A9 DUALLING
PERTH TO INVERNESS

Appendix A10.2

Outline Soil and Peat Management Plan

TRANSPORT SCOTLAND
CÒMHDHAIL ALBA

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1. Introduction

1.1.1. This report forms a Technical Appendix to Chapter 10: Geology, Soils and Groundwater as part of the DMRB Stage 3 assessment for A9 Dualling Tomatin to Moy scheme, and should be read with reference to Chapter 18 Materials.

1.1.2. The Proposed Scheme is located between the settlements of Tomatin and Moy in The Highland Council area, where deposits of peaty soils and peat have been identified within the DMRB Stage 2 assessment. Feedback from stakeholders as part of the DMRB Stage 2 assessment has highlighted the requirement for a Soil and Peat Management Plan for the Proposed Scheme.

1.1.3. The Scottish Environment Protection Agency (SEPA), has issued a regulatory position statement for Developments on Peat (2010), stating that “developments on peat should seek to minimise peat excavation and disturbance to prevent the unnecessary production of waste soils and peat”. Article 4 of the Revised Waste Framework Directive (2008/98/EC) also details the waste hierarchy is to be applied as a priority order in waste prevention and management legislation and policy.

1.1.4. The waste hierarchy sets out the principles to reduce waste, including:

- waste prevention
- re-use
- recycling
- other recovery (including energy recovery)
- disposal

1.1.5. Soil and peat management during the construction process falls into four main categories:

- excavation – at the location of all site infrastructure, including mainline carriageway, drainage infrastructure, areas of hardstanding and site compounds during construction works
- re-use – including re-use for landscaping on slopes and embankments. There may be options for re-use of excavated material both within the Proposed Scheme and off site (if required)
- storage – including both the short term storage of excavated material before re-use for landscaping and restoration of the Proposed Scheme, and storage of excavated material to facilitate potential restoration at off-site locations (if required)
- disposal – where there is an excess of excavated material over reasonable opportunities for re-use in line with good practice, there may be a need for disposal of that material to a licensed waste facility

1.1.6. This report reviews the volume of soil and peat likely to be excavated during the construction process, the potential to minimise excavation of peat and identifies the potential re-uses of soil and peat within the Proposed Scheme. It is recognised that while re-use of any soil and peat during the construction process represents the preferred option, any such use should be carefully considered regarding risks to the environment or human health. Where options within the Proposed Scheme are not viable or if there is an excess of soil / peat, the use of off-site locations has also been considered for restoration and enhancement.

2. Scope of Work

2.1.1. During the construction phase there will be a need to excavate soil and peat for the Proposed Scheme. Where there is not a defined use for this material during the construction process, excess material will be considered for off-site use, for potential restoration and enhancement. If no re-use options are viable, then it would be considered as waste and would need to be disposed of in accordance with regulatory requirements.

2.1.2. This report reviews the likely excavation volumes based on the data available and examines potential re-use strategies for the excavated material. While there may be minor amendments to the site layout as the planning process progresses and during construction, evaluating the likely volumes of material requiring excavation, storage, re-use and disposal (if unavoidable) at this stage facilitates early engagement in this process in advance of the construction phase. This approach is aimed to allow diverse options to be given due consideration to assess feasibility.

2.1.3. Reference has been made to the following guidance documents during the development of this report:

- Developments on Peatland: Guidance on the assessment of peat volumes, re-use of excavated peat and the minimisation of waste[i]
- Restoration Techniques using peat spoil from construction works[ii]
- Promoting the sustainable re-use of greenfield soils in construction[iii]
- SEPA Regulatory Position Statement – Developments on Peat[iv]
- Joint Nature Conservation Committee (JNCC). Report No. 445 Towards an Assessment of the state of UK Peatlands[v]
- Manual of Contract Documents for Highways Works (MCDHW) Volume 1 Specification for Highways Works, Series 600: Earthworks[vi]
- Developments on Peatland: Site Surveys and Best Practice, SNH, SEPA, Scottish Government and The James Hutton Institute (2011)[vii]
- Restoration Techniques Using Peat Spoil from Construction Works, EnviroCentre and SEPA (2011)[viii]
- Developments on Peatland: Guidance on the Assessment of Peat Volumes, Re-use of Excavated Peat and the Minimisation of Waste, Scottish Renewables and SEPA (2012)[ix]
- Land Use Planning System, SEPA Guidance Note 4, Planning guidance on on-shore windfarm developments (2014)[x]

2.1.4. The nature of peat encountered across the Proposed Scheme from site walkovers, peat probing surveys, desktop studies and geotechnical analysis is provided in full detail in Appendix A10.1 Peat Stability Assessment.

3. Methodology / Approach

3.1. Peat Avoidance by Design

3.1.1. Peat constraints have been considered throughout the design process at Stages 2 and 3. Areas of Class 1 peatland have largely been avoided through option selection at Stage 2, with consideration of peat areas within the Proposed Scheme footprint considered further at Stage 3.

3.1.2. Areas of deep peat and priority peatland habitat have been avoided, where possible, at the Stage 2 route selection process avoiding the Class 1 Priority Peatland west of Lynebeg, and large areas of Class 3 peatland adjacent to the Allt Creag Bheithin, west of Moy.

3.1.3. The Stage 3 design development process considered peat as a constraint at the proposed Moy South LILO, where deeper peat on Class 1 priority peatland to the north was avoided. Tier 3 access tracks and a potential Moy North junction had potential to impact on Class 1 Priority peatland west of Moy, this peat data along with other considerations led to the discontinuation of these particular design options. The land take required for the Tomatin junction was also reduced in the form of a Compact Grade Separated Junction (CGSJ), resulting in a reduction of local material requiring excavation. The Stage 3 design also introduces the potential for floating tracks along sections of the proposed access tracks, reducing peat excavation volumes as retained *in-situ*. However, the excavation volumes calculated in Section 5 represent a worst case scenario, should floating tracks not be feasible.

3.2. Investigation Works

3.2.1. Information was obtained and applied from five phases of Ground Investigation works:

- Stage 2 peat probing (August 2015) – including 893 probing records
- Stage 2 Preliminary Ground Investigation works (August 2015) including four boreholes and one trial pit
- Stage 3 peat probing and coring (April 2016) – including 255 probing records and five cores
- Stage 3 Preliminary Ground Investigation works (August 2016) – including 92 trial pits and 43 boreholes
- Stage 3 peat probing and coring (December 2016) – including 90 probing records and four cores
- Stage 3 Supplementary Ground Investigation works (March 2017) – including 138 probing records and three cores

3.2.2. The Ground Investigation has provided data of areas where peat has been encountered across the Proposed Scheme.

3.2.3. 1,376 peat probing records were carried out across the scheme, with a further 40 peat depths recorded from Ground Investigation results (21 trial pit and 19 borehole locations) combining to a total dataset of 1,416 peat depth records. These results are summarised in Chapter 10: Geology, Soils and Groundwater with a detailed methodology and mapping within the Peat Stability Assessment, Technical Appendix A10.1.

3.2.4. Peat probing at the Proposed Scheme recorded an average depth of 0.63m, however, over 60% of soil / peat depth records were shallower than 0.5m, demonstrating that although there are defined areas of deep soil / peat present within the site, in general it is less than 0.5m. The maximum peat depth recorded was 11.6m, on Class 1 peatland north of Dalmagarry at NH 2783 8332.

