Appendix 8.3: Outline Peat Management Plan
Millennium East Wind Farm

Table of Contents

1 Introduction

This Outline Peat Management Plan (OPMP) document has been prepared by Fluid Environmental Consulting (Fluid) on behalf of the RSK Ltd to support the Environmental Impact Assessment Report (EIAR) for Millennium East Wind Farm (the 'Proposed Development'). The Site (**Figure 8.1** of the EIAR) is located approximately 50 km southwest of Inverness and 8 km west of Fort Augustus within the Highland Council administrative area and covers an area of approximately 190 km^2.

The Site is characterized by having an existing adjacent active Millennium and Millennium Extension Wind Farm around the ridgeline. The Proposed Development uses the existing Millennium Wind Farm access track from A887 in the River Moriston valley in the north to undulating upland terrain on a broad ridgeline mostly covered by open moorland. The Site generally slopes to the north into numerous tributaries of the River Moriston with some areas on the top sloping to the northeast towards the River Oich and southeast and south towards the River Garry surface water catchments. The elevations of the Site range from 129 m AOD at the Site entrance by A887 to 670 m AOD at the mid-western section of the ridgeline.

The Proposed Development comprises approximately 2.27 km of new access tracks; up to eight turbine locations and associated crane hardstandings; a substation; five temporary construction compounds and extension to an existing borrow pit.

The total area of the Proposed Development infrastructure (55,405 m^2) and associated earthworks (72,875 m^2) is 128,299 m^2.

The design of the Proposed Development has been undertaken as an iterative process to avoid areas of peat and deeper peat, using existing tracks where possible considering other constraints to minimise the disturbance of peat. Further details on the iterative design process are discussed in **Chapter 2: Proposed Development** of the EIAR and the Design and Access Statement.

The OPMP will be further developed and implemented after the Proposed Development receiving consent from the Scottish Government in consultation with SEPA, NatureScot and The Highland Council (the Council). Further details and specific plans will be determined during the detailed design process and once further site investigations have been undertaken. These details will then be included in a detailed PMP as a part of the Contractor's detailed Construction Environmental Management Plan (CEMP). The responsibility for the implementation of the detailed PMP will be with the Principal Contractor (PC).

This OPMP has been developed due to the presence of peat (see **Chapter 8: Hydrology, Geology, Hydrogeology and Peat**) and potential peatland habitats on the Site (**Chapter 6: Ecology** of the EIAR) and as requested by SEPA at scoping and should be read in conjunction with the Peat Survey Report included as **Appendix 8.2** of the EIAR.

The potential volumes of peat extracted and re-used have been calculated based on an area specific or infrastructure specific basis, using a modelled peat contour plan developed on a high-density probing grid where excavations will be undertaken (Scottish Government, Scottish Natural Heritage, SEPA (2017) *Peatland Survey. Guidance on Developments on Peatland and IUCN (2024)National Committee United Kingdom Peatland Programme Peatland Code*

Guidance). This has allowed high levels of confidence in the estimation of the volumes of peat that will be excavated and that will require appropriate re-use.

This OPMP addresses the management of peat during the construction period for the Proposed Development and the restoration of the site both during construction and once construction has been completed. In accordance with the SEPA Regulatory Position Statement (2010) Developments on Peat, as much excavated peat as possible is reused on site.

2 Objectives

This OPMP has been developed to demonstrate that peat has been afforded significant consideration during the design and assessment process and will be afforded necessary protection during the construction phase of the Proposed Development, should consent be granted. It proposes mitigation and enhancement measures that will minimise any impacts to peat and presents the long-term habitat restoration and management plans to enhance the Site.

The OPMP outlines the overall approach of minimisation of peatland disruption that has been adopted during the design stage (as detailed in EIAR **Chapter 2**). It aims to ensure that all further opportunities to minimise peat disturbance and extraction will be taken.

The OPMP seeks to demonstrate that appropriate proposals to re-use the surplus peat can be accommodated within the Site, without significant environmental or health and safety implications, to minimise risk in terms of carbon release and human health.

3 Structure

The structure of the OPMP is as follows:

- Section 4 sets out the legislation, policy, and guidance, and the role of the outline peat management plan;
- Section 5 presents the definition of peat, details of peatland characteristics and peat conditions on Site;
- Section 6 states the principles of avoidance and minimisation of peat disturbance;
- Section 7 presents the infrastructure and areas considered for excavation or floating and the assumptions that the calculations are based on;
- Section 8 presents the peat excavation volumes and sensitivity associated with the Proposed Development;
- Section 9 presents the proposed reuse of excavated peat and the overall peat balance;
- Section 10 details the general peat excavation and handling methods / controls and temporary peat storage;
- Section 11 discusses the general methodologies for reuse in infrastructure construction restoration and in habitat enhancement; and

- Section 12 provides a summary.

Tables are included showing:

- **Table 1:** a summary of depth of penetration probe data.
- **Table 2:** a summary of interpreted peat depth at infrastructure areas.
- **Table 3** and **Table 4**: a summary of dimension and area details of the infrastructure and associated excavation areas on peat.
- **Table 5**: presents the sensitivity of the peat and soils where it interacts with the proposed infrastructure.
- **Table 6:** where excavated peat will be re-used and the associated quantities.
- **Table 7:** a summary of the peat extraction and re-use balance.

