APPENDIX 4-2

FEHILY TIMONEY – PEAT & SPOIL MANAGEMENT PLAN SLIEVEACURRY RENEWABLE ENERGY DEVELOPMENT, COUNTY CLARE

FEHILY TIMONEY

CONSULTANTS IN ENGINEERING, ENVIRONMENTAL SCIENCE & PLANNING

PEAT & SPOIL MANAGEMENT PLAN

SLIEVEACURRY RENEWABLE ENERGY DEVELOPMENT

Prepared for: **MKO Ltd**

Date: October 2021

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PEAT AND SPOIL MANAGEMENT PLAN
SLIEVEACURRY RENEWABLE ENERGY FARM

REVISION CONTROL TABLE, CLIENT, KEYWORDS AND ABSTRACT
User is responsible for Checking the Revision Status of This Document

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0	Draft for Comment	IH/AD	PJ	BdeH	24.08.20
1	Updates following Client Comments	IH	PJ	BdeH	23.09.20
2	Minor update to layout and project description	IH	PJ	BdeH	13.10.20
3	Revision to access road types	IH	PJ	BdeH	29.10.20
4	Layout revisions	IH	PJ	BdeH	25.03.21
5	Updates following Client Comments	IH	PJ	BdeH	12.04.21
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7	Updates following Client Comments	IH	PJ	BdeH	21.10.21

Client: MKO Ltd

Keywords: **Peat, Spoil, Management, Excavation, Borrow Pits**

Abstract: Fehily Timoney and Company (FT) were engaged by McCarthy Keville O'Sullivan (MKO) to compile a Peat and Spoil Management Plan (PSMP) for Slieveacurry Renewable Energy Development. The purpose of this report is to provide a Peat and Spoil Management Plan for the construction phase of the wind farm. The report describes how peat and spoil which will be excavated from infrastructure locations such as turbine bases and roads and will be handled and placed/reinstated onsite. The report also provides construction details for the types of roads which will be put in place at the site and proposed peat and spoil placement/reinstatement areas which will be developed at the site.

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1. INTRODUCTION

1.1 Fehily Timoney and Company

Fehily Timoney and Company (FT) is an Irish engineering, environmental science and planning consultancy with offices in Cork, Dublin and Carlow. The practice was established in 1990 and currently has c.70 members of staff, including engineers, scientists, planners and technical support staff. We deliver projects in Ireland and internationally in our core competency areas of Waste Management, Environment and Energy, Civils Infrastructure, Planning and GIS and Data Management.

1.2 Project Description

Fehily Timoney and Company (FT) was engaged by McCarthy Keville O'Sullivan on behalf of Slieveacurry Ltd. to compile a Peat and Spoil Management Plan for the Slieveacurry Renewable Energy Development site.

The proposed Slieveacurry Renewable Energy Development is at a site located approximately 5km east of Miltown Malbay in Co. Clare.

The site is typically covered in a layer of peat and has undulating terrain. Peat depths vary across the site depending mainly on topography. Generally, deeper peat was encountered in the flatter areas of the site with thinner peat on the surrounding slopes. Mature forestry and open peatland are present across the site.

The development comprises of the following:

i. 8 no. wind turbines with an overall ground to blade tip height in the range of 175m maximum to 173m minimum, a blade length in the range 75 metres maximum to 66.5 metres minimum, and hub height in the range 108.5 metres maximum to 100 metres minimum
ii. A permanent Meteorological Mast with a maximum height of 30 metres
iii. Underground cabling (33kV) connecting the proposed turbines via a Ring Main Unit (RMU) to the 110kV substation in the townland of Knockalassa
iv. Permanent extension to the 110kV substation at Knockalassa comprising extension to the existing substation compound, provision of a new control building with welfare facilities and all associated electrical plant and equipment for an additional 110kV bay and security fencing
v. Upgrade of access junctions
vi. Upgrade of existing tracks/ roads and provision of new site access roads and hardstand areas
vii. 2 no. borrow pits
viii. 2 no. temporary construction compounds
ix. Site drainage
x. Forestry felling
xi. Operational stage site signage; and
xii. All associated site development ancillary works and apparatus

1.3 Purpose

The purpose of this report is to provide a peat and spoil management plan with particular reference to peat stability for the construction phase of the project. This peat and spoil management plan also includes a monitoring programme which will be implemented during the construction phase of the wind farm and a contingency plan should peat instability/failure occur at the site.

As for all construction projects, a detailed engineering construction design must be carried out by the appointed construction stage designer prior to any construction work commencing on site. This must take account of the consented project details and any conditions imposed by that consent. This must include a detailed peat stability assessment to account for any changes in the environment which may have occurred in the time leading up to the commencement of construction and a peat and spoil management plan to allow for the most appropriate geotechnical and environmental led solutions to be developed for the management of peat and spoil. As work is carried out on site the contents of the peat and spoil management plan and peat stability monitoring programme will be updated, as appropriate.

This peat and spoil management plan contains some drainage guidelines for construction works and for management of peat on site. It should be noted that the control of water quality and drainage measures for site is outlined in detail in Chapter 9 of the Environmental Impact Assessment Report (EIAR).

1.4 Peat Instability Definition

Peat instability in this report is defined as a mass movement of a body of peat that would have a significant adverse impact on the surrounding environment. Peat instability excludes localised movement of peat that would occur below a floating access road, creep movement or localised erosion type events.

Adherence to the peat and spoil management plan should reasonably minimise the potential for all such peat movements. However, it is noted that due to the soft ground nature of the peat terrain it is not possible to completely avoid localised peat movement.

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Road Type Legend:

Type A - Upgrade of Existing Access Tracks

Type B - New Excavate & Replace Access Road

County Road to be Maintained

Public Road Widening Area

Site Boundary

Planning Application Boundary

Proposed Construction Compound

New Proposed Track

New Proposed Track

Existing Track to be Upgraded

Proposed Borrow Pit No. 2

Proposed Cable Route

Proposed Construction Compound

Proposed Borrow Pit No..1

Proposed Met Mast

T1 T2 T3 T4 T5 T6 T7 T8

0m 75m 150m 225m 300m 375m 450m 525m 600m 675m 750m

Scale 1:15000

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Date - 10.11.21

FIGURE 2-1 : PLAN DRAWING OF WIND FARM WITH ROAD CONSTRUCTION TYPE

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2. CONSTRUCTION ACTIVITIES COVERED BY PEAT AND SPOIL MANAGEMENT PLAN

2.1 Construction Activities

For the construction phase of the Slieveacurry Renewable Energy Development the activities that will generate peat and spoil are as follows:

(1) Upgrade of existing access tracks

(2) Construction of new excavated roads through peat

(3) Excavation and placement of arisings

(4) Excavations in peat for turbine bases, hardstands and other infrastructure foundations

(5) Excavations in peat for underground cables

Peat and spoil management of the above construction activities are covered individually in this report.

2.2 Road Construction Types

To provide access within the site and to connect the wind turbines and associated infrastructure existing tracks will need to be upgraded and new access roads will need to be constructed. This report has taken into account the following key factors:

(1) Buildability considerations

(2) Maximising use of existing infrastructure

(3) Minimising excavation arisings

(4) Serviceability requirements for construction and wind turbine delivery and maintenance vehicles

(5) Requirement to minimise disruption to peat hydrology

Whilst the above key factors are used to determine the road design the actual construction technique employed for a particular length of road will be determined by the prevailing ground conditions encountered along that length of road.

The general road construction techniques to be considered are given in Table 2-1.

It should be noted that this report does not include a detailed design for the access roads on the Slieveacurry Renewable Energy Development site. This report includes the most suitable type of road construction that will be utilised for each section of access road based on the ground/site conditions recorded during the site walkovers.

