Appendix 9-1

Peat Stability Risk Assessment

Malachy Walsh and Partners

Consulting Engineers

Cork | Tralee | Limerick | London

Shronowen Wind Farm

County Kerry

Peat Stability Risk Assessment Report

EMP Energy Ltd.

Project	Document	Revision	Prepared	Checked	Date	Purpose
19876	6005	A	**ED/DC**	PC	16.10.2020	Draft
19876	6005	A	**ED/DC**	PC	05.01.2021	Updated for latest layout

Table of Contents

Table of Figures

List of Tables

1 Peat Stability Risk Assessment

1.1 Project Overview

The proposed Shronowen Wind Farm comprises of 12 No. wind turbines, a meteorological mast, a substation, and their respective associated roads, hardstands, material storage areas, electrical cables and drainage infrastructure. The site of the proposed Shronowen Wind Farm is situated within the rural locale between Listowel and Ballylongford in North Co. Kerry. The development site is located in an area of open low peatland east of the R552 Regional Road, approximately 4km southeast of Ballylongford village and 6km north of Listowel town. A map of the assessment area is given in Figure 1-1 and Figure 1-2.

EMP has requested Malachy Walsh and Partners (MWP) to complete a Peat Stability Risk Assessment (PSRA) as part of the Environmental Impact Assessment Report (EIAR) for the project. MWP has extensive experience in completing PSRAs. MWP has completed PSRA's for over 20 planning applications and the construction of in excess of 30 wind farms located in peatland throughout Ireland.

The PSRA presented in this report has been carried out within the area of the proposed wind farm infrastructure. MWP adhere to the latest industry standard when completing PSRAs. The guidance of the Scottish Government publication *"Peat Landslide Hazard and Risk Assessments: Best Practice Guide for Proposed Electricity Generation Developments, Energy Consents Unit Scottish Government, Second Edition, April 2017"* has been used for this PSRA.

The assessment uses peat depth and geomorphology to categorise the peat slide risk. This assessment is used to identify if areas of the site present a stability risk and require further analysis of the risk presented. A desk study was completed which included a review of the Geological Survey of Ireland (GSI) soil, landslide susceptibility and landslide event maps. Topographical information was reviewed, and a site reconnaissance was conducted to "ground truth" the desk study.

Quantitative assessment of peat stability risk is carried out using infinites slope analysis to calculate the factor of safety against peat instability. This calculation is used to assess the level of peat stability risk at the site.

The Peat Stability Risk Assessment presented in this document focuses on the wind farm and substation areas of the sites. The grid connection goes through areas of public roadway and agricultural grassland. For this reason, the grid connection has been included in the desk study section of the assessment but not in the quantitative peat stability risk assessment presented in this report.

