peat is thixotropic, meaning that its viscosity decreases under applied stress. This property may be considered less important where the peat has been modified through artificial drainage and is drier but can be an important factor when the peat body is saturated and is an important issue to consider in relation to potential peat stability failures.

2.1.4. Peat movements can be small-scale or large-scale. Small-scale movements include slope terracing, slumps, collapse of peat banks and collapses above peat pipe features. These small-scale events are relatively widespread in peatland environments and have limited consequences to receptors, although they do provide useful indicators of peatland morphology and processes which may influence large-scale peat instability.

2.1.5. A series of large scale (mass movement) peat events in autumn 2003, including at Derrybrien in the Republic of Ireland[4], and Dooncanton in Channerwick (South Shetland Mainland), Scotland[5], led to an increased recognition of the mass movement hazard, particularly in relation to development design and construction of windfarm projects on peatland. This led to Scottish Government guidance for energy developments being published in 2006 and updated in 2017[1] to assess development risk of peat landslide to which forms the basis for this assessment. More recently, in November 2020 a mass movement of peat was recorded and widely reported at Meenbog Wind Farm, in County Donegal, Republic of Ireland[6].

2.1.6. Peat mass movement events have been classified by geomorphologists Dykes & Warburton[7], the primary processes of concern are peat landslides and peaty debris slides, with limited evidence of historic bog bursts and other phenomena. These features are defined below:

- Peat landslide - failure of a blanket bog slope, involving intact peat material shearing and sliding along at, or immediately above, the interface with underlying mineral soil, bedrock or boulder clay substrate. The peat above the shear plane generally initially moves as an intact mass, then breaks into smaller pieces and may then act as a liquid flow and follow drainage routes until material has been deposited[8] ; and
- Peaty debris slides - shallow translational failure of a slope, often on very steep gradients, with the failure zone occurring wholly in mineral soil substrate below a shallow organic soil surface

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4 AGU Blogosphere, 2022. Available at https://blogs.agu.org/landslideblog/2022/03/31/derrybrien-1/ [accessed July 2026]
5 Dykes, A.P., Warburton, J. Characteristics of the Shetland Islands (UK) peat slides of 19 September 2003. *Landslides* **5**, 213–226 (2008). https://doi.org/10.1007/s10346-008-0114-7
6 BBC news, 2020. Available at https://www.bbc.co.uk/news/uk-northern-ireland-foyle-west-54994865 [accessed July 2026]
7 Dykes, A.P. & Warburton, J. (2007). Mass movements in peat: A formal classification scheme. Geomorphology, Volume 86, 2007.
8 Boylan, N., Jennings, P. & Long, M (2008). Peat slope failure in Ireland. Quarterly Journal of Engineering Geology and Hydrogeology, Volume 41, 2008.

layer which may be less than 0.50 m depth. Surface peat is sheared and displaced due to failure of underlying material, rather than inherent peat instability.

2.1.7. In comparison with other peat mass movement phenomena described by Dykes & Warburton[7], peat landslides and peaty debris slides typically involve lower volumes of material, estimated as 500 - 50,000 m^3, with estimated velocities of 0.1 - 5.0 m/s for peat landslides and 0.1 - 10.0 m/s for peaty debris slides.

2.1.8. Peatland characteristics that may initially suggest a higher likelihood of peat mass movement, i.e. pre-disposition, include:

- increasing depth of peat;
- increasing slope angle;
- the presence of amorphous peat (well humified/decomposed); with less structural integrity and cohesion to remain on slope;
- convex slopes; instability may occur at or immediately downhill of the 'break of slope', often at the interface of deeper peat on a lower slope angle plateau or ridge; and
- waterlogged peat conditions; providing extra weight upon slope and lubricating transition zone/ basal surface between peat and underlying materials, such as clay, mineral soil or bedrock.

2.1.9. Specific conditions that are generally recognised as triggers for mass movement of peat include:

- Removal of slope support; reduces slope stability by natural or anthropogenic removal of support material below peat body. This could also be caused by decreased strength of slope materials on a temporal basis.
- Additional loading of slope; reduction in slope stability due to increasing of mass of slope above the peat body. This could be a result of development design or ancillary activities such as stockpiling of materials or heavy plant movement.
- Alteration to drainage patterns; increasing the mass of the peat body and lubricating the transition zone, potentially also increasing pore-water pressure at base of peat body. Can be a particular concern when intense rainfall follows a prolonged dry period, as fissures in peat body may enable rapid ingress to the transition zone. Prolonged wet periods in autumn and winter months in Ireland are considered as having a greater probability for peatslide events and seasonal accumulation of snow may also be a factor, in terms of both weight and snowmelt input.
- Vibration; construction activities such as piling, stockpiling of materials or traffic, including heavy plant, movement. Potentially also caused by earth movement at susceptible geological locations.

2.1.10. Examples of mass peat instability can occur involving peat of less than 1 m depth and on relatively low gradient slopes (<5°), where appropriate combinations of conditions occur. Where depths are relatively shallow and gradients relatively shallow, events may be expected to be more limited in terms of area, volume of material and run-out distance. Peatslide events often commence on a susceptible slope and then follow drainage pathways downslope, with sediment release into such receptors.

2.1.11. There are a number of geotechnical variables in relation to peat properties. Those applicable to the FoS stability methodology applied by WSP are detailed below. The FoS calculation and method is discussed further in **Section 5** of this report. These variables include both site data and values based on academic literature. Where using literature values, conservative values are typically applied as a precautionary approach, which can then be potentially refined where there is justification to do so from further site information:

- Depth of peat - measured onsite, to full depth with an accuracy of +/- 0.05 m;
- Slope angle - measured using site Digital Terrain Model (DTM) data at 5 m resolution, for both peat probes and using mean values for grid cells. The slope angles have been assessed as follow:
  - Low slope: 0° - <5°;
  - Gentle slope: 5° - <10°;
  - Moderate slope: 10° - <15°; and
  - Steep slope: >15°.
- Shear strength of peat - Literature values suggest an expected pressure (expressed as force per area) range between 4 - 20 Kilonewton / square metre (kN / m^2)[4], with higher values for less humified/decomposed peat.
- Cohesive strength of peat - back-calculated using site-specific data using a 99th percentile value from the site depth data, this parameter largely dictates the shear strength of the peat in the FoS calculation[8]. As above, literature values of shear strength suggest a range between 4 - 20 kN/m^2.
- Undrained bulk density of peat - values for in situ peat range from 900 - 1300 kg/m^3 quoted in various papers and reports, with a typical value of 1,000 kg/m^3 (1.0 Mg/m^3) referenced in literature[9].
- Bulk density of water - Standard scientific value of 1,000 kg/m^3.
- Water table depth as ratio of peat depth - a value of 1 represents water level being constantly at surface, this is conservative as the water level will vary temporally and geographically across peat deposits within the Site, often dropping below ground level.
- Angle of internal friction - a number of variables are present in peat (particularly fibre content and water content), a lower angle is more susceptible to movement on a slope. At 'quaking bog' locations, where the peat takes the form of a slurry beneath a surface mat of vegetation, the angle of internal friction will be very low (less than 5°) as the peat will effectively act as a fluid, however friction values of up to 58° are quoted in peat literature[10].

2.1.12. The Von Post classification system is a field-based method for characterising the level of peat humification/decomposition across 10 classes, with H1 categorised as completely undecomposed peat and H10 categorised as completely decomposed peat. Amorphous catotelmic peat is generally considered to be classified as H6 - H10, i.e. strongly decomposed or greater on this scale[11].

2.1.13. There are a number of recognised indicators that may occur in advance of mass peat instability, with the factors below particularly applicable to low velocity peat slides:

- development of tension fracture cracking across the slope or in semi-circular patterns, particularly if these reach to base of peat;
- boggy ground or new springs appearing at the base of slopes;
- sudden reactivation of spring lines;

[9] Dykes AP, Kirk KJ (2006). Slope instability and mass movements in peat deposits. Peatlands: Evolution and Records of Environmental and Climate Changes. Elsevier, Amsterdam, 377-406

[10] Dykes, A.P. & Warburton, J. (2007). Mass movements in peat: A formal classification scheme. Geomorphology, Volume 86, 2007.

[11] N. B. Hobbs; Mire morphology and the properties and behaviour of some British and foreign peats. *Quarterly Journal of Engineering Geology and Hydrogeology* 1986;; 19 (1): 7–80. doi: https://doi.org/10.1144/GSL.QJEG.1986.019.01.02

- peat creep or compression features, such as bulging of ground;
- displacement and leaning of trees, fence posts, dykes etc.; and
- breaking of underground services.

2.2 INFORMATION SOURCES

2.2.1. A desk study was undertaken, reviewing available information on the ground conditions within the Site; sources included:

- OS Infrastructure digital layers[12];
- OS Terrain 5 DTM (5 m resolution)[12];
- Ordnance Survey (OS) digital raster maps at 1:50,000 and 1:25,000 scale[12];
- OS Historical mapping[13];
- British Geological Survey maps of bedrock, superficial and linear geology at 1:50,000 scale, available through Geology Digimap[14];
- British Geological Survey Hydrogeological Map of Scotland, 1:625,000 scale[14];
- Unified peat map of Wales evidence (POWE)[15]; and
- Bing Aerial Imagery available via QGIS plugin.

[12] Ordnance Survey, UK. Available at: https://www.ordnancesurvey.co.uk/products/open-data [Accessed July 2026]
[13] National Library of Scotland. OS 25 inch England and Wales. Available at: https://maps.nls.uk/os/25inch-england-and-wales/ [Accessed July 2026]
[14] British Geological Survey. GeoSure (Online). Available at: BGS GeoSure - British Geological Survey [Accessed June 2026]
[15] Peatlands of Wales Maps, DataMapWales, 2022. Available at: https://datamap.gov.wales/maps/peatlands-of-wales-maps/ [Accessed: June 2026].

3 BASELINE CONDITIONS

3.1 SURVEY METHODOLOGY

3.1.1. Phase 1 depth survey was undertaken by WSP in November-December 2023, with further targeted Phase 2 depth surveys conducted by WSP between October 2025 and April 2026. Soil coring was conducted in January and April 2026. These site visits focussed on gaining a robust understanding of the Site, collecting representative soil strata data. During site visits, surveyors did not observe any evidence of previous peat instability within the Site, with peat itself very limited in extent.

3.1.2. The peat surveys undertaken have been conducted with reference to the Scottish Government guidance for peat surveys[24].

3.1.3. Peat depth survey methods followed good practice. Depths were recorded using utility probes advanced by hand through the soil until refusal. Notations on morphology, condition and a judgement of the likely substrate were also recorded.

3.1.4. The weather during the site visits was generally good. There were no occasions where frozen conditions prevented soil depth measurements being taken.

3.1.5. Soil cores were taken using a Dutch or Gouge auger in January and April 2026.

3.1.6. Soil cores were recorded using onsite texture analysis to provide a coarse description of the encountered soil type, including the following key soil attributes:

- General description of soil profile;
- Soil wetness;
- Colour;
- Stoniness;
- Soil texture; and
- Substrate / subsoil.

3.1.7. The texture analysis flow chart used during the surveys was based on the approach prescribed by Natural England, Technical Information Note (TIN 037)[16].

3.1.8. Where peat was identified as part of horizon description, the following information was recorded during core sampling:

- Observation of prevailing organic horizons (acrotelm and catotelm);
- Degree of humification according to von Post humification scale[17];
- Water content (including water depth); and
- Substrate underlying the peat (where possible).

3.1.9. Baseline conditions at the Site are discussed in detail within **Chapter 10: Geology and Soils**.

[16] Natural England. 2008. Soil texture (TIN037). Available at https://publications.naturalengland.org.uk/publication/32016# (accessed June 2026)
[17] Blackland Centre. Available at https://www.blacklandcentre.org/the-science/von-post-humification-scale/ (accessed June 2026)

3.1.10. **Appendix 10A: Baseline Soil Report** of the ES includes details of soil, peaty soil and peat identified at locations throughout the Site. A brief description is provided below.

- Baseline data indicate that peat is not widespread across the Study Areaand occurs as discontinuous, localised pockets associated with wetter topographic depressions, flushes, basin features and areas of flow convergence.
- Phases 1 and 2 depth surveys conducted a total of 3,472 probing measurements across the Site. Of these, 2,748 locations (79.1%) recorded depths of less than 0.3 m.
- Within 10 m of proposed infrastructure, 85.7% (of 2,129 probing locations) recorded depths of less than 0.3 m, indicating that the layout (and particularly hardstanding zones) was located mainly on shallow ground and classified as non-peat.
- Soils ≥0.3 m depth were highly localised and generally coincided with mapped areas of potential peat and bog or mire habitat.
- Desk-based mapping, probing data and targeted core results consistently indicate that the Site is dominated by shallow mineral soils. Deeper organic deposits are restricted to a limited number of discrete areas, rather than a continuous peat deposit across the Site.
- Locations where infrastructure is planned with soils ≥0.3 m are limited and include parts of track south of T03 and the T03 cranepad, the upslope track access to T04, a small area west of the crane pad at T06 and T07, plus short sections of track access between T10 and T09.
- A total of 30 soil cores were collected to characterise peat, peaty soil and mineral soil distribution. Of the 30 cores, 7 were classified as peat profiles, 4 as peaty soils, 10 as medium-textured mineral soils and 9 as heavy-textured mineral soils. Peat was generally encountered in isolated pockets within natural depressions and local wet features. Peat depth averaged 0.5 m and reached a maximum of 0.8 m at one location. Core sample locations are presented on **Figure 10.11**, and photographs are provided in **Appendix 10A: Baseline Soil Report**.
- The core data indicate that mineral soils are the dominant substrate and that peat is limited in extent and thickness. The footprint of the Proposed Development is located mainly within areas of non-peat, with marginal disturbance of peaty soils and peat, due to peat being applied as a constraint within the iterative design process.
- Areas with high sensitivity soils (including peat underlain by clay) were identified using aerial imagery, soil strata data and coring results and expert judgement.
- Photographs and descriptive text of the landscape and vegetation at the Site are found within **Appendix 10A: Baseline Soil Report**. It should be noted that these photos provide context and do not necessarily indicate the location of infrastructure.

3.1.11. The geotechnical input (soil depth probing and coring surveys) provided to date does not replace geotechnical site investigations that would take place post consent and prior to construction commencing to inform the detailed site design, with the above information intended to provide design advice and the basis for assessment for the purposes of the application submission.

3.2 TOPOGRAPHY

3.2.1. The Site is located on hills to the north of the A470 trunk road, approximately 2.7km north of the village of Clatter, 3.5 km northeast of the village of Carno, 3.5km north of the village of Pontdolgoch and 12 km northwest of Newtown.

3.2.2. The elevation varies across the Site, with the highest point being 485 m Above Ordnance Datum (AOD), whilst the turbines are situated on land ranging from 345 to 458 m AOD, with the lowest point of the Proposed Development area being 327 m AOD.

3.2.3. Further geomorphology information is provided within **ES Chapter 9: Hydrology** and **ES Chapter 10: Geology and Soils**.

3.3 CLIMATE & HYDROLOGY

3.3.1. Rainfall in Wales can vary from >3,000 mm per year in mountainous areas down to <1,000 mm per year in lowland regions[18]. According to the National River Flow Archive, the Standard Average Annual Rainfall at the Site is 1,100 mm per year.

3.3.2. The Site is located within the Severn River Basin District and is located on the watershed divide between the Afon Carno and Afon Rhiw waterbodies, both tributaries to the River Severn. The eastern section of the Site drains into the Afon Rhiw (63% of Site area), while the western section drains into the Afon Carno (35% of Site area).

3.3.3. Further baseline information for hydrology is provided in **Chapter 9: Hydrology**.

3.4 GEOLOGY

Bedrock Geology

3.4.1. The Site is mainly underlain by the Silurian Penstrowed Grits Formation, comprising mudstones with greywacke sandstones. Sandstone units vary from isolated beds to thicker packets, with sandstone content ranging from 20% to 100%. Additional Silurian formations occur only locally, mainly along minor sections of the southern access track and western Site boundary. Several inferred faults cross the Site, mostly trending northwest–southeast, with some faults near the access track trending southwest–northeast. A major syncline is mapped with an axial plane trace running northeast–southwest. No borehole records are available within the Site, although a nearby borehole south of the Site records mudstone below a 1 m soil horizon to at least 100 m depth.

Superficial Geology

3.4.2. BGS superficial mapping shows intermittent superficial deposits across the Site. Approximately half of the Site has no superficial deposits. The predominant superficial deposits are glacial till (mostly in the east and south of the Site), with some glacial head deposits also present. Isolated pockets of peat are indicated as present, with alluvial fan deposits on the southern periphery of the Site at the base of the valley.

3.4.3. Bedrock geology and superficial deposits (superficial geology) are presented on **Figure 10.1** and **Figure 10.2** of the ES, respectively.

3.5 PEAT STABILITY AND MORPHOLOGY

3.5.1. Online searches and Artificial Intelligence (AI)[19] as well as anecdotal evidence from landowners has shown no evidence of historic peat landslide or mass movements present within the Site, with particular attention to features within 50 m of the Proposed Development. All AI generated output has been reviewed and sense-checked to ensure it was suitable for use. No evidence of peat instability was identified from a review of aerial imagery or from site observations.

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[18] Met Office. Wales: Climate. Availible at https://www.metoffice.gov.uk/binaries/content/assets/metofficegovuk/pdf/weather/learn-about/weather/regional-climates/wales_-climate-met-office.pdf (accessed June 2026)

[19] Microsoft Copilot. 2026. Response to user query on historical peat landslides on Kintyre, Scotland. Available online at: https://copilot.microsoft.com (Accessed June 2026).

3.6 HISTORICAL INFORMATION

3.6.1. OS historical mapping was reviewed and identifies moorland and legacy farming / rough pasture land use.

4 PLHRA MODEL INPUT

4.1 ASSUMPTIONS AND LIMITATIONS

4.1.1. It is acknowledged that Welsh Government guidelines[20] stipulates that the minimum threshold for peat depth is 0.3 m, however, due to the lack of applicable Welsh guidance regarding PLHRA, Scottish guidance has been applied.

4.1.2. As a result, a minimum strata depth of 0.5 m is used for the lower boundary for presence of peat deposits in the PLHRA model and associated assessments, in accordance with Scottish guidance on Peat Landslide Hazard and Risk Assessment.

4.1.3. Considering peat deposits are not widespread across the Study Area, the PLHRA has assumed minimising disturbance of Long Undisturbed Soils (LUS) could be achieved by minimising impact on areas marked as high sensitivity soils, using a cautionary approach.

4.1.4. For PLHRA stability modelling, all probing depth data was initially treated as peat strata as a conservative assumption, notwithstanding the discontinuous nature of peat occurrence demonstrated by the probing and coring survey data. This approach provided a robust coverage of the Study Area across a variety of slope angles, before focusing upon peat zones for instability risk.

4.2 FIELD SURVEY RESULTS

4.2.1. A total of 3,472 soil strata depth measurements were made, with the results summarised in **Table 10C-1** below. 83.3% of the points probed had a peat depth of less than 0.5 m, with 97.0% of the results less than 1.00 m and 98.9% less than 1.50 m, the average peat depth was 0.16 m. The peat depth results are presented in **Figure 10.5.**

Table 10C-1 - Results of the Soil Strata Depth Survey

Soil Strata Depth (m)	Number of Locations Surveyed	Percentage of Locations Surveyed	Average DEPTH in Range (m)
0.0 to <0.5	3065	88.3%	0.21
≥0.5 to <1.0	303	8.7%	0.70
≥1.0 to <1.5	66	1.9%	1.23
≥1.5 to <2.0	33	1.0%	1.71
≥2.0 to <2.5	4	0.1%	2.28
≥2.5	1	0.0%	2.65
Total / Aggregate	**3,472**	**100.0**	**0.29 (from all points)**

[20] Natural Resources Wales 2020, *National Peatland Action Programme 2020-2025*. Available at: National Peatlands Action Programme, 2020-2025 (cyfoethnaturiol.cymru)

4.3 INDICATIVE PEAT DEPTH MAPPING

4.3.1. To assess peat landslide risk across the Site and to inform the refinement of the infrastructure layout, recorded soil strata depth data were extrapolated to a 50 x 50 m grid covering the Study Area. The use of a regular grid for terrain analyses of this type is a standard geospatial technique and is widely applied in a range of situations. It allows for a systematic extrapolation of relevant properties across the terrain, including in locations with no measurements. In this analysis, soil strata depths are extrapolated and mean, maximum and minimum slope angles for each cell derived from a DTM.

4.3.2. The choice of 25 x 25 m grid is determined by the resolution of DTM as using a very fine grid with a resolution identical to or finer than the DTM would return spurious results with a false indication of accuracy. For the Study Area, a 25 x 25 m grid was used in line with WSP's established peat stability analysis method as this resolution is fine enough to provide an appropriate level of detail for analysis but also sufficiently large to gain meaningful results from a high resolution DTM (e.g. Ordnance Survey DTM 5m) and derived slope model.

4.3.3. An enlarged portion of the indicative peat depth grid is shown in **Plate 10C-1**. Each cell within the indicative depth grid is assigned the maximum measured depth value within a 10m buffer of the grid cell. In some cases, aerial imagery is also consulted, for instance if it shows water bodies, this is taken as an indication of no peat present. For cells where no measured depth was observed within 10m of the grid cell, a background value has been applied. For this Site, the background value has been set to 0.29 m, representing the average probing depth across the Survey Area.

4.3.4. **Table 10C-1** shows the distribution of probed strata depth across depth ranges and representative average strata depth within depth range. As can be seen from **Plate 10C-1** and **Figure 10.5**, where a cluster of peat probing points is all within the same peat depth category this has been taken as a good indication of the general representation of occurring peat depth in the surrounding area and the indicative peat depth map has been coloured accordingly. Where clusters of peat probing points have returned depths in a range of depth categories a cautious approach has been taken, with the indicative peat depth map being classified in line with the deepest category of peat found in the area. This leads to a conservative indicative peat depth map.

4.3.5. As previously mentioned in **Section 1.6**, the minimum strata depth recognised as peat in the PLHRA model was fixed at 0.5 m. For modelling purposes, the strata depth values in the resulting indicative peat grid are hereafter referred to as 'peat depth' following the breakdown provided in **Table 10C-2**.