Table 2.1: General Road Construction Techniques

Construction Method	Typical Site Conditions			Comment
	Construction Type	Typical Peat Depth (m)	Typical Slope Inclination (degs)	
Upgrade of existing access roads	Type A	Varies, up to 2.7m	Varies	Upgrade existing excavated access roads to the required width and finished with a layer of selected granular fill – Figure 1-1
Construction of new excavated roads through peat	Type B	Typically, less than 1.5m, locally up to 2.0m	Varies	New access road construction technique that will be used for various locations on site – Figure 1-1

Further details on access road construction types A and B are given in Sections 3 and 4 of the report.

3. UPGRADE OF EXISTING ACCESS ROADS – TYPE A

Up to 2km of existing access road requiring upgrade is present across the Slieveacurry Renewable Energy Development site and have been in operation for a significant number of years. Based on the site walkover carried out by FT the existing access roads were typically noted as being in relatively good condition. Upgrade works will involve both widening and resurfacing of the existing access road. The proposed locations for upgrade of the existing access roads on site are shown in Figure 1-1 and details are shown in Figure 3-1.

3.1 Upgrading Existing Access Tracks Construction Methodology

This methodology includes procedures that are to be included in the construction to minimise any adverse impact on peat stability. The methodology is not intended to cover all aspects of construction such as drainage and environmental considerations.

(1) Access road construction shall be to the line and level requirements as per the planning application drawings.

(2) For upgrading of existing access roads (Type A - Figure 3-1) the following guidelines apply:

(a) Excavation of the widened section of access road should take place to a competent stratum beneath the peat, removing all peat and soft clay (as agreed with the designer) and backfilled with suitable granular fill.

(b) Benching of the excavation may be required between the existing section of access road and the widened section of access road depending on the depth of excavation required.

(c) The surface of the existing access road should be overlaid with up to 500mm of selected granular fill.

(d) Access roads to be finished with a layer of capping across the full width of the track

(e) A layer of geogrid/geotextile may be required at the surface of the existing access road and at the base of the widened section of access road (to be confirmed by the designer).

(f) For excavations in peat, side slopes shall be not greater than 1 (v): 3 (h). This slope inclination should be reviewed during construction, as appropriate. Where areas of weaker peat are encountered then slacker slopes will be required to ensure stability.

(3) The finished road will have a running width of 5m, with wider sections on bends and corners.

(4) Where the ground is higher on one side of the access road than the other, any road widening works required will be done on the upslope side of the existing access road, where appropriate.

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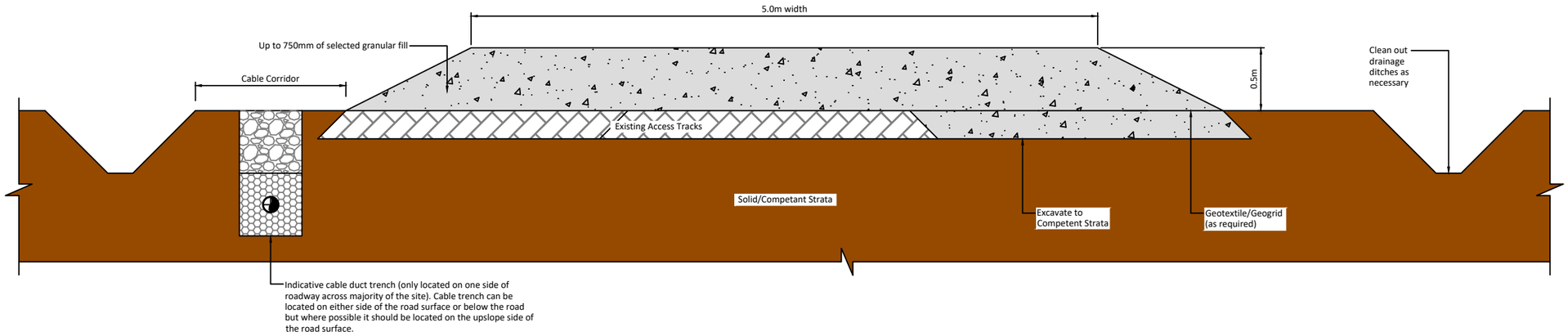

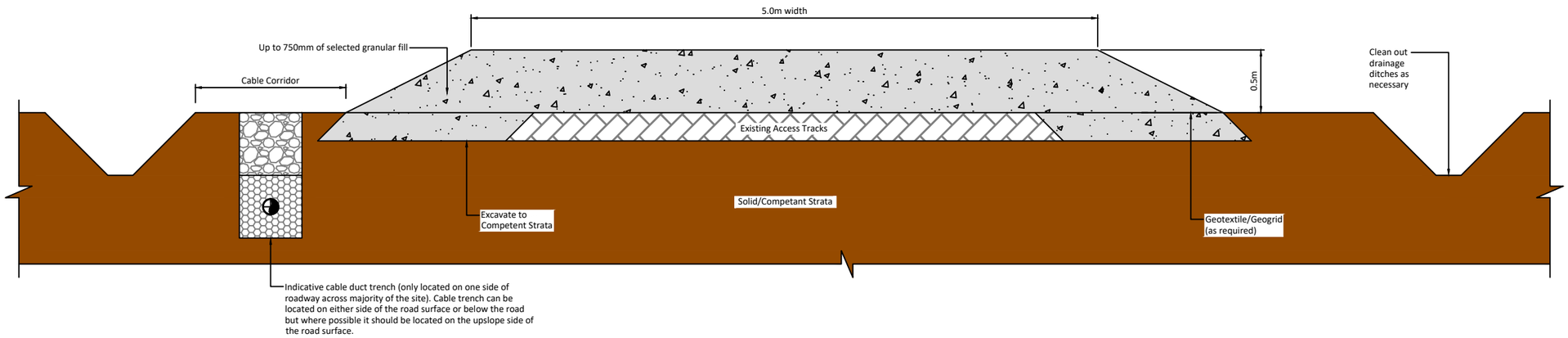

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0m 0m 0m 1m 1m 1m 1m 1m 2m 2m 2m
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Date - 21.10.21

FIGURE 3-1 : TYPE A - UPGRADE OF EXISTING ACCESS TRACKS

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4. CONSTRUCTION OF NEW EXCAVATED ROADS THROUGH PEAT – TYPE B

The excavation of peat and spoil and founding of access roads on competent stratum (below the peat) for new access roads will be carried out at various locations on the site. The proposed locations for new excavated access roads on site are shown in Figure 1-1 and details are shown in Figure 4-1.

Excavate and replace type access roads are the conventional method for construction of access roads on peatland sites and the preferred construction technique in shallow peat, provided sufficient placement/reinstatement capacity is available on site for the excavated peat.

4.1 Excavated Road Construction Methodology

This methodology includes procedures that are to be included in the construction to minimise any adverse impact on peat stability. The methodology is not intended to cover all aspects of construction such as drainage and environmental considerations.

(1) Prior to commencing the construction of the excavated roads movement monitoring posts will be installed in areas where the peat depth is greater than 2.0m.

(2) Interceptor drains will be installed upslope of the access road alignment to divert any surface water away from the construction area.

(3) Excavation of roads will be in accordance with the design requirements. Excavation will take place to a competent stratum beneath the peat, removing all peat and soft clay present beneath the road footprint.

(4) Once excavated, peat will be temporarily stored in localised areas adjacent to excavations for roads and hardstands before being placed into the permanent peat storage areas within the borrow pits. All temporary storage areas will be upslope of founded roads/hardstands and will be inspected by a suitably qualified person before material is stored in the area.

(5) Road construction will be carried out in sections of approximately 50m lengths i.e. no more than 50m of access road should be excavated without re-placement with stone fill.

(6) Excavation of materials with respect to control of peat stability:

  (a) Acrotelm (to about 0.3 to 0.4m of peat) is generally required for landscaping and will be stripped and temporarily stockpiled locally for re-use as required. Acrotelm stripping will be undertaken prior to main excavations.