3.2.5. It should be noted that The Soil Survey of Scotland and Peat Landslide Hazard and Risk Assessments - Best Practice Guide for Proposed Electricity Generation Developments[xi], both indicate a minimum depth for soil to be defined as peat of 0.5m.

3.2.6. Peat cores were obtained at 12 locations across the Study Area during three stages of fieldwork, providing information on the structure of peat encountered. These are also summarised in the Peat Stability Assessment Technical Appendix A10.1. The Von Post classification of each peat core describes the level of decomposition of peat at various core depths, this ranged from H2 Very Weakly Decomposed to H8 Very Strongly Decomposed.

3.3. Classification of Excavated Material

3.3.1. Topsoil has been defined using the definition of Class 5 material in Series 600: Earthworks of the MCDHW Volume 1[vi].

3.3.2. In terms of classification of peaty soils and peat, definitions of each class have been based on JNCC Report 445 definitions[v]. These include:

- peaty (or organo-mineral) soil: a soil with a surface organic layer less than 0.5m deep
- peat: a soil with a surface organic layer greater than 0.5m deep which has an organic matter content of more than 60%
- deep peat: a peat soil with a surface organic layer greater than 1.0m deep

3.3.3. Therefore, peat has been classified into the following groups as detailed in Table A3.1.

Table A3.1: Peat Classification

Depth (m)	Classification	Peat Depth range (m)
< 0.5	Peaty soil	n/a
> 0.5	Peat – Acrotelm	0.0 - < 0.3
	Peat – Catotelm (Fibrous)	0.3 - < 1.0
	Peat – Catotelm (Amorphous)	> 1.0

3.3.4. For the purpose of this report, the following assumptions have been made:

- The depth of the acrotelm / catotelm boundary is 0.3m from the top of the peat strata in areas that have a proven depth of greater than 0.5m. This is a conservative estimate, with peat core samples unable to provide a specific boundary. The change in depth between fibrous and amorphous peat is estimated at 1.0m, based on Von Post classification (as reported in Technical Appendix A10.1) data for continuous peat core data.
- Where peat has been encountered underneath the mainline footprint, along major side roads and at major junctions, the whole peat depth requires excavation (as it will not be sealed *in-situ*). Where peat is encountered on minor side roads and access tracks, the full depth of the underlying peat may not require excavation (i.e.

floating roads could be employed). However, the volume calculations assume a worst case scenario (i.e. the full extent of the peat would require excavation).

3.4. Soil and Peat Volume Calculations

3.4.1. The Proposed Scheme has been broken down into 20 areas based on dividing the mainline into sections as well as areas to cover junctions and side roads.

3.4.2. These 20 areas are listed below, and shown on Figure A10.2.1a-k:

- Junction (JN) - Tomatin South Junction
- Side Road (SR) C1121/U2856 works
- Mainline Chainage (CH) 300 – CH380
- Junction (JN) Tomatin Grade Separated Junction (GSJ) (includes the GSJ, Variable Message Sign (VMS) location and Advance Directional Sign (ADS) location)
- Mainline (NB and SB) CH400 – CH1200
- Ruthven Tomatin Link Road
- Mainline CH1200-CH2700
- National Cycle Network Route 7 (NCN7)
- Mainline CH2700 – CH3620
- Ruthven Moy Link Road
- Dalmagarry Access Tracks
- Mainline CH3620 - CH4100
- Moy Left In Left Out (LILO)
- Mainline CH4100 – CH4780
- Mainline CH4780 – CH6600
- Lynebeg Access Tracks
- Lynebeg LILO
- Moy Access Tracks
- Mainline CH6600 – CH9600
- Forestry Access Tracks

3.4.3. Section 4 provides a description of the baseline conditions with regard to soil and peat within each of these 20 areas.

3.4.4. A Cut and Fill Assessment undertaken as part of the Engineering Assessment identified volumes of soils and peat in areas of cut, underlying infrastructure such as the widened carriageway, embankments, access tracks and SuDs ponds.

3.4.5. Soil and peat volumes were calculated for each area using an approach based on geological cross sections taken at 20m intervals using all the available Ground Investigation data and calculated using the End Area methodology.

3.4.6. As detailed in Section 3.3.4 above, where peat was identified underneath the land take boundary, it has been assumed this material would require excavation over the full depth. There is the potential for sections of the Forestry Access Track and Moy Access

Track to be constructed as 'floating' track where peat greater than 1m is encountered, thereby reducing the volume of peat to be excavated. However, the volume calculations assume a worst case scenario (i.e. full peat depth will require excavation).

3.4.7. The estimated volumes of topsoil and peat including a breakdown in the four peat classifications is provided in Section 5.

3.5. Consideration of Re-use Options

3.5.1. An appraisal was undertaken to look at potential re-uses of soil and peat both within the Proposed Scheme and offsite should this be required due to an excess of excavated soil and peat materials.

Re-use Within the Proposed Scheme

3.5.2. The main on-site re-uses that were deemed acceptable include the following:

- fill/dressing on landscaping embankments
- wet woodland in areas of existing peat
- blocking drainage ditches as part of proposed restoration proposals

3.5.3. With regard to fill / dressing within landscaping, the estimated required volume as discussed in further detail in Section 6.2 assumes that a 100mm thickness would be applied in grassed verge areas with a 300mm thickness used in all other landscaping areas away from the immediate verge area.

3.5.4. There were a number of constraints within the Proposed Scheme when undertaking the appraisal including, although not limited to, the following:

- unsuitability of peat material for the full depth of landscaped slopes due to the required depths to the base of the engineered slope potentially causing it to become unstable
- presence of other environmental mitigation, for landscape and drainage, presence of existing peatland, or where peat or peaty soils are unsuitable for required planting
- avoiding additional loss of existing habitats for a new peatland area which would itself require additional ecological mitigation
- lack of suitable ground conditions (i.e. comprises free draining soils) which would result in the degradation of the peat
- steep slopes (i.e. above 6 degrees) which may result in an increased risk of peat slides

Re-use Outwith the Proposed Scheme

3.5.5. Should there be an excess volume of peat that cannot be used within the Proposed Scheme, then alternative off-site locations suitable for peat re-use would be sought, in preference to disposal. Re-use options adjacent to the scheme and within the local area would be considered, with the aim to reduce or eliminate the amount of waste being sent to landfill.

3.5.6. Good practice for the re-use of peat includes the prioritisation of application as close to the point of extraction as is possible. This minimises the storage requirements and transportation of peat which can contribute towards the loss of structure.

3.5.7. In the early stages of the Proposed Scheme development potential off-site uses/locations were scoped for suitability and this included:

- existing areas of recently felled forestry where peatland habitats could be created
- areas of Class 1 or Class 2 Priority peatland, and other areas of blanket bog, where there may be the potential for peatland restoration through drain blocking to restore water levels
- restoration of sites previously used for peat excavation for horticultural use
- borrow pits in existing local quarries where peat ponds/basins could be established to recreate wetland habitats

3.5.8. The following locations were identified as potential options for off-site re-use.

- Tomatin House underpass (drain blocking)
- Tomatin Junction (embankment woodland, planting and blanket bog habitat)
- Allt na Slanaich Forestry Commission Woodland (peatland restoration)
- Valley of Allt Creag Bheithin Forestry Commission Woodland (peatland restoration)
- Meallmore Moss (drain blocking)
- Class 1 peatland west of Moy (drain blocking)

3.5.9. Should any of these be further considered as part of the detailed design then discussions with landowners and stakeholders, together with detailed assessment of site conditions/constraints would be required.

