Scottish & Southern Electricity Networks

TRANSMISSION

Annex N - Peat Management Plan (PMP)

September 2022

ARCUS
An ERM Group Company

AN SUIDHE SUBSTATION ENVIRONMENTAL APPRAISAL

ANNEX N

OUTLINE PEAT MANAGEMENT PLAN VERSION 1

JUNE 2022

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1 INTRODUCTION

1.1 Preparation of the Peat Management Plan

Arcus Consultancy Services Ltd (Arcus) was commissioned by ERM on behalf of SSEN Transmission (the Applicant) to draft an outline Peat Management Plan (oPMP) to support an Environmental Assessment (EA) for a new 275 kV electricity substation and overhead line (OHL) Tie Ins (hereby known as 'the Project') in the vicinity of the existing An Suidhe substation is located at National Grid Ref. 204861, 705524.

The new substation and accompanying infrastructure aspects located within the red line boundary as shown in **Appendix 1 Figure 1** (hereby known as the Proposed Development) will be subject to a Town and Country Planning Application, while the OHL Tie in and accompanying towers (hereby known as the Associated Development) will be submitted for Section 37 consent to the Energy Consents Unit (ECU).

It should be noted that construction schedules for both the Proposed Development and the Associated Development will be aligned. Therefore, peat excavation and re-use will be considered within the wider scope of the Project.

This oPMP has been prepared to inform Argyll and Bute Council (ABC) and statutory consultees of the estimated peat excavation and re-use potential, proposed peat and soils management methodologies to be employed during construction.

This oPMP will ensure the Project constitutes a construction project that complies with good practice in accordance with Scottish Renewables (SR) and Scottish Environment Protection Agency (SEPA) guidance.

The purpose of the oPMP is to:

- Define the materials that will be excavated as a result of the Project, focusing specifically, on the excavation of peat;
- Report on detailed investigations into peat depths within the Project;
- Detail proposals for the management of excavated peat and other soils;
- Consider the potential effect of the Project on Ground Water Dependent Ecosystems (GWDTEs);
- Determine volumes of excavated peat at the Project and proposals for re-use or reinstatement using excavated materials; and
- Detail management techniques for handling, storing and depositing peat for reinstatement.

The oPMP has been produced in accordance with SR and SEPA guidance on peat excavations and management[1]. It is also intended to be a document that will evolve during the different phases of the project and as such will be subject to continued review to address:

- Requirements to discharge future planning conditions;
- Detailed ground investigations and design development;
- Unforeseen conditions encountered during construction;
- Changes in best practice during the life of the wind farm; and
- Changes resulting from the construction methods used by the contractor(s).

Whilst this oPMP provides a base standard for good practice, where avoidance or further minimisation of risks to the environment can be demonstrated through use of alternative

[1] SR and SEPA (2012) Guidance on the Assessment of Peat volumes, Re-use of Excavated Peat and the Minimisation of Waste [Online] Available at: http://www.scottishrenewables.com/media/uploads/publications/a4_developments_on_peatland.pdf (Accessed 25/03/22)

methods or improvements to current practices, the Contractor will implement these wherever possible and will correspond with SEPA and ABC.

1.2 The Project

The land which the Project occupies is located approximately 5 km southwest of Inveraray covering an area of approximately 42 hectares (ha) and is located within the administrative boundary of ABC. The Project extends northeast to southwest, making use of the existing access track to An Suidhe Substation which connects to the A83. The Project is illustrated on **Figure 1Site Layout Plan**, within **Appendix 1** of this oPMP.

The topography of land within the red line boundary and immediate vicinity is relatively complex. The elevation ranges approximately from 190 metres (m) Above Ordnance Survey Datum (AOD) and falls to around 160 m AOD towards the north-eastern boundary. There is one notable hilltop at the centre of the Project named Tom nam-Buachaillean.

Published British Geological Survey (BGS)[2] data information on superficial soils indicates the majority of the Project to be unrecorded. However, glacial deposits of Till are shown northern area of the Project, which hosts the proposed substation and temporary construction compound. **Figure 2** within **Annex O Peat Slide Risk Assessment** illustrates the 'Superficial Soils' map.

Published BGS mapping information on solid geology indicates the majority of the Project underlain by a mix of Semipelite and Metagabro rock. A metamorphic Bedrock, which was formerly sedimentary belonging to the Ardrishaig Formation was present in the northern area of the Project, in close vicinity to the substation and temporary construction compound. Throughout the central area of the Project, in close vicinity to the tower infrastructure, there is metamorphic Bedrock, which was formerly Igneous rocks formed by intrusions of silica-poor magma. **Figure 3** within **Annex O Peat Slide Risk Assessment** illustrates the 'Solid Geology'.

Published BGS Geosure mapping[3] indicates that no faulting exists on-site with the nearest faulting recorded approximately 1.5 km to the north west of the infrastructure, running south west- north east.

2 OBJECTIVES

2.1 Introduction

2.1.1 Background

Detailed peat survey work and completion of assessments such as Peat Slide Risk Assessment (PSRA), presented in **Annex O: Peat Slide Risk Assessment** of the EA **,** allows a consistent approach to the management of peat across the Site can be achieved.