  (b) Where possible, the acrotelm shall be placed with the vegetation part of the sod facing the right way up to encourage growth of plants and vegetation.

  (c) All catotelm peat (peat below about 0.3 to 0.4m depth) shall be transported immediately on excavation to the designated placement areas.

(7) Side slopes in peat shall be not greater than 1 (v): 3 (h). This slope inclination will be reviewed during construction, as appropriate. Where areas of weaker peat are encountered then slacker slopes will be required. Battering of the side slopes of the excavations will be carried out as the excavation progresses.

(8) The excavated access road will be constructed with up to 500mm of selected granular fill. Granular fill to be placed and compacted in layers in accordance with the TII Specification for Road Works.

(9) Access roads to be finished with a layer of capping across the full width of the road.

(10) A layer of geogrid/geotextile may be required at the surface of the competent stratum.

(11) Where slopes of greater than 5 degrees are encountered along with relatively deep peat (i.e. greater than 1.5m) and where it is proposed to construct the access road perpendicular to the slope contours it is best practice to start construction at the bottom of the slope and work towards the top, where possible. This method avoids any unnecessary loading to the adjacent peat and greatly reduces any risk of peat instability.

(12) A final surface layer shall be placed over the excavated road and graded to accommodate wind turbine construction and delivery traffic.

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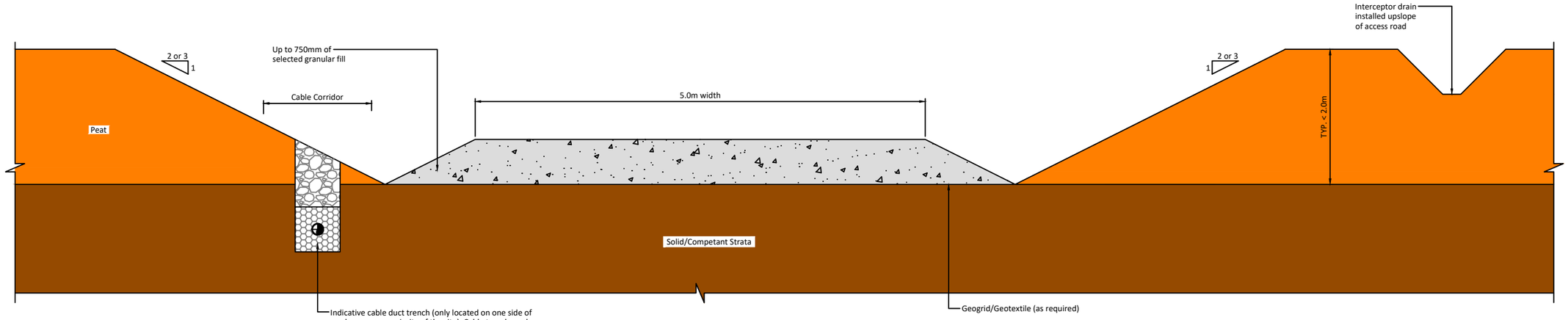

Scale 1:50

0m 0m 1m 1m 1m 1m 2m 2m 2m 2m 3m

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FIGURE 4-1 : TYPE B NEW EXCAVATE AND REPLACE ACCESS ROAD

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5. GENERAL CONSTRUCTION GUIDELINES FOR ACCESS ROADS

The following general construction guidelines are given for the access roads on site.

(1) Where an open ditch is present alongside an existing access track, the ditch may need to be filled prior to upgrading/constructing the access track. The ditch shall be filled with suitable drainage stone. As applicable, a perforated pipe shall be laid into the ditch prior to filling so as to maintain water flow within the ditch.

(2) Where existing drainage crosses the road then it will be necessary to ensure that this drainage is not affected by settlement of the upgraded access road. Cross drains comprising flexible perforated pipes within a permeable stone fill surround will be used to maintain the existing drainage.

(3) In areas of deeper peat (<1.5m), temporary excavations should be excavated in short lengths and backfilled as soon as practicable.

(4) End-tipping of stone onto the road during the construction/upgrading of the access road should be carefully monitored to ensure that excessive impact loading, which may adversely affect the underlying peat, is limited.

(5) It is recommended that the construction and upgrading of access roads in areas of deep peat (greater than 1.5m) is inspected on a routine basis during the works, particularly before/following trafficking by heavy vehicular loads.

6. EXCAVATION AND STORAGE OF PEAT AND SPOIL

6.1 Excavation and Storage of Arisings Methodology

This methodology includes procedures that are to be included in the construction to minimise any adverse impact on peat stability. The methodology is not intended to cover all aspects of construction such as drainage and environmental considerations.

(1) All excavated peat and spoil shall be transported on excavation to one of the 2 no. borrow pits (see Figure 1-1) or temporarily stored in designated spoil areas alongside the access roads/hardstands. All temporary storage areas will be upslope of founded roads/hardstands and will be inspected by a suitably qualified person before material is stored in the area.

(2) Further details on the construction and reinstatement of the 2 no. borrow pits are given in Section 6.4.

(3) Further details on the placement of excavated material to designated spoil areas alongside the access roads are given in Section 6.5.

(4) Some of the peat, in particular the acrotelm (upper layer of the peat), excavated during construction will be used for landscaping purposes.

6.2 Summary of Peat and Spoil Volumes on Site

A summary of the excavated peat and spoil volumes calculated for the Slieveacurry Renewable Energy Development site are given in Table 6-1.

Table 6.1: Summary of Excvated Peat and Spoil Volumes on Site

Infrastructure Element (1)	Typical Dimensions	Peat Volume (m^3) (2)	Spoil (non-peat) Volume (m^3) (2) and (3)	Comment
8 no. Turbines and Hardstands	27m diameter excavation footprint for turbine foundation with 62.5 x 25m hardstand area.	18,700	18,600	Hardstanding area and foundation footprint. Allowance included for mini-crane pads and blade finger hardstands associated with the main hardstand, plus allowance for side slopes in areas of cut.
Access Roads	Assumed 5m running surface with 6m wide development footprint.	31,200	12,400	Allowance includes for widening on bends, at junctions, laybys, and tie-ins to hardstands.
Meteorological Mast	10 x 10m foundation footprint and 30 x 30m hardstanding area.	-	400	-
Temporary Construction Compounds	Hardstanding area of 90 x 70m.	600		
Borrow Pits	2 no. borrow pits.	4,000	18,000	Borrow pit footprint
Cable Trench	1.2m x 0.9m	1,300	5,300	7.1km in length
	Total =	**55,800m^3**	**54,700m^3**	**Total = 110,500m^3 (peat and spoil volume) (4)**

Note (1) The location of the infrastructure elements on site are shown on Figure 1-1.

Note (2) A factor of 20% (bulking factor of 15% and contingency factor of 5%) has been applied to the excavated peat and spoil volumes to allow for expected increase in volume upon excavation and to allow for a variation in ground conditions across the site.

Note (3) The excavated spoil volumes have been determined based on a cut-fill assessment carried out for the site, see Section 12 of this report for further details.

Note (4) Tree felling is proposed at various locations across the site, however this generally will not involve any excavation of tree stumps and as such does not affect the excavation volumes. Where tree stumps are removed along proposed access roads, the excavation volume has been included in the above table.

6.3 Summary of Peat and Spoil Placement/Reinstatement Areas on Site

A summary of the potential peat and spoil placement/reinstatement areas at the Slieveacurry Renewable Energy Development site are given in Table 6-2.

