ARCUS

ACKRON WIND FARM
SUPPLEMENTARY INFORMATION

APPENDIX 13.2

OUTLINE PEAT MANAGEMENT PLAN
VERSION 1

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TABLE OF CONTENTS

1 INTRODUCTION

1.1 Preparation of the Peat Management Plan

This outline Peat Management Plan (oPMP) for the Ackron Wind Farm has been prepared initially to inform The Highland Council 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 has been prepared to be a technical appendix to an Environmental Impact assessment Report (EIAR) for Ackron Wind Farm. This OPMP will ensure the development constitutes 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 Development, focusing specifically on the excavation of peat;
- Report on detailed investigations into peat depths within the Development;
- Detail proposals for the management of excavated peat and other soils;
- Consider the potential effect of the Development on Ground Water Dependent Ecosystems (GWDTEs);
- Determine volumes of excavated peat at the Development 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 Scottish Renewables (SR) and Scottish Environment Protection Agency (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 methods or improvements to current practices, the Contractor will implement these wherever possible and will correspond with SEPA and Highland Council.

[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 07/01/20)

1.2 The Site

The Site is located approximately 18 kilometres (km) west of Thurso and 2 km southeast of Melvich in Sutherland, Highland Council. The Site extents and location are shown on Figure 1. The Site ranges from approximately 186 m Above Ordnance Datum (AOD) in the east of the Site at Beinn Ruadh, generally sloping westward to 30 m AOD along the A897. The Site predominantly comprises of open moorland used for rough grazing; there is a small area of improved pasture in the northwest and pockets of woodland.

Available British Geological Survey (BGS)[2] indicates the site to be underlain by superficial soils, predominantly Hummocky (Moundy) Glacial Deposits (HGMD) composed of rock debris, clayey till and poorly to well-stratified sand and gravel.

Published bedrock geology mapping indicates the site to be underlain almost entirely by Portskerra Psammite Formation. No faulting exists on site.

[2] British Geological Survey (2019): http://mapapps.bgs.ac.uk/geologyofbritain/home.html (Accessed 07/01/20)

2 OBJECTIVES

2.1 Introduction

2.1.1 Background

Detailed peat survey work and completion of assessments such as Peat Slide Risk Assessment (PSRA) for the 2020 EIA Report allows a consistent approach to the management of peat across the Site can be achieved.

The overall objective of the design of the Development has been to minimise the excavation of peat where possible, and achieve as close as practicable an overall material balance within the Site. 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 Site are understood through extensive peat probing and assessing the Site topography;
- Understand the extent of the Site layout and how excavations will take place; and
- Modelling the peat depth profile based on probing and digital terrain modelling in 3D.

2.1.2 Approach to Minimising Peat Excavation

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

- The development of an access track design which avoids deeper peat where practicable;
- The design and orientation of turbines and crane hardstandings considers local topography, deep peat and other environmental constraints; and
- Consideration of borrow pit locations in an area of shallow peat cover.

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;
- Consideration of floating tracks; 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 Site through investigation and developing a design that achieves the materials management objectives. For the Development, this principle is achieved by undertaking significant peat investigation works prior to preparing this oPMP.

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 Development 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 Development has been designed so far as practicably possible to reduce the volumes of peat excavated;
- How volumes of peat excavated during the course of the works have been considered in the design; and
- How excavated peat will be managed.

2.2.2 Objectives of the outline Peat Management Plan

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

This is achieved through responding to the following objectives:

- Providing a description of the extent and depths of peat at the development and how this was determined;
- Estimation of peat volumes to be excavated and re-used;
- 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 Waste Management Plan for the development.

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

3 PEAT MANAGEMENT

3.1.1 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 Site 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 and permitted track gradients 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 Site have been determined through a phased survey approach. The survey was initiated to inform the EIA and Site design work while supporting the PSRA. The survey comprised a total of 2656 probes.

Peat depths ranged from 0 m to 5.3 m thickness across the study area and were shown as localised or isolated zones within the central area of the Site.

Initial peat depth surveys were undertaken in March 2019 comprising 100 m grid coverage across the Site, where accessible. This methodology was applied to the additional Phase 1 survey following a boundary extension South into Golval land which was carried out in October 2019. This rationale of probing is in accordance with the phase one approach as detailed in the Scottish Government guidance for investigating peat.