The overall objective of the design of the Project has been to minimise the excavation of peat where possible and achieve as close as practicable an overall material balance. This is considered to give the best opportunity to achieve reinstatement or restoration in accordance with good practice and remove the need for waste management controls.

This objective is achieved through:

- Ensuring the characteristics of the Project are understood through extensive peat
- probing and assessing the Projects topography;
- Understand the layout of the Project and how excavations will take place; and
- Calculate the peat volumes using the peat depths and infrastructure areas.

[2] BGS (2019): http://mapapps.bgs.ac.uk/geologyofbritain/home.html (Accessed 25/03/22)
[3] BGS (2019): https://mapapps2.bgs.ac.uk/geoindex/home.html (Accessed 20/04/22)

2.1.2 Approach to Minimising Peat Excavation

The following steps have been taken during the outline design stage of the Project to minimise the effect on peat:

The development of an access track design which avoids deeper peat where practicable or utilises existing tracks; and

The design and orientation of infrastructure considers local topography, deep peat and other environmental constraints.

At detailed design and construction stage these steps will be supplemented by taking the following measures to minimise disturbance:

- Maximisation of batter angles in cuttings; and
- The use of appropriate construction plant to avoid unnecessary disturbance of the ground surface.

The fundamental principle upon which this oPMP is based is that achieving a successful materials strategy is contingent on gaining a thorough understanding of the Project through investigation and developing a design that achieves the materials management objectives. For the Project, this principle is achieved by undertaking significant peat investigation works prior to preparing this oPMP, and design evolution that considers the peat recorded.

2.2 Aims and Objectives

2.2.1 Need for a Peat Management Plan

This oPMP is prepared to demonstrate to the planning authority, SEPA and other consultees that the construction of the Project will progress in a manner that is planned, is in accordance with good practice and achieves the aim of being environmentally sustainable.

The oPMP is therefore prepared in accordance with the SR and SEPA guidance. It defines how:

- The Project has been designed so far as practicably possible to reduce the volumes of peat excavated;
- Volumes of peat excavated during the works have been considered in the design; and
- Excavated peat will be managed and reused.

2.2.2 Objectives of the Peat Management Plan

The main objective of the oPMP is to outline how any peat expected to be excavated will be managed and re-used during the construction of the Project.

This is achieved through responding to the following objectives:

- Providing a description of the extent and depths of peat at the Project and how this was determined;
- Estimation of peat volumes to be excavated and re-used;
- Preliminary classification of excavated materials;
- Consideration of the use of appropriate peat(s);
- Describing how excavated peat will be handled to ensure suitability for re-use;
- Determining if temporary storage of peat will be required during construction and how this will be done to ensure suitability for re-use; and
- Considering the potential volume of peat which may not be suitable for re-use and any requirement for a Site Waste Management Plan (SWMP) for the Project.

The response to these objectives is provided in the following sections.

3 PEAT MANAGEMENT

3.1 General Peat Classification

Acrotelmic peat is the upper layer of peat consisting of living and partially decayed material with a higher hydraulic conductivity and a variable water table. These deposits are generally found to exist in the upper 0.5 m of peat deposits and is typically suitable for re-instatement because it contains viable plant life to assist in the regeneration of peatland vegetation and carbon sequestration.

Catotelmic peat is variable in characteristics, with decomposition of fibres generally increasing with depth. Water content can be highly variable and affects the structural strength of the material. Suitability for re-use generally depends on fibre and water content. The upper catotelm is commonly deemed as being appropriate for re-use in restoration due to its relatively high fibre content.

Generally, excavated semi fibrous catotelmic peat from the Project will have sufficient structural strength to be able to be used in the lower layers of verge restoration as it will not be 'fluid'.

The catotelmic peat would be capped with a surface layer of actrotelm to re-establish the peat vegetation. If any fluid like wet catotelmic peat is encountered, then it would be placed in more appropriate locations such as low-lying sections of the borrow pits or concave deposition areas.

The following assumptions have been made in classifying peat excavated during the construction work:

- Where the total peat depth was found to be less than 0.5 m, this peat material is assumed to be 100% acrotelmic;
- Where the total peat depth is between 0.5 m and 1.0 m, the upper acrotelmic peat is at least 0.5 m deep; and
- Where the total peat depth as found to be greater than 1.0 m, acrotelmic peat is assumed to account for at least 30% of total depth but generally applying minimum of 0.5 m thickness.

Existing topography, environmental constraints and electrical engineers, drive the design of the infrastructure with due consideration given to potential construction risk and effects on environmentally sensitive receptors including deep peat, watercourse buffers and any GWDTEs. Further micro-siting post-consent would take place in such a way as to avoid where possible the excavation of deep peat.

3.2 Investigations

The existing peat depths across the Project have been determined through a phased survey approach. The survey was initiated to inform the EA and design of the Project while supporting the PSRA and oPMP.

Preliminary peat probing was undertaken as part of the initial site optioneering, which was superseded by phases of detailed peat probing focussing on the Project. The survey comprised a total of 470 probes.