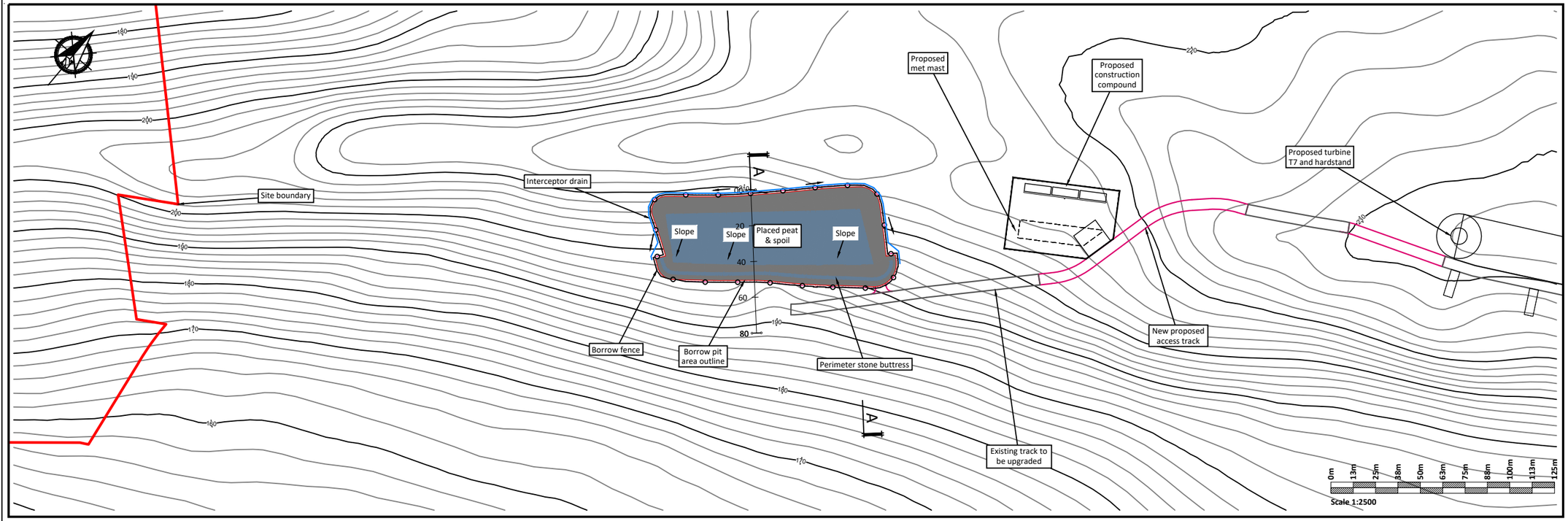
Table 6.2: Summary of Peat and Spoil Placement/Reinstatement Areas on Site

Location (1)	Peat and Spoil Volume (m^3)	Comment
Borrow Pit No. 1	29,000	See Figures 6-1 and 6-2 for further details.
Borrow Pit No. 2	84,500	See Figures 6-1 and 6-2 for further details.
Peat and spoil placement alongside designated access roads	5,000	1m in height and 10m wide corridor on both sides of the access road, in the areas of the site only where topography is typically flat and peat thickness is <1.5m. See Section 6.5 of the report for further details.
Landscaping (2)	7,200	It is estimated that approximately 900m^3 of peat will be required for landscaping purposes at the turbine locations.
Total =	**125,500m^3**	

Note (1) The location of the proposed borrow pits at the site are shown on Figure 1-1.

Note (2) Some of the acrotelm (upper layer of the peat) excavated during construction will be used for landscaping purposes.

Note (3) Storage capacity in both borrow pits is based on the construction of a perimeter berm to maximise storage capacity above the volume of rock removed from the borrow pit.



PLAN (SOUTHERN BORROW PIT 1)

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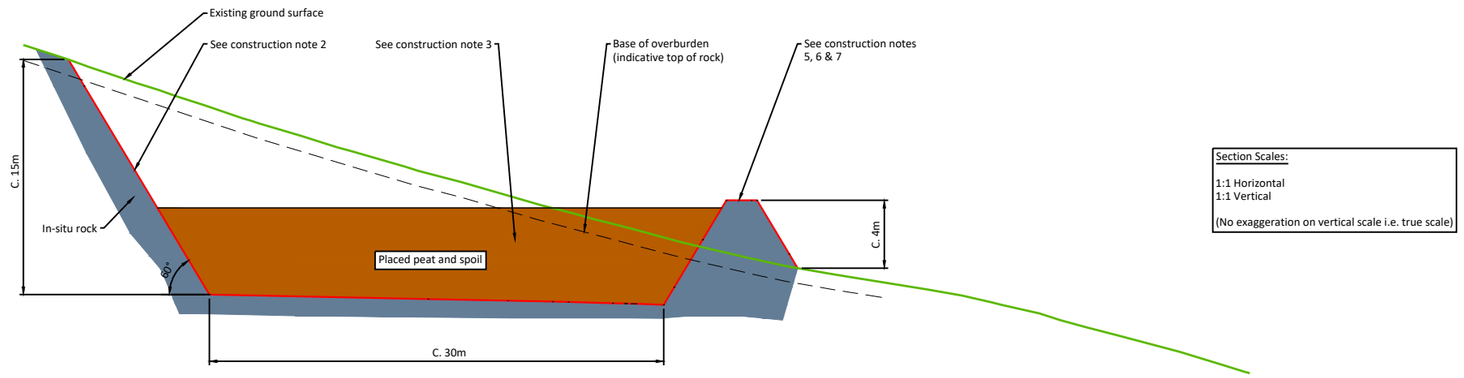

Section Scales:

1:1 Horizontal
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SECTION A-A

Scale 1:400

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Construction Notes Borrow Pit:

(1) It is proposed to construct the borrow pit so that the base of the borrow pit is below the level of the adjacent section of access road.

(2) Slopes within the excavated rock formed around the perimeter of the borrow pit will be formed at stable inclinations to suit local in-situ rock conditions.

(3) Infilling of the peat & spoil should commence at the back edge of the borrow pit and progress towards the borrow pit entrance/rock buttress. Leaving in place upstands/segments of intact rock which will help to retain the placed peat & spoil and will allow the borrow pit to be developed and infilled in cells.

(4) A rock buttress is required at the downslope edge of the borrow pit to safely retain the infilled peat and spoil. The height of the rock buttresses constructed should be greater than the height of the infilled peat & spoil to prevent any surface peat & spoil run-off. A buttress is likely to be required.

(5) The rock buttress will be founded on competent strata. The founding stratum for the rock buttress should be inspected and approved by the project geotechnical engineer.

(6) In order to prevent water retention occurring behind the buttresses, the buttresses should be constructed of coarse boulder fill with a high permeability.

(7) The surface of the placed peat & spoil should be shaped to allow efficient run-off of surface water from the placed arising's.

(8) Control of groundwater within the borrow pit may be required and measures will be determined as part of the ground investigation programme.

(9) All the above-mentioned general guidelines and requirements must be confirmed by the designer prior to construction.