4.3.6. The full indicative peat depth map across the Site is included as **Figure 10.5**.

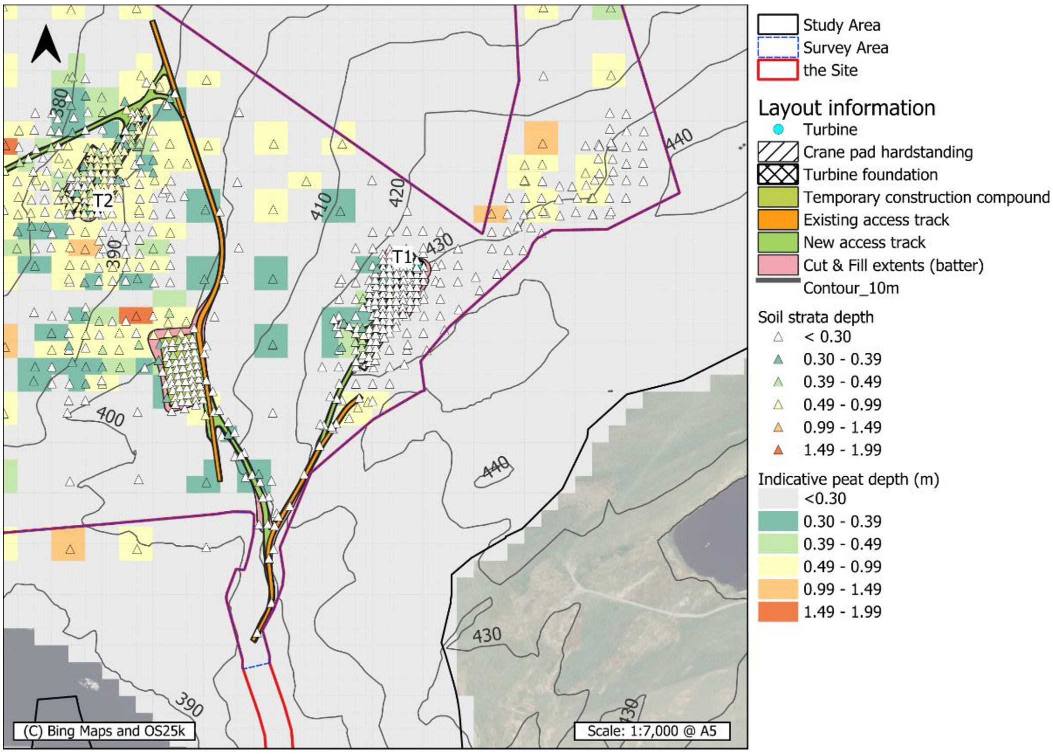


Plate 10C-1 - An Example of Indicative Peat Depth Grid Mapping

4.3.7. The peat depth category breakdown for the peat depth grid, for all cells within the grid and cells with measured peat depths, is given in **Table 10C-2**.

Table 10C-2 - Indicative Peat Depth Category Breakdown

Indicative peat depth range (m)		<0.50	0.50 - <1.00	1.00 - <1.50	1.50 - <2.00	2.00 - <2.50	2.50 - <4.00	≥4.00	Total
Indicative peat depth grid	No. of cells	13,728	598	167	100	12	4	0	14,609
	% of cells	94.0%	4.1%	1.1%	0.7%	0.1%	0.0%	0.0%	100.0%
Indicative peat depth grid (with measured soil strata depth)	No. of cells	1,916	598	167	100	12	4	0	2,797
	% of cells	68.5%	21.4%	6.0%	3.6%	0.4%	0.1%	0.0%	100.0%

5 FACTOR OF SAFETY ANALYSIS

5.1 INTRODUCTION

5.1.1. To establish the stability of peatland areas, WSP applies the 'Factor of Safety' methodology. This procedure involves the application of site data (indicative peat depth and slope angle) alongside values for a number of further variables, with the more sensitive of these being the values allocated for cohesive strength and in situ (undrained) bulk density of peat. The values applied are based on literature review and are generally considered conservative, in accordance with a purposefully precautionary approach.

5.1.2. This PLHRA determined areas at greatest risk of slope failure, based on FoS slope stability calculations. Using the collated data an initial analysis of slope stability can be carried out using the infinite slope model. The stability of a slope can be assessed by calculating the FoS, F which is the ratio of the sum of resisting forces (shear strength) and the sum of the destabilising forces (shear stress):

$$F = \frac{c' + (\gamma - m\gamma_w) z \, Cos^2 \beta \, Tan\phi}{\gamma \, z \, Sin\beta \, Cos\beta}$$

5.1.3. Where c' is the effective cohesion, γ is the unit weight of saturated peat, γ_w, is the bulk density of water, m is the height of the water table as a fraction of the peat depth, z is the peat depth in the direction of normal stress, β is the angle of the slope to the horizontal and φ' is the effective angle of internal friction.

5.1.4. The FoS, F, represents the ratio of the forces resisting a slide to the forces causing the material to slide. If F > 1 then the slope is stable and normally if F >1.4 then there is a degree of comfort that the slope would not fail. The boundary value of 1.4 is in accordance with the current recommendations of Eurocode 7[21].

5.1.5. To establish an indication of the stability of the peat at the Proposed Development, the FoS can be calculated for each soil depth probing location. In addition, to gain a better view of peat stability in the areas surrounding the infrastructure, FoS calculations can be carried out for the grid cells of the indicative peat depth map in the vicinity of the infrastructure. To do this, the parameters required for the FoS equation must be known or reasonably inferred for each probing location and grid cell.

5.1.6. The slope angle, β, can be derived from the DTM for the Site. For the soil depth probing locations, a single slope angle value is generated for each point, whilst for the grid maximum, minimum and mean slope values are calculated for each grid cell. The mean slope angle was used in the grid FoS calculations, although the other statistics provide useful supporting information on the variability of slope within the cells.

5.1.7. The measured soil strata depth data for each probing location is used in calculating the point FoS values. For the grid-based FoS assessment, indicative strata depth values were assigned to cells with no measurements (as described in **Section 5**).

[21] BSI (2004 & 2007). Geotechnical design. Eurocode 7: BS EN 1997-1: 2004 & BS EN 1997-2: 2007, British Standards Institute.

5.1.8. The bulk density of water, γ_w, is known to be 1.00 Mg/m^3.

5.1.9. The bulk density of peat is known to vary with the level of decomposition. In situ undrained bulk density of peat reported in literature ranged from 0.50 to 1.40 Mg/m^3. Laboratory analyses undertaken on samples collected by or on behalf of WSP from other projects have returned bulk density values generally ranging between 0.80 and 1.40 Mg/m^3. Based on this experience and also after reviewing externally published values by Lindsay[22], Dykes & Warburton[23] and Scottish Government guidance[24], an average wet bulk density value of 1.00 Mg/m^3 has been applied for the FoS calculations.

5.1.10. For the purpose of the model, as described in **Section 3**, it is assumed that all soil strata within the Site are considered to comprise of peat. In line with this assumption, the model assumes that the extent of peat within the Study Area is completely saturated, with a water table at or close to the surface. Consequently, a water table ratio, m, of 1.0 has been chosen, which is considered conservative given most of the Site exhibits lack of peaty and peat soils over 0.5m depth, and thus may occur locally during or following heavy rainfall 'trigger' events.

5.1.11. The angle of internal friction in peat also varies, decreasing with increasing decomposition and moisture content. For the FoS calculations, a φ' value of 5° has been selected as per WSP's conservative approach.

5.1.12. Finally, a value for the effective cohesion, c', must be derived. Literature values for c' in peat vary widely, generally ranging from 4 - 20 kN/m^2. To provide an indication of the cohesive strength of any peat at this Site, where it occurs, a back-calculation using the FoS equation and measured soil strata depth data for the Site has been completed. The techniques involved are discussed below.

5.2 ESTIMATION OF COHESIVE STRENGTH

5.2.1. A range of field and laboratory tests can be carried out to determine the effective cohesion of a material. However, owing to its fibrous and thixotropic nature and the variation in strength with decomposition, peat is a particularly difficult material to analyse both in the field and in the laboratory. An alternative approach to assessing the strength of the peat is to rearrange the FoS equation to calculate a value of c' at actual peat probing locations. Essentially, this approach assumes that if the hillside is stable then the material must have at least a certain minimum strength.

5.2.2. Each peat probing location visited is known to have been stable at the time of the visit and therefore must have a FoS of at least 1. By conservatively assuming F=1 and using values for the other parameters as discussed above, the FoS equation can be rearranged to allow derivation of a value for c' at each probing location. Slope angles for the probing points are generated from the DTM. It is important to note that the value of c' calculated for each location represents the minimum cohesive strength necessary for the peat to be stable at that location. In fact, the shear strength may be, and in most cases probably is, considerably higher.

22 Lindsay, R.A (2010). *Peatbogs and Carbon, a critical synthesis to inform policy development in oceanic peat bog conservation and restoration in the context of climate change.. Available at* https://repository.uel.ac.uk/item/862y6 [Accessed in April 2026].

23 Dykes, A.P. & Warburton, J. (2007). Mass movements in peat: A formal classification scheme. Geomorphology, Volume 86, 2007.

24 Scottish Government (2017). Guidance on Developments on Peatland - Peatland Survey (2017 Edition). [online] Available at: https://www.gov.scot/publications/peatland-survey-guidance/ [Accessed in January 2026].

5.2.3. In the Study Area, 3,472 locations have been probed during the different phases of fieldwork, c' values for each of these have been calculated and the distribution of these values is shown in **Plate 10C-2**. For example, reading from the graph, 80% of the probing locations require a theoretical c' value of 0.47 kN/m^2 or less to be stable and retain peat on the slope.

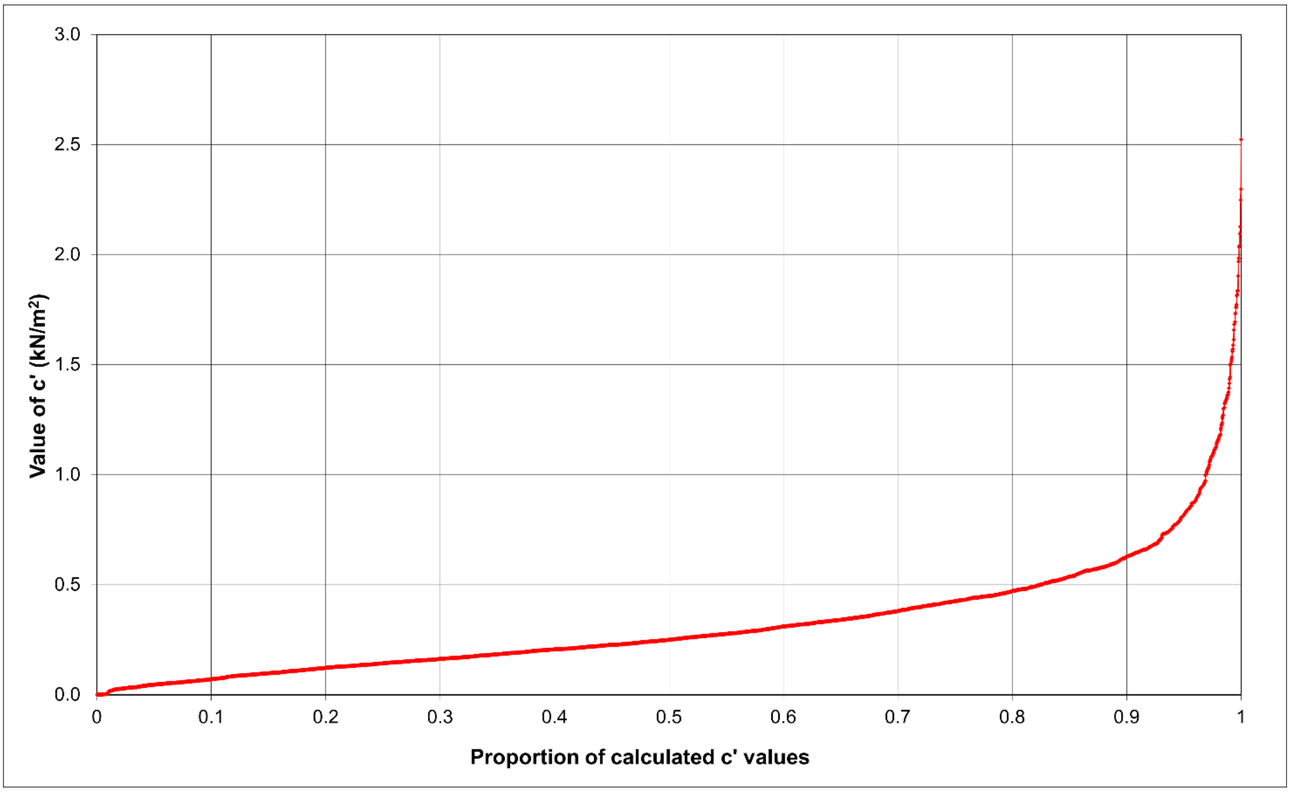


Plate 10C-2 - Estimate of Minimum Cohesive Strength, c'

5.2.4. From this work it is possible to state, with reasonable confidence, that across the Site as a whole the shear strength of the peat is unlikely to be less than 1.44 kN/m^2 as this is the value of the 99th percentile point on the graph.

5.2.5. Similarly, c' values for the grid cells were calculated giving the 99th percentile value of 1.37 kN/m^2, lower than for the point data due to inclusion of indicative depths for a large number of cells outwith the Proposed Development.

5.2.6. Compared to c' values of 4 - 20 kN/m^2 found in the peat literature, the actual effective cohesion of the peat at the Site may be substantially higher, where peat occurs. However, application of these site-derived values ensures a reasonably conservative initial assessment using data from the Site, in tandem with an understanding of literary values.

5.2.7. The basis for applying these calculation details depends upon:

- The deliberate choice of conservative values for assumed parameters such as bulk density and water table level, coupled with the assumption of an FoS of 1 when back-calculating c' values.
- Recognition of what the calculations are stating, which is that these are the minimum strengths that would be required, not the actual in situ strengths. Therefore, where slopes are gentle and the observed peat shallow, a low shear strength is required to ensure stability of the slope. This accounts for the vast majority of the lower values.

- Assuming a reasonable degree of homogeneity for peat properties, particularly strength, across the Site. This seems reasonable, except for very shallow peat where the acrotelm, which is more fibrous, represents a significant proportion of the total depth. Such areas are, in any case, unlikely to be areas of concern.
- Given the above considerations, it is the higher strength values that are relevant. If this were not the case, then one would expect large areas of the Site to be denuded of peat as it would not have the strength to adhere to the hillsides.

5.3 FACTOR OF SAFETY STABILITY RESULTS

5.3.1. Having assigned measured or inferred values to each parameter in the FoS equation, the FoS value was calculated for each probing location and for each cell of the indicative peat depth grid. The results of the FoS assessment for the probing points and site grid are summarised in **Table 10C-3**. The FoS assessment maps generated with these values are shown across the Site as **Figure 10.9**.

5.3.2. Selecting the 99th percentile value of the back-calculated c' strengths implies that 1.0% of the sample locations are subject to slope failure, plus any similar cells across the Site as a whole. Only 0.93% of all cells (136) and 1.0% of probing locations have a FoS value of less than 1 (35); in theory these should either have failed or currently be failing. It is unlikely that this be the case in reality, and these results are a consequence of the conservative approach adopted.

5.3.3. Also, only 0.9% of cells and 1.6% of points have a FoS between 1.0 and 1.4, where stability can be considered marginal.

5.3.4. Taken together, 1.8% of the cells have FoS values of less than 1.4, based on 9.7% of grid cells with measured depths.

5.3.5. Note that where soil strata depth is less than 0.50 m, these cells were not considered as peat for modelling purpose and were removed from further stability investigation, in accordance with Scottish guidance for assessing PLHRA[1].

5.3.6. To summarise, 97.4% of the soil strata points have a FoS value of 1.4 or greater (including locations with soil strata less than 0.50 m depth), where stability can be assumed with a degree of comfort. 90.3% of grid cells with measured strata depths, have FoS values greater than 1.4 (including cells with indicative peat depth less than 0.50 m depth), again these are locations where stability can be assumed with a degree of comfort.

Table 10C-3 - Summary of FoS Assessment

Factor of Safety	<1.0	1.0 - <1.4	1.4 - <3.0	≥3.0	Soil strata depth less than 0.5 m depth	Total
Probing Data (points)	35	56	143	173	3,065	3,472
% of Probing Points	1.0	1.6	4.1	5.0	88.3	100.0
Grid Cells	136	134	392	219	13,728	14,609
% of Grid Cells	0.9	0.9	2.7	1.5	94.0	100.0
Grid Cells (with measured depths)	136	134	392	219	1,916	2,797
% of Grid Cells (with measured depths)	4.9	4.8	14.0	7.8	68.5	100

5.4 FACTOR OF SAFETY STABILITY RESULTS - ZOI

5.4.1. Site reconnaissance and survey results demonstrate that peat likely only occurs in site areas indicated as high sensitivity soils (HSS)[25]. For this reason, further assessment of peat landslide risk will specifically target Zone of Interest (ZoI) locations to increase focus and interpretation of datasets for these peat zones and associated 50 m buffer regions (aggregating to a dataset of 1,613 cells), albeit on margins of Proposed Infrastructure. The FoS stability analyses targeting the reduced ZoI dataset is displayed in **Table 10C-4** and discussed below. Other site areas are excluded from further consideration.

5.4.2. Locations where soil strata depth is less than 0.50 m were not treated as peat for modelling purposes and are presented separately in **Table 10C-4** as 'No Peat'. These account for 77.9% of all grid cells and 56.8% of grid cells with measured strata depths within the ZoI.

5.4.3. FoS values of less than 1.0 were identified for 77 grid cells (4.7%), supported by 17 probing points (1.8%). A further 60 grid cells (3.7%) and 25 probing points (2.6%) had FoS values between 1.0 and less than 1.4.

5.4.4. 13.7% of grid cells recording FoS values of 1.4 or greater, supported by 13.2% of probing points, excluding locations where no peat was identified.

5.4.5. In summary, 91.6% of grid cells (and 95.6% of probing points) within the ZoI either have FoS values of equal to or greater than 1.4 or are not defined as peat for the purposes of the assessment.

[25] Areas of high sensitivity soils were marked up using triangulation of aerial imagery, Phase 1 and 2 peat depth surveys and coring surveys. High sensitivity soils may comprise peat presence is assumed, together with organic-rich soils and locations where peat is consistently underlain by clay. Due to their low resilience to handling damage, higher susceptibility to erosion and compaction, and potential for saturation-related instability, such locations informed design to minimise disturbance.

5.4.6. For grid cells with measured peat depths only, 83.4% have FoS values of 1.4 or greater or are classified as ‘No Peat’, indicating that the majority of cell locations with measured values within ZoI may be considered stable with a reasonable degree of confidence.

Table 10C-4 - Summary of FoS Assessment within ZoI for High Sensitivity Soils

Factor of Safety	<1.0	1.0 - <1.4	1.4 - <3.0	≥3.0	No Peat (less than 0.5 m depth)	Total
Probing Data (points)	17	25	55	72	790	959
% of Probing Points	1.8	2.6	5.7	7.5	82.4	100.0
Grid Cells	77	60	124	96	1,256	1,613
% of Grid Cells	4.7	3.7	7.7	6.0	77.9	100.0
Grid Cells (with measured depths)	77	60	124	96	469	826
% of Grid cells (with measured depths)	9.3	7.3	15.0	11.6	56.8	100.0

6 INITIAL RISK ASSESSMENT

6.1 OVERALL APPROACH

6.1.1. Based on the data collated from the desk study, reconnaissance survey, peat probing and FoS stability analysis the peat stability risk across the site can be classified. The Guidelines[1] define risk as a function of likelihood and consequence and this has been applied by WSP as:

Risk = Likelihood x Adverse Consequence

6.1.2. The risk level is derived by applying a matrix of likelihood and consequence outcomes to derive a risk value ranging from 'Negligible' to 'High Risk'. Additionally, where peat is not present (such as organic soils with depth less than 0.50 m) these areas were identified as 'N/A - Not Peat'.

6.1.3. Central to WSP's analysis is a grid model of the Study Area, using 25 m x 25 m individual cell dimensions. It is therefore essential to have processes that assign likelihood and consequence ratings to the cells and build a map of spatial variability across the Study Area. The rationale for evaluating likelihood and consequence is given in the following sections.

6.2 LIKELIHOOD

6.2.1. Although overall the topography is gently undulating, bedrock outcrops exhibit a range of slope gradients. Peat surveys show that deeper peat is generally found in flat basins in between bedrock outcrops. Cells with Likely and Probable Initial Likelihood values generally recorded low to gentle mean slope gradients but exhibited a relatively wide range of slope gradients, some recorded mean cell slopes of up to 38.3 °.

6.2.2. In WSP's method, the primary and non-subjective measure of likelihood of slope stability is the FoS calculation. Slopes with FoS values greater than 1.4 are generally regarded as 'safe', and slopes with lower FoS values of greater instability concern.

6.2.3. Within FoS analysis, the parameter which may be considered to have the greatest uncertainty is the shear strength of the peat. The derivation of this parameter has been discussed above. The back-calculation approach is more conservative (i.e. gives a safer assumption) than that commonly derived from in situ shear vane tests, which have known limitations when applied to peat. For the initial risk assessment, the likelihood is based solely on FoS, enabling an objective, reasonably cautious initial 'screening' approach to likelihood. The initial likelihood criteria and classification of cells is provided on **Table 10C-5** and **Table 10C-6,** respectively.

Table 10C-5 - Criteria Relating to Initial Likelihood Values

Likelihood	Factor of Safety
Almost certain	Not applied at initial likelihood stage, better determined in conjunction with additional data available from a specific peat stability survey of such areas
Probable	FoS <1.0
Likely	FoS is between 1.0 and <1.4
Unlikely	FoS is between 1.4 and <3.0
Negligible	FoS 3.0+
N/A - No Peat	Soil at depth shallower than 0.50 m

Table 10C-6 - Summary of Initial Likelihood Grid Classification within ZoI for High Sensitivity Soils

Likelihood							
	Almost Certain	Probable	Likely	Unlikely	Negligible	No Peat*	Total
No. of Grid Cells	Not Applied	77	60	124	96	1,256	1,613
% of Grid Cells	Not Applied	4.8	3.7	7.7	6.0	77.9	100.0
No. of Grid Cells (with measured soil depths)	Not Applied	77	60	124	96	469	826
% of Grid Cells (with measured soil depths)	Not Applied	9.3	7.3	15.0	11.6	56.8	100.0

6.2.4. The initial likelihood classification of grid cells across the Site is presented as **Figure 10.10 Initial Likelihood**.

6.3 ADVERSE CONSEQUENCE

6.3.1. The Guidelines[1] identify that 'Consequence' relates to impact upon receptors, this would include property, existing infrastructure and assets, environmental features and/or the Proposed Development infrastructure. These terms need to be taken in their broader context if an itemised list of receptors is to be considered which would include:

- existing public and private infrastructure (roads, bridges, buildings, business facilities, etc.);
- terrestrial ecology;
- aquatic ecology and water quality;

- archaeology; and
- proposed internal infrastructure (access tracks, turbines, cabling, etc.).

6.3.2. In order to include nearby receptors (shown on **Figure 10.11 Receptors**), the Study Area for the PLHRA model was set to extend 250 m beyond the Site. This enables consideration of sensitive features outwith the Proposed Development.

6.3.3. These features have varying dimensions of costs and magnitude caused by an occurrence of mass peat instability, but in addition there may be irretrievable personal, societal or habitat losses:

- Costs: the only quantification provided within the Guidelines is in terms of project costs, which are easier to apply to infrastructure assets than to ecology. If ecology is of relatively minor importance for a particular site, economic impacts or delays in the construction programme may be the main drivers.
- Magnitude: naturally occurring peatslides have been observed to range in size from small-scale, localised slides involving tens of square metres to large-scale slides involving thousands of square metres and with run-out distances of km. Consequently, magnitude may be expressed in terms of area, peat volume and run-out distance and receptor. Provided sufficient peat probing has been undertaken and an indicative peat depth map produced, areas and peat volumes can be derived using professional judgement given local ground conditions. The associated run-out distance is of less significance than the receptor damaged and again should be considered taking account of local conditions to arrive at a realistic outcome.

6.3.4. **Table 10C-7** assembles the above considerations to outline the degrees of consequence. Using the table, the three columns are considered, and professional judgement applied, to identify the appropriate ‘Consequence’ rating. The consequence values were identified and applied using mapping software to escalate the value based on local receptors, with the default (starting) position being that each grid cell was considered of ‘Low’ consequence, taking a reasonably precautionary approach.

6.3.5. The consequence classification of cells is provided in **Table 10C-7**. The consequence classification of grid cells is presented as **Figure 10.12 Consequence**.