4. Baseline Conditions - Identified Areas of Peat

4.1.1. Areas of deep peat were identified in order to highlight areas where excavated peat material may originate. This will provide an indication of the likely volumes that will be encountered at particular locations of the Proposed Scheme and allow more detailed planning of the re-use options. This is detailed in Section 6.

4.1.2. This section provides a description of the types and estimated depths of peat that are present in each of the 20 earthworks areas listed in 3.4.2.

Tomatin South Junction

4.1.3. Small area of gently sloping ground featuring both conifer plantation and semi natural mixed woodland, located between the existing A9 and the Highland Main Line railway (HML). No peat was encountered in this area during the ground investigations, as such the only volumes calculated in relation to this assessment have been for Class 5 topsoil.

Side Road (SR) C1121/U2856 works

4.1.4. All earthworks areas are located on or immediately adjacent to the C1211/U2856, largely within agricultural land with some areas of conifer plantation. The vast majority of the area has been classified on the SNH peatland and carbon mapping as Class 0 (i.e. mineral soils).

4.1.5. The nearest peat probing data within the four earthworks areas obtained from the ground investigations shows maximum depths of 0.1m, with a number of the areas being on existing roads. As the soils encountered were of a depth less than 0.5m, it is not categorised as peat. As a result of no peat being encountered at this location, the soil volumes calculated for this assessment have been for the underlying Class 5 topsoils.

Tomatin Grade Separated Junction (GSJ)

4.1.6. The area of Tomatin GSJ located on the southbound side of the mainline comprises a mix of blanket bog, marshy grassland and wet woodland habitats on gently sloping ground at the base of the existing A9 embankment. This area has an SNH peatland classification of Class 0 (mineral soils). However peat depths ranging between 0.1m and 2m were found across the area. The area further north towards the River Findhorn is located within blanket bog habitats and generally contains deeper peat depths. Peat core TM-PC-15 is located in the area of blanket bog, with von post data showing weakly to moderately decomposed peat (increasing at depth) to approximately 1.25m. Given the core and peat depth evidence from this area, the average threshold depth for catotelmic (amorphous) peat is anticipated to be at approximately 1m.

4.1.7. The northbound area of the GSJ is located on gently sloping improved pasture, with an SNH classification of Class 0. The majority of the area recorded probing depths of less than 0.5m and is therefore not categorised as peat. A small hollow located on the outer edge of this area comprises blanket bog habitat with peat depths of up to 2.1m recorded.

4.1.8. Two small outlying areas of verge widening to the south of the main extent of the Proposed Scheme (VMS location and ADS location) have been included with the Tomatin GSJ excavation areas. As these are largely located on existing A9 embankment they are assumed to have shallow topsoil present.

Mainline CH400 – CH1200

4.1.9. This earthworks area is located mainly on the existing A9 and its embankments, but also includes small areas of semi-improved acid grassland and marshy grassland at the toe of the embankments, particularly on the southbound side of the mainline. The entire area is categorised on the SNH peatland mapping as Class 0 (mineral soils).

4.1.10. Peat probing data across the majority of the area is of depths less than 0.5m, indicating thin topsoil is present. A small area in the far north of the area, on the southbound side contains probing depths of 1.2m, located within marshy grassland.

Ruthven Tomatin Link Road

4.1.11. This earthworks area extends alongside the southbound side of the mainline from the base of the Tomatin GSJ to Dalmagarry Quarry. The vast majority of this area is classified by SNH as Class 0, however around Dalmagarry Quarry there is an area of SNH Peatland Class 5.

4.1.12. In the vicinity of Tomatin GSJ peat depths up to 1.89m have been recorded within the area, corresponding to an area of wet modified bog and wet woodland. Peat core TM-PC-15 is located adjacent to the southern border of this earthworks area, with von post data at this location displaying weakly to moderately decomposed peat (increasing at depth) to approximately 1.25m. Given the core and peat depth evidence from this area, the average threshold depth for catotelmic (amorphous) peat is anticipated to be at approximately 1m.

4.1.13. A small number of probes in the centre of the earthworks area, opposite the existing Tomatin junction and within a gently sloping area of marshy grassland, recorded peat depths of 1.2m.

4.1.14. Peat depths within the remainder of the earthworks area, through conifer plantation at Tigh an Allt, unimproved acid grassland and marshy grassland at Invereen and conifer plantation and open quarry at Dalmagarry Quarry are mostly less than 0.5m, indicating thin soils present. As these soils encountered were of a depth less than 0.5m, it is not categorised as peat.

Mainline CH1200-CH2700

4.1.15. This earthworks area is located on the existing A9 and its associated earthworks, but also encompasses adjacent conifer plantation and woodland around Tigh an Allt and semi improved and unimproved acid grassland around Invereen. The vast majority of this area is classified by SNH as Class 0, however at the northern end there are small areas classified as SNH Peatland Class 5 and Class 3.

4.1.16. Peat depths within the earthworks area are largely less than 0.5m, indicating thin soils present. As these soils encountered were of a depth less than 0.5m, it is not categorised as peat. However a small number of isolated probes indicate peat depths of up to 0.7m. No peat cores were taken in this area. Catotelmic (amorphous) peat volumes are anticipated to be relatively small.

NCN7

4.1.17. Running between the HML and the northbound side of the A9 mainline from Tigh an Allt to Dalmagarry Farm, this area passes through mainly broadleaved plantation woodland and some wet heath located at the base of the steep railway embankment. The southern half of this area is classified as SNH Peatland Class 0, while the northern half is predominantly Class 5.

4.1.18. Peat depths within this area are largely less than 0.5m, indicating thin soils present. As these soils encountered were of a depth less than 0.5m, it is not categorised as peat. However a small number of probes, in mostly flat coniferous forestry to the north of The Bellhouse, in the south of the earthworks area, had depths up to 0.6m, indicating a presence of peat.

Mainline CH2700 – CH3620

4.1.19. The majority of this earthworks area is located on the existing A9 and its embankments, with moderately sloping areas on the southbound side of the mainline located within coniferous forestry adjacent to the Dalmagarry Burn.

4.1.20. Peat depths within the northbound earthworks area in this area are largely less than 0.5m, indicating thin soils present. As these soils encountered were of a depth less than 0.5m, it is not categorised as peat.

4.1.21. However a small number of probes, within woodland to the east of the southbound carriageway and adjacent to the Dalmagarry Burn, show peat is present up to a depth of 2.2m. Within this area is peat core TM-PC-02, with von post data displaying very weakly decomposed peat.

Ruthven Moy Link Road

4.1.22. The southern half of this earthworks area straddles the current channel of the Dalmangarry Burn, passing predominantly through unimproved acid grassland, with shallow soil depths. Near the southern boundary of the area there is pocket of peat up to 2.2m deep, located at the toe of a steep slope and adjacent to the Dalmagarry Burn. Peat core TM-PC-02 is located within this area of deeper peat, with von post data displaying very weakly decomposed peat.