(10) Further guidelines on the construction of the borrow pit are included within Section 7.4 of the Peat & Spoil Management Plan

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FIGURE 6-1 : SOUTHERN BORROW PIT - PLAN AND CROSS SECTION DETAILS

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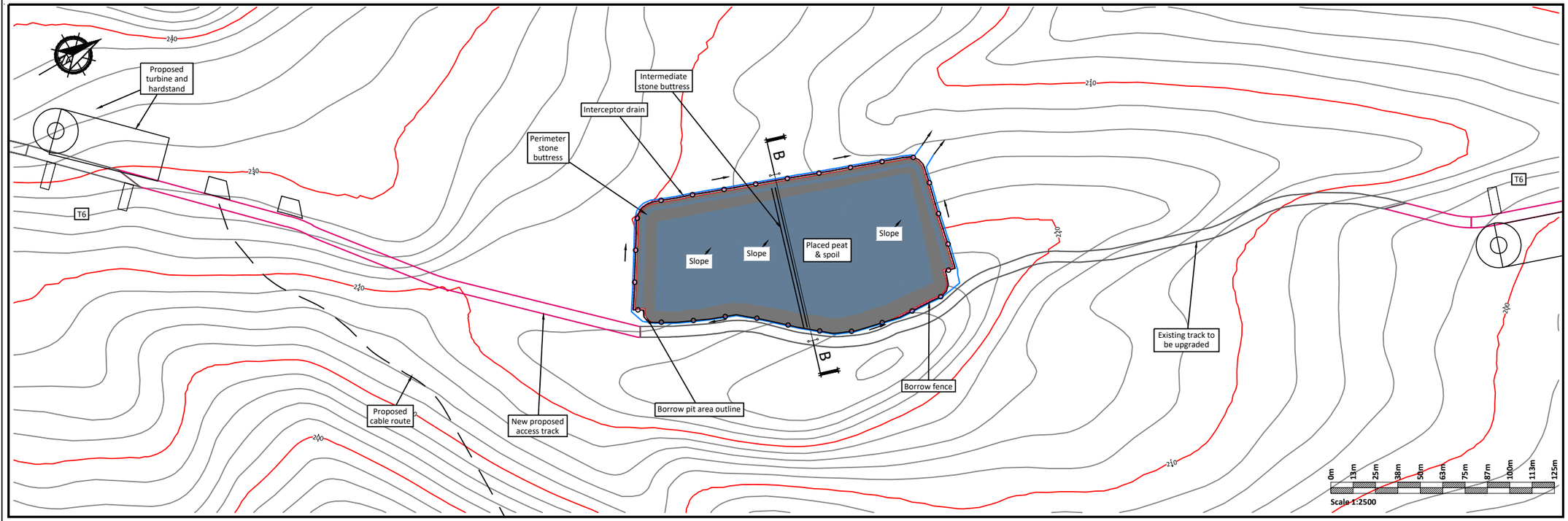
Friday 22 October 2021



PLAN (NORTHERN BORROW PIT 2)

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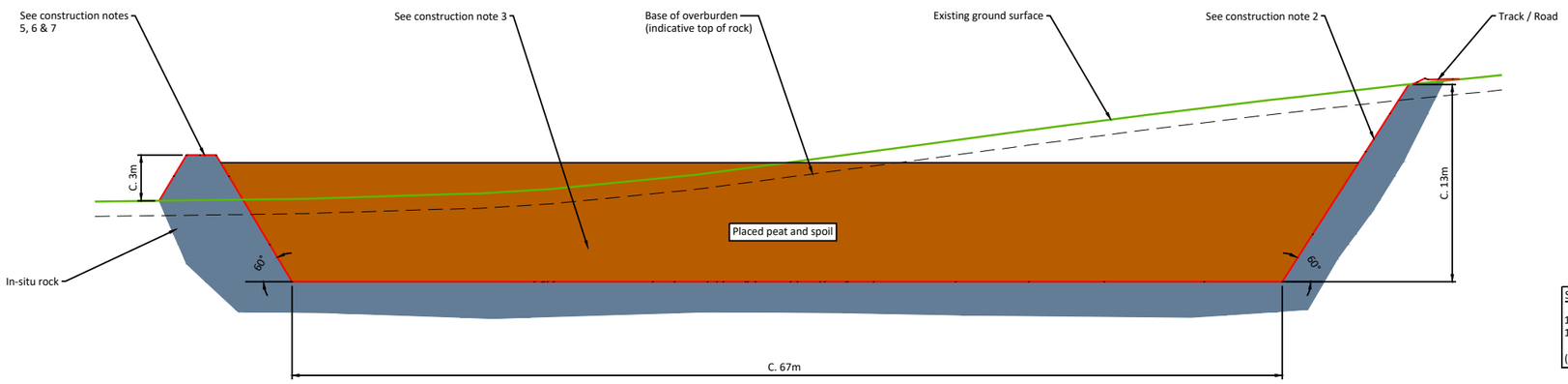

Section Scales:

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SECTION B-B

Scale 1:400

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Construction Notes Borrow Pit:

(1) It is proposed to construct the borrow pit so that the base of the borrow pit is below the level of the adjacent section of access road.

(2) Slopes within the excavated rock formed around the perimeter of the borrow pit will be formed at stable inclinations to suit local in-situ rock conditions.

(3) Infilling of the peat & spoil should commence at the back edge of the borrow pit and progress towards the borrow pit entrance/rock buttress. Leaving in place upstands/segments of intact rock which will help to retain the placed peat & spoil and will allow the borrow pit to be developed and infilled in cells.

(4) A rock buttress is required at the downslope edge of the borrow pit to safely retain the infilled peat and spoil. The height of the rock buttresses constructed should be greater than the height of the infilled peat & spoil to prevent any surface peat & spoil run-off. A buttress is likely to be required.

(5) The rock buttress will be founded on competent strata. The founding stratum for the rock buttress should be inspected and approved by the project geotechnical engineer.

(6) In order to prevent water retention occurring behind the buttresses, the buttresses should be constructed of coarse boulder fill with a high permeability.

(7) The surface of the placed peat & spoil should be shaped to allow efficient run-off of surface water from the placed arising's.

(8) Control of groundwater within the borrow pit may be required and measures will be determined as part of the ground investigation programme.

(9) All the above-mentioned general guidelines and requirements must be confirmed by the designer prior to construction.

(10) Further guidelines on the construction of the borrow pit are included within Section 7.4 of the Peat & Spoil Management Plan

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FIGURE 6-2 : NORTHERN BORROW PIT - PLAN AND CROSS SECTION DETAILS

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6.4 Guidelines for the Construction and Reinstatement of Borrow Pits

Two number locations have been identified as potential borrow pits and are shown on Figure 1-1. The peat depth within the development footprint of the borrow pits is less than 0.5m.

Upon removal of the rock from the borrow pits, it is proposed to reinstate the borrow pits using excavated peat and spoil. The excavated rock from the borrow pits will be used in the construction of the infrastructure elements (turbine bases, roads, etc.) at the wind farm. The contractor excavating the rock will be required to develop the borrow pits in a way which will allow the excavated peat and spoil to be placed safely. It is proposed to construct cells within the borrow pits for the placement of the excavated peat and spoil. This is to allow for the safe placement and grading of the peat and spoil using dumper trucks and excavators. The text below provides design and construction guidelines for the borrow pits.

Figures 6-1 to 6-2 show typical construction details for the borrow pits.

The borrow pits shall be constructed as follows:

(1) The rock within the proposed borrow pit footprints will be removed by either breaking or blasting depending on its excavatability, which will be determined from a ground investigation carried out at the proposed borrow pits. The ground investigation shall comprise rotary core drilling with associated engineering logging including rock quality designation and strength testing, as required.

(2) It is proposed to construct the borrow pits so that the base of the borrow pits are below the level of the adjacent section of access road. As excavation progresses into the back edge of the borrow pits, the base of the borrow pits may be raised to suit local conditions. Localised deepening of the borrow pit floors may be required depending on extraction operations.

(3) Depending on the depth and type of rock present in the borrow pits it may be possible to excavate the rock from the borrow pits whilst leaving in place upstands/segments of intact rock which will help to retain the placed peat and spoil. The upstands/segments of intact rock will essentially act as engineered rock buttresses within the borrow pits.

(4) Slopes within the excavated rock formed around the perimeter of the borrow pits will be formed at stable inclinations to suit local in-situ rock conditions. Exposed sections of the rock slopes will be left with irregular faces and declivities to promote re-vegetation and provide a naturalistic appearance.

(5) The stability of the rock faces within the borrow pits will be inspected by competent personnel upon excavation to ensure stability during construction works and in the long term. This inspection will allow unfavourable rock conditions to be identified and suitable mitigation measures to be applied such as removal of loose rock.