Probing was undertaken across several visits between November 2021 and February 2022. The probe positions for these visits were focussed on the Proposed infrastructure including the substation, tower locations, temporary works area and permanent access tracks. Peat depths were measured along the proposed access tracks at 50 m centres with offsets of 25 m on either side of the centre line where possible, while an intense 10 m grid provided detailed peat information at the proposed substation and a 25 m grid was adopted to cover the temporary works area. Furthermore, regarding the Associated Development, six tower positions were covered at 10 m spacing to a 25 - 30m distance in all directions to allow for

potential micrositing and proposed temporary access tracks were covered in a similar methodology to the permanent tracks.

The peat depths are illustrated in **Figure 2 Recorded Peat Depths** within **Appendix 1** of this oPMP.

3.3 Summary of Peat Depths

Peat depths ranged from 0 m to 3.9 m thickness across the Project and were shown as localised or isolated zones, with only 8 probes confirming peat in excess of 2 m, their locations confined to lower lying localised pockets in the south-western area of the Study Area.

Much of the proposed infrastructure is on relatively steep gradients, and the layout avoids any significant convex topographical areas where peat may have accumulated.

The Associated Development including a tower and a section of temporary access track are located in the vicinity of the deep peat near the periphery of the forestry in the west of the site and some micro-siting may be required to re-locate it to an area of thinner peat, if possible. The Proposed Development infrastructure including proposed substation and temporary works area (TWA) are located in a deforested area (spruce plantation) with overgrown grasses and discarded wood cutting noted. The area has a very shallow peat profile, although only one probe reached depths greater than 1.0 m on the southern edge of the substation while all probes in the TWA recorded peat depths less than 1.0 m.

The Permanent Access Track (the Proposed Development) linking the substation to the existing track generally lies on shallow peat, however one reading of 1.4 m was noted on the centre line and may require some micrositing to avoid. The Permanent Access Tracks in the east connecting two towers to the existing track were recorded to be in areas of peat less than 0.5m. Temporary track between towers was located mainly in areas less than 0.5m with only a localised area where peat was greater than 0.5m, with depths reaching almost 2.0m.

Figure 3 Interpolated Peat Depths included in **Appendix 1** illustrates the peat depths recorded across the Project, the distribution of peat deposits along the proposed access tracks and infrastructure.

3.3.1 Excavation Calculation

Peat excavation volumes have been estimated based on the footprint of the site layout (access tracks, hardstandings and towers) and the recorded peat depths. The total excavation and subtotal by infrastructure are included in **Table 1** below.

In addition, a further 10% of the total volume of excavated material has been applied as contingency bulking factor.

Table 1: Peat Excavation Volumes Based on Construction Activity

Project Component	Estimated Volume of Excavated Peat (m^3)	Estimated Volume of Acrotelmic Peat (m^3)	Estimated Volume of Catotelmic Peat (m^3)
Infrastructure Towers	156	156	0
Temporary Tracks	1000	1000	0
Permanent Tracks	644	644	0
Temporary Works Area	1,340	1,340	0
Substation	2,849	2,849	0
SUB-TOTAL	**5,989**	**5,989**	**0**
+ 10% contingency Bulking Factor	**599**	**599**	**0**
TOTAL	**6,588**	**6,588**	**0**

A detailed assessment of excavated volumes by location is provided in **Appendix 2** of this oPMP.

The principles of re-instating peat and peaty soils should be adhered to for all elements of the infrastructure, comprising the below:

- Peat and peaty soils will be reinstated on track and infrastructure verges with turves placed on the upper horizons encouraging re-vegetation;
- All peat, soil and turves excavated from beneath infrastructure will be re-instated in the vicinity of its original location; and
- Reinstatement activities will be overseen by the Ecological Clerk of Works (ECoW) to ensure methods are properly adhered to.

Table 2 shows the opportunities for re-use of peat including the demand for acrotelm and catotelm peat. **Table 3** summarises the total peat balance estimated during construction of the Project. Detailed excavation calculations are included in **Appendix 2**.

Table 2: Peat Re-use Volumes Based on Construction Activity

Project Area	Total Demand Estimate (m^3)	Acrotelm Demand (m^3)	Catotelm Demand (m^3)	Estimated Reinstatement Thickness (max) where gradient permits (m)	Assumptions
Towers	360	360	0	Up to 0.5 m	Towers and associated earthworks will be dressed off with up to 0.5 m of peat and peaty soils.
Temporary Access Tracks	1674	1674	0	Up to 0.6 m	Where new temporary access tracks are proposed, peat will be reinstated along verges and associated earthworks with

Project Area	Total Demand Estimate (m^3)	Acrotelm Demand (m^3)	Catotelm Demand (m^3)	Estimated Reinstatement Thickness (max) where gradient permits (m)	Assumptions
					peat up to 0.6 m thick with verges not expected to exceed 3.0 m on either side during construction phase and reinstated fully post construction of the Associated Development. Average peat depths suggest only acrotelmic peat will need to be reused.
Permanent Access Tracks	1642	1642	0	Up to 0.6 m	Where new permanent access tracks are proposed, peat will be reinstated along verges and associated earthwork banking with peat up to 0.6 m thick with verges not expected to exceed 2.5 m on either side. Average peat depths suggest only acrotelmic peat will need to be reused.
Temporary Works Area	2212	2212	0	Up to 0.45 m	Temporary Works Area and associated earthworks will be dressed off with up to 0.45 m of peat and peaty soils and reinstated fully post construction of the Project Average peat depths suggest only acrotelmic peat will need to be reused.
Substation	700	700	0	Up to 0.6 m	Substation hardstanding area and associated earthworks will be dressed off with up