4.1.23. The northern section of the earthworks area, to the north of Dalmagarry Farm, is located largely on the existing access road to the farm. The very northern extent lies within semi-improved grassland on generally flat ground. Within this area is an isolated area of shallow peat, of between 0.54m and 0.61m depth.

Dalmagarry Access Tracks

4.1.24. The main access track area will provide access from the farm, under the Proposed Scheme and the HML, to agricultural land and moorland to the west of the HML. The area to the east of the HML largely comprises existing hardstanding areas, with only shallow soils recorded adjacent to these. On the western side of the HML the access track area crosses semi improved acid grassland and wet heath adjacent to the Dalmagarry Burn, where shallow soils are anticipated.

4.1.25. There is a small outlying area to the north of the farm where a field access is proposed. Located on generally flat ground in semi-improved grassland, peat probing data indicates an isolated area of shallow peat, of between 0.535m and 0.605m depth.

4.1.26. The entire area is classified as SNH Peatland Class 4.

Mainline CH3620 - CH4100

4.1.27. The earthworks area is located on a flat area of semi-improved grassland to the northwest of Dalmagarry, between the existing A9 and the HML.

4.1.28. Peat probing data in the south of the earthworks area shows depths less than 0.5m, indicating thin soils present. As the soils encountered are of a depth less than 0.5m, it is not categorised as peat.

Moy LILO

4.1.29. The earthworks area is located on in a largely flat area of agricultural fields comprising unimproved and semi-improved grassland, with areas of wet heath and blanket bog in the central area.

4.1.30. Deep peat up to 4m in depth has been recorded in the central area. Peat cores TM-PC-10 and TM-PC-16 located in this area displayed moderately to strongly decomposed peat (increasing at depth) to approximately 3.5m. This area is classified as SNH Peatland Class 3.

4.1.31. Closer to the boundary of the area the peat depths are generally less than 0.5m, indicating thin soils present, particularly adjacent to the B9154 and the existing Dalmagarry Farm Access Road. As the soils encountered here are of a depth less than 0.5m, it is not categorised as peat. This area is classified as SNH Peatland Class 4.

Mainline CH4100 – CH4780

4.1.32. This earthworks area is located mostly within woodland on the steep embankments of the existing A9, however there is a more gently sloping area between the A9 and the HML where wet heath predominates.

4.1.33. Peat probing data across the majority of the area recorded depths less than 0.5m, indicating thin soils present. As the soils encountered are of a depth less than 0.5m, it is not categorised as peat.

4.1.34. However peat depths up to 1.1m were recorded in a small areas at the northern extent of the gently sloping land between the HML and A9.

Mainline CH4780 – CH6600

4.1.35. This area extends along the northbound side of the existing A9, crossing steeply sloping wet heath at the southern extent, and a mix of wet heath and conifer plantation across the central and northern extents where slopes are more gentle. The entire area is classified as SNH Peatland Class 5.

4.1.36. Probing data recorded a large number of depths less than 0.5m across the entire area, indicating largely thin soils, rather than peat. However, isolated locations in the centre and south of the earthworks area, within coniferous forestry, contain peat depths up to 2.6m and 0.7m, respectively. The locations of deep peat appear to be isolated, at the base of the embankments of the existing A9 and the lower slopes of Carn na Loinne.

Lynebeg Access Tracks

4.1.37. This earthworks area can be divided into two discrete areas, the first running parallel with the southbound carriageway of the mainline from the Moy Rail Bridge to Lynebeg. This section passes through conifer plantation on moderately steep ground, where probing depths were generally less than 0.5m, indicating non peat soils. Scattered points of depths ranging from 0.5m to 0.94m were also recorded suggesting several isolated pockets of shallow peat. The southern extent of this area is classified as SNH Peatland Class 5, while the northern end is Class 4.

4.1.38. The second area lies to the northbound side of the mainline, passing through conifer plantation, wet heath, unimproved acid grassland and the settlement of Lynebeg. The terrain is gently undulating, and probing recorded soil depths of less than 0.5m over the majority if the area. Two isolated probing locations within the wet heath at the northern end of this area recorded depths of 0.7m and 0.9m, indicating small pockets of shallow peat. The whole of this area is classified as SNH Peatland Class 5.

Lynebeg LILO

4.1.39. This earthworks area crosses conifer plantation on both the northbound and southbound sides of the mainline. The terrain on the northbound side is gently undulating, while on the southbound side slopes are moderately steep.

4.1.40. Peat probing data across the earthworks area shows a large number of depths less than 0.5m, indicating largely thin soils, rather than peat. However there are a number of small isolated locations on gentler slopes with probing depths of less than 0.6m, indicating the presence of pockets of shallow peat.

4.1.41. The northbound side is classified as SNH Peatland Class 5, while the southbound side is mainly Class 4.

Moy Access Tracks

4.1.42. This earthworks area can be split into two discrete sections, one which runs parallel to the southbound mainline from the Allt Loinne Moire to the Allt Creag Bheithin, and the second which runs from the A9 northwest to the B9154.

4.1.43. The section running parallel with the A9 crosses a gently sloping mix of grassland, flushes, mires and blanket bog. Peat depths are highly variable ranging from 0.1m to 1.5m, although the vast majority are less than 1m. The deeper peat probes were confined to scattered isolated pockets in the central section. Peat core TM-PC-14 is located within this area, with von post results indicating moderately decomposed peat at approximately 1.5m depth. This area is almost entirely classified as SNH Peatland Class 3.

4.1.44. The section running between the A9 and the B9154 is located on a small scarp at the edge of the Allt Creag Bheithin floodplain, crossing unimproved acid grassland. Probing recorded shallow soils of less than 0.5m along most of this section, although a small area of shallow peat up to 0.87m deep has been identified in an area of more gentle slopes. This area is almost entirely classified as SNH Peatland Class 4.

Mainline CH6600 – CH9600

4.1.45. This earthworks area is located largely adjacent to the northbound carriageway, with the eastern half traversing moderate slopes at the junction where the steeper hillsides to the south meet the gently sloping valley floor to the north, and the western half travelling up the edge of the upper Allt Creag Bheithin valley.

4.1.46. The eastern half crosses areas of wet and dry heath, and conifer plantation, where probing depths range from 0.1 to 0.9m, indicating a mix of soil and shallow peat. Several isolated areas of deeper peat up to 1.65m in depth have been identified, generally corresponding to localised hollows. The eastern end of this section has been classified as SNH Peatland Class 3, while the western end if Class 4.

4.1.47. Within the upper Allt Creag Bheithin valley the area largely crosses moderate to steep slopes covered with conifer plantation, with correspondingly shallow soils of less than

0.5m. However there are localised topographic lows where peat depths of up to 1.65m have been recorded. This area is almost entirely classified as SNH Peatland Class 5.

Forestry Access Tracks

4.1.48. The earthworks area is split into two sections; one which includes upgrades to the windfarm/forestry track following the Midlairgs Burn in the west and the other crossing the Allt Creag Bheithin in the east. Both areas are located to the south of the existing A9 and mostly based within forestry, with areas of blanket bog, wet dwarf shrub heath and acid neutral flush areas surrounding watercourses.