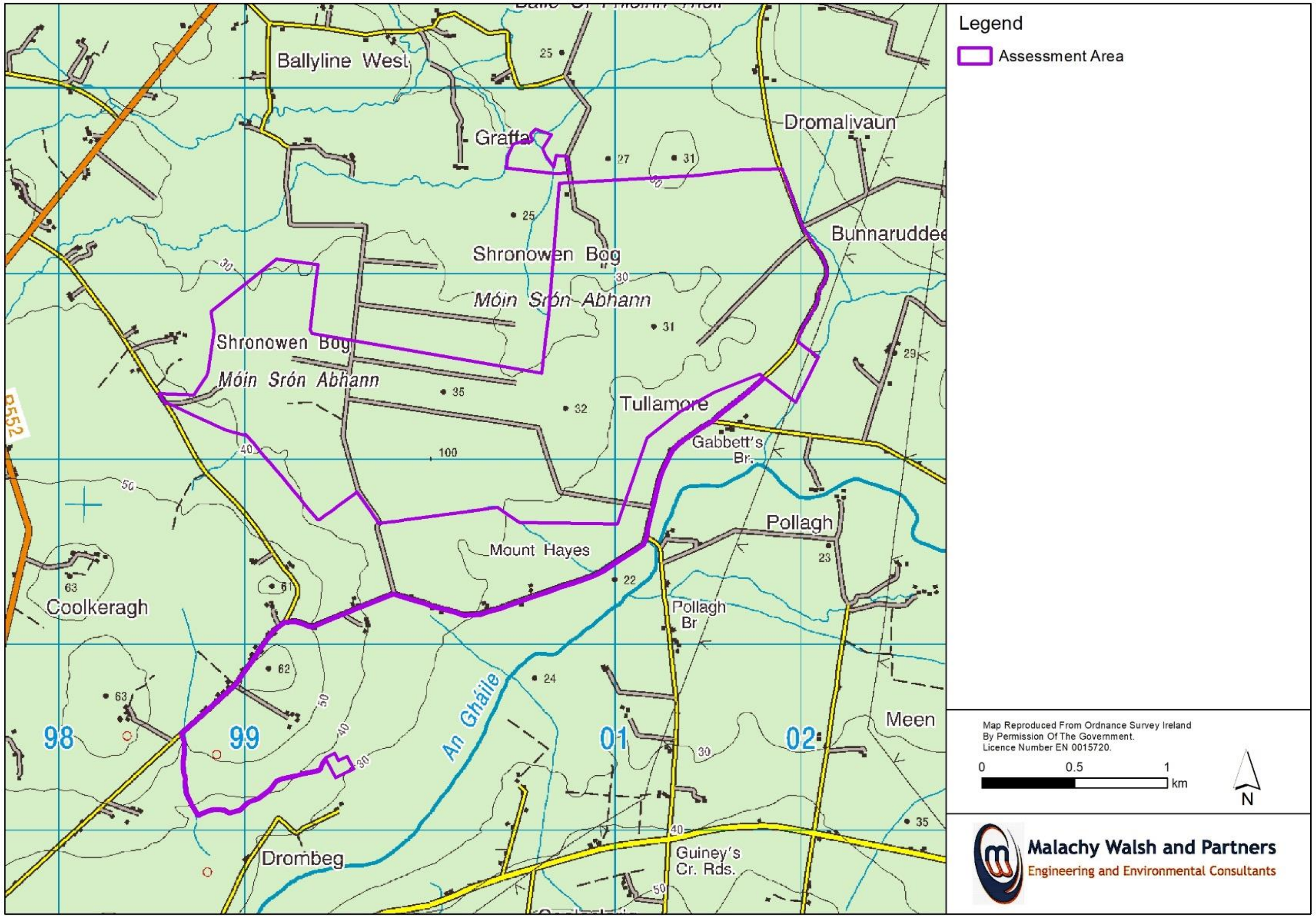

Figure 1-1 –Assessment Area on OS Mapping

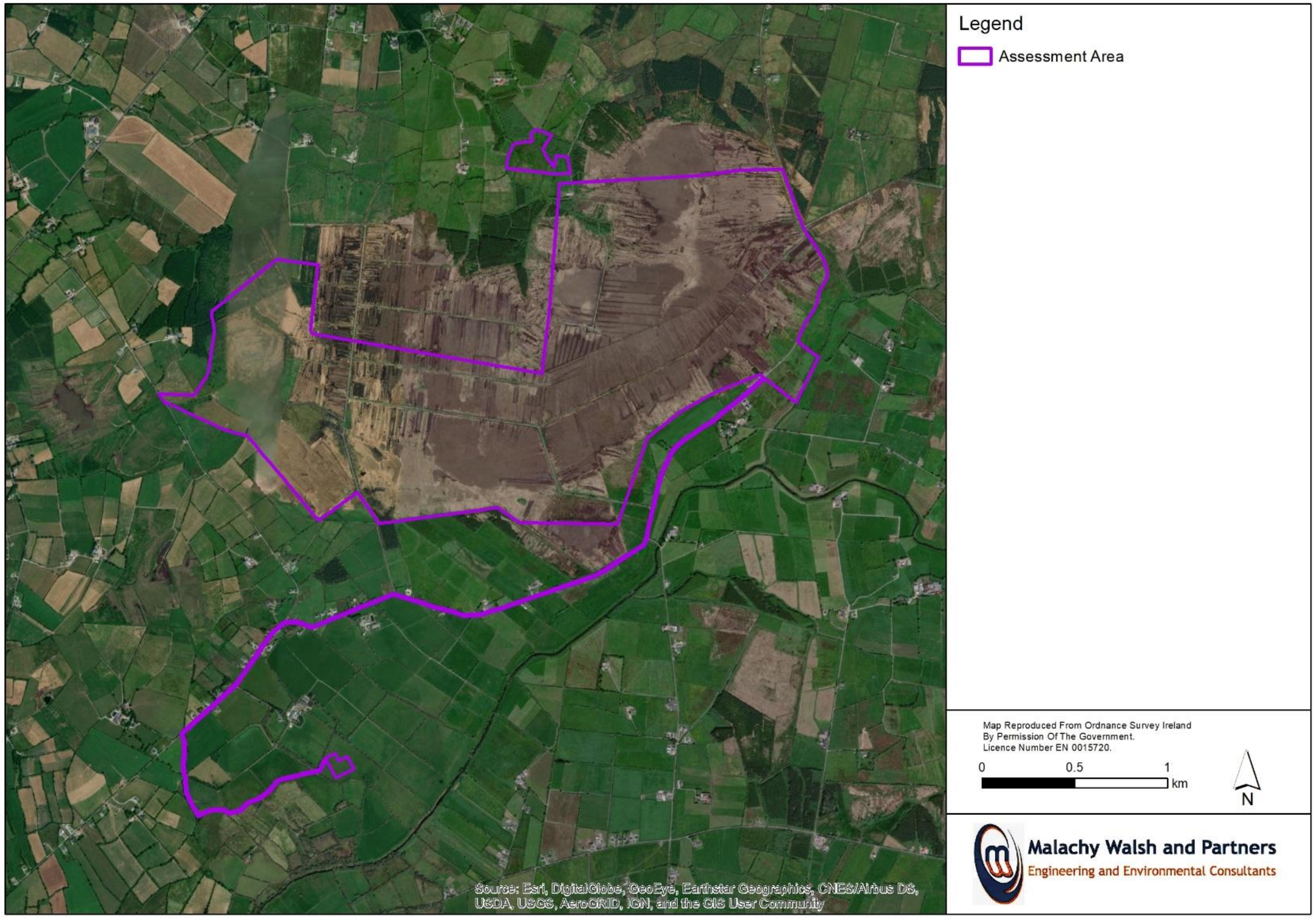

Figure 1-2 – Study Area on Aerial Photographic Background

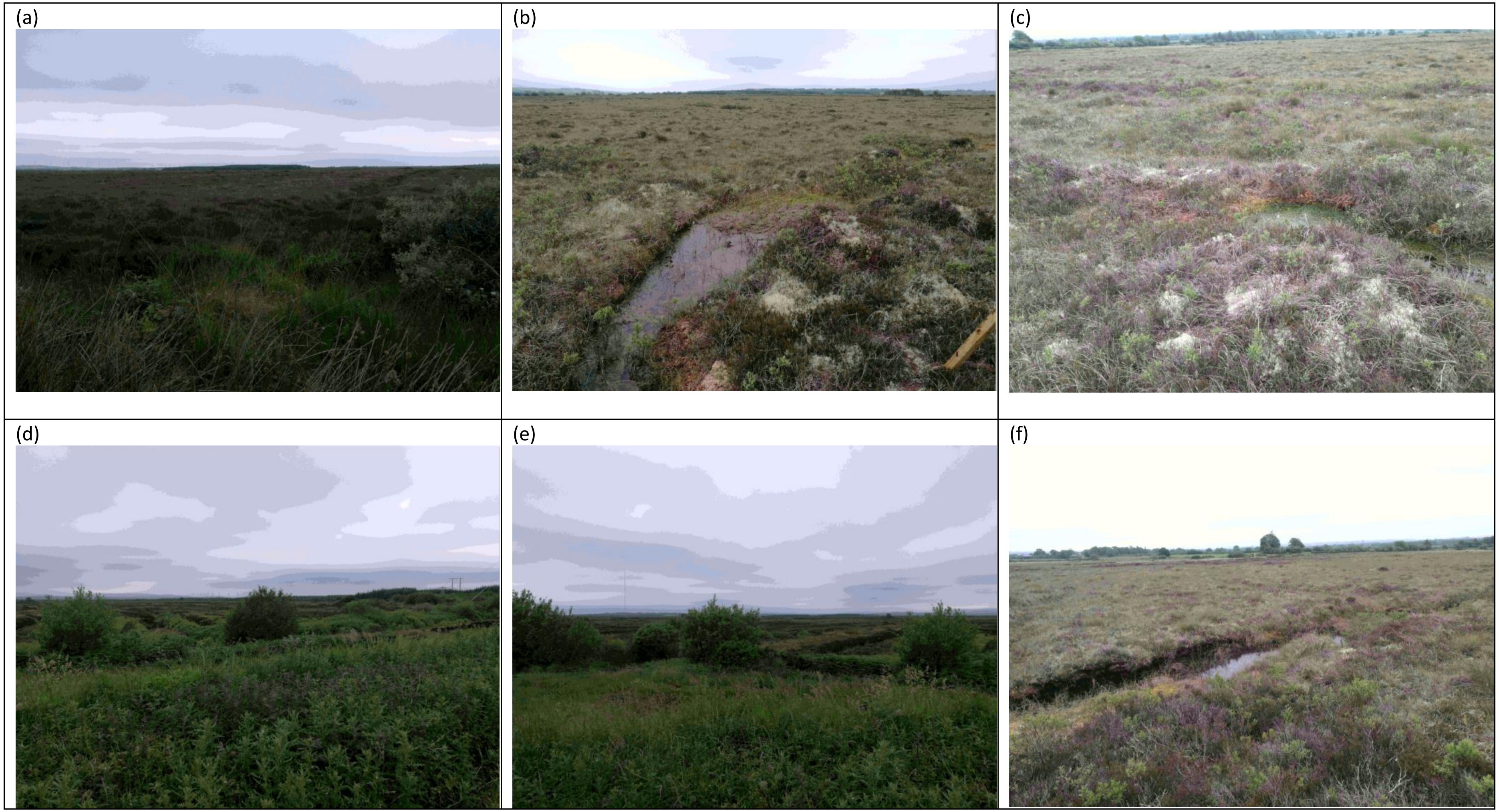

Figure 1-3 – Typical photographs from within the proposed wind farm site (note the flat nature of the site)

2 Desk Study and Site Reconnaissance

The desk study for the Peat Stability Risk Assessment consisted of the following main elements:

- Review of existing site information including:
    - Study of Aerial photography from the Geological Survey Ireland (GSI), Ordnance Survey Ireland (OSI) and publicly available aerial imagery.
    - Examination of Geological records from the GSI (Soil and Teagasc Maps).
    - Examination of GSI Landslide Susceptibility Maps.
- Review of site reconnaissance data

2.1 Landslide Susceptibility - Geological Survey Ireland Dataset

The GSI dataset includes landslide susceptibility mapping. The susceptibility mapping for the Shronowen site is illustrated in Figure 2-1

From Figure 2-1 it can be seen that the full range of susceptibility ratings (Low through to High) are present within the site. The grid connection route is in areas mapped as low susceptibility for it's entire length.

No landslide events are shown in the GSI dataset of recorded landslides. The nearest recorded landslide is approximately 18km east of the Shronowen site. Refer Figure 2-2.

The areas shown as moderate to high on the GSI susceptibility map were identified on site as being likely to be a result of man-made actions in the area highlighted. Peat cutting activity resulted in shear drops being formed in the peat as it was being harvested. It is likely that these shear drops triggered the algorithm used by GSI to give this site the higher rating.

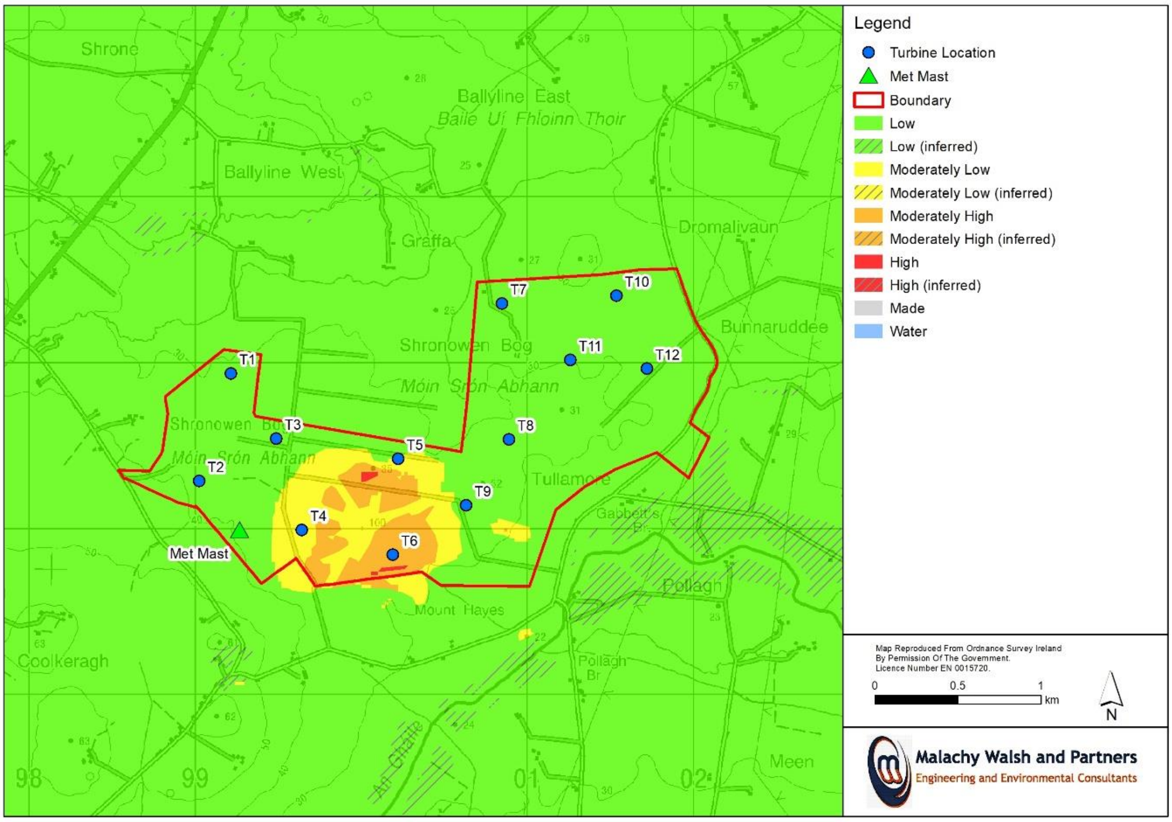

Figure 2-1 – GSI Landslide Susceptability Mapping

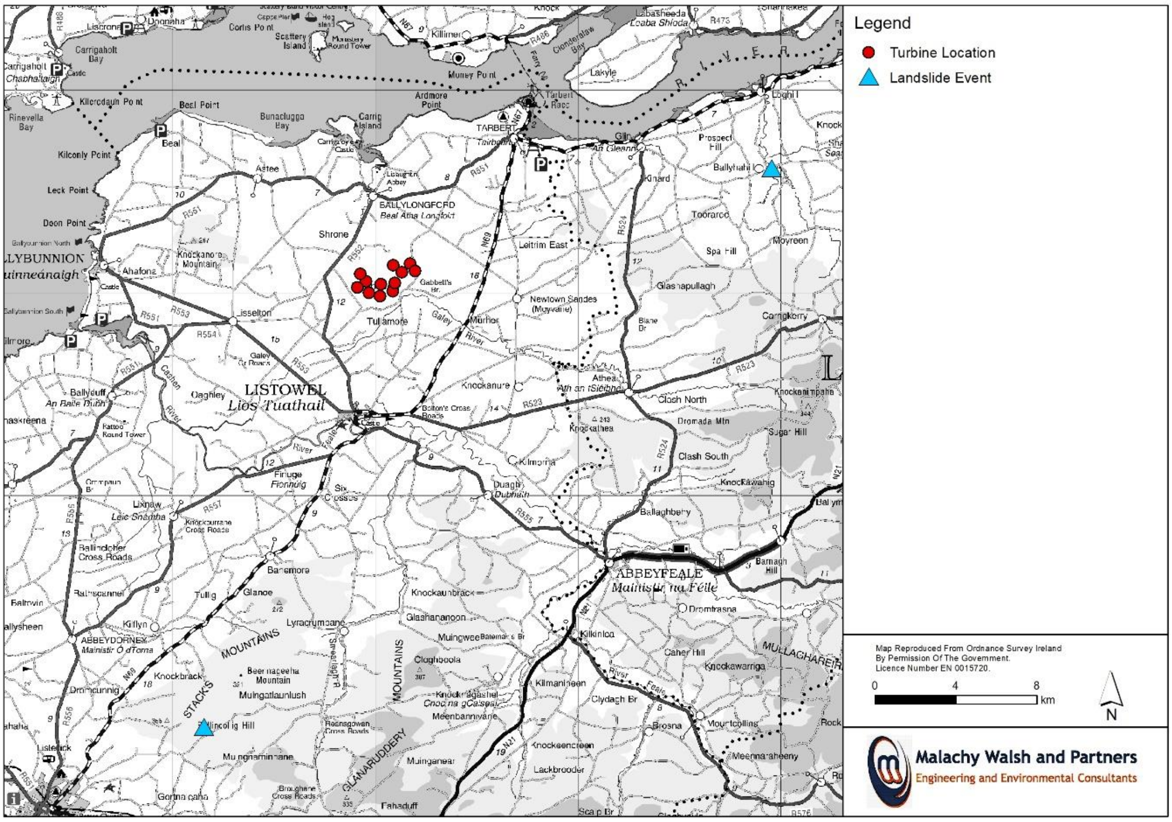

Figure 2-2 – GSI Recorded Landslide Events

2.2 Soil Maps - Geological Survey Ireland Dataset

The predominant soil type present at this site is "Cutaway/ Cutover *Raised Peat*" according to the Teagasc/ EPA Soil Maps available on the Geological Survey of Ireland online mapping system, refer to Figure 2-3. Areas of "*Peaty Podzols*" are present in the northern half of the site. Pockets of "*Surface water Gleys/ Ground water Gleys Acidic*" and "*Peaty Gleys Acidic*" are present to the north and south of the site. An area of "*Mineral Alluvium*" is present along mapped watercourses to the north and south of the site. The characteristics of the *Peat* soil type based on data from Teagasc are a high level of organic matter and very high moisture content.

