Appendix 7.3: Outline Peat Management Plan

Appendix 7.3: Outline Peat Management Plan (OPMP)

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1 Introduction

This Outline Peat Management Plan (OPMP) document has been prepared by Fluid Environmental Consulting (Fluid) on behalf of Loch Liath Wind Farm Limited (the 'Applicant') to support the Environmental Impact Assessment (EIA) for Loch Liath Wind Farm (the 'Proposed Development'). The Site (**Figure 7.1** of the EIA Report) is located predominantly within the Balmacaan Estate, with the access located within the Glenmoriston Estate, north-west of Invermoriston in the Great Glen and to the West of Loch Ness.

The Site is approximately 1,605ha in area and ranges from less than 60m above Ordnance Datum (AOD) at the A887 to 550m AOD along the existing Bhlaraidh Wind Farm access track and up to approximately 615m AOD on the western and southern boundary of the Site at Carn na Ruighe Duibhe, and Carn Tarsuinn within the main area of the Site.

There is no evidence of cutting or systematic draining of peat, however there are some areas of erosion.

The Proposed Development is comprised of approximately 1.1km of new floated tracks, approximately 8.2km of new excavated tracks, up to 13 wind turbines and associated crane hardstandings, a construction compound, a substation with control building, one borrow pit, temporary concrete batching facilities (anticipated to be located within the borrow pit area), and a met mast.

The tracks, substation, met mast and the turbine bases will be permanent infrastructure. The borrow pit, construction compound and some sections of the crane hardstanding are temporary and can be reinstated.

The total area during the construction phase of the Proposed Development infrastructure (footprint), including existing tracks, is 153,349m^2. There is also an additional area that will either be excavated or covered by hardcore comprising the drainage and batters required to build the infrastructure which amounts to an area of 16,042m^2 where it either excavates or covers peat (see calculations section).

The design of the Proposed Development has been undertaken as an iterative process to avoid areas of peat as far as possible, to limit peat excavation and to limit the potential for peat slide, as discussed in **Chapter 3: Site Selection and Design Strategy** and **Chapter 7: Geology, Hydrology, Hydrogeology and Peat** of the EIA Report.

The OPMP will be further developed and implemented subsequent to the Proposed Development receiving consent from the Scottish Government in consultation with Scottish Environment Protection Agency (SEPA), NatureScot and The Highland Council (THC). Further details and specific plan requirements 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 PMP will be with the Principal Contractor (PC).

This OPMP has been developed due to identification of the presence of peatland (see **Chapter 7: Geology, Hydrology, Hydrogeology and Peat** of the EIA Report) and peat habitats on the Site (see **Chapter 8: Ecology** of the EIA Report) and as requested by SEPA at Scoping, and should be read in conjunction with the **Appendix 7.2 Peat Survey Report** of the EIA Report.

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*). 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, all excavated peat will be re-used onsite.

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 (**Chapter 3**). 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 OPMP;
- Section 5 presents the definition of peat, details of peatland characteristics and peat conditions onsite;
- 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 balance between excavation volumes associated with the Proposed Development and the proposed reuse of excavated peat;
- Section 9 details the general peat excavation and handling methods / controls and temporary peat storage; and,
- Section 10 discusses the general methodologies for reuse in infrastructure construction restoration and in habitat enhancement; and

- Section 11 provides a summary.

Tables are included within this OPMP as follows:

- Table 1: a summary of depth of penetration probe data;
- Table 2: a summary of interpreted peat depth at infrastructure areas;
- Tables 3 and 4: a summary of dimension and area details of the infrastructure and associated excavation areas on peat;
- Tables 5 and 6: where excavated peat will be generated and the associated quantities;
- Tables 7 and 8: where excavated peat will be re-used and the associated quantities both for degraded and higher quality peat; and,
- Tables 9 and 10: a summary of the peat extraction and re-use balance for both for degraded and higher quality peat.

The following EIA Report figures are referenced throughout where relevant:

- Figure 7.8: Depth of Penetration;
- Figure 7.9: Estimated Peat Depth;
- Figure 7.10: Temporary Peat Storage Areas; and
- Figure 7.11: 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; and
- 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 OPMP 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 Environment Management Plan (CEMP).

4.2.1 Stage 1: Environmental Impact Assessment (EIA)

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 onsite based on a broad 100m grid;
2. Design of layout based on environmental and technical constraints, including peat occurrence onsite;
3. Further detailed site surveys undertaken to obtain peat depth across the proposed infrastructure 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 associated with construction;
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 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-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 the 50m micro-siting allowance, 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 Ecological/Environmental Clerk of Works (ECoW) onsite, and made available to regulators as required.

5 Peat Conditions

5.1 Definitions of Peat

Organic material less than 0.5m 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 – 100cm' (https://www.hutton.ac.uk/learning/exploringscotland/soils/organicsoils); and
- The Forestry Commission use 45cm 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 1m.
- 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 7.2** and **8.2** of the EIA Report).

The Site is characterised as an undulating upland moorland plateau with numerous rocky/knolly outcrops and numerous upland lochans and peatland within depressions. There are numerous steep-sided rocky hills within the Site and the immediate surrounding area.

The land cover for the Site mainly consists of open upland to sub-alpine moorland comprising of bog and heathland habitats.

Peat cover is generally concentrated between the rock outcrops on the valley floors and some higher ridges and saddles (**Figure 7.9** of the EIA Report).

The Ecology Chapter of the EIA Report (**Chapter 8**) notes that the habitats on Site comprise a complex mosaic of upland communities that correspond to the variable topography and associated peat depth due to the underlying topography. The Ecology Survey Area (ESA) (as defined in **Chapter 8** and shown in **Figure 8.1**) is dominated by extensive areas of habitat mosaics, the principal components of which are blanket bog (including wet and dry modified bog), and wet and dry dwarf shrub heath. Wet heath was often recorded in intimate mosaic with blanket bog, often in response to varying peat depth, while dry heath was generally noted on drier, steeper slopes.

The peatland condition varied across the ESA, with areas of 'near natural' occurring among larger extents of 'modified' peatland. Areas of bare peat were recorded scattered across the ESA generally comprising relatively small patches, and in hags and gullies, which were considered indicative of 'modified' conditions.

The condition of peatland therefore comprises a mosaic, with large extents showing a degree of modification. However, the ESA lacks extensive areas of 'drained' or 'actively eroding' condition.

Blanket bog habitat is extensive and well-connected within the ESA and beyond. Although some areas are modified and affected by grazing, others are moderately species-rich and semi-natural. Dwarf birch was recorded throughout, with scattered juniper. Habitats in a degraded state should be considered with regards to their potential value, and as such, the bog habitats within the ESA either currently or potentially represent a functional example of an Annex 1 habitat, and are therefore a valuable component of the wider resource.