Table 10C-7 - Criteria for Consequence Values

Consequence	Habitat	Internal Infrastructure	Public / Private Infrastructure
Extremely High	Large loss/damage to valued terrestrial and/or aquatic habitat, i.e. within designated sites. Large loss/damage to archaeological designated sites.	N/A	Damage to property: domestic/public building or business (*within 100 m*). Impact on railways or A class road or bridges, including lower category roads which provide key transport corridors in remote locations (*within 100 m*). Impact on public utilities, water, gas, electricity, telecoms, etc. (*within 100 m*).
High	Medium loss/damage to valued terrestrial and/or aquatic habitat, i.e. designated sites (*within 100 m*). Medium loss/damage to archaeological designated sites (*within 100 m*).	Damage to BESS, substation and/or control building *(within 100 m).*	Damage to minor/unclassified public roads or bridges *(within 100 m)*. Impact on private utilities, local electrical connection, water and wastewater *(within 100 m).*
Moderate	Small loss/damage to valued terrestrial and/or aquatic habitat. Large loss/damage to common terrestrial and/or hydrology features shown on 1:10,000 OS mapping (*within 50 m*). Peat grid cells identified with peat depth 1.50 m+.	Damage to planned turbines (*within 100 m*). Damage to section of new access track, construction compound and borrow pits *(within 50 m)* which would require repair to enable functionality. Damage to car parking (*within 50 m*). Interruption to construction or operation of development.	Damage to section of existing unclassified access track, or bridge *(within 100 m).*
Low *Default Position*	Medium loss/damage to common terrestrial and/ or hydrology features shown on 1:10,000 OS mapping.	Minor damage to section of access track which does not necessitate immediate repair for access.	Minor damage to assets.
Very Low *Not Applied*	Small temporary loss/damage to common terrestrial and/or aquatic habitat.	No damage to assets.	No damage to assets.

Table 10C-8 - Summary of Consequence Grid Classification within ZoI for High Sensitivity Soils

	Consequence				
	Extremely High	High	Moderate	Low	Total
No. of Grid Cells	260	561	490	302	1,613
% of Grid Cells	16.1	34.8	30.4	18.7	100.0
No. of Grid Cells (with measured soil strata depth)	113	325	304	84	826
% of Grid Cells (with measured soil strata depth)	13.7	39.3	36.8	10.2	100.0

6.3.6. **Table 10C-8** summarises consequence values identified within ZoI.

6.3.7. Grid cells with 'Extremely High' were identified in the centre of the Study Area and coincide with scheduled monuments.

6.3.8. Areas of cells with 'High' consequence are identified throughout the Site, coinciding with archaeological sites, areas of existing access track listed as minor roads from the OS data, proposed substation, control building and BESS compound. The latter three development features are all sited outwith Zones of Interest associated with areas of high sensitivity soils.

6.3.9. Areas of cells with 'Moderate' consequence are primarily due to the presence of priority habitat (including watercourses), unclassified existing tracks, areas of soil strata >1.5 m and new proposed access tracks for the Proposed Development.

6.4 INITIAL RISK ASSESSMENT OUTCOMES

6.4.1. The results of the initial likelihood (solely based on FoS) and consequence grid cell categorisations reflect the characteristics of the Site, with the methods and key features of both elements covered in preceding sections.

6.4.2. The risk scoring is determined via a matrix table, combining likelihood and consequence, as set out in **Table 10C-9**. A summary of the grid cell counts for each risk category is provided in **Table 10C-10**.

Table 10C-9 - Risk matrix based on Likelihood and Consequence Values

		Adverse Consequence				
		Extremely High	High	Moderate	Low	Very Low
Peat Landslide Likelihood	Almost Certain	High	High	Moderate	Moderate	Low
	Probable	High	Moderate	Moderate	Low	Negligible
	Likely	Moderate	Moderate	Low	Low	Negligible
	Unlikely	Low	Low	Low	Negligible	Negligible
	Negligible	Low	Negligible	Negligible	Negligible	Negligible

Table 10C-10 - Summary of Initial Risk for ZoI for High Sensitivity Soils

	Number of Grid Cells	% of Grid Cells	Number of Grid Cells (with measured strata depth)	% of Grid Cells (with measured strata depth)	Suggested 'Guideline' Actions (Table 5.4[1])
High	2	0.1	2	0.2	*"Avoid project development at these locations".*
Moderate	107	6.6	107	13	*"Project should not proceed unless risk can be avoided or mitigated at these locations, without significant environmental impact, in order to reduce risk ranking to low or negligible".*
Low	154	9.6	154	18.6	*"Project may proceed pending further investigation to refine assessment and mitigate hazard through relocation or re-design at these locations"*.
Negligible	94	5.8	94	11.4	*"Project should proceed with monitoring and mitigation of peat landslide hazards at these locations as appropriate"*.
N/A No Risk (No Peat)*	1,256	77.9	469	56.8	Indicative peat depth grid < 0.5m, no perceived modelled peat slide risk.
Total Cells:	1,613	100	826	100	

* No peat class is based on cells where indicative peat depth grid < 0.5m as per modelled minimum depth for peat slides to occur.

6.4.3. **Table 10C-10** shows that a total of 826 grid cells of the 1,613 total had measured strata points within them, with ~86.8% of the cells with measured strata depth in ZoI assessed as having 'No Risk', 'Negligible' or 'Low' risk of peatslide hazard at the initial risk assessment stage.

6.4.4. **Figure 10.13 Initial Risk** shows the planned infrastructure layout overlaid on the Initial Risk mapping, from which 'Moderate' and 'High' risk of peat instability are identified.

6.4.5. As shown in **Table 10C-10**, within ZoI, initial risk of peatslides for cells with measured depths was assessed as High for 0.1% (2) of cells and Moderate for 6.6% (107) of cells.

6.4.6. For further analysis, cells were clustered into six peat stability assessment areas (PSA), with PSA Areas A - F each identifying a specific location of ZoI that overlaps with the Proposed Development. The two cells assessed as 'High' initial risk are both outwith the influence of the Proposed Development, applying professional judgement due to relative location and intervening features, therefore omitted from further analysis.

6.4.7. Further detailed location-specific information has been focused on locations within each PSA area where Initial risk was assessed as 'High' or 'Moderate', with likelihood defined by factor of safety values <1.4 combined with consequence values ranging from 'Low' to 'High'.

6.4.8. Appended datasheets provided in **Annex 10C.1** summarise considerations per PSA and resulting Revised Risk assessment outcomes to justify that amended risk levels were considered reasonable as part of a sensitivity analysis of the theoretical data. **Section 7** presents the results of this process.

7 DETAILED ASSESSMENT AND REVISED RISK ASSESSMENT

7.1 APPROACH TO DETAILED ASSESSMENT

7.1.1. For each of the PSA areas, a Detailed Assessment has been undertaken on individual datasheets. This includes description of the peat depths, FoS values, local characteristics including geomorphology and geotechnical information, remote sensing/aerial imagery and available photographs. These datasheets also identify site-specific mitigation, considering the additional information gathered at each of the PSA Areas. The individual datasheets are provided in **Annex 10C.1**, with an overview of the locations presented in **Figure 10.14 Detailed Assessment Areas**.

7.1.2. Maps in the detailed assessment datasheets display grid cells with Moderate and High Initial Risk values (each cell measuring 25 m x 25 m) and cells with FoS values less than 1.4. **Annex 10C.2** provides additional imagery.

7.1.3. Likelihood values assigned to each cell are based solely on FoS values, as discussed for the initial risk assessment, however, regional and local context information may provide additional data that justifies changing the likelihood category at the revised risk assessment stage for locations of concern. These contextual factors are consolidated into **Table 10C-11**, which provides rationale to assigning revised likelihood values to refine the assessment outcome.

7.1.4. In a regional context, some areas have a higher propensity for peatslide events than others and this may be evident from historical records, if reliable. Regional climatic factors influence the development of peat, its coverage and depth; at a site-level peat depths are determined from peat probing fieldwork rather than generalisations. Although the regional context does not provide any spatial differentiation within the Study Area, it may influence the level of caution applied.

7.1.5. In a local context, the variability of local factors to the development of peatslides may be considered. The primary local factors not already incorporated into the FoS calculations include convex slopes, breaks of slope, drainage patterns, landuse, grazing intensity and incidental events such as fire, which may alter the likelihood of peatslides. These factors may operate across the whole Study Area, in which case they offer no spatial differentiation, but if localised to specific parts of the Site they may be helpful in spatial characterisation. Identification of instability identified from aerial imagery and confirmed by 'ground truthing' as non-peatslide events, such as peaty debris slides, may be relevant as these forms of instability are not caused by peat instability (rather, are due to the slope failure of material underlying the peat layer, or where peat is not present). The Peat Landslide and Hazard Risk Assessment Guidance[1] included suggestions of probability values, these have been included in italics as a contextual reference.

Table 10C-11 - Criteria relating to Revised Likelihood values

Likelihood/ Hazard	Regional Context	Local Context
Almost Certain	The wider region (if it consists of similar condition units to the Study Area) has several historic peatslides. Study Area has several historic peatslides.	FoS <1.0 Ancillary considerations: ▪ Locally, indications of incipient mass peat instability such as tension cracks, bulges, misaligned fences or trees etc; ▪ Peat depths on slopes consistently over 1.50 m; ▪ Topography: convex breaks in slope; extensive unconfined slopes; ▪ Drainage: converging flow paths; large contributing area; peat pipes; ▪ GeoSure Landslide Hazard Class D; *Probability of mass peat instability event occurrence during lifetime of scheme considered greater than 1 in 3.*
Probable	Study Area has evidence of historic peatslide	FoS <1.0 Ancillary considerations: ▪ Locally, indications of incipient mass peat instability; ▪ Peat depths on slopes consistently over 1.00 m; ▪ Topography: convex breaks in slope; extensive unconfined slopes; ▪ Drainage: converging flow paths; large contributing area; peat pipes; ▪ GeoSure Landslide Hazard Class D; *Probability of mass peat instability event occurrence during lifetime of scheme considered between 1 in 3 - 1 in 10.*
Likely	Study Area has evidence of historic peatslide	FoS is between 1.0 and 1.4 Ancillary considerations: ▪ Locally, no adjacent indications of incipient mass peat instability but some within 100 m; ▪ Peat depths on slopes consistently over 1.00 m; ▪ Topography: generally rounded/undulating landforms; ▪ Drainage: suspicious absence of surface channels indications of peat pipes; ▪ GeoSure Landslide Hazard Class C; *Probability of mass peat instability event occurrence during lifetime of scheme considered between 1 in 10 - 1 in 100.*
Unlikely	Study Area has no evidence of past peatslides.	FoS is between 1.4 and 3.0 Ancillary considerations:

Likelihood/ Hazard	Regional Context	Local Context
		▪ Locally, no indications of incipient mass peat instability ▪ Isolated peat depths over 1.00 m on slopes; ▪ Topography: generally rounded/undulating landforms; ▪ Drainage: natural well-defined channels; artificial improvements to drainage; ▪ Not GeoSure Landslide Hazard Class D or C; *Probability of mass peat instability event occurrence during lifetime of scheme considered between 1 in 100 - 1 in 10,000,000.*
Negligible	The wider region (if it consists of similar condition units to the Study Area) has no historic peatslides. Study Area has no evidence of historic peatslides.	FoS > 3.0 Ancillary considerations: ▪ Locally, no indications of incipient mass peat instability; ▪ Peat depths less than 1.00 m on slopes; ▪ Topography: concave or no break in slope; small confined slopes or pockets; ▪ Drainage: diverging flow paths; small contributing area; natural well-defined channels; artificial improvements to drainage; ▪ Not GeoSure Landslide Hazard Class D or C; *Probability of mass peat instability event occurrence during lifetime of scheme considered less than 1 in 10,000,000.*
N/A - No Peat		Indicative peat depth grid shallower than 0.50 m.

7.1.6. To aid the revised risk assessment process, focussed on detailed assessment areas, geomorphology data was collated, including grid cells with indicative/measured peat depth greater than 1.50 m, BGS GeoSure Landslide Hazard classes C and D, slope angles greater than 10º and breaks in slope. These features are displayed with planned infrastructure on **Figure 10.7 Geomorphology**.

7.1.7. A series of images for each PSA area are also presented in **Annex 10C.2**. These display aerial imagery and GeoSure Landslide Hazard classes as well as slope derived from the DTM data.

7.1.8. In addition to good practice and design measures, there are also a number of area-specific mitigation measures that are proposed to be deployed to reduce likelihood at particular locations, with further details in **Section 9**.

7.1.9. The revised risk information on the six individual datasheets (**Annex 10C.1**) reflects refinement, following consideration of specific characteristics for each area, using applicable ground investigation information and the identification and application of any appropriate mitigation measures during design, construction and operation.

7.1.10. Potential runout distances and volumes of material for each datasheet have been estimated, factoring-in local conditions, with these estimates recorded within the datasheets, alongside identified receptors within and outwith the Site.

7.2 REVISED RISK ASSESSMENT OUTCOMES

7.2.1. Following detailed assessment of the PSA areas, using contextual criteria provided in **Table 10C-11** and assuming application of appropriate good practice and area-specific mitigation measures, likelihood for all cells within the PSA areas were revised. Location-specific rationale and details are provided for each PSA area in the Datasheets. This revised outcome anticipates proposed tracks to be constructed using techniques to avoid or minimise excavation of peat where applicable and slope monitoring.

7.2.2. Following the risk matrix displayed in **Table 7.5**, the revised risk is reduced to 'Low' or 'N/A no peat' for all cells within PSA areas assessed as 'Moderate' initial risk (with no 'High' initial risk cells applicable). The revised risk for grid cells within ZoI are shown in **Table 7-2** and **Figure 10.15 Revised Risk**.

Table 10C-12 - Revised Risk Outcomes for ZoI for High Sensitivity Soils

Revised Risk	Number of Grid Cells	% of Grid Cells	Number of Grid Cells (with measured peat depth)	% of Grid Cells (with measured peat depth)	Suggested 'Guideline' Actions
High	2	0.12	2	0.24	*"Avoid project development at these locations".*
Moderate	14	0.87	14	1.69	*"Project should not proceed unless risk can be avoided or mitigated at these locations, without significant environmental impact, in order to reduce risk ranking to low or negligible".*
Low	208	12.9	208	25.18	*"Project may proceed pending further investigation to refine assessment and mitigate hazard through relocation or re-design at these locations".*
Negligible	94	5.83	94	11.38	*"Project should proceed with monitoring and mitigation of peat landslide hazards at these locations as appropriate".*
N/A No Risk (No Peat)	1,295	80.29	508	61.25	Non-peat material (<0.5m), no modelled peatslide risk.
Total Cells:	1,613	100	826	100	

7.2.3. The revised risk assessment considered all High and Moderate risk cells that were deemed to have to potential to be affected / to affect the Proposed Development.

7.2.4. **Table 10C-12** includes a number of revised risk cells that retain these values but are outwith development concern on margins of the grid, due to intervening distance and topography.

8 ASSESSMENT ASSUMPTIONS AND LIMITATIONS

8.1 REGULATORY CONTROL

8.1.1. Following previous peat stability report feedback from the Scottish Government Peat Stability Independent Assessor (Ironside Farrar) from similar sites, this section identifies key assumptions which have been applied during the preparation of this deliverable. These assumptions are considered appropriate and proportionate for a development seeking planning consent, with expectation that further data shall be available as the design progresses into construction.

8.2 STUDY AREA

8.2.1. A Study Area extending 250 m beyond the Site was applied, based on local ground conditions and slope angles and taking account of the Proposed Development activities. It is considered unlikely that any peat landslide that occurred outwith this zone would be caused by or cause adverse influence to the Proposed Development.

8.2.2. This is taking into consideration the fact that peatslides in Scotland tend to originate and complete run-out over distances of up to 250 m, with small-scale events a more common occurrence than such larger events that would reach distances of 250 m. Run-out distances have been estimated within the detailed datasheets, these have all been assessed to be less than 50 m.

8.2.3. Longer run-out zones may occur in areas with less constraints, increasingly likely where mass peat movement events meet and then follow watercourse flow paths, as occurred in some well-documented examples such as Meenbog and Derrybrien in the Republic of Ireland. These Irish events may be more likely to represent bog burst phenomena, with higher water content within the peat body involved. Intermittent areas of shallow peaty soils, bedrock exposures, variable gradients, change of slope direction and forestry are local factors that may act individually or collectively to reduce run-out distances in the context of this project.

8.3 INTERPOLATION OF SOIL STRATA DEPTH

8.3.1. This initial (conservative) allocation of indicative peat depths across the grid cells by experienced staff was a critical step for the subsequent analysis that determines factor of safety results, which determined the initial likelihood value, input alongside consequence value to evaluate the initial risk of grid cells, irrespective of collected peat survey data.

8.3.2. The initial risk assessment was refined by undertaking a detailed assessment of locations in proximity to areas of high sensitivity soils where interference with the Proposed Development was anticipated due cells assessed with ‘High’ and ‘Moderate’ initial risk levels.

8.3.3. To ensure representative locations were included and not dependent solely on indicative peat depth records only, BGS GeoSure datasets, aerial imagery and soil coring results were reviewed, alongside the factor of safety outcomes.

8.3.4. WSP’s staged approach, with professional judgement applied throughout, results in a high degree of confidence that relevant locations of concern have been identified and appropriately risk assessed by experienced assessment staff. This included noting recommendations for future tasks, including further soil and peat surveys requirements, as the design develops and more GI information may become available.

8.4 FACTOR OF SAFETY

8.4.1. The key variables and most sensitive factors in the FoS analysis are indicative peat depth and slope angle, which are directly applied using a large dataset of site information focussed on planned turbine positions, applying a back-calculated c' specific to site data and conservative lower-bound literature values for other calculation inputs. Thus, the assessment of peat stability at this stage follows an inherently conservative approach. The site visit observations act as a form of sensitivity analysis, as the method bases initial probability directly upon FoS outcomes for the initial risk stage and typically leads to the identification of locations which can be justifiably reduced to a lower probability and potentially lower revised risk, following the collation of ancillary local information.

8.4.2. Reduction in slope stability due to increasing of mass of slope above the peat body is considered as a trigger for mass movement of peat, although peat loading is not a parameter included as part of the Factor of Safety method, specific mitigation measures seek to avoid or reduce this situation occurring at locations of concern. This assessment focussed upon in situ (undrained) peat, at the detailed design stage it may be deemed appropriate to also conduct analysis for drained peat for representative locations including the PSA Areas.

8.5 RECEPTORS

8.5.1. OS infrastructure digital layers were primarily used to determine receptors and consequence values alongside some data source listed in **Section 2** of this report. The assessment relies on the completeness and accuracy of these datasets.

8.6 PEAT MANAGEMENT

8.6.1. Excavated peat would be re-used in as short a timescale as feasible and follow principles provided in **Appendix 10.4 Soil and Peat Management Plan**. Post-consent, the detailed design would include details of plans for temporary storage of peat and associated methodologies for excavation/transfer/storage/reuse and include specific storage locations. The Geotechnical Risk Register would include peat storage as a specific risk, with applicable controls that would be kept up-to-date with current good practice and lessons learned from Site works.

8.7 MAPPING

8.7.1. Breaks of slope were mapped in the vicinity of the Proposed Infrastructure based on OS Terrain 5 DTM, and where the break extended horizontally for at least 10 m. However, complex terrain morphology exhibits a variety of slope gradients and orientations across the Site, and should additional break of slope mapping be considered appropriate at the detailed design stage, this could be undertaken.

8.7.2. Artificial drainage is present at the Site but these features have not been mapped. These channels are not all shown on OS mapping. Should additional channel mapping be considered appropriate at the detailed design stage, this could be undertaken.

9 MITIGATION AND GOOD PRACTICE MEASURES

9.1.1. The purpose of the PLHRA is to identify areas of the Site which are potentially at most risk of peat instability and thereafter assess potential construction impacts. Where avoidance through design is not possible, mitigation measures require to be implemented to avoid or reduce the risk of peat instability. In addition to specific mitigation measures which may be deployed at particular locations, itemised in the specific detailed assessment datasheets, there are a number of generic construction good practice measures that would be applied, where applicable, as additional data becomes available at the pre-construction stage.

9.1.2. A number of these potential actions are set out in **Table 10C-13**, including area-specific mitigation measures identified for the Proposed Development PSAs.

9.1.3. Good practice guidance documents, such as Floating Roads on Peat[26], Managing Geotechnical Risk[27] (Clayton, 2001) and Peat Landslide Hazard and Risk Assessments: Best Practice[1] would be consulted to inform the design and construction processes. All site investigation work would be undertaken in compliance with relevant British Standards (BS), including BS 5930:1999[28] and BS 6031:2009[29].

9.1.4. Onsite construction staff are often the best placed to provide advance notification of potential problems, provided sufficiently trained and with an appropriate reporting mechanism. There are a number of recognised indicators for slope failures and these may indicate a potential peatslide or the commencement of a peatslide event, as outlined in **Section 1** of this report. The suspected identification of any of these indicators should be assessed by specialist peat stability or geotechnical personnel.

9.1.5. Additional items to those identified in **Table 10C-13** may be introduced as further site data becomes available at pre-construction and construction stages.

[26] FCE & SNH N (2010). Floating Roads on Peat. Scottish Natural Heritage and Forestry Civil Engineering. [online]. Available at: http://www.roadex.org/wp-content/uploads/2014/01/FCE-SNH-Floating-Roads-on-Peat-report.pdf [Accessed in June 2025].

[27] Clayton, C. R. I. (2001). Managing Geotechnical Risk: Improving Productivity in UK Building & Construction. Thomas Telford, London.

[28] BSI (1999). Code of practice for site investigations. BS 5930:1999, British Standards Institute.

[29] BSI (2009). Code of practice for earthworks. BS 6031: 2009, British Standards Institute.