Project Area	Total Demand Estimate (m^3)	Acrotelm Demand (m^3)	Catotelm Demand (m^3)	Estimated Reinstatement Thickness (max) where gradient permits (m)	Assumptions
					to 0.5 m of peat and peaty soils. Average peat depths suggest only acrotelmic peat will need to be reused.
TOTAL	**6588**	**6588**	**0**		

Table 3 is presented as a summary of the assessment of peat reinstatement volumes. A detailed assessment is provided in **Appendix 2** of this oPMP.

Excavated peat will be temporarily placed adjacent to where it is excavated where possible. However, where this is not possible, temporary peat storage areas are shown on **Figure 4**, included in **Appendix 1**. These are low vulnerability areas, out with 50 m buffer of watercourses and where topography permits.

Table 3: Peat Balance Calculations

Peat Description	Total Peat Demand Estimate for Reinstatement (m^3)	Total Peat Supply from Excavation (m^3)	Surplus (+) or Deficit (-) (m^3)
Acrotelm	6588	6,588	0
Catotelm	0	0	0
Total	**6,588**	**6,588**	**0**

Table 3 demonstrates that there will be balance in excavation and re-use of peat and peaty soils. These volumes should be considered in the context of the total excavated peat during construction. It is likely that balance would be achieved once total excavated peat is established by the appointed Principal Contractor and reinstatement depths are adjusted accordingly.

Notably, due to the peat depths found during surveys and an iterative design process accounting for peat depth data, deep peat has largely been avoided.

3.3.2 Handling and Storage of Peat

It will be necessary for the Principal Contractor to prescribe methods and timing involved in excavating, handling and storing peat for use in reinstatement. The Principal Contractor will be responsible for appointing a chartered geotechnical engineer who will monitor any potential stability risks. Construction methods will be based on the following principles:

- The surface layer of peat (acrotelm) and vegetation will be stripped separately from the catotelmic peat. This will typically be an excavation depth of up to 0.5 m;
- Careful handling is required to retain any existing structure and integrity of the excavated materials and thereby maximise the potential for excavated material to be re-used;
- Acrotelmic material will be replaced as intact as possible once construction progresses/as it is complete;
- To minimise handling and transportation of peat, acrotelmic will be replaced, as far as is reasonably practicable, in the locality from which it was removed. Acrotelmic material is to be placed on the surface of reinstatement areas;

- Temporary storage of peat will be minimised, with reinstatement occurring as early as possible during the construction works;
- Suitable areas should be sited in locations with lower ecological value, low stability risk and at a suitable distance from water courses;
- Reinstatement will, in all instances, be undertaken at the earliest opportunity to minimise storage of turves and other materials;
- Managing the construction work as much as possible to avoid periods when peat materials are likely to be wetter (i.e., high rainfall events); and
- Transport of peat on-site from excavation to temporary storage and re-use Site should be minimised.

Indicative temporary peat storage areas are illustrated on **Figure 4** within **Appendix 1** of this oPMP.