The following EIA Report figures are referenced throughout where relevant:

- **Figure 8.9**: Depth of Penetration
- **Figure 8.10:** Estimated Peat Depth
- **Figure 8.11**: Peat Reinstatement Areas
- **Figure 8**.12: Peat Restoration Areas

4 Legislation, Policy and Guidance for Peat Management

4.1 Legislation Policy and Guidance

When considered as part of a carbon landscape, peat has a capacity to act as a carbon sink. The management of peat therefore has implications for carbon emissions and climate change. There is a substantial body of legislation, policy and guidance regarding climate change and carbon which is relevant to the management of peat including:

- *The Carbon and Water Guidelines.* Carbon Landscapes and Drainage, 2012 www.clad.ac.uk;
- IUCN National Committee United Kingdom Peatland Programme Peatland Code Guidance v 2.1 (2024);
- Forestry Commission, 2011, 'Forests and climate change: UK Forestry Standard Guidelines;
- National Planning Framework 4 (NPF4), Scottish Government, 2023;

- Scotland's National Peatland Plan Working for our future. Scottish Natural Heritage, 2015;
- Best Practice Guidance to Planning Policy Statement 18 'Renewable Energy', August 2009;
- *Peatland Survey: Guidance on Developments on Peatland*. Scottish Government, Scottish Natural Heritage, SEPA, 2017;
- *Good practice during windfarm construction* (Scottish Renewables, SNH, SEPA & Forestry Commission Scotland, 4th Edition 2019)*;*
- SEPA Regulatory Position Statement – Developments on Peat. February 2010;
- Guidance on the Assessment of Peat Volumes, Reuse of Excavated Peat and the Minimisation of Waste. Scottish Renewables, 17 January 2012;
- Floating Roads on Peat: A Report into Good Practice in Design, Construction and Use of Floating Roads in Peat with particular reference to Windfarm Developments in Scotland. Forestry Civil Engineering and SNH, 2010;
- *Forestry Commission (2012).* Forests & Water Guidelines. 5th Edition. HMSO;
- Peat Slide Hazards and Risk Assessments: Best Practice Guide for Proposed Electricity Generation Developments. Scottish Executive, 2017; and
- Towards an assessment of the state of UK Peatlands. JNCC, 2010.

4.2 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 CEMP.

4.2.1 Stage 1: Environmental Impact Assessment Report (EIAR)

It is necessary to show how, through site investigation and iterative design, the Proposed Development has been designed to minimise, so far as reasonably practicable, the quantity of peat which will be excavated; that volumes of peat anticipated to be excavated by the Proposed Development have been considered; and how excavated peat will be managed. The overall aim is to minimise the impacts associated with excavation of peat by using the following hierarchy of design principles: prevent excavation; reduce volumes of peat excavated; and reuse excavated peat in a manner to which it is suited. This hierarchical approach comprises:

1. Initial assessment of peat coverage on site based on a broad 100m grid;
2. Design of layout based on various constraints including peat occurrence on site;
3. Further detailed site surveys undertaken to obtain peat depth across the proposed layout and micro-siting allowance and iteration as necessary;

4. Calculation of estimated volumes of excavated peat and potential reuse volume requirements based upon the proposed site design / layout;

5. Determine whether there is likely to be negative or positive overall peat balance, and whether the generation of excess material can be avoided, and, if not, where reductions in the volumes of excavated materials may be achieved;

6. The layout is refined to avoid areas of deeper peat and hence reduce carbon impacts of the Proposed Development's construction activities;

7. Further surveys undertaken if required in new sections of infrastructure;

8. Record specific examples of how overriding principles of prevention and minimisation of peat disturbance are to be taken into account in the design of the Site;

9. The assessment is to be consistent with and feed into the peat stability and carbon payback assessment; and

10. Identify limitations and make recommendations for further site investigation (post-consent) to steer detailed design and micro-siting such that opportunities for further reductions in excavated peat volumes can be implemented where possible.

4.2.2 Stage 2: Post Consent / Pre-Construction

As part of the EIA Report it has been demonstrated that, on the basis of the investigation and data gathered, the excavated materials for the Proposed Development can be managed in an appropriate manner. The peat mass balance calculations may be further developed and refined post planning consent, and prior to the relevant works commencing, as a consequence 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.

4.2.3 Stage 3: Construction Stage

Actual peat volumes excavated during construction will be recorded against the overall predicted volumes provided in **Tables 5** and **6** of this OPMP. Within micro-siting allowances, the alignment and design of tracks, hardstanding orientation and construction methods will be reviewed to avoid/minimise peat disturbance as far as possible taking account of 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 Environmental Clerk of Works (EnvCoW) on site and made available to regulators as required.

5 Peat Conditions

5.1 Definitions of Peat

Organic material less than 0.5 m depth is not defined as peat. This is in accordance with guidance from:

- Scottish Government, Scottish Natural Heritage, SEPA (2017) Peatland Survey. Guidance on Developments on Peatland states that *'Peat soil is an organic soil which contains more than 60 per cent of organic matter and exceeds 50 centimetres in thickness'*;

- The James Hutton Institute define shallow peat as having 'a prescribed depth of organic matter of 50 – 100 cm' (https://www.hutton.ac.uk/learning/exploringscotland/soils/organicsoils); and
- The Forestry Commission use 45 cm as the critical depth for peat to occur (*Understanding the GHG implications of Forestry on Peat Soils in Scotland,* 2010).

Peat can therefore be classified as organic material over 0.5m in depth.

Peat can be separated into three main layers: acrotelmic (the upper living layer), catotelmic (the middle to lower layer) and occasionally amorphous (lower layer) peat:

- Acrotelmic peat is the living layer of the peat including the peat turf being a thin, floating vegetation mat layer. The acrotelm is generally found within the top layer of peat (often less than 0.5 m) depending on the degree of decomposition and fibrous nature of the peat (approximately H1 to H5 on the Von Post classification scale). The acrotelm is generally of high permeability, decreasing with depth. The water table fluctuates in this layer and conditions vary from aerobic to anaerobic. Material may be fibrous or pseudofibrous (plant remains recognisable), spongy, and when excavated strength is lost but retains integral structure and can stand unsupported when stockpiled up to 1 m.

- Catotelmic peat is the dead layer of peat found deeper than acrotelmic peat which has some remnant plant structures. Material has high water content and is permanently below the water table (saturated) therefore organic matter decomposes anaerobically. Some plant structures may be recognisable but are highly humified losing most of their characteristics (approximately H6 to H8 on the Von Post classification scale) and strength. Water flow through the catotelm is slow unless peat structures such as sink holes or peat pipes are present.

