Technical Appendix 10.2: Peat Management Plan

Torfichen Wind Farm

Renewables Energy Systems Ltd.

Prepared by:

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Basis of Report

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1.0 Introduction

1.1 General

SLR Consulting Ltd (SLR) was commissioned by Renewable Energy Systems Ltd (The Applicant) to undertake a Stage 1 Outline Peat Management Plan (PMP) for the proposed Torfichen Wind Farm ('the Proposed Development'). The location and layout of the Proposed Development are detailed on **Figures 10.2.1** and **10.2.2** respectively with the site defined by the red line boundary.

The Proposed Development would comprise 18 wind turbines with associated infrastructure including access tracks, crane hardstandings, borrow pits, control building and substation, battery storage compound and temporary construction compounds. A complete description of the Proposed Development for the purposes of the Environmental Impact Assessment (EIA) regulations is provided in EIA Report Volume 1: Chapter 3.

This report presents the findings of data obtained from peat depth probing surveys conducted by SLR Consulting between September 2022 and July 2023.

The work has been undertaken by a team of Geotechnical Engineers and Geologists, with over 10 years' experience in undertaking peat assessments. The team was led by a Chartered Hydrogeologist with 30 years' consultancy experience and specialising in the assessment of soils, geology and water for renewable power projects in Scotland.

1.2 Site Description

The Proposed Development is located approximately 4 km south of Gorebridge, in the Midlothian Council area. The Proposed Development is located on the northern edge of the Moorfoot Hills and general slopes in a northerly direction ranging between 490 m Above Ordnance Datum (AOD) in the south and 230 m AOD in the north.

The site is accessed from the south via the B7007. The land use on the site is predominantly pastoral with rough pasture and cultivated agricultural land. A working quarry is located within the south of the site adjacent to the B7007. Other man-made features within the site boundary include numerous sheepfolds, dry stone walls and post and wire fences. The site is drained by a series of watercourses including the Black and Latch Burns and their associated tributaries which drain the northern slopes of the escarpment.

1.3 Objectives

The PMP outlines the overall approach of minimising disruption to peatland, and it aims to ensure that all further opportunities to minimise peat disturbance and extraction would be taken during detailed design and construction of the Proposed Development.

The PMP has been developed to demonstrate that peat has been afforded significant consideration during the construction phase of the Proposed Development, should consent be granted.

The purpose of this report is to ensure that there has been a systematic consideration of peat management and a quantitative assessment throughout the development process.

1.4 Role of the Peat Management Plan

The PMP is intended to be a working document to be used throughout the key stages of the design, construction, operation, decommissioning and re-instatement phases of the Proposed Development as part of an overall Construction Environmental Management Plan (CEMP). These stages are outlined below.

1.4.1 Stage 1: Environmental Impact Assessment (EIA)

The Outline Peat Management Plan submitted as part of the EIA Report. From this initial report the Peat Management Plan will be developed further into a Stage 2 Pre-Construction PMP.

1.4.2 Stage 2: Post Consent / Pre-Construction

As part of the EIA Report it will have been demonstrated that, based on the investigation and data collected, it is likely that the excavated materials for the Proposed Development can be managed in an appropriate manner. The peat mass balance calculations may be further developed, and prior to the relevant works commencing, because of any further or more detailed ground investigation or survey works required to inform detailed design, or that may be required under planning consent conditions.

1.4.3 Stage 3: Construction Stage

Actual peat volumes excavated during construction will be recorded against the overall predicted volumes. Within micro-siting allowances, the alignment and design of tracks, hardstanding orientation and construction methods will be reviewed to avoid/minimise peat disturbance as much as possible considering the more detailed information available once construction commences. A regular review and update of the peat mass balance table will be undertaken by the appointed Contractor and monitored by the Ecological Clerk of Works (ECoW) on site and made available to regulators as required.

1.5 Legislation and Guidance

The PMP has been compiled in accordance with the following legislation and best practice guidance:

- National Planning Framework for Scotland 4 (NPF4) (Scottish Government, February 2023);
- Advising on peatland, carbon-rich soils and priority peatland habitats in development management. NatureScot. June 2023;
- SEPA Regulatory Position Statement - Developments on Peat (Scottish Environment Protection Agency, 2010);
- Good Practice during Windfarm Construction, 4th Edition (Scottish Renewables, Scottish Natural Heritage (now NatureScot), Scottish Environment Protection Agency, Forestry Commission Scotland, Historic Environment Scotland, Marine Scotland Science and AEECoW, 2019);
- Guidance on the Assessment of Peat Volumes, Reuse of Excavated Peat and the Minimisation of Waste (Scottish Renewables and SEPA, 2012);
- Peat Landslide Hazard and Risk Assessments: Best Practice Guide for Proposed Electricity Generation Developments (Scottish Government, January 2017);
- Floating Roads on Peat - Report into Good Practice in Design, Construction and Use of Floating Roads on Peat with reference to Wind Farm Developments in Scotland (Forestry Commission Scotland & Scottish Natural Heritage, 2010);
- The Waste Management Licensing (Scotland) Regulations 2011; and
- Developments on Peat and Off-site Uses of Waste Peat (SEPA, 2017).

1.5.1 Requirements of National Planning Policy 4

The intent of Policy 5 (Soils) of National Planning Policy 4 (NPF4)[1] is "*to protect carbon rich soils, restore peatlands and minimise the disturbance of soils from development*".

The Policy states [5(a)] that development proposals should only be supported if they are designed and constructed:

- in accordance with the mitigation hierarchy by first avoiding and then minimising the amount of disturbance to soils on undeveloped land; and
- in a manner that protects soils from damage including from compaction and erosion, and that minimises soils sealing.

Further [5(c)] confirms that development proposals on peatland, carbon rich soils, and priority peatland will only be supported if they are:

- essential infrastructure and there is a specific locational need and no other suitable site;
- the generation of energy from renewable sources that optimises the contribution of the area to greenhouse gas emissions reductions targets;
- small-scale development directly linked to a rural business, farm or croft;
- supporting a fragile community in a rural or island area; or
- restoration of peatland habitats.

And [5(d)] confirms that where development on peatland, carbon-rich soils or priority peatland habitat is proposed, a detailed site-specific assessment will be required to identify:

- the baseline depth, habitat condition quality and stability of carbon rich soils;
- the likely effects of the development on peatland, including on soil disturbance; and
- the likely net effects of the development on climate emissions and loss of carbon.

Policy 5 also confirms that the site specific (above) assessment [5(d)] "*should inform careful project design and ensure, in accordance with relevant guidance and the mitigation hierarchy, that adverse impacts are first avoided and then minimised through best practice. A peat management plan will be required to demonstrate that this approach has been followed, alongside other appropriate plans required for restoring and/ or enhancing the site into a functioning peatland system capable of achieving carbon sequestration*".

This stage 1 PMP considers the protection and safeguarding of peat and seeks to fulfil the requirements of Policy 5(d).

1.5.2 Mitigation Hierarchy

SEPA[2,3] has published guidance regarding the mitigation hierarchy for developments on peat which is summarised below:

- Prevention – avoiding generating excess peat during construction (e.g., by avoiding peat areas or by using construction methods that do not require excavation such as floating tracks);

1 Scottish Government (2023). https://www.gov.scot/binaries/content/documents/govscot/publications/advice-and-guidance/2022/11/national-planning-framework-4-revised-draft/documents/national-planning-framework-4-revised-draft/national-planning-framework-4-revised-draft/govscot%3Adocument/national-planning-framework-4-revised-draft.pdf

2 Scottish Environment Protection Agency. 2010. Regulatory Position Statement – Developments on Peat.

3 Scottish Renewables, Scottish Environment Protection Agency. 2012. Guidance on the Assessment of Peat Volumes, Reuse of Excavated Peat and the Minimisation of Waste.

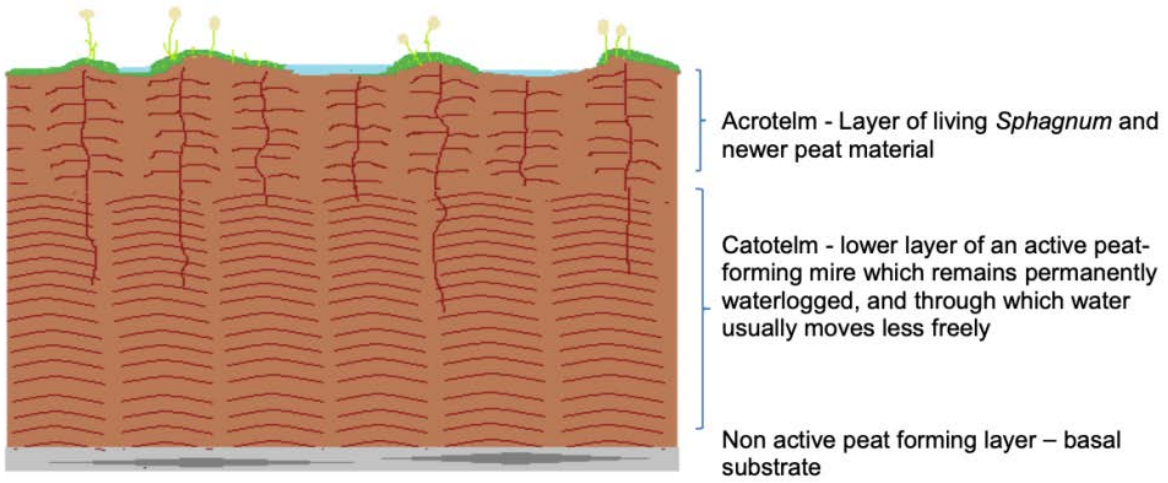
- Re-use – use of peat produced on-site in restoration or landscaping, provided that its use is fully justified and suitable;
- Recycling / Recovery / Treatment – modify peat produced on-site for use as fuel, or as a compost / soil conditioner, or dewater peat to improve its mechanical properties in support to re-use; and
- Storage – storage of peat up to a depth of 2 m is not classified as a waste and does not require authorisation from SEPA, however care must be taken to ensure that it does not cause environmental pollution.

1.5.3 Definition of Peat

Peat is defined as a material consisting of the partially decomposed remains of plant material and organic matter preserved over a period in a waterlogged environment resulting in anaerobic conditions, and is of depths >0.5 m.

Peat can be classed as two principal types, the acrotelm layer, and the catotelm layer as shown on **Plate 1-1**.

Plate 1-1: Drawing of two layered Structure of Active Bog Peatlands above Non-Active Peat



The acrotelm layer is found in the upper layer of peat where conditions are relatively dry and comprises living vegetation and partially decomposed plant material. Hydraulic conductivity in this layer tends to be higher in relation to distance from the water table. The thickness of the acrotelm layer varies depending on topography such as steepness of slope, peat hags, and hummocks. In particular, the acrotelm layer can be affected during periods of drought or as a consequence of drainage. Fibrous in texture, the acrotelm layer has some tensile strength and is generally considered to be stable for storage and re-use.

The catotelm layer is found under the acrotelm layer and comprises decayed plant material and organisms and is denser and with a very low hydraulic conductivity. The catotelm layer sits below the water table resulting in permanent anaerobic conditions. The catotelm layer is amorphous and has very low tensile strength making it less suitable for storage and re-use.

2.0 Site Work

2.1 Peat Depth Survey

Peat depth surveys have been undertaken across a number of phases by SLR. The surveys carried out followed best practice guidance for developments on peatland**Error! Bookmark not defined.**[4,5].

Phase 1 peat probing resulted in probing on a 100 m grid to allow for initial assessment of the Proposed Development which was used in preliminary site layout designs. Phase 2 probing saw detailed probing undertaken across the proposed layout, focussing on access tracks, turbine locations and other site infrastructure.

Where surveys were undertaken by SLR, the thickness of the peat was assessed using a graduated peat probe, approximately 6 mm diameter and capable of probing depths of up to 10 m. This was pushed vertically into the peat to refusal and the depth recorded, together with a unique location number and the co-ordinates from a handheld Global Positioning System instrument (GPS). The accuracy of the GPS was quoted as ±2 m, which was considered sufficiently accurate for this survey. All data was uploaded into a GIS database for incorporation into various drawings and analysis assessments.

Where the probing recorded less than 0.5 m thick, this has been considered to be an organic/peaty soil rather than peat.

Where the peat probing met refusal on a hard substrate, the 'feel' of the refusal can provide an insight into the nature of the substrate. The following criteria were used to assess material:

- Solid and abrupt refusal – rock;
- Solid but less abrupt refusal with grinding or crunching sound – sand or gravel or weathered rock;
- Rapid and firm refusal – clay; or
- Gradual refusal – dense peat or soft clay.

2.2 Peat Depth Results

Surveys encountered largely peaty soils across the Proposed Development with peat recorded in localised areas defined by topography.

The peat depths encountered across the Proposed Development as presented on **Figure 10.2.3**. A total of 3,539 peat probes were undertaken across all survey phases, with the results summarised in **Table A** below.