Table 10C-13 - Good Practice and Mitigation Measures

Potential Actions	Good Practice	PSA Area-Specific Mitigation Measures, as applicable
1. Geotechnical specialist onsite during the construction phase to undertake advance inspection, carry out regular slope monitoring and provide ongoing advice at locations of concern.	☐	All PSA Areas
2. Maintain and update geotechnical risk register or similar management system.	☐	PSA Area A, B, C, E, & F
3. Construction staff should be made aware of peatslide indicators and emergency procedures (see below).	☐	
4. Emergency procedures should include steps to be taken on detection of any evidence of potential peat instability.	☐	
5. Microsite the infrastructure in order to avoid the area of concern (subject to non-violation of other constraints).	☐	
6. Ensure that good groundwater and surface water control, such as moor gripping or drainage ditches, is in place in advance of construction activities.	☐	
7. Installation of stand-pipes / piezometers to monitor ground water levels and pore pressures.	☐	
8. Ensure artificial drainage does not concentrate flows onto slopes, gully heads or into excavations.	☐	
9. Ensure that sediment control measures are incorporated into all artificial drainage measures and including specific scour protection mitigation where steep slopes or high activity erosion processes are identified. Concrete aprons, rip rap, gabion/reno mattress or geotextile mats may be applicable options, depending on watercourse characteristics and sensitivities.	☐	
10. Earthmoving activities should be restricted during and immediately after heavy and/or prolonged rainfall events, including use of weather forecasting and re-programming of construction activities as applicable. Particular care should be taken when heavy rainfall events are predicted following a prolonged dry spell.	☐	
11. The construction plan should minimise the extent and duration of open excavations and bare ground.	☐	
12. Avoid placing excavated material or other forms of loading on or immediately above breaks of slope or any other potentially unstable slopes.	☐	All PSA Areas

Potential Actions	Good Practice	PSA Area-Specific Mitigation Measures, as applicable
13. Avoid removing slope support, particularly where slope stability has been highlighted as of concern. Consider temporary or floating access track at appropriate locations to avoid removing slope support.	☐	All PSA Areas, PSA F has suggested floated track section
14. Establish / re-establish vegetation as soon as possible to improve slope stability and provide sediment transport control.	☐	
15. Consider limiting loads crossing newly created peat embankments to enable pore water pressure in both embankment and underlying peat to reduce to pre-construction levels and original shear strength.	☐	
16. Modify slope geometry to provide a 'weighted toe'.	☐	
17. Use of retaining structures, such as gabion terracing to support specific slopes.	☐	
18. In locations where limited opportunity for avoidance or other mitigation to reduce likelihood, the application of debris nets, catch fences, catch ditches and/or deflection systems to protect receptors and reduce adverse consequences. Such installations should be subject to routine inspection and maintenance.	☐	
19. Forestry clearance activities should be undertaken following good practice, including careful positioning of log piles to avoid overloading of slope, sediment control and consideration of retaining tree roots *in situ* for soil stabilisation in appropriate locations.	☐	
20. Borrow pit blasting activities to take account of any peat stability locations of concern in the proximity, including seeking alternative methods that avoid blasting. If sensitive peat stability receptors are identified, there are a number of methods to manage, mitigate and monitor, such as careful placement, charge size, vibration monitoring and pre- and post-blasting slope monitoring.	☐	

10 SUMMARY AND RECOMMENDATIONS

10.1.1. Peat depth probing in conjunction with slope angle mapping is a cost-effective method to establish peat depth and peat stability profiles across large areas. Combining this with aerial imagery data interpretation and GeoSure datasets enables potential evidence of mass movement events to be efficiently identified. Experienced staff used professional judgement to interpolate and determine indicative peat depths, where measured results were not available.

10.1.2. The Proposed Development is predominantly underlain by mineral soils, and in isolated locations by peat of varying depths and shallower peaty soil, with strata depth ranging from 0 to 2.7m, with an average depth of 0.29 m across the Study Area. Slope angles and orientation vary greatly reflecting the nature of upland heathland terrain of the Site. Breaks of slope were also identified in several places near and within the Proposed Infrastructure. Where deeper peat coincides with steeper slopes, the likelihood of peatslide increases. Higher likelihood for instability was identified primarily in areas with deeper peat deposits (> 0.99 m, measured or inferred) found on gentle to moderate slopes.

10.1.3. Initial risk was determined following a conservative approach based on FoS analysis and the presence of receptors. The potentially least stable areas in any specific locations were initially applied 'Moderate', with this risk level relative to the remainder of the Site. Two areas of 'High' initial risk were identified, but outwith the Proposed Infrastructure. In order to review the initial risk, six areas with initial 'Moderate' risk locations close to Proposed Infrastructure were selected for the detailed assessment and revised risk process.

10.1.4. **Annex 10C.1** provides datasheets for these six locations identified for 'Detailed Assessment', initially identified as of 'Moderate' risk. Further information was collated in the datasheets to discuss initial and revised risk assessment outcomes for these locations.

10.1.5. Following the Detailed Assessment process, 'Low' risk was confirmed for all locations deemed to have the potential to be affected by / affect the Proposed Development. This takes account of local ground conditions, surveyor observations and mitigation measures, including construction of access tracks without excavation where appropriate to avoid/minimise disturbance of deeper peat, ensuring slope support is retained and slope monitoring where appropriate, and consideration of micrositing to avoid deeper peat and breaks of slope.

10.1.6. On the basis of applying mitigation recommendations including the potential use of floating tracks where appropriate, no areas likely to be impacted by the Proposed Infrastructure are considered to be above 'Low' revised risk (with the vast majority of the Site considered 'Negligible', 'Low' risk or non-peat) in terms of peat stability assessment. Revised risk outcomes for the Site are shown on **Figure 10.15 Revised Risk**.

10.1.7. The Guidelines[1] quote the following requirements, of which 'Low' and 'Negligible' risk applies to this Site:

- High risk - 'Avoid project development at these locations';
- Moderate risk - 'Project should not proceed unless risk can be avoided or mitigated at these locations, without significant environmental impact, in order to reduce risk ranking to low or negligible';

- Low risk - ‘Project may proceed pending further investigation to refine assessment and mitigate hazard through relocation or re-design at these locations’; and
- Negligible risk - ‘Project may proceed with monitoring and mitigation of peat landslide hazards at these locations as appropriate’.

10.1.8. Further geotechnical investigation is proposed as part of the site investigations, which would take place post consent and prior to construction. This is standard practice and would inform the final, detailed design of the Proposed Development, along with detailed mitigation to be implemented during construction, undertaken by an appropriately qualified geotechnical engineer. Any additional areas of concern identified by surveys pre-construction, should be added to the areas for further investigation.

10.1.9. Whilst good practice and specific mitigation measures have been identified in this document in order to minimise risk, the suggested techniques are not exhaustive and it is expected that a design consultancy and contractor would use these and other techniques, as appropriate, to effectively manage the peat stability risk at the pre-construction stage.

10.1.10. Management of peat stability risk would remain a consideration throughout the subsequent detailed design processes, including additional site investigation, pre-construction activities and during construction, subject to the development receiving consent. A key issue is that the design remains ‘live’ and subject to ongoing optimisation, with the iterative design process continuing into construction phase. The contractor shall consider to microsite to reduce peat instability risk, whilst taking account of other local environmental and engineering constraints.

10.1.11. The need for risk management has been emphasised throughout this report. Risk management would include the regular review of the Geotechnical Risk Register, supported by appropriate actions within the contractor’s Construction Method Statement (CMS) and Construction Environmental Management Plan (CEMP), in due course.

11 TECHNICAL AUTHOR EXPERIENCE

11.1.1. The technical reviewer of this report was Stuart Bone B.Sc. (Hons.) M.Sc. PIEMA CWEM CEnv.

11.1.2. Stuart Bone is a Chartered Environmentalist (CEnv) and Chartered Water and Environmental Manager (CWEM) holding chartered status since 2005 and is also a Practitioner Member of the Institute of Environmental Management & Assessment (PIEMA). Stuart has a B.Sc. (Hons.) in Environmental Geography from the University of Aberdeen and a M.Sc. in Marine Resource Development and Protection from Heriot-Watt University. Stuart has over 25 years environmental experience, since 2006 focused on delivering PLHRA and other soil and water EIA deliverables in the renewable energy sector and highways. He has been involved in the planning of fieldwork and the delivery of PLHRA reports since 2006, following the initial Scottish Government guidance being published, becoming a technical lead on these deliverables in 2012. Stuart has a strong understanding of peat morphology, geomorphological processes, environmental data collection, FoS stability analysis and risk assessment both from project experience and from his academic background. Stuart has a thorough familiarity of the latest guidance and promotes early data collation and stability interpretation to inform the iterative design process in accordance with good risk management and proportionate assessment principles. Stuart has been supported by a range of staff undertaking various field and desk tasks, providing guidance and technical reviews at every stage of this PLHRA process, leading the GIS-based assessment, detailed assessment refinements and acting as report reviewer.

11.1.3. Author of this report was Taco Regensburg B.Sc, M.Sc, PhD, M.I. Soil Sci.

11.1.4. Taco Regensburg is a Principal Environmental Consultant with a PhD in Geography focused on peatland hydrology and fluvial carbon pathways, supported by over 11 years of research and consultancy experience in peatland geomorphology, hydrology, soil physics, erosion processes and sustainable land and water management. Taco is a full member of the British Society of Soil Science (M.I. Soil Sci) and is a published author. Following his PhD in 2021, Taco has built up particular expertise in consulting on the delivery of Peat Landslide Hazard and Risk Assessments (PLHRA), peat surveys, peat management plans, soil and land use Environmental Statement chapters, soil carbon budgets and peatland restoration strategies for renewable energy, infrastructure and development projects. He has led numerous baseline surveys, including peat probing, coring surveys and water table monitoring, and acted as technical lead on survey design, data processing, GIS-based analysis, hazard interpretation and reporting to support planning applications and iterative site design. Taco has a strong technical understanding of peat morphology, hydrological functioning, geomorphological processes, subsurface erosion, peat stability indicators and risk-based assessment principles. He is experienced in identifying peat and soil constraints, developing proportionate mitigation and management measures, advising on peat quality, landslide risk and carbon balance, and preparing robust technical deliverables for minimised planning and consenting risk. Taco also brings strong skills in interdisciplinary coordination for data assimilation in technical reporting, restoration design and monitoring, and the translation of complex peatland science into clear, practical advice for project teams, clients and regulators.

Annex 10C.1

DETAILED ASSESSMENT DATASHEET DESCRIPTIONS

LEGEND FOR DETAILED ASSESSMENT DATASHEETS

- the Site
- Turbine
- Crane pad hardstanding
- Turbine foundation
- BESS compound
- Temporary construction compound
- Control building compound
- Existing access track
- New access track
- Substation compound
- Cut & Fill extents (batter)
- Study Area
- Survey Area
- Zones of Interest
- High sensitivity soils
- PSA areas
- Break of slope
- Indicative peat depth > 1.5 m

Coring results

- Mineral - Heavy
- Mineral - Medium
- Peat
- Peaty soil

Indicative Peat Depth (m)

- < 0.30
- 0.29 - 0.39
- 0.39 - 0.49
- 0.49 - 0.99
- 0.99 - 1.49
- 1.49 - 1.99
- 2.00 +

Soil strata depth

- < 0.30
- 0.29 - 0.39
- 0.39 - 0.49
- 0.49 - 0.99
- 0.99 - 1.49
- 1.49 - 1.99
- 2.0 +

FoS grid

- <1.0
- 1.0 - <1.4

FoS points

- 0 - 1
- 1 - 1.4
- 1.4 - 3
- 3 - inf

BGS Geosure Landslide Hazard Class

- C
- D

Initial Risk

- High
- Moderate

Slope (degrees)

- <= 10
- 10 - 15
- 15 - 20
- 20 - 25
- > 25
- Contour (10 m)
- Watercourses

PSA Area A:

Initial Risk – Moderate (Initial Likelihood of 'Probable' and 'Likely', Consequence is 'Moderate' and 'High')

Good Practice and Design

Section 9 details standard good practice measures.

Following initial Phase 2 probing surveys, track sections leading to T3 and T4 have been moved south, to minimise disturbance of areas of high sensitivity soils. Within PSA area A, a total 29 cells of Moderate Initial Risk are located within 50m of high sensitivity soils, of which 12 are within 25m of the proposed access track towards T3 and T4 (T3 is located north of the PSA area A, and T4 is located northeast of PSA area A).

Specific Mitigation, Potential Scale and Receptor

Section 9 lists standard mitigation measures.

In areas of deep peat, access tracks shall adopt construction techniques to reduce or avoid excavation, including floating track. Slope monitoring would be applied, as applicable. This area will be identified within the project Geotechnical Risk Register.

Should peatslide occur: Approximated width 20 m, runout length 20 m, at an average depth of 0.8 m; volume of peat 320 m^3; Receptor – 200m access track towards T3.

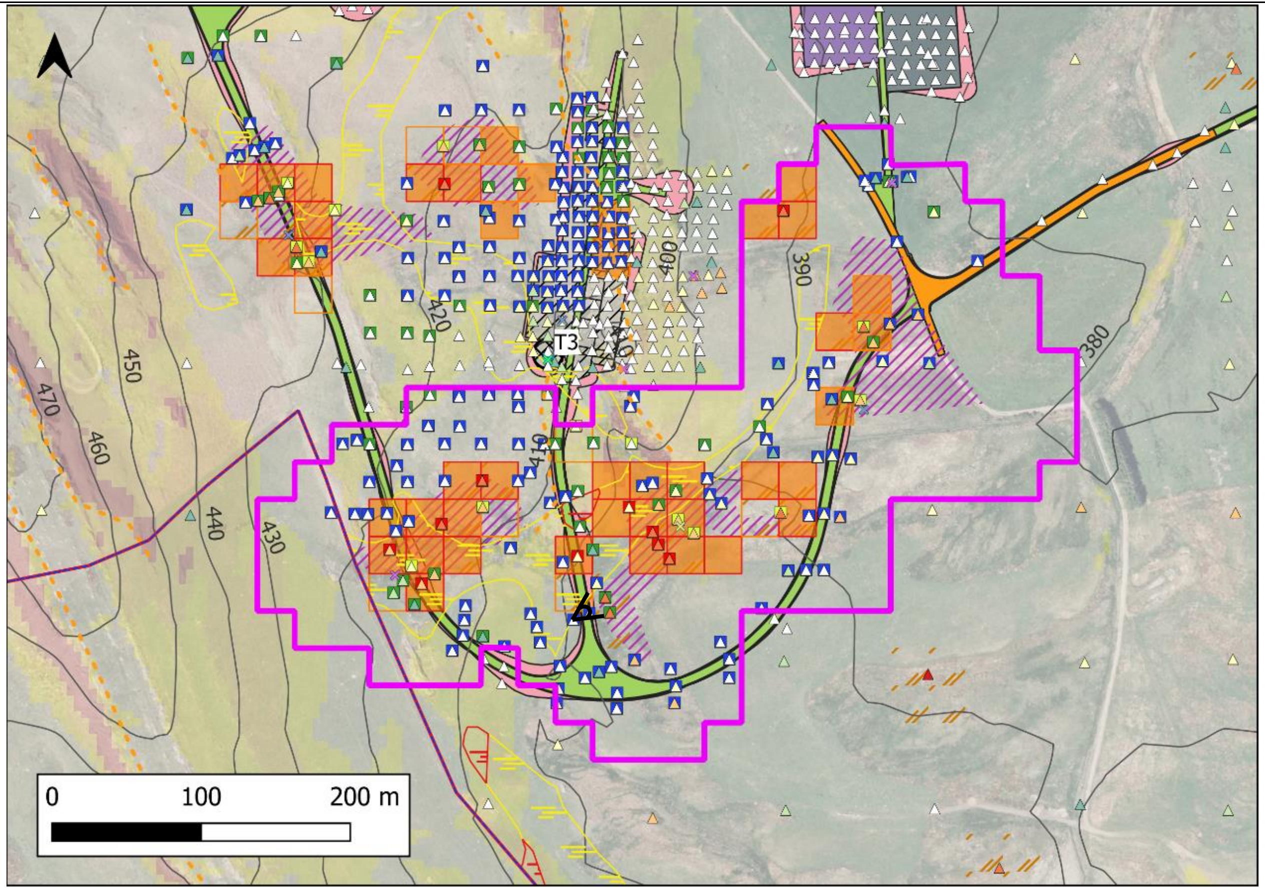


Plate A1: Aerial Image of PSA Area A, (grid cells are 25m x 25m) *Microsoft Bing screen shot reprinted with permission from Microsoft Corporation. Contains Ordnance Survey data © Crown copyright and database right 2026.*

Area Details

PSA Area A is characterised by a slope that runs into a flush area to the northeast, with a drain channel lining the upslope area of existing track perpendicular to the slope to the west of the PSA area. The area is covered by improved grassland and rough pasture with active attempts to drain visible. An area of Class C landslide hazard area is identified from the BGS GeoSure data, following the natural confluence along the slope to the east, with a small area of Class D (located adjacent to the spur of T3). No evidence of active or historic peat instability was identified from satellite imagery, nor any noted during site visits.

The Consequence for some cells was elevated to High due to the presence of the Proposed Development assets, peat depths >1.5 m and presence of existing minor tracks. 29 Moderate Initial Risk cells were identified, slopes ranged from 3.3 to 16.5 degrees, with measured soil strata depth ranging 0.74 to 1.93 m. These cells include peat and other soil types. A total of 53 FoS point values contributed to these cells, 17 of which had an FoS < 1.4, with 10 cells recording an FoS < 1.0.

Appendix 10A Baseline Soils Report identified a peat profile within an area of high sensitivity soils to the east boundary of the PSA (**Appendix 10A Annex 10A.1 – Track_NR_T03**). This area coincides with a section of ~200 m of the access track east of T3, at around 390m AOD. Coring results show peat to a maximum depth of 0.8 m and no amorphous peat was identified. Locally the peat was observed to be drier, with drainage installed in wetter areas nearby. Risk values in these cells was based on two data points with strata depth of 1.3m (FoS 1.3) and 1.8 m (FoS 1.1), with cell slopes ranging from 3.3 to 5.1 degrees.

The theoretical shear strength value is 1.37 kN/m^2 (the 99th percentile across the site). Although conservative, this is based on all soil strata depth, not merely for areas of high sensitivity soils. The value is lower than the literature lower-bound peat value (4 kN/m^2) and the actual shear strength in areas of peat, where it occurs, is likely to be typically higher, often substantially higher – with increased associated slope stability.

For 25 (of 29) cells of Moderate Initial Risk, field surveys and desk assessments did not provide sufficient evidence to assume the presence of peat, and therefore the Initial Likelihood for these cells has been revised to 'N/A no peat', omitting them from a Revised Risk value. Location of cells excluded from revised risk are shown in **Appendix 10C Annex 10C.2 – Plate B3**.

The remaining 4 cells of Moderate Initial Risk cells had sufficient evidence to assume the presence of peat (see **Appendix 10C Annex 10C.2 – Plate B3**), based on the considerations outlined above, field surveys and desk assessments provided. In combination with absence of historic peat landslides in the area, the Initial Likelihood value for these 4 cells on peat soils was downgraded to 'Unlikely'.

Further supporting information is provided in **Appendix 10C Annex 10C.2 Plate B1, Plate B2 and Plate B4**.

Revised Risk Despite BGS Geosure data showing Class C and D landslide hazard within the PSA area, no peat instability evidence was observed during Site visit or identified on aerial imagery. A section of 200m of access track across peat will be floated. The deepest peat is found in areas with low slope angle. Overall, taking account of the peatland morphology, existing drainage, individual peat probe FoS, design and mitigation (floating track): ***Initial Likelihood is reduced to Unlikely, with the Initial Risk reduced to Low*.** ***Cells for which Likelihood was downgraded to N/A no peat, were omitted from Revised Risk.***	 **Photograph A1: on the track to T3, looking in north east direction. NGR SO 00400 97630 (397 m AOD)**

PSA Area B:

Initial Risk – Moderate (Initial Likelihood of Probable and Likely, Consequence is Moderate and 'High')

Good Practice and Design

Section 9 details standard good practice measures.

This area is located south of T4, including access and ancillary assets at T3. 13 cells of Moderate Initial Risk are located within 50m of high sensitivity soils, of which 6 are within 25m of the proposed access track south of T4.

Specific Mitigation, Potential Scale and Receptor

Section 9 lists standard mitigation measures.

In areas of deep peat, access tracks shall adopt construction techniques to reduce or avoid excavation, including application of floating track. Slope monitoring would be applied, as applicable. This area will be identified within the project Geotechnical Risk Register.

Should peatslide occur: Approximated width 20 m, runout length 30m, at an average depth of 0.5 m; volume of peat 300 m^3; Receptor – access track to T4.

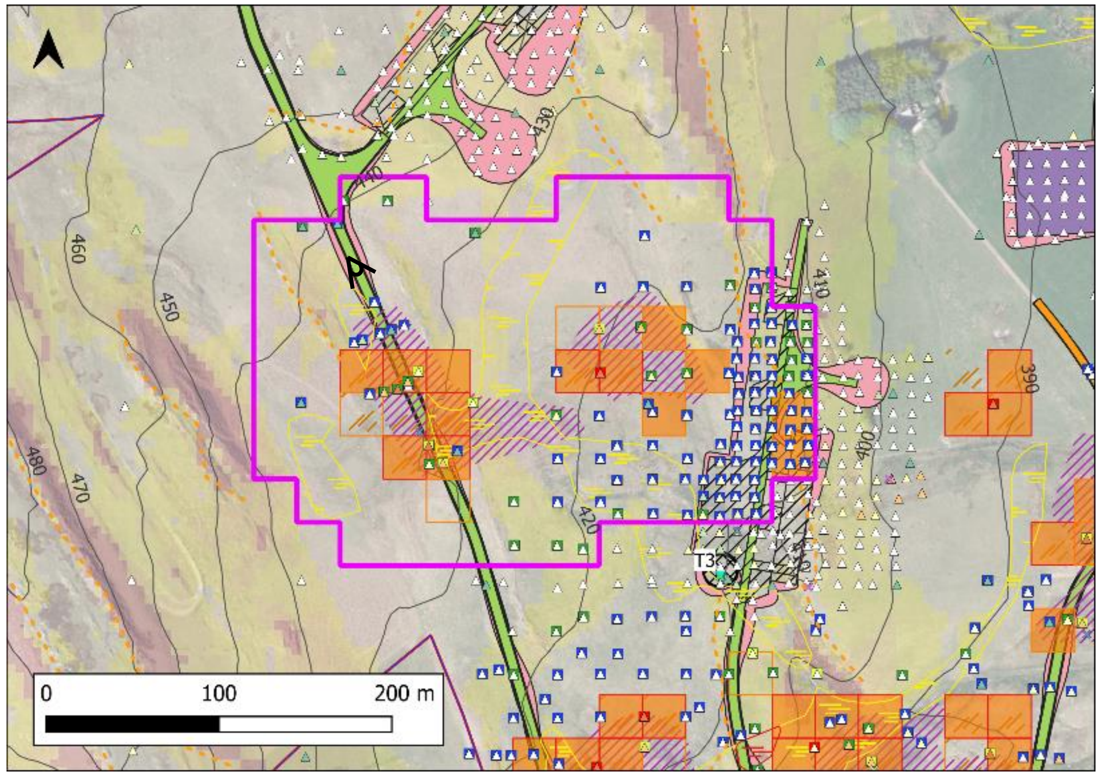


Plate A2: Aerial Image of PSA Area B, including access track towards T4 (north) and T3 (east) (grid cells are 25m x 25m) *Microsoft Bing screen shot reprinted with permission from Microsoft Corporation. Contains Ordnance Survey data © Crown copyright and database right 2025.*

Revised Risk

Despite BGS Geosure data showing Class C landslide hazard within the PSA area, no historic peat instability evidenced on site or identified on aerial imagery. A section of ~100m of access track through peat will be floated. The deepest peat is found in areas with low slope angle. Overall, taking account of the site topography, existing drainage, individual peat probe FoS, design and mitigation (floating track):

Likelihood is reduced to Unlikely, with the Initial Risk reduced to Low.

Area Details

PSA Area B is characterised by undulating terrain, including two elevated rifts that run north to south. BGS GeoSure mapping shows landslide Class C overlaps with the proposed access track, as well as the adjacent area associated with high sensitivity soils. Breaks of slope have been identified from DTM data to the west of the access track south of T4. No evidence of active or historic peat instability was identified from satellite imagery, nor any noted during site visits.

The Consequence across PSA Area B is Moderate due to the presence of the Proposed Development, strata depth > 1.5m, then elevated to 'High' where cells coincide with presence of archaeological sites. Across the 13 Moderate Initial Risk cells, average slopes ranged from 4.8 to 12.3 degrees, with measured soil strata depth ranging 0.9 to 1.78 m. A total of 29 FoS point values contributed to these cells, 5 of which had an FoS < 1.4, with 1 location with FoS < 1.0.