(6) Where it is not possible to leave upstands/segments of intact rock in place it may be necessary to construct rock buttresses founded on in-situ rock within the borrow pits. The rock buttresses should be constructed of rock fill from the borrow pit excavation. The founding stratum for each rock buttress should be inspected and approved by a competent person.

(7) It may be necessary to construct the rock buttresses within the borrow pits in stages as infilling of peat and spoil behind the buttresses progress. The buttress should be constructed of selected rock fill and placed and compacted in suitable layers to form a buttress of sufficient stability to retain the placed peat and spoil, as necessary.

(8) Infilling of the peat and spoil should commence at the back edge of the borrow pit and progress towards the borrow pit entrance/rock buttress. The contractor excavating the rock will be required to develop the borrow pits in a way which will allow the excavated peat and spoil to be reinstated safely.

(9) A number of rock buttresses to form cells with the borrow pits may be required to ensure access for trucks and excavators can be achieved. See Figures 6-1 to 6-2 for the location of the rock buttresses. The locations of the rock buttresses shown on Figures 6-1 to 6-2 for the borrow pit are indicative only and may change subject to local conditions encountered on site during construction and as a result of the ground investigations.

(10) The rock buttresses should be wide enough to allow construction traffic access for tipping and grading during the placement of the excavated peat and spoil. The side slopes of the rock buttress should be constructed between 45 to 60 degrees.

(11) The height of the rock buttresses constructed should be greater than the height of the reinstated peat and spoil to prevent any surface peat and spoil run-off. Buttresses up to 5m in height are likely to be required.

(12) The use of temporary access ramps and long reach excavators during the placement of the excavated peat and spoil is likely to be required.

(13) The surface of the placed peat and spoil will be shaped to allow efficient run-off of surface water from the placed arisings.

(14) A layer of geogrid to strengthen the surface of the placed peat and spoil within the borrow pits may be required.

(15) An interceptor drain should also be installed upslope of the borrow pit, where necessary. This drain will divert any surface water away from the borrow pit and hence prevent water from ponding and lodging during construction and also when reinstated.

(16) Control of groundwater within the borrow pits may be required and measures will be determined as part of the ground investigation programme. A temporary pump and suitable outfall locations are likely to be required during construction.

(17) A silting pond will be required at the lower side/outfall location of the borrow pits.

(18) Where possible, the acrotelm shall be placed with the vegetation part of the sod facing the right way up to encourage growth of plants and vegetation at the surface of the peat and spoil within the borrow pits.

(19) Supervision by a geotechnical engineer or appropriately competent person is recommended for the works.

(20) All the above mentioned general guidelines and requirements will be confirmed by the designer prior to construction. A detailed construction methodology for the borrow pits should be compiled prior to construction.

6.5 Designated Spoil Placement Areas alongside the Access Roads

The following recommendations/best practice guidelines for the placement of peat and spoil alongside the access roads will be considered and taken into account during construction.

(1) The potential spoil placement area locations identified are alongside the proposed access roads in the northeast and east of the site where the topography is typically flat (<5^{o}). The placement of spoil alongside the access roads should be restricted to areas where the peat depth is less than 1.5m.

(2) Given the relatively flat topography present at the northeast and eastern part of the site, the placement of peat and spoil alongside the access roads is deemed appropriate.

(3) The peat and spoil placed adjacent to the new proposed access roads will be restricted to a maximum height of 1m over a c.10m wide corridor on the upslope side of the access road, or both sides of the access road where the ground is flat (slope <2^{o}).

(4) The placement of excavated peat and spoil is to be avoided without first establishing the adequacy of the ground to support the load. The placement of peat and spoil within the placement areas will likely require the use of long reach excavators, low ground pressure machinery and possibly bog mats in particular for drainage works.

(5) Where there is any doubt as to the stability of the peat surface then no material shall be placed on to the peat surface. The risk of peat instability is reduced by not placing any loading onto the peat surface.

(6) The surface of the placed peat and spoil will be shaped to allow efficient run-off of surface water. Shaping of the surface of the peat and spoil should be carried out as placement of peat and spoil within the placement area progresses. This will reduce the likelihood of debris run-off and ensure stability of the placed peat and spoil.

(7) Finished/shaped side slopes in the placed peat and spoil shall be not greater than 1 (v): 2 (h) (for spoil) or 1 (v): 3 (h) (for peat). This slope inclination will be reviewed during construction, as appropriate. Where areas of weaker peat and spoil are encountered then slacker slopes will be required.

(8) Where possible, the acrotelm shall be placed with the vegetation part of the sod facing the right way up to encourage growth of plants and vegetation at the surface of the placed peat and spoil within the placement areas.

(9) No peat or spoil shall be sidecast in buffer zones adjacent to watercourses.

(10) Movement monitoring instrumentation may be required adjacent to the access road where peat has been placed. The locations where monitoring is required will be identified by the designer on site.

(11) Supervision by a geotechnical engineer or appropriately competent person is recommended for the works.

(12) An interceptor drain will be installed upslope of the designated peat placement areas to divert any surface water away from these areas. This will help ensure stability of the placed peat and reduce the likelihood of debris run-off.

(13) All the above mentioned general guidelines and requirements should be confirmed by the designer prior to construction.

7. EXCAVATIONS IN PEAT FOR TURBINE BASES, HARDSTANDINGS AND INFRASTRUCTURE FOUNDATIONS

The works require that turbine bases are to be founded on competent founding strata which will require excavation through peat and spoil. Some turbine bases may require a piled solution following confirmatory ground investigations by the Contractor.

Similarly, crane hardstandings, construction compound, substation platforms and met mast foundations are to be founded on competent mineral soil and/or rock which will also require excavation through peat and spoil. Excavations for the borrow pits will also require the removal of peat and non-peat spoil overlying the rock.

7.1 Methodology

This methodology includes procedures that are to be included in the construction to minimise any adverse impact on peat stability. The methodology is not intended to cover all aspects of construction such as drainage and environmental considerations.

(1) With respect to placement of arisings from excavations the guidelines given in Section 6 are to be followed.

(2) All excavations within peat are to be adequately supported or peat slopes are to be battered to a safe slope inclination typically of 1 (v): 3 (h). This slope inclination will be reviewed during construction, as appropriate. Where areas of weaker peat are encountered then slacker slopes will be required.

(3) Excavations shall be kept reasonably free from water at all times. Water should be prevented from being impounded within excavations by either using drainage channels cut into the excavation face or by pumping.

(4) Where water is channelled or pumped from an excavation then this water is to be fed into an established watercourse or drainage ditch following suitable treatment.

8. EXCAVATIONS FOR UNDERGROUND CABLES

A connection between the Slieveacurry Renewable Energy Development and the national electricity grid will be necessary to export electricity. It is proposed that the Slieveacurry Renewable Energy Development will connect to the national grid via an existing substation located in Knockalassa townland to the south of the proposed wind farm development. The proposed underground cabling route is approximately T⇧Mkm in length and will predominately follow existing and proposed tracks and the public road corridor.

The proposed underground cable construction methodology, including proposals for water crossings on the underground cabling routes is described in the EIAR.

It is proposed to excavate the trenches for the underground cable at a uniform level in peat or other overburden material. The trenches will typically be 900mm wide and 1200mm deep.

The cable trench route will encounter peat and till derived from Namurian sandstones and shales.

8.1 Methodology

This methodology includes procedures that are to be included in the construction to minimise any adverse impact on peat stability. The methodology is not intended to cover all aspects of construction such as drainage and environmental considerations.

(1) With respect to placement of arisings from excavations the guidelines given in Section 6 are to be followed.

(2) It is proposed to excavate the trenches for the underground cable at a uniform depth in peat or other overburden material.

(3) All excavations within peat are to be adequately supported or peat slopes are to be battered to a safe slope inclination typically of 1 (v): 3 (h). This slope inclination will be reviewed during construction, as appropriate. Where areas of weaker peat are encountered then slacker slopes will be required.