3.3.3 Waste Management Plan Requirements

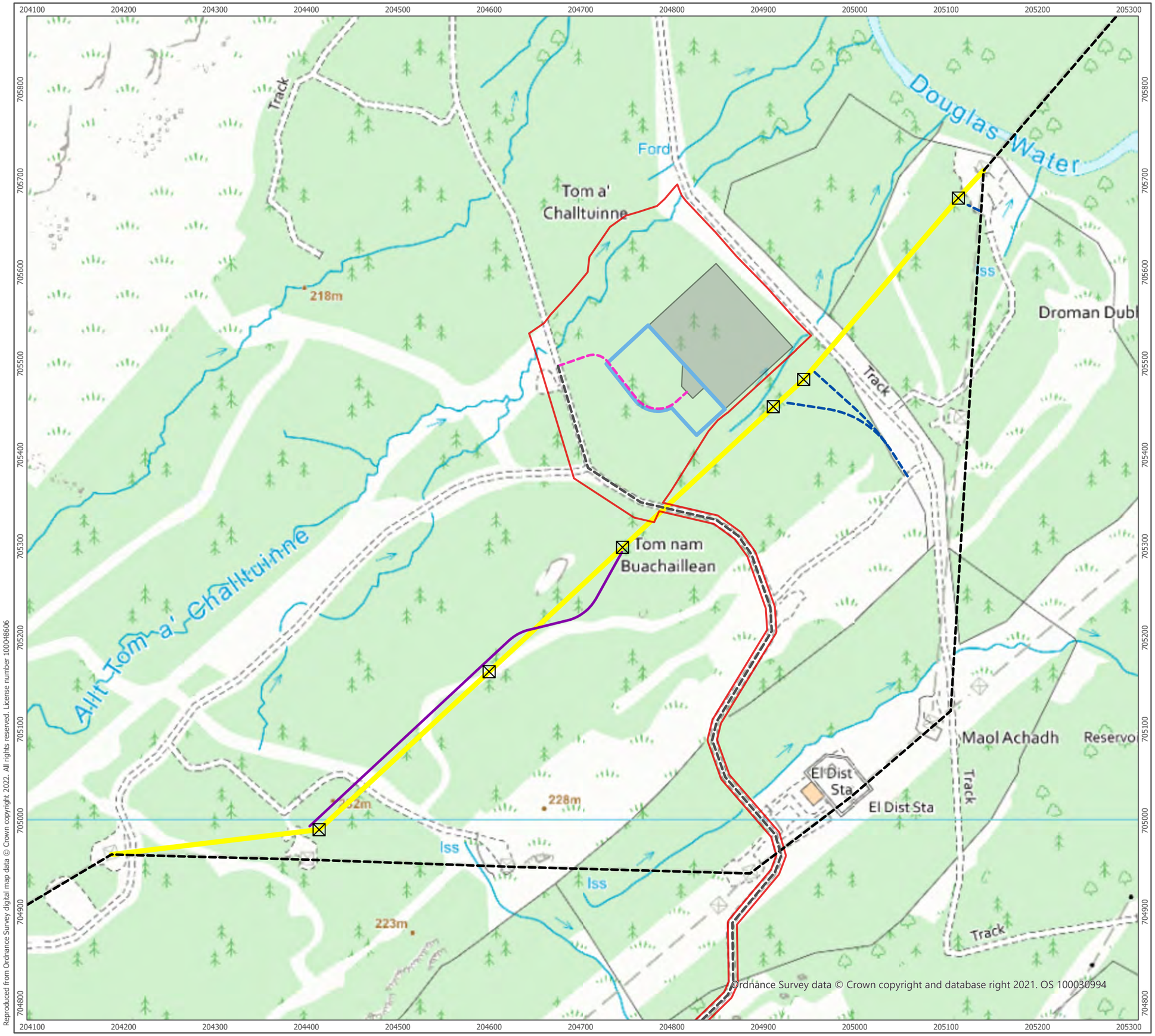
Based on the calculations carried out, the total peat volumes excavated will be fully incorporated into the re-instatement works, therefore is unlikely to require a waste management licence.

4 CONCLUSIONS

The following conclusions are drawn regarding the management of peat and excavated materials within the Project:

- As a result of the peat excavation and re-use estimates, it is demonstrated that all excavated peat for can be suitably re-used on-site;
- Excavated peat will be used for the reinstatement of access track verges, cut and fill embankment slopes, reinstatement of temporary tracks and towers hardstandings and the reinstatement of compound areas;
- The estimates of excavated peat provided in this oPMP are likely to be higher than actual peat excavation volumes as micro-siting during construction (if required) will allow for the avoidance of localised pockets of deeper peat;
- Sufficient methods have been defined to ensure that peat can be sensitively handled and stored on-site to allow for effective re-use; and
- No waste licence is required for the construction work.

APPENDIX 1 - FIGURES



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- Existing Access Track
- Existing Inveraray to Crossaig Overhead Line

Proposed Development

- Indicative Town and Country Planning Boundary
- Proposed Substation Temporary Works Area
- Proposed Substation Layout
- Proposed Permanent Access Track

Associated Development

- Proposed Permanent Access Track
- Proposed Temporary Tracks
- Proposed OHL Alignment
- Tower Location

1:4,000 Scale @ A3

0 100 200 M

NORTH

Produced By: BM	Ref: 4534-REP-002
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Site Layout Plan
Figure 1