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:

- National vegetation classification (NVC) habitat mapping (detailed within **Chapter 8** and shown in **Figure 8.4** of the EIA Report);
- Depth penetration probing (see **Appendix 7.2** and **Figure 7.8** of the EIA Report) at 10,799 locations:
    - in a 100m grid over the initial survey area (see **Figure 1 Appendix 7.2**);
    - transects with spacing 15 m between points in a line and 50 m between lines;
    - at the turbine bases and hardstanding areas in a 10 m grid, along with probing in the 50 m micrositing area on a 20 m grid; and
    - at 50 m intervals with probes at 10 m offsets on each side along all proposed tracks.
- Peat coring at 52 locations to verify the probing is representative of peat depth and to assess the peat structure and properties (see **Appendix 7.2** of the EIA Report);
- Development of a penetrable substrate depth map to indicate the maximum depth of probe penetration at all investigated points across the Site (**Figure 7.8** of the EIA Report);
- Development of an interpreted maximum depth of peat contour map across the Site to indicate the potential penetrable substrate or inferred peat depth based on the depth penetration probing results and verified by coring (**Figure 7.9** of the EIA Report); 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 7.2** and **Figure 7.8** of the EIA Report).

Of the 10,779 locations probed a total of 7,388 probes (68.54%) recorded depths of 0.5m or less (no peat), 2,191 probes (20.33%) recorded depths of penetration between 0.5m and 1.0m and 1,200 probes (11.13%) 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 to 0.5 (no peat)	7,388	68.5%
0. 5 – 1.0	2,191	20.3%
1.0 – 2.0	984	9.13%
2.0 – 3.0	183	1.70%
3.0 – 4.0	23	0.21%
4.0 – 5.0	9	0.08%
>5.0	1	0.01%
Total	**10,779**	**100%**

The depth of penetration at each probe location within the Site is presented on **Figure 7.8** of the EIA Report.

Based on the data collected, an interpreted peat depth map (**Figure 7.9** of the EIA Report) was produced to demonstrate the variation in peat across the Site and at the various infrastructure locations. A comparison of the peat depth with the infrastructure footprint is presented in **Table 2**.

Table 2 Peat Penetration Depth across the Infrastructure

Depth Range (m)	Area of infrastructure footprint (m^2)	Area of infrastructure footprint (%)
0 to 0.5 (no peat)	107,306	69.98
>0. 5 – 1.0	37,140	24.22
>1.0 – 1.5	5,919	3.86
>1.5 – 2.0	1,374	0.90
>2.0 - 2.5	1,035	0.67
>2.5 – 3.0	385	0.25
>3.0 – 3.5	146	0.10
>3.5 – 4.0	40	0.03
>4.0	4	0.00
Total	**153,349**	**100**

These data indicate that peat (>1.0m depth) is present across 5.8% of the Proposed Development infrastructure and no peat (0 – 0.5m depth) is present across 70% of the Proposed Development infrastructure. The OPMP is therefore necessarily focussed on the 30% of the infrastructure that overlies peat (>0.5m depth).

A total of 52 cores were completed with 49 encountering peat with acrotelm and catotelm layers identifiable. The average acrotelm depth recorded is 0.15m and the peat depth minus the acrotelm depth can been used to calculate the potential catotelm thickness.

5.5 Peat Characteristics

The peat is moderate to highly fibrous (mainly moderate to high content of fine fibres in cores and low to moderate content of coarse fibres) and moderate to high moisture content (Von Post B values) at the surface with a distinctive acrotelmic layer occurring in 49 of the 52 coring locations and ranging between 0.05 m and 0.30 m in thickness.

The catotelmic peat was up to a maximum of 1.75m in thickness with no amorphous peat (H9/H10) observed. Very little wood was observed within the cores.

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

6 Avoidance and Minimisation of Peat Disturbance

6.1 Avoidance

The design of the Proposed Development layout has been an iterative process aimed at avoiding or minimising impacts on blanket bog habitats and deep 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 deep peat has been unavoidable for any section of track, a floating track design is proposed where feasible, as informed by construction and engineering considerations. The infrastructure has also been designed to avoid areas where peat slide risk is moderate or higher (**Appendix 7.4** of the EIA Report. The final iteration of the infrastructure layout was informed by detailed peat probing across all infrastructure which resulted in layout modifications which further reduced the presence of infrastructure located on peat (>0.5m depth) to 30.0% of its footprint.

The impact on the blanket bog habitats is discussed within **Chapter 8** of the EIA Report.

6.2 Further Minimisation

The disturbance of peat during the construction of the tracks, crane hardstandings, turbine foundations and other infrastructure will be minimised, as far as practicably possible, taking into account other constraints. This will reduce any peat waste onsite 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 (PC) (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 micrositing limits (proposed as 50m) is likely to allow further improvements to the layout for peat. Further measures to minimise peat disturbance will be incorporated in the detailed design and construction processes. The principles of the waste hierarchy (outlined above) will be adhered to, i.e.:

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

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.

An Ecological/Environmental Clerk of Works (ECoW) 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 Proposed Development footprint with engineers before construction commences;
- authorise minor movement of infrastructure within the 50m micro-siting available where impacts on peat can be further reduced; and
- monitor construction to ensure that any micro-siting does not result in movements into more sensitive habitats and deep peat unless unavoidable (e.g. for construction and engineering reasons).

7 Peat Excavation Areas and Assumptions

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

There are areas outside of the Proposed Development infrastructure footprint that are within areas of peat and will also be excavated. These are presented in **Table 4** and are based on the following assumptions:

- Excavated Tracks
    - Slope batters will be installed either side of the 6m excavated track width on a 2 in 1 gradient, extending the footprint to about 10m wide; and

    - V drains will be installed on the upgradient side of the track where necessary (dimensions assume 0.5m length of each side of the V).
- Floated Tracks
    - It is assumed that floated tracks will be elevated above ground level by up to 1m. Slopes will be installed either side of the 6m wide tracks on 2 in 1 slopes, therefore they will extend the floating track about 2m on either side (10m total track width). No peat will be excavated in these sections. V drains will be installed either side of the track.
- Construction Compound and Substation
    - The construction compound and substation will be excavated and will have slope batters installed along the perimeter on a 2 in 1 gradient to ground level with the base raised above the surrounding ground.
    - V drains will be installed alongside all of the compounds (dimensions assume 0.5m length of each side of the V).
- Turbine Foundations
    - Turbine foundations will be backfilled with concrete. The areas outside of this footprint will have sloped sides for construction. Where these adjoin the crane hardstanding they will be filled with hardcore. Where these adjoin the surrounding habitat, they will be backfilled with the material removed.
    - V drains will be installed on the side of the turbine foundations not connected to the crane hardstandings (dimensions assume 0.5m length of each side of the V).
- Crane Hardstandings
    - The excavated crane hardstanding areas will have slope batters installed along the perimeter on a 2 in 1 gradient to ground level where the base is raised above the surrounding ground.
    - V drains will be installed on all sides of the crane hardstandings (dimensions assume 0.5m length of each side of the V).
- Borrow Pit Search Area
    - The borrow pit will be excavated with a perimeter diversion V ditch on all sides of the borrow pit (dimensions assume 0.5m length of each side of the V).
- Met Mast
    - The met mast base will have slope batters installed along the perimeter on a 2 in 1 gradient to ground level where the base is raised above the surrounding ground.
    - V drains will be installed on all sides of the met mast base (dimensions assume 0.5m length of each side of the V).