[4] Scottish Renewables & SEPA (2012) 'Developments on Peatland Guidance on the Assessment of Peat Volumes, Reuse of Excavated Peat and the Minimisation of Waste'.

[5] Scottish Natural Heritage (SNH), SEPA, Scottish Government & James Hutton Institute. (2014)' Peat Survey Guidance; Developments on Peatland: site Surveys'.

Table A: Peat Probing Results

Peat Thickness (m)	No. of Probes	Percentage (of total probes undertaken on-site)
0 (no peat)	85	2.4
0.01 – 0.49 (peaty soil)	3,166	89.5
0.50 – 0.99	51	1.4
1.00 – 1.49	203	5.7
1.50 – 1.99	0	0.0
2.00 – 2.49	19	0.5
2.50 – 2.99	0	0.0
3.00 – 3.49	7	0.2
3.50 – 3.99	0	0.0
> 4.0	7	0.2

2.3 Peat Condition

Peat is described using the von Post[Error! Bookmark not defined.] classification. Peat samples were collected by SLR in July 2023, using a peat auger and used to inform interpretations of the peat condition and underlying substrate.

Based on interpretations from probing and peat core samples, the peat within the Proposed Development is predominantly fibrous to pseudo fibrous. There are some localised deposits of shallow peat that generally comprise clayey layers, whilst areas of thicker peat are predominantly fibrous layers.

Based on field descriptions at augering points, most of the shallow peat would be classified as between H2 and H6 in the von Post classification, showing insignificant to moderate decomposition. Peat Core logs and photographs are presented within Annex B.

3.0 Potential Impacts on Peat During Construction

The initial construction phase for energy projects will often include soil and peat stripping and excavation activities associated with constructing the foundations for turbine bases, crane pads, access tracks, control compound, battery storage, substation, temporary construction compounds, and borrow pits.

There are four main types of impact on peat which can occur during construction. These are:

- Loss of structural integrity and peat strength, due to stripping off or damaging the surface vegetation turf, excavation, handling and transporting peat (particularly wet, subsurface peat);
- Erosion and gullying, caused by exposure and desiccation of bare peat surfaces primarily caused by water erosion, due to surface runoff after rainfall;
- Contamination, caused by leaks, spillages or inappropriate laydown of materials; and
- Peat slide, caused by laying wet peat on top of wet peat, laying other heavy materials (including excavated mineral soil or other construction materials) on top of wet peat or by inappropriate stockpiling, such as attempting to create stockpiles of peat that are too high, without bunding, engineering or geotechnical support.

A range of methods and control measures are described below which are designed to prevent these impacts from occurring.

4.0 Peat and Peaty Soils Management Proposals

The Proposed Development design required to take account of a number of environmental and technical constraints. The design sought to avoid areas of known or potential deep peat where possible, taking into account other environmental and technical factors such as ecology, ornithology, archaeology, hydrology, topography and existing infrastructure. The Proposed Development has largely avoided areas where peat is >1 m and efforts have been made by iterative design to minimise the footprint of site infrastructure on peat>0.5 m as far as practicable. Where peat and peaty soils are to be excavated, re-used or reinstated, the following good practice applies.

4.1 Excavation

Excavated peat should be excavated as turves, including the acrotelm (surface vegetation) and a layer of adjoining catotelm (more humified peat) typically up to 500 mm thick in total, or as blocks of catotelm; the acrotelm should not be separated from its underlying peat;

- the turves should be as large as possible to minimise desiccation during storage, though the practicalities of handling should be considered;
- contamination of excavated peat with substrate materials to be avoided at all times; and
- consider timing of excavation activities to avoid very wet weather and avoid multiple handling to minimise the likelihood of excavated peat losing structural integrity.

If possible, extract intact full depth acrotelm layers from the top surface of the peat deposit. This technique will maintain connectivity between the surface vegetation and the partially decomposed upper layers of the catotelm.

4.2 Storage

The following good practice applies to the storage of peaty soils/peat:

- stripped materials should be carefully separated to keep peat and other soils apart;
- to minimised handling and haulage distances, excavated material should be stored local to the site of excavation or end point of restoration;
- peat turves should be stored in wet conditions or irrigated in order to prevent desiccation (once dried, peat will not rewet);
- stockpiling of peat should be in large volumes to minimise exposure to wind and sun (and desiccation), but with due consideration for slope stability, but should not exceed 1 m in height to maintain stability of stockpile;
- stockpiles should be isolated from watercourses or drains with appropriate bunding to minimise pollution risks;
- excavated peat and topsoil stored separately, should be stored to a maximum of 1 m thickness;
- stores of non-turf (catotelm) peat should be bladed off to reduce the surface area and desiccation of the stored peat; and
- peat storage areas should be monitoring during periods of very wet weather, or during snowmelt, to identify early signs of peat instability.

4.3 Temporary Storage

Any peaty soils/peat to be removed during construction would require a temporary storage area near to the construction works/area of re-use. Where peat cannot be transferred immediately to an appropriate restoration area, short term storage will be required. In this case, the following good practice applies:

- peat should be stored around the turbine perimeter at sufficient distance from the cut face to prevent overburden induced failure;
- local gullies, diffuse drainage lines (or very wet ground) and locally steep slopes should be avoided for peat storage; and
- drying of stored peat should be avoided by irrigation or by seeding (although this is unlikely to be significant for peat materials stored less than two months).

For crane pads, borrow pits and compounds (with longer term storage requirements), the following good practice applies:

- peat generated from crane pad locations should be transported directly to its allocated restoration location, to minimise the volume being stockpiled with the possibility of drying out;
- stores of catotelmic peat should be bladed off to reduce their surface area and minimise desiccation;
- where transport cannot be undertaken immediately, stored peat should be irrigated to limit drying and stored on a geotextile mat to promote stability; and
- monitoring of large areas of peat storage during wet weather or snowmelt should be undertaken to identify any early signs of peat instability.

4.4 Transport

The following good practice applies to transport:

- movement of turves should be kept to a minimum once excavated, and therefore it is preferable to transport peat planned for translocation and reinstatement to its destination at the time of excavation; and
- if HGVs/dump trucks that are used for transporting non-peat material are also to be used for peat materials, measures should be taken to minimise cross-contamination of peat soils with other materials.

4.5 Handling

Following refinement of the wind farm peat model, a detailed storage and handling plan should be prepared as a detailed PMP forming part of the detailed CEMP, including:

- best estimate excavation volume at each infrastructure location (including peat volumes split into area/volume of ‘acrotelm’ or ‘turf’, and volume of catotelm) which would be achieved by undertaking additional probing in line with current guidance following removal of trees post-consent;
- volume to be stored locally and volume to be transferred directly on excavation to restoration areas elsewhere (e.g. disused quarries, borrow pits or forest drains) in order to minimise handling;
- location and size of storage area relative to turbine foundation, crane hardstanding and natural peat morphology / drainage features; and

- irrigation requirements and methods to minimise desiccation of excavated peat during short term storage.

These parameters are best determined post-consent in light of detailed ground investigation with the micro-siting areas for each element of infrastructure.

4.6 Restoration

During restoration, the following best practice should be followed:

- carefully evaluate potential restoration sites, such as borrow pits for their suitability, and agree that these sites are appropriate with the ECoW, landowners and relevant consultees;
- undertake restoration and revegetation or reseeding work as soon as possible;
- where required, consider exclusion of livestock from areas of the Proposed Development undergoing restoration, to minimise impacts on revegetation; and
- as far as reasonably practicable, restoration should be carried out concurrently with construction rather than at its conclusion.

4.7 Access Tracks

There is much guidance[6,7] available to support access track design in peatlands. Guidance is generally focused on floating tracks and excavated tracks and is summarised below. Based on the avoidance of significant areas of deep peat with tracks all typically present on peat <1.0 m and only limited sections of track on localised areas of peat >1.0 m then the use of excavated tracks is proposed. It is not expected that floating tracks design will be utilised at the Proposed Development.

Excavated tracks require complete excavation of soil/peat to a competent substrate. Excavated tracks will generally be undertaken where peat depths are less than 1m. This peat/soil would require storage ahead of re-use elsewhere within Proposed Development. Good practice guidance relates mainly to drainage in association with excavated tracks:

- trackside ditches should capture surface water (within the acrotelm) before it reaches the road;
- interceptor drains should be shallow and flat bottomed (and preferably entirely within the acrotelm to limit drawdown of the water table);
- any stripped peat turves should be placed back in the invert and sides of the ditch to assist regeneration and prevent erosion to the peat and wash out that could occur; and
- culverts and cross drains should be installed under excavated tracks to maintain subsurface drainage pathways (such as natural soil pipes or flushes). Discharge from constructed drainage should allow for as much diffuse dispersion of clean (silt free) water as possible while minimising disturbance to existing peatland as far as possible. Silt mitigation measures will be incorporated into all constructed drainage as per the requirements of the CEMP.

Although excavation is normally undertaken in peat of minor thickness (< 1.0 m), there is a possibility of minor slippage from the cut face of the peat mass. Accordingly:

6 Scottish Renewables, Scottish Natural Heritage, Scottish Environmental Protection Agency, Forestry Commission Scotland, Historic Environment Scotland, Marine Scotland, AEECoW (2019)., Good Practice During Wind Farm Construction. 4th Edition.

7 Scottish Natural Heritage, Forestry Commission (August 2010)., Floating Roads on Peat

- free faces should be inspected for evidence of instability (cracking, bulging, excessive discharge of water or sudden cessation in discharge); and
- where significant depths of peat are to be stored adjacent to an excavation, stability analysis should be conducted to determine Factor of Safety (FoS) and an acceptable FoS adopted for loaded areas.

Regular routine monitoring should be scheduled post-construction to ensure that hydrological pathways and track integrity have been suitably maintained.

4.8 Monitoring and Inspection

There would be frequent, routine and regular inspections of peat in all stockpiles and temporary storage areas as part of the PMP audit process. Inspections would assess in situ peat physical conditions, integrity of containment and temporary drainage conditions, and they would seek to confirm that stockpile design and management was adequate to prevent erosion and peat slide. These inspections would take place weekly during stockpile creation and storage.

Should any problems be observed during regular visual inspections of peat stockpiles, this would invoke implementation of an appropriate corrective action which would be recorded and monitored for effectiveness. Types of corrective actions would include, but would not necessarily be limited to; modification of temporary drainage, additional or modified bunding, incorporating of sediment fencing if required, light re-grading to correct any areas of surface erosion, etc.

Regular, frequent inspections of peat conditions during construction and restoration phases of work would be carried out by the Geotechnical Engineer and ECoW as follows:

- peat surface, peat profile and peat consistency conditions would be carried out as part of ground investigations prior to the start of construction. This information would provide detailed information on the baseline conditions for each part of the infrastructure footprint;
- restored peat conditions would be inspected immediately after restoration to ensure that the methods detailed in the PMP had been correctly implemented and to inform any corrective actions should they be required; and
- the physical condition of peats would be retained as carefully as possible both at the peat storage and the peat restoration stages. This is particularly important for vegetation establishment.

5.0 Estimation of Peat Volumes

Table B provides an estimate of peat and peaty soil volumes to be excavated and re-used during the construction of the proposed development. The peat and peaty soil excavation and re-use volumes are detailed for each infrastructure element in **Annex B**. The excavated materials data indicates that the areas of infrastructure within the Proposed Development are typically located in areas of peaty soils with limited infrastructure present in areas of peat >0.5 m.

The table also demonstrates the following:

- the avoidance of areas of deep peat where possible;
- re-use of the excavated materials is minimised where possible;
- and any excavation and re-use is undertaken in line with updated industry good practices and guidance; and
- limitations and consideration for future work.