An Suidhe
Annex N: Peat Management Plan

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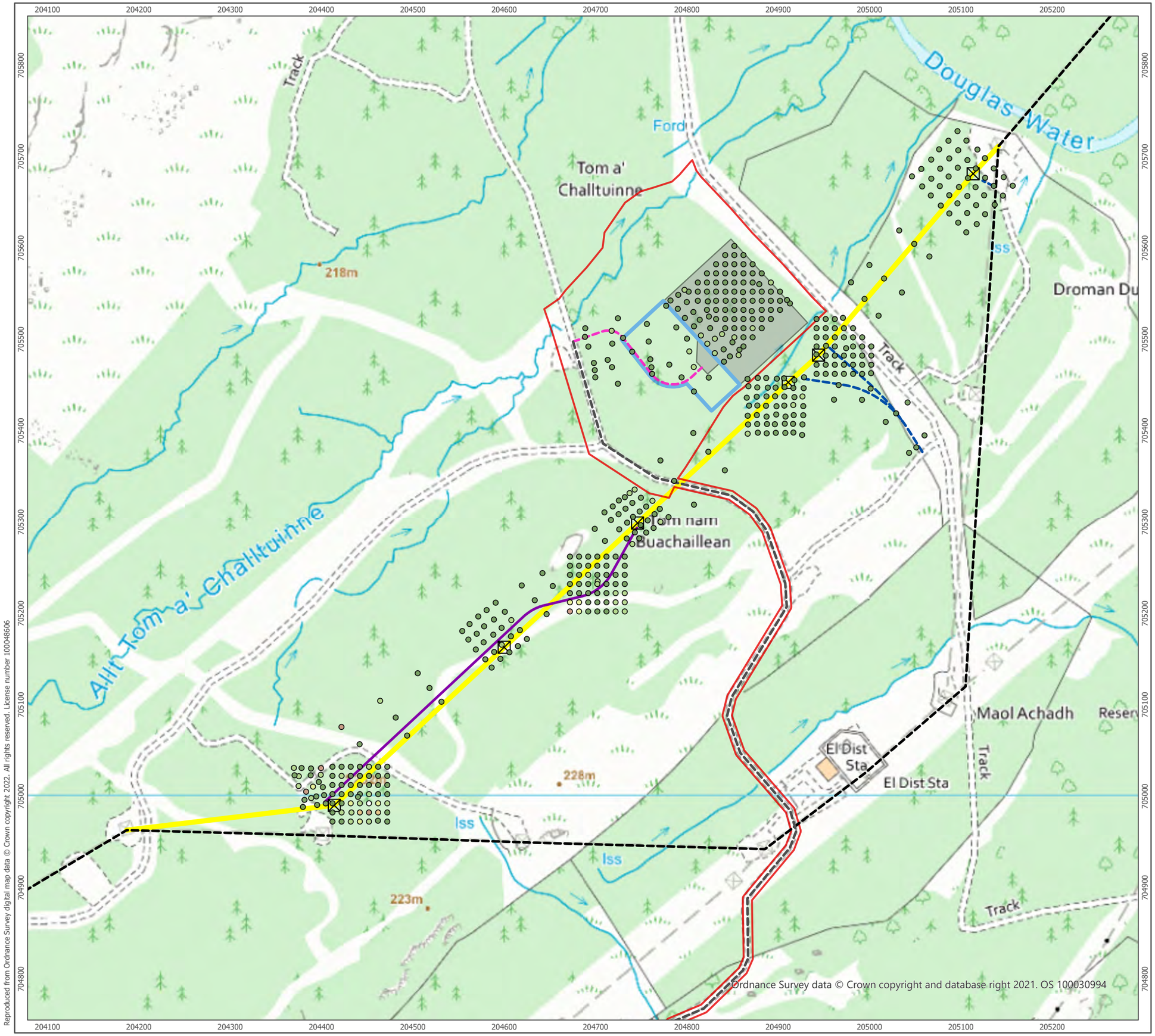

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ARCUS

- Existing Access Track
- Existing Inveraray to Crossaig Overhead Line

Proposed Development

- Indicative Town and Country Planning Boundary
- Proposed Substation Temporary Works Area
- Proposed Substation Layout
- Proposed Permanent Access Track

Associated Development

- Proposed Permanent Access Track
- Proposed Temporary Tracks
- Proposed OHL Alignment
- Tower Location

Recorded Peat Depths (m)

- 0.01 - 0.50
- 0.51 - 1.50
- 1.51 - 2.00
- 2.01 - 2.50
- 2.51 - 3.00
- 3.01 - 3.50
- 3.51 - 4.00