Table 3 – Infrastructure Dimension Final Layout

Infrastructure	Dimensions	Area (m2)
13 Turbine and Crane Hardstanding Areas (permanent)	Irregular Shape	25,883
13 Turbine and Crane Hardstanding Areas (temporary)	Irregular Shape	45,838
Substation	70m x 120m	8,400
Met Mast Hardstanding	17m x 17m	287
New Track Excavated	Width of 6m and approximate length of 8.2km which includes bellmouths, passing places and turning areas	53,774
New Track Floating	Width of 6m and approximate length of 1.1km which includes bellmouths, passing places and turning areas	7,700
Construction Compound	50m x 50m	2,501
Borrow Pit	Irregular ~165m x 40m	8,966
Total		**153,349**

The Proposed Development infrastructure and dimensions used in the peat balance calculations are summarised in **Table 4**. These relate to the actual excavated dimensions where peat will be intersected (probe depths >0.5m).

It is assumed that 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 or reuse volume.

Table 4 – Infrastructure Additional Dimensions

Infrastructure	Dimensions	Area (m2)
Turbine 1 (includes crane hardstanding)	2 in 1 excavation around free perimeter of 122m on peat, plus 0.5m V drains	254
Turbine 2 (includes crane hardstanding)	2 in 1 excavation around free perimeter of 209m on peat, plus 0.5m V drains	464
Turbine 3 (includes crane hardstanding)	2 in 1 excavation around free perimeter of 69m on peat, plus 0.5m V drains	159
Turbine 4 (includes crane hardstanding)	2 in 1 excavation around free perimeter of 101m on peat, plus 0.5m V drains	191
Turbine 5 (includes crane hardstanding)	2 in 1 excavation around free perimeter of 159m on peat, plus 0.5m V drains	456
Turbine 6 (includes crane hardstanding)	2 in 1 excavation around free perimeter of 124m on peat, plus 0.5m V drains	246

Infrastructure	Dimensions	Area (m2)
Turbine 7 (includes crane hardstanding)	2 in 1 excavation around free perimeter of 56m on peat, plus 0.5m V drains	126
Turbine 8 (includes crane hardstanding)	2 in 1 excavation around free perimeter of 52m on peat, plus 0.5m V drains	103
Turbine 9 (includes crane hardstanding)	2 in 1 excavation around free perimeter of 38m on peat, plus 0.5m V drains	80
Turbine 10 (includes crane hardstanding)	2 in 1 excavation around free perimeter of 165m on peat, plus 0.5m V drains	429
Turbine 11 (includes crane hardstanding)	2 in 1 excavation around free perimeter of 173m on peat, plus 0.5m V drains	368
Turbine 12 (includes crane hardstanding)	2 in 1 excavation around free perimeter of 189m on peat, plus 0.5m V drains	413
Turbine 13 (includes crane hardstanding)	2 in 1 excavation around free perimeter of 256m on peat, plus 0.5m V drains	655
Met Mast Hardstanding	2 in 1 excavation around free perimeter of 58m on peat, plus 0.5m V drains	153
Construction Compound	2 in 1 excavation around free perimeter of 40m on peat, plus 0.5m V drains	88
Borrow Pit	2 in 1 excavation around free perimeter of 42m on peat, plus 0.5m V drains	87
New Track Excavated	2 in 1 slope back to ground level along free perimeter of 2,625m on peat	6,116
New Track Floated	0.5m V drains along a free perimeter of 1,916m on peat	5,652
Total		**16,042**

8 Excavation and Reuse Volume Estimates and Reuse Requirements

8.1 Excavated Volumes

Peat excavation volumes associated with the Proposed Development have been calculated using the GIS package ArcGIS based on the data in **Tables 3** and **4** and these further assumptions:

- A contour map of assumed peat depth based on interpolation of values from probing across the Site (shown in **Figure 7.9** of the EIA report);

- Dimensions of the proposed areas for excavation for site infrastructure on peat of >0.5m based on the Final layout shape files provided (shown in **Figure 7.9** of the EIA report) and detailed in **Table 3**;
- An estimated acrotelm depth of 0.15m 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 (0.15m) 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 52 cores);
- 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 7.9** of the EIA report), the volumes of peat that would be excavated during construction were calculated based on the final layout infrastructure dimensions (ArcGIS shapefiles) as shown in **Table 3**, plus the additional associated excavation areas provided for the Proposed Development (**Table 4**). These calculations produced the following volume estimates and are detailed in **Table 5**, **Table 6** and **Table 7**:

- A total volume of peat to be excavated of 35,011 m^3; comprising 31,257m^3 from the infrastructure footprint (Table 5) and 3,755m^3 from the additional associated excavation areas.

  This comprises:

  - Total volume of acrotelm which will be excavated = 7,282 m^3; and
  - Total volume of catotelm which will be excavated = 27,729 m^3.

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

A bulking factor[1] of 10% is applied to these values which increases them to:

- Total volume of peat once excavated = 38,512 m^3;

  This comprises:

  - Total volume of acrotelm once excavated = 8,010 m^3; and
  - Total volume of catotelm once excavated = 30,502 m^3.