- Amorphous peat is highly decomposed organic material where all recognisable plant remains are absent (approximately H9 to H10 in the Von Post classification scale). These deposits are dark brown to black in colour, plastic, are low tensile strength and are unable to stand unsupported up to 1 m when stockpiled.

5.2 Peat Conditions on Site

The Site was assessed for peat vegetation through desktop review of maps and plans and field surveys by ecologists and hydrologists; including intrusive site investigation in terms of peat depth probing and coring (see **Appendices 6.1** and **8.2** of the EIAR).

The Proposed Development is located on upland moorland that slopes from higher areas in the west to lower areas in the east and north. The site is mostly bare moorland scattered with bog poolspeat hags and erosional gullies, with a small area of forestry located in the lower areas to the north along the existing Millennium Wind Farm access track.

Peat cover was found to be present across 56% of the Peat Survey Area (**Appendix 8.2**). Much of the peat is concentrated in the east of the Site, with depths up to 3.5 m found in areas in the east of the Site. Most of the infrastructure has been designed to avoid the deeper peat areas

by being located in the western areas with less peat and close to existing access tracks, where possible.

The peatland habitats are degraded in areas by existing wind farm activities and erosional gullies; however some good habitat and bog pools are also present across the Site. The depth of the peat does not always relate to the quality of the overlying peatland habitat. The peatland habitats and peat condition are assessed in **Chapter 6 Ecology** and **Appendix 6.1: Habitats and Vegetation**.

5.3 Peat Surveying Methodology

To obtain a detailed understanding of the spatial and depth distribution of peat and its properties, a series of tasks have been completed which include:

- Phase 1 habitat mapping (detailed within **Chapter 6**, **Appendix 6.1**, and shown in **Figures 6.2 and 6.3** of the EIAR);
- Depth penetration probing (see **Appendix 8.2** and **Figure 8.9** of the EIAR) at 3,233 locations within the site boundary:
    - On a 100 m grid across the Peat Study Area (area originally considered for development);
    - across the footprint of all infrastructure within peat areas on a 10 m grid and probing within a 50 m buffer area on a 20 m grid; and
    - at 50 m intervals with 10 m offset probes along all proposed access tracks.
- Peat coring at 25 locations to verify the probing is representative of peat depth and to assess the peat structure and properties (see **Appendix 8.2** of the EIAR);
- Development of a penetrable substrate depth map to indicate the maximum depth of probe penetration at all investigated points across the site (**Figure 8.9** of the EIAR);
- Development of an interpreted maximum depth of peat contour map to indicate the potential penetrable substrate or inferred peat depth based on the depth penetration probing results and verified by coring (**Figure 8.10** of the EIAR); and
- Examination of the variability of the depth of the acrotelm, the thickness of the catotelm and the thickness of amorphous peat.

5.4 Peat Survey Results

Each probe measured the depth of penetration and the potential substrate at the limit of penetration (see **Appendix 8.2** and **Figure 8.9** of the EIAR).

Of the 3,233 locations probed a total of 1,877 probes (58.2%) recorded depths of 0.5m or less (no peat), 919 probes (28.5%) recorded depths of penetration between 0.5m and 1.0m and 427 probes (13.2%) recorded depths of penetration >1.0m, as shown in **Table 1**.

Table 1: Depth of Penetration Distribution

Depth Range (m)	Number of Probes	Percentage of Probes
0 – 0.5	1,877	58.2%
0.5 - 1.0	919	28.5%
1.0 – 1.5	280	8.69%
1.5 - 2.0	113	3.51%
2.0 – 3.0	32	0.99%
>3.0	2	0.06%
Total	3,223	100.0%

The depth of penetration at each probe location within the peat survey area is presented on **Figure 8.9** of the EIAR.

Based on the data collected an interpreted peat depth map (**Figure 8.10** of the EIAR) was produced to demonstrate the variation in peat across the survey area and at the various infrastructure locations. The peat depth within the infrastructure footprint is presented in **Table 2**.

Table 2: Peat Penetration Depth across the Infrastructure and Earthworks Footprint

Depth Range (m)	Peat depth distribution across infrastructure and earthworks footprint (m^2)	Peat depth percentage distribution across infrastructure and earthworks footprint
0 to 0.5 (no peat)	81,493	65.46%
>0.5 – 1.0	33,634	27.02%
>1.0 – 1.5	8,264	6.64%
>1.5 – 2.0	1,097	0.88%
Total	124,489	100.00%

The data indicates that peat (>0.5 m depth) is present across 34.54% of the Proposed Development infrastructure and associated earthworks and no peat (0 – 0.5 m depth) is present across 65.46% of the Proposed Development infrastructure and associated earthworks. The OPMP is therefore only concerned with the 34.54% of the infrastructure and earthworks footprint that overlies peat.

A total of 25 cores were completed with all 25 cores encountering peat (greater than 0.5 m depth). The peat depth minus the acrotelm depth can been used to calculate the potential catotelm thickness.

5.5 Peat Characteristics

The coring identified a distinctive acrotelm layer in 23 of the 25 coring locations that ranged between 0.10 m and 0.20 m in thickness and averaged 0.13 m where present. In two locations

there was no identifiable acrotelm layer due to peat erosion. The catotelm thickness ranged between 0.45 m and 1.30 m in the 25 cores where present.

No amorphous peat was identified or recorded on site.

These values have been used in calculations of volumes of peat across the Peat Survey Area where the peat contour map indicates that peat is present (e.g. >0.5 m probe depth).