Quaternary sediments for the majority of the site is dominated by "*Cutover Peat*", aside from a small area of alluvium on the northern edges around the Ballylongford and Coolbeha rivers, and a small pocket of till derived from Namurian sandstones and shales around the same area. Refer Figure 2-4 for further information.

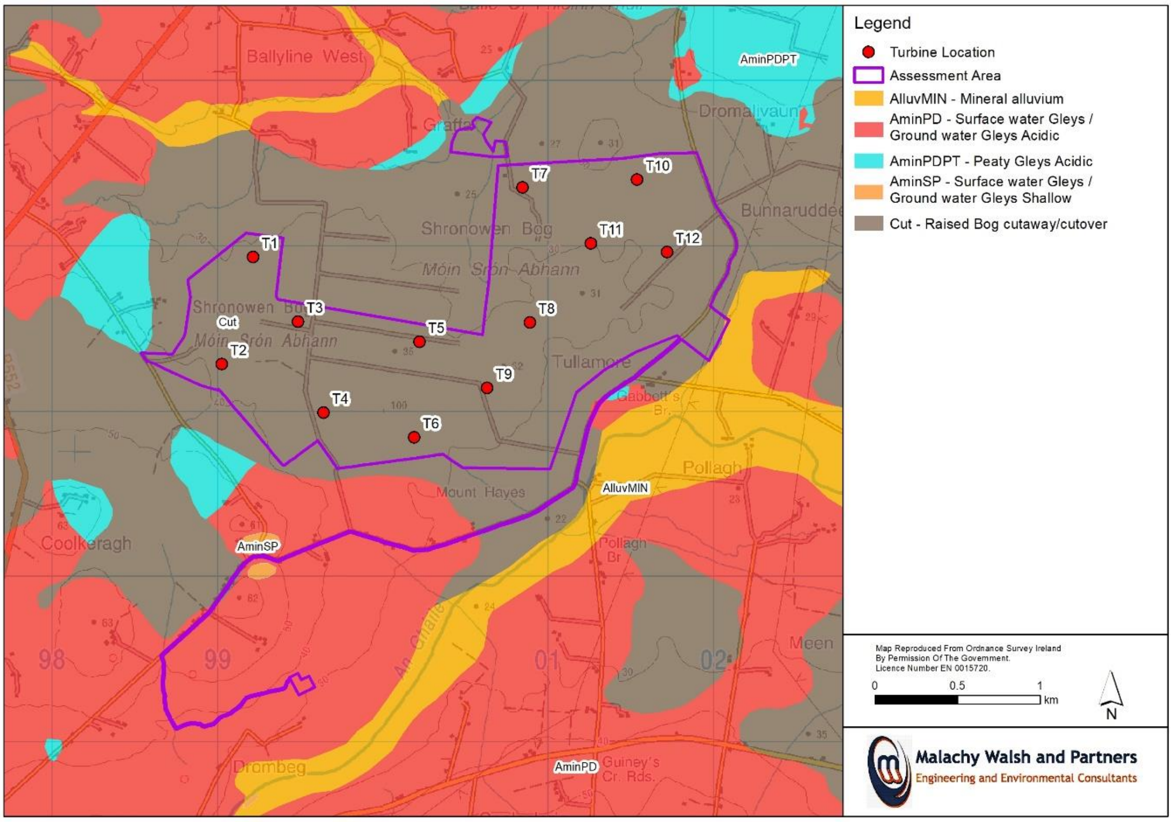

Figure 2-3: Soil Descriptions

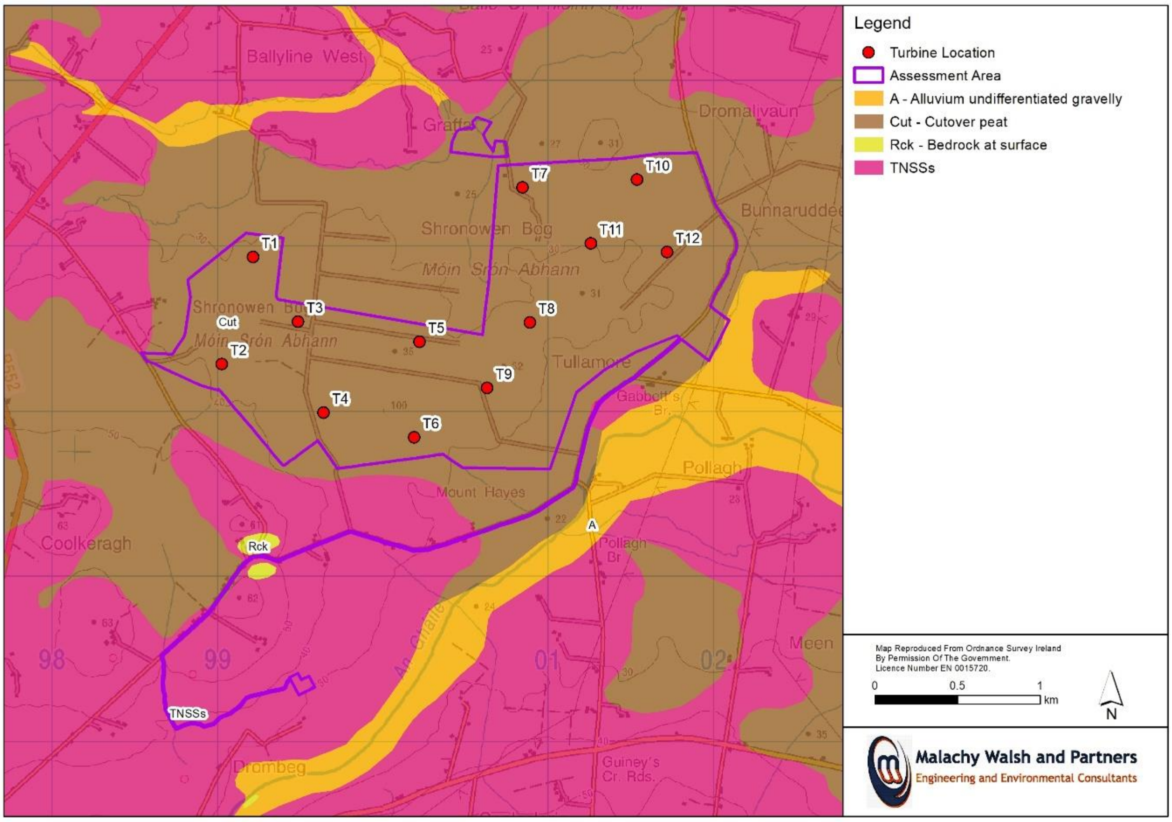

Figure 2-4:Sub-Soil Map

2.3 Existing Land Use

The mapped land use of the site is shown in Figure 2-5. This mapping was created using information from CORINE Land Cover 2018 available on the EPA online mapping system. The following land uses have been identified at the site:

- Pastures
- Peat Bogs
- Transitional woodland scrub

T3 to T12 and the Permanent Met Mast are located in areas mapped as *Peat Bogs*. T1 is located in mapped areas of *Mixed Forest*. T2 is located in an area of *Pastures*. The proposed access tracks and internal cable routes predominantly traverse areas of *Peat Bog.* Small sections of access track near T1 and T2 are located in land mapped as *Mixed Forest* and *Pastures* respectively.

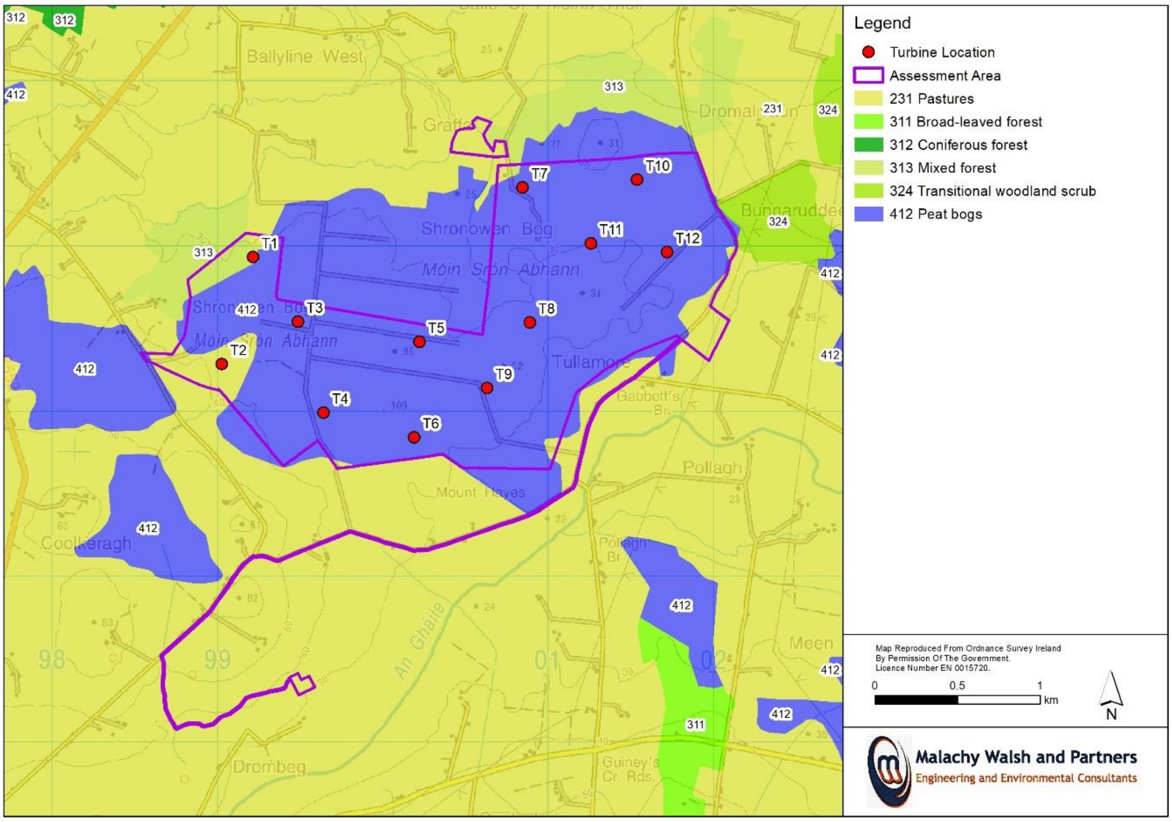

Figure 2-5: Land Cover (CORINE)

2.4 Review of Aerial Photography

Aerial photograph of the site was reviewed to identify any feature relevant to peat stability (eg signs of existing peat slides, drainage features, evidence of historical slides etc).