4.1.49. The western area of the earthworks area consists of upgrades to the existing windfarm/forestry track, including widening in areas of conifer plantation (felled in areas), blanket bog, wet dwarf shrub heath and acid neutral flush areas. This area features the Midlairgs burn, which flows to the north, with steep slopes within the valley featuring wet habitats with deeper soils at the valley base adjacent to the watercourse. Soil depths are generally shallow, with a larger area of deep peat adjacent to the Midlairgs Burn (up to 2.82m depth) at the northern end of the access track and smaller pockets of deep peat (up to 1.72m) at the southern end. One peat core (TM-PC-17) was taken, with Von Post class of H6 Moderately Decomposed recorded at full depth.

4.1.50. The eastern area of the earthworks area, located on a moderate slope within coniferous forestry, contains a large number of peat probes up to a maximum of 1.88m in depth, particularly along the coniferous forestry rides, indicating deep peat. A number of probes to the north of the section, nearest to the existing A9 embankments, are of depths less than 0.5m, indicating thin soils.

4.1. Peat Characteristics and Properties

4.1.1. The Von Post classification of nine cores collected are reported in Table A4.1 below, with three further cores classified to full depth reported in Table A4.2. These locations are also shown on Figure 10.4a-k within Chapter 10 and on the Peat Depth Map, Figure A10.1.3a-c, within Technical Appendix A10.1. Where peat cores have been taken in areas where peat will be removed, the earthworks area references (described above) have been included.

4.1.2. Interpretation of the data provided in Tables A4.1 and A4.2 is provided in the sections below.

Table A4.1: Characteristics and Properties of Peat Cores Collected During Stage 3 Fieldwork (April and December 2016)

Location ID & Sample date Peat Excavation Area ID (if applicable)	Core NGR	Depth of core (m)	Von Post Class	Moisture Content (%)	Bulk density (Mg/m^3)	Dry Bulk density (Mg/m^3)	Total Organic Carbon Content (%)	Lowest Shallow hand shear vane at 0.3m (kN/m^2)
TM-PC-02 14/04/16 - Ruthven Moy Link Road and Mainline	NH 791 319	1.0	H3 Very Weakly Decomposed	676	0.822	0.106	31.1	8

Location ID & Sample date Peat Excavation Area ID (if applicable)	Core NGR	Depth of core (m)	Von Post Class	Moisture Content (%)	Bulk density (Mg/m^3)	Dry Bulk density (Mg/m^3)	Total Organic Carbon Content (%)	Lowest Shallow hand shear vane at 0.3m (kN/m^2)
CH2700 - 3620								
TM-PC-03 14/04/16	NH 756 342	3.0	H4 Weakly Decomposed	1041	0.822	0.077	34.6	7
TM-PC-04 14/04/16 - Mainline CH6600 - 9600	NH 757 345	1.0	H4 Weakly Decomposed	733	0.935	0.112	35.8	8
TM-PC-06 14/04/16 - Mainline CH6600 - 9600	NH 746 347	1.0	H4 Weakly Decomposed	755	0.87	0.102	36.1	7
TM-PC-10 08/12/16 - Moy LILO	NH 784 326	3.74	H6 Strongly Decomposed	858	0.52	0.05	24.8	10
TM-PC-11 08/12/16	NH 783 328	1.0	H7 Strongly Decomposed	558	0.53	0.06	9.8	6
TM-PC-12 08/12/16	NH 759 342	1.0	H7 Strongly Decomposed	784	0.51	0.06	24.5	10
TM-PC-13 08/12/16	NH 759 343	1.9	H6 Strongly Decomposed	784	0.40	0.06	24.5	11
TM-PC-14 08/12/16	NH 760 345	1.5	H5 Moderately Decomposed	1,358	0.44	0.03	25.6	12

Table A4.2: Peat Cores Featuring Von Post classification Results to Full Depth (April 2017)

Location ID Peat Excavation Area ID (if applicable)	Core NGR	Depth of core (m)	Von Post Classification
TM-PC-15 - Tomatin Grade Separated Junction	NH 799 299	0 – 0.50	H3 Very weakly decomposed
		0.50 – 0.75	H3 Very weakly decomposed
		0.75 – 1.00	H4 Weakly Decomposed
		1.00 – 1.25	H5 Moderately Decomposed
		1.25 – 1.40	n/a – grey fine silt/sand
TM-PC-16 - Moy LILO	NH 784 326	0 – 0.2	H3 Weakly Decomposed
		0.2 – 0.30	H4 Weakly Decomposed
		0.3 – 0.50	H5 Moderately Decomposed
		0.5 – 0.75	H4-H5 Moderately decomposed
		0.75 – 1.00	H5 Moderately decomposed
		1.00 – 1.25	H5 Moderately decomposed
		1.25 – 1.50	H6 Strongly decomposed
		1.50 – 1.75	H7 Strongly Decomposed
		1.75 – 2.00	H8 Very Strongly Decomposed
		2.00 – 2.25	H8 to H9 Very strongly decomposed
		2.25 – 2.50	H8 Very strongly decomposed
		2.50 – 2.75	H5 Moderately Decomposed
		2.75 – 3.00	H5 Moderately Decomposed
		3.00 – 3.25	H8 Very strongly decomposed
		3.25 – 3.50	H8 Very strongly decomposed
TM-PC-17 - Forestry Access Tracks	NH 726 350	0 – 0.25	H3 Very weakly decomposed
		0.25 – 0.50	H4 Weakly Decomposed
		0.50 – 0.75	H5 Moderately Decomposed
		0.75 – 1.00	H5 Moderately Decomposed
		1.00 – 1.25	H5 Moderately Decomposed
		1.25 – 1.50	H5 Moderately Decomposed

4.1.3. The Von Post classification system is a field-based method for characterising the level of peat humification / decomposition across 10 classes, with H1 completely undecomposed peat and H10 completely decomposed peat. Catotelmic amorphous peat is generally considered to be classified as H6 - H10, strongly decomposed or greater on this scale (Scottish Government, 2014[xii]). From site samples, a number of locations exhibited Von Post values of H6 (or greater) suggesting that catotelmic amorphous peat may be present at a depth beyond 1.0m but varies with local conditions, with peat core TM-PC-03 recording H4 weakly decomposed peat (i.e. non-catotelmic) at a depth of 3.0m. Table A4.2 provides Von Post results to full-depth, these 3 core locations display the expected trend of increasing levels of decomposition at greater depth below surface, with

catotelmic peat identified at core location TM-PC-16 beyond a depth of 1.25m, although not recorded on the other full-depth cores at shallower locations.