1:4,000 Scale @ A3

0 100 200 M

NORTH

Produced By: BM	Ref: 4534-REP-003
Checked By: SC	Date: 10/05/2022

Recorded Peat Depths
Figure 2

An Suidhe
Annex N: Peat Management Plan

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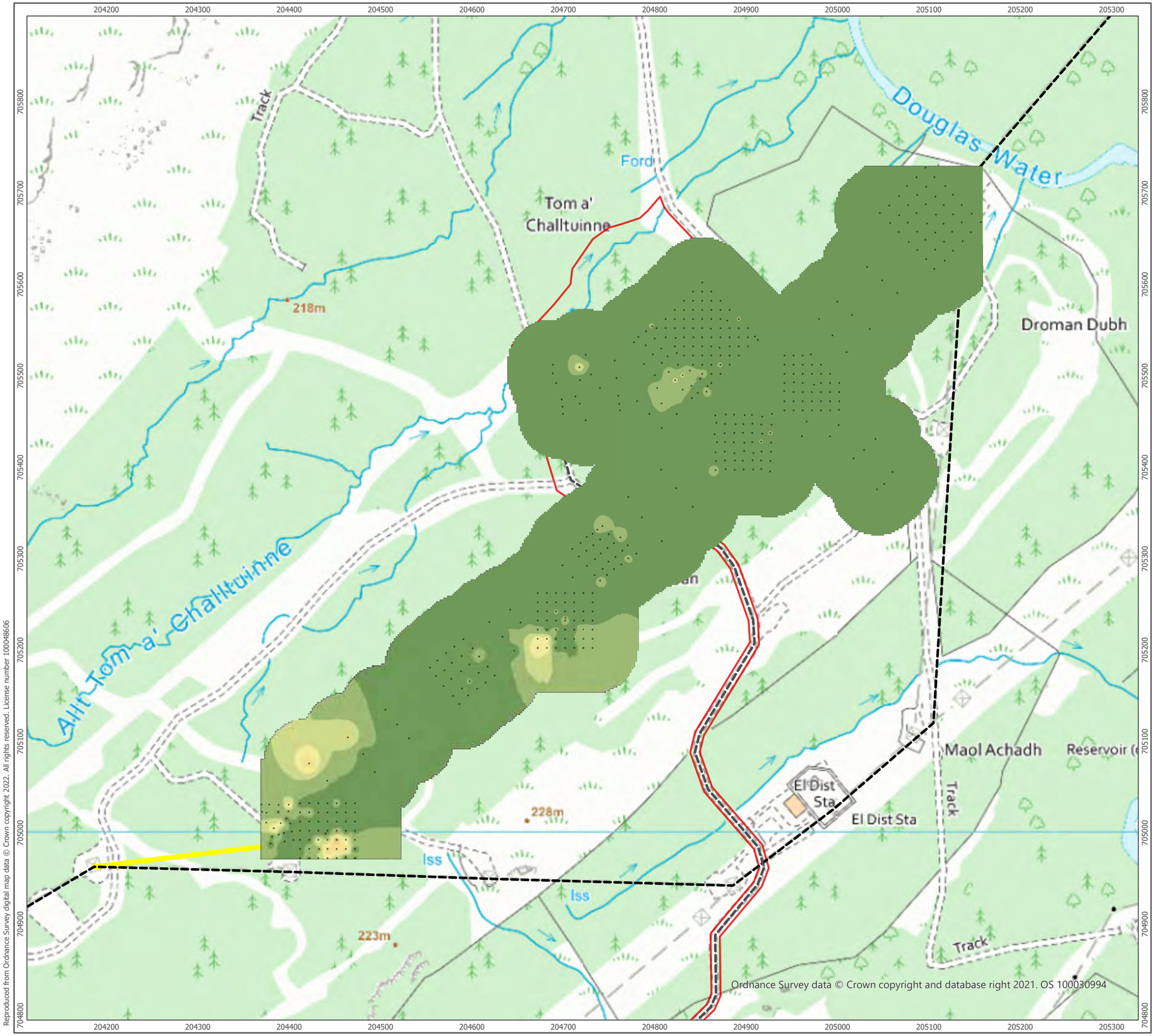

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Scottish & Southern Electricity Networks

ARCUS

- Existing Access Track
- Existing Inveraray to Crossaig Overhead Line
- Peat Probe Location

Proposed Development

- Indicative Town and Country Planning Boundary
- Proposed Substation Temporary Works Area
- Proposed Substation Layout
- Proposed Permanent Access Track

Associated Development

- Proposed Permanent Access Track
- Proposed Temporary Tracks
- Proposed OHL Alignment
- Tower Location

Interpolated Peat Depths (m)

- 0.00 - 0.50
- 0.51 - 1.00
- 1.01 - 1.50
- 1.51 - 2.00
- 2.01 - 2.50
- 2.51 - 3.00
- 3.01 - 3.50
- 3.51 - 4.00

1:4,000 Scale @ A3

0 100 200 M

NORTH

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Interpolated Peat Depths
Figure 3

An Suidhe
Annex N: Peat Management Plan

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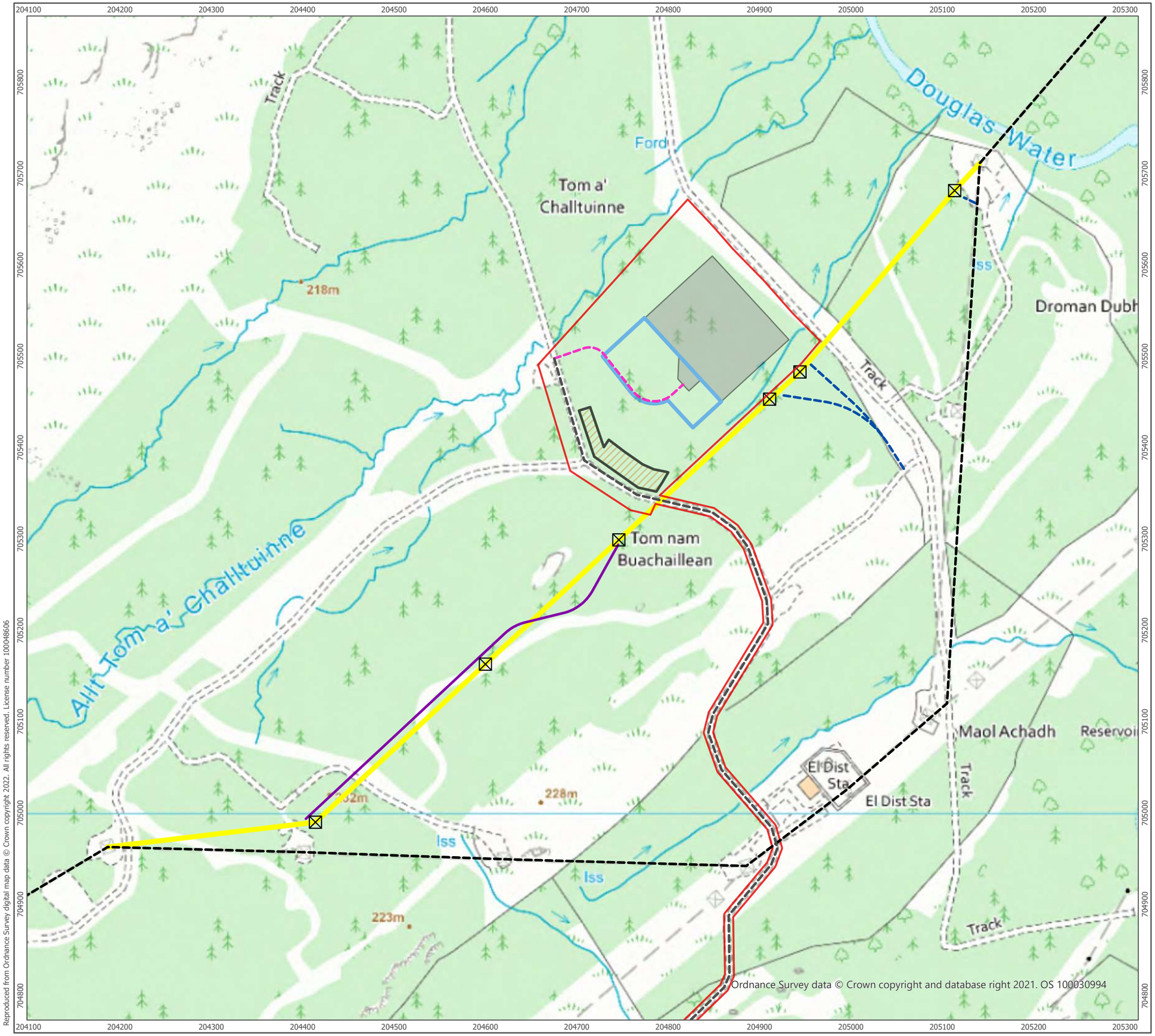