Further peat depth surveys (phase two) was undertaken across several visits between December 2019 and July 2020. The probe positions for this visit were focussed on the

proposed turbine, access tracks and other key infrastructure. 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, an intense 10 m across the proposed turbine locations.

The peat depths are illustrated in Figure 13.2.2 'Recorded Peat Depths' within Appendix 1 of this document.

3.3 Summary of Peat Depths

Throughout the peat surveys to date, a total of 2656 probes were progressed. 51% of these recorded no peat or peat less than 0.5 m, while 26% recorded peat between 0.5 m and 1.0 m. Thick peat (where the depth was greater than >1.0 m) was recorded at 23% of locations.

The maximum peat depth recorded was 5.3 m in the southern site area out with any proposed infrastructure. More generally across the site peat depths were 1.0 m or less, with only localised deeper pockets recorded in topographically flatter areas.

Figure 13.2.3 'Peat Depth Interpolation' included in Appendix 1 illustrates the peat depths across the site area. The distribution of peat deposits along the proposed tracks and infrastructure are shown on Figure 13.2.3 'Peat Depth Interpolation' included in Appendix A.

Where peat is consistently over 1.0m thick and existing ground levels permit, the use of floating roads should be adopted. The 'Potential Areas for Floating Tracks' are shown on Figure 13.2.4 included in Appendix 1. Prior to commencing works on site, the Contractor as part of any floating road design will undertake further ground investigation to establish peat characteristics and surcharging strategies.

3.3.1 Excavation Calculation

To derive an accurate estimate of excavated volumes, the access tracks and turbine hardstandings have been developed to outline design stage in 3D based on Ordnance Survey digital Terrain 5 data. This design is overlaid on the 3D peat surface model which has been derived from the extensive peat probe surveying undertaken.

In addition, a further 5% of the total volume of excavated material has been applied as contingency bulking factor

By analysing these models, it is possible to derive volumes of excavation and estimate what the excavated material comprises – be this non peat superficial soils, peat or other materials. Table 3.1 shows the construction activities that will generate excavated peat, and the expected volumes produced from each activity based on the 3D modelling exercise, and without the proposed mitigation of micro-siting.

Table 3.1: Peat Excavation Volumes Based on Construction Activity

Development Component	Estimated Volume of Excavated Peat (m^3)	Estimated Volume of Acrotelmic Peat (m^3)	Estimated Volume of Catotelmic Peat (m^3)
General earthworks associated with widening/ upgrade of existing tracks, new access tracks, crane Pads and turbine bases	70,026	45,991	24,035
Borrow pits	9,864	2,960	6,904
Construction compound/Substation	183	183	0
SUB-TOTAL	80,073	49,134	30,939
+ 10% contingency Bulking Factor	8,007	4,913	3,094
Deduction for 210m of Floating Track	-5,040	-1,512	-3,528
TOTAL	83,040	52,535	30,505

A detailed assessment of excavated volumes by location within the Site is provided in Appendix 2 of this report.

3.3.2 Peat Re-use Requirements

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 (excluding any floating track section) will be re-instated in the vicinity of its original location;
- Any wet catotelmic peat will be placed at the bottom of any restoration profile, followed by semi fibrous catotelmic peat and then acrotelmic should be placed on top; and
- Restoration activities will be overseen by the Ecological Clerk of Works (ECoW) to ensure methods are properly adhered to.

Table 3.2 shows the opportunities for re-use of peat with the Site including the demand for acrotelm and catotelm peat. Table 3.3 summarises the total peat balance estimated during construction of the Development. It should be noted that 5040 m3 of peat is estimated as a reduction in peat excavations associated with floating tracks. Detailed excavation calculations are included in Appendix 2.

Table 3.2: Peat Re-use Volumes Based on Construction Activity

Development Area	Total Demand Estimate (m^3)	Acrotelm Demand (m^3)	Catotelm Demand (m^3)	Estimated Reinstatement Thickness (max) where gradient permits (m)	Assumptions
General earthworks associated with widening/ upgrade of existing tracks, new access tracks, crane pads, turbine bases and full reinstatement at blade laydown areas.	36,688	25,672	11,016	Up to 0.75m	Turbines and associated earthworks will be dressed off with up to 0.75m of peat and peaty soils, with any catotelm placed in the lower regions and acrotelm and turves placed nearer surface. Where new wind farm tracks are proposed, peat will be reinstated along verges and associated earthwork banking with peat up to 0.5m thick with verges not expected to exceed 2.5m on either side. It is assumed that where peat depths are 1.0m or greater, floating track construction techniques will be adopted.
Borrow Pits	27,110	13,555	13,555	0.5m	It is assumed that peat reinstatement thicknesses will reflect the peat excavated prior to borrow pit workings, i.e. up to 1.0 m at both borrow pits 1 and 2.
Construction Compounds/ Substation	175	175	0	Up to 1.0m	The construction compound will be placed on an existing hardstand and no excavation of peat or re-use is likely. The substation will be dressed off across the extents of the substation with up

