Appendix 10-2: Outline Peat Management Plan

Executive Summary

This appendix supersedes the original February 2022 submission document. This Outline Peat Management Plan (OPMP) has been completed using the best available guidance regarding re-use of peat and peat reinstatement on wind farm sites. The document outlines the best practice guidance for handling excavated peat, providing temporary peat storage and reinstating peat. Peat has been identified at various locations across the site, most of which are below 0.5m thick and are mainly highly decomposed. The proposed development has been designed to avoid the placing of infrastructure on areas of deep peat deposits.

This PMP identifies that excavated peat will be stored appropriately and used for the reinstatement of access track verges, turbine hardstanding's and borrow pits. Constraints to the location of these storage areas is presented within this document. Care will be taken while peat is being excavated to ensure the acrotelmic and catotelmic peat is kept separate and stored appropriately in the specified areas.

Contents

1 Introduction

10.1.1 Wallingford HydroSolutions Ltd (WHS) has been commissioned by Dulas Ltd to complete an Outline Peat Management Plan (OPMP) for the proposed Garn Fach Wind Farm. This document forms an appendix to the Environmental Statement (ES) to accompany a planning application for a proposed 17 turbine wind farm to the south of Newtown, Powys, NGR: SO 03413 81467 and covers an area of approximately 700ha. This OPMP has been completed in accordance with the Scottish Renewables and SEPA Guidance on the effective management of peat, along with the relevant Welsh Government Guidance on peatlands.

10.1.2 This OPMP estimates the potential quantities of peat to be excavated in order to construct the wind farm, details temporary storage requirements and identifies reuse opportunities of excavated peat in reinstatement and/or peatland restoration. It details the proposed peat and soils management methodologies to be employed during construction.

10.1.3 Given consent, this OPMP would be updated as part of an overarching Construction Environmental Management Plan (CEMP) and would be used by environmental managers on site to ensure peat is managed appropriately and remains in a good condition for future use. The updated PMP will be developed further post-consent informed by further site investigation, detailed design and detailed construction method statements. Volumes to be excavated would be reviewed, including estimated volumes of acrotelmic and catotelmic peat, with temporary storage and reuse areas quantified.

2 Relevant Legislation and Guidance

10.1.4 There is a wealth of legislation and guidance relating to peat environments in Wales, however, there is no specific guidance on building wind farms on areas of peat. As such a combination of Welsh and Scottish guidance has informed the site layout and PMP.

- Scottish Renewables, SNH, SEPA, Forestry Commission Scotland (FCS) 2010. Good Practice During Wind Farm Construction.
- SEPA 2010. SEPA Regulatory Position Statement: Developments on Peat.
- Scottish Renewables and SEPA 2012. Guidance on the Assessment of Peat Volumes, Reuse of Excavated Peat and the Minimisation of Waste.
- SEPA 2012. Land Use Planning System SEPA Guidance Note 4 Planning guidance on wind farm developments.
- Calculating Carbon Savings from Wind Farms on Scottish Peatlands – A new Approach (Nayak et al., 2008; Nayak et al., 2010 and Smith et al., 2011).
- SNH, SEPA, Scottish Government and The James Hutton Institute 2011. Guidance Developments on Peatland: Site Surveys.
- SNH/FCS 2010. Floating Roads on Peat.

- CCW Guidance Note: Assessing the Impact of Windfarm Development on Peatlands in Wales (Countryside Council for Wales, 2010).
- Welsh Government, Woodlands for Wales. The Welsh Government's Strategy for Woodlands and Trees (2018)
- Welsh Assembly Government, Practice Guidance. Planning Implication of Renewable and Low Carbon Energy. February 2011.
- Natural Resources Wales, Information Note. Peatlands. (Available on NRW's website via: https://naturalresources.wales/guidance-and-advice/business-sectors/education-learning-and-skills/looking-for-learning-resources/learning-resources-search-by-topic/peatland-bogs/?lang=en. Accessed May 2021.)

3 Wind Farm Design Considerations

10.1.5 The proposed wind farm layout has been designed to minimise the quantity of peat to be excavated during the construction phase of the project. A Phase 1 peat survey was completed by WHS in May 2020 to inform embedded mitigation in terms of the turbine locations, tracks and associated infrastructure (Appendix 1). Where practicable the final footprint of the layout has been designed to avoid the following:

- Areas of deeper peat;
- Areas with steep gradients; and
- Natural and man-made drainage within the peat.

10.1.6 To minimise the disturbance of peat the following design features and construction practices have been incorporated into the project:

- Existing site drainage would be maintained at all times (other than areas where artificial drains will be blocked to encourage re-wetting), aided by the SUDS design outlined in Appendix 10.6; and
- Construction works would be phased to minimise areas under construction.

10.1.7 Even with embedded mitigation through sensitive layout design, there will be areas of peat that are disturbed due to the construction of the proposed wind farm. This report provides the estimated volume of peat to be excavated due to the development and describe how this can be sustainably managed during and following the construction phases of the project.

4 Peat Conditions

4.1 Introduction

10.1.8 Wind farm developments have the potential to impact upon the ecology of peatlands and the role that peatland areas play in carbon storage. Wind farms can cause direct and indirect impacts to the peat environment through both the direct excavation of peat and as an indirect result of temporary or permanent changes in the drainage or quality and quantity of surface and ground water. This can result in down-slope droughting or up-slope flooding of peat-based habitats.

10.1.9 Peat is found in both the upland and lowland regions of the UK and is defined as the partly decomposed plant remains that have accumulated in-situ, rather than being deposited by sedimentation. When peat forming plants die, they do not decay completely as their remains become waterlogged due to regular rainfall. The effect of water logging is to exclude air and hence limit the degree of decomposition. Consequently, instead of decaying to carbon dioxide and water, the partially decomposed material is incorporated into the underlying material and the peat 'grows' in-situ. Peat is characterised by low density, high moisture content, high compressibility and low shear strength, all of which are related to the degree of decomposition and hence residual plant fabric and structure.