Table B: Excavated Materials Management Plan

Method	Volume of Excavated Material (m^3)	Opportunity for Avoidance or Minimisation of Excavated Material	Volume of Re-use Material (m^3)	Re-use Requirements	Hierarchy Adherence	Limitations and Considerations
Permanent Access Tracks 12.02 km with an average thickness of 0.22 m	1,587 m^3	The access track route has been subject to a number of design iterations to avoid deeper peat and steep slopes.	397 m^3	Verge restoration and visual screening, particularly along access track. Sections of the route may require cut and fill and these slopes would require restoration to minimise visual impact.	Avoidance was first level of screening to avoid areas of thicker peat. Routing has been planned on thinner peat or peaty soils where possible. The layout design has been guided by constraints which highlight ecological, hydrogeological and geomorphological - all of which identify the peat areas to avoid.	Requires detailed ground investigation to fully characterise extent of peat and peaty soils. Detailed assessment may identify lengths of floating access tracks, which would further reduce requirement for excavation.
Temporary Access Tracks 21 m with an average thickness of 0.11 m.	14 m^3	The access track route has been subject to a number of design iterations to avoid deeper peat and steep slopes.	14 m^3	It is anticipated that temporary tracks will be fully reinstated on completion of construction works.	N/A	N/A
Turbine Foundations 18 No. turbines with an average thickness of 0.26 m.	3,306 m^3	Turbine locations have been subject to a number of design iterations to avoid thicker peat and steep slopes.	1,800 m^3	At turbine foundations topsoil would be stripped keeping top 200 mm of turf intact. This would be stored adjacent to the base	Avoided areas of thick peat for turbine bases where possible to minimise removal of excessive materials.	Requires detailed ground investigation to fully characterise peat and peaty soils.

				working area and would be limited to 0.5 m height.		
Hardstanding 18 No. with an average thickness of 0.22 m.	16,089 m^3	Hardstanding locations have been influenced by the turbine design iterations to avoid thicker peat and steep slopes.	3,600 m^3	At crane hardstandings topsoil would be stripped keeping top 200 mm of turf intact. This would be stored adjacent to the base working area and would be limited to 0.5 m height.	Avoided areas of thick peat for turbine crane pads to minimise removal of excessive materials.	Requires detailed ground investigation to fully characterise peat and peaty soils.
Temporary Enabling Works Compound with an average thickness of 0.10 m.	111 m^3	Temporary infrastructure has been subjected to several design iterations to avoid thicker peat and steep slopes.	0 m^3	Temporary infrastructure would be re-used on site to reinstate working areas and for appropriate landscaping.	Avoided areas of thick peat to minimise removal of excessive materials.	Requires detailed ground investigation to fully characterise peat and peaty soils.
Temporary Construction Compound with an average thickness of 0.12 m.	498 m^3	Temporary infrastructure has been subjected to several design iterations to avoid thicker peat and steep slopes.	0 m^3	Temporary infrastructure would be re-used on site to reinstate working areas and for appropriate landscaping.	Avoided areas of thick peat to minimise removal of excessive materials.	Requires detailed ground investigation to fully characterise peat and peaty soils.
Battery Storage Compound with an average thickness of 0.16 m.	1,416 m^3	Permanent infrastructure has been subjected to several design iterations to avoid thicker peat and steep slopes.	0 m^3	Permanent infrastructure would be re-used on site to reinstate working areas and for appropriate landscaping.	Avoided areas of thick peat to minimise removal of excessive materials.	Requires detailed ground investigation to fully characterise peat and peaty soils.

Control Building and Substation Compound with an average thickness of 0.12 m.	758 m^3	Permanent infrastructure has been subjected to several design iterations to avoid thicker peat and steep slopes.	0 m^3	Permanent infrastructure would be re-used on site to reinstate working areas and for appropriate landscaping.	Avoided areas of thick peat to minimise removal of excessive materials.	Requires detailed ground investigation to fully characterise peat and peaty soils.
Turning Heads with an average thickness of 0.44 m.	630m^3	Permanent infrastructure has been subjected to several design iterations to avoid thicker peat and steep slopes.	0 m^3	Permanent infrastructure would be re-used on site to reinstate working areas and for appropriate landscaping.	Avoided areas of thick peat to minimise removal of excessive materials.	Requires detailed ground investigation to fully characterise peat and peaty soils.
Borrow Pits There are 2 No. borrow pit options, covered by peaty soils.	Borrow Pit North: 10,928 m^3 Borrow Pit South: 3,476 m^3	There is limited peaty soils overlying the selected borrow pits.	Borrow Pit 1: 27,320 m^3 Borrow Pit 2: 10,427 m^3	Limited peaty topsoil can be stockpiled and used for restoration. Peat/peaty soils from elsewhere on-site could be used to restore the proposed borrow pits.	site selection avoided areas of peat for borrow pits, identified sites on bedrock or close to minimise removal of excessive materials.	Current calculations are based on conservative re-use and based on the use of the borrow pits. Detailed ground investigation is required to assess the ground conditions at each site.
Total Excavated	38,814 m^3		Total Re-use	43,557 m^3		

6.0 Peat Classification

This section of the stage 1 PMP includes the method for dealing with peat which could potentially be classified as waste (only if the above volumes estimate significant quantities of catotelmic peat, which cannot be re-used).

Table C outlines where those materials that are likely to be generated on-site, fall within the Waste Management Licensing (Scotland) Regulations 2011.

Based on the results presented in **Table B**, it has been concluded that all of the materials to be excavated on-site would fall within the non-waste classification as most of the topsoil and peaty soils would be re-used on-site. Based on a detailed probing exercise and visual inspection of the peat, it is predominantly fibrous peat which would be suitable to be re-used on-site. Typically, the peat was found to be fibrous and fairly dry within the top metre before becoming slightly more pseudo-fibrous with depth.

The majority of the excavated peat is therefore entirely re-useable as it is predominantly fibrous and easily re-used on-site. Areas of deep peat have been avoided by design, where possible.

Table C: Excavated Materials – Assessment of Suitability

Excavated Material	Indicative Volume on site by % of total excavated soils	Is there a suitable use for material	Is the Material required for use on site	Material Classified as Waste	Re-use Potential	Re-use on site
Mineral Soil	25	Yes	Yes	Not classified as waste	Yes	Will be re-used in reinstatement of floated access track verges, cut and fill verges, road verges, side slopes and check drains. Peripheral embankments of turbine bases, crane hardstandings and restoration of borrow pits.
Turf (Surface layer of vegetation and fibrous matt)	35	Yes	Yes	Not classified as waste	Yes	
Acrotelmic peat	35	Yes	Yes	Not classified as waste	Yes	Will be re-used in reinstatement of floated access track verges, cut and fill verges, road verges, side slopes and check drains. Peripheral embankments of turbine bases, crane hardstandings and restoration of borrow pits.
Catotelmic Peat (amorphous material unable to stand unsupported when stockpiled >1 m)	5 Very limited as it has been avoided by design.	Potentially	Potentially*	Potentially if not required as justifiable restoration of habitat management works	Limited	If peat does not require treatment prior to re-use it can be used on-site providing adequate justification and method statements are provided and approved by SEPA. If it is unsuitable for use without treatment then it may be regarded as a waste. However, every attempt to avoid this type of peat has been incorporated into the design.

*Such uses for this type of material are limited, however there may be justification for use in the base of borrow pits to maintain waterlogged conditions and prevent desiccation of restored area and in some habitat management works such as gully or ditch blocking where saturated peat is required to mimic mire type habitats and encourage establishment of sphagnum.

7.0 Conclusion

This Stage 1 PMP presents a pre-construction assessment of the expected peat extraction and reuse volumes associated with the works phase of the construction of the proposed development. The PMP also provides the guiding principles which would be applied during the construction of the proposed development. Peat depth surveys have shown that there are limited peat deposits present with localised areas of deep peat typically present on the flatter areas in the west and north of the Proposed Development.

Through a process of continued design refinement (focused on minimising peat excavation volumes) and adoption of best practice working method, the development is expected to achieve an overall peat balance. Thus, all excavated material will be required for reuse as part of the works and no surplus peat is anticipated.

The figures detailed within this report are to be considered indicative at this stage. The total peat volumes are based on a series of assumptions for the layout of the proposed development and the results of several phases of peat probing. Such parameters can still vary over small scale areas and therefore topographic changes in the bedrock profile could impact the total accuracy of the volume calculations.

The various calculations presented here would be updated and expanded upon as part of detailed design works, taking account of pre-construction site investigations and micro-siting, to confirm actual quantities of arising peat. The Applicant would achieve an actual balance between arising peat and reinstatement by prioritising the areas for reinstatement, following advice from the project ECoW and Geotechnical Engineer. It is anticipated that a detailed, construction phase PMP would be developed, and maintenance and updating of this plan in conjunction with a Geotechnical Risk Register. The implementation of the detailed PMP would ensure a robust commitment to excavating, storing and reinstating peat in a manner that follows best practice and ensures the protection of peat throughout the construction and post-construction phases.

Figures

Technical Appendix 10.2: Peat Management Plan

Torfichen Wind Farm

Renewables Energy Services Ltd.

SLR Project No.: 405.064791.00001

18 October 2023

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TORFICHEN WIND FARM EIA REPORT

FIG 10.2.1

SITE LOCATION

KEY

SITE BOUNDARY

SCALE - 1:60,000 @ A3

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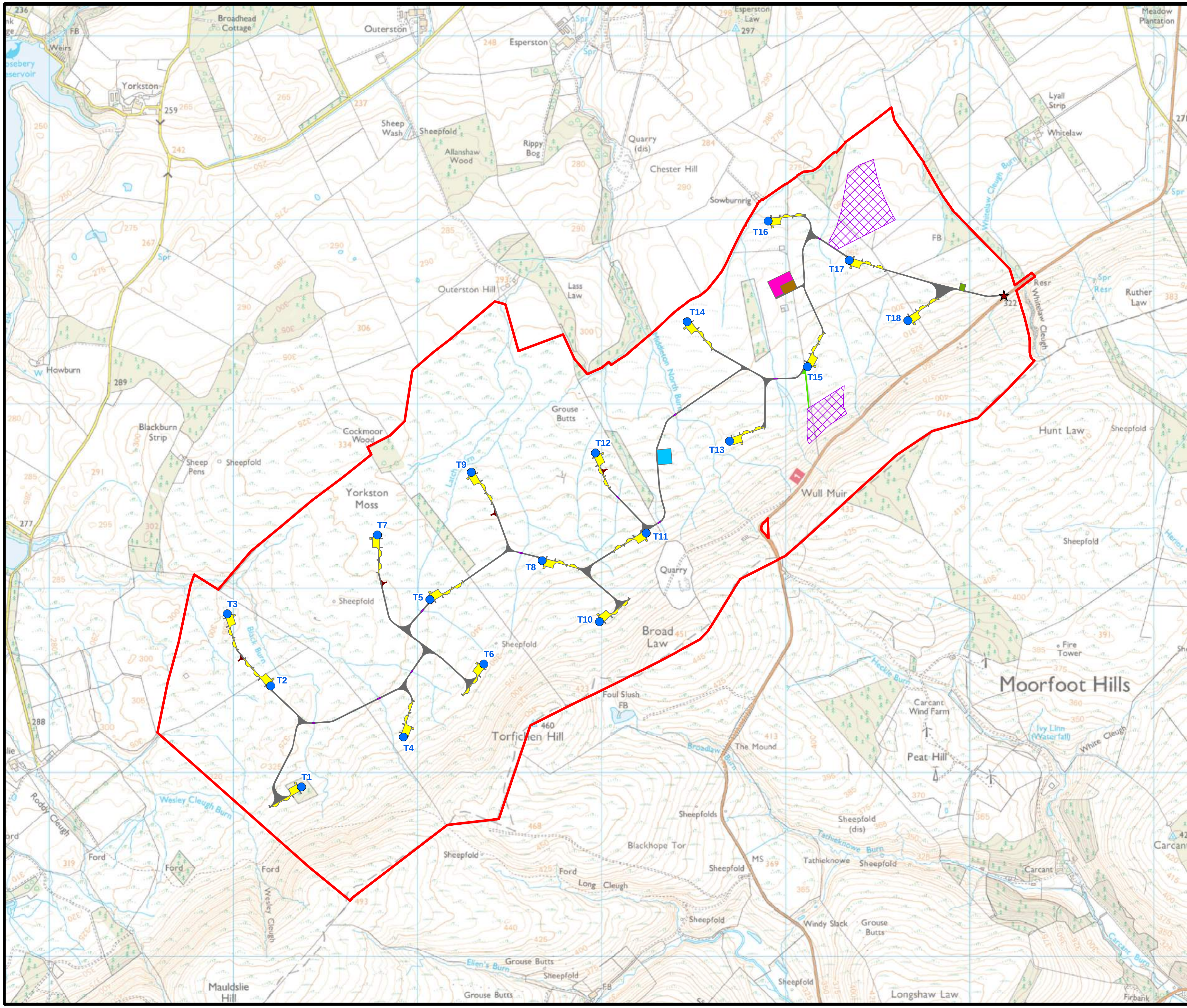

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FIG 10.2.2

SITE LAYOUT

KEY

- SITE BOUNDARY
- PROPOSED TURBINE LOCATION
- SITE ENTRANCE
- PROPOSED HARDSTANDING
- PROPOSED TEMPORARY CONSTRUCTION COMPOUND
- PROPOSED CONTROL BUILDING AND SUBSTATION COMPOUND
- PROPOSED TEMPORARY ENABLING WORKS COMPOUND
- PROPOSED BATTERY STORAGE COMPOUND
- PROPOSED TRACK
- PROPOSED TEMPORARY TRACK
- TURNING HEAD
- PROPOSED BORROW PIT SEARCH AREA
- PROPOSED WATERCOURSE CROSSING

SCALE - 1:20,000 @ A3

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FIG 10.2.3

PEAT DEPTH

KEY

- SITE BOUNDARY
- PROPOSED TURBINE LOCATION
- SITE ENTRANCE
- PROPOSED HARDSTANDING
- PROPOSED TEMPORARY CONSTRUCTION COMPOUND
- PROPOSED CONTROL BUILDING AND SUBSTATION COMPOUND
- PROPOSED TEMPORARY ENABLING WORKS COMPOUND
- PROPOSED BATTERY STORAGE COMPOUND
- PROPOSED TRACK
- PROPOSED TEMPORARY TRACK
- TURNING HEAD
- PROPOSED BORROW PIT SEARCH AREA
- PROPOSED WATERCOURSE CROSSING