6 Avoidance and Minimisation of Peat Disturbance

6.1 Avoidance

The development of the infrastructure layout has been an iterative process designed to avoid or minimise impact on blanket bog habitats and peat where possible. The mapping of peat depth through probing has therefore allowed a peat depth contour map to be generated with a greater level of detail at proposed infrastructure locations to inform further layout modifications to enable higher confidence in the avoidance of peat. Where avoidance of peat has been unavoidable for any section of track, a floating track design is proposed, if feasible. The infrastructure has also been designed to avoid areas where peat slide risk is moderate or higher (**Appendix 8.5** of the EIAR). The final iteration of the infrastructure layout was informed by detailed peat probing across all infrastructure which resulted in layout modifications that further reduced the presence of infrastructure located on peat to 27.02% and on peat >1.0 m depth to 6.64 % of its footprint including earthworks. No infrastructure or earthworks or earthwork excavations are on peat >2 m in depth.

6.2 Further Minimisation

The disturbance of peat by the construction of the tracks, crane hardstandings, turbine foundations and other infrastructure will be minimised as far as practicably possible, taking into account the other constraints to the Proposed Development, to try and reduce any peat waste on site and the need for a waste management licence, and reduce potential carbon losses from the peat excavation process.

Throughout the construction process, the appointed Principal Contractor (and / or Designer) will aim to minimise the volumes of excavated peat. Appropriate handling and storage of excavated materials will be undertaken such that their integrity and subsequent reuse is not jeopardised.

Adjustment of infrastructure within the micro siting limits (proposed as 50 m) could allow further improvements. Further measures to minimise peat disturbance will be incorporated in the development and construction process. The principles of the waste hierarchy (outlined above) will be applied to:

- avoid and/or minimise production of excavated peat;
- reuse, where possible, excavated peat on site to facilitate habitat, ecological and hydrogeological restoration, improvement and enhancement; and
- avoid waste peat being sent for disposal, recovery and/or reuse off site.

All contractors will be made aware of the sensitivity of peat and wetland habitats and will be required to work within the narrowest practical construction corridor when working in or near areas of peat.

All plans and method statements will be accompanied by justification of the final design and/or construction methods identified by the Contractor, including reasons for discounting alternative methods. This is required to demonstrate that all avenues for avoiding hydrological disruption and reducing the disturbance and excavation of peat have been considered.

It is anticipated that an EnvCoW will be appointed and will:

- identify areas of sensitive habitat;
- clearly mark sensitive habitats near to construction areas and make the Principal Contractor aware of the sensitivity of peat habitats and inform all sub-contractors;
- walk the areas affected by the Proposed Development with engineers before construction commences;
- authorise minor movement of infrastructure within the 100m micro-siting areas where impact can be reduced; and
- monitor construction to ensure that any micro-siting does not result in movements into more sensitive habitats and deep peat unless unavoidable.

7 Peat Excavation Areas and Assumptions

The Proposed Development infrastructure and dimensions including associated earthworks used in the peat balance calculations are summarised in **Table 3**.

Table 3: Infrastructure and Associated Earthworks Dimension Final Layout

Infrastructure	Dimensions (m)	Area (m^2)
T01 Turbine and Crane Hardstanding(Permanent)	Irregular (appr.33x78)	3,478
T01 Earthworks	Irregular (appr.13x100)	2,219
T02 Turbine and Crane Hardstanding(Permanent)	Irregular (appr.33x78)	3,639
T02 Earthworks	Irregular (appr.7x87)	2,468
T03 Turbine and Crane Hardstanding 3 (Permanent)	Irregular (appr.33x78)	3,479
T03 Earthworks	Irregular (appr.63x109)	6,271
T04 Turbine and Crane Hardstanding (Permanent)	Irregular (appr.33x78)	3,479

Infrastructure	Dimensions (m)	Area (m^2)
T04 Earthworks	Irregular (appr.16x61)	4,142
T05 Turbine and Crane Hardstanding(Permanent)	Irregular (appr.33x78)	3,637
T05 Earthworks	Irregular (appr.31x84)	7,611
T06 Turbine and Crane Hardstanding(Permanent)	Irregular (appr.33x78)	3,639
T06 Earthworks	Irregular (appr.23x94)	4,165
T07 Turbine and Crane Hardstanding(Permanent)	Irregular (appr.33x78)	3,639
T07 Earthworks	Irregular (appr.33x49)	2,972
T08 Turbine and Crane Hardstanding(Permanent)	Irregular (appr.33x78)	3,639
T08 Earthworks	Irregular (appr.247x26)	11,509
Substation	Regular (appr. appr. 40x50)	2,000
Substation Earthworks	Irregular (appr.5x36)	224
Temporary Construction Compound (Entrance/northern most)	Regular (appr. 20x20)	400
Temporary Construction Compound (North)	Regular (appr. appr. 40x20)	800
Temporary Construction Compound (South)	Regular (appr. appr. 35x80)	4,000
Temporary Construction Compound (West)	Regular (appr. appr. 40x100)	1,000
Main Temporary Construction Compound	Regular (appr. 33 x 80)	2,640
One Borrow Pit Extension	Irregular (appr. 61x80)	2,365
New Track	Irregular (appr. 5.5x2659)	14,623
New Track Earthworks	Irregular (appr.20x285)	27,629
Floating Track	Irregular (appr. 5.5x256)	1,314
Floating Track Earthworks	Irregular (appr. 4x256)	1,318
Total		**128,299**

The calculations are based on the GIS footprint and earthworks provided for Proposed Development.

8 Excavation Volume Estimates

8.1 Excavated Volumes

Peat excavation volumes associated with the project have been calculated using the GIS package QGIS based on the data in **Table 3** and these further assumptions:

- A contour map of assumed peat depth based on interpolation of values from probing across the site (shown in **Figure 8.10** of the EIAR);
- Dimensions of the proposed areas for excavation for site infrastructure on peat of >0.5 m based on the Final layout shape files provided (shown in **Figure 8.10** of the EIAR and detailed in **Table 3**;
- An estimated acrotelm depth of 0.13 m across infrastructure area where peat (>0.5 m organic soil) is present based on the peat core data;
- An estimated catotelm thickness of the average depth of the peat minus the acrotelm (0.12 m) across infrastructure areas where peat is present and based on the peat core data;
- An assumption that the probe depth is representative of the actual depth of the peat (validated by the spatial coverage of 25 cores); and
- Any peat excavated for cable trenches is stored adjacent to the trench while the track is laid and then replaced, therefore this volume is not applicable to the excavated volume.