10.1.10 There are two distinct layers within a peat bog, the upper acrotelm and the lower catotelm. The acrotelm is the fibrous surface to the peat bog, these deposits are typically found in the upper 0.5 - 0.3m of peat deposits; which exists between the growing bog surface and the lowest position of the water table in dry summers. Below this are various stages of decomposition of the vegetation as it slowly becomes assimilated into the body of the peat. The lower (catotelm) layers can be highly amorphous, with very high water content and very low tensile strength. Where this is the case, material excavated from this layer tends to disrupt completely on excavation and handling. The suitability for reuse of this peat generally depends upon the fibre and water content. For the purposes of this OPMP it is assumed that all excavated peat is deemed as appropriate for reuse in restoration.

10.1.11 Peatlands also hold large stores of carbon and excavation of peat can result in large carbon losses if the peat is allowed to dry out or if surrounding areas are detrimentally affected by changes in drainage patterns. Minimising peat excavation and promoting reuse and restoration will reduce the potential carbon losses and consequently reduce the carbon payback time associated with developments on peat.

4.2 Peat Condition and Distribution at Garn Fach

10.1.12 As peat is present on the development site, Phase 1 and Phase 2 peat surveys have been undertaken to establish the extent and depth of peat soils across the site. Appendix 10.1 of the ES, the Peat Slide Risk Assessment, details the results of the peat survey which are summarised here. Peat probing was conducted using a phased approach. A Phase 1 peat survey was completed in May 2020 by WHS and consisted of sampling peat depths across the entire site on a 100m grid. A Phase 2 peat survey was completed in two separate site visits in November 2020 and March 2021, where points were surveyed on a 10m grid within a 50m radius of turbine locations and at 50m intervals along the track centre line and at 10m offsets to the centre line.

10.1.13 The Phase 1 probing indicated that a relatively small proportion of the site to be underlain with peat. 63% of the probes during the Phase 1 survey recorded no deep peat deposits (deep peat being identified as >0.3m).

10.1.14 The Phase 2 survey identified that 58% of the probe locations recorded less than 0.3m of peat, hereafter referred to as peaty soils and not classed as deep peat deposits. 40% of the Phase 2 probes recorded 0.3m-1m of peat while only 2% recorded greater than 1m (see Table 4-1).

Table 4-1- Phase 2 Peat Survey Peat Depth Summary

Peat Thickness	% (of peat samples identified during Phase 2 survey)
<0.3m	58%
0.3-1.0m	40%
1.0-1.5m	1.5%
>1.5m	0.5%

10.1.15 During the Phase 2 survey auger samples were taken, the depth of soil and general soil classification (i.e. peat, clay or non-peat) was recorded, where both peat and clay were present the depth of both was recorded. 77% of the auger samples taken during the Phase 2 survey were not peat. Where peat was present the degree of humification was recorded using the Von Post Scale.

10.1.16 The deepest peat depths (based on individual probe depths rather than total excavated volumes for specific turbines) on site were observed in the northern section of the site along the western boundary. No infrastructure is located within this area of deep peat. Further deep peat deposits are located around Turbine 2 (T2) and Turbine 5 (T5) and the northern construction compound, where peat depths are shown to range from 1-1.5m. Depths around Turbine 7 (T7) are between 0.5-1m deep. At all other proposed infrastructure points peat depths are mostly shown to be below 0.5m. Observed peat depths are shown in Appendix 1.

10.1.17 The degree of composition (humification) was estimated for the auger samples based on field descriptions using the Von Post Classification[1] (samples were taken from the base of the peat deposit in the sample); where the humification value ranges from H1 (no decomposition) to H10 (highly decomposed). The survey concluded that the majority of peat samples are classified between H5, H6, H7 and H10, showing a range of decomposition but mostly high decomposition rates. The sample classifications can be seen in Table 4-2 below.

Table 4-2- Auger Sample Peat Classifications

Peat Classification	Number of Samples	Percentage (%)
H1	1	0.5
H3	6	2.8
H4	4	1.9
H5	37	17.2
H6	28	13.0
H7	35	16.3
H8	14	6.5
H9	12	5.6
H10	41	19.1
Peat mineral soil mixture	37	17.2

5 Approach to Peat Management

5.1 Introduction

10.1.18 The Phase 1 peat survey identified the site characteristics and presence of peat across the site at an early stage of the wind farm development process. As such this information was used as a design constraint to inform the final turbine layout to minimise peat disturbance on site. This is referred to in the ES as embedded mitigation.

10.1.19 During the construction of the wind farm, where possible peat would be reused on site as part of site restoration following the completion of the construction phase. This OPMP aims to set out, based upon the available data, how the construction of the proposed wind farm could impact on the peat and the measures that would be implemented to reduce the overall impact and carbon losses. This plan will be revisited prior to construction following further detailed design and ground investigation work. Revisions will be made as required to ensure suitable handling and reuse measures are undertaken.

10.1.20 Where infrastructure is located on areas of peat it is proposed that all peat would be excavated and reused in line with this OPMP. It is proposed that all peat excavated on site would be stored and

[1] Von Post, L and Grunland, E. (1926) Sodra Sveriges torvillganger 1' Sverges Geol. Unders. Avh., C335, 1-127.

used during and following construction for ground reinstatement within the site. This approach is considered the most sustainable as it would avoid any waste peat being transported off-site.

10.1.21 The handling and storage of peat would seek to ensure that excavated peat does not lose either its structure or moisture content. The character of the peat varies across the site and an estimated[2] total of 21,920m^3 of peat is to be excavated as a result of construction (see Section 5.3 below for details). It is recommended that when the peat is excavated it is assessed for quality and stored within a defined area. This process will ensure that peat of the same character and originating from a similar area is stored separately allowing for easier management during storage and reinstatement.