Appendix 10A Baseline Soils Report identified a peat profile within an area of high sensitivity soils, lining a section of ~100m access track towards T4. Soil coring recorded peat to a maximum depth of 0.5m and no amorphous peat was identified (**Appendix 10A Annex 10A.1 – Core Log T04_AT_HIGH**). The average strata depth across this area is 0.7 m, with a maximum of 1.78 m and average slopes ranging 4.8 – 12.3 degrees. Across these 6 cells, four of 14 contributing points had FoS values <1.4, with the minimum FoS value of 1.19 on a slope of 14.7 degrees - this location is sited 30m downslope and east of the proposed access track and related to rock outcrop rather than peat surface.

The theoretical shear strength value is 1.37 kN/m^2 (the 99th percentile across the site). Although conservative, this is based on all soil strata depth, not merely for areas of high sensitivity soils. The value is lower than the literature lower-bound peat value (4 kN/m^2) and the actual shear strength in areas of peat, where it occurs, is likely to be typically higher, often substantially higher – with increased associated slope stability.

Based on the considerations outlined above, for 6 Moderate Initial Risk cells, field surveys and desk assessments provided sufficient evidence to assume the presence of peat (see **Appendix 10C Annex 10C.2 – Plate B7)**. In combination with absence of historic peat landslides in the area, the Initial Likelihood for the 6 cells of Moderate Initial Risk on peat soils was downgraded to Unlikely.

For a total of 7 cells of Moderate Initial Risk, field surveys and desk assessments did not provide sufficient evidence to confirm the presence of peat, and therefore the Initial Likelihood for these cells has been revised to 'N/A no peat', omitting them from a Revised Risk value. Location of cells excluded from revised risk are shown in **Appendix 10C Annex 10C.2 – Plate B7**.

Cells for which Likelihood was revised to N/A no peat, were omitted from a Revised Risk value (N/A no peat).	 Further supporting information is provided in **Appendix 10C Annex 10C.2 Plate B5, Plate B6, and Plate B8**. **Photograph A2: Looking from the upslope side of the proposed access track towards T4 in southern direction to downslope depression around core location T04_AT_LOW. NGR SO 00037 97938 (432 m AOD)**

PSA Area C: **Initial Risk – Moderate (Initial Likelihood of Probable and Likely, Consequence is Moderate and High)**	**Area Details** PSA Area C is characterised by a west facing slope with overall shallow soil strata depth, with the boggy flush on gentler slopes in western extent recorded as an area of high sensitivity soils. BGS GeoSure mapping shows landslide Class C west of the T6 cranepad area, and across the section of existing access track to the north. A minor break of slope has been identified from DTM data directly east of the T6 platform as well as a more definitive break west of PSA Area C, at approximately 420m AOD – which includes a more substantial area of GeoSure Class C and Class D risk. No evidence of active or historic peat instability was identified from satellite imagery, nor any noted during site visits. The Consequence for cells in PSA Area C is High due to the presence of existing minor tracks. The Consequence value for the cell on the existing access track towards T6 is Moderate due to the proximity to the proposed development. Across the 16 Moderate Initial Risk cells, average slopes ranged from 3.9 to 16.6 degrees, with measured soil strata depth ranging 0.59 to 1.69 m. A total of 102 FoS point values contributed to these cells, only four of which had an FoS < 1.4 and two locations had an FoS < 1.0 (all of which outwith the footprint of the Proposed Development). Soil cores taken across the turbine foundation of T6 recorded shallow mineral soils of up to 0.2m (see further info **Appendix 10A Annex 10A.1 – Core Log T06** and **T06_NEW**). A soil core was taken within the marked area of high sensitivity soils, on the western edge of the T6 platform, showed black fibrous peat of down to 0.5m below ground level, over clay (see further info **Appendix 10A Annex 10A.1 – Core Log T06_PEAT**).
Good Practice and Design **Section 9** details standard good practice measures. Following initial Phase 2 probing surveys, the platform of T6 has been moved ~25m east, to minimise disturbance to an area of high sensitivity soils. The platform of T6 (foundation and cranepad hardstanding) is now sited in the east of the PSA, but outwith direct overlap with the area of high sensitivity soils. Within PSA area C, 16 cells of Moderate Initial Risk are located within 50 m of high sensitivity soils, of which 7 are within 25m of the T6 platform.	
Specific Mitigation, Potential Scale and Receptor **Section 9** lists standard mitigation measures**.** In areas of deep peat, access tracks shall adopt construction techniques to reduce or avoid excavation. Slope monitoring would be applied, as applicable. Where within area of high sensitivity soils, additional mitigation should be considered to safeguard integrity of natural deposit during construction. This area will be identified within the project Geotechnical Risk Register. **Should peatslide occur:** Approximated width 10 m, runout length 50 m, at an average depth of 1.0 m; volume of peat 500 m^3; Receptor – western edge of T6 platform.	

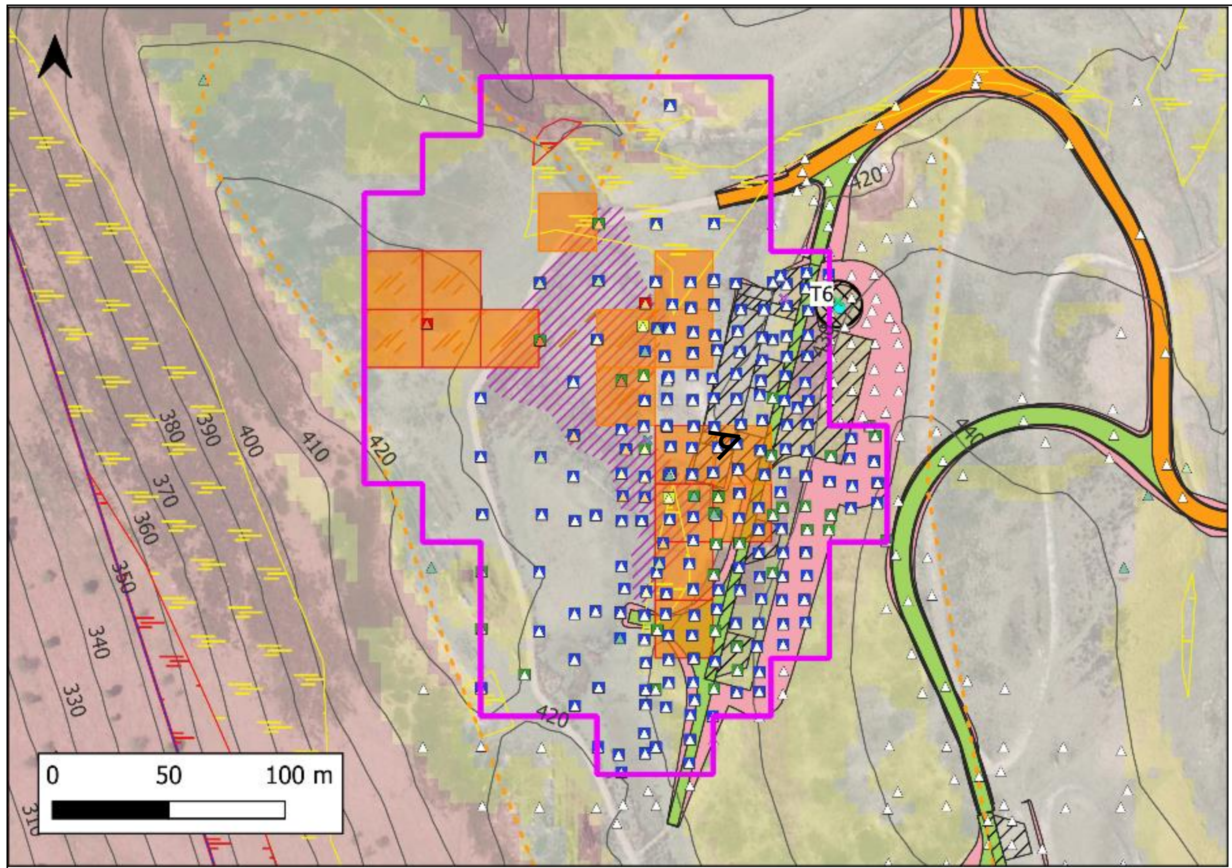


Plate A3: Aerial Image of PSA Area C, including T6 and associated access track (grid cells are 25m x 25m) *Microsoft Bing screen shot reprinted with permission from Microsoft Corporation. Contains Ordnance Survey data © Crown copyright and database right 2025.*

Revised Risk

Overall, taking account of the site topography, individual peat probe FoS, design and mitigation:

***Initial Likelihood is reduced to Unlikely and the Initial Risk reduced to Low*.**

The location with the lowest FoS point value of 0.78 is located ~125 m to the west and downslope of the Proposed Development. The minimum FoS grid value was 0.676 with a mean slope of 8.8 degrees, ~36 m to the west and downslope of the Proposed Development.

The theoretical shear strength value is 1.37 kN/m^2 (the 99th percentile across the site). Although conservative, this is based on all soil strata depth, not merely for areas of high sensitivity soils. The value is lower than the literature lower-bound value (4 kN/m^2) and the actual shear strength in areas of peat, where it occurs, is likely to be typically higher, often substantially higher – with increased associated slope stability.

Based on the consideration above, for all 16 Moderate Initial Risk cells, field surveys and desk assessments provided sufficient evidence to assume the presence of peat (see **Appendix 10C Annex 10C.2 – Plate B11)**. In combination with absence of historic peat landslides in the area, the Initial Likelihood for the 16 cells of Moderate Initial Risk within PSA Area C was downgraded to Unlikely.

Further supporting information is provided in **Appendix 10C Annex 10C.2 Plate B9, Plate B10 and Plate B12**.

Photograph A3: Looking south/southwest from turbine foundation T6, with view over peaty depression to the right-hand side. NGR SN 99304 98042 (418 m AOD).

PSA Area D:

Initial Risk – Moderate (Initial Likelihood of ‘Likely’ and ‘Probable’, Consequence is ‘Extremely High’ and ‘High’)

Good Practice and Design

Section 9 details standard good practice measures.

The Proposed Development incudes an existing access track which crosses 3 cells of Moderate Initial Risk, two at the southern extent, the remaining cell positioned to the north, close to the fork of the spur to T7.

Specific Mitigation, Potential Scale and Receptor

Section 9 lists standard mitigation measures.

This area will be identified within the project Geotechnical Risk Register.

Should peatslide occur: Approximated width 20 m, runout length 20m, at an average depth of 1.4 m; volume of peat 560 m^3; Receptor – upgraded access track.

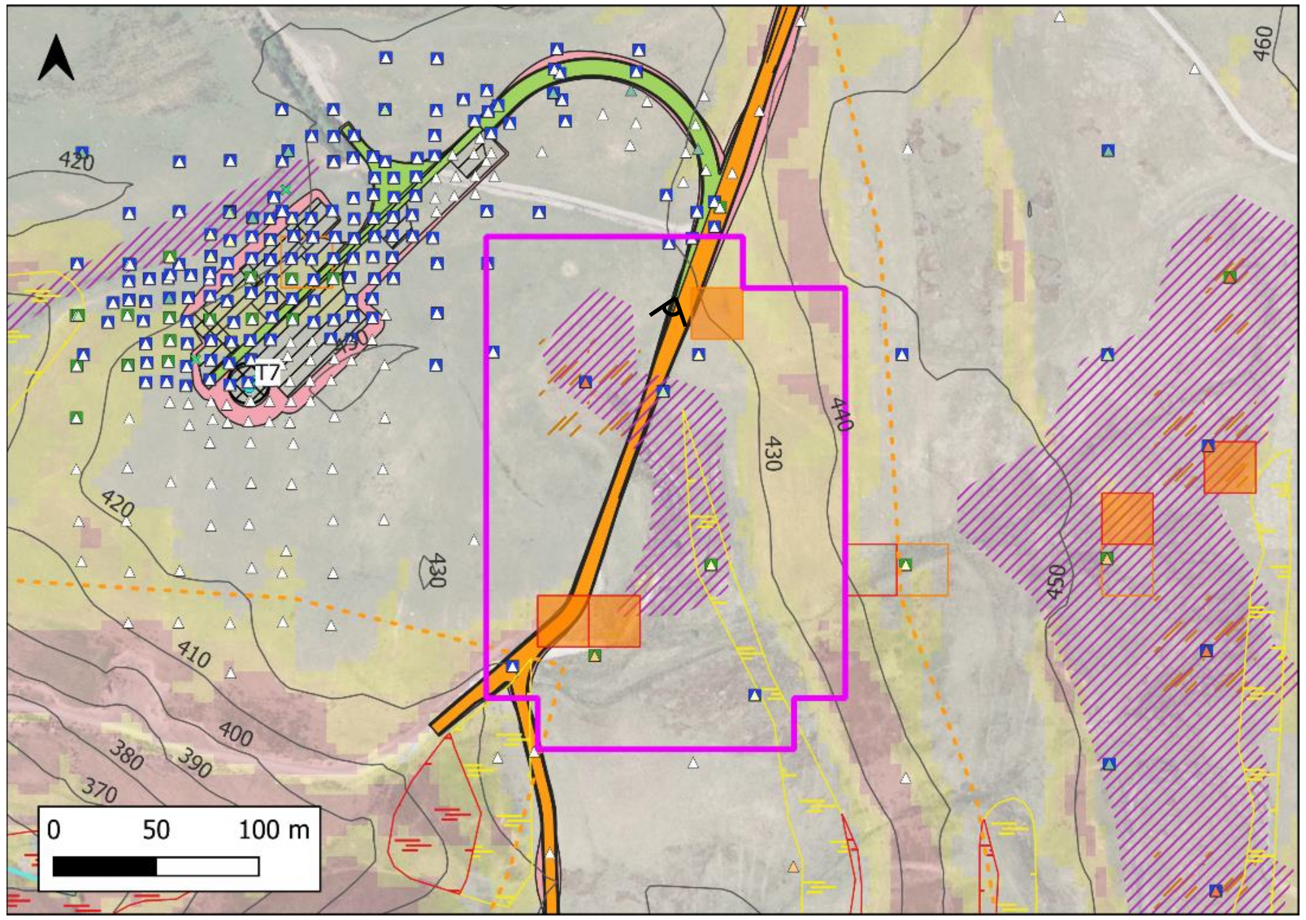


Plate A4: Aerial Image of PSA Area D, including existing track section towards T7 spur (grid cells are 25m x 25m) *Microsoft Bing screen shot reprinted with permission from Microsoft Corporation. Contains Ordnance Survey data © Crown copyright and database right 2025.*

Area Details

PSA Area D is characterised a section of cut existing track that crosses steep slopes at southern and northern extents, immediately south of a new spur track to T7. An area of high sensitivity soils is crossed by the existing track with a culvert enabling hydrological connectivity.

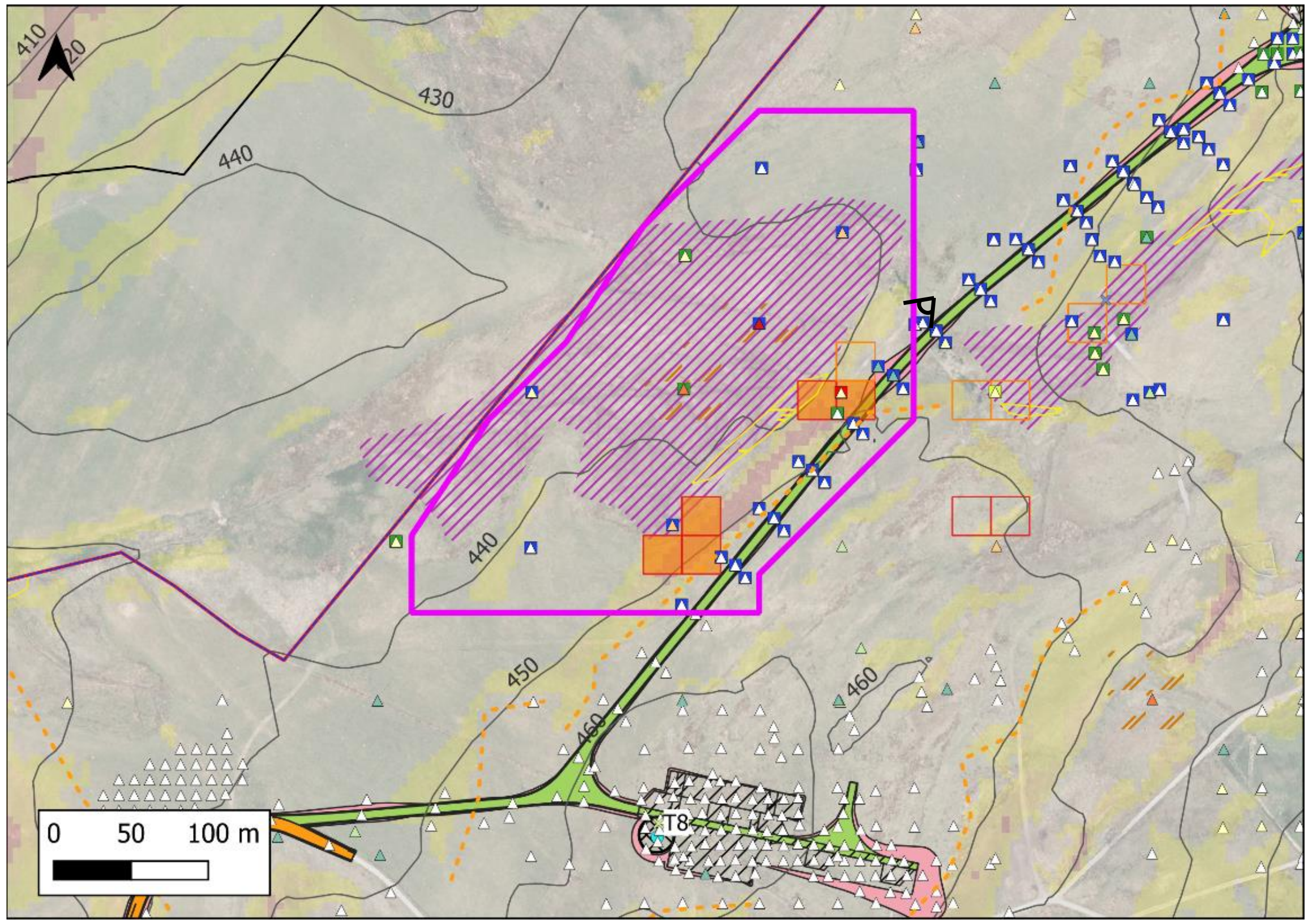
BGS GeoSure mapping identifies landslide Class C southeast of the existing track section across a depression in the landscape, coinciding with the foot of a steep west facing slope, with break of slope upslope to the east. No evidence of slope instability was identified from satellite imagery nor any noted during site visits.

Consequence is Extremely High due scheduled monuments, and High elsewhere due to existing minor tracks. The Moderate Initial Risk cell south of the fork of the spur to T7 had a probe with a strata depth of 0.56 m and FoS >1.4. This cell had an average slope of 10.8 degrees and FoS of 1.35. The two Moderate Initial Risk cells identified in the south were based on a single nearby probe location, ~8 m south of both cells, with a strata depth of 1.4 m and FoS >1.4. These cells have an average slope of 11.0 and 6.6 degrees, with FoS of 0.53 and 0.88, respectively. Site notes about underfoot conditions across the area of high sensitivity area, indicated area was wet and inundated (and see **Photograph A4**).

The theoretical shear strength value is 1.37 kN/m^2 (the 99th percentile across the site). Although conservative, this is based on all soil strata depth, not merely for areas of high sensitivity soils. The value is lower than the literature lower-bound value (4 kN/m^2) and the actual shear strength in areas of peat, where it occurs, is likely to be typically higher, often substantially higher – with increased associated slope stability.

Based on the above, for all 3 Moderate Initial Risk cells, surveys and desk assessments provided sufficient evidence to assume the presence of peat using a cautionary approach (see **Appendix 10C Annex 10C.2 – Plate B15**). In combination with absence of historic peat landslides in the area, the Initial Likelihood for the 3 cells of Moderate Initial Risk within PSA Area D will be revised to Unlikely.

Revised Risk Three cells with Moderate Initial Risk across section of existing access track were assumed to be peat. There is no identified historic landslide evidence and no requirements to update the existing track. Taking account of the site topography, individual peat probe FoS, design and mitigation: ***Initial Likelihood is reduced to Unlikely and the Initial Risk reduced to Low*.**	 Further supporting information is provided in **Appendix 10C Annex 10C.2 Plate B13, Plate B14 and Plate B16**. **Photograph A4: On the track near spur of T7, looking southwest, crossing an area of high sensitivity soils and vegetation coverage indicating wetter ground conditions; NGR SN 99448 98517 (426 m AOD).**

PSA Area E: Initial Risk – Moderate (Initial Likelihood of Likely and Probable, Consequence is Moderate)	Area Details
Good Practice and Design **Section 9** details standard good practice measures. A section of new proposed track crosses PSA Area E to northeast towards T10. 5 cells of Moderate Initial Risk are located within 50m of high sensitivity soils, all of which are within 25m of the proposed access track. **Specific Mitigation, Potential Scale and Receptor** **Section 9** lists standard mitigation measures. Care to be taken when constructing tracks in local areas of peat, to minimise removal of slope support or excess loading upon slopes. This area will be identified within the project Geotechnical Risk Register. **Should peatslide occur:** Approximated width 30 m, runout length 50 m, at an average depth of 1.3 m; volume of peat 1,950 m³; Receptors – high sensitivity soil zone and new access track.  **Plate A5: Aerial Image of PSA Area E, including new proposed track section towards T10 - located north east (grid cells are 25m x 25m)** *Microsoft Bing screen shot reprinted with permission from Microsoft Corporation. Contains Ordnance Survey data © Crown copyright and database right 2025.*	The track centreline follows an elevated ridge, including crossing a break of slope at northern extent of PSA Area E, sloping to northwest. A large area of high sensitivity soil is present downslope, ~15 m west of the proposed access track, with strata depths ranging 0.28 to 2.18 m and straddles the site boundary. BGS Geosure Class C landslide data overlaps with the upper zone of this area but lies outwith (immediately west) of the proposed access track. Across PSA Area E no evidence of historic slope instability was identified from satellite imagery, nor any noted during site visits. Consequence is Moderate due proximity to the Proposed Development. Across the 5 Moderate Initial Risk cells, average slopes ranged from 16.4 to 19.2 degrees, with measured soil strata depth ranging 0.69 to 1.35 m. Eight FoS point values contributed to these cells, one location had a FoS < 1.4 (0.706), with a strata depth of 0.69 m and slope of 18.5 degrees. This was located ~14 m northwest and downslope of the proposed track. Outwith the PSA Area E, but within a similar area of high sensitivity soils to the north east, coring results showed presence of peat. The theoretical shear strength value is 1.37 kN/m2 (the 99th percentile across the site). Although conservative, this is based on all soil strata depth, not merely for areas of high sensitivity soils. The value is lower than the literature lower-bound value (4 kN/m2) and the actual shear strength in areas of peat, where it occurs, is likely to be typically higher, often substantially higher – with increased associated slope stability. Based on the considerations outlined above, for all 5 Moderate Initial Risk cells, field surveys and desk assessments provided sufficient evidence to assume the presence of peat using a cautionary approach (see **Appendix 10C Annex 10C.2 – Plate B19)**. In combination with absence of historic peat landslides in the area and location in relation to the Proposed Development, the Initial Likelihood for the 5 cells of Moderate Initial Risk was downgraded to Unlikely. Further supporting information is provided in **Appendix 10C Annex 10C.2 Plate B17, Plate B18 and Plate B20**.