[1] The British Geological Survey consider the bulking factor to *'be the ratio or percentage of the volume change of excavated material to the volume of the original in situ volume before excavation.'*

Table 5 – Excavated Peat Volumes Based on Actual Footprint

Infrastructure	Infrastructure area (m^2)	Average peat depth over infrastructure area (m)	Percentage of infrastructure with >0.5m depth of peat	Area of infrastructure with >0.5m depth of peat (m^2)	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)
Hardstanding 1	1,996	0.32	14.1	281	0.56	157	42	115
Temporary Hardstanding 1	3,639	0.35	18.2	662	0.75	497	99	397
Hardstanding 2	1,962	0.25	5.7	111	0.61	68	17	51
Temporary Hardstanding 2	3,631	0.35	29.7	1,080	0.78	842	162	680
Hardstanding 3	2,054	0.57	44.9	923	0.91	840	138	701
Temporary Hardstanding 3	3,553	0.46	35.8	1,271	0.78	991	191	801
Hardstanding 4	2,021	0.42	38.8	784	0.60	470	118	353
Temporary Hardstanding 4	3,457	0.38	25.5	881	0.57	502	132	370
Hardstanding 5	2,004	0.52	53.7	1,077	0.67	722	162	560
Temporary Hardstanding 5	3,640	0.72	51.6	1,877	1.15	2,159	282	1,877
Hardstanding 6	1,975	0.42	35.4	700	0.65	455	105	350

Infrastructure	Infrastructure area (m^2)	Average peat depth over infrastructure area (m)	Percentage of infrastructure with >0.5m depth of peat	Area of infrastructure with >0.5m depth of peat (m^2)	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 Hardstanding 6	3,651	0.25	4.7	170	0.59	100	26	75
Hardstanding 7	1,997	0.51	38.3	764	0.87	665	115	550
Temporary Hardstanding 7	3,509	0.41	31.6	1,108	0.71	787	166	620
Hardstanding 8	2,026	0.43	34.1	690	0.64	442	104	338
Temporary Hardstanding 8	2,549	0.24	0.6	16	0.55	9	2	6
Hardstanding 9	1,990	0.24	4.0	80	0.63	50	12	38
Temporary Hardstanding 9	3,616	0.21	6.5	235	0.74	174	35	139
Hardstanding 10	1,973	0.68	46.1	909	1.20	1,091	136	954
Temporary Hardstanding 10	3,633	0.50	41.2	1,497	0.75	1,123	225	898
Hardstanding 11	1,989	0.55	44.3	881	0.85	749	132	617
Temporary Hardstanding 11	3,615	0.35	20.0	722	0.67	484	108	375

Infrastructure	Infrastructure area (m^2)	Average peat depth over infrastructure area (m)	Percentage of infrastructure with >0.5m depth of peat	Area of infrastructure with >0.5m depth of peat (m^2)	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)
Hardstanding 12	1,910	0.50	50.3	960	0.70	672	144	528
Temporary Hardstanding 12	3,679	0.42	27.6	1,016	0.75	762	152	610
Hardstanding 13	1,986	0.23	7.8	154	0.69	106	23	83
Temporary Hardstanding 13	3,666	0.62	50.0	1,834	0.94	1,724	275	1,449
Substation	8,400	0.36	15.6	1,309	0.64	838	196	641
Met Mast	287	0.96	100.0	287	0.96	276	43	232
Construction Compound	2,501	0.45	40.9	1,022	0.74	756	153	603
Borrow Pit	8,966	0.31	13.0	1169	0.68	795	175	620
Floating Track	7,700	1.02	85.9	6,615	1.12	0	0	0
Excavated Track	53,774	0.42	27.4	14,756	0.81	11,952	2,213	9,739
Total	**153,349**			**45,841**		**31,257**	**5,884**	**25,373**

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

Table 6 – Excavated Peat Volumes Based on Additional Areas

Infrastructure	Free perimeter on peat (m)	Volume of peat excavated from drains and side slopes (m^3)	Volume of acrotelm peat excavated (m^3)	Volume of catotelm peat excavated (m^3)
Hardstanding 1	41	18	9	9
Temporary Hardstanding 1	81	56	21	34
Hardstanding 2	30	15	7	8
Temporary Hardstanding 2	179	131	48	83
Hardstanding 3	11	10	3	7
Temporary Hardstanding 3	58	43	16	27
Hardstanding 4	63	31	14	16
Temporary Hardstanding 4	38	17	8	9
Hardstanding 5	24	14	6	8
Temporary Hardstanding 5	135	195	49	146
Hardstanding 6	98	54	23	31
Temporary Hardstanding 6	26	12	6	7
Hardstanding 7	22	19	6	13
Temporary Hardstanding 7	34	21	9	13
Hardstanding 8	52	28	12	16

Infrastructure	Free perimeter on peat (m)	Volume of peat excavated from drains and side slopes (m^3)	Volume of acrotelm peat excavated (m^3)	Volume of catotelm peat excavated (m^3)
Temporary Hardstanding 8	0	0	0	0
Hardstanding 9	13	7	3	4
Temporary Hardstanding 9	25	17	6	10
Hardstanding 10	72	113	27	85
Temporary Hardstanding 10	93	64	24	40
Hardstanding 11	37	31	11	21
Temporary Hardstanding 11	136	78	33	45
Hardstanding 12	43	26	11	16
Temporary Hardstanding 12	146	100	38	62
Hardstanding 13	16	10	4	6
Temporary Hardstanding 13	240	242	75	167
Substation	0	0	0	0
MetMast	58	61	18	42
Construction Compound	40	6	10	17
Borrow Pit	42	25	10	14
Floating Track	1,916	240	160	80

Infrastructure	Free perimeter on peat (m)	Volume of peat excavated from drains and side slopes (m^3)	Volume of acrotelm peat excavated (m^3)	Volume of catotelm peat excavated (m^3)
Excavated Track	2,625	2,755	729	1,321
Total	**6,394**	**3,755**	**1,398**	**2,357**

8.2 Peat Reuse Volumes

From **Tables 5** and **6** above, the volume of peat that will be removed by excavation of the infrastructure is ~7,300 m^3 of acrotelm, and ~27,700 m^3 of catotelm. This will increase in size due to bulking by an estimated 10% once excavated to ~8,000 m^3 of acrotelm and 30,500 m^3 of catotelm.

This volume of peat will be reused within the Site in the following areas, as detailed in **Table 7**:

- In appropriate locations around the infrastructure perimeter such as track verges, the edges of crane hardstandings and the edge of the substation in a 2m wide strip at a thickness of approx. 0.3m where the infrastructure is located within a peat area. This essentially comprises the reinstatement of excavated peat turfs to ensure it ties in with the adjacent peat as presented on **Figure 7.9** of the EIA Report. The length of the infrastructure coincident with peat as defined by the peat contour mapping has been calculated at ~6,400 m.
- Reinstatement of all temporary hardstanding areas either the whole of the area where the majority is on peat and there is good connectivity to peat habitats, or part of the area where only a small volume of peat will be excavated and a similar volume will be replaced.
- Reinstatement of the construction compound over the 2,501m^2 area with a 0.74m thickness of peat as is currently present in this area.
- Reinstatement of the borrow pit that occupies an area of 8,966m^2. Peat depths are variable in this area but a 1m thickness of peat will be reinstated across the whole of the area to connect to adjacent peat habitat.
- A total of 16 areas have identified for peat restoration that comprise a combined total of 36,530m^2 and will be restored with 0.6m to 1.0m depths of peat. These are discussed in more detail below and shown in **Figure 7.11** of the EIA Report.