					to 0.3m of peat and/ or peaty soils.
SUB-TOTAL	63,973	39,402	24,571		
Peat Reuse in Ditch Blocking in accordance with HMP recommendations	19,068	13,133	5,935		Peatland restoration including ditch blocking, damming and reinstatement of historic peat workings is proposed as part of a wider Habitat Management Plan for the site. The restoration techniques are discussed in more detail in the oHMP.
TOTAL	83,041	52,535	30,506		

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.

The following assumptions have been made in assessing peat re-use:

Excavated peat will be temporarily placed adjacent to where it is excavated. However, where this is not possible, temporary peat storage areas are shown on Figure 13.2.5, included in Appendix 1. These are areas of previous disturbance, out with 50 m buffer of watercourses and where topography permits.

Table 4: 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	30,506	30,506	0
Catotelm	52,535	52,535	0
Total	83,041	83,040	0

Table 4 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 Contractor and reinstatement depths are adjusted accordingly.

3.3.3 Handling and Storage of Peat

It will be necessary for the Contractor to prescribe methods and timing involved in excavating, handling and storing peat for use in reinstatement. The 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;
- Acrotelmic material will be stored separately from catotelmic material;
- Careful handling is essential to retain any existing structure and integrity of the excavated materials and thereby maximise the potential for excavated material to be re-used;
- Less humified catotelmic peat which maintains its structure upon excavation should be kept separate from any highly humified amorphous or wet catotelmic peat;

- Acrotelmic material will be replaced as intact as possible once construction progresses/as it is complete;
- To minimise handling and transportation of peat, acrotelmic and catotelmic 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 restoration occurring in parallel with other 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;
- Temporary storage and replacement of any peat excavated from the borrow pit should occur adjacent to and within the source pit; and
- Transport of peat on Site from excavation to temporary storage and restoration Site should be minimised.

Indicative temporary peat storage areas are illustrated on Figure 13.2.5.

3.3.4 Waste Management Plan Requirements

Based on the calculations carried out, the total peat volumes excavated will be fully incorporated in to 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 Development:

- As a result of the peat excavation and re-use estimates, it is demonstrated that all excavated peat 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 turbine hardstandings, reinstatement of borrow pits and compound areas;
- The estimates of excavated peat provided in this report are likely to be higher than actual peat excavation volumes as micro-siting during construction 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

Statkraft

ARCUS

- Site Boundary
- Proposed Turbine Location

Proposed Site Infrastructure

- Access Track
- Borrow Pit
- Construction Compound
- Crane Hardstanding
- Crane Pads
- Laydown Area
- Substation
- Proposed Meteorological Mast

1:13,000 Scale @ A3

0 250 500 M

NORTH

Produced By: BM	Ref: 3138-REP-124
Checked By: SC	Date: 07/08/2020

Site Layout Plan
Figure 13.2.1

Ackron Wind Farm
PMP

P:\Projects\Engineering\Projects\3138 Ackron\3138 Ackron.aprx\3138-REP-124 Fig13.2.1 Site Layout Plan

Statkraft

ARCUS

- Site Boundary
- Proposed Turbine Location

Proposed Site Infrastructure

- Access Track
- Borrow Pit
- Construction Compound
- Crane Hardstanding
- Crane Pads
- Laydown Area
- Substation
- Proposed Meteorological Mast

Recorded 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
- 4.01 - 4.50
- 4.51 - 5.00
- 5.01 - 5.50