10.1.22 A number of policy guidelines are available to inform the management, reuse and storage of peat during wind farm construction, where these are appropriate, they are detailed in the following section. This OPMP aims to set out clearly for statutory consultees and construction contractors how peat would be most sustainably managed on site as part of the proposed wind farm.

5.2 Prevention

10.1.23 The design of the wind farm including turbine and track layout has taken into consideration the presence of peat on site with the aim of avoiding areas that are sensitive and with large peat depths. The results of the Phase 1 peat survey were used to inform the initial layout, allowing areas of deep peat to be avoided where possible (given other constraints such as turbine spacing, watercourse buffers, rights of way, bat corridors etc). Following the design freeze a more detailed Phase 2 peat survey was undertaken concentrating on the proposed layout and allowing for refinement of the layout design taking into consideration additional peat depth information. More details on the alternative layouts considered for the wind farm are presented in [Chapter 4 of the ES and Chapter 4 of the Supplementary Environmental Information (SEI) Report.]

10.1.24 The turbine foundations, hardstanding, substations, construction compounds, access tracks and cable runs have been micro sited and placed, where possible, in areas of shallower peat when compared with depths elsewhere across the site. The use of floating tracks will be utilised across the site where practically possibly to reduce the volume of excavated peat from cut tracks.

5.2.1 Design Assumptions Floating tracks

10.1.25 In order to determine where floating tracks can be used across the site, a threshold value for peat depth of 0.5m has been used, above which floating tracks are considered to be viable. Other constraints for the use of floating tracks includes the ground slope, which in general should not exceed 2%, thus reducing peat slide risk. An indicative plan of the use of floating tracks across the site is provided in Appendix 2.

10.1.26 It is proposed that verges should be used on the shoulders of the floating tracks to utilise surplus peat arising from excavation. These will be carefully designed to use appropriate peat material that most closely matches the host habitat and to avoid any barrier to the proper drainage of water from the track surface. Where possible peat will be reused as close to the excavation site as possible to allow continuity in habitat. Construction of floating tracks will be in accordance with best practice guidelines[3] ensuring that construction is appropriate for the anticipated loading on the tracks (minimising geotechnical risk) as well as proper consideration to the maintaining of existing drainage pathways through the peatland where possible, thus preserving the established hydrological equilibrium. This will require particular attention where the track may provide impediment to surface water flows, potentially requiring the construction of drainage ditches and cross-track culverts. This will be particularly pertinent where the track is on a cross-slope. The amount of compaction of the aggregate material will be carried out according to the ground conditions along the route. In most cases the use of mechanical vibratory equipment to compact the aggregate will not be appropriate, instead relying on compaction from general trafficking over the surface during the period of settlement.

10.1.27 The construction of floating tracks will take place according to a suitable timescale to allow for proper consolidation and compression of the peat prior to use by construction traffic, thereby minimising risk of failure of the material.

10.1.28 Monitoring of the tracks will be carried out following construction to monitor the rate of settlement, which in turn may affect the hydrology of the bog, altering drainage pathways. This will be carried out through the use of a combination of settlement plates, dip wells (alongside rain gauges) to monitor adjacent groundwater levels and visual records. Routine monitoring will be carried out at 6 monthly intervals for two years following construction, unless impacts occur and additional monitoring is required. During the natural settlement of floating tracks, maintenance may be required such as providing additional drainage channels as required. Routine, preventative interventions will take place such as filling of potholes, blockages to culverts and other drainage features, to prevent more extensive repairs ensuing.

[3] See Forestry Civil Engineering and Scottish Natural Heritage 2010. FLOATING ROADS ON PEAT, A Report into Good Practice in Design, Construction and Use of Floating Roads on Peat with particular reference to Wind Farm Developments in Scotland

5.2.2 Cut tracks (excavation and replacement)

10.1.29 Where peat depths are less than 50cm, standard cut tracks will be utilised for tracks, turning areas and crane pads. These tracks will be constructed in accordance with standard construction guidance[4], though will be designed according also to local ground conditions following detailed site investigation. Prior to construction, the most sensitive areas - defined as those crossing watercourses, steep slopes or springs, will be established, where specific mitigation or construction measures will be used.

10.1.30 Excavated peaty soils from this process will be used to create track verges in a continuous process along the construction route, with excavation, followed by infilling with aggregate and then replacement of the peaty soils along the previous created section of track, to create verges. As such, the excess material from the excavation, for either temporary storage or removal to elsewhere in the site, will be minimised.

5.3 Peat Excavation Volumes

10.1.31 The volume of peat excavated as result of this wind farm has been calculated using the Phase 1 and Phase 2 peat depth survey data. The point data was interpolated using QGIS to generate a peat depth raster across the whole site. Each component of the infrastructure was categorised as either permanent or temporary depending upon its use. All areas of earth works surrounding infrastructure were assumed to be temporary while all other hardstanding has been considered to be permanent. Diagram 5-1 below shows an example of a turbine with the permanent and temporary infrastructure labelled. All floating tracks assume that no peat will be excavated.