Revised Risk Cells with Moderate Initial Risk across section of new access track were primarily based on slope facing away from the Proposed Development which will not be adversely influenced due to standard good practice and mitigation: ***Initial Likelihood is reduced to Unlikely and the Initial Risk reduced to Low*.**	 **Photograph A5: Looking southwest on the proposed track to T10; NGR SN 99888 98925 (454 m AOD)**

PSA Area F: **Initial Risk – Moderate (Initial Likelihood of Likely and Probable, Consequence is Moderate and High)**	**Area Details** PSA Area F is characterised by a section of new proposed track that runs down and across a slope between T10 and T9, where this slope slackens deeper deposits were recorded on shallower gradients. Within the PSA, the desk-based study did not identify BSG Geosure landslide evidence nor signs of active or historic slope instability, as verified during site visits. The proposed development overlaps with three areas of high sensitivity soils, which sections of concern are split into: north, middle, and south. Across these sections, construction levels for the access track will likely require extended batter surfaces as it crosses this slope, likely increasing the local footprint markedly. Consequence was High due proximity to archaeological sites and reduced to 'Moderate' elsewhere, due to the presence of the proposed development. Across the 27 Moderate Initial Risk cells within PSA Area F, average slopes ranged from 4.4 to 15.6 degrees, with measured soil strata depth ranging 0.55 to 1.62 m. A total of 54 FoS point values contributed to these cells, 7 of which had an FoS < 1.4, with 2 locations had an FoS <1.0. Four probing locations with FoS <1.4 and one with FoS <1.0 are located at the proposed footprint or within 25m. Six cells in the northern section have measured soil depth ranging 0.81 – 1.47 m, average slope of 4.3 – 14.3 degrees, with FoS values 0.62 – 1.25. Nine of ten contributing points all had an FoS value > 1.4, with an average soil strata depth of 0.42 m. Although
Good Practice and Design **Section 9** details standard good practice measures. Following initial Phase 2 probing surveys, track connection between T10 and T9 has been moved to the north east of the PSA, to minimise disturbance of an area of high sensitivity soils located in the southwest part of the PSA. The current layout shows the track to cover three locations of high sensitivity soils. Within PSA Area F a total of 27 cells of Moderate Initial Risk are located within 50m of high sensitivity soils, of which 7 are crossed by or within 25m of the proposed track.	
Specific Mitigation, Potential Scale and Receptor **Section 9** lists standard mitigation measures. In areas of peat, access tracks shall adopt construction techniques to reduce or avoid excavation, including application of floating track. Slope monitoring would be applied, as applicable. This area will be identified within the project Geotechnical Risk Register. **Should peatslide occur:** Approximated width 20 m, runout length 30 m, average depth of 1.0 m; volume of peat 600 m³; Receptor – access track.	

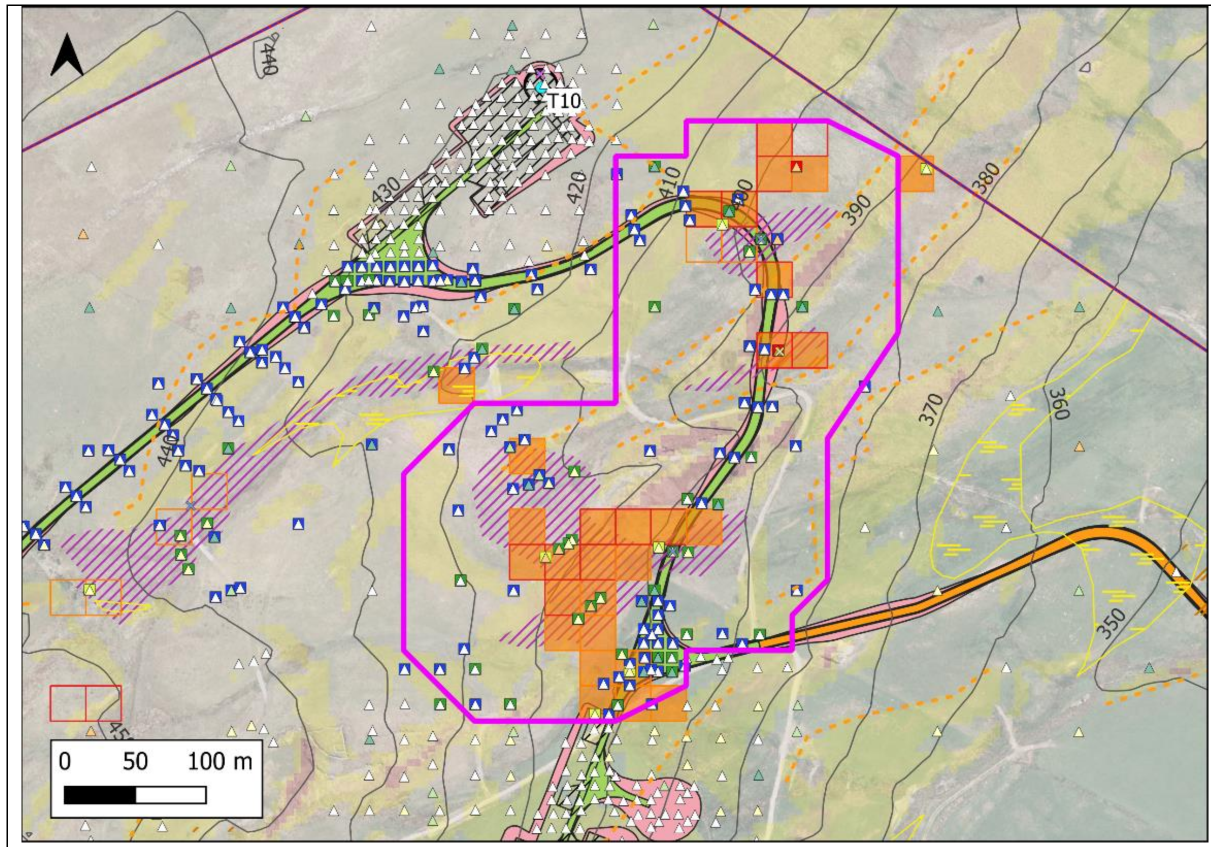


Plate A6: Aerial Image of PSA Area F, including existing track section towards spur of T7 and T8 further north (grid cells are 25m x 25m) *Microsoft Bing screen shot reprinted with permission from Microsoft Corporation. Contains Ordnance Survey data © Crown copyright and database right 2025.*

coring results show that peat is present under the access track footprint, up to 1.0 m depth (see further info **Appendix 10A Annex 10A.1 – Core Log T09_AT_NORTH**), model results show that peatslide likelihood at the coring location itself is Unlikely.

Four cells in the southern section received their depth values only from probing points (6) outside the cell surfaces, but the cells which cover these areas did not flag as Moderate or High Initial Risk. Measured depth for these cells of Moderate Initial Risk is 0.71 and 0.72 m and were both recorded. A single probing locations registered an FoS < 1.4 (1.37) for a depth of 0.72 m on a 8.7-degree slope, located ~10m west from the proposed access track within an area of high sensitivity soils. Soil core results confirmed the presence of peat at the centre of the access track to a depth of at least 0.48 m (see further info **Appendix 10A Annex 10A.1 – Core Log T09_AT_SOUTH**). Site observations suggest this profile is representative of the wider area in the isolated depression, which informed the spatial extent of high sensitivity soils in this location. A further 10 cells of Moderate Initial Risk to the west of the four cells based on probe locations around **Core Log T09_AT_SOUTH**. Though none of 15 contributing probing points showed FoS < 1.4, the cells are located within the same area of high sensitivity soils and have therefore been assumed to be peat using a cautionary approach.

The middle section cells recorded a modelled soil depth of 1.62 m, average slope of 8.3 degrees, and FoS of 0.6. Three probe locations informed these cells, two of which lie within the cell surface and Proposed Development footprint. The batter footprint probe recorded 1.62 m strata depth on a 6.3° slope, with FoS of 0.83, while the other two points recorded depths <0.3 m and FoS >1.4. At the 1.62 m location, coring confirmed only 0.2 m of peat over predominantly clay subsoil (**Appendix 10A Annex 10A.1 – Core Log T09_AT_MIDDLE**).

Five cells of Moderate Initial Risk in the southern edge of the PSA show overlap with the proposed development, but are outwith an area of high sensitivity soil. Only 1 of 18 contributing probing locations shows an FoS < 1.4 (1.07), with an average strata depth of 0.29 m. Based on limited soil depth and absence of coring information, is it assumed these five cells do not contain peat.

The theoretical shear strength value is 1.37 kN/m^2 (the 99th percentile across the site). Although conservative, this is based on all soil strata depth, not merely for areas of high sensitivity soils. The value is lower than the literature lower-bound value (4 kN/m^2) and the actual shear strength in areas of peat, where it occurs, is likely to be typically higher, often substantially higher – with increased associated slope stability.

In summary, for 20 of 27 Moderate Initial Risk cells, field surveys and desk assessments provided sufficient evidence to assume the presence of peat (see **Appendix 10C Annex 10C.2 – Plate B23)**. In combination with absence of historic peat landslides in the wider area, the Initial Likelihood for 20 cells assumed to be peat was downgraded to Unlikely.

For a total of 7 cells of Moderate Initial Risk, field surveys and desk assessments did not provide sufficient evidence to assume the presence of peat, and therefore the Initial Likelihood for these cells has been revised to 'N/A no peat', omitting them from a Revised Risk value. Location of cells excluded from revised risk are shown in **Appendix 10C Annex 10C.2 – Plate B23**.

Further supporting information is provided in **Appendix 10C Annex 10C.2 Plate B21, Plate B22 and Plate B24**.

Revised Risk

Two sections of ~75m of access track crossing peat will be floated. Overall, taking account of the site topography, existing flow pathways, individual peat probe FoS values, design and mitigation:

Initial Likelihood is reduced to Unlikely and the Initial Risk reduced to Low.

Cells for which Initial Likelihood was revised to N/A no peat, were omitted from a Revised Risk value (N/A no peat).

	 **Photograph A6: generic outlook of landscape associated with PSA Area F; photograph location outwith PSA Area F. NGR SO 00533 98831 (380 m AOD)**

Annex 10C.2

ADDITIONAL INFO FOR DETAILED ASSESSMENT DATASHEETS

LEGEND FOR ADDITIONAL INFO FOR DETAILED ASSESSMENT DATASHEETS

- the Site
- Turbine
- Crane pad hardstanding
- Turbine foundation
- BESS compound
- Temporary construction compound
- Control building compound
- Existing access track
- New access track
- Substation compound
- Cut & Fill extents (batter)
- Study Area
- Survey Area
- Zones of Interest
- High sensitivity soils
- PSA areas
- Break of slope
- Indicative peat depth > 1.5 m

Coring results

- Mineral - Heavy
- Mineral - Medium
- Peat
- Peaty soil

Indicative Peat Depth (m)

- < 0.30
- 0.29 - 0.39
- 0.39 - 0.49
- 0.49 - 0.99
- 0.99 - 1.49
- 1.49 - 1.99
- 2.00 +

Soil strata depth

- < 0.30
- 0.29 - 0.39
- 0.39 - 0.49
- 0.49 - 0.99
- 0.99 - 1.49
- 1.49 - 1.99
- 2.0 +

FoS grid

- <1.0
- 1.0 - <1.4

FoS points

- 0 - 1
- 1 - 1.4
- 1.4 - 3
- 3 - inf

BGS Geosure Landslide Hazard Class

- C
- D

Initial Risk

- High
- Moderate
- Revised Likelihood - N/A No Peat

Revised Risk - Zones of Interest

- High
- Moderate
- Negligible
- Low
- No peat

Slope (degrees)

- <= 10
- 10 - 15
- 15 - 20
- 20 - 25
- > 25
- Contour (10 m)
- Watercourses

PSA Area A

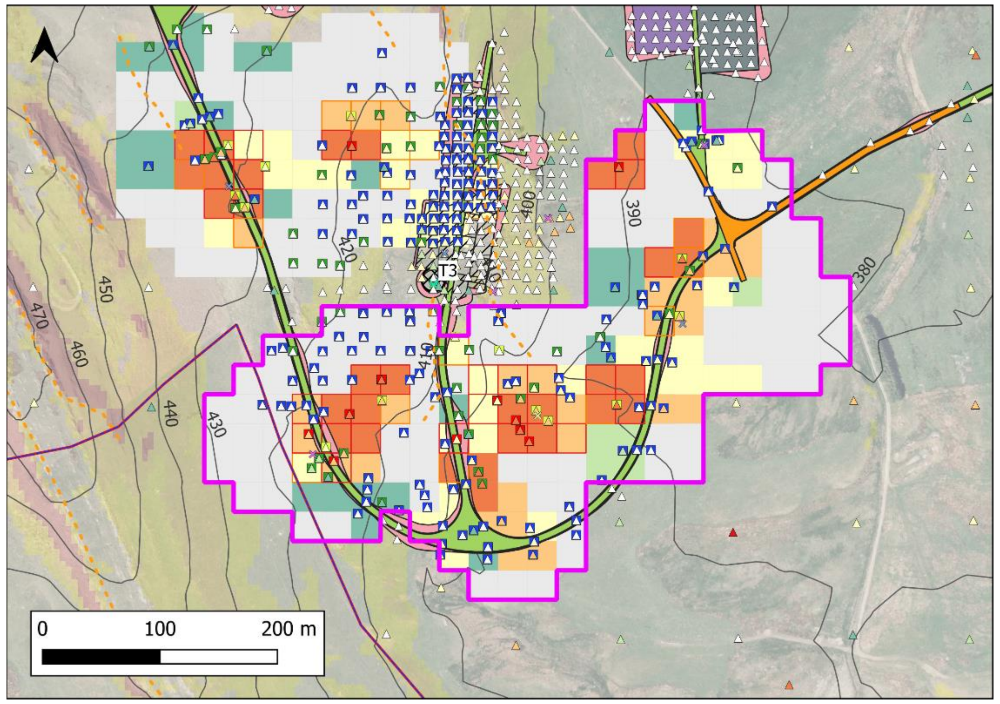


Plate - 3. PSA Area A - indicative depth grid superimposed by Factor of Safety points (squares) and probed strata depths (triangles).

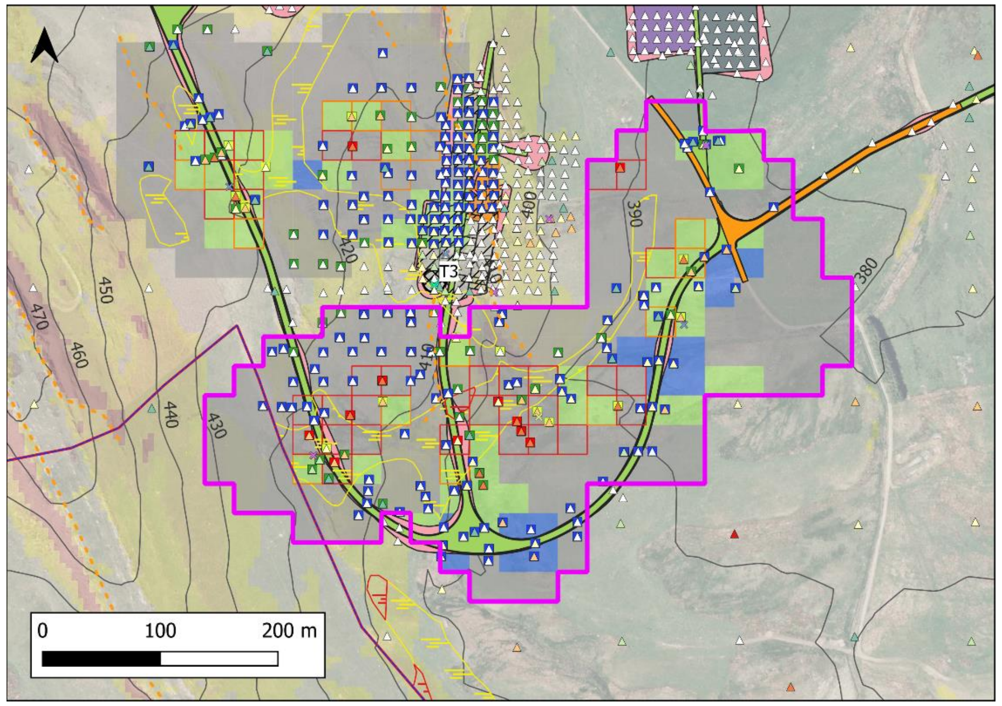


Plate - 4. PSA Area A – revised risk grid superimposed by Factor of Safety points (squares) and probed strata depth (triangles).

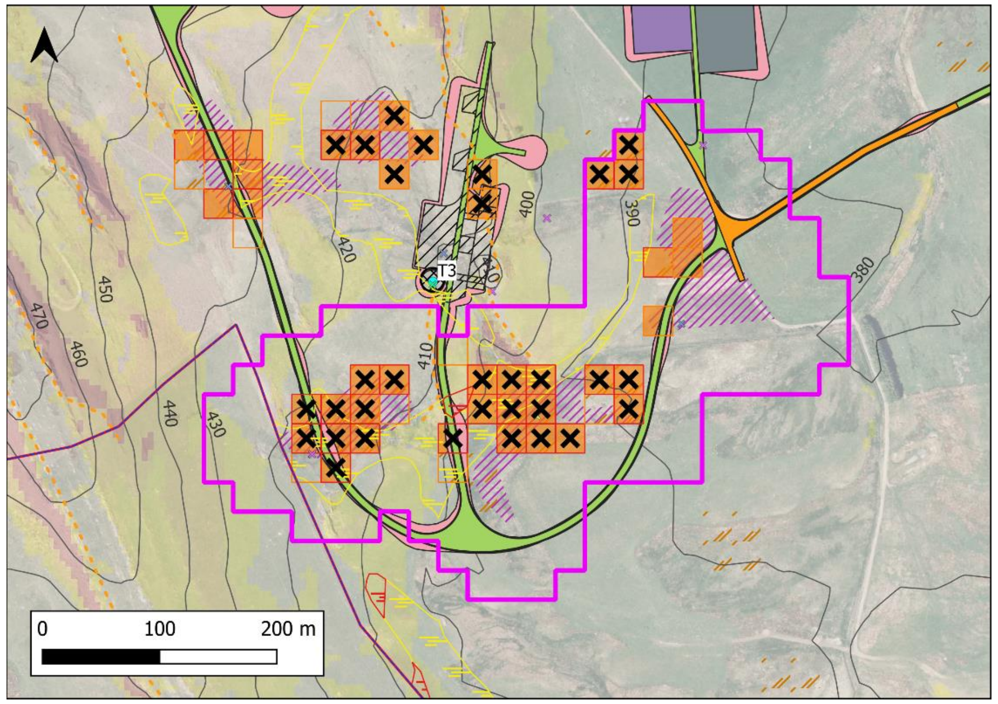


Plate - 5. PSA Area A – cells for which revised likelihood was changed to 'N/A no peat' due absence of coring information confirming presence of peat. All cells assessed as Moderate Initial Risk without a black cross were assumed to be peat for PLHRA modelling, based on probing and coring information following a cautionary approach.

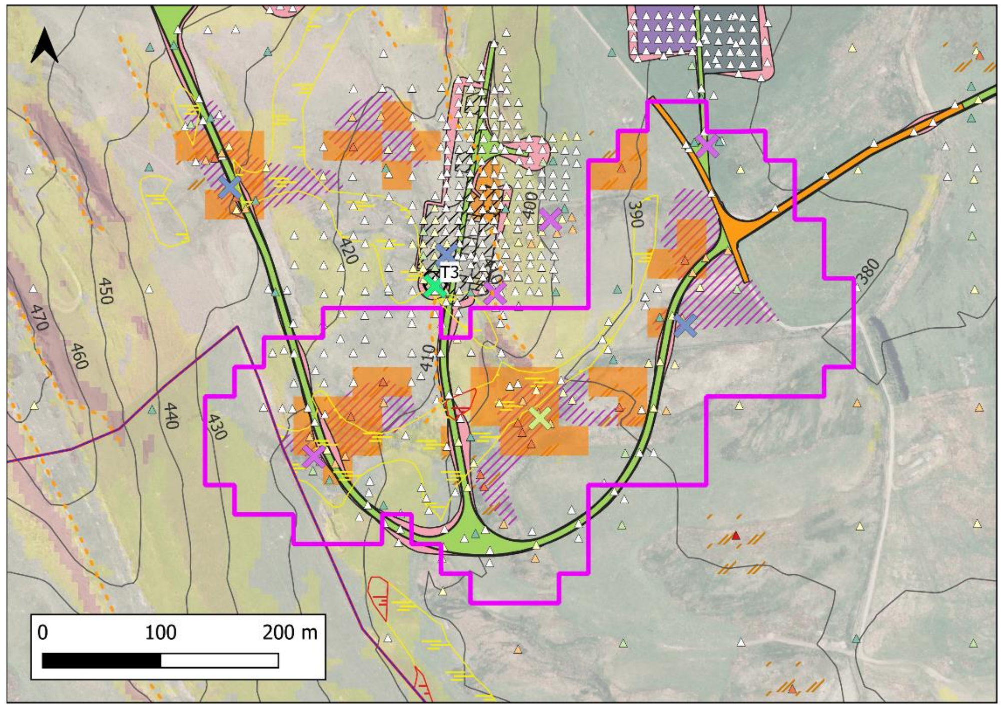


Plate - 6. PSA Area A – Cells of Moderate Initial Risk superimposed by coring locations (coloured crosses) and probed strata depth (triangles).

PSA Area B

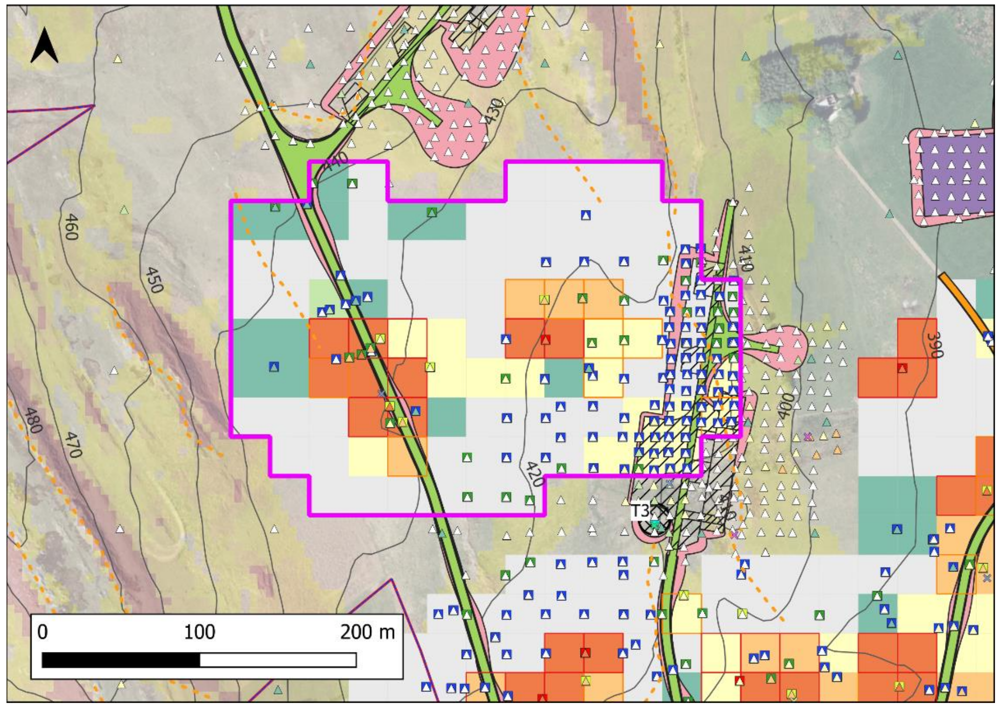


Plate - 7. PSA Area B - indicative depth grid superimposed by Factor of Safety points (squares) and probed strata depths (triangles).