1:12,986 Scale @ A3

0 250 500 M

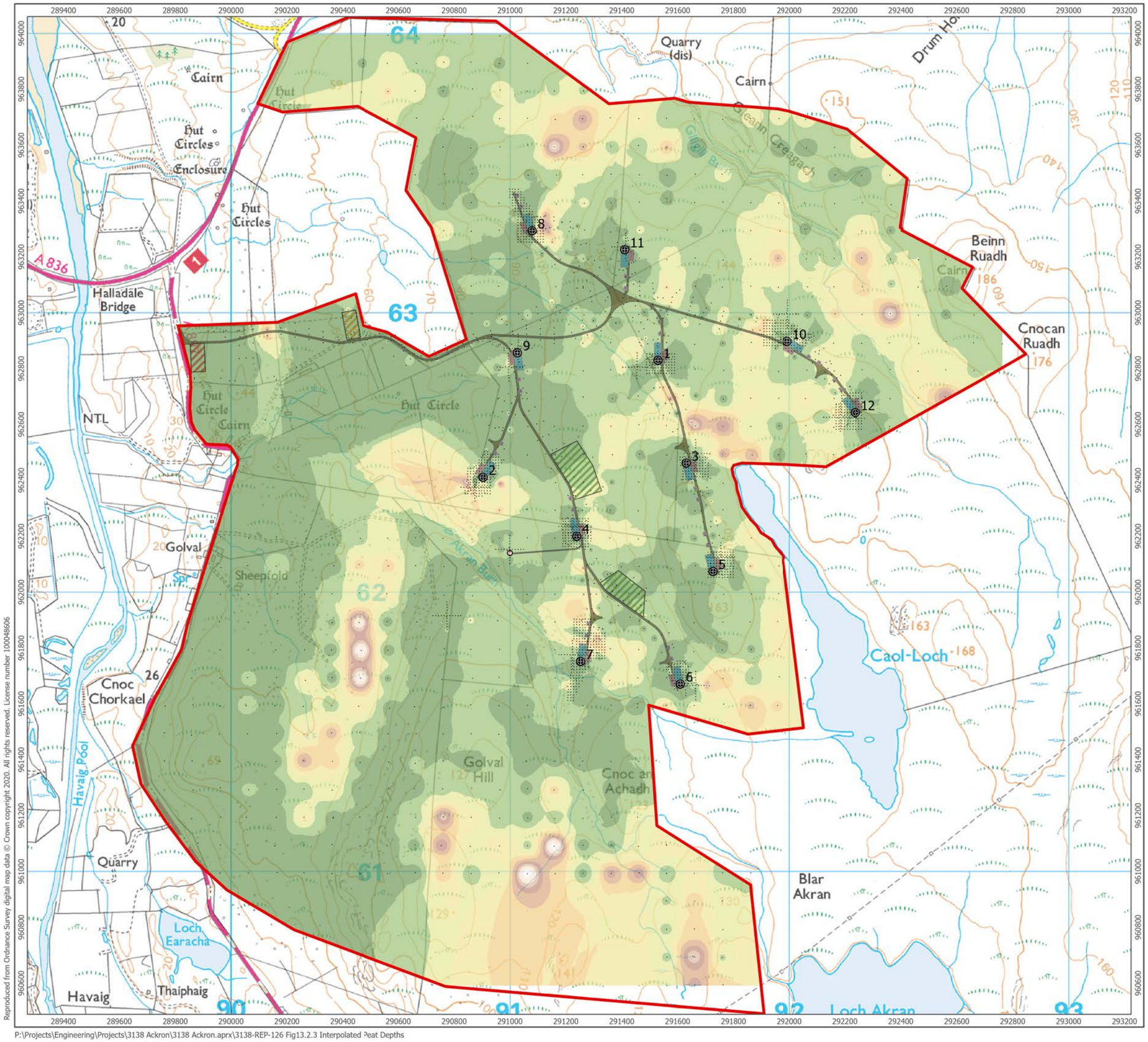
NORTH

Produced By: BM	Ref: 3138-REP-115
Checked By: SC	Date: 07/08/2020

Recorded Peat Depths
Figure 13.2.1

Ackron Wind Farm
PMP

P:\Projects\Engineering\Projects\3138 Ackron\3138 Ackron.aprx\3138-REP-125 Fig13.2.2 Recorded Peat Depths



P:\Projects\Engineering\Projects\3138 Ackron\3138 Ackron.aprx\3138-REP-126 Fig13.2.3 Interpolated Peat Depths

Statkraft

ARCUS

- Site Boundary
- Peat Probe Locations
- Proposed Turbine Location

Proposed Site Infrastructure

- Access Track
- Borrow Pit
- Construction Compound
- Crane Hardstanding
- Crane Pads
- Laydown Area
- Substation