Evidence of possible peat movement was noted to the east of the proposed location of Turbine T9. Tension cracks in the surface of the peat can be seen (See Figure 2-6). A bank of cut-away peat can be seen immediately south of this location. The removal of peat to the south of this area may have led to the movement of peat in this area and caused the tension cracks. The proposed infrastructure at turbine T9 has been located away from the area where tension cracks are evident. Photographs of the surface tension cracks are displayed in Figure 1-3 photographs b and f.

Aerial mapping of the site indicate that a movement of peat has previously occurred on the site to the east of T9, see Figure 2-6. Upon review of the historic data and site walkovers, it was concluded that this movement of peat was likely to be a result of a manmade issue. It was likely caused by the peat harvesting process that occurred here. The harvesting process left the peat with a vertical bank in the region of 3-4m high immediately south of the area that has moved. Over time the peat in this face began to move to its natural angle of repose which resulted in this peat movement occurring. No works are proposed in this affected area.

An extensive existing drainage networks was also evident on the aerial photography. Long drains can be seen which generally align with the turbary plots and existing access tracks.

Figure 2-6 Aerial Imagery in 2012 showing location of mass movement near T9 (Google Earth)

2.5 Site Reconnaissance

The initial site reconnaissance survey completed by MWP for this report was carried out in June 2019. Further site investigations and site visits were carried out as part of the iterative design process.

The key objective of the site reconnaissance is to obtain reliable information from which an accurate analysis of the site can be performed. The interpretations and conclusions of this report are made in light of these walkovers and the resultant analytical assessment.

The majority of the site consists of a peat bog. Some areas of the bog have been extensively cut over while others remained un-cut. Steep banks of peat were noted in the cut away areas which lead to sudden localised changes in levels. Deep drains were noted around the peat turbary plots throughout the site.

Overall the topography of the site was noted as being flat with the exception of localised changes in topography around the areas of cut peat.

The area where movement of peat was noted was visited during the site reconnaissance. The removal of peat to the south of this area may have led to the movement of peat in this area and caused the tension cracks. The proposed infrastructure at turbine T9 has been located away from the area where tension cracks are evident. Photographs of the surface tension cracks are given in Figure 1-3 photographs b and f.

The review of information during the desk study and site reconnaissance suggests that the site is low risk in terms of peat instability.

2.5.1 Topography and Geomorphologic Model

A peat slide is a result of a confluence of many factors in order to initiate the movement. Two factors are necessary to exceed the shear strength of the peat: sufficient depth and sufficient ground slope. The effects of peat depth and slope on the probability of a peat slide, presented in Figure 2-8, are calculated from the GSI dataset of recorded peat slides in Ireland. The shapes of the curves adopted for the probability analysis below are influenced by the relationship between ground slope and peat depth as calculated using Infinite Slope Stability Analysis.

The peat depth and geomorphology is used to categorise the peat slide risk in terms of the relationship identified in Figure 2-8.

If the combination of slope and depth falls in the green area of Figure 2-8 and the area does not present any land use or other indicators of potential instability then the risk of peat instability is considered low. Gradients at Shronowen are very low. Slopes across the site are less than 3 degrees for the vast majority of the site. Some areas have slopes of up to 6 degrees as shown in Figure 2-9. As such, the probability of a peat slide is considered low across the site. There are localised exceptions to the above in areas where peat has been cut away leaving near vertical slopes at the edge of the peat banks.

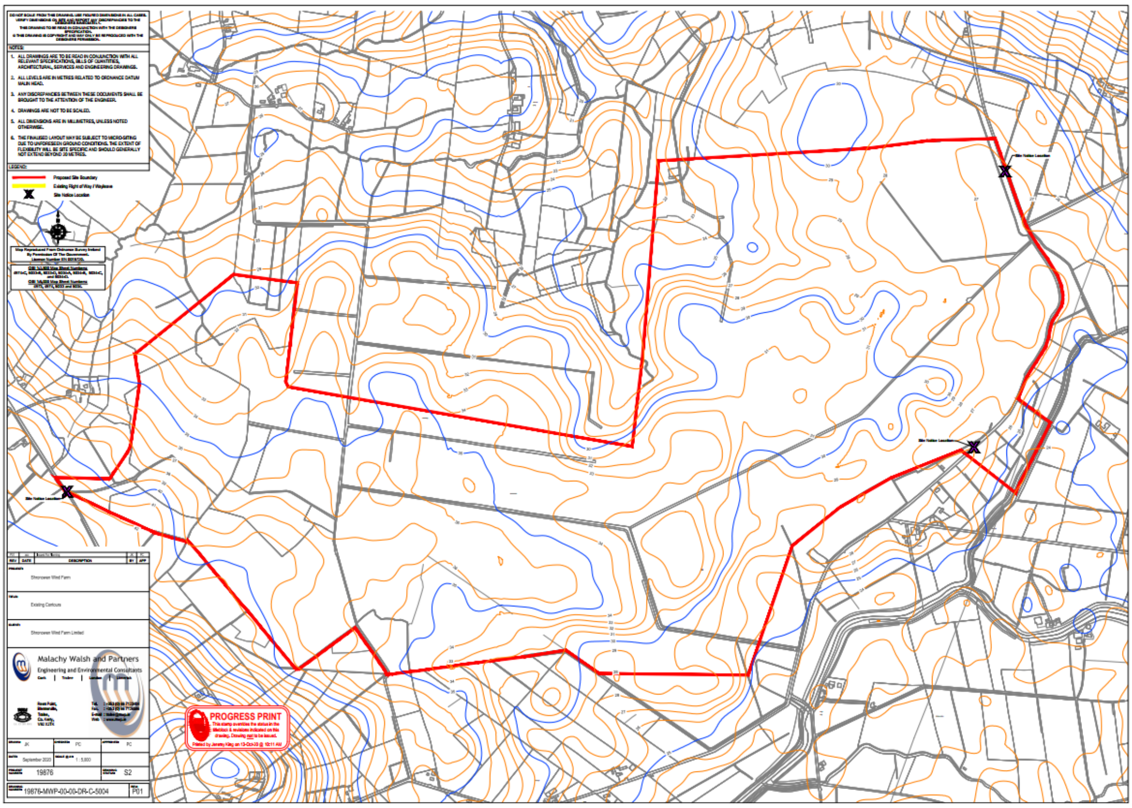

Figure 2-7 – 1m Cotuour Map of the Site

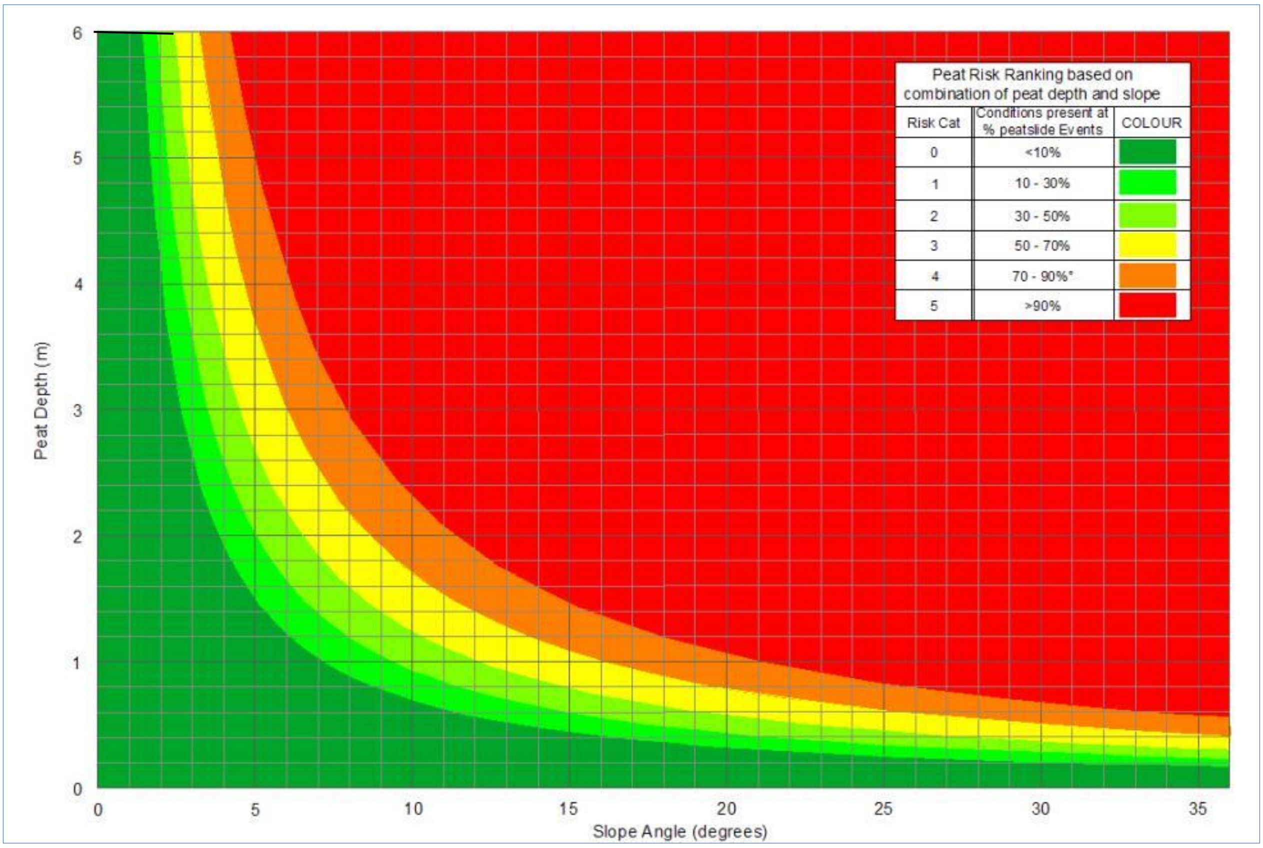

Figure 2-8 - Relationship of Depth and Slope to Peat Slide Events

2.5.1.1 Slope Model

A slope model is produced using the 1m contour data. Maximum slope on the site is under 10.5% (Approx 6°) with the slope across the site being generally under 5.24% (Approx 3 °), as can be seen in Figure 2-9.