- PEAT PROBE LOCATION - PHASE 1
- PEAT PROBE LOCATION - PHASE 2

PEAT DEPTH (M)

- 0
- 0 - 0.5
- 0.5 - 1
- 1 - 1.5
- 1.5 - 2
- 2 - 2.5
- 2.5 - 3
- > 3

SCALE - 1:20,000 @ A3

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FIG 10.2.4.1

PEAT DEPTH: T1

KEY

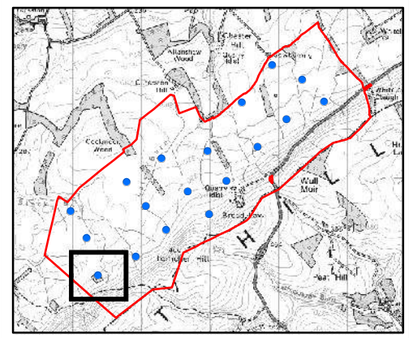
- Site Boundary
- Proposed Turbine Location
- Proposed Hardstanding
- Proposed Track

T1

- Peat Probe Location - Phase 1
- Peat Probe Location - Phase 2

Peat Depth (m)

- 0
- 0 - 0.5
- 0.5 - 1
- 1 - 1.5



SCALE - 1:2,500 @ A3

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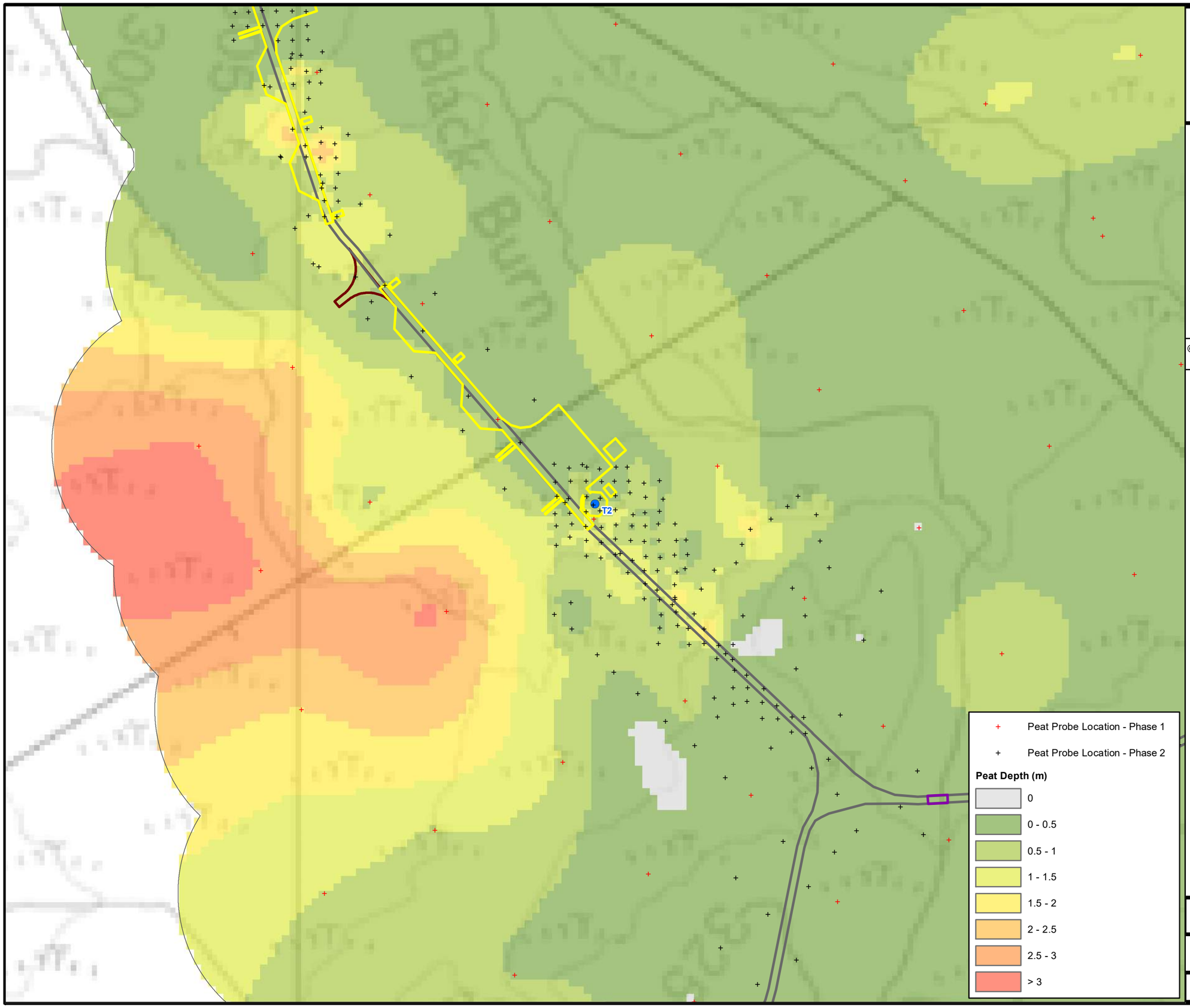

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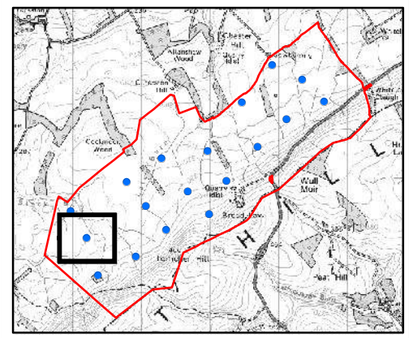
FIG 10.2.4.2

PEAT DEPTH: T2

KEY

- Site Boundary
- Proposed Turbine Location
- Proposed Hardstanding
- Proposed Track
- Turning Head
- Proposed Watercourse Crossing



SCALE - 1:2,500 @ A3

ENVIRONMENTAL IMPACT ASSESSMENT REPORT 2023

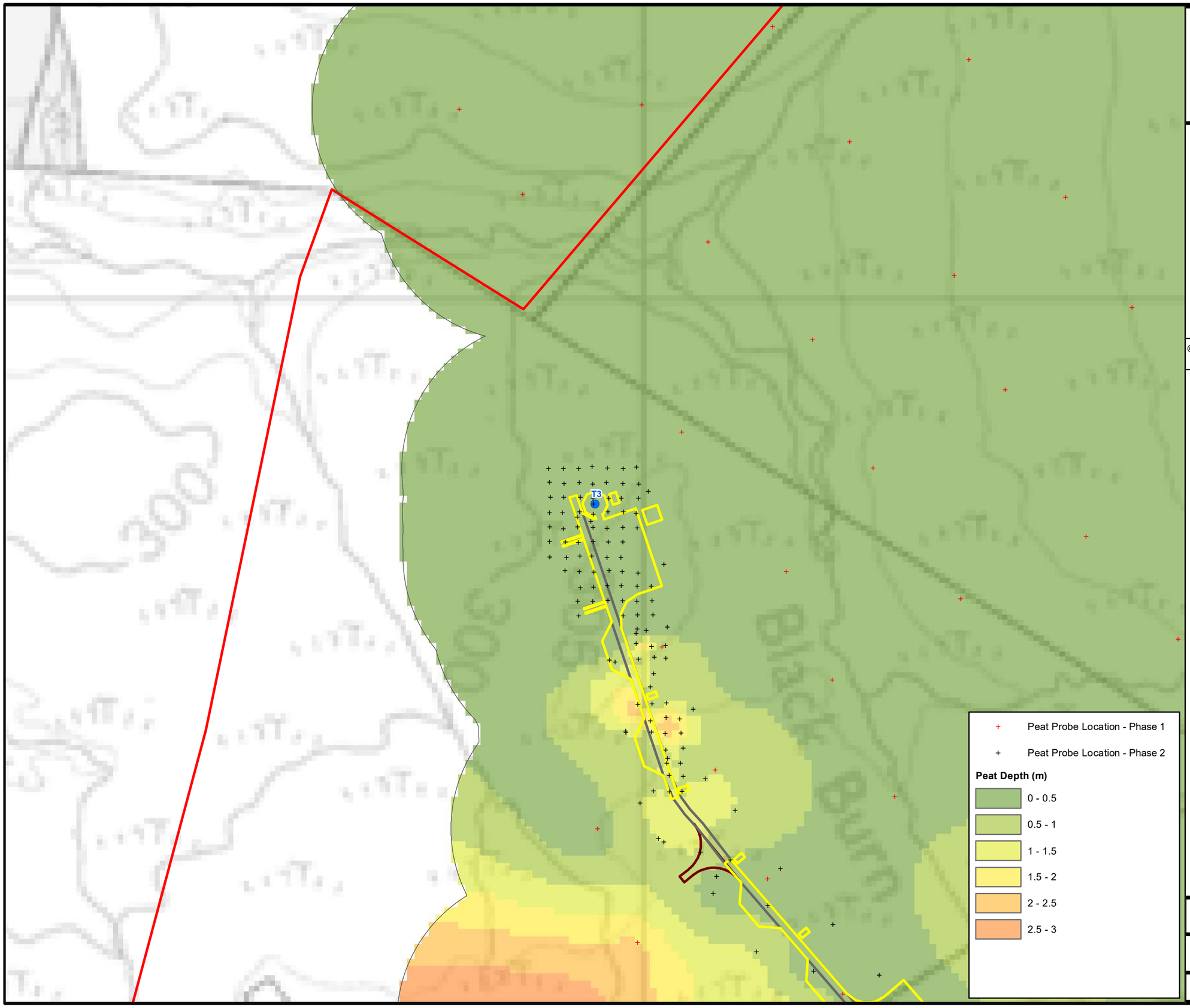


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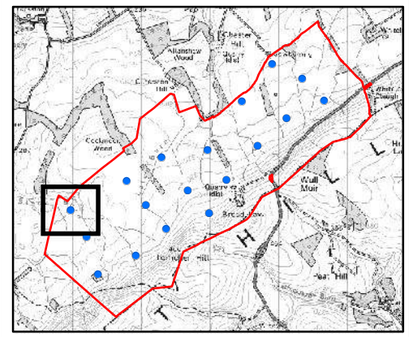
FIG 10.2.4.3

PEAT DEPTH: T3

KEY

- Site Boundary
- Proposed Turbine Location
- Proposed Hardstanding
- Proposed Track
- Turning Head



SCALE - 1:2,500 @ A3

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FIG 10.2.4.4

PEAT DEPTH: T4

KEY

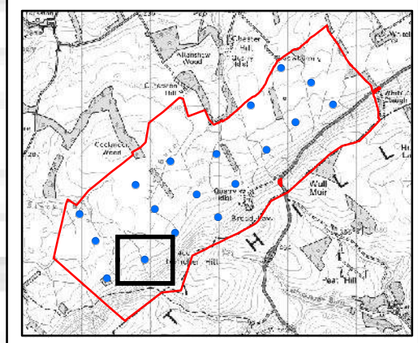
- Site Boundary
- Proposed Turbine Location
- Proposed Hardstanding
- Proposed Track
- Proposed Watercourse Crossing

T4

- Peat Probe Location - Phase 1
- Peat Probe Location - Phase 2

Peat Depth (m)

- 0
- 0 - 0.5
- 0.5 - 1



SCALE - 1:2,500 @ A3

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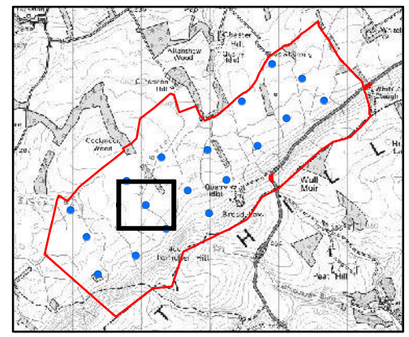
FIG 10.2.4.5

PEAT DEPTH: T5

KEY

- Site Boundary
- Proposed Turbine Location
- Proposed Hardstanding
- Proposed Track
- Turning Head
- Proposed Watercourse Crossing



- Peat Probe Location - Phase 1
- Peat Probe Location - Phase 2

Peat Depth (m)