Using the interpreted peat depth contour map (**Figure 8.10** of the EIAR), the volumes of peat that would be excavated during construction were calculated based on the final layout infrastructure dimensions (ESRI shapefiles) as shown in **Table 3**. These calculations produced the following volume estimates and are detailed in **Table 4**.

- A total volume of peat to be excavated of 33,113 m^3. This comprises:
    - Total volume of acrotelm which will be excavated = 5,252 m^3; and
    - Total volume of catotelm which will be excavated = 27,861 m^3.

These values are estimates based on the available data and the above assumptions.

- A bulking factor of 10% is applied to these values which increases them to a total volume of peat once excavated = 36,425 m^3. This comprises:
    - Total volume of acrotelm once excavated = 5,778 m^3; and
    - Total volume of catotelm once excavated = 30,647 m^3.

Table 4: Excavated Peat Volumes Based on Actual Footprint of Infrastructure and Earthworks

Infrastructure	Infrastructure area (m^2)	Area of infrastructure with >0.5m depth of peat (m^2)	Percentage of infrastructure with >0.5m depth of peat	Average peat depth over area of infrastructure	Average peat depth over area of infrastructure with >0.5m depth of peat (m)	Volume of peat excavated (m^3)	Volume of acrotelm peat excavated (m^3)	Volume of catotelm peat excavated (m^3)
T01 Turbine and Crane Hardstanding (Permanent)	3,478	232	7	0.2	0.7	171	30	140
T01 Earthworks	2,219	189	9	0.2	0.7	130	25	105
T02 Turbine and Crane Hardstanding (Permanent)	3,639	50	1	0.2	0.6	28	7	22
T02 Earthworks	2,468	0	0	0.1	0.0	0	0	0
T03 Turbine and Crane Hardstanding (Permanent)	3,479	519	15	0.3	0.7	345	67	278
T03 Earthworks	6,271	1,698	27	0.3	0.7	1,228	221	1,007
T04 Turbine and Crane Hardstanding (Permanent)	3,479	3,046	88	0.8	0.8	2,521	396	2,125
T04 Earthworks	4,142	3,129	76	0.7	0.9	2,774	407	2,367
T05 Turbine and Crane Hardstanding (Permanent)	3,637	2,830	78	0.7	0.8	2,183	368	1,815
T05 Earthworks	7,611	4,746	62	0.6	0.8	3,613	617	2,996

Infrastructure	Infrastructure area (m^2)	Area of infrastructure with >0.5m depth of peat (m^2)	Percentage of infrastructure with >0.5m depth of peat	Average peat depth over area of infrastructure	Average peat depth over area of infrastructure with >0.5m depth of peat (m)	Volume of peat excavated (m^3)	Volume of acrotelm peat excavated (m^3)	Volume of catotelm peat excavated (m^3)
T06 Turbine and Crane Hardstanding (Permanent)	3,639	800	22	0.3	1.0	763	104	659
T06 Earthworks	4,165	1,953	47	0.6	1.0	1,959	254	1,705
T07 Turbine and Crane Hardstanding (Permanent)	3,639	778	21	0.3	0.8	587	101	486
T07 Earthworks	2,972	704	24	0.4	0.7	499	92	407
T08 Turbine and Crane Hardstanding (Permanent)	3,639	57	2	0.2	0.6	33	7	25
T08 Earthworks	11,509	706	6	0.2	0.7	510	92	419
Substation	2,000	0	0	0.0	0.0	0	0	0
Substation Earthworks	224	0	0	0.1	0.0	0	0	0
Temporary Mobilisation Compound (Entrance/northern most)	400	0	0	0.0	0.0	0	0	0
Temporary Construction Compound (North)	800	0	0	0.0	0.0	0	0	0

Infrastructure	Infrastructure area (m^2)	Area of infrastructure with >0.5m depth of peat (m^2)	Percentage of infrastructure with >0.5m depth of peat	Average peat depth over area of infrastructure	Average peat depth over area of infrastructure with >0.5m depth of peat (m)	Volume of peat excavated (m^3)	Volume of acrotelm peat excavated (m^3)	Volume of catotelm peat excavated (m^3)
Temporary Construction Compound (South)	4,000	0	0	0.0	0.0	0	0	0
Temporary Construction Compound (West)	1,000	0	0	0.0	0.0	0	0	0
Main Temporary Construction Compound	2,640	0	0	0.0	0.0	0	0	0
New Track	14,623	4,210	29	0.4	0.8	3,323	547	2,775
New Track Earthworks	27,629	14,756	53	0.5	0.8	12,447	1,918	10,529
One Borrow Pit Extension	2,365	0	0	0.0	0.0	0	0	0
Floating Track	1,314	1,283	98	1.3	1.3	0	0	0
Floating Track Earthworks	1,318	1,309	99	1.4	1.4	0	0	0
Total	**128,299**	**42,995**	**763**	**9.9**	**15.7**	**33,113**	**5,252**	**27,861**

Note: Where rows do not exactly add up this is due to rounding up of values.

8.2 Peat Sensitivity

The sensitivity of the peat can be determined by both the depth and the quality of the peat. Unmodified peat greater than 1 m in depth is of higher sensitivity, while modification (such as grazing, drainage, peat cutting or forestry) and less than 1 m depth of peat reduces the sensitivity of the peat for excavation. Some of peat within the Site is in a modified condition largely due to the existing wind farm activity, grazing and erosional areas. (**Chapter 6: Ecology**). The summary of the peat across the infrastructure is detailed below in **Table 5**.