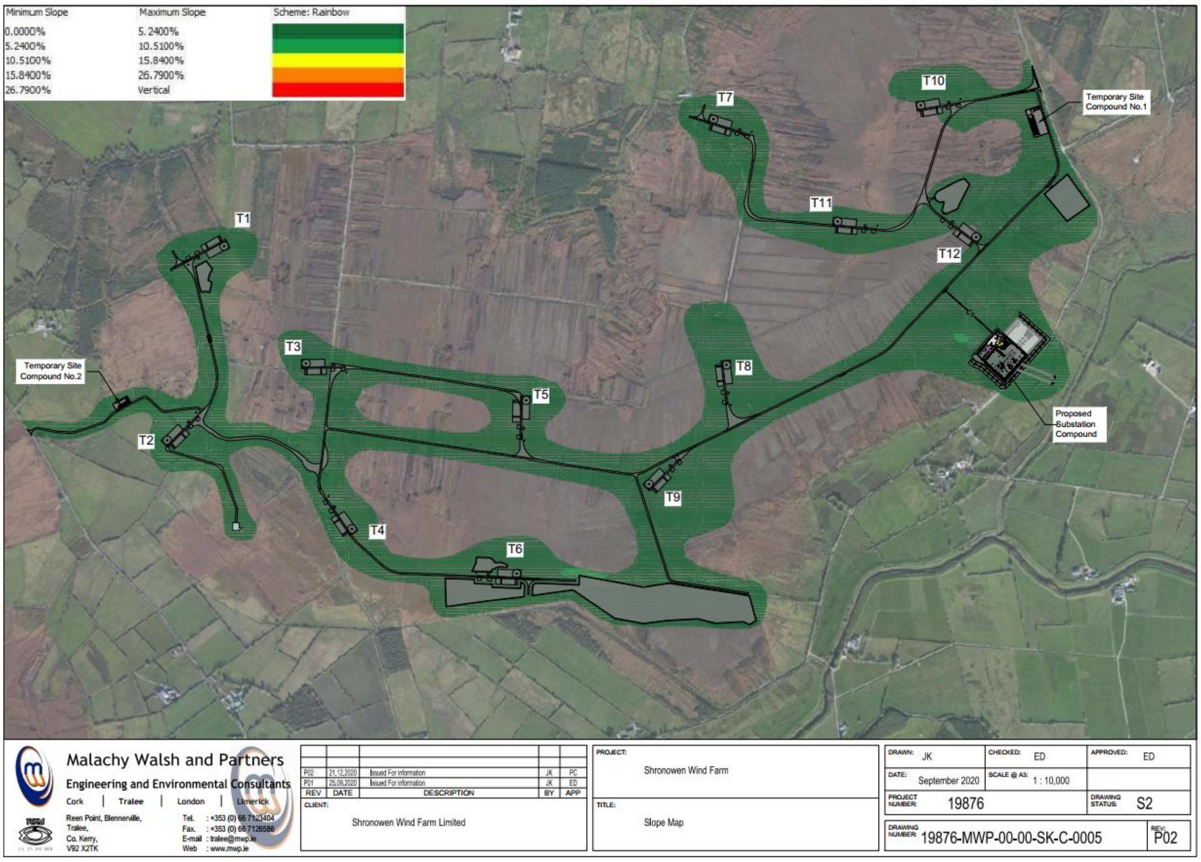

Figure 2-9: Slopes across the study area

2.5.2 Peat Depth Survey

Peat depth was measured by inserting peat depth probes into the ground to reach refusal. For the peat probes, refusal is judged from experience from the feel and sound the probe makes with the refusal material. Refusal in wood is not uncommon in deeper peat but is discernibly different to other materials and a modest relocation of the probe will normally reveal the true depth of peat. It is very difficult to differentiate between rock and larger cobbles and this should be considered when interpreting peat data for other uses. A gouge core is attached to the end of the probe and a sample is recovered which is used to confirm that the probe penetrated the full depth of peat. Grey clay was recovered from the gouge core from peat probes at Shronowen. The locations of these probes are shown in Figure 2-10 and the interpolated depths are shown in Figure 2-11. The depths recorded varied from 0m to 7.4m.

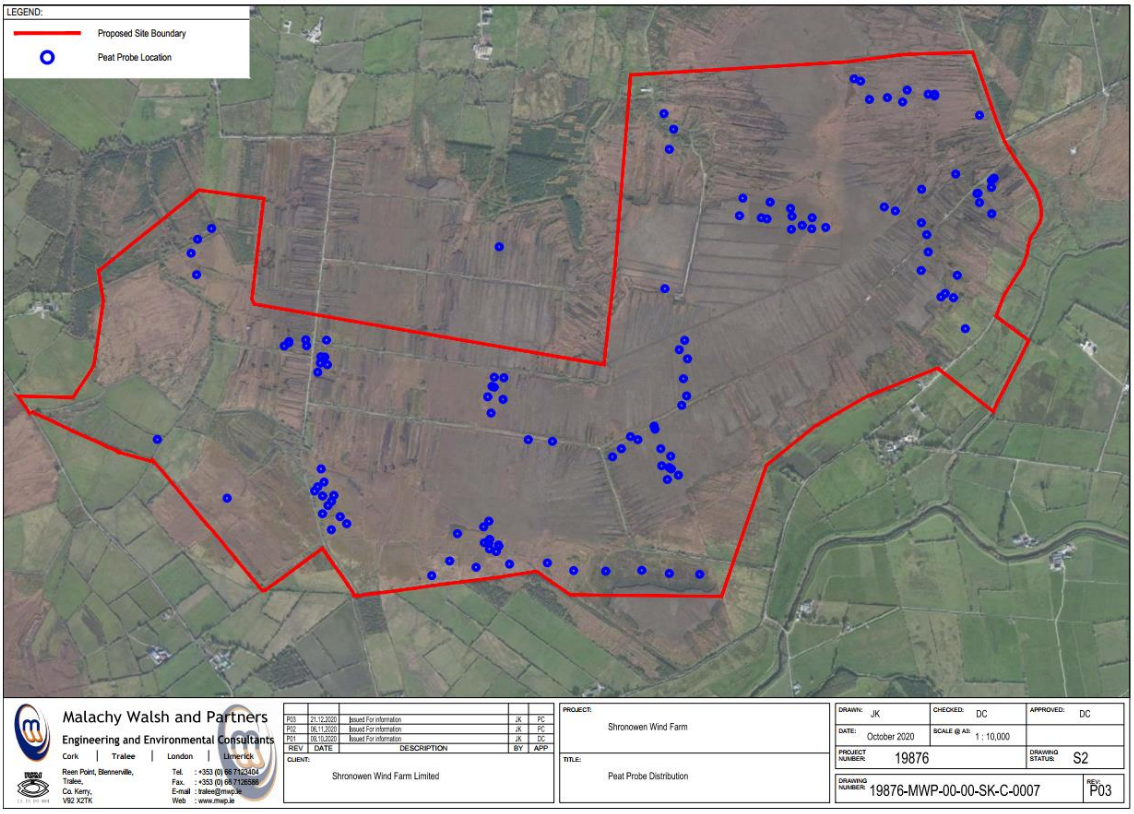

Figure 2-10: Peat Probes completed within the study area

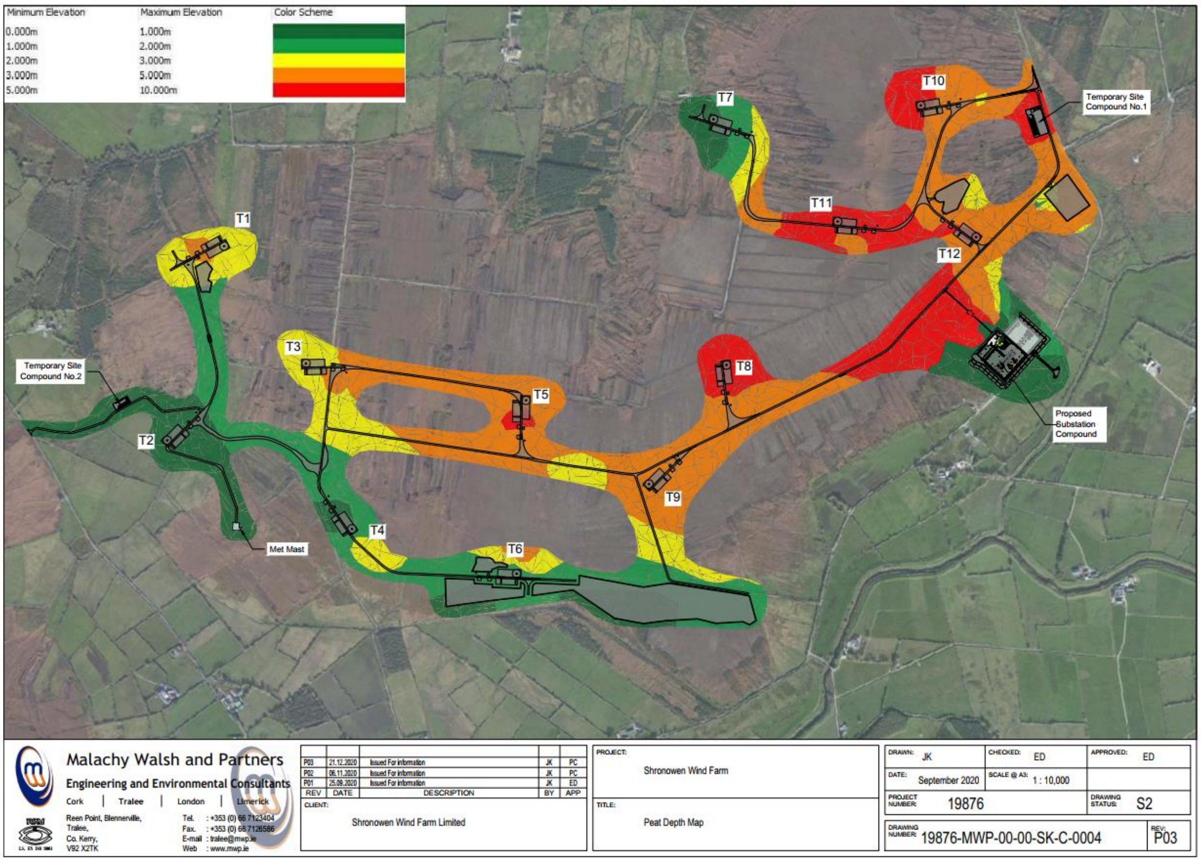

Figure 2-11: Peat Depths across the assessment area

2.5.2.1 Stability Analysis and Risk Ranking

The Scottish Executive Guidelines for Peat Landslide Hazard and Risk Assessments is considered best practice for assessing peat stability on a site. recommends the use of Infinite Slope Stability Analysis to calculate a Factor of Safety (FoS) for quantitative assessment of peat stability risk.

The outcome of the initial site reconnaissance and site investigations at Shronowen indicated peat depths of greater than 7m in some areas of the site. The presence of low slopes across the site, mostly less than 3°, would normally result in very little threat of peat instability if the site was intact. The historical land use of the site, as well as areas of very deep peat, dictates a conservative approach to account for the potential disturbed nature of the peat. A very conservatively low shear strength of 5kPa was applied to all data points as part of this analysis. A surcharge of 10kPa was applied within the model to simulate the placement of 1m of peat on top of the existing peat.

Using the data acquired from the peat probe surveys, Infinite Slope Stability Analysis and Factor of Safety mapping was produced for the full peat probe dataset (see Figure 2-12).

Factors of safety were calculated for the un-drained condition using the equation:

$$FoS = \frac{S_u}{\gamma z Sin\theta Cos\theta}$$

where S_u= Shear Strength, γ = Density, z = depth, θ = Slope Angle

Using these values and a peat density of 10kN/m^3, Factor of Safety calculations were carried out for the entire site with the 10kPa surcharge applied. A model of the site was created showing graphically the FoS calculated for each point within the study area.