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
- 4.01 - 4.50
- 4.50 - 5.00
- 5.01 - 5.50

1:13,000 Scale @ A3

0 250 500

NORTH

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Peat Depth Interpolation
Figure 13.2.3

Ackron Wind Farm
PMP

Statkraft

ARCUS

- Site Boundary
- Proposed Turbine Location
- Proposed Meteorological Mast
- Proposed Floating Track

Proposed Site Infrastructure

- Access Track
- Borrow Pit
- Construction Compound
- Crane Hardstanding
- Crane Pads
- Laydown Area
- Substation

1:13,000 Scale @ A3

0 250 500 M

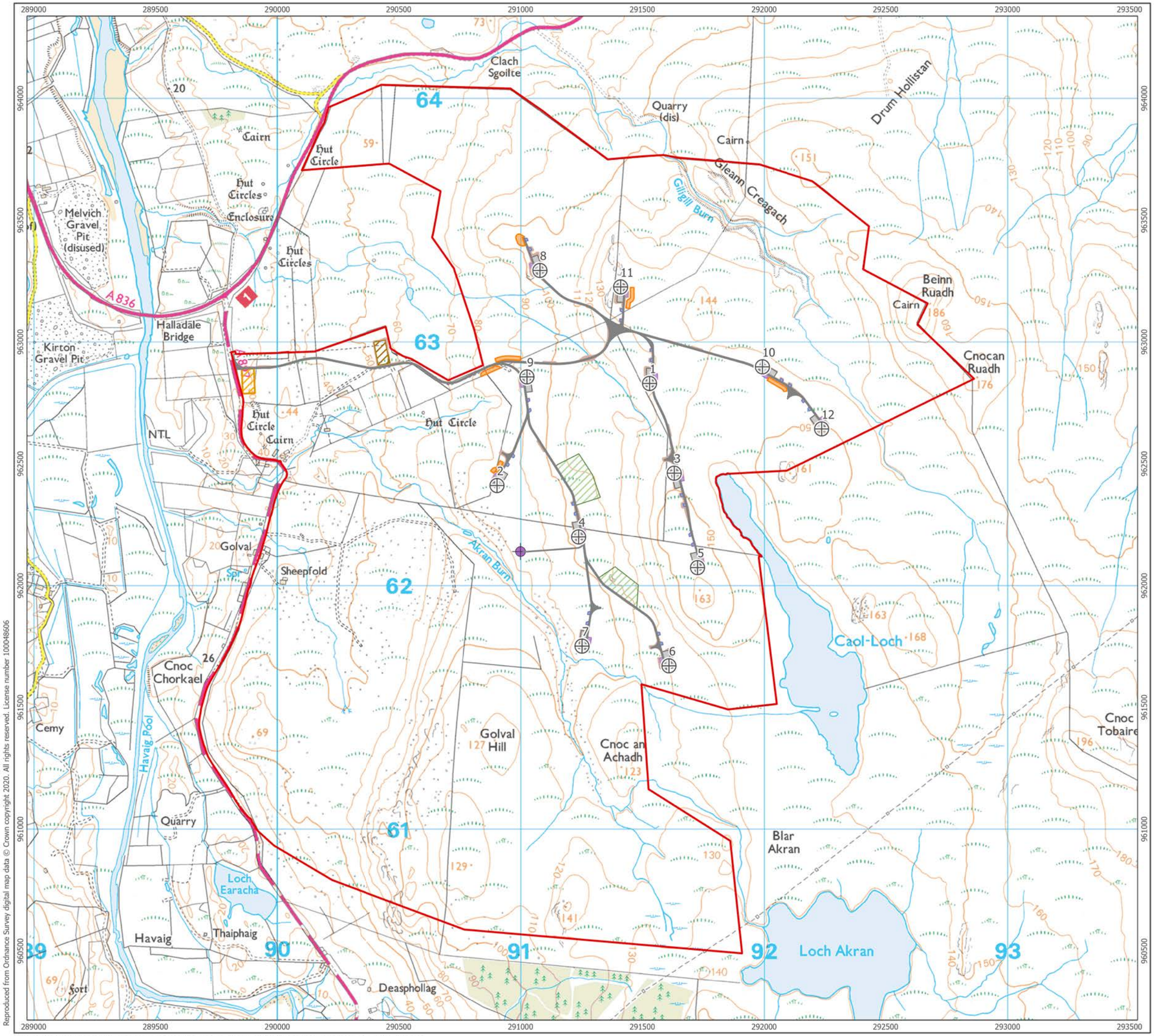
NORTH

Produced By: BM	Ref: 3138-REP-127
Checked By: SC	Date: 07/08/2020

Potential Area for Floating Tracks
Figure 13.2.4

Ackron Wind Farm PMP

P:\Projects\Engineering\Projects\3138 Ackron\3138 Ackron.aprx\3138-REP-127 Fig13.2.4 Proposed Floating Tracks



P:\Projects\Engineering\Projects\3138 Ackron\3138 Ackron.aprx\3138-REP-129 Fig13.2.5 Temporary Peat Storage Areas

Statkraft

ARCUS

- Site Boundary
- Temporary Peat Storage Areas
- Proposed Turbine Location

Proposed Site Infrastructure

- Access Track
- Borrow Pit
- Construction Compound
- Crane Hardstanding
- Crane Pads
- Earthworks
- Laydown Area
- Substation
- Meteorological Mast

1:15,000 Scale @ A3

0 250 500 M

NORTH

Produced By: BM	Ref: 3138-REP-129
Checked By: SC	Date: 26/08/2020

Temporary Peat Storage Areas
Figure 13.2.5

Ackron Wind Farm
Peat Management Plan

APPENDIX 2 - EARTHWORKS VOLUMES AND CALCULATIONS

3138 - Ackron - Peat and Borrow Pit Excavation and Re-Use Calculations

Infrastructure	Total Area of Infrastructure inc EW.	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.
Turbines								
T1	5656	2377	2377	0	2716	2205	1629.6	575.4
T2	5663	3277	2831.5	445.5	2723	2205	1633.8	571.2