- 0
- 0 - 0.5
- 0.5 - 1
- 1 - 1.5

SCALE - 1:2,500 @ A3

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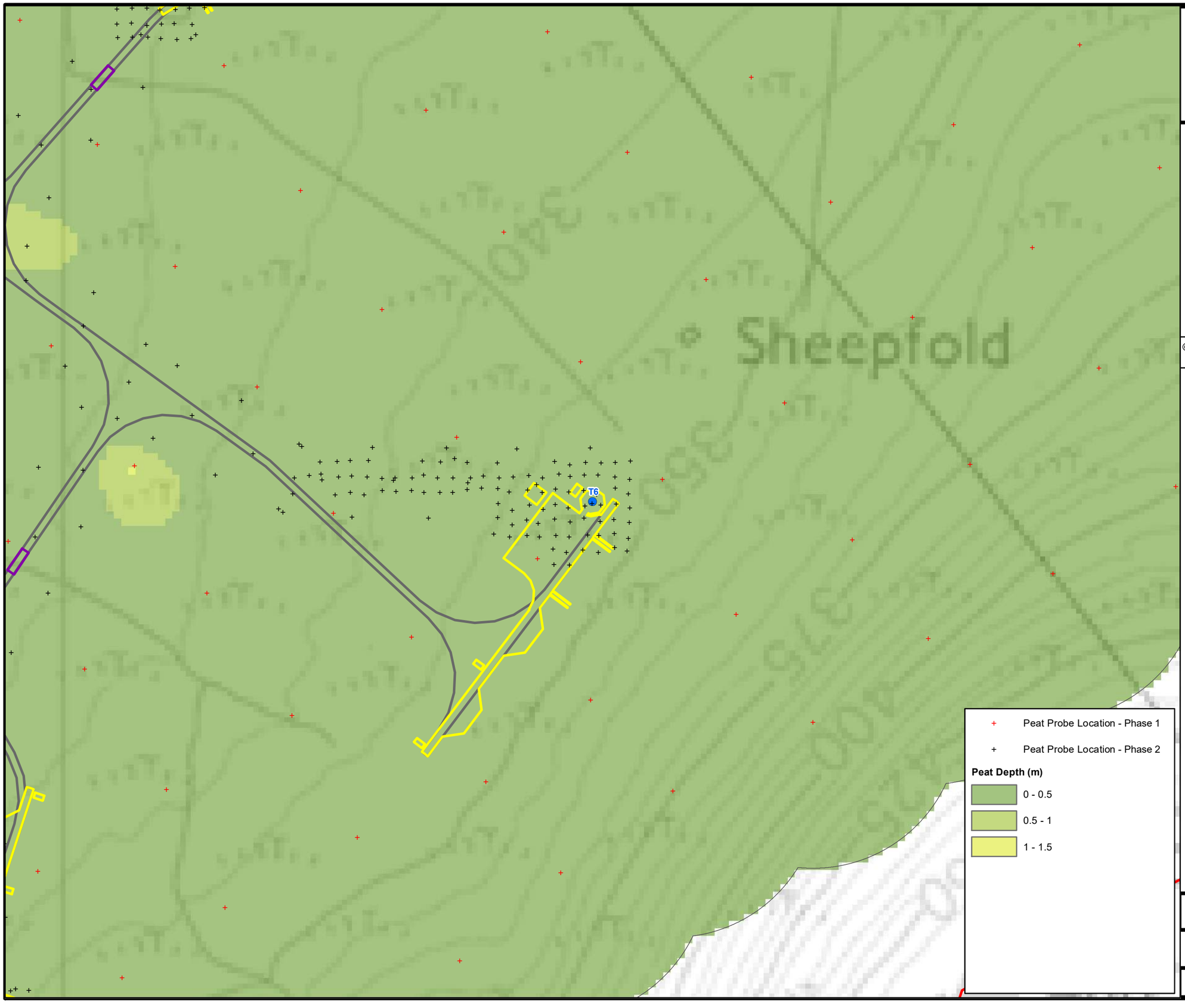

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FIG 10.2.4.6

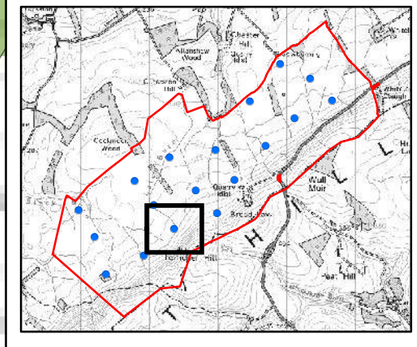
PEAT DEPTH: T6

KEY

- Site Boundary
- Proposed Turbine Location
- Proposed Hardstanding
- Proposed Track
- Proposed Watercourse Crossing
- Peat Probe Location - Phase 1
- Peat Probe Location - Phase 2

Peat Depth (m)

- 0 - 0.5
- 0.5 - 1
- 1 - 1.5



SCALE - 1:2,500 @ A3

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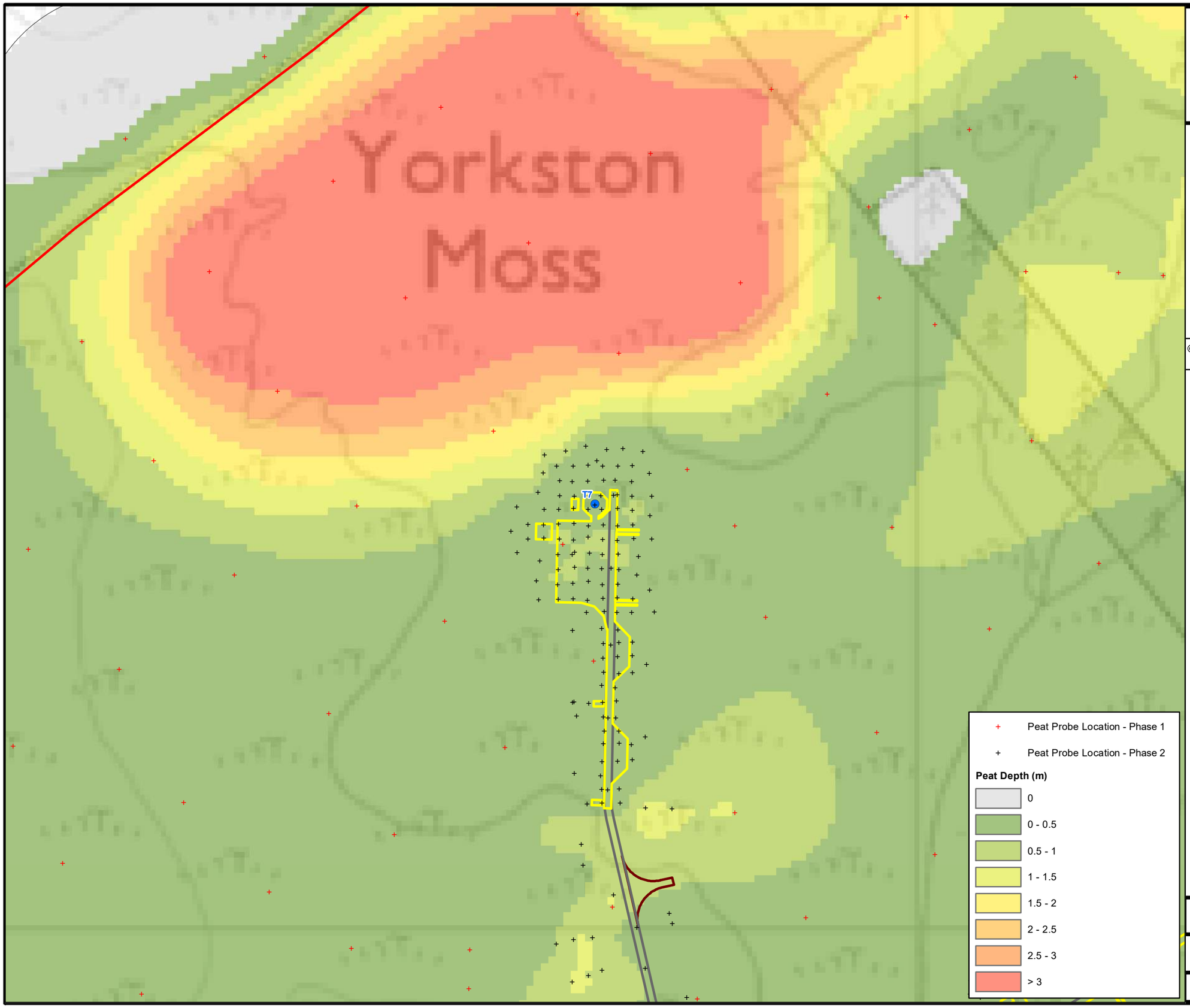

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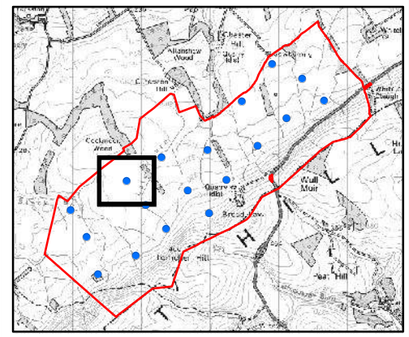
FIG 10.2.4.7

PEAT DEPTH: T7

KEY

- Site Boundary
- Proposed Turbine Location
- Proposed Hardstanding
- Proposed Track
- Turning Head



SCALE - 1:2,500 @ A3

ENVIRONMENTAL IMPACT ASSESSMENT REPORT 2023

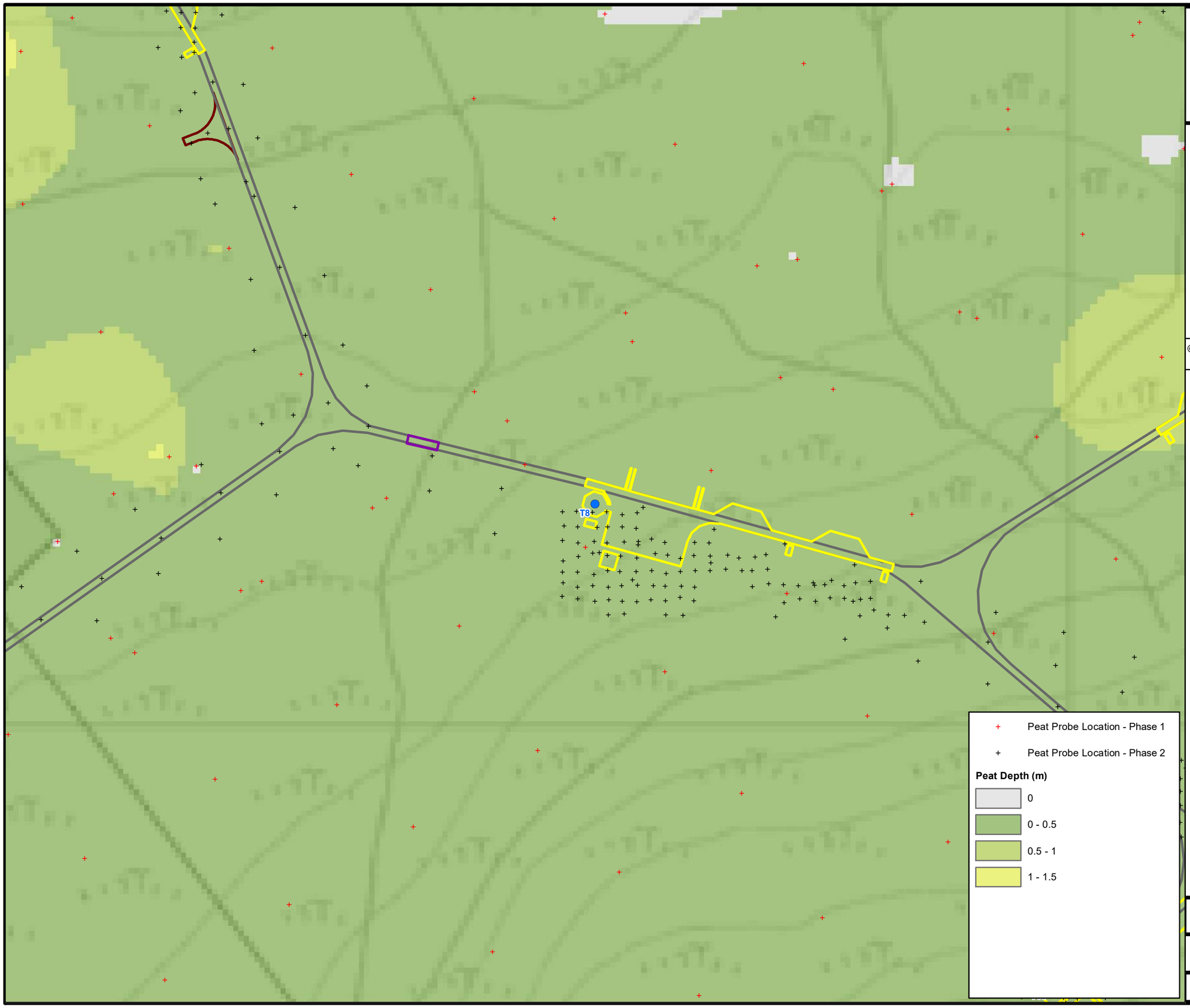


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FIG 10.2.4.8

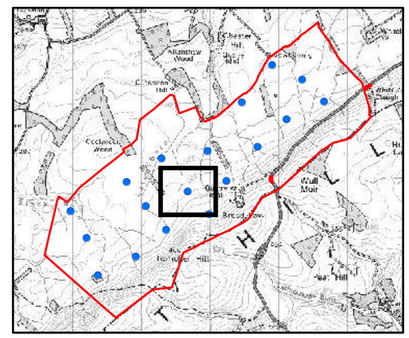
PEAT DEPTH: T8

KEY

- Site Boundary
- Proposed Turbine Location
- Proposed Hardstanding
- Proposed Track
- Turning Head
- Proposed Watercourse Crossing
- Peat Probe Location - Phase 1
- Peat Probe Location - Phase 2