(4) Similarly, all excavations within non-peat overburden for the cable trench are to be adequately supported or battered to a safe slope inclination typically of 1 (v): 1.5 or 2 (h). This slope inclination will be reviewed during construction, as appropriate.

(5) Excavations shall be kept reasonably free from water at all times.

(6) Any material excavated from the cable trench which is deemed suitable for reinstatement of the trench will be used for this purpose i.e. stockpiled locally to the works and reused for backfilling.

(7) Any material not deemed suitable for the reinstatement of the cable trench will be landscaped locally to the trench, where possible, or transported to the onsite borrow pit or appropriate permitted facility.

9. GENERAL RECOMMENDATIONS FOR GOOD CONSTRUCTION PRACTICE

To minimise the risk of construction activity causing potential peat instability it is recommended that the Construction Method Statements (CMS) for the project will also take into account, but not be limited, to the general recommendations below together with the specific recommendations above.

(1) Avoidance of uncontrolled concentrated water discharge onto peat slopes identified as being unsuitable for such discharge. All water discharged from excavations during work shall be piped over areas specifically assessed as being unsuitable and hence directly into suitable drainage lines.

(2) Avoidance of unstable excavations. All excavations shall be suitably supported to prevent collapse and development of tension cracks.

(3) Avoidance of placing fill and excavations in the vicinity of steeper peat slopes, that is at the crest or toe of the slope.

(4) Installation and regular monitoring of geotechnical instrumentation, as appropriate, during construction in areas of possible poor ground, such as deeper peat deposits (see Section 10).

(5) Site reporting procedures to ensure that working practices are suitable for the encountered ground conditions. Ground conditions to be assessed by suitably experienced geotechnical engineer.

(6) Regular briefing of all site staff (e.g. toolbox talks) to provide feedback on construction and ground performance and to promote reporting of any observed change in ground conditions.

(7) Routine inspection of wind farm site by Contractor to include an assessment of ground stability conditions (e.g. cracking, disrupted surface, closed-up drains) and drainage conditions (e.g. blocked drains, absence of water in previously flowing drains, springs, etc).

10. INSTRUMENTATION

10.1 Movement Monitoring Posts

To monitor possible peat movements, it is proposed to install sighting posts upslope and downslope of the access road at staggered intervals at locations where the peat depth is greater than 2.0m. Additional monitoring locations may be required at infrastructure locations with deeper peat deposits. Details of sighting posts are given below.

(1) A line of sighting posts shall comprise:

(a) A line of wooden stakes (typically 1 to 1.5m long) placed vertically into the peat to form a straight line.

(b) The sighting line shall comprise 6 no. posts at 5m centres that is a line some 25m long.

(c) A string line shall be attached to the first and last posts and all intervening posts shall be adjusted so they are just touching the string line.

(2) Lines of sighting posts shall be placed across the existing slope about 5m away from the area to be worked. It is recommended that the posts are located along the road at 10m intervals in areas of deep peat (say greater than 2.0m). Where there are relatively steeper slopes or softer ground a sighting line shall be placed down the slope, or at any location where monitoring is deemed useful.

(3) Each line of sighting posts shall be uniquely referenced with each post in the line given a reference. The post reference shall be marked on each post (e.g. reference 1-1, 1-2, 1-3, 1-4, 1-5, 1-6 for posts in line 1).

(4) The sighting lines shall be monitored at the beginning of each working day, and during the day where considered appropriate (e.g. when working activity is concentrated at a specific location).

(5) Monitoring of the posts shall comprise sighting along the line and recording any relative movement of posts from the string line.

(6) Where increased movements are recorded the frequency of monitoring shall be increased.

(7) A monitoring record shall be kept of the date, time and relative movement of each post, if any. This record shall be updated and stored as a spreadsheet.

11. CONTINGENCY MEASURES

11.1 Excessive Movement

Where there is excessive movement or continuing peat movement recorded at a monitoring location or identified at any location within the site but no apparent signs of distress to the peat (e.g. cracking, surface rippling) then the following shall be carried out.

(1) All activities (if any) shall cease within the affected area.

(2) Increased monitoring at the location shall be carried out. The area will be monitored, as appropriate, until such time as movements have ceased.

(3) Re-commencement of activities shall only start following a cessation of movement and agreement with all parties.

11.2 Onset of Peat Slide

In the unlikely event where there is the onset or actual detachment of peat (e.g. cracking, surface rippling) then the following shall be carried out.

(1) On alert of a peat slide incident, all activities (if any) in the area should cease and all available resources will be diverted to assist in the required mitigation procedures.

(2) Action will be taken to prevent a peat slide reaching any watercourse. This will take the form of the construction of check barrages on land. Due to the terrain and the inability to predict locations it may not be possible to implement any on-land prevention measures, in this case a watercourse check barrage will be implemented.

(3) All relevant authorities should be notified if a peat slide event occurs on site.

(4) For localised peat slides that do not represent a risk to a watercourse and have essentially come to rest the area will be stabilised initially by rock infill, if required. The failed area and surrounding area will then be assessed by the engineering staff and stabilisation procedures implemented. The area will be monitored, as appropriate, until such time as movements have ceased.

11.3 Check Barrages

Whilst it is not anticipated from the analysis undertaken that a peat slide will occur on site, as a contingency a check barrage procedure is included below.

The check barrage procedure deals with preventing a peat slide from moving downstream within a watercourse.

The most effective method of preventing excessive peat slide debris from travelling downstream in a watercourse is the use of a check barrage. A check barrage comprises the placement of rock fill across a watercourse. The check barrage is a highly permeable construction that will allow the passage of water but will prevent peat debris from passing through. Rock fill should comprise well-graded coarse rock pieces from about 300mm up to typically 1000mm.

The rock fill for the check barrage could be sourced from locally won granular fill material on site.

The size of the barrage will vary depending on the scale of the peat debris to be contained and the geometry of the watercourse at the barrage location. In general, due to the low speed of a peat slide there is generally little impact force and most of the lateral load is due to fluid pressure on the upslope face of the barrage.

Typically, the check barrage should fill the entire channel width of the watercourse up to a height of 3 to 4m with a crest width of typically 2m and side slopes of about 45 degrees depending on the geometry of the barrage location.

The check barrage procedure is as follows:

(1) Access to the check barrage location shall be along the existing access roads on the wind farm site and/or along public roads, where possible. When it is necessary to form the barrage then rock fill will be placed across the watercourse to effectively block the passage of peat debris.

(2) Operatives employed to carry out the construction of the check barrage would need to be inducted by means of a briefing by on-site supervisors as to the proposed location of the check barrage.

(3) The check barrage provides containment for peat debris in the highly unlikely event of a major peat slide. Further remedial measures, should they be required, will be assessed by the Contractor and the Project Geotechnical Engineer and carried out as soon as physically possible when the location and extent of the failure is established.

(4) Where a barrage was constructed as a precaution and no peat debris reached the watercourse then the barrage should be removed as soon as any measures to prevent further peat sliding is agreed with all parties.

12. CUT AND FILL EARTHWORKS ASSESSMENT

FT carried out an assessment for the site which quantifies the total volume of cut and fill earthworks required for the construction of the wind farm. The cut and fill assessment is graphically presented in Figure 12-1.

The outputs from the cut and fill earthworks assessment includes the following:

- Plan drawing of the entire site showing an outline of cut and fill earthworks at all infrastructure elements (Figure 12-1)
- Cut and fill earthwork volumes (see Table 6-1 of this report)

A summary of the basis for the cut and fill earthworks assessment are included in Appendix B of this report.

A summary of the stone volumes required is given in Table 12-1.

12.1 Commentary on Earthworks Volumes

This section of the report should be read in conjunction with Sections 6.2 and 6.3 of the report which summarise the peat and spoil volumes for site and the placement/reinstatement areas on site.