The Risk Analysis Matrix for this approach, integrating the Scottish Executive and GSI Landslide Working group study, is shown below in Table 2-1. This corresponds to the colour coding used in the peat risk zone mapping from the FoS analysis presented in Figure 2-12 and Table 2-1. Therefore, an area identified by the colour yellow in the risk mapping will be a Risk Zone Category 3, with a FoS, calculated using infinite slope stability analysis, of between 2.0 and 4.0.

The risk mapping is colour coded from the Risk Analysis Matrix to match the unmitigated Risk Category (ie worst-case scenario). It should be noted that the application of mitigation measures further reduces the risk (as summarised in Table 2-1). The mitigation measures need apply only to areas directly affected by construction activity. Mitigation measures are discussed in Section 3 of this report.

Figure 2-12 shows that the entire site has a FoS greater than 2, indicating stable conditions in the study area. This reduces the potential for a propagating peat slide resulting from construction activities. A propagating peat slide occurs in unstable areas where a failure in one location causes the peat in the adjacent areas to also fail. Major failures that have occurred in the past would have been initiated as a localised failure that propagated to the wider area. Turbines T6, T8 and T9 are located near areas of medium risk but this risk becomes low when the mitigation measures listed are employed. T11 is located in an area of medium risk which becomes low when mitigation measures are applied. An area of significant risk is located to the west of T11 (this risk becomes medium when mitigation measures are applied).

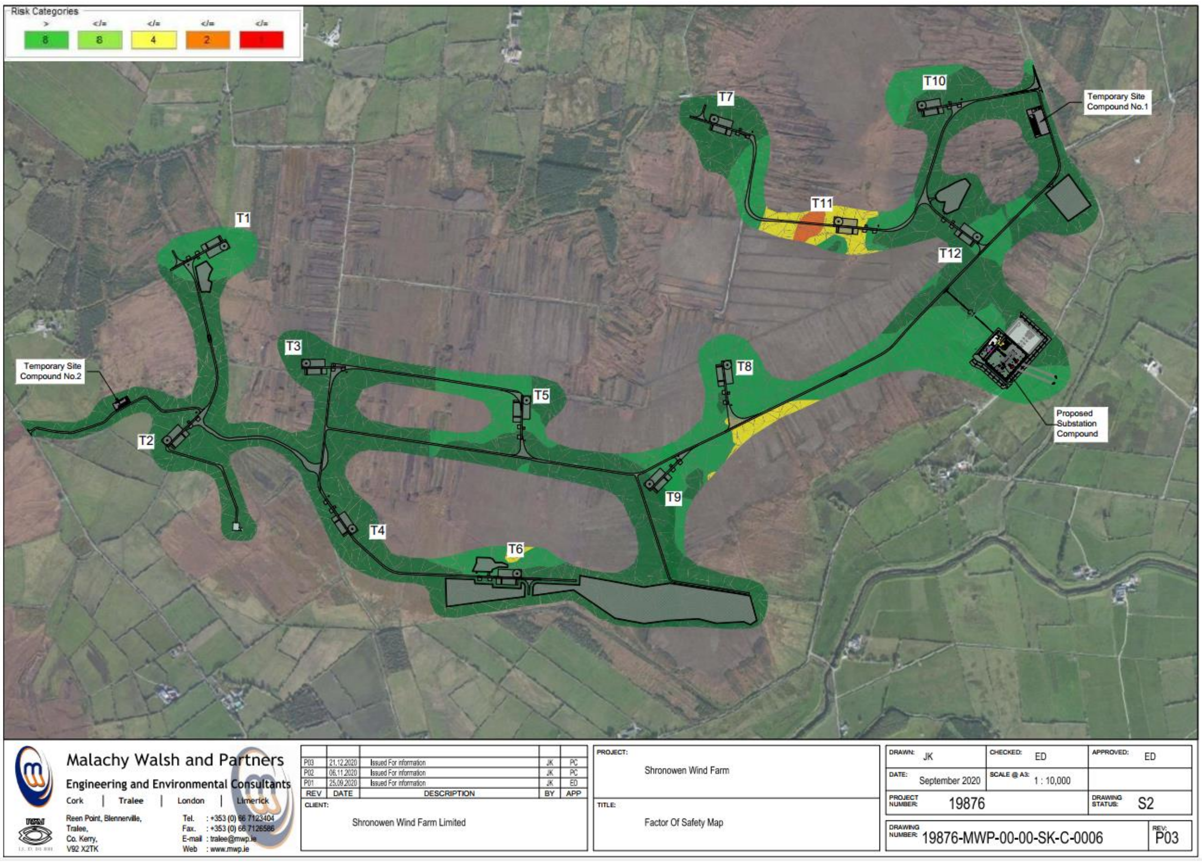

Figure 2-12: Factor of Safety for Peat Stability across the study area with 10kPa surcharge applied (Unmitigated)

Table 2-1: Risk Analysis Matrix

Risk Zones Category	Identified Risk Category	Calculated Factor of Safety	Mitigation Measure.	Residual Risk
1	Nominal	> 8.0	Supervision of Method Statement Implementation.	Nominal
2	Low	4.0 - 8.0	Mitigation by design. Supervision of Method Statement Implementation. Peat Stability Monitoring Plan.	Nominal
3	Medium	2.0 – 4.0	Avoid where practical. Mitigation by Design. Supervision of Method Statements Implementation. Peat Stability Monitoring Plan.	Low
4	Significant	1.0 – 2.0	Avoid if Possible. Specific Mitigation By Design if unavoidable. Supervision of area specific Method Statements Implementation. Peat Stability Monitoring Plan.	Medium
5	High	< 1.0	Avoid with buffer zone and Monitor.	Significant

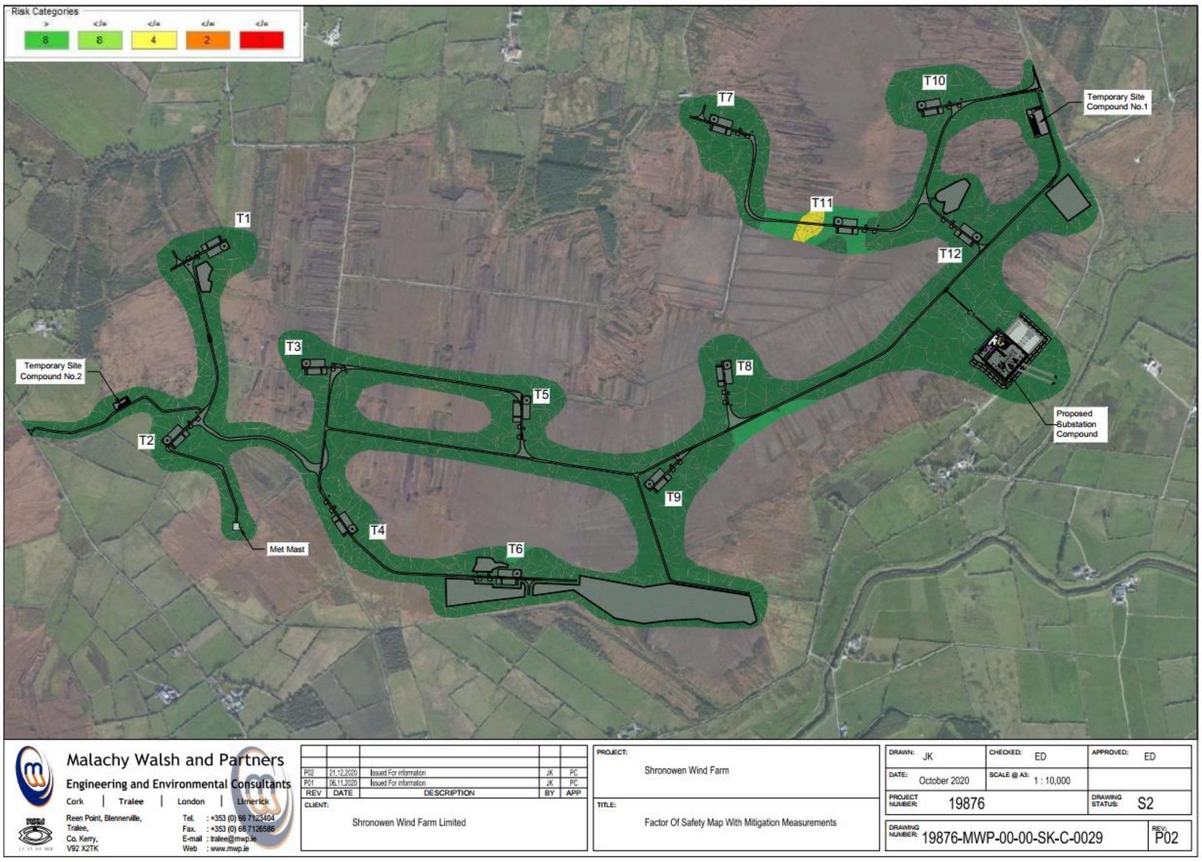

Figure 2-13: Residual Risk Map with Mitigation Measures Applied

3 Mitigation

The finding of the Peat Stability Risk Assessment is that all of the turbines have been placed in areas of low residual risk of peat instability. The mitigation measures required to achieve a low risk of peat instability are discussed below.

Construction methodologies for excavations in deep peat will need to consider that depths of over 7m are present in places. Turbines and crane hardstands cannot be constructed directly onto the peat due to its low strength. Loads from these structures will need to be on a firmer strata below the peat. This leads to large scale excavations being required. Temporary stabilisation measures at the sides of excavation will be required to prevent peat movements into the excavation. The risk of instability of peat during excavation work is a construction health and safety risk to those working on the construction of the scheme. Temporary works such as sheet pile cofferdams or granular berms will be required around the perimeter of the excavations to prevent movement of peat into the excavation. Alternatively, piled crane hardstands could be considered to remove the need for large scale excavations at the hardstands. Drainage works will need to be installed such water is directed away from areas where steep banks of cut peat to avoid saturating the peat. This is a particularly important consideration in the area to the west of T9 where evidence of previous peat movement and tension crack was noted during the desk study and site walkover. Stockpiling of materials shall not be permitted on peat. Excavated material shall be removed to the designated deposition areas immediately following excavation.

At the area of significant risk to the east of T11, more stringent mitigation measures shall be applied to reduce the risk to a medium level. Note, the only infrastructure proposed at this location is an access road, no turbine or hard stand infrastructure is proposed here.. These are to include the following:

- No stockpiling of material in this area
- More frequent monitoring and inspection of the floated road
- The used of a log road construction
- No excavation or removal of peat to be carried out in this area

Peat monitoring by sightline monitoring method shall be carried out by the appointed contractor for this development. Monitoring will be carried out at areas of deep excavations (eg turbine bases), material deposition areas and any area of works where peat is present.

Monitoring by sightlines entails driving a series of posts at approximately 5m centres, exactly aligned, across the section of bog being monitored. An illustration of this approach is given below in Figure 3-1. Any signs of distress or deformation in the bog will quickly manifest itself by some of the posts moving out of alignment. Early discovery of stress in the peat will give the developer a opportunity to implement emergency procedures to prevent the onset of a bog burst or localised peat slide. While the risk of such occurrence is low in this instance, the precautionary principle dictates that monitoring posts should be installed in work areas where there are areas with a risk rating higher than “low” or peat depths are greater than 2m.