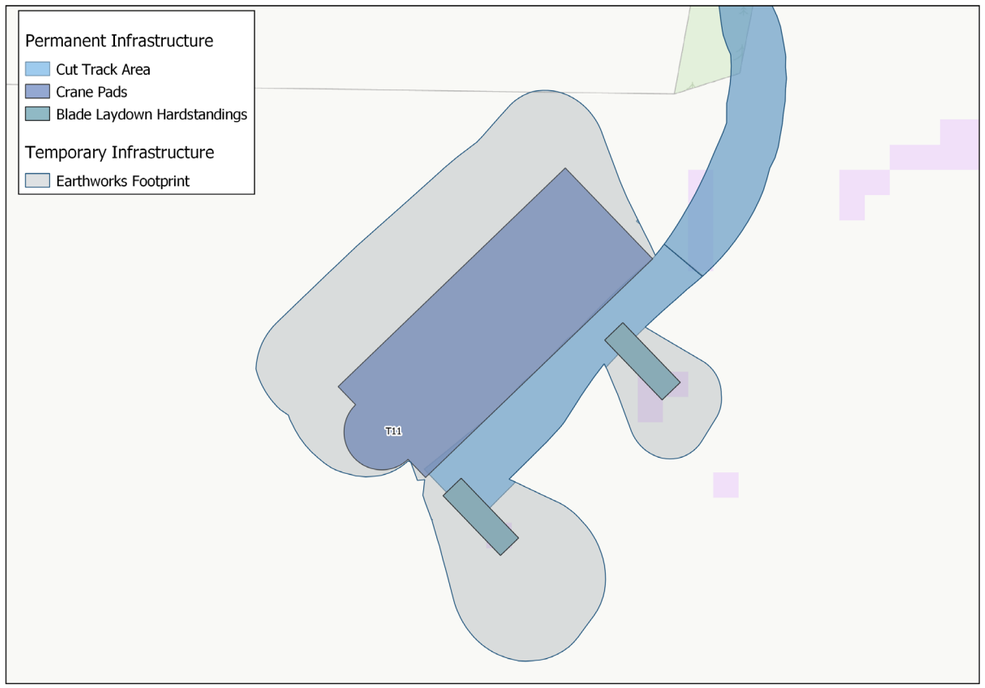


Diagram 5-1: Example of permanent and temporary infrastructure

10.1.32 To calculate the excavation volumes (including the temporary working areas), all areas of infrastructure were split into a 2m x 2m grid. The average peat depth in the centre of each grid cell was sampled from the interpolated raster which was used to calculate the volume of peat present. These volumes were added together for each infrastructure component to calculate the total peat excavated. Where peat is present it is assumed the full depth of peat will be excavated during construction. Where the peat depth was recorded as <0.3m this has been categorised as peaty soils and do not form part of the excavated peat volumes.

10.1.33 This technique was used as it provides a more realistic figure compared with using a single average peat depth for each turbine. The calculations used to determine the excavated peat volumes are provided in Table 5-1. A more detailed table including volumes of acrotelmic peat and mineral soils are provided in Appendix 3.

[4]Nature Scot (2019) Guidance – Good practice during Wind Farm construction.

10.1.34 A total estimated volume of 21,920m^3 of peat would be excavated from the construction of cut tracks, turbine bases and temporary construction compounds. These volumes will be reviewed in the final PMP considering all construction activities following further detailed site investigation post-consent.

Table 5-1 Peat excavation volumes

Name	Permanent Peat Excavation (m^3)	Temporary Peat Excavations (m^3)	Total (m^3)
T1	0	6	6
T2	896	1,008	1,904
T3	819	1,091	1,910
T4	40	107	147
T5	1,435	1,506	2,941
T6	11	0	11
T7	1,150	1,493	2,643
T8	625	1,289	1,914
T9	0	0	0
T10	0	0	0
T11	19	15	34
T12	0	0	0
T13	0	0	0
T14	460	223	683
T15	0	0	0
T16	1,159	733	1,893
T17	0	0	0
Cut Tracks	4,369	0	4,369
CC North	2,541	617	3,158
CC South	0	0	0
Substation	206	99	306
BP South	0	0	0
BP North	0	0	0
Total (m^3)	**13,731**	**8,189**	**21,920**

10.1.35 Borrow pits have been sited in the southern parcel of land and located so as to avoid intersection with any significant peat deposits. The table above shows that the greatest permanent excavation of peat occurs around T5, T7 and T16, as well as the construction compound north.

10.1.36 Where peat excavation is required to construct turbine foundations and access tracks/cable runs, consolidated peat turves (whether the vegetated top layer or deeper layers) would need to be sorted appropriately and stored on site before being reused or reinstated onsite post-construction. These storage areas would be located close to the location of excavation at defined points within the project boundary. Care would be taken to ensure the peat storage does not cause environmental pollution as highly organic materials such as peat can negatively impact watercourses if there is wash off from storage areas. Peat would be stored for the shortest time possible following excavation to minimise exposure of the peat to the air and maintain moisture conditions in the peat to keep carbon losses to a minimum.

10.1.37 During the construction phase of the project the selection of areas for the temporary storage of peat would take into account site constraints (as defined within the Environmental Statement - Chapter 10) and consider the following criteria.

- Minimise the distance excavated peat is transported.
- Storage in a manner that will avoid oxidation of excavated peat (such as covering and re-wetting as required), thus maintaining its function as a carbon sink.
- Avoidance of areas which have a Peat Landslide Hazard risk classification of Moderate to Extremely High as defined within Appendix 10.1 of the ES.
- Avoidance of areas within 50m of a watercourse.
- Avoidance of ecologically sensitive habitats (See Chapter 8 of the ES).
- Avoidance of cultural heritage constraints (See Chapter 11 of the ES).
- Utilisation of natural surface depressions.

10.1.38 The standard protocol for temporarily stored peat will be that it is placed as close to source as possible, laid on a geotextile membrane or onto heavy duty polythene sheeting (polythene sheeting to be used on low gradient slopes only to avoid slide risk), not stockpiled into mounds any higher than 1.5m and covered with additional weighted down polythene sheeting to prevent desiccation. Storage areas will be located in flatter areas as far away as possible from watercourses or drains. Silt traps (e.g. fencing) will be used to capture any suspended solids generated. Peat stored for longer than 1 week or during dry conditions will be regularly wetted to maintain near-saturated conditions.

10.1.39 The exact areas to use for peat storage will be identified in the final PMP following detailed site investigation post-consent.

10.1.40 During construction the correct storage of peat in line with the final PMP will be monitored by the ecological clerk of works (ECoW). The ECoW will identify any additional measures that should be implemented to ensure the excavated materials remain in a condition to be reused on site. If required material will be moved to a more suitable storage area within the site.