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- Existing Access Track
- Existing Inveraray to Crossaig Overhead Line
- Temporary Peat Storage Areas

Proposed Development

- Indicative Town and Country Planning Boundary
- Proposed Substation Temporary Works Area
- Proposed Substation Layout
- Proposed Permanent Access Track

Associated Development

- Proposed Permanent Access Track
- Proposed Temporary Tracks
- Proposed OHL Alignment
- Tower Location

1:4,000 Scale @ A3

0 100 200 M NORTH

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Checked By: SC	Date: 19/07/2022

Temporary Peat Storage Areas
Figure 4

An Suidhe
Annex N: Peat Management Plan

APPENDIX 2 - EARTHWORKS VOLUMES AND CALCULATIONS

4534 - Argyll Substations 'An Suidhe' - Peat Excavation and Re-Use Calculations

Infrastructure	Total Area	Average Peat Depth	Peat Cut Volume	Total Acrotelm Excavation Est.	Total Catotelm Excavation Est.	Areas of Reinstament	Total Peat Re-use Est.	Total Acrotelm Re-use Est.	Total Catotelm Re-use Est.
Pylons									
P1	100	0.03	3	3	0	120	60	60	0
P2	100	0.25	25	25	0	120	60	60	0
P3	100	0.29	29	29	0	120	60	60	0
P4	100	0.3	30	30	0	120	60	60	0
P5	100	0.29	29	29	0	120	60	60	0
P6	100	0.4	40	40	0	120	60	60	0
SUB-TOTAL	**600**		**156**	**156**	**0**	**720**	**360**	**360**	**0**
Permananent Tracks									
Entrance to SS	840	0.44	369.6	369.6	0	1008	604.8	604.8	0
Track to P2/P3	1370	0.2	274	274	0	1644	986.4	986.4	0
Track to P1	70	0.01	0.7	0.7	0	84	50.4	50.4	0
SUB-TOTAL	**2280**		**644**	**644**	**0**	**2736**	**1642**	**1642**	**0**
Temporaray Tracks									
Temporary Track to P4/P5/P6	2325	0.43	999.75	999.75	0	2790	1674	1674	0
Tracks (Temporaray + Permanent) SUB-TOTAL	**4605**		**1644**	**1644**	**0**	**5526**	**3316**	**3316**	**0**
Temporary Works Area									
Temporary Works Area	5361	0.25	1340.25	1340.25	0	5361	2211.9486	2211.9486	0
SUB-TOTAL	**5361**		**1340.25**	**1340.25**	**0**	**5361**	**2211.9486**	**2211.9486**	**0**
Substation									
Substation Compound	12950	0.22	2849	2849	0	1167	700.2	700.2	0
SUB-TOTAL	**12950**		**2849**	**2849**	**0**	**1167**	**700.2**	**700.2**	**0**
TOTAL Excavation Volume			**5989**	**5989**	**0**	**12774**	**6588**	**6588**	**0**
. +10% contingency for Bullking			**599**	**599**	**0**				
TOTAL			**6588**	**6588**	**0**				
Peat Re-use in Habitat Management Plan									
SUB-TOTAL							0	0	0
TOTAL PEAT EXCAVATION and REUSE	**25796**		**6588**	**6588**	**0**	**12774**	**6588**	**6588**	**0**