4.1.4. Bulk density is the weight of soil in a given volume, with the associated dry bulk density obtained following heating of the sample to remove moisture. Peat has a relatively low dry bulk density in comparison with other soils, which is considered to be due to a combination of factors, including entrapped gas, high water content and the presence of low density organic content in the peat body (Boylan et al, 2008[xiii]). The bulk density (undrained) values recorded from site cores are lower than the expected peat values of approximately 1.0 Mg/m^3 (Dykes & Warburton, 2007[xiv]) and the typical range of 0.9 – 1.3 Mg/m^3, with site values averaging 0.65 Mg/m^3 and ranging from 0.40 – 0.935 Mg/m^3. Guidance on conducting site surveys on peatland (Scottish Government, 2014[xii]) suggests dry bulk density of basin and blanket peat having a mean value of 0.132 g/cm^3, ranging between 0.072 - 0.293 g/cm^3, with another reference suggesting a range of 0.04 – 0.34 g/cm^3 (SEPA & James Hutton Institute, 2015[xv]). The site samples are again low in comparison to these values, with an average dry bulk density of 0.07 Mg/m^3 and individual values ranging from 0.03 – 0.112 Mg/m^3 (note that 1 Mg/m^3 = 1 g/cm^3). Low bulk density values would reduce associated shear stress on a peat slope.

4.1.5. Scottish Government guidance (Scottish Government, 2017 [xi] and [xvi]) defines peat as a soil with a surface organic layer greater than 0.5m depth which has an organic matter content of more than 60%. The total organic carbon content of each collected peat core is less than 60%, with values ranging from 9.8 – 36.1%. The cores classified as weakly decomposed peat recorded higher organic content, with plant fibres more prevalent. The lower organic content values may suggest the cores include a proportion of peat-containing soils, such as peaty podzols which are mapped locally.

4.1.6. Shear vane results provide information on the shear strength of the soil, which for peat is typically dictated by cohesive strength characteristics (Boylan et al, 2008[xiii]). Shear strength of peat is generally considered to range between 4 – 20 KN/m^2 (Boylan et al, 2008[xiii]), with site results falling within this range (6 – 12 KN/m^2). It is important to note that there are a number of limitations and concerns with regard to use of shallow shear vane testing for peat and peaty soils, such as the presence and orientation of fibres (e.g. vegetation matter) which may lead to an over-estimation of shear strength and that shear vane results from greater depth would be anticipated to record lower shear strength, due to higher level of decomposition and associated loss of structural integrity. However, shallow shear vane data provides useful additional data to enable comparison of different locations across the project area.

4.1.7. In summary, the peat core results suggest that the levels of decomposition and organic material at the representative peat core locations are less than would be typically expected in peat, indicating that some core locations may be peat-containing soils, which would be expected to have a greater structural integrity than peat and of less sensitivity in terms of excavation and re-use. Low bulk density values indicate a peat mass that is likely to be more stable upon sloping ground, but temporal changes in water content would remain a key trigger factor. The degree of peat decomposition, i.e. classified via Von Post, is considered to be a better practical indicator of stability than shallow shear strength for peat bodies.

5. Excavation

5.1. Excavation Areas

5.1.1. The Proposed Scheme has been broken down into 20 earthworks areas based on dividing the mainline into sections as well as areas to cover junctions and side roads. These areas have been used when calculating earthworks volumes using the Average End Area Method which includes volumes for peat and topsoil for each area.

5.1.2. Table A5.1 below provides a summary of the volumes of topsoil and peat (broken down into peaty soil, acrotelm and catotelm – fibrous and amorphous) for each of the earthworks areas.

Table A5.1: Topsoil and Peat Volumes by Earthworks Area

Earthworks Area Reference	Topsoil Volume (m^3)	Peaty Soil (m^3)	Peat Acrotelm (m^3)	Peat Catotelm (Fibrous) (m^3)	Peat Catotelm (Amorphous) (m^3)	Total Peat Volume (m^3)
Tomatin South Junction	1,218	0	0	0	0	**0**
C1121*	0	0	0	0	0	**0**
Mainline CH300-CH380	400	0	0	0	0	**0**
Tomatin GSJ	14,200	1,255	3,812	8,893	2,868	**16,828**
Mainline CH400-CH1200	1,600	0	1,949	4,548	1,486	**7,983**
Ruthven Tomatin Link Road	27,580	3,650	2,244	5,234	0	**11,128**
Mainline CH1220-CH2700	14,300	121	447	1,044	0	**1,612**
NCN7	1,300	0	38	89	28	**155**
Mainline CH2720-CH3620	9,800	0	164	383	15	**562**
Ruthven Moy Link Road	27,660	913	1,699	3,966	502	**7,080**
Dalmagarry Access Tracks	5,960	0	329	768	125	**1,222**
Mainline CH3620-CH4100	5,200	0	240	560	1,600	**2,400**
Moy LILO	3,600	0	2,552	5,954	9,306	**17,812**
Mainline CH4100-CH4780	10,100	2,724	3,194	7,453	1,716	**15,087**

Earthworks Area Reference	Topsoil Volume (m^3)	Peaty Soil (m^3)	Peat Acrotelm (m^3)	Peat Catotelm (Fibrous) (m^3)	Peat Catotelm (Amorphous) (m^3)	Total Peat Volume (m^3)
Mainline CH4780-CH6600	15,200	7,900	738	1,721	658	**11,017**
Lynebeg Access Tracks	4,900	363	179	418	96	**1,056**
Lynebeg LILO	5,800	0	1,325	3,093	0	**4,418**
Moy Access Tracks*	3,000	0	0	0	0	**0**
Mainline CH6600-CH9600	26,600	5,220	5,750	13,417	3,729	**28,116**
Forestry Access Tracks	400	0	202	472	2,023	**2,697**
Total Topsoil	**178,818**	**22,146**	**24,862**	**58,013**	**24,152**	**129,173^**

* - Only Class 1/2 material due to be excavated

^ - This volume has been rounded to 129,200m^3 within the earthworks calculations

5.2. Overall Soil and Peat Volumes

5.2.1. This section details the overall volumes of soil and peat requiring excavation as part of the Proposed Scheme. This has been calculated using the volumes calculated for each of the 20 earthworks areas as detailed in the Section above. A summary of the total volume of topsoil, peaty soil and peat are shown below in Table A5.2.

Table A5.2: Soil and Peat Volumes Requiring Excavation

Category	Volume (m^3)		
Topsoil	178,818		
Peaty Soil	22,146		
Peat	107,027	Acrotelm (0.0 - <0.3m)	24,862
		Peat – Catotelm (Fibrous) (0.3 - <1.0m)	58,013
		Peat – Catotelm (Amorphous) >1.0m	24,152
Total	307,991		

5.2.2. The volume calculations show most of the material excavated, 58%, will be topsoil, with the smallest proportion featuring catotelmic (amorphous) peat, estimated at 8% of the total excavation volume. Peat (acrotelm and fibrous / amorphous catotelm account for 35% of the soil / peat material to be excavated.

5.3. Topsoil / Peaty Soil

5.3.1. Shallow peat depths are predominant within the scheme, with over 60% of all 1,416 peat probes recording depths of less than 0.5m.

5.3.2. Furthermore, specific to the 440 peat probes undertaken within the Proposed Scheme footprint, these register an average depth of 0.45m and a median depth of 0.30m. The reduced depth within the Proposed Scheme footprint helps demonstrate that the iterative design process has taken account of peat as a constraint.

5.3.3. With such shallow peat depth confirmed at most locations, it is very likely that Proposed Scheme footprint is predominantly underlain by peaty soils or topsoil.

5.3.4. A total of 178,818m^3 of topsoil is calculated to be excavated within the Proposed Scheme. The earthworks areas with the highest volumes of anticipated topsoil excavation include Ruthven Tomatin Link Road, Ruthven Moy Link Road and the Mainline between CH6600 and CH9600.