Table 7 Estimated Potential Reuse Volumes for Excavated Peat

Reuse Type	Reuse Summary	Acrotelm volume (m3)	Catotelm volume (m3)	Total Volume (m3)
Infrastructure margins across all areas	0.3m thickness at all infrastructure margins adjacent to peat habitat (6,394m in length)	1,415	1,415	2,830
Temporary Hardstanding 1	Backfill temporary area with 0.75m depth of peat in area where peat was previously located	99	398	497
Temporary Hardstanding 2	Backfill temporary area with 0.75m depth of peat in area where peat was previously located	168	674	842
Temporary Hardstanding 3	Backfill temporary area with 0.78m depth of peat in area where peat was previously located	191	800	991

Reuse Type	Reuse Summary	Acrotelm volume (m3)	Catotelm volume (m3)	Total Volume (m3)
Temporary Hardstanding 4	Backfill temporary area with 0.57m depth of peat in area where peat was previously located	132	370	502
Temporary Hardstanding 5	Backfill temporary area with 1.15m depth of peat across whole of temporary hardstanding area	546	3,640	4,186
Temporary Hardstanding 6	Backfill temporary area with 0.59m depth of peat in area where peat was previously located	25	75	100
Temporary Hardstanding 7	Backfill temporary area with 0.71m depth of peat in area where peat was previously located	166	621	787
Temporary Hardstanding 8	Backfill temporary area with 0.55m depth of peat in area where peat was previously	2	7	9
Temporary Hardstanding 9	Backfill temporary area with 0.74m depth of peat in area where peat was previously located	35	139	174
Temporary Hardstanding 10	Backfill temporary area with 0.75m depth of peat across whole of temporary hardstanding area	545	2,180	2,725
Temporary Hardstanding 11	Backfill temporary area with 0.67m depth of peat in area where peat was previously located	108	376	484
Temporary Hardstanding 12	Backfill temporary area with 0.75m depth of peat in area where peat was previously located	152	610	762
Temporary Hardstanding 13	Backfill temporary area with 0.94m depth of peat across whole of temporary hardstanding area	550	2,896	3,446
Construction Compound	Reinstatement of construction compound with 0.74m of peat across whole of compound area	375	1,476	1,851
Borrow Pit	Reinstatement of borrow pit with 1m depth of peat	1,345	7,621	8,966
Peat restoration area 1	Degraded peat area of 3,730m^{2}to be infilled over 70% of area = 2,610m^2 to a depth of 0.9m	390	1,960	2,350
Peat restoration area 2	Degraded peat area of 280m^2 to be infilled over 85% of area = 240m^2 to a depth of 0.9m	30	180	210

Reuse Type	Reuse Summary	Acrotelm volume (m3)	Catotelm volume (m3)	Total Volume (m3)
Peat restoration area 3	Degraded peat area of 12,880m^2 to be infilled over 40% of area = 5,150m^2 to a depth of 0.8m	770	3,350	4,120
Peat restoration area 4	Degraded peat area of 2,860m^2 to be infilled over 50% of area = 1,430m^2 to a depth of 0.7m	210	790	1,000
Peat restoration area 5	Degraded peat area of 5,230m^2 to be infilled over 40% of area = 2,090m^2 to a depth of 0.9m	310	1,570	1,880
Peat restoration area 6	Degraded peat area of 6,330m^2 to be infilled over 30% of area = 1,900m^2 to a depth of 0.9m	290	1,420	1,710
Peat restoration area 7	Degraded peat area of 1,610m^2 to be infilled over 25% of area = 400m^2 to a depth of 0.8m	60	260	320
Peat restoration area 8	Degraded peat area of 11,840m^2 to be infilled over 45% of area = 5,330m^2 to a depth of 1.0m	800	4,530	5,330
Peat restoration area 9	Degraded peat area of 3,430m^2 to be infilled over 35% of area = 1,200m^2 to a depth of 1.0m	180	1,020	1,200
Peat restoration area 10	Degraded peat area of 3,280m^2 to be infilled over 40% of area = 1,310m^2 to a depth of 1.0m	200	1,110	1,310
Peat restoration area 11	Degraded peat area of 12,750m^2 to be infilled over 60% of area = 7,650m^2 to a depth of 1.2m	1,150	8,030	9,180
Peat restoration area 12	Degraded peat area of 3,110m^2 to be infilled over 35% of area = 1,090m^2 to a depth of 0.6m	160	490	650
Peat restoration area 13	Degraded peat area of 1,550m^2 to be infilled over 40% of area = 620m^2 to a depth of 0.6m	90	280	370
Peat restoration area 14	Degraded peat area of 570m^2 to be infilled over 65% of area of 370m^2 to a depth of 1.4m	60	460	520
Peat restoration area 15	Degraded peat area of 7,980m^2 to be infilled over 60% of area = 4,790m^2 to a depth of 0.9m	720	3,590	4,310
Peat restoration area 16	Degraded peat area of 700m^2 to be infilled over 50% of area = 350m^2 to a depth of 1.0m	50	300	350
Total		**11,953**	**52,008**	**63,961**

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

8.3 Peat Restoration Areas

The peat onsite is generally in good condition (**Chapter 8** of the EIA Report), however it is experiencing erosion in a number of locations and will continue to do so without intervention. There are a number of areas where the erosion is spreading in a dendritic pattern due to erosion from water, wind and freeze/thaw transferring peat particles away from the Site and into watercourses. Some of these areas have bare peat at the base of the gullies, but it is more common at the margins where peat is often exposed and is resulting in continued gradual degradation.

It is considered that the best approach to restore these areas is through the infill with translocated peat. Where the base of the eroded areas has vegetated, this should be carefully lifted off and set to one side and the excavated peat from other areas of the Site placed in each eroded area and the vegetated layer reinstated on top. If necessary, damming structures may be required to assist stabilisation and in a number of locations the Proposed Development infrastructure will also act as a down gradient barrier to retain this peat.

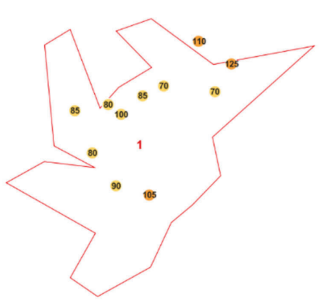
There are some clear advantages with this type of restoration such as:

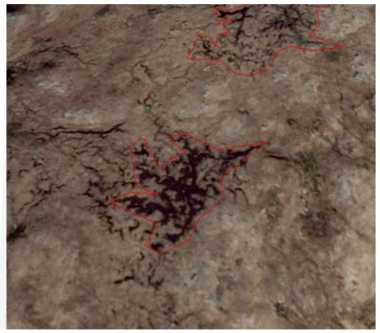
- The excavated peat can be placed directly into the restoration areas so there is no storage required where the peat would otherwise be subject to weathering, dewatering and erosion;
- There are a number of areas of peat restoration identified close to infrastructure so the distances from excavation areas to restoration areas can be minimised; and
- Although not extensive, the degraded peat areas onsite will continue to erode as the bare peat surface areas increase so reversing this trend is desirable.