Emergency procedures are the responsibility of the appointed contractor and are to be included in the appointed contractor’s method statements. As a minimum, the following shall be included in the contractor’s methodologies:

- Emergency response procedures to protect the health and safety of workers and to implement containment procedures for remoulded peat slurry on or off site.
- Identification of potential flow paths of peat slides to determine accessible intervention points on or off site to construct barrages, settlement ponds and silt traps to contain the peat slurry and to prevent downstream contamination of watercourses.
- Stockpiling of rockfill on or off site to use in the construction of emergency containment barrages in the event of a slide (noting that stockpiling of material on peat shall not be permitted)

The Construction Manager for the project should impart the philosophy that everyone on the site is aware of peat stability and report any sign of misalignment in monitoring posts. Vigilance is a fundamental requirement when working on peat where inappropriate construction methodology can cause instability in otherwise benign conditions.

A Geotechnical Engineer experienced in working in peat environments should be employed full-time to ensure the implementation of best practice in this environment. The methodology of all civil works should be reviewed by the Geotechnical Engineer and the monitoring posts should be the subject of a dedicated inspection on a weekly basis by the Geotechnical Engineer.

The following general measures incorporated into the construction phase of the project will assist in the management of the risks for this site:

- Appointment of experienced and competent contractors and detailed designers;
- The construction works on site will be supervised by experienced and qualified personnel;
- Ensure construction method statements are followed or where agreed modified/ developed.
- Allocate sufficient time for the project to be constructed safely with all peat stability mitigation measures included in the programme;
- Set up, maintain and report findings from monitoring systems, including sightline monitoring;
- Maintain vigilance and awareness through Tool-Box-Talks (TBTs) on peat stability;
- Prevent undercutting of slopes and unsupported excavations;
- No sidecasting of excavated material other than in areas selected for such activities by a suitably qualified environmental professional or site geotechnical engineer.
- Prevent placement of loads/overburden on marginal ground; and,
- Manage and maintain a robust drainage system.

Retention berms founded on a solid formation layer below peat shall be constructed around the peat depositions areas. The retention berms shall be constructed from free drain granular material or cohesive material with drainage outlets to prevent water build up within the deposition area. The deposition areas shall also be split into cells using internal berms so that they are more manageable in size and to reduce risk of peat movement within the deposition area during construction. A drainage system shall be put in place around the perimeter of the deposition area to prevent siltation of any drains or water courses. See a typical berm detail in Figure 3-2.

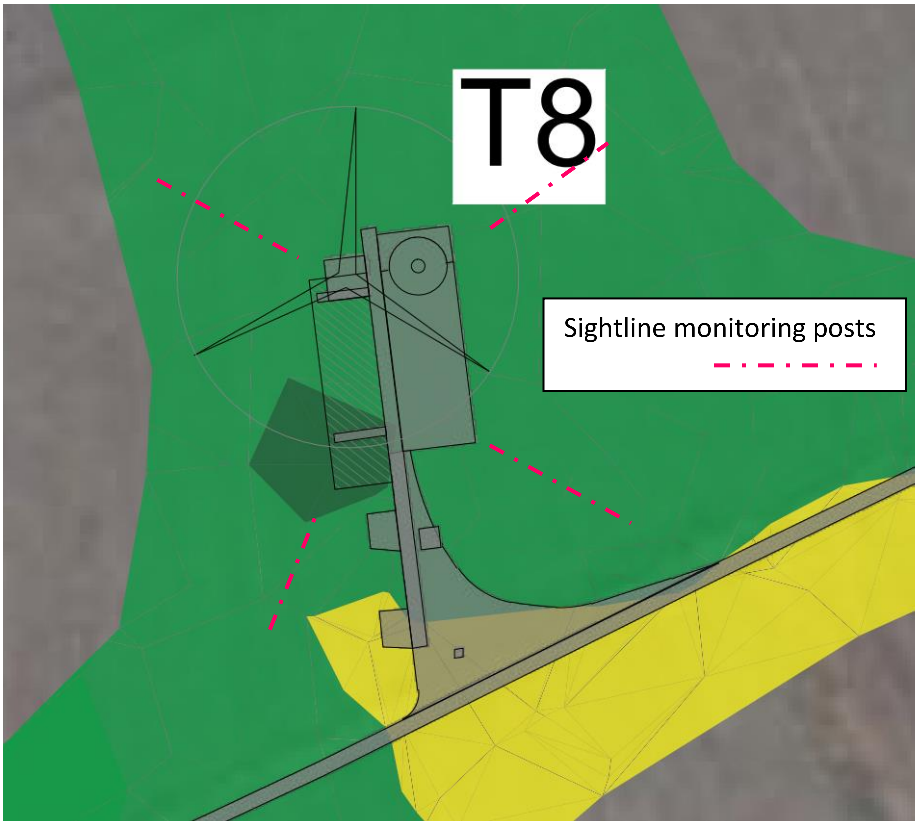

Figure 3-1 Example of a typical monitoring post layout

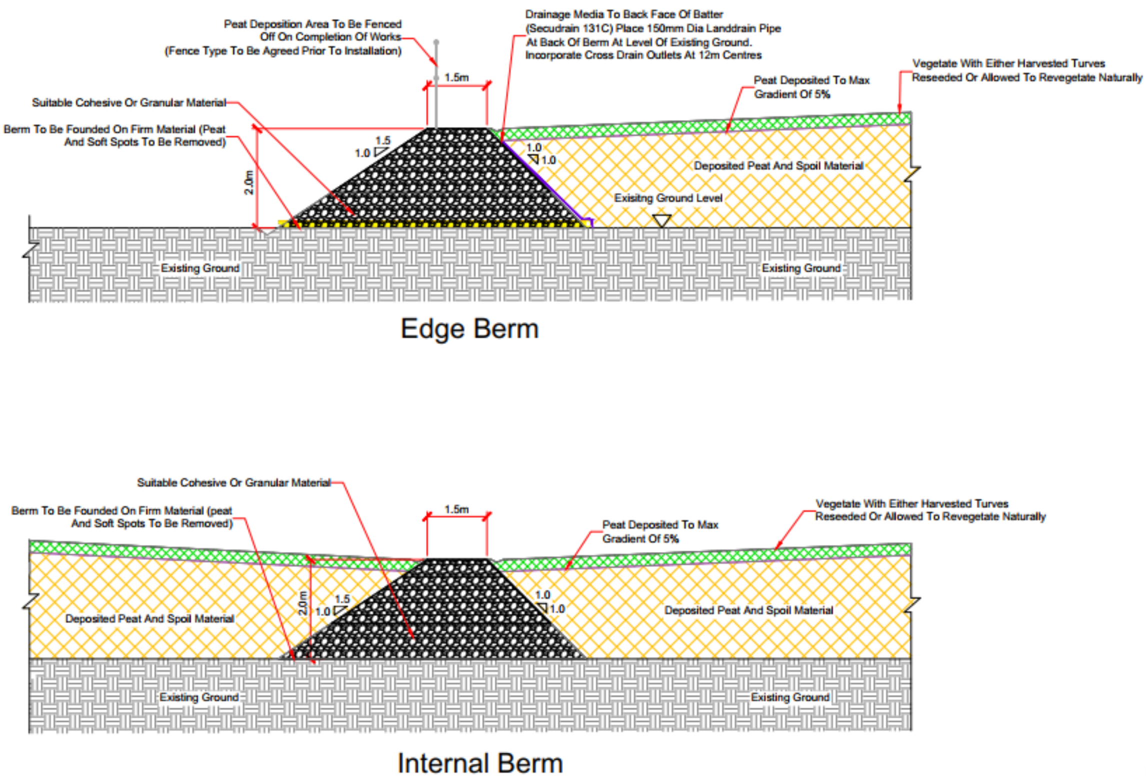

Figure 3-2 Typical Detail of Retention Berms at Peat Deposition Areas

4 Conclusions

The finding of the Peat Stability Risk Assessment is that all of the turbines have been placed in areas of low residual risk of peat instability. The mitigation measures required to achieve a low risk of peat instability have been detail.

The site is generally flat in terms of overall topography. Maximum slope on the site is under 10.5% (Approx 6^0) with the slope across the site being generally under 5.24% (Approx 3^0), with the exception of localised areas where the face of peat banks have been cut at near vertical angles.

A peat survey was carried out in areas of proposed infrastructure across the site. Peat depths were found to range from 0m to 7.4m in parts of the site.

A quantitative risk assessment of the slope stability at the site was carried out using infinite slope analysis. This is in line with best practice recommendations from the Scottish Government Peat Landslide Hazard Risk Assessment (2nd Ed 2017) guidelines. The quantitative risk assessment found that the worst-case factor of safety against peat instability was 1.9 in an area to the west of T11. The vast majority of the site has a factor of safety greater than 4.

A number of mitigation measures to further reduce the risk of peat instability have been provided. These must be adopted by the appointed contractor into their construction methodologies.

5 References

Geohive 2020, Online Map Viewer, https://geohive.ie/

Geological Survey of Ireland 2020, Online Geological Map Viewer, https://www.gsi.ie/en-ie/data-and-maps/Pages/default.aspx

Scottish Government Peat Landslide Hazard Risk Assessment (2nd Ed 2017)

Nichol, D., 2006. Peatslide hazard rating system for wind farm development purposes. Proceedings of the 28th Annual Conference of the British Wind Energy Association (BWEA28), 10-12 October 2006, Glasgow, B2.