5.3.5. A total of 22,146m^3 of peaty soil are calculated to be excavated within the Proposed Scheme footprint with the highest volumes anticipated in the earthworks areas along the Mainline between CH4780 to CH9600.

5.4. Peat - Acrotelmic and Catotelmic (Fibrous)

5.4.1. Acrotelmic peat is encountered across the Proposed Scheme, with a total of 24,862m^3 requiring excavation. The earthworks areas containing the highest volumes of acrotelmic peat that will require excavation are located within Tomatin GSJ and along the Mainline between CH6620 and CH9600.

5.4.2. Catotelmic (fibrous) peat is also widely encountered, with 58,013m^3 requiring excavation. Tomatin GSJ and along the Mainline between CH4100 to 4780 and CH6600 to 9600 contain the highest volumes of Catotelmic (fibrous) peat that will require excavation.

5.4.3. The combined volumetric total within the upper 1.0m of peat is estimated as 82,875m^3.

5.5. Peat - Catotelmic (Amorphous)

5.5.1. Catotelmic (amorphous) peat is encountered within the Proposed Scheme, with a total of 24,152m^3 requiring excavation. A threshold value of 1.0m depth for catotelmic (amorphous) peat has been suggested as a generally accepted value by SEPA in the published waste guidance related to peatland[xvii]. Given soil map evidence and local characteristics across the large site area (including peat core data provided in Tables A5.1 and A5.2), it is likely that applying the 1.0m threshold value is reasonably precautionary and potentially still overestimates catotelmic (amorphous) peat conditions that would require excavation below infrastructure.

5.5.2. The Moy South LILO earthworks area contains the highest volume of amorphous catotelmic peat that will require excavation. This accounts for 39% of all the amorphous catotelmic peat to be excavated across the Proposed Scheme. Other significant volumes of amorphous catolmic peat (>2,000m^3) are located within the following earthworks areas:

- mainline between CH6600 and CH9600
- Tomatin Grade Separated Junction
- forestry access tracks

5.5.3. Due to the inherent lack of structure and high water content in catotelmic (amorphous) peat, it is difficult to manage and successfully re-use when excavated. Thus, the

Proposed Scheme design has sought to avoid excavating such material in the first instance, but where there is a requirement to excavate this deeper peat, it has been important to establish the likely volumes.

6. Re-use Options for Soil and Peat

6.1. Introduction

6.1.1. This section details the re-use options for soil and peat within the Proposed Scheme. It also considers the need for potential off-site locations and is based on the approach detailed in Section 3.5. This uses the results presented in Sections 4 and 5 above on the classification and volumes of soil and peat likely to be encountered during the construction works.

6.1.2. SEPA's guidance, as detailed in their Position Statement on peat, states: "Developers should attempt to re-use as much of the peat produced on site as is possible"[iv].

6.2. Re-Use Options within Proposed Scheme

6.2.1. Fill and landscape requirements for the Proposed Scheme will predominantly use appropriate geotechnical material, applying topsoil / peaty soil as surface dressing. The re-use of material for landscaping (dressing) will require an estimated 244,273m^3.

6.2.2. The majority of which could be met by the estimated excavation volume of Class 5 topsoil (178,818m^3).

6.2.3. There is an anticipated shortfall to meet the Proposed Scheme's total landscaping requirement, representing 65,455m^3. This shortfall could be met using the more fibrous peat (acrotelm and catotelm) as well as the amorphous catotelmic peat by blending the peaty soil which will be encountered during the construction works.

6.2.4. It is anticipated that overall, the peaty soils and peat (all types) will undergo an average shrinkage in volume of 50% due to dewatering / drying / mixing with topsoil and peaty soil. Therefore, the likely available volume of peaty soils / peat is estimated to be 64,600m^3.

6.2.5. It is anticipated that all 64,600m^3 of the peaty soils, the more fibrous peat as well as the amorphous peat could be used to meet the majority of the shortfall in landscaping material requirements, as detailed above.

6.2.6. Overall, there remains a deficit of approximately 855m^3 required for landscaping and this is anticipated to be made up from imported sand. It should be noted that this sand would be mixed with topsoil, not peaty material, prior to re-use within the landscaping.

6.2.7. Both acrotelmic and catotelmic (fibrous) peat are likely to be suitable for re-use throughout the Proposed Scheme due to the fibrous structure giving good potential for application. This material is anticipated to be excavated as the upper 1.0m of peat.

6.2.8. The deeper peat, consisting of the amorphous catotelm (> 1.0m), generally has a high water content and very low tensile strength, which makes it difficult to handle due its physical properties. If placed directly for restoration or for landscaping it can lead to a number of issues including low bearing capacity, propensity to slide off slopes and potential to release water with high suspended solids content.

6.2.9. It is estimated that there is 24,152m^3 of catotelmic (amorphous) peat that will require to be excavated during the construction works, across a number of discrete locations. This will not all require excavation at one time and will be excavated during various stages of the construction programme.

6.2.10. It is proposed the catotelmic (amorphous) peat will be pre-treated to provide a more stable combined structure through drying and mixing with peaty soils. This will require to be discussed with the relevant statutory body as to the suitability of pre-treatment options and subsequent re-use.

6.2.11. The acrotelm and the fibrous catotelmic peat will be mixed with the topsoil in order to produce a peaty soil for dressing within landscaping areas.

6.2.12. Suitability for re-use, such as for landscaping purposes, is ultimately dependent on the structure of the material excavated during the construction works, this would require assessment and confirmation of appropriate application by the Contractor and in consultation with the Environmental Clerk of Works (EnvCoW). The EnvCoW will be appointed by the Contractor and report to the Environmental Coordinator and be present during the construction period to monitor the implementation of mitigation measures and ensure activities are carried out in such a manner to prevent or reduce impacts on the environment.

6.3. Re-Use Options Outwith Proposed Scheme

6.3.1. The appraisal of potential re-use options has concluded that all of the excavated soil and peat can be re-used within the Proposed Scheme as detailed in the sections above. As such no off-site reuse options have been progressed.

6.4. Pre-Treatment for Re-Use

6.4.1. The mixing of peat with topsoil / peaty soils has been considered as a viable treatment option in areas which already host peaty soil, depending on the proposed ecology and landscape mitigation planned for the area.

6.4.2. It is estimated that there is 24,152m^3 of amorphous catotelmic peat that will require to be excavated in total for the Proposed Scheme. This can be broken down into discrete volumes identified along the Proposed Scheme, and range in volume from 15m^3 within Mainline CH2720 – CH3620 up to 9,306m^3 at Moy South LILO.

6.4.3. Pre-treatment measures under consideration include the potential to reduce volume and improve the mechanical properties of the amorphous catotelmic peat by de-watering and then mixing with peaty soils.

6.4.4. As discussed in Section 6.2.11 above, the acrotelm and the fibrous catotelmic peat will be mixed with the topsoil in order to produce a peaty soil for dressing within landscaping areas.