The following areas (**Figure 7.11** of the EIA Report) have been identified from site surveying and aerial imagery interpretation and were selected due to their proximity to the Proposed Development infrastructure. The restoration depths have been determined from measurements taken onsite. These measurements are presented in the images below as depths relative to the surrounding peat level.

Area 1:

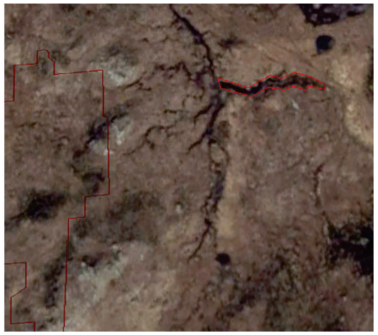
Restoration depth measurements for this area were estimated to be 0.9m. Approximately 70% of the marked area was visually estimated as suitable for restoration from the aerial photography, resulting in an area of ~2,610m^2 suitable for reinstatement with peat excavated from the Proposed Development.





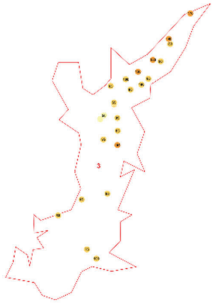
Area 2:

Restoration depth measurements for this area were estimated to be 0.9m. Approximately 85% of the marked area was visually estimated as suitable for restoration from the aerial photography, resulting in an area of ~240m^2 suitable for reinstatement with peat excavated from the Proposed Development.



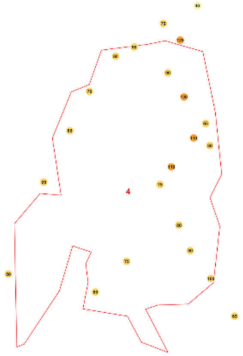
Area 3:

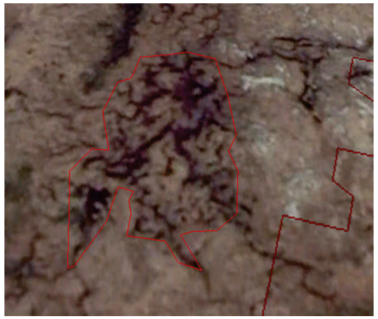
Restoration depth measurements for this area were estimated to be 0.8m. Approximately 40% of the marked area was visually estimated as suitable for restoration from the aerial photography, resulting in an area of ~5,150m^2 suitable for reinstatement with peat excavated from the Proposed Development.



Area 4:

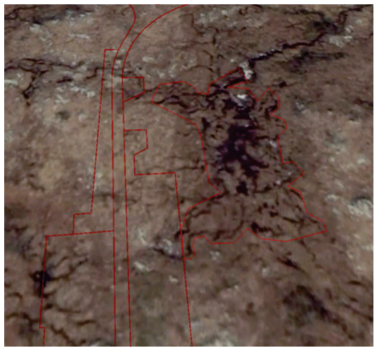
Restoration depth measurements for this area were estimated to be 0.7m. Approximately 50% of the marked area was visually estimated as suitable for restoration from the aerial photography, resulting in an area of ~1,430m^2 suitable for reinstatement with peat excavated from the Proposed Development.





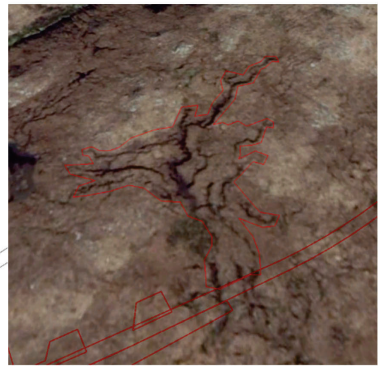
Area 5:

Restoration depth measurements for this area were estimated to be 0.9m. Approximately 40% of the marked area was visually estimated as suitable for restoration from the aerial photography, resulting in an area of ~2,090m^2 suitable for reinstatement with peat excavated from the Proposed Development.



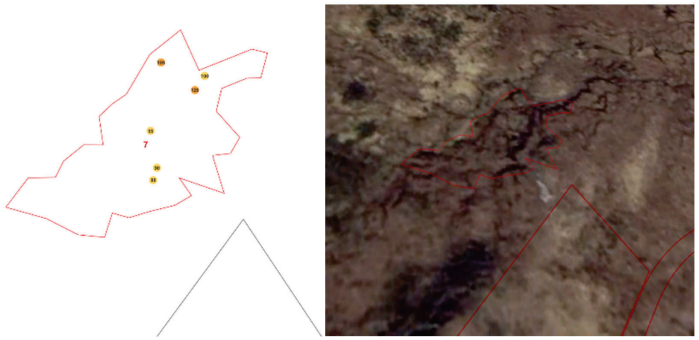
Area 6:

Restoration depth measurements for this area were estimated to be 0.9m. Approximately 30% of the marked area was visually estimated as suitable for restoration from the aerial photography, resulting in an area of ~1,900m^2 suitable for reinstatement with peat excavated from the Proposed Development.



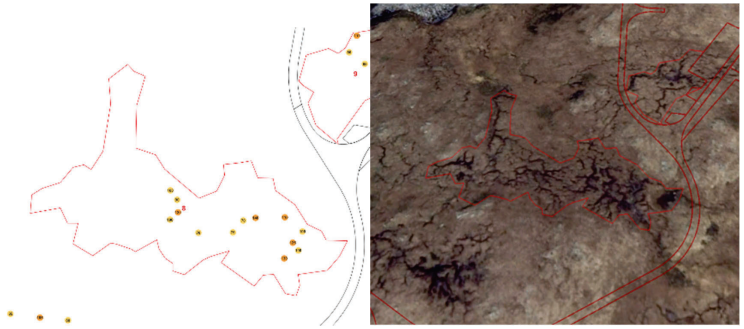
Area 7:

Restoration depth measurements for this area were estimated to be 0.8m. Approximately 25% of the marked area was visually estimated as suitable for restoration from the aerial photography, resulting in an area of ~400m^2 suitable for reinstatement with peat excavated from the Proposed Development.