10.1.41 The following lists the assumptions regarding the reuse of excavated peat.

- Peat would be placed with sufficient depth and at a gentle slope to maintain hydrology with adjacent deposits to minimise drying out and encourage growth.
- The peat generated from cable trench excavation would be backfilled using the same excavated peat, thus these areas are not considered in the OPMP.

5.4 Peat Reuse Requirements

10.1.42 Stored peat turves and unconsolidated peat, depending upon the character of the material, can be used for the following purposes:

- Borrow pit reinstatement;
- Floating track shoulders;
- Creation of trench bunds; and
- Reinstatement in areas of deep peat.

10.1.43 It has been assumed that where less than 0.3m of peat is present this is classified as peaty soils and therefore does not require peat specific reinstatement measures as outlined in this section.

10.1.44 For trackside landscaping where floating tracks are employed, it is assumed that shoulders would be built to tie the height of the floating track into the existing ground level. These shoulders are therefore assumed to be 0.5m high and 2m in width. It is assumed that no peat would be used to create shoulders along the length of cut tracks.

10.1.45 For peat excavated around the turbine bases and crane pads, these would be reinstated to the edge of the concrete foundations as built. These areas have been calculated as temporary excavation in Table 5-1.

10.1.46 Excavated peat will be used to cap the borrow pits up to 1m in depth (0.7m of catotelmic peat and 0.3m of acrotelmic peat). The nature of the existing peat disbursement throughout the site includes small pockets of peat and wet boggy areas. Therefore, the use of discreet areas of borrow pit restoration is considered to be in keeping with baseline. The borrow pits will form artificial low points within the site (due to their excavated nature) therefore it is assumed these areas will naturally drain water towards them to maintain water levels within the peat.

10.1.47 A volume of peat will be reused around Turbine 16 to supplement the deep peat deposits surrounding the turbine (see Diagram 5-2). The peat would be spread to the west of the turbine on land which currently has low levels of peat and poor habitat. The area slopes down towards the north west and therefore the access track and turbine base can be used to reduce water flow and ensure peat deposits remain wet.

10.1.48 The use of trench bunds have been proposed to help maintain water level in certain areas of the site (see section 5.6). Excavated peat would be used to create these bunds. It is assumed these bunds would be 0.5m high and up to 2m wide. The purpose of the bunds is to hold water behind them, and therefore would remain naturally wet and would be likely to dry out.

10.1.49 Peat would be stored in accordance with the principles set out below at locations close to where they would be reused. This would avoid unnecessary disturbance through transportation around site. The final locations would be identified in the final PMP following detailed design and site investigation post-consent.

10.1.50 It is assumed that excavated peat will be reused and reinstated on site within the borrow pits, tracks and hardstanding areas (as described above), the largest volumes of excavated peat will be used to cap the reinstated borrow pits. Due to the stronger structure and presence of living vegetation and seed source, acrotelmic peat is generally considered more suitable for use and thus may be used instead of catotelmic peat in many restoration purposes. Any wet catotelmic peat will be placed at the bottom of the restoration profile followed by semi fibrous catotelmic peat. Restoration activities would all be overseen by the ECoW to ensure best practice methods are adhered to. With careful design, unconsolidated peat may be used to create a wetland habitat, as illustrated within the available guidance[5]. The potential peat reuse volumes are tabulated in Table 5-2.

[5] Scottish Renewables and SEPA 2012. Guidance on the Assessment of Peat Volumes, Reuse of Excavated Peat and the Minimisation of Waste

Table 5-2 Peat reuse volumes

Reuse	Calculation	Technique	Justification	Total peat reuse (m^3)
Reinstated in temporary excavations (earth work areas)	Sum of all temporary excavated volumes	Excavated material will be stored locally and reinstated directly to point of excavation	Standard practice.	8,189
Use of acrotelmic peat in surface bunding	Bund length (3,376m) x 0.5m height x 2m width	Using previously excavated materials without excavation of new material along bund alignment	Bunds will help rewet drier areas and encourage bog forming species, bunds will not dry out due to retention of water upslope which will assist in keeping bund material wet.	3,376
Reinstatement in borrow pits (BP)	Area of BP x 1.0m North borrow pit = 2,600m^2 South borrow pit = 3,700m^2	Infill with catotelmic peat (0.7m) and then overlay with acrotelmic peat (0.3m)	Site is characterised by localised deep peat pockets, reinstatement of peat in borrow pits to create new deep peat pockets would be in keeping with site conditions, provided peat remains wet.	6,300
Track shoulders on floating track	Floating track length x 2m width x 0.5m height x 0.5 (to make wedge) x 2 (for one shoulder each side) Total floating track length = 2,360m	Track will sit elevated above ground surface due to multiple aggregate and geomembrane / geotextile layers, berm will build up to level of track elevation, nominally modelled as 0.5m	Standard reuse technique	2,360
Reinstatement adjacent to turbines in deep peat	T16: Infill between spur to T16 and main access to north side of minor spur (preventing creep into adjacent watercourse) Area = 2360m^2 x 0.5m.	Placement of catotelm directly over underlying grassland, placement of acrotelm over the top	The area doesn't currently contain good habitat and reuse here minimises trafficking of peat from T16 elsewhere. Location is present at head of subtle drainage line that should keep infilled area wet if through track drainage is maintained.	1,180
			Total	**21,405**

Diagram 5-2: Turbine 16 Peat Reinstatement

10.1.51 Table 5-2 shows that the Proposed Development has the capacity to reuse 21,405m^3 of excavated peat. As can be seen in Table 5-1, a total of 21,920m^3 of peat would be excavated meaning no surplus (waste) peat will be generated by the development.

5.5 Handling Excavated Peat and Temporary Storage

10.1.52 Peat handling during construction will be carried out by construction teams that are experienced working on peat sites. The following principles will be applied within the final PMP following detailed site investigation post-consent.