6.4.5. The mixing of peat with non-peaty topsoil is not generally recommended due to the following issues that may arise:

- if mixing is not done correctly pockets of peat may form, which may affect planting
- the peat material may not meet specific requirements for nutrient, pH values, etc., which may not meet British Standards required for planting requirements
- the properties of the peat once removed are likely to change and can become unpredictable in its nature

6.4.6. However, in this instance the intention is to promote the establishment of vegetation in landscaping areas similar to that in the adjacent surrounding areas. As such, it has

been deemed acceptable to mix topsoil and peat in order to create a peaty soil similar to that shown to be underlying the majority of the Proposed Scheme footprint.

6.5. Environmental Considerations for Re-Use

6.5.1. When considering the potential re-use options the following considerations should also be taken into account:

- potential impacts on peat stability created from re-use
- potential impacts on water quality and geomorphology of watercourses
- potential loss of existing ecological habitats within the area of re-use, ideally in areas of low ecological value
- impacts on drainage and flood risk where the hydrological and sub-surface regime could be impacted

6.5.2. It is important to consider a number of factors for potential landscaping / restoration work in line with current guidance, these include:

- topography – ensure peat remains stable in each location, with consideration given to subsurface flows that may also contribute to hydrological flow, as well as downstream receptors that could be adversely effected by peat/sediment becoming entrained in runoff
- hydrogeology – near surface groundwater levels to allow some level of hydraulic connectivity between the peat and underlying aquifer
- existing peatland condition – the condition of existing peatland and land use needs to be considered for any peatland restoration work to be successful
- ecology – need to ensure no additional impacts on existing habitats and woodlands are created as a result of peat re-use

7. Storage and Handling of Material

7.1.1. It is assumed that both peat required for re-use and for disposal (if there is no re-use potential) may require storage areas. If it is deemed suitable, any pre-treatment of the peat may also require storage either prior to or after treatment, prior to re-use application.

7.1.2. It is anticipated that not all peat will need to be stored at the same time, due to the phasing of the construction programme. The estimated volume of excavated soil and peat, within discrete areas along the Proposed Scheme, are detailed in Tables A5.1 and A5.2, and shown in Figure A10.2.1a-k. This should allow planning of the anticipated location and size of storage areas required.

7.1.3. The location of soil and peat storage / drying areas is the responsibility of the contractor, and cannot be determined at this time. However, preliminary calculations indicate that during the construction phase the maximum volume of this material that will require storage at any one time will be approximately 100,000m^3, and will occur approximately in the 17th to the 20th month of the construction period.

7.1.4. A preliminary review of the indicative land made available (LMA) and of adjacent land indicates that there will be sufficient suitable land in the vicinity of the Proposed Scheme to safely store this material, in compliance with the good practice methods and the requirements of the Waste Management Licence Regulations as discussed below.

7.1.5. Furthermore, the peat excavation volumes calculated indicate that amorphous catotelmic peat will be excavated at several discrete locations, with the largest volume to be excavated at Moy South LILO (9,306m^3). A review of the adjacent land suggests that sufficient suitable land can be found adjacent to each of these areas for the pre-treatment drying of this material.

7.1.6. It is expected that prior to construction commencing, the contractor will provide an updated plan detailing potential locations for temporary storage and an outline programme indicating the duration and quantity of stored peat and measures to mitigate and/or capture sediment run-off from stored material. At all times, the primary objectives shall be to minimise both the time and volume of temporary storage, and to prevent sedimentation of any watercourse or waterbody.

7.1.7. Excavated soil and peat would be carefully separated to ensure they are kept apart and stored in appropriately designated areas.

7.1.8. Bunding would be included, where appropriate, to minimise any pollution risks.

7.1.9. Elements of the management and re-use of excavated peat could require approval from stakeholders and should be factored into timescales. Any mixing, drying or other pre-treatment of excavated material would be undertaken with prior stakeholder approval and following strict and agreed protocols.

Good Practice Methods

7.1.10. Good practice storage and handling methods would include:

- careful removal of vegetated turves
- turves should kept vegetated side up to prevent damage to the living vegetation
- short timescales between lifting and replacement of turves (with a 6 week reinstatement objective) and ensuring stored turves are kept in good condition

(including watering during dry weather conditions which could lead to the peat drying out)

- revegetation of bare soil with native vegetation would be encouraged as soon as practicable
- the maximum storage depth of peat should not exceed 2.0m in depth and volume should not exceed 20,000m^3 per hectare[ii]
- storage as close as practicable to the excavation location and/or planned re-use location
- storage of materials at a minimum distance of 10m from any watercourses and 50m from any watercourse identified on Ordnance Survey 50,000 scale mapping and taking account of other environmental or engineering sensitivities

Peat - Catotelm (Amorphous)

7.1.11. As it has been confirmed that catotelm (amorphous) peat will require excavation during pre-construction or construction activities, confirmation of acceptable pre-treatment, storage, transfer methods and re-use should be obtained from the relevant statutory bodies and built into construction phase environmental and waste management plans.

8. Disposal Route

8.1.1. Should there be an excess of excavated material unsuitable for re-use, disposal options would require to be explored and recommendations made as to the potential disposal routes for any such material, as a last option. Disposal of amorphous catotelmic peat can lead to a number of issues due to the high water content and low tensile strength and will require further consideration under Waste Management Licensing and the potential requirement for pre-treatment prior to disposal.

9. Monitoring and Construction Mitigation

9.1.1. Further pre-construction Ground Investigation works may allow opportunity for peat volumes to be refined on the basis of more detailed data becoming available.

9.1.2. To ensure that peat volumes are minimised during construction, and to reduce impact on peat areas, the Contractor and EnvCoW would be responsible for ensuring the Soil and Peat Management Plan is adhered to, including mitigation measures proposed. Mitigation measures that should be included for soil and peat excavation on the Proposed Scheme were identified in Section 7.

9.1.3. The volumes outlined in the Soil and Peat Management Plan and other environmental management documents should be updated (in line with guidance[i]) before and during construction, as part of maintaining as-built records for the Proposed Scheme[i].

10. Conclusions

10.1.1. This report identifies the estimated volume of soil and peat that will require to be excavated for the Proposed Scheme; 178,818m^3 of Class 5 topsoil and 129,172m^3 of peat.

10.1.2. It is estimated that all the topsoil, peaty soil and peat excavated as part of the Proposed Scheme could be used for the required landscaping within the scheme boundary.

10.1.3. The predicted catotelmic (amorphous) peat arisings, calculated based on all peat excavated at a depth of beyond 1.0m total 24,152m^3. If deemed suitable, the catotelmic (amorphous) peat could be pre-treated and re-used within the scheme boundary. This will require consultation with the relevant stakeholders regarding the suitability of application, specific locations and pre-treatment methods. Actual material excavated may have more fibrous characteristics than estimated and therefore have more potential applications and/or less pre-treatment requirement. It would be preferable to re-use catotelmic (amorphous) peat locally, minimising handling, transfer and storage issues, with the sensitivities of this material recognised.

10.1.4. Based on the volume estimates, there is not an excess of peat beyond that anticipated to be re-used within the Proposed Scheme boundary.

10.1.5. It has been established that there is the potential, based on reasonable and pragmatic assumptions, to re-use all excavated peaty soil and peat generated from the Proposed Scheme. With characteristics of peat potentially varying over relatively short distances and depths, specific peat characteristics and management strategies will require to be confirmed during pre-construction with the contractor, regulators, stakeholders and landowners.

11. References

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