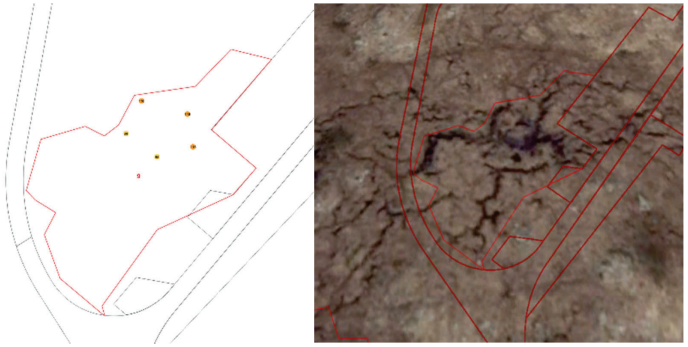
Area 8:

Restoration depth measurements for this area were estimated to be 1.0m. Approximately 45% of the marked area was visually estimated as suitable for restoration from the aerial photography, resulting in an area of ~5,330m^2 suitable for reinstatement with peat excavated from the Proposed Development.



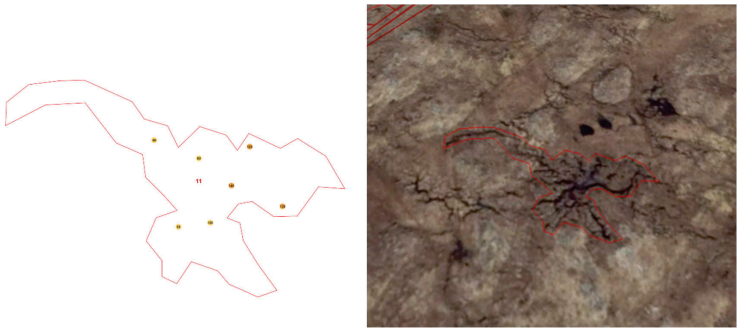
Area 9:

Restoration depth measurements for this area were estimated to be 1.0m. Approximately 35% of the marked area was visually estimated as suitable for restoration from the aerial photography, resulting in an area of ~1,200m^2 suitable for reinstatement with peat excavated from the Proposed Development.



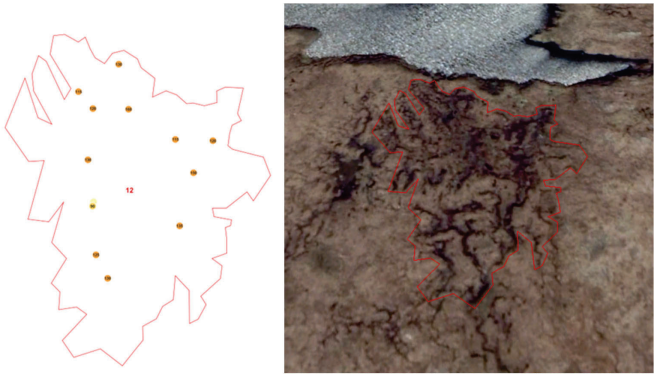
Area 10:

Restoration depth measurements for this area were estimated to be 1.0m. Approximately 40% of the marked area was visually estimated as suitable for restoration from the aerial photography, resulting in an area of ~1,310m^2 suitable for reinstatement with peat excavated from the Proposed Development.



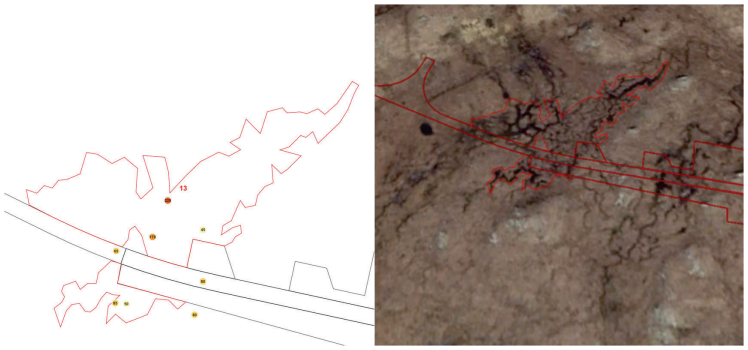
Area 11:

Restoration depth measurements for this area were estimated to be 1.2m. Approximately 60% of the marked area was visually estimated as suitable for restoration from the aerial photography, resulting in an area of ~7,650m^2 suitable for reinstatement with peat excavated from the Proposed Development.



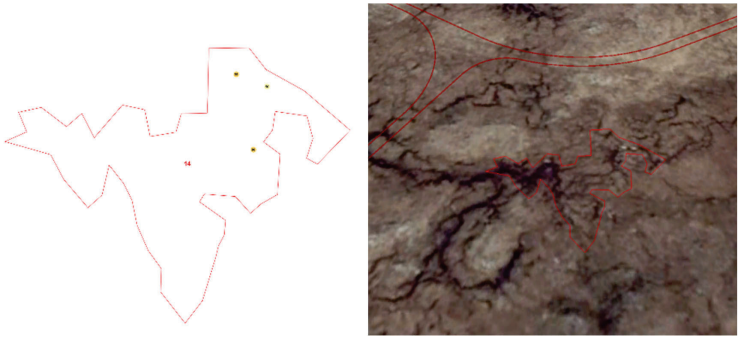
Area 12:

Restoration depth measurements for this area were estimated to be 0.6m. Approximately 35% of the marked area was visually estimated as suitable for restoration from the aerial photography, resulting in an area of ~1,090m^2 suitable for reinstatement with peat excavated from the Proposed Development.



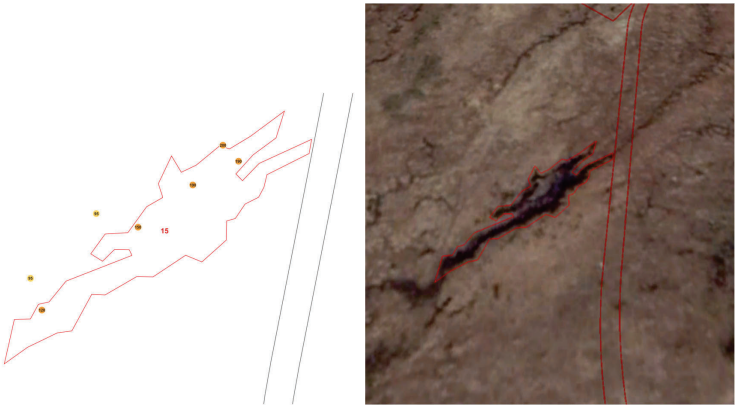
Area 13:

Restoration depth measurements for this area were estimated to be 0.6m. Approximately 40% of the marked area was visually estimated as suitable for restoration from the aerial photography, resulting in an area of ~620m^2 suitable for reinstatement with peat excavated from the Proposed Development.