Peat Depth (m)

- 0
- 0 - 0.5
- 0.5 - 1
- 1 - 1.5



SCALE - 1:2,500 @ A3

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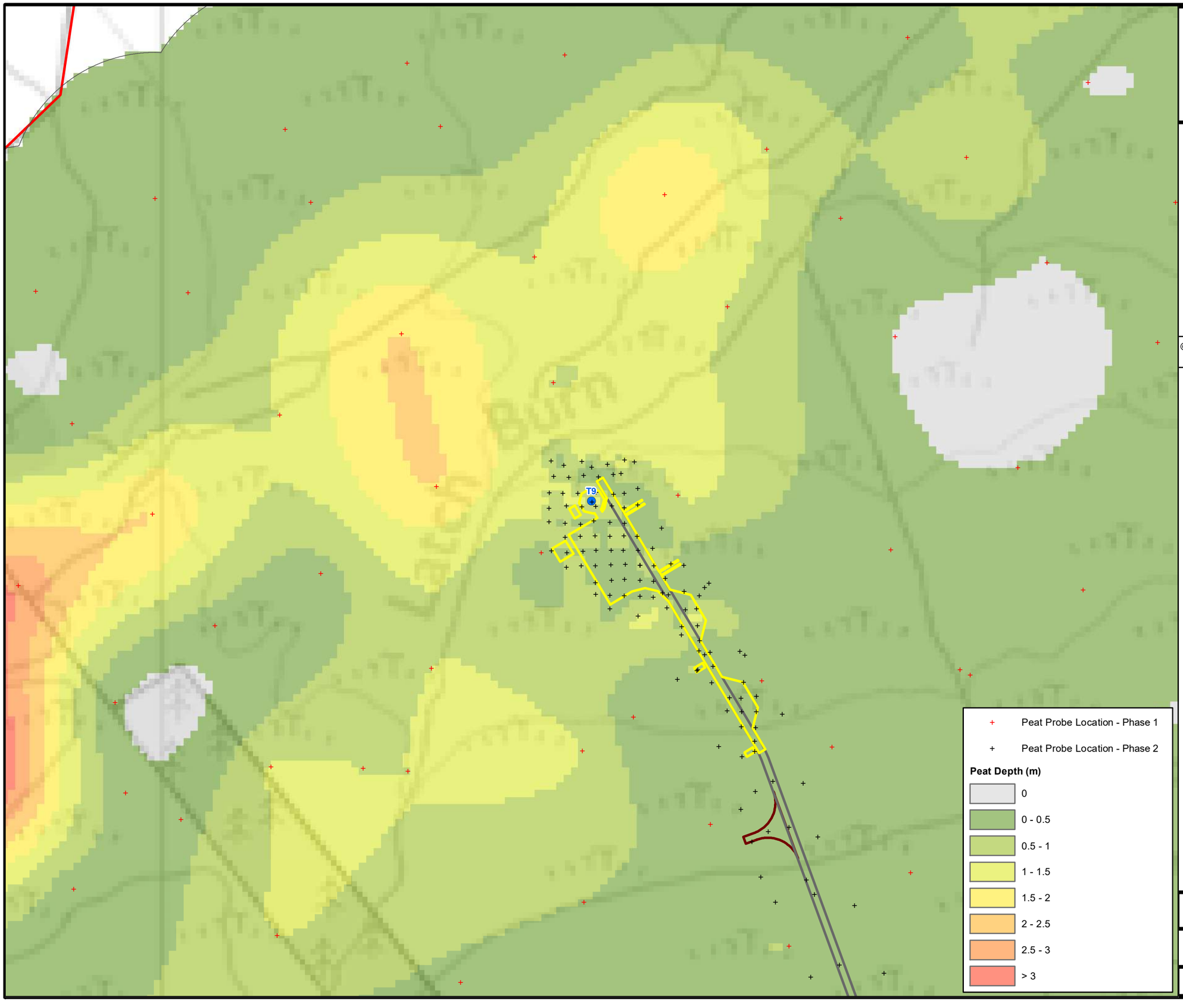
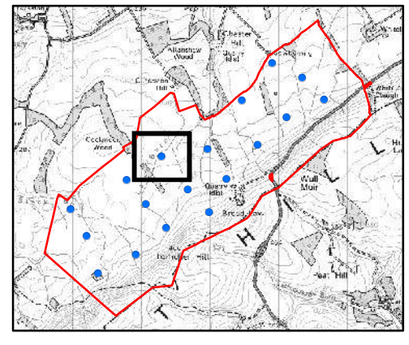
FIG 10.2.4.9

PEAT DEPTH: T9

KEY

- Site Boundary
- Proposed Turbine Location
- Proposed Hardstanding
- Proposed Track
- Turning Head





SCALE - 1:2,500 @ A3

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FIG 10.2.4.10

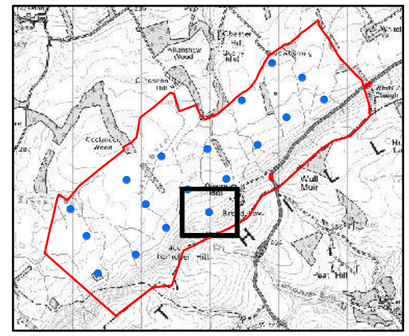
PEAT DEPTH: T10

KEY

- Site Boundary
- Proposed Turbine Location
- Proposed Hardstanding
- Proposed Track
- Peat Probe Location - Phase 1
- Peat Probe Location - Phase 2

Peat Depth (m)

- 0
- 0 - 0.5



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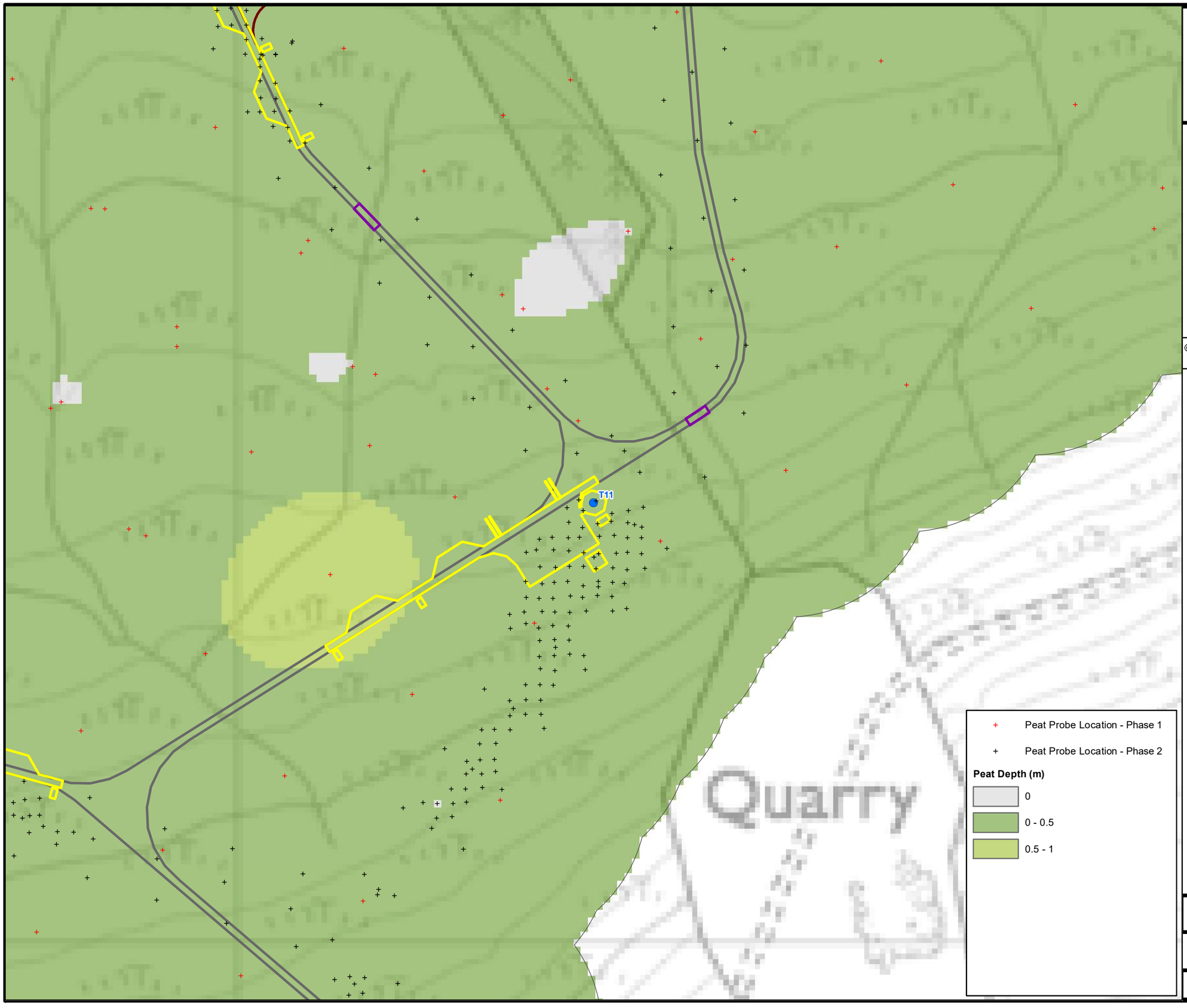

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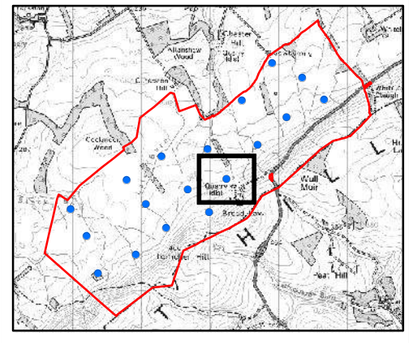
FIG 10.2.4.11

PEAT DEPTH: T11

KEY

- Site Boundary
- Proposed Turbine Location
- Proposed Hardstanding
- Proposed Track
- Turning Head
- Proposed Watercourse Crossing



- Peat Probe Location - Phase 1
- Peat Probe Location - Phase 2

Peat Depth (m)

- 0
- 0 - 0.5
- 0.5 - 1

SCALE - 1:2,500 @ A3

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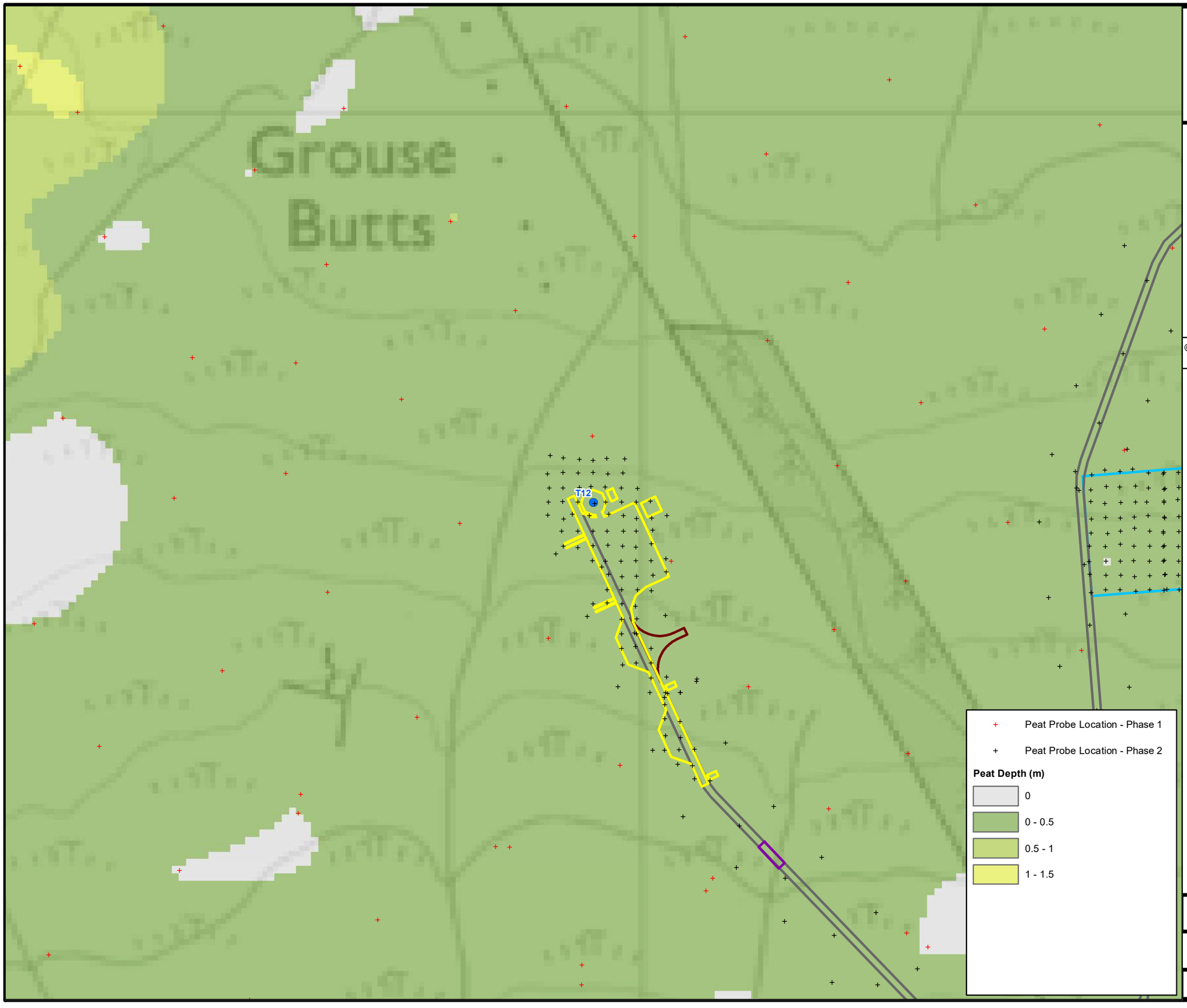