Table 5: Peat Summary of Individual Infrastructure

Peat Presence	Ground / Peat Condition	Infrastructure including associated earthworks	Sensitivity
<0.5m (no peat)	Partially modified / moderate condition	T01, T06, T07, T08 New Access track	Low
	Heavily modified /poor condition	T02, T03, Substation, Temporary Construction Compounds, Borrow Pit and Sections of Existing Access Track.	Low
Peat 0.5m to <1m	Unmodified / good condition	T04, Sections of Floating Track and Access Track	High
	Partially modified / moderate condition	T05, T06 earthworks	Moderate
Peat >1m	Unmodified / good condition	Sections of Floating Access Track and Access Track	Very High
	Partially modified / moderate condition	Sections of Floating Access Track and Access Track	High

The Site and Peat Survey Area is mostly open upland moorland and over 25% of the Peat Survey Area is on peat depth of 0.5 m to 1.0 m depth (**Appendix 8.2 Peat Survey Report, Table 3)** and in open terrain. Therefore, sensitivity for peat disturbance across the Site overall is **Medium** (based on **Chapter 8 Table 8.3)**.

Based on the peat survey area, the average peat depth across the survey area is 0.94 m. There is approximately 7,828,590 m^2 area of peat and 7,358,874 m^3 volume of peat on the Site. A total of 36,425 m^3 volume of peat including earthworks and bulking factor will require excavation for the Proposed Development. This is calculated on average as approximately 4,450 m^3 of excavated peat per turbine or approximately 0.5% of the Peat on the Site (within the Peat Survey Area) will be excavated as part of the Proposed Development which is lower

proportionally many recent Scottish wind farm applications. Therefore, the magnitude of effect on peat volume disturbance is assessed as Low (based on the **Chapter 8 Table 8.4** Magnitude Criteria).

A Low magnitude effect on a Moderate sensitivity receptor is assessed as being of **Low Significance (not significant)** (**Chapter 8 Table 8.3**) if the excavated peat from the Proposed Development can be appropriately re-used.

9 Peat Restoration and Reuse Volume

9.1 Peat Restoration Areas

The peat on Site is experiencing erosion in numerous locations and will continue to do so without intervention. There are numerous gullies of varying size which are draining and dewatering the peatlands, and transferring peat particles away from the Assessment Boundary and into watercourses. There are areas of bare peat at the base of the gullies, and at the margins peat is often exposed and is resulting in continued gradual degradation.

This type of restoration is beneficial as:

- The excavated peat can be placed directly into the restoration area so there is no storage required where the peat be subject to weathering, dewatering and erosion; and
- The isolated area of peat will only diminish further if not protected and become more vulnerable.
- Connecting the isolated area and the wider area will both expand the extent of peat and protect both areas from current ongoing erosion.

Two further areas of peat restoration will be undertaken for an existing hard standing area and borrow pit are associated with the original Millenium wind Farm after being reused for this Proposed Development for the southern temporary construction compound and borrow pit respectively. This will improve peat conditions and link habitat areas together developing the continuation of habitats around the existing infrastructure.

The translocation of excavated peat will be used up to depths of 0.75 m to restore erosional areas and up to 1.0 m depth to restore existing infrastructure hard areas as shown in **Figure 8.12.**

The restoration of these areas is presented in the **Outline Biodiversity Enhancement Management Plan (oBEMP) Appendix 6.7.**

9.2 Peat Reuse Volumes

From **Table 3** and **Table 4** above, the amount of peat that will be removed by the excavation of the infrastructure is 5,252 m³ acrotelm and 27,861 m³ catotelm. This will increase in size due to bulking by an estimated 10% once excavated to 5,778 m³ of acrotelm and 30,647 m³ of catotelm.

The areas identified for peat reinstatement are those that have been excavated and are linked to existing areas of peat. The peat will be reinstated to the average depth of peat >0.5 m present in these areas. The areas are outlined in **Table 6** below and shown in **Figure 8.11**, they include:

- Reinstatement within the earthwork areas which are connected to peat. This gives a total volume of 13,240 m³. The depth will be consistent with the surrounding peatland habit and so vary with each area.

Table 6: Estimated Potential Peat Reuse Volumes for Excavated Peat

Reuse Location	Reuse Summary	Acrotelm volume (m^3)	Catotelm volume (m^3)	Total Volume (m^3)
T03 Earthworks	Backfill earthworks with 0.5 m depth of peat.	753	2,383	3,136
T04 Earthworks	Backfill earthworks with 0.5 m depth of peat.	497	1,574	2,071
T05 Earthworks	Backfill earthworks with 0.5 m depth of peat.	913	2,892	3,806
T06 Earthworks	Backfill earthworks with 0.5 m depth of peat.	500	1,583	2,083
T07 Earthworks	Backfill earthworks with 0.5 m depth of peat.	357	1,748	1,486
Floating Track Earthworks	Embankment infill earthworks with 0.5 m depth of peat.	158	501	659
		3,177	**10,681**	**13,240**

Note: Where rows do not exactly add up this is due to rounding up of values.

The re-use of the excavated peat has taken a conservative approach in terms of the areas that will be possible to restore and the depths achievable.

9.3 Net Peat Balance

The total volume of peat predicted to be excavated, 36,425 m^3 including bulking factor. A total of 41,457 m^3 has been identified for reuse, including restoration activities across the Site as detailed in the **Appendix 6.7**. This reuse volume exceeds the volume to be excavated, indicating that all excavated peat will be suitably reused on Site, with additional restoration proposed in areas of degraded peat.

The peat balance demonstrates that peat will be retained and reused as far as practicable, supporting the principles of peat minimisation and site restoration. The summary of volumes is provided in **Table 7** below.