- The surface layer of peat and vegetation (acrotelm) would be stripped separately from the catotelmic peat.
- The removal of vegetation will be minimised so that the area of exposed or bare peat is limited as far as practicable. When the site infrastructure is being excavated, the surface vegetation would be removed in sods which can be stored (vegetation site up) and later replaced around the foundation and infrastructure. This would allow for more rapid re-vegetation of bare peat and help reduce erosion.
- Careful handling is essential to retain any existing structure and integrity of the excavated materials and thereby maximise the potential for excavated material to be reused.
- Acrotelmic material would be stored separately from catotelmic material. The less humified catotelmic peat which maintains its structure upon excavation would be kept separate from the highly humified amorphous peat.
- Acrotelmic material would be replaced as intact as possible once construction is complete.
- To minimise handling and transportation of peat, acrotelmic and catotelmic peat would be replaced, as close as is reasonably practicable, to the location from which it was removed. Acrotelmic peat would always be placed on the surface.
- Within permanent landscaping areas and bunds the catotelmic peat would be capped with acrotelmic peat.
- Reuse would occur as soon as possible after excavations where practicable. Temporary storage of peat will be avoided as far as possible, instead re-cycling of peat through excavation and quick re-instatement of the material shall take place in a continuous process through the construction of tracks (and other foundation elements for the site). As such, temporary storage of peat for lengthy periods from construction of tracks (through bunding/stockpiling) will be avoided.
- Where dedicated temporary peat storage areas are required, these areas will be assessed for peat stability, further drainage requirements, geotechnical properties and groundwater properties. Pollution prevention mitigations (particularly if close to watercourse networks) will also be produced as part of the detailed construction method statement. In general, areas of deep peat will be avoided for siting of temporary storage.
- Geo-textile matting will be used as a protective barrier to the underside of the deposits, preventing ingress of groundwater and any subsequent erosion of the material.
- If storage is required, handling and storage of peat would seek to ensure that excavated peat does not lose either its structure or moisture content. This would include watering of peat and careful arrangement of material to prevent drying and desiccation. The maintaining of a vegetated layer to the peat will be an important part of this process. Many distributed temporary storage areas will be avoided, instead using fewer stockpiles. The consolidation of peat into larger volumes reduces the relative surface area of the units, therefore reducing the drying potential of material. A system of monitoring will be carried out for the stored material, alongside a system of watering where necessary, to ensure the peat remains damp, thereby maintaining the vegetated top layers and prevent drying.
- A suitably experienced contractor will be engaged to carry out these works.

5.6 Peat Reinstatement and Restoration

10.1.53 An Outline Habitat Management Plan (OHMP) has been produced for the project (ES Appendix 8-9) which includes information on the management of peatland habitats. Existing peatland within the site not directly impacted by infrastructure, will be preserved and where possible, restoration of former peatland habitats will be assessed. Two areas of potential peatland habitat enhancement have been identified, these are presented in Appendix 2. Preservation of existing peat bogs will be ensured by ongoing maintenance such as:

- Grazing of the habitat will be reviewed at the site to prevent overstocking of the land and reduction in vegetation cover. This will involve a review of seasonal rotation of livestock on the land and introduction of fenced-off areas to allow restoration of land.

- Vegetation will be monitored and interventions made to maintain its current state, including removal of saplings and grown trees where necessary.

10.1.54 Trench bunding is proposed across the northern land area of the Site to improve and restore peat habitats. The bunds will form an effective hydrological boundary, restricting both surface and shallow sub-surface flow from the bunded areas and locally increasing groundwater levels. This will allow re-wetting of the treated areas to encourage the growth of peat forming species. This will be achieved through the use of an internal (subsurface bund) and a surface bund (both constructed of compacted peat). The height and width of the bunds is not specified at this stage and should be constructed according to the enclosed area and local topography. Areas potentially suitable for bunding have been identified, shown in Figure 3 of the Addendum document (to the Peat and Hydrology Chapter of the ES). The proposed bunds contain an estimated area of 31.6ha. It is noted that the areas are at present indicative only and exact locations will be confirmed in the detailed design stage. The lines labelled as bunds do not necessary represent continuous features, but rather may represent the leading edge of cells of smaller bunds (thus reducing the risk of bund failure). Further details of ongoing habitat restoration is provided in the OHMP (Appendix 8-9).

10.1.55 Where small drains have been identified (see Appendix 2) these will be blocked slowing water flow and allowing more water to be held within the landscape. As above this will help encourage water logged areas of habitat which will be beneficial in the growth of peat forming species.

10.1.56 Reused peat will be managed post-construction to ensure its long-term health. This will include the following actions.

- Re-vegetation of the reused peat will be made immediately upon reinstatement of the peat where existing vegetation cannot be maintained and in the event of any damaged areas of peatland caused through construction. This will be done to both stabilise the soil and to reduce water loss. Appropriate seeding and re-vegetating will be carried out where required using locally collected seeds, collected using a brushcutter.
- Fencing will be used where necessary to exclude grazing livestock from the restoration sites if appropriate. Trees and vegetation will also be removed in restoration areas to encourage water retention and reduce the impacts of shading and their impacts on nutrient cycling in the habitat.
- Measures to manage runoff from and control drainage from these areas will be assessed on a site specific basis.
- Monitoring will be carried out both within restored peat bogs and across existing peatland throughout the site during both construction and post-construction (as well as pre-construction to establish a baseline). This will include ecological monitoring of habitats and vegetation cover, as well as hydrological surveys.
- Hydrological surveys will include the use of shallow boreholes to monitor groundwater levels within the peat. In combination with rainfall gauges and control boreholes, this will determine the short to medium term impacts of the development of the site upon recharge and drying rates. Boreholes will be distributed across the site within peaty areas to monitor effects not only adjacent to built infrastructure (though boreholes are likely to also be placed adjacent to tracks and turbines to monitor for any drying in these locations which may impact upon ground stability), but also those areas downslope of these sites, in order to observe any widespread impacts. These monitoring activities will take place for at least two years post-development.
- Borrow pits are to be sited outside of any peat deposits and would be filled with appropriate material based upon local soil types. Post-operation foundations for turbines and substation will be reduced to 1m below surface, with suitable back-fill again being used to ensure tie-in to surrounding ground material. It is anticipated that tracks will remain (more details are provided in the CEMP).