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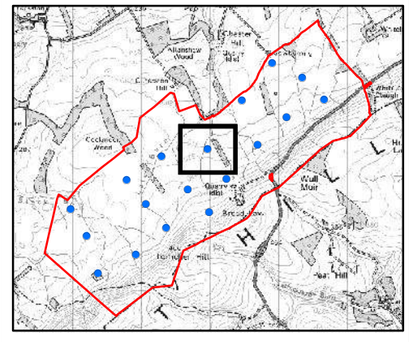
FIG 10.2.4.12

PEAT DEPTH: T12

KEY

- Site Boundary
- Proposed Turbine Location
- Proposed Hardstanding
- Proposed Control Building and Substation Compound
- Proposed Track
- Turning Head
- Proposed Watercourse Crossing



SCALE - 1:2,500 @ A3

ENVIRONMENTAL IMPACT ASSESSMENT REPORT 2023

T13

Peat Probe Location - Phase 1

Peat Probe Location - Phase 2

Peat Depth (m)

0

0 - 0.5

0.5 - 1

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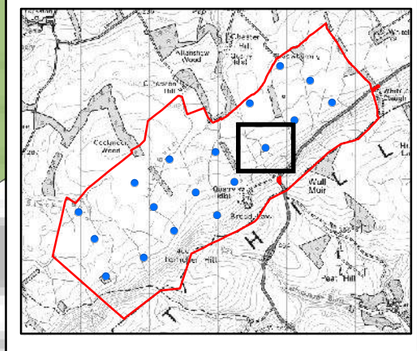
FIG 10.2.4.13

PEAT DEPTH: T13

KEY

- Site Boundary
- Proposed Turbine Location
- Proposed Hardstanding
- Proposed Control Building and Substation Compound
- Proposed Track
- Proposed Watercourse Crossing



SCALE - 1:2,500 @ A3

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FIG 10.2.4.14

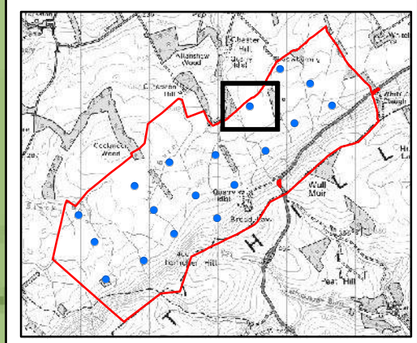
PEAT DEPTH: T14

KEY

- Site Boundary
- Proposed Turbine Location
- Proposed Hardstanding
- Proposed Track
- Peat Probe Location - Phase 1
- Peat Probe Location - Phase 2

Peat Depth (m)

- 0
- 0 - 0.5
- 0.5 - 1



SCALE - 1:2,500 @ A3

ENVIRONMENTAL IMPACT ASSESSMENT REPORT 2023

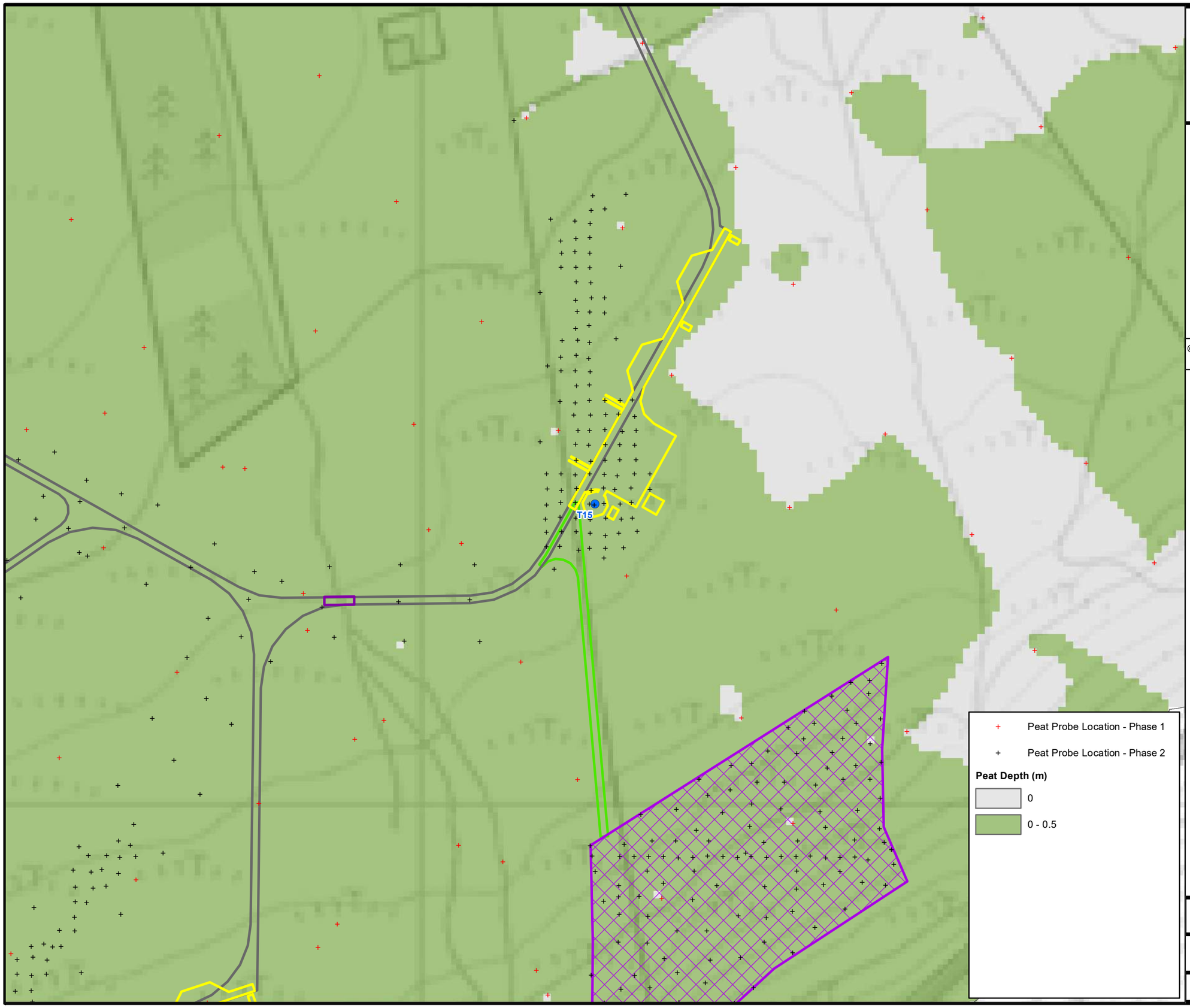


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FIG 10.2.4.15

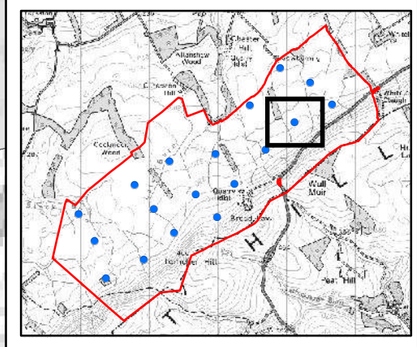
PEAT DEPTH: T15

KEY

- Site Boundary
- Proposed Turbine Location
- Proposed Hardstanding
- Proposed Track
- Proposed Temporary Track
- Proposed Borrow Pit Search Area
- Proposed Watercourse Crossing
- Peat Probe Location - Phase 1
- Peat Probe Location - Phase 2

Peat Depth (m)

- 0
- 0 - 0.5



SCALE - 1:2,500 @ A3

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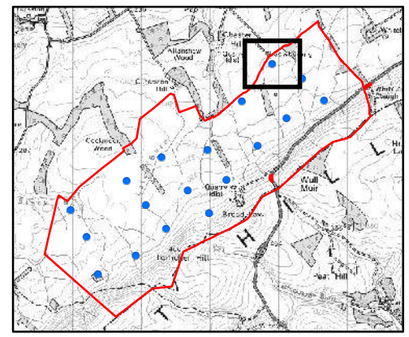
FIG 10.2.4.16

PEAT DEPTH: T16

KEY

- Site Boundary
- Proposed Turbine Location
- Proposed Hardstanding
- Proposed Temporary Construction Compound
- Proposed Battery Storage Compound
- Proposed Track
- Proposed Borrow Pit Search Area
- Proposed Watercourse Crossing



- Peat Probe Location - Phase 1
- Peat Probe Location - Phase 2

Peat Depth (m)

- 0
- 0 - 0.5
- 0.5 - 1
- 1 - 1.5
- 1.5 - 2

SCALE - 1:2,500 @ A3

ENVIRONMENTAL IMPACT ASSESSMENT REPORT 2023

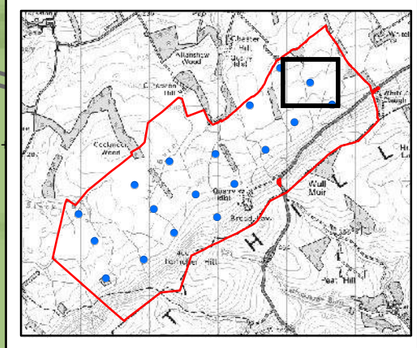
TORFICHEN WIND FARM EIA REPORT

FIG 10.2.4.17

PEAT DEPTH: T17

KEY

- Site Boundary
- Proposed Turbine Location
- Proposed Hardstanding
- Proposed Temporary Construction Compound
- Proposed Battery Storage Compound
- Proposed Track
- Proposed Borrow Pit Search Area
- Proposed Watercourse Crossing



- Peat Probe Location - Phase 1
- Peat Probe Location - Phase 2

Peat Depth (m)