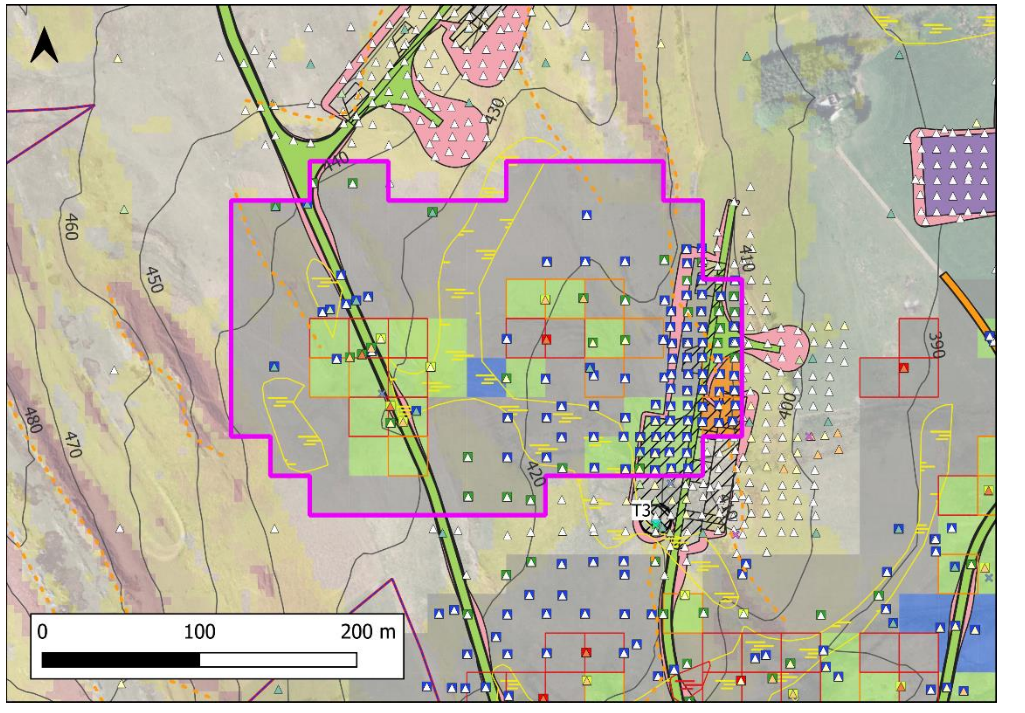


Plate - 8. PSA Area B – revised risk grid superimposed by Factor of Safety points (squares) and probed strata depth (triangles).

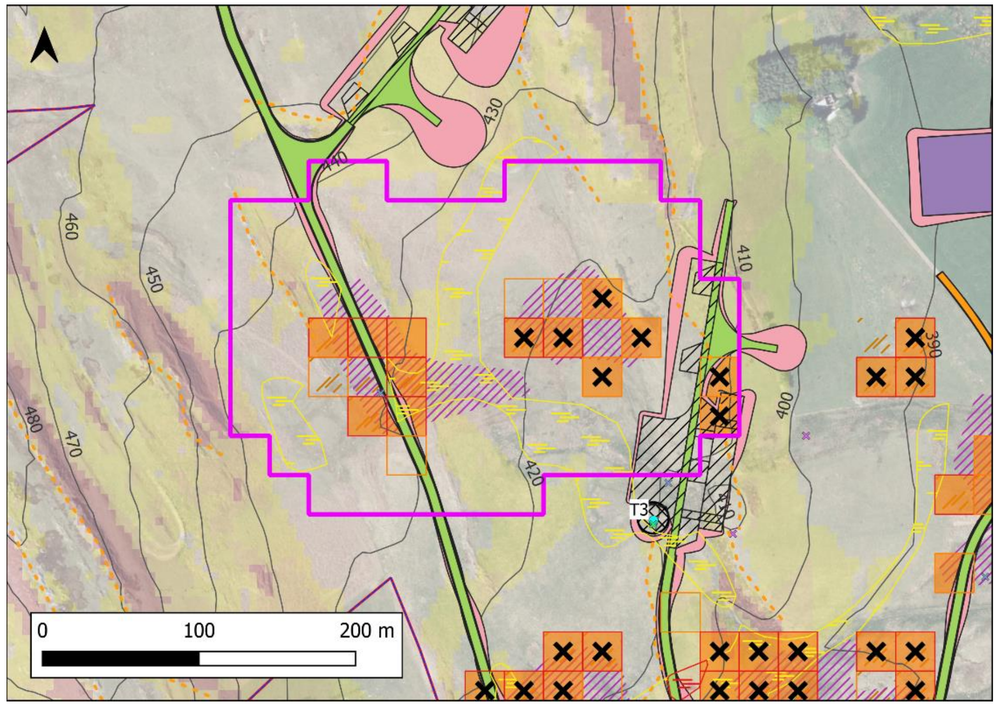


Plate - 9. PSA Area B – cells for which revised likelihood was changed to 'N/A no peat' due absence of coring information confirming presence of peat. All cells assessed as Moderate Initial Risk without a black cross were assumed to be peat for PLHRA modelling, based on probing and coring information following a cautionary approach.

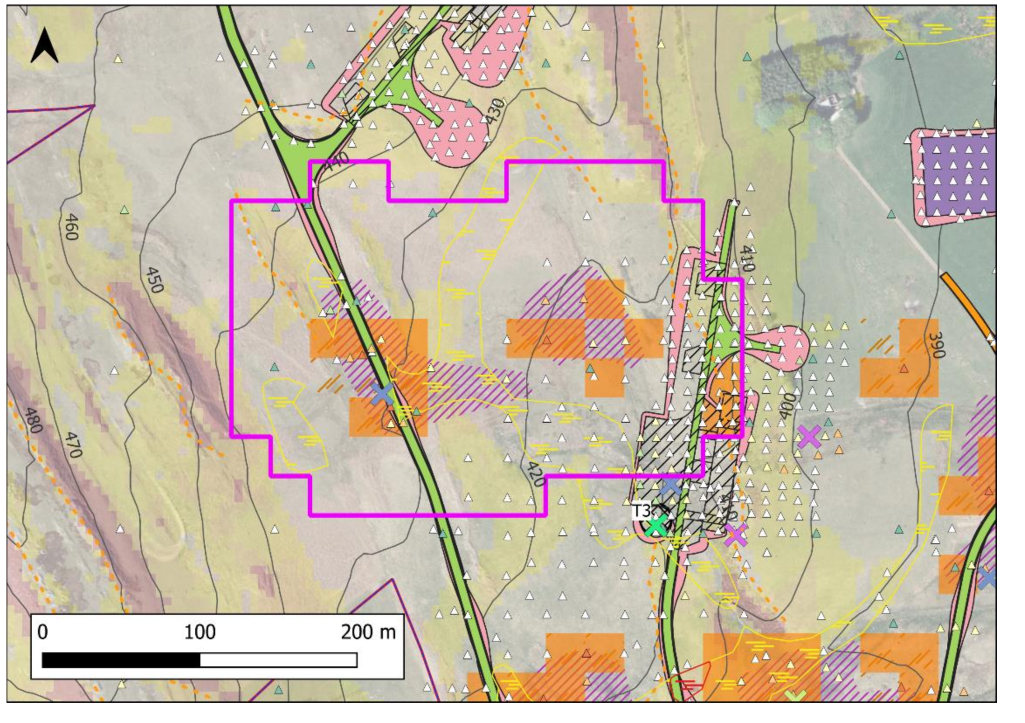


Plate - 10. PSA Area B – Cells of Moderate Initial Risk superimposed by coring locations (coloured crosses) and probed strata depth (triangles).

PSA Area C

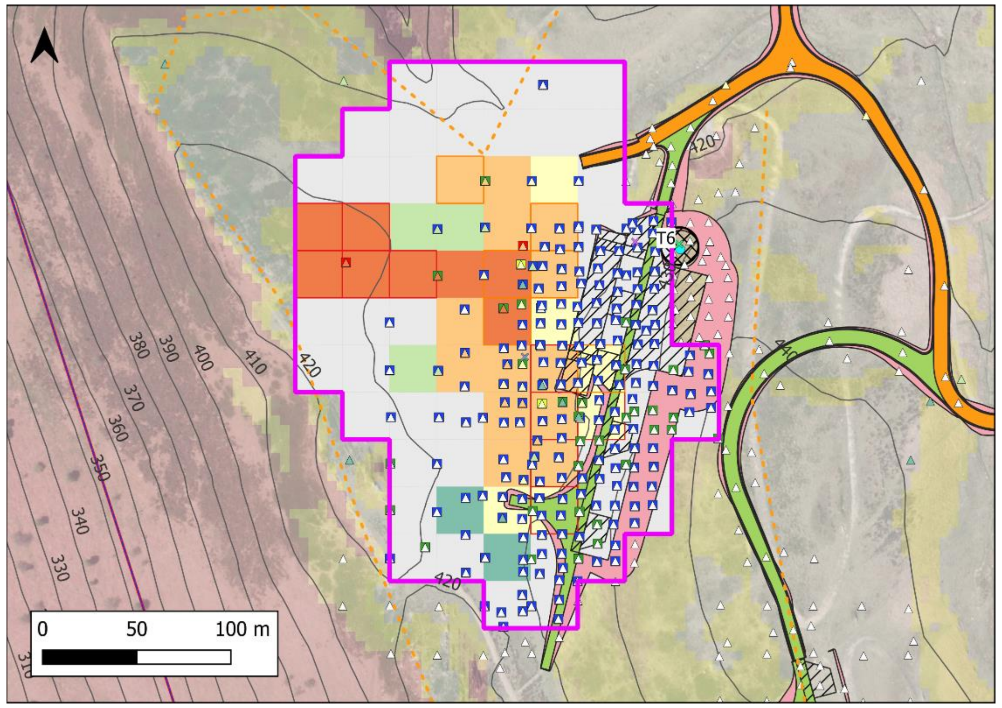


Plate - 11. PSA Area C - indicative depth grid superimposed by Factor of Safety points (squares) and probed strata depths (triangles).

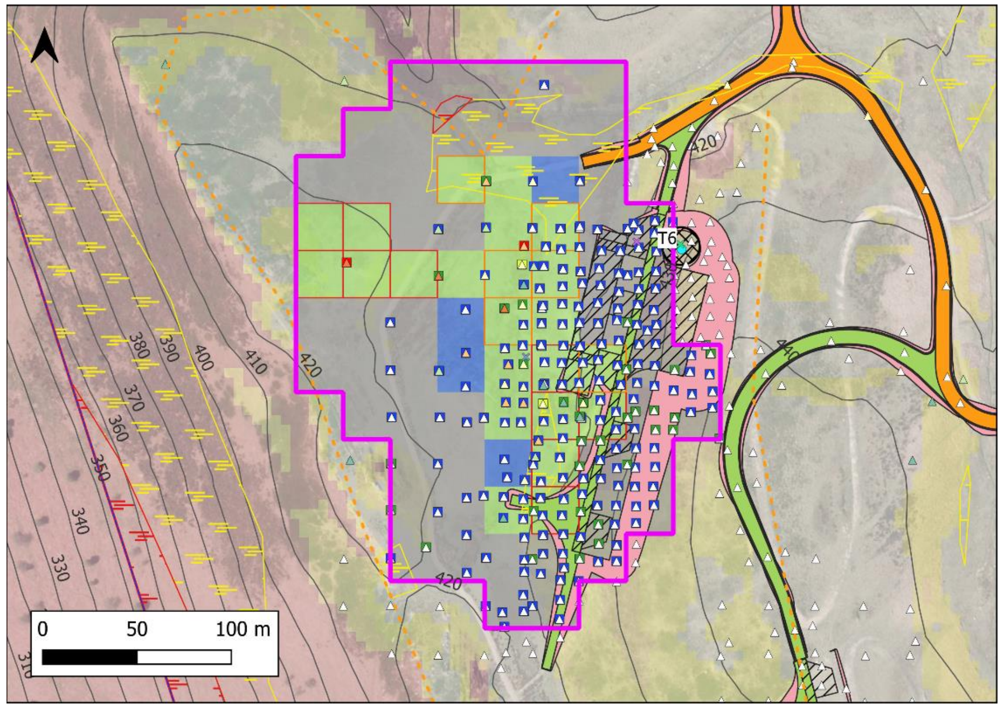


Plate - 12. PSA Area C – revised risk grid superimposed by Factor of Safety points (squares) and probed strata depth (triangles).

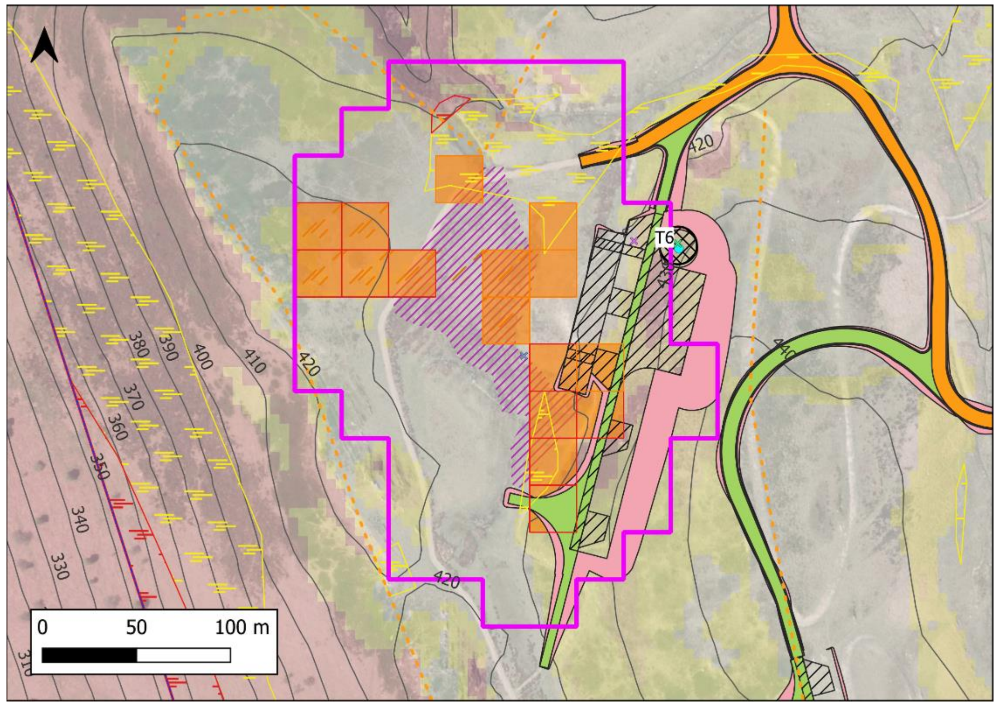


Plate - 13. PSA Area C – cells for which revised likelihood was changed to 'N/A no peat' due absence of coring information confirming presence of peat. All cells assessed as Moderate Initial Risk without a black cross were assumed to be peat for PLHRA modelling, based on probing and coring information following a cautionary approach.

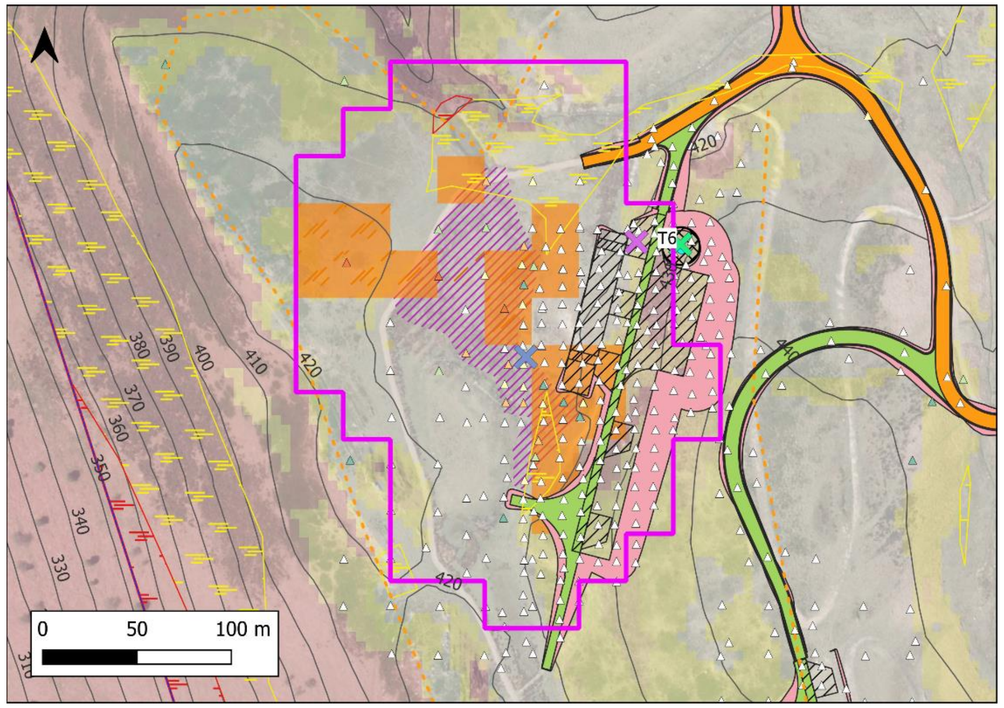


Plate - 14. PSA Area C – Cells of Moderate Initial Risk superimposed by coring locations (coloured crosses) and probed strata depth (triangles).

PSA Area D

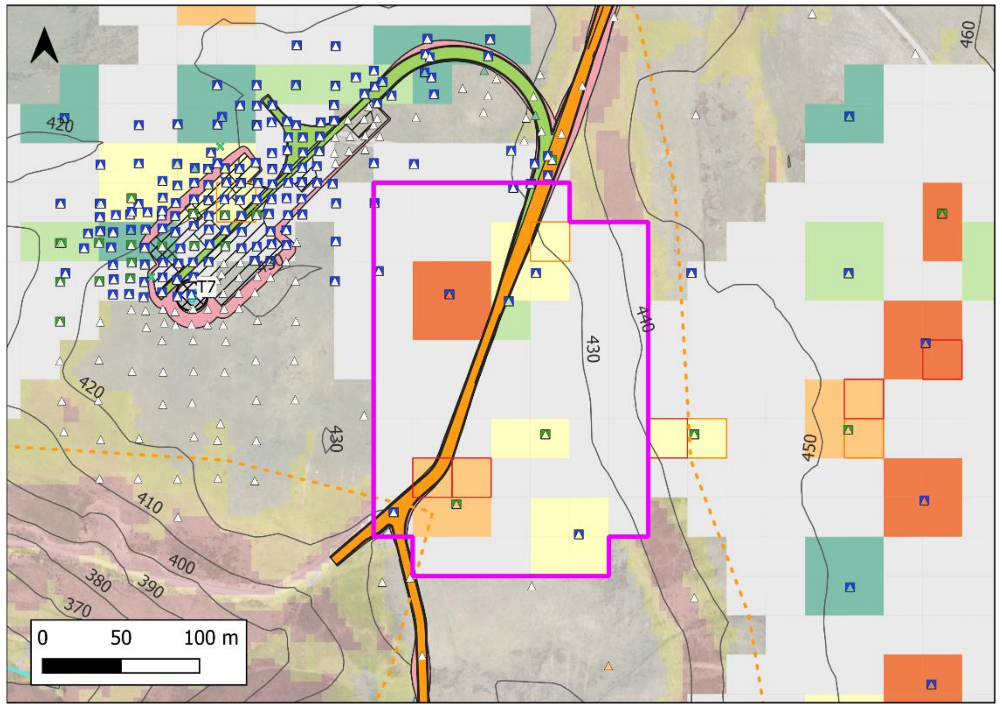


Plate - 15. PSA Area D - indicative depth grid superimposed by Factor of Safety points (squares) and probed strata depths (triangles).

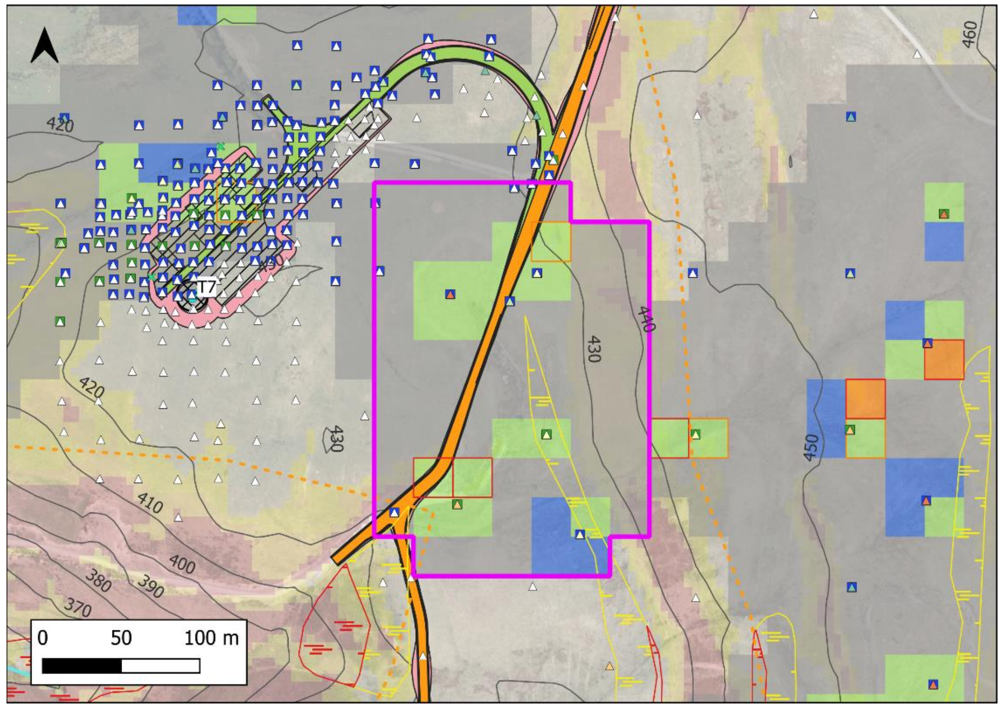


Plate - 16. PSA Area D – revised risk grid superimposed by Factor of Safety points (squares) and probed strata depth (triangles).