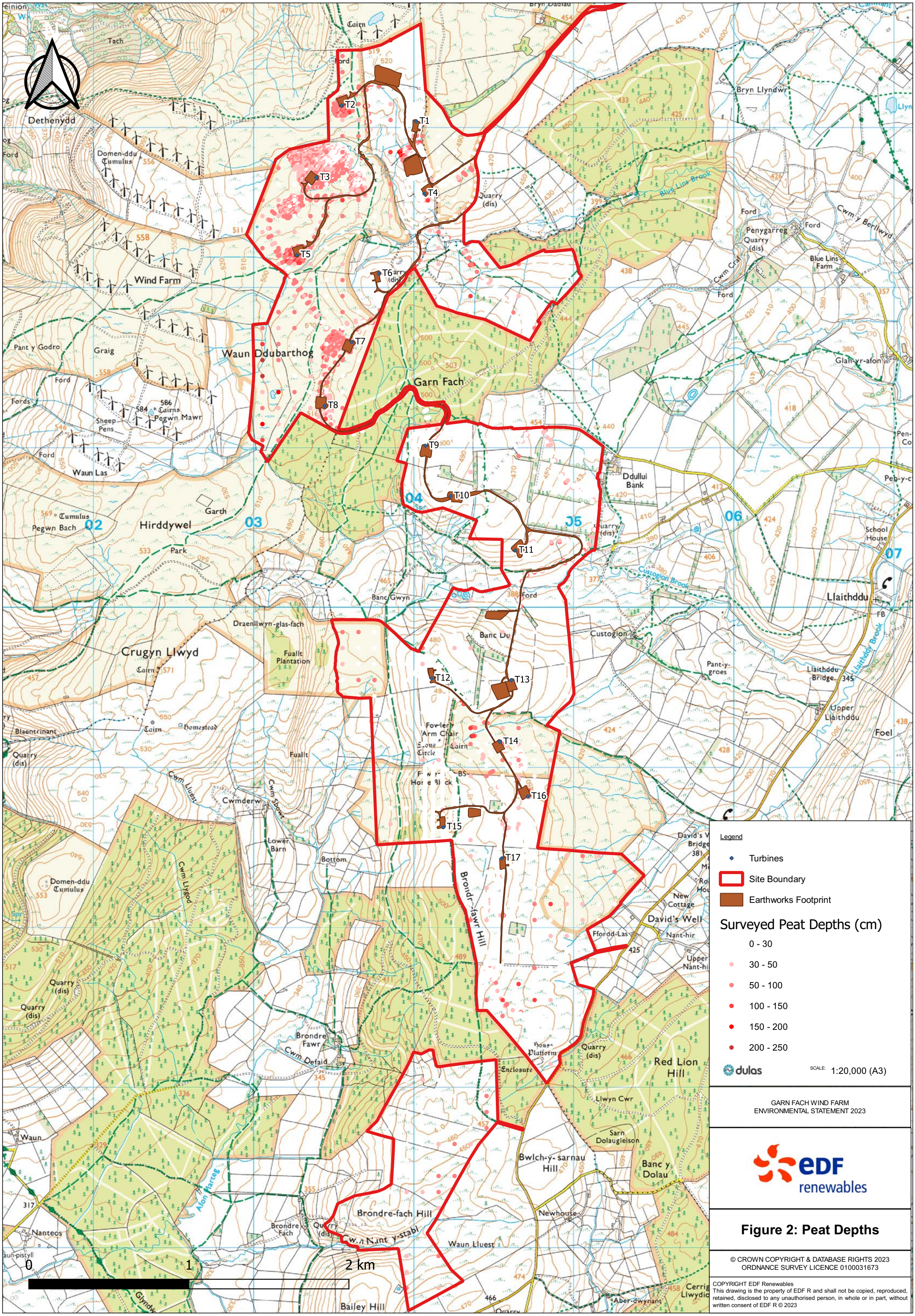
6 Conclusion

10.1.57 This OPMP has been completed using the best available guidance regarding reuse of peat and peat reinstatement on wind farm sites. The document outlines the best practice guidance for handling excavated peat, providing temporary peat storage and reinstating peat. The main conclusions from this OPMP are as follows.

- Peat has been identified at various locations across the site, the peat depths are mostly below 0.5m thick and are mainly highly decomposed, however some areas of deeper peat have been identified.
- Layout constraints and micro siting of the development has avoided the placing of infrastructure on areas of deep peat deposits as far as possible, although there is still some overlap and some peat excavation is required.
- It is expected that excavated peat will be stored appropriately and used for the reinstatement of access track verges, turbine hardstandings and borrow pits.
- During the construction of the proposed wind farm, temporary storage of peat would be required prior to reinstatement post construction. This document specifies the constraints upon the siting of these areas to aid identification of areas for peat storage. The exact areas will be considered in the final PMP following further detailed design and site investigation post-consent.
- Care would be taken while peat is being excavated to ensure the acrotelmic and catotelmic peat is kept separate and stored appropriately in the specified areas.

10.1.58 It should be noted that this OPMP is a live document and will be developed into a final PMP post-consent. The final PMP will be informed by further site investigation, detailed design and detailed construction method statements.