Peat Landslide Hazard and Risk Assessments: Best Practice Guide for Proposed Electricity Generation Developments, Energy Consents Unit Scottish Government, Second Edition, April 2017

Peat slope failure in Ireland, Article in Quarterly Journal of Engineering Geology and Hydrogeology · February 2008 DOI: 10.1144/1470-9236/06-028, N. Boylan, P. Jennings and M. Long

Appendix 1: Peat Probe Data

GC or PP	Proposed or Existing Infrastructure	Grid Ref - ING Letter or "ITM"	Easting	Northing	Substrate Description	Total Peat Depth (m)	Depth Interval (m)	Von Post (H)	Refusal Type/Bedrock/ Hard Pan Occurence
GC 1	T1	ITM	498996	640250	Topsoil	0		H	Topsoil
GC 2	T2	ITM	499583	640100	Peat	0.4		H 5	Rock
GC 3	T3	ITM	499592	640600	Peat	3.4		H 6	Rock
GC 4	T4	ITM	499187	640993	Peat	2		H 6	Rock
GC 5	T5	ITM	500175	640437	Peat	3.2		H 7	Rock
GC 6	T6	ITM	500201	640929	Peat	2.2		H 6	Rock
GC 7	T7	ITM	500146	639942	Peat	2.4		H 8	Clay
GC 8	T8	ITM	500750	640286	Peat	4.7		H 7	Clay
GC 9	T9	ITM	500784	640781	Peat	5		H 8	Rock
GC 10	T10	ITM	500800	641272	Peat	0.5		H 6	Clay
GC 11	T11	ITM	501944	641170	Peat	2.7		H 7	Rock
GC 12	T12	ITM	501451	641520	Peat	6		H 8	Peat
GC 13	T13	ITM	501351	640997	Peat	6		H 8	Peat
GC 14	T4 (New)	ITM	499573	640146	Peat	1.1		H 5	Rock
GC 15	T6 (New)	ITM	500164	639962	Peat	4.4		H 6	Rock
GC 16	T9 (New)	ITM	500807	640146	Peat	4.1		H 7	Rock
GC 17	T10 (New)	ITM	501474	641512	Peat	6.1		H 7	Rock
GC 18	T12 (New)	ITM	501888	641117	Peat	0.6		H 3	Rock
GC 19	T4 (08/08)	ITM	499618	640053	Peat	1		H 5	Clay
GC 20	T4 (08/08) Hardstand	ITM	499610	640032	Peat	1.3		H 4	Clay
GC 21	T4 (08/08) Hardstand	ITM	499597	640017	Peat	1.1		H 4	Clay
GC 22	T4 (08/08) Hardstand	ITM	499550	640068	Peat	0.45		H 5	Unknown
GC 23	T4 (08/08) Hardstand	ITM	499561	640083	Peat	0.35		H 4	Unknown
GC 24	T4 (08/08) Hardstand	ITM	499578	640051	Peat	0.8		H 5	Unknown
GC 25	T10 (08/08)	ITM	499572	640541	Peat	3.35		H 6	Clay
GC 26	T10 (08/08) Hardstand	ITM	499586	640540	Peat	3		H 5	Clay
GC 27	T10 (08/08) Hardstand	ITM	499561	640487	Peat	3		H 8	Clay
GC 28	T10 (08/08) Hardstand	ITM	499570	640519	Peat	3.6		H 5	Unknown
GC 29	T10 (08/08) Hardstand	ITM	499595	640513	Peat	3		H 5	Unknown
GC 30	T7 (08/08) Hardstand	ITM	500148	639886	Peat	1.2		H 4	Unknown
GC 31	T7 (08/08)	ITM	500163	639884	Peat	1.4		H 5	Clay
GC 32	T7 (08/08) Hardstand	ITM	500167	639898	Peat	1.2		H 7	Clay
GC 33	T7 (08/08) Hardstand	ITM	500166	639864	Peat	1.55		H 9	Clay
GC 34	T7 (08/08) Hardstand	ITM	500190	639855	Peat	1.5		H 5	Clay
GC 35	T7 (08/08) Hardstand	ITM	500198	639878	Peat	1.2		H 6	Clay
GC 36	T7 (08/08) Hardstand	ITM	500199	639874	Peat	1		H 6	Clay
GC 37	T8 (08/08)	ITM	501638	641381	Peat	3.4		H 8	Unknown
GC 38	T8 (08/08) Hardstand	ITM	501712	641466	Peat	2.3		H 9	Unknown
GC 39	T8 (08/08) Hardstand	ITM	501735	641466	Peat	3.6		H 8	Unknown
GC 40	T8 (08/08) Hardstand	ITM	501735	641460	Peat	5		H 10	Rock
GC 41	T8 (08/08) Hardstand	ITM	501935	641162	Peat	3		H 5	Gravel
GC 42	T8 (08/08) Hardstand	ITM	501935	641138	Peat	2		H 5	Unknown
GC 43	T8 (08/08) Hardstand	ITM	501884	641116	Peat	3.6		H 5	Clay
GC 44	T8 (08/08) Hardstand	ITM	501893	641084	Peat	4.7		H 5	Clay
GC 45		ITM	500183	640469	Peat	4.3		H 7	Unknown
GC 46		ITM	500217	640467	Peat	4		H 8	Unknown
GC 47		ITM	500214	640391	Peat	5.3		H 9	Unknown
GC 48		ITM	500160	640400	Peat	6		H 9	Unknown

GC or PP	Proposed or Existing Infrastructure	Grid Ref - ING Letter or "ITM"	Easting	Northing	Substrate Description	Total Peat Depth (m)	Depth Interval (m)	Von Post (H)	Refusal Type/Bedrock/ Hard Pan Occurence
GC 49		ITM	500183	640434	Peat	5.6		H 8	Unknown
GC 50		ITM	501303	641031	Peat	5.7		H 7	Gravel
GC 51		ITM	500815	641343	Peat	0		H	Road
GC 52		ITM	500781	641398	Peat	0.6		H 6	Unknown
GC 53		ITM	501809	641185	Peat	4		H 8	Unknown
GC 54		ITM	501689	641131	Peat	1.9		H 8	Unknown
GC 55		ITM	501557	641069	Peat	4.6		H 9	Unknown
GC 56		ITM	501707	640971	Peat	3.8		H 8	Unknown
GC 57		ITM	501815	640596	Peat	6		H	Rock
GC 58		ITM	501818	640536	Peat	6.2		H	Unknown
GC 59		ITM	501936	641045	Peat	4		H	Unknown
GC 60		ITM	501047	641038	Peat	5.1		H	Unknown
GC 61		ITM	501144	641027	Peat	6.7		H	Unknown
GC 62		ITM	501232	641036	Peat	5		H	Unknown
GC 63		ITM	501230	640990	Peat	4.8		H	Unknown
GC 64		ITM	501268	641004	Peat	4		H	Unknown
GC 65		ITM	501302	640992	Peat	4		H	Unknown
GC 66		ITM	500172	640343	Peat	3.9		H 8	Unknown
GC 67		ITM	500303	640249	Peat	2.5		H 8	Unknown
GC 68		ITM	500388	640243	Peat	2.4		H 7	Unknown
GC 69		ITM	500663	640260	Peat	3.9		H	Unknown
GC 70		ITM	500746	640297	Peat	4.5		H	Clay
GC 71		ITM	500770	640217	Peat	4.9		H	Unknown
GC 72		ITM	500773	640157	Peat	3.5		H	Unknown
GC 73		ITM	500793	640109	Peat	3.9		H	Unknown
GC 74		ITM	500832	640124	Peat	4		H	Unknown
GC 75		ITM	500800	640151	Peat	4.4		H	Unknown
GC 76		ITM	500805	640191	Peat	4.6		H	Unknown
GC 77		ITM	500844	640370	Peat	3		H	Unknown
GC 78		ITM	500861	640403	Peat	3.1		H	Unknown
GC 79		ITM	500850	640464	Peat	4.7		H	Unknown
GC 80		ITM	500864	640534	Peat	6.7		H	Unknown
GC 81		ITM	500835	640566	Peat	5.6		H	Unknown
GC 82		ITM	500854	640599	Peat	6.5		H	Unknown
GC 83	T1 Hardstand	ITM	499138	640955	Peat	4.1		H 5	Clay
GC 84	Peat Deposition Area	ITM	499134	640830	Peat	1.8		H 5	Clay
GC 85	Peat Deposition Area	ITM	499115	640906	Peat	2.5		H 6	Clay
GC 86	Met Mast	ITM	499242	640043	Peat	0.7		H 4	Clay
GC 87	Peat Deposition Area	ITM	499609	639932	Peat	1.6		H 5	Clay
GC 88	Peat Deposition Area	ITM	499663	639953	Peat	3		H 6	Clay
GC 89	Peat Deposition Area	ITM	499640	639978	Peat	3		H 4	Rock
GC 90	Peat Deposition Area	ITM	499578	639988	Peat	1.5		H 5	Clay
GC 91	Peat Deposition Area	ITM	499963	639770	Peat	0.4		H 4	Clay
GC 92	Peat Deposition Area	ITM	500026	639822	Peat	0.3		H 3	Clay
GC 93	Peat Deposition Area	ITM	500119	639800	Peat	1.2		H 5	Clay
GC 94	Peat Deposition Area	ITM	500237	639811	Peat	1.3		H 6	Clay
GC 95	Peat Deposition Area	ITM	500053	639918	Peat	1.6		H 6	Clay
GC 96	Peat Deposition Area	ITM	500370	639815	Peat	0.7		H 4	Rock

GC or PP	Proposed or Existing Infrastructure	Grid Ref - ING Letter or "ITM"	Easting	Northing	Substrate Description	Total Peat Depth (m)	Depth Interval (m)	Von Post (H)	Refusal Type/Bedrock/ Hard Pan Occurence
GC 97	Peat Deposition Area	ITM	500463	639788	Peat	0.8		H 6	Clay
GC 98	Peat Deposition Area	ITM	500576	639786	Peat	0.3		H 4	Clay
GC 99	Peat Deposition Area	ITM	500703	639789	Peat	1		H 6	Clay
GC 100	Peat Deposition Area	ITM	500800	639778	Peat	1.7		H 7	Clay
GC 101	Peat Deposition Area	ITM	500907	639775	Peat	1.2		H 7	Rock
GC 102	Peat Deposition Area	ITM	501843	640640	Peat	0.5		H 4	Rock
GC 103	Substation/Gridline	ITM	501801	640749	Peat	0.8		H 6	Rock
GC 104	Substation/Gridline	ITM	501772	640764	Peat	1.8		H 7	Rock
GC 105	Substation/Gridline	ITM	501757	640752	Peat	4.6		H 7	Rock
GC 106	Substation/Gridline	ITM	501687	640845	Peat	4.9		H 7	Clay
GC 107	Substation/Gridline	ITM	501712	640910	Peat	3		H 7	Clay
GC 108	Substation/Gridline	ITM	501814	640828	Peat	0.5		H 5	Clay
GC 109	Construction Compound	ITM	501893	641392	Peat	6		H 7	Clay
GC 110	Hardstand	ITM	499519	640601	Peat	2		H 5	Rock
GC 111	Turbine	ITM	499459	640590	Peat	3.2		H 5	Clay
GC 112	Hardstand	ITM	499443	640579	Peat	2.8		H 4	Clay
GC 113	Hardstand	ITM	499459	640595	Peat	2.3		H 4	Rock
GC 114	Hardstand	ITM	499522	640580	Peat	3.1		H 7	Clay
GC 115	T12		501688	641013	Peat	5.5		H 7	Unknown
GC 116	T12		501596	641055	Peat	5.2		H 7	Unknown
GC 117	West of T11		501227	641064	Peat	6.2		H 8	Unknown
GC 118	West of T11		501155	641086	Peat	6.3		H 9	Unknown
GC 119	West of T11		501059	641100	Peat	5.2		H 8	Unknown
GC 120	West of T11		501124	641031	Peat	7.4		H 9	Unknown
GC 121	T9		500689	640249	Peat	4.5		H 7	Unknown
GC 122	T9		500631	640217	Peat	3.8		H 7	Unknown
GC 123	T9		500600	640189	Peat	4.4		H 7	Unknown
GC 124	T10		501505	641448	Peat	5.2		H 6	Unknown
GC 125	T10		501568	641454	Peat	4.9		H 8	Unknown
GC 126	T10		501622	641439	Peat	3.6		H 8	Unknown