T3	6001	3000	3000	0	3061	2205	1836.6	368.4
T4	5439	3415	2719.5	695.5	2499	2205	1499.4	705.6
T5	4433	2927	2216.5	710.5	1493	2205	895.8	1309.2
T6	6355	2662	2662	0	3415	2205	2049	156
T7	5531	5103	2765.5	2337.5	2591	2205	1554.6	650.4
T8	6609	2684	2684	0	3669	2205	2201.4	3.6
T9	4900	2613	2450	163	1960	2205	1176	1029
T10	5034	4561	2517	2044	2094	2205	1256.4	948.6
T11	5691	2510	2510	0	2751	2205	1650.6	554.4
SUB-TOTAL	**61312**	**35129**	**28733**	**6396**	**28972**	**24255**	**17383.2**	**6871.8**
Tracks								
Tracks - New	57527	34897	17258.1	17638.9	40950	12432.75	8288.5	4144.25
Tracks - Upgrade			0	0		0	0	0
SUB-TOTAL	**57527**	**34897**	**17258**	**17639**	**40950**	**12433**	**8289**	**4144**
Construction Compound								
Construction Compound	5812	0	0	0	5000	0	0	0
SUB-TOTAL	**5812**	**0**	**0**	**0**	**5000**	**0**	**0**	**0**
Substation								
Substation Compound	5698	183	183	0	5000	174.5	174.5	0
SUB-TOTAL	**5698**	**183**	**183**	**0**	**5000**	**174.5**	**174.5**	**0**
Borrow Pits								
BP1	16288	4886	1465.8	3420.2	16288	16288	8144	8144
BP2	10822	4978	1493.4	3484.6	10822	10822	5411	5411
SUB-TOTAL	**27110**	**9864**	**2959.2**	**6904.8**	**27110**	**27110**	**13555**	**13555**
TOTAL Excavation Volume	**157459**	**80073**	**49133**	**30940**	**107032**	**63972**	**39401**	**24571**
. +10% contingency for Bullking		**8007**	**4913**	**3094**				
TOTAL		**88080**	**54047**	**34034**				
Deduction For floating Tracks	2520	5040	1512	3528	2520			
SUB-TOTAL After Deduction								
Peat Re-use in Habitat Management Plan								
Ditch Blocking/Peat						**19068**	**13133**	**5935**
SUB-TOTAL								
TOTAL PEAT EXCAVATION and REUSE	**157459**	**83040**	**52535**	**30506**		**83041**	**52535**	**30506**