Table 7: Net Peat Balance

	Acrotelm volume (m^3)	Catotelm volume (m^3)	Total Volume (m^3)
Excavated Peat (including bulking factor)	5,778	30,647	36,425

	Acrotelm volume (m^3)	Catotelm volume (m^3)	Total Volume (m^3)
Peat Reuse (infrastructure)	3,177	10,681	13,240
Peat Restoration (existing infrastructure and erosional gullies)	3,443	20,593	28,217
Total Balance	-842	-627	-5032

10 Handling Excavated Materials

The following section summarises the management of excavated peat and reference should be made to **Appendix 8.1: Good Practice Methods** for details on the good practice environmental management practices to be employed during construction of the Proposed Development.

10.1 Excavation

The following methodologies for excavation of peat are recommended:

- Areas of peat within the footprint of any excavation will have the top layer of vegetation stripped off as turf, prior to construction by an experienced specialist contractor. When excavating areas of peat, the excavated turfs should be kept as intact as possible. Often it is easiest to achieve this by removing large turfs up to 500 mm to keep the peat intact.
- These turfs should be stored adjacent to the construction area such that they remain moist and viable (see temporary storage below). Excavated turfs should be as intact as possible to minimise carbon losses. Stacking of turfs will be avoided to best preserve the viability of the vegetation layer.
- Peat will then be removed, stored separately and kept damp (Carbon and Water Guidelines, 2012).
- Excavated soils and turfs will be handled to avoid cross contamination between distinct horizons and allow reuse potential to be maximised.
- Mineral soil and aggregate will be kept separate from peat or peaty soils to avoid contamination (which could result in a change in chemical or hydrological properties in the peat, reducing the likelihood of successful reinstatement on placement).
- Prior to any excavations, the Principal Contractor will produce a detailed Method Statement identifying where and how excavated peat will be used in reinstatement works. Specific requirements for the excavation, handling, storage and reinstatement of peat will be outlined in this Method Statement. The Principal Contractor will consider potential impacts on downstream hydrological receptors in consultation with EnvCoW, and the potential for instability issues with the excavated material.

- Care will be taken when stripping and removing topsoil and peat turfs and appropriate storage methods used on-site, i.e. excavated material will be stored in separate horizons and vegetation rich top layers will be stored vegetation side up.
- Classification of excavated materials will depend on their identified re-use in reinstatement works. At this site it is anticipated that the material to be excavated will comprise peat (which may be sub-divided into turf, acrotelm and catotelm/amorphous), peaty soils and mineral soils (subsoil and topsoil).

10.2 Temporary Storage

Following excavation, peat will be required to be temporarily stored before reuse, where the material is planned for placement in either, the auxiliary construction compound or the areas of temporary hardstanding, as these will not be available until after the construction period. Excavated peat should be stored in stockpiles to minimise carbon losses while being stored.

Where possible, excavated turfs will be stored adjacent to the construction area such that they remain moist and viable.

Areas of temporary storage required for peat will be identified in the Principal Contractor's Method Statement taking into account constraints and mitigation requirements identified in further pre-construction investigations. This will describe any intended drainage, pollution prevention and material stability mitigation measures that may be required. The following general guidelines will apply:

- The appropriate temporary storage areas for excavated peat will be as close to the excavation as practicable.
- Temporary peat storage areas require the ground conditions to be suitable for loading, the peat slide risk and the topographical gradients to be low and to be located outside of the main watercourse buffers.
- The design and location of stockpiles, including incorporated drainage elements, will be agreed with the EnvCoW and Geotechnical Consultant / Geotechnical Clerk of Works prior to excavation works commencing.
- Temporary peat storage areas should be located so that erosion and run off is limited, leachate from the material is controlled, and stability of the existing peatland in the vicinity is not affected.
- Excavated material is to be stockpiled at least 50 m away from watercourses. This will ensure that any wetting required on stored peat does not runoff and discharge into adjacent watercourses.
- Any edges of cut peat that may remain exposed, or areas of peat excavation on steep slopes, will be covered with geotextile or similar approved. This will allow re-turfing and re-vegetation and reduce erosion risks.
- Suitable storage areas are more appropriately sited in areas with lower ecological value and low slopes. Cleared areas of forestry are preferred to areas of higher ecological value or areas close to watercourses.

- An up-gradient cut off ditch should be installed around the edge of the storage bund in order to collect up-gradient surface water runoff and divert water runoff from eroding the toe of the bund.
- It is desirable to keep haul distances of excavated peat as short as possible, and as close as possible to intended re-use destinations, to minimise plant movements in relation to any earthworks activity, including peat management, in order to minimise the potential impact on the peat structure. It is important that temporary storage is safe and keeps the material suitable for its planned reuse.
- The handling and storage of peat will seek to ensure that excavated peat does not lose either its structure or moisture content. Peat turfs require careful storage and wetting and to be maintained to prevent drying out and subsequent oxidisation to ensure that they remain fit for re-use.
- Stockpiling of peat should be in large volumes, taking due regard to potential loading effects. Piles should be bladed off at the side to minimise the available drying surface area.
- Higher piles are more likely to become dewatered, while smaller piles expose a greater area to evaporation. Reducing mound size may also increase likelihood of erosional losses as particulate organic carbon (POC).
- Stockpile areas and dimensions will be determined following detailed investigations and subject to conditions at individual locations, will not exceed a height to be approved by the SEPA.
- Stockpiles should be battered so as to limit instability and erosion and should be bunded or covered using impermeable material. The bunds should extend to a level above the toe of the stockpiled material to provide restraint to surface runoff.
- When planning the temporary storage areas any additional disturbance areas should be minimised.
- Transport of peat to temporary storage areas, restoration areas or designated spoil areas will be by low ground pressure vehicles to avoid excessive compaction of the peat.

11 Reuse of Peat in Infrastructure Restoration

As stated above, priority for peat reuse will be given to the peat restoration areas around the proposed infrastructure shown in **Figure 8.11**. The following methodologies apply to any potential excavated peat that may be reused within infrastructure excavations.