- 0
- 0 - 0.5
- 0.5 - 1
- 1 - 1.5
- 1.5 - 2

SCALE - 1:2,500 @ A3

ENVIRONMENTAL IMPACT ASSESSMENT REPORT 2023

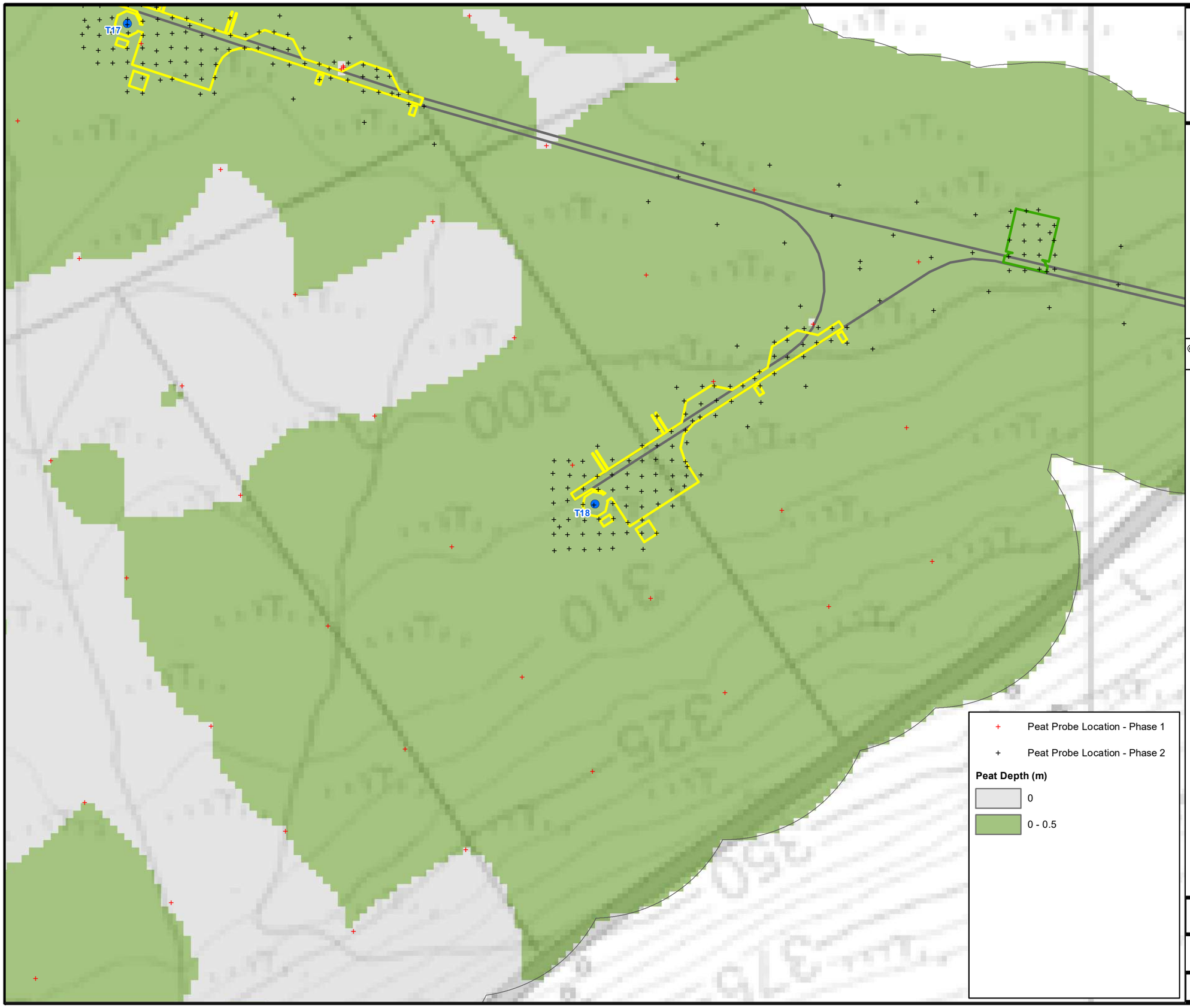


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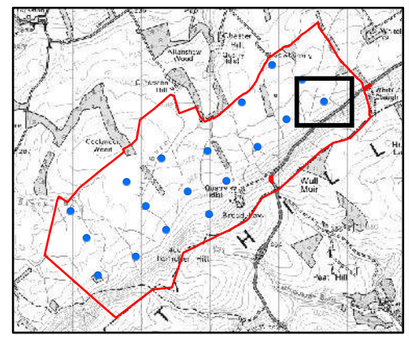
FIG 10.2.4.18

PEAT DEPTH: T18

KEY

- Site Boundary
- Proposed Turbine Location
- Proposed Hardstanding
- Proposed Temporary Enabling Works Compound
- Proposed Track



SCALE - 1:2,500 @ A3

ENVIRONMENTAL IMPACT ASSESSMENT REPORT 2023

Annex A Excavated Materials Calculations

Technical Appendix 10.2: Peat Management Plan

Torfichen Wind Farm

Renewables Energy Services Ltd.

SLR Project No.: 405.064791.00001

18 October 2023

Infrastructure	Length (m)	Width (m)	Area (m^2)	Average Depth (m)	Number	Total Excavated Volume (m^3)	Length (m)	Width (m)	Area (m^2)	Average Depth (m)	Number	Total Re-use Volume of (m^3)	Notes
Permenant Access Track	1202	6	7212	0.22	1	1587	1202	2	1803	0.22	1	397	
Temporary Access Track	21	6	126	0.11	1	14	21	6	126	0.11	1	14	
Turbines			707	0.26	18	3306	100	2	200	0.50	18	1800	
Hardstandings			4063	0.22	18	16089	200	2	400	0.50	18	3600	
Temporary Enabling Works Compound			1113	0.10	1	111			1113	0.00	1	0	
Temporary Construction Compound			4148	0.12	1	498			0	0.00	1	0	
Battery Storage Compound			8851	0.16	1	1416	320	2	640	0.00	1	0	
Control Building and Substation Compound			6318	0.12	1	758	230	2	460	0.00	1	0	
Turning Heads			358	0.44	4	630	84	2	168	0.00	4	0	
Borrow Pit North			91068	0.12	1	10928			91068	0.30	1	27320	
Borrow Pit South			34755	0.10	1	3476			34755	0.30	1	10427	
Totals						**38814**						**43557**	

Total Excavated Volume (m^3)	**38814**
Total Re-use Volume (m^3)	**43557**
Net Balance (m^3)	**-4744**

Annex B Peat Coring Data

Technical Appendix 10.2: Peat Management Plan

Torfichen Wind Farm

Renewables Energy Services Ltd.

SLR Project No.: 405.064791.00001

18 October 2023

Peat Core Log

Hole No. **PC01**

Sheet 1 of 1

Project: Torfichen Wind Farm	Client: RES		Dates: 27-07-2023
Project No: 405.064791.00001	Logger: CR	Approved By:	Coordinates: E: 332258.00 N: 653405.00
Location: Borders	Hole Type: PC	Level:	Vertical Scale: 1:26

Water	Depth (m)	Sample Type	Depth	Recovery (%)	Depth (m) / Discontinuity Detail	Level (mAOD)	Legend	Stratum Description
	0.00 - 1.00	C	0.00 - 1.00	Recovery = 100%	1.00			Light brown fibrous PEAT. Frequent fragments of plant remains throughout (H3), (B2).
	1.00 - 2.00				1.20			Brown fibrous PEAT. Frequent fragments of plant remains throughout (H4), (B2).
					1.80			Brown pseudo-fibrous PEAT (H5), (B2).
	2.00 - 2.20	C	1.00 - 2.00	Recovery = 100%	2.10			Dark brown pseudo-fibrous PEAT. Occasional fragments of plant remains throughout (H6), (B3).
		C	2.00 - 2.20	Recovery = 100%	2.20			Grey clayey coarse to fine SAND.
								Peat Core Complete at 2.20m

Remarks:

Peat core recovered using peat sampler.

Peat Core Log

Hole No. **PC02**

Sheet 1 of 1

Project: Torfichen Wind Farm	Client: RES		Dates: 27-07-2023
Project No: 405.064791.00001	Logger: CR	Approved By:	Coordinates: E: 332802.00 N: 654200.00
Location: Borders	Hole Type: PC	Level:	Vertical Scale: 1:26

Water	Depth (m)	Sample Type	Depth	Recovery (%)	Depth (m) / Discontinuity Detail	Level (mAOD)	Legend	Stratum Description
	0.00 - 1.00	C	0.00 - 1.00	Recovery = 100%	0.90			Brown fibrous PEAT (H3), (B2).
					1.00			Very soft brownish grey CLAY.
								Peat Core Complete at 1.00m

Remarks:

Peat core recovered using peat sampler.

Peat Core Log

Hole No. PC03

Sheet 1 of 1

Project: Torfichen Wind Farm	Client: RES		Dates: 27-07-2023
Project No: 405.064791.00001	Logger: CR	Approved By:	Coordinates: E: 332749.00 N: 654320.00
Location: Borders	Hole Type: PC	Level:	Vertical Scale: 1:26

Water	Depth (m)	Sample Type	Depth	Recovery (%)	Depth (m) / Discontinuity Detail	Level (mAOD)	Legend	Stratum Description
	0.00 - 1.00				0.60			Dark brown fibrous PEAT (H3), (B2).
		C	0.00 - 1.00	Recovery = 100%	1.10			Brown fibrous PEAT (H4), (B2).
	1.00 - 1.20	C	1.00 - 1.20	Recovery = 100%	1.20			Soft grey CLAY.
								Peat Core Complete at 1.20m

Remarks:

Peat core recovered using peat sampler.

Peat Core Log

Hole No. **PC04**

Sheet 1 of 1

Project: Torfichen Wind Farm	Client: RES		Dates: 27-07-2023
Project No: 405.064791.00001	Logger: CR	Approved By:	Coordinates: E: 332267.00 N: 654622.00
Location: Borders	Hole Type: PC	Level:	Vertical Scale: 1:26

Water	Depth (m)	Sample Type	Depth	Recovery (%)	Depth (m) / Discontinuity Detail	Level (mAOD)	Legend	Stratum Description
	0.00 - 1.00	C	0.00 - 1.00	Recovery = 100%	0.85			Brown fibrous PEAT (H4), (B2).
					1.00			Soft brownish grey coarse to fine sandy CLAY.
								Peat Core Complete at 1.00m

Remarks:

Peat core recovered using peat sampler.

Peat Auger 01
0 – 1.0m

Peat Auger 01
1.0 – 2.0m

SLR

Floor 2
4/5 Lochside View
Edinburgh Park
Edinburgh
EH12 9DH

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Web: www.slrconsulting.com

Project : Torfichen Wind Farm

res

Project No. :- 405.064791.00001

Date :- July 2023

Peat Auger 01
2.0 – 2.2m

Peat Auger 02
0 – 1.0m

SLR

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Edinburgh
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Web: www.slrconsulting.com

Project : Torfichen Wind Farm

res

Project No. :- 405.064791.00001

Date :- July 2023

Peat Auger 03
0 - 1.0m

Peat Auger 03
1.0 – 1.2m

SLR

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Project : Torfichen Wind Farm

res

Project No. :- 405.064791.00001

Date :- July 2023

Peat Auger 04
0 – 1.0m

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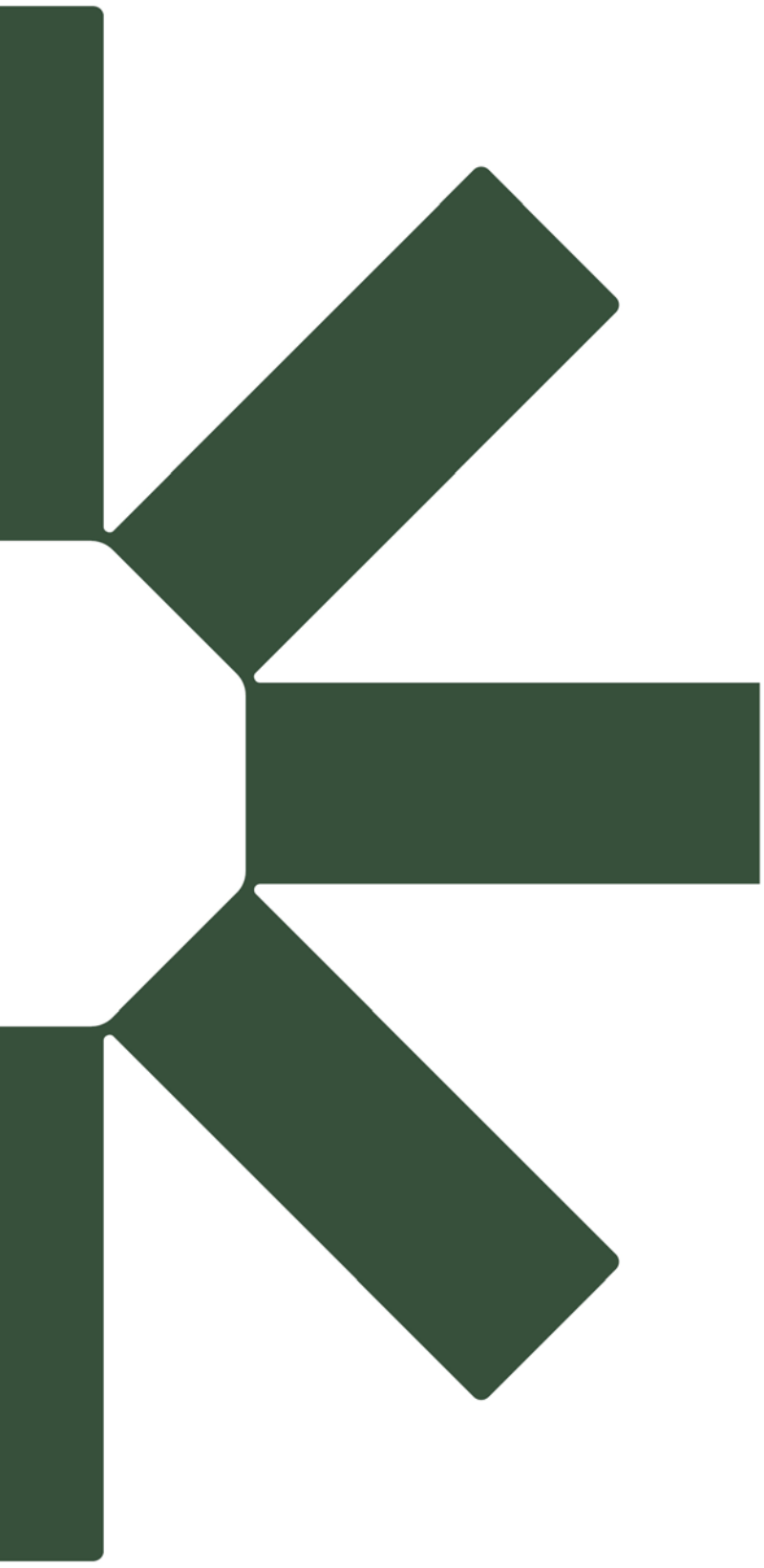

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