In summary:

1) A total of 110,500m^3 of peat and spoil will be generated during the construction of the proposed development.
2) The peat and spoil generated will be stored within the two borrow pits and used for landscaping around hardstands. A small volume of material (5,000m^3) will be stored adjacent to the access roads. A total storage capacity of 125,500m^3 is available across the proposed development (Table 6.2).
3) A total of 83,832m^3 of stone is required in order to construct the hardstands, access roads and compounds across the proposed development excluding the final blinding layer which will come from external sources (Table 12.1).
4) Based on available ground investigation information the estimated quantity of available rock within the borrow pits is 85,000m^3. Conservative assumptions were made in estimating the quantity of rock available in the borrow pits. Some reusable rock is also expected to be generated during the excavations for the turbines and site infrastructure.
5) A factor of 20% (bulking factor of 15% and contingency factor of 5%) has been applied to all excavation volumes to allow for expected bulking upon excavation and to allow for a variation in ground conditions.

Table 12.1: Summary of Stone Volume Requirements

Infrastructure Element (1)	Typical Dimensions	Stone Volume (m^3) (2)	Comment
8 no. Turbines and Hardstands	27m diameter excavation footprint for turbine foundation with 62.5 x 25m finished hardstand surface.	35,582	Hardstanding area and foundation footprint. Allowance included for mini-crane pads and blade finger hardstands associated with the main hardstand, plus allowance for side slopes in areas of fill.
Access Roads (including cabling)	Assumed 5m running surface with 6m wide development footprint. Typical stone depth of 0.75m.	35,100	Allowance includes for widening on bends, at junctions, laybys, and tie-ins to hardstands.
Meteorological Mast	10 x 10m foundation footprint and 30 x 30m hardstanding area.	350	-
Temporary Construction Compounds	Hardstanding area of 90 x 70m.	6,300	
Borrow Pits	2 no. borrow pits.	6,500	Borrow pit perimeter berm
	Total =	**83,832m^3**	

Notes
Note (1) A contingency factor of 20% has been applied to the volumes to allow for expected bulking upon excavation and to allow for a variation in ground conditions across the site.
Note (2) It should be noted that the volumes given in Table 12-1 are subject to confirmatory design.

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Cut / Fill Legend:

Areas of Cut

Areas of Fill

Site Boundary

New Proposed Track

New Proposed Track

Existing Track to be Upgraded

Proposed Borrow Pit No. 2

Proposed Cable Route

Proposed Construction Compound

Proposed Construction Compound

Proposed Borrow Pit No..1

Proposed Met Mast

T1

T2

T3

T4

T5

T6

T7

T8

0m 75m 150m 225m 300m 375m 450m 525m 600m 675m 750m

Scale 1:15000

Scale 1:15000

Scale (@ A3)
1:15000

Date - 10.11.21

FIGURE 12-1 : PLAN DRAWING OF CUT FILL EARTHWORKS FOR SITE

Drawn - POR

Checked - IH

Rev - H

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Wednesday 10 November 2021

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APPENDIX A

Photos from Site Walkover

Photo 1 Example of an existing excavated access track on site

Photo 2 Example of an existing access track on site

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APPENDIX B

Basis for Cut and Fill Earthworks Assessment

Basis for Cut/Fill Earthwork Assessment

Main Infrastructure Locations

Appendix B provides a summary of the main assumptions for the cut/fill earthworks assessment.

Table B1 provides a summary of the dig depths adopted for the cut/fill assessment for the main infrastructure elements at Slieveacurry Renewable Energy Development.

The assumed excavation footprint for the turbine foundation is the turbine base diameter of 19m plus 2m working room all around the base i.e. 23m.

Table B1: Summary of the dig depths at the main infrastructure locations

Turbine	Easting	Northing	Average Peat Depth for Turbines (m)	Dig depth for Turbine Foundation (m) (1)	Average Peat Depth for Crane Hardstands (m)	Max Dig depth for Associated Crane Hardstand (m) (2)
T1	111820	180747	1.8	3.0	1.8	2.1
T2	112486	180776	0.6	3.0	0.6	0.9
T3	111548	180243	0.4	3.0	0.4	0.7
T4	112104	180269	1.0	3.0	1.0	1.3
T5	112881	180470	0.7	3.0	0.7	1.0
T6	112421	179804	0.8	3.0	0.8	1.1
T7	111517	179163	0.5	3.0	0.5	0.8
T8	112026	179412	0.6	3.0	0.6	0.9
Infrastructure Element	**Easting**	**Northing**	**Average Peat Depth (m)**	**Max Dig depth for Infrastructure Element (m) (3)**		
Construction Compound	111330	179019	0.1	0.4		
Met Mast	111331	179007	0.1	0.4		
Cable Trench	Varies		0.3	1.2		
Borrow Pit 1	111226	178909	0.15	Varies		
Borrow Pit 2	112688	180126	0.15	Varies		

Notes

(1) Founding depths for the turbines was assumed to be the average peat depth + 1m to a competent strata. To be confirmed at detailed design stage following detailed ground investigation. A minimum dig depth of 3m is assumed for each turbine foundation. For the purpose of this assessment it is assumed that all turbine foundations will be gravity type founded bases i.e. no piled foundations.

(2) Founding depths for the crane hardstands was assumed to be the average peat depth + 0.3m to a competent strata. To be confirmed at detailed design stage following a ground investigation. In areas of steeper terrain (say greater than 10% gradient), for the crane

hardstandings and for the purpose of this assessment, it was endeavoured to balance the earthworks for the footprint of the hardstands, where possible.

(3) For the construction compounds the founding depth was assumed to be the average peat depth +0.3m to a competent strata. To be confirmed at detailed design stage following ground investigation. In areas of steeper terrain (say greater than 10% gradient), for the compounds and substation platform and for the purpose of this assessment, it was endeavoured to balance the earthworks for the footprint of the platforms, where possible.

(4) For the met mast the founding depth was assumed to be the average peat depth +1.0m to a competent strata. To be confirmed at detailed design stage following ground investigation.

(5) Note the maximum dig depths stated in the Table above are indicative and for information purposes only and are subject to confirmation at detailed design stage following a ground investigation.

Access Roads

The following assumptions for the cut/fill assessment are given in relation to the access roads.

- Typical gradient requirements from turbine suppliers were assumed for the cut and fill assessment i.e., maximum gradients of 10 to 12%. A maximum gradient of 12% has been assumed for straight sections of access road on site.
- For the purpose of the assessment, it is assumed that the existing access tracks on site are typically 3m in width.
- There are 3 types of access tracks/roads proposed/present on site, which include:
    - Existing excavated and replace type access tracks - some excavation works as a result of localised widening will be required. It is assumed that widening will typically take place on both sides of the road. In areas of side long ground/steeper terrain (greater than 5% gradient), widening of existing tracks will take place on the upslope side of the road. Estimated dig depth to competent strata for both cases is 0.3m below the base of the peat.
    - Existing entrance access track – excavation work will be required to remove and widen this section of track.
    - New proposed excavate and replace type access roads – excavation work will be required. Estimated dig depth to competent strata was 0.3m below the base of the peat.

Borrow Pits

The cut/fill assessment for the borrow pits is based on the cross-section drawings (Figures 6-1 and 6-2) included in this report. The borrow pits were sized to allow for the reinstatement of the excavated peat volume generated on site and to accommodate the estimated site-won stone fill requirements.

General Assumptions

A 1(v): 2(h) configuration for all excavation faces was assumed for the cut and fill earthworks assessment, except for excavations in rock at the borrow pits where a configuration of 1(v): 0.7(h) i.e. 60 degrees was assumed. These configurations are considered reasonable based on the ground conditions encountered on the site, and in line with best practice guidelines.

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