11.1 Bare Peat

There are several important methodologies regarding the exposure of bare peat including:

- The amount of time any bare peat will be exposed will be minimised to preserve its integrity.
- The phasing of work should be carried out to minimise the total amount of exposed ground at any one time. By stripping turf and replacing as soon as reasonably possible after peat has been re-distributed there will be minimal areas of bare peat.

- Any peat areas on steep ground or that remains partially bare will be covered using geotextile or a similar method to stop erosion.
- Any areas of bare peat, where vegetation is not re-growing, will be seeded with a seed mixture obtained from the existing habitat. Stock exclusion in these areas will continue until vegetation is properly established.
- The re-vegetated areas will be monitored.
- Areas where full recovery is complete will have fences removed.

This approach has been shown to be effective on other peat sites and the turfs re-grow quickly both establishing vegetation and consolidating the peat.

11.2 Infrastructure Reuse

Peat reuse infrastructure within infrastructure areas allows a further opportunity to maintain the integrity of the excavated peat, enhance habitats and create new habitats beyond use of peat in restoration of already degraded areas. This will be undertaken through:

- The Principal Contractor will be required to provide appropriate plant for undertaking all reinstatement works such that no unnecessary disturbance of the ground surface occurs. To minimise disturbance and damage to the ground surface, any mobile plant required for reinstatement works will be positioned on constructed access tracks, hardstanding areas or existing disturbed areas wherever possible. The use of a long reach excavator for excavations and reinstatement works is preferable as it enables sufficient room to allow initial side casting and subsequent pulling back of turfs over reinstated peat or soil.
- Excavated catotelm or amorphous peat will only be used in restoration works where the topography allows straight forward deposition with no pre-treatment or containment measures and without risk to the environment. Suitable scenarios may be present in those disturbed areas where natural topography profile allows such use. A fibrous layer of acrotelm and turf will be placed above any catotelm or amorphous peat reinstated.
- Reinstatement of vegetation will be focused on natural regeneration utilising peat vegetated turfs. To encourage stabilisation and early establishment of vegetation cover, where available, peat turfs (acrotelmic material) or other topsoil and vegetation turfs in keeping with the surrounding vegetation type will be used to provide a dressing for the final surface.
- Any reinstatement and re-profiling proposals will consider, and mitigate against, identified significant risks to environmental receptors. In particular, in areas of replaced peat, water management will be considered in the Principal Contractor's Construction Method Statements to ensure that as far as possible an appropriate hydrological regime is re-established within areas of disturbance. Particular attention will be paid to maintaining hydrological continuity and preventing the creation of preferential subsurface flow paths (for instance within backfilled cable trenches).
- When cutting the track the vegetation layer (appr. 500 mm thick) will be undercut and rolled back. A geotextile layer will then be installed on the side slopes of the track immediately after track construction to prevent erosion. The undercut vegetation layer will then be rolled back over the verge of the installed track. Through careful management of upgradient water

and track cambers to shed water to the peat on the verges the level of saturation can be maintained.

- Peat placed on track verges should gently taper into the adjacent landform, with the peat blocks placed snugly together and the edge of the peat placed furthest from the track should be firmed into the adjacent ground to form a seal, in order to minimise water loss through evaporation.
- Track edges and passing places would be reinstated post construction through the removal of capping material and the reuse of peat turfs. Where peat turfs are used to reinstate track edges this will be done in a manner to ensure works tie in with the surrounding topography, landscape and ground conditions.
- The design and construction of tracks on peat shall be done in such a way so as to reduce impacts on the existing peat hydrology at the site. The built track should allow for the transmittance of water, so natural drainage can be maintained as far as possible.
- Where possible drains will be blocked as soon as they are no longer required to reduce impacts on adjacent peat habitat and allow recovery of the drains to peat habitat.

12 Summary

Depth penetration probing has been undertaken at 3,223 locations with associated cores comprising a high-density grid over at all site infrastructure and a 100 m grid across the Study Area to obtain a detailed understanding of peat variability, depth and characteristics of the Study Area.

The total area of the Proposed Development infrastructure (55,405 m^2) and including associated earthworks (footprint) is 128,299 m^2

The infrastructure has avoided peat where possible with deeper peat (>1.0 m depth) present across only 6.64% of the Proposed Development infrastructure and any peat >0.5 m depth) present across 27.02 % of the Proposed Development infrastructure.

The total volume of excavated peat associated with the footprint of the infrastructure and associated earthworks has been calculated at about 36,425 m^3 with about 5,778 m^3 of acrotelmic peat and about 30,647 m^3 of catotelmic peat when allowing for a 10% bulking factor, all of which is modified due to historic and current commercial forestry.

The potential reuse of excavated peat has been calculated based on SEPA guidance. The peat reinstatement areas that have been identified within the earthwork areas which could accommodate an estimated total volume of 13,240 m^3 of excavated peat. This is comprised of about 3,177 m^3 of acrotelmic peat and about 10,681 m^3 of catotelmic peat.

The potential reuse of excavated peat has been calculated based on SEPA guidance within the temporary infrastructure and reuse in peat erosional gully and existing infrastructure restoration areas identified within the Site, which results in full reuse of excavated peat.

Based on the peat depth, characteristics and distribution investigations undertaken across the development area and the final layout, a surplus of peat is not expected to be generated by the Proposed Development. All estimated excavated peat is planned for re-use for restoration work during the construction and post-construction phases of the Proposed Development.

Further investigations will be undertaken prior to works commencing to confirm peat depth, distribution and characterisation. The additional survey data will be used to inform any micro-siting, and potentially further minimise the volume of peat extracted. The peat management plan will be further updated using the additional survey data and detailed infrastructure design. The detailed PMP will be approved by the Council in consultation with SEPA and NatureScot as part of the CEMP pursuant to the imposition of a planning condition.

The Principal Contractor will maintain a record of actual peat volumes excavated and the subsequent peat re-use to compare the predicted and actual peat volumes. This record during the construction, operation, decommissioning and restoration phases of the Proposed Development will be made available for review by regulators as and when required.

13 References

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