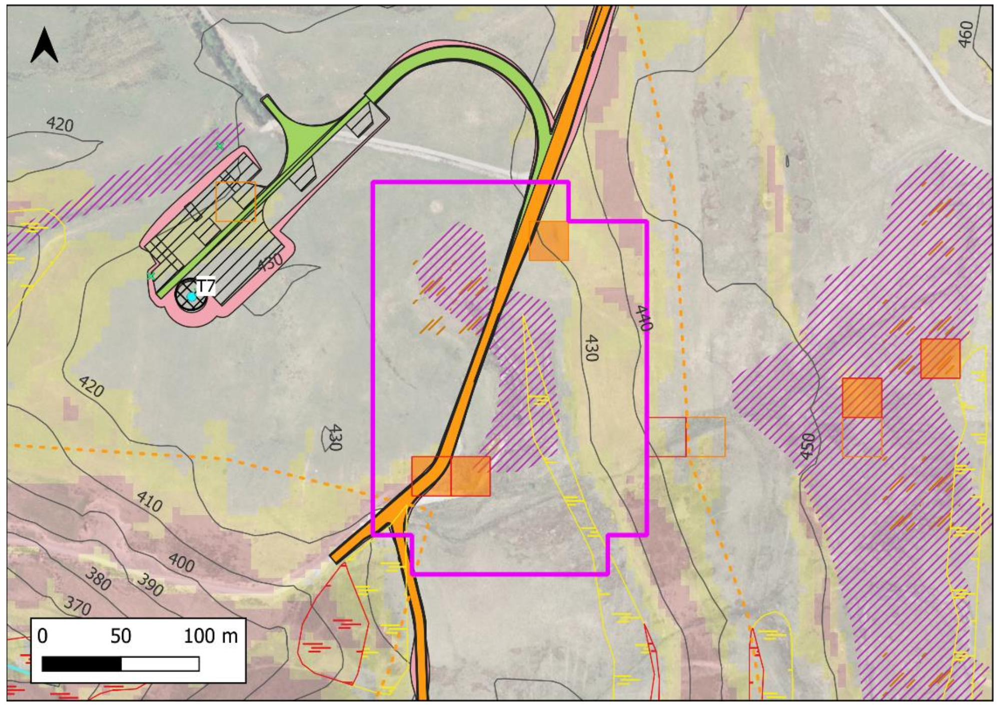


Plate - 17. PSA Area D – cells for which revised likelihood was changed to 'N/A no peat' due absence of coring information confirming presence of peat. All cells assessed as Moderate Initial Risk without a black cross were assumed to be peat for PLHRA modelling, based on probing and coring information following a cautionary approach.

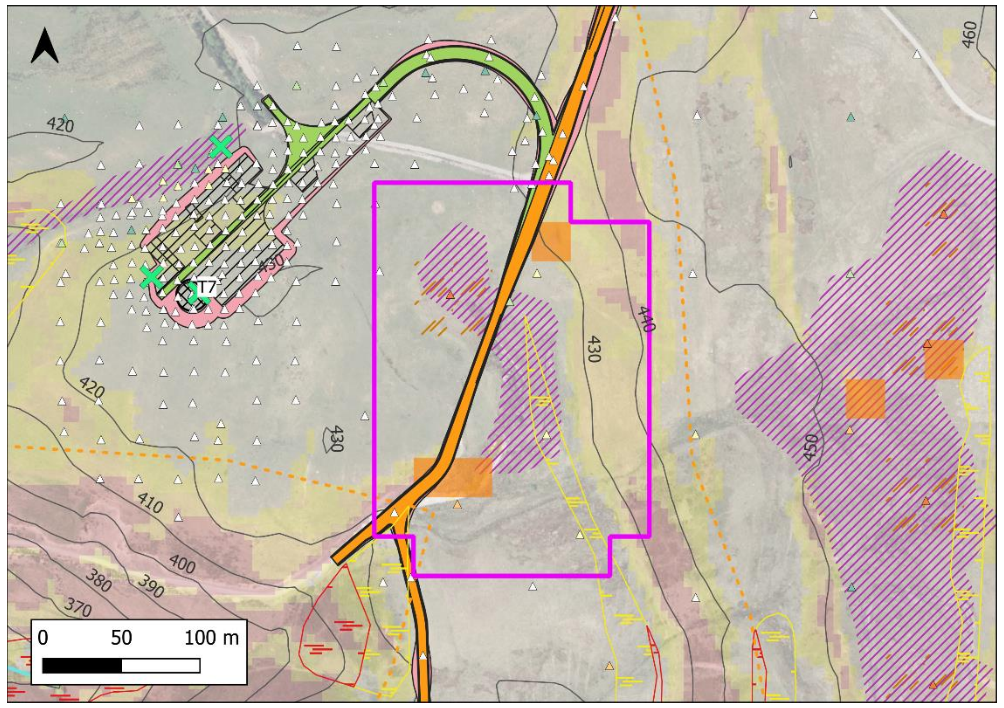


Plate - 18. PSA Area D – Cells of Moderate Initial Risk superimposed by coring locations (coloured crosses) and probed strata depth (triangles). No cores were collected for PSA Area D.

PSA Area E

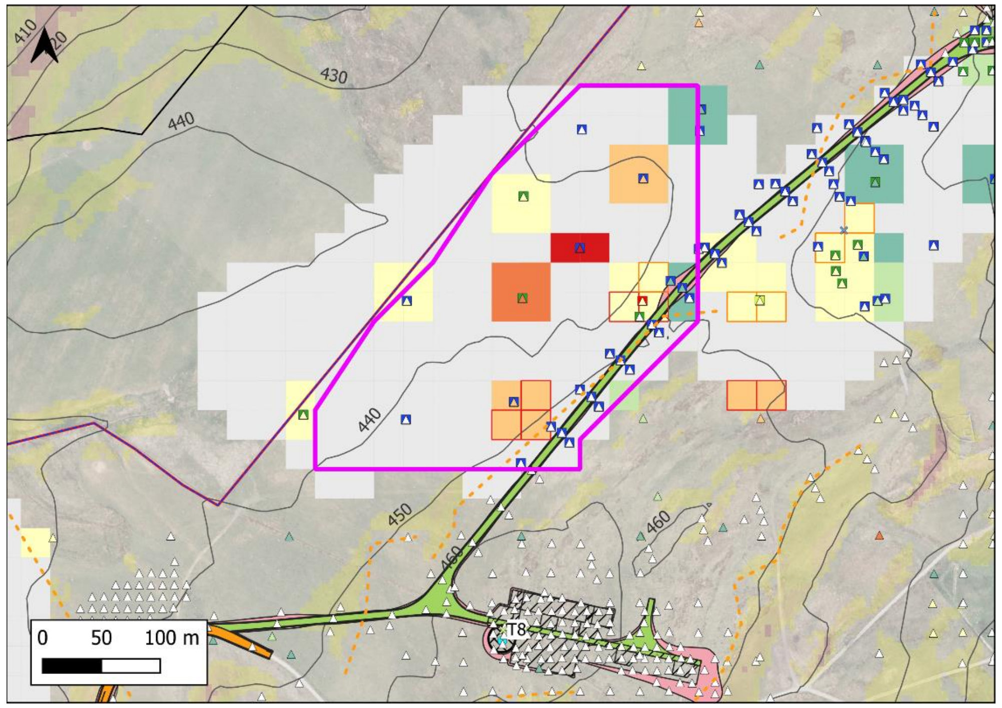


Plate - 19. PSA Area E - indicative depth grid superimposed by Factor of Safety points (squares) and probed strata depths (triangles).

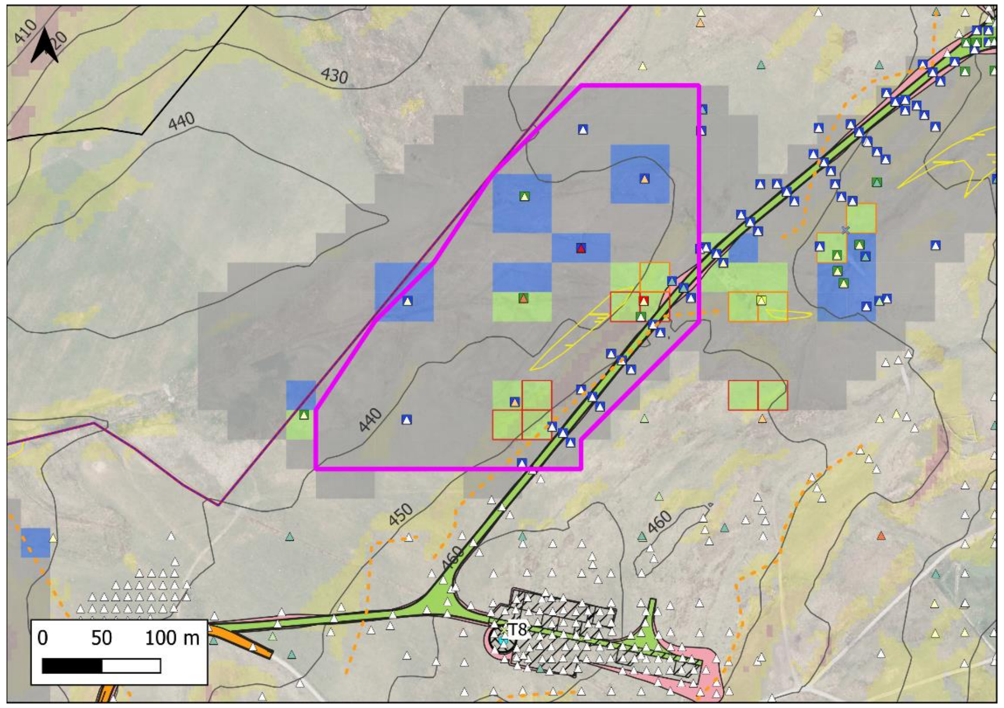


Plate - 20. PSA Area E – revised risk grid superimposed by Factor of Safety points (squares) and probed strata depth (triangles).

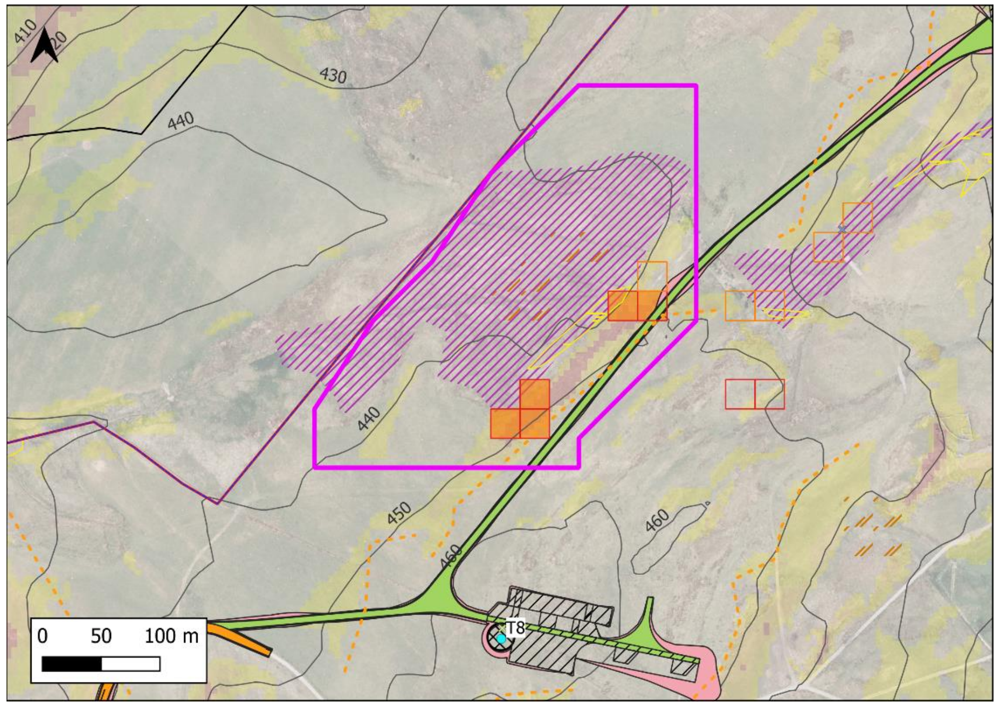


Plate - 21. PSA Area E – cells for which revised likelihood was changed to 'N/A no peat' due absence of coring information confirming presence of peat. All cells assessed as Moderate Initial Risk without a black cross were assumed to be peat for PLHRA modelling, based on probing and coring information following a cautionary approach.

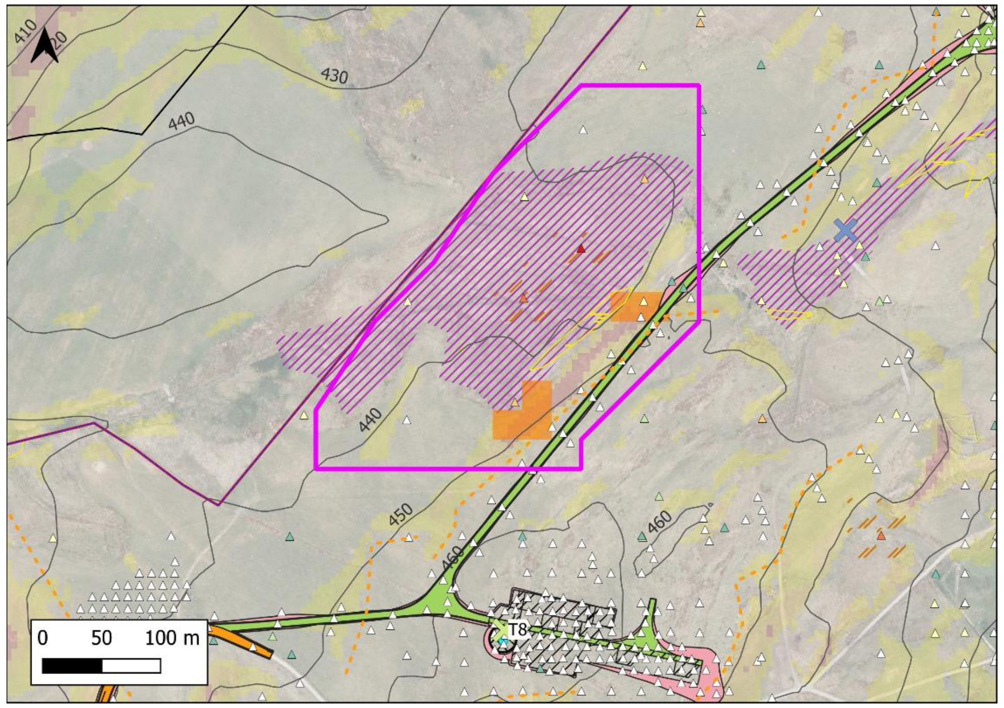


Plate - 22. PSA Area E – Cells of Moderate Initial Risk superimposed by coring locations (coloured crosses) and probed strata depth (triangles). No cores were collected for PSA Area E, but a core in vicinity of the PSA Area confirms presence in similar area of high sensitivity soils.

PSA Area F

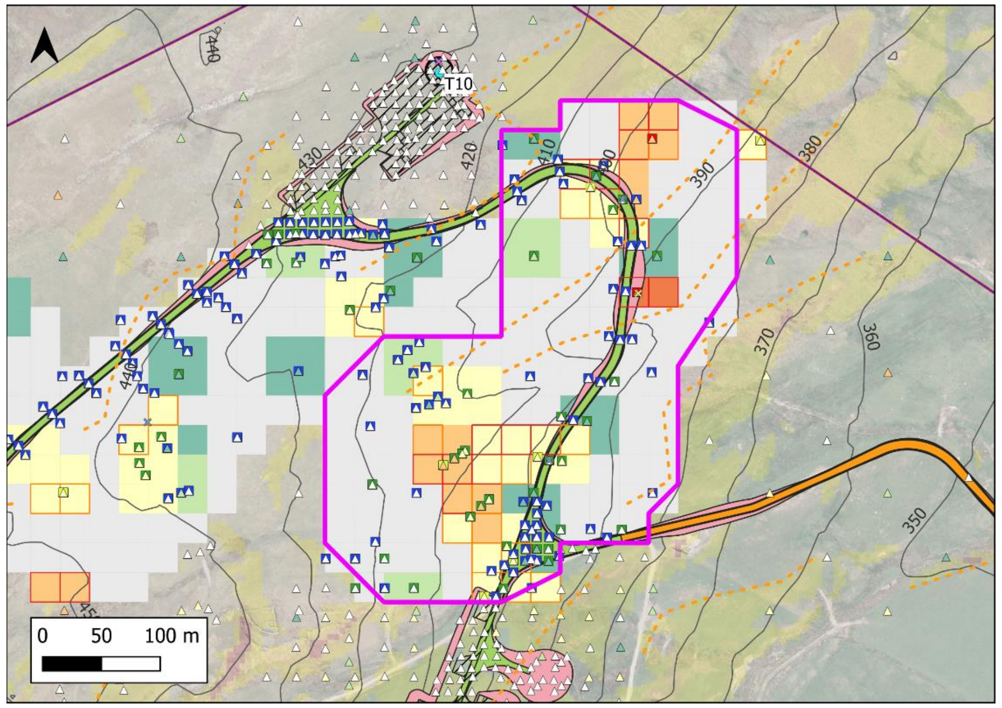


Plate - 23. PSA Area F - indicative depth grid superimposed by Factor of Safety points (squares) and probed strata depths (triangles).

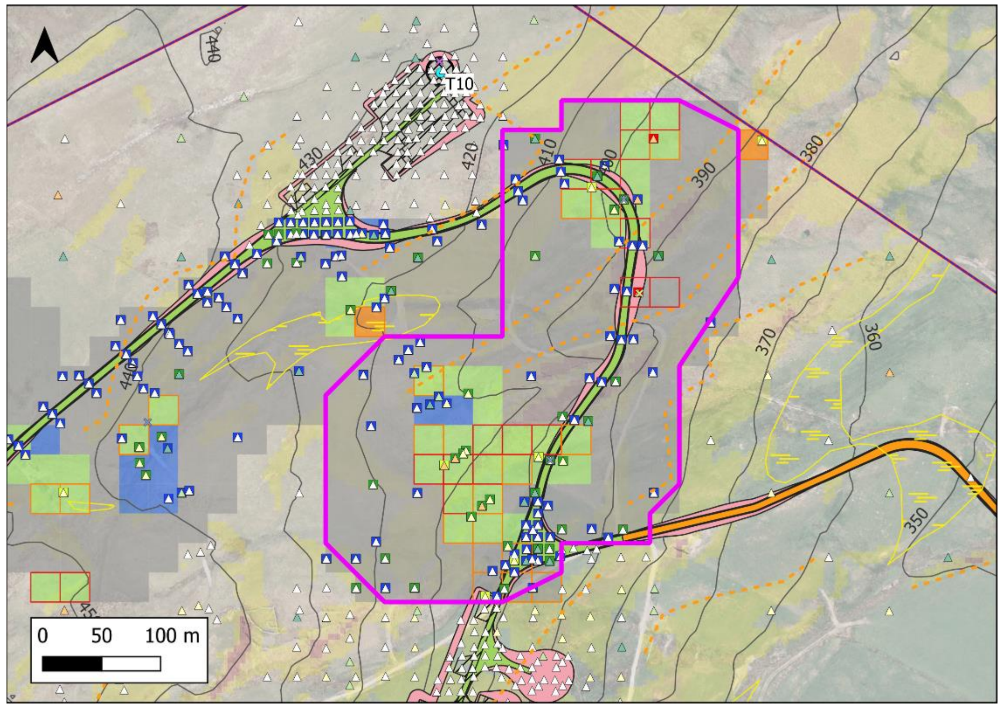


Plate - 24. PSA Area F – revised risk grid superimposed by Factor of Safety points (squares) and probed strata depth (triangles).

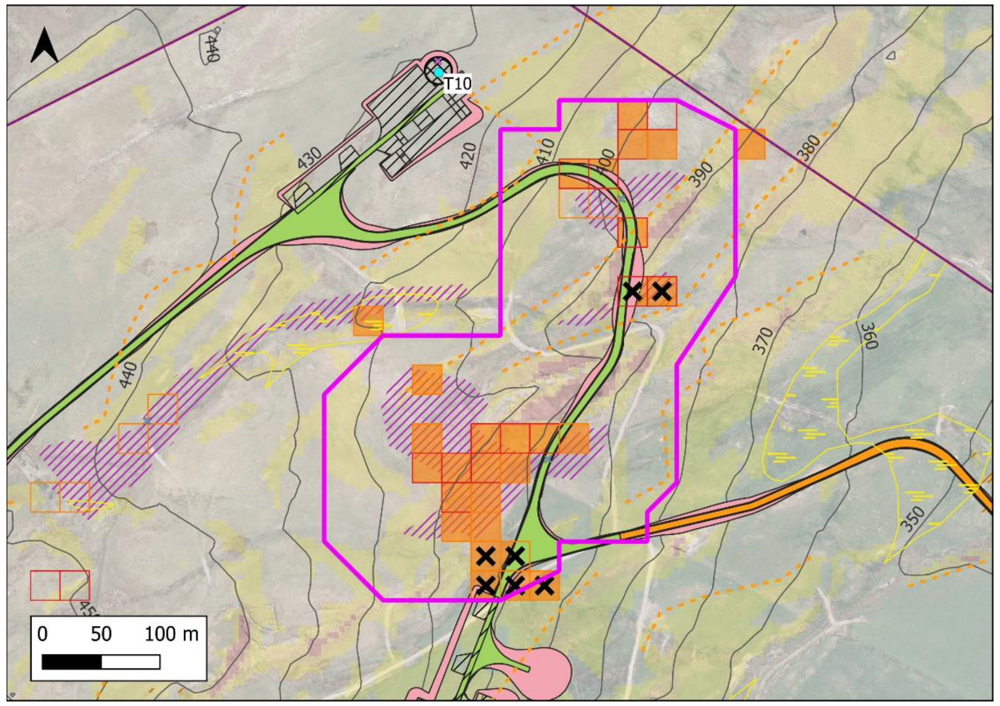


Plate - 25. PSA Area F – cells for which revised likelihood was changed to 'N/A no peat' due absence of coring information confirming presence of peat. All cells assessed as Moderate Initial Risk without a black cross were assumed to be peat for PLHRA modelling, based on probing and coring information following a cautionary approach.

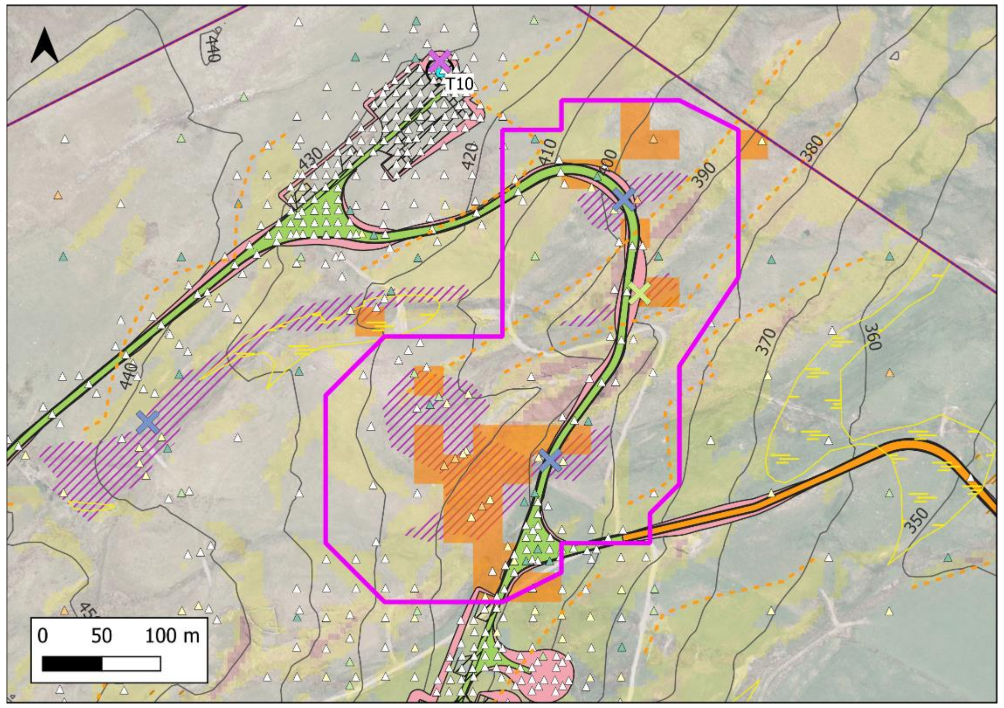


Plate - 26. PSA Area F – Cells of Moderate Initial Risk superimposed by coring locations (coloured crosses) and probed strata depth (triangles).

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