Appendix 1 Surveyed Peat Depths



Legend

- Turbines
- Site Boundary
- Earthworks Footprint

Surveyed Peat Depths (cm)

- 0 - 30
- 30 - 50
- 50 - 100
- 100 - 150
- 150 - 200
- 200 - 250

dulas

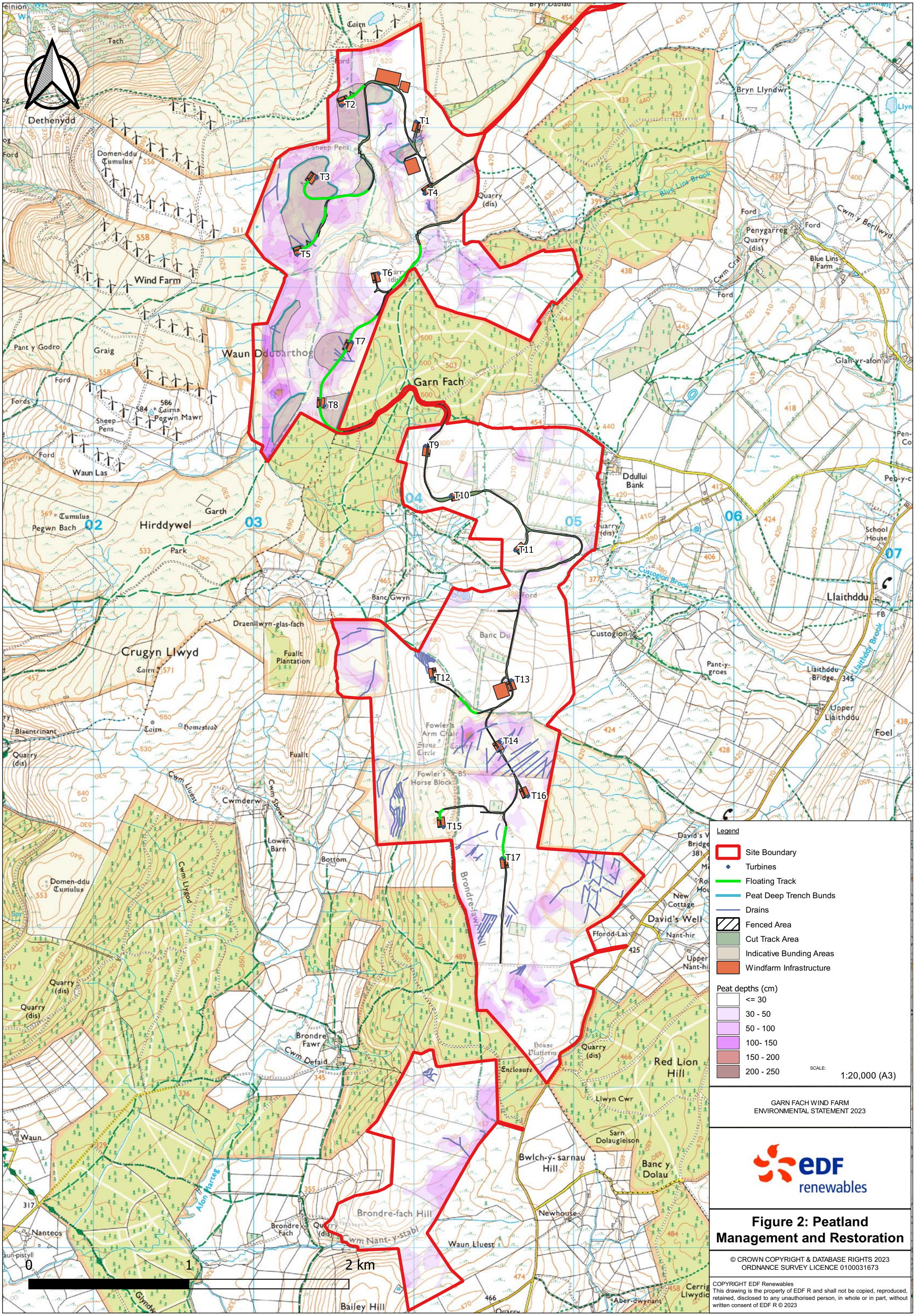
SCALE: 1:20,000 (A3)

GARN FACH WIND FARM
ENVIRONMENTAL STATEMENT 2023

EDF renewables

Figure 2: Peat Depths

Appendix 2 Peatland Management and Restoration



GARN FACH WIND FARM
ENVIRONMENTAL STATEMENT 2023

Figure 2: Peatland Management and Restoration

Appendix 3 – Peat Volumes

Name	Permanent Peat Excavation (m^3)	*(of which Catotelm)*	*Of which Acrotelm*	*Organic Soils*	Temporary Peat Excavations (m^3)	*(of which Catotelm)*	*Of which Acrotelm*	*Organic Soils*
T1	**0**	0	0	181	**6**	0	6	70
T2	**896**	350	546	0	**1,008**	424	583	4
T3	**819**	282	536	10	**1,091**	431	660	0
T4	**40**	3	37	352	**107**	9	98	153
T5	**1,435**	890	545	0	**1,506**	894	612	0
T6	**11**	0	11	334	**0**	0	0	85
T7	**1,150**	615	535	11	**1,493**	809	684	0
T8	**625**	155	470	67	**1,289**	439	850	32
T9	**0**	0	0	293	**0**	0	0	356
T10	**0**	0	0	267	**0**	0	0	292
T11	**19**	2	17	206	**15**	2	13	353
T12	**0**	0	0	207	**0**	0	0	31
T13	**0**	0	0	162	**0**	0	0	179
T14	**460**	84	376	136	**223**	44	179	209
T15	**0**	0	0	248	**0**	0	0	98
T16	**1,159**	645	515	24	**733**	330	403	164
T17	**0**	0	0	400	**0**	0	0	138
Tracks	**4,369**	1,396	2,972	7,094	**0**	0	0	0
CC North	**2,541**	1,085	1,456	489	**617**	219	398	347
CC South	**0**	0	0	803	**0**	0	0	151
Substation	**206**	23	184	2,264	**99**	15	84	444
BP South	**0**	0	0	401	**0**	0	0	179
BP North	**0**	0	0	197	**0**	0	0	178
Total (m3)	**13,731**	**5,531**	**8,200**	**14,146**	**8,189**	**3,618**	**4,571**	**3,465**