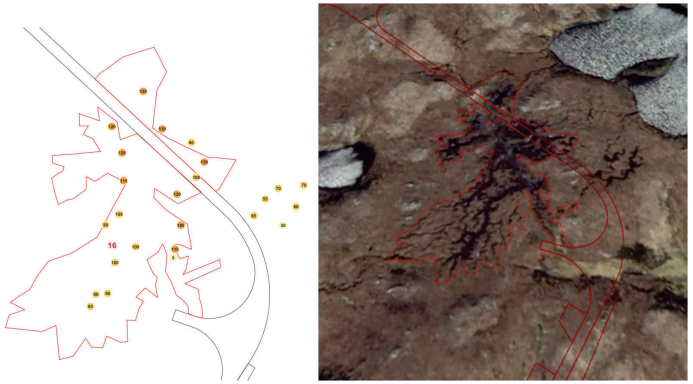
Area 14:

Restoration depth measurements for this area were estimated to be 1.4m. Approximately 65% of the marked area was visually estimated as suitable for restoration from the aerial photography, resulting in an area of ~370m^2 suitable for reinstatement with peat excavated from the Proposed Development.



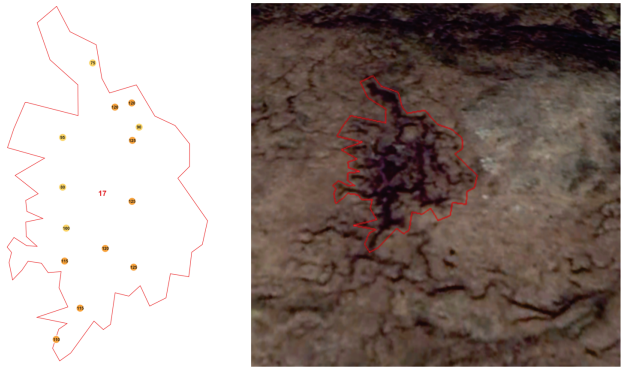
Area 15:

Restoration depth measurements for this area were estimated to be 0.9m. Approximately 60% of the marked area was visually estimated as suitable for restoration from the aerial photography, resulting in an area of ~4,790m^2 suitable for reinstatement with peat excavated from the Proposed Development.



Area 16:

Restoration depth measurements for this area were estimated to be 1.0m. Approximately 50% of the marked area was visually estimated as suitable for restoration from the aerial photography, resulting in an area of ~350m^2 suitable for reinstatement with peat excavated from the Proposed Development.



8.4 Net Peat Balance

The excavated peat volumes and reuse volumes are summarised in **Table 8** below.

Table 8 Net Peat Balance

	Acrotelm volume (m^3)	Catotelm volume (m^3)	Total Volume (m^3)
Excavated Peat (including bulking factor)	**8,010**	**30,502**	**38,512**
Peat Reuse	**11,953**	**52,008**	**63,961**
Total Balance (if negative then peat restoration opportunities are > excavated peat volumes)	**-3,943**	**-21,506**	**-25,449**

Based on the figures and reuse strategy presented, it is expected that there will be the potential for more peat to be reused on the Site than the volume excavated. The substantial number of opportunities for peat reuse will allow the best locations in the closest proximity to the works to be restored as a priority and areas with more marginal benefits can be used, if necessary.

Therefore, the total volume of peat predicted to be excavated does not exceed the intended reuse volume, so no disposal of excess peat offsite is expected for the final layout of the Proposed Development.

9 Handling Excavated Materials

9.1 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 500mm to keep the peat intact.
- These turfs should either be transferred immediately for use in peat restoration areas or stored adjacent to the construction area such that they remain moist and viable (see temporary storage below and **Figure 7.10** of the EIA Report). Excavated turfs should be as intact as possible to minimise carbon losses. Stacking of turfs will be avoided in order 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 so as 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 in order 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, and also the potential for instability issues with the excavated material.

9.2 Temporary Storage

Following excavation, peat will be required to be temporarily stored before reuse, where the material is planned for placement in the borrow pit, the construction compound or the areas of temporary hardstanding, as these will not be available until after the construction period. Excavated peat will 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.
- A number of potential areas for temporary peat storage have been identified alongside the proposed tracks (**Figure 7.10** of the EIA Report). These have been determined to be suitable areas for temporary excavated peat storage as the ground conditions are suitable for some loading, there is no peat, the peat slide risk is low, they are outside of the main watercourse buffers and the gradients are low. This would be supplemented by smaller peat storage areas near to each section of infrastructure where the peat is extracted and to be re-used to minimise the handling and transportation requirements.
- The design and location of stockpiles, including incorporated drainage elements, will be agreed with the ECoW 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 50m 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 will be sited in areas with lower ecological value.
- An up-gradient cut off ditch will 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 (smoothed by machinery) at the side to minimise the available drying surface area.
- 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.

10 Reuse of Peat in Infrastructure Restoration

10.1 Bare Peat

There are a number of 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 will 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, if present.

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.

10.2 Peat Reinstatement Methodology

Peat reuse within the Site is an important aspect of the Proposed Development, as it allows an opportunity to maintain the integrity of the excavated peat and enhance degraded habitats. This peat re-use will be undertaken reflecting the following measures:

- 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. In order 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 constructing track the vegetation layer (approx. 500mm 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 in to the adjacent land form, with the peat blocks placed snugly together and the edge of the peat placed furthest from the track should be firmed in to 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.

11 Summary

Four phases of peat probing totalling 10,779 peat probes and associated cores has been completed between 2019 and 2022 to obtain a detailed understanding of peat variability, depth and characteristics at the Site.

The infrastructure has been designed to avoid peat where possible with peat (>0.5m depth) present across 30.0% of the Proposed Development infrastructure and peat (>1.0m depth) present at 5.8% of the Proposed Development infrastructure.

The total volume of excavated peat associated with the infrastructure footprint, side slopes and drains has been calculated at approximately 38,500m^3 with approximately 8,000m^3 of acrotelmic peat and about 30,500m^3 of catotelmic peat when allowed for a 10% bulking factor.

The potential reuse of excavated peat has been calculated based on SEPA guidance, and an extensive peat restoration program to improve the condition of the peat across the Site and reverse the current process of peat loss/erosion and degradation. The total potential reuse exceeds the peat excavation volumes with a re-use volume of approximately 64,000m^3, comprised of approximately 12,000m^3 of acrotelmic peat and about 52,000m^3 of catotelmic peat.

Based on the peat depth, characteristics and distribution investigations undertaken across the Site and the Proposed Development Infrastructure, 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 Highland Council in consultation with SEPA 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.

12 References

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