APPENDIX 4-2

PEAT AND SPOIL MANAGEMENT PLAN

FEHILY TIMONEY

CONSULTANTS IN ENGINEERING, ENVIRONMENTAL SCIENCE & PLANNING

PEAT & SPOIL MANAGEMENT PLAN

GLENARD WIND FARM

Prepared for: **MKO Ltd**

Date: December 2021

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GLENARD WIND FARM

PEAT AND SPOIL MANAGEMENT PLAN

REVISION CONTROL TABLE, CLIENT, KEYWORDS AND ABSTRACT
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Client: MKO Ltd

Keywords: **Peat, Spoil, Management, Excavation, Floated, Borrow Pit**

Abstract: Fehily Timoney and Company (FT) were engaged by McCarthy Keville O'Sullivan (MKO) to compile a Peat & Spoil Management Plan (PSMP) for Glenard wind farm. The purpose of this report is to provide a Peat & 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. In addition, the report contains a cut/fill assessment for the site which quantifies and graphically presents the total volume of cut and fill earthworks required for the construction of the development.

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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.

FT have been involved in over 100 wind farm developments in both Ireland and the UK at various stages of development i.e. preliminary feasibility, planning, design, construction and operational stage and have established themselves as one of the leading engineering consultancies in peat stability assessment, geohazard mapping in peat land areas, investigation of peat failures and site assessment of peat.

This Report was written by Ian Higgins (FT Principal Geotechnical Engineer, MSc in Geotechnical Engineering). Ian is a Principal Geotechnical Engineer with Fehily Timoney and has over 20 years' experience in geotechnical engineering.

1.2 Project Description

Fehily Timoney and Company (FT) was engaged in August 2019 by McCarthy Keville O'Sullivan (MKO) on behalf of Futurenergy Glenard Designated Activity Company (DAC) to compile a Peat & Spoil Management Plan for the Glenard wind farm site.

The proposed Glenard wind farm is located approximately 5.9km east of Buncranna in Co. Donegal.

The site is heavily forested and consists predominantly of blanket peat with a mainly man-made drainage network.

The development will comprise 15 no. wind turbines and associated hardstanding areas, 1 no. electricity substation, 1 no. borrow pit, 1 no. peat repository, 2 no. temporary construction compounds, upgrade of existing roads, construction of new site access roads, underground cabling connecting to the existing Trillick substation, proposed new link roads and accommodation works along the turbine delivery route, 1 no. permanent meteorological mast, amenity walkways, site drainage and all associated work.

A full and detailed description of all elements of the proposed development is included in Chapter 4 of the EIAR.

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. The intention of the report is to describe 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 in an appropriate manner.

The report also provides construction details for the types of roads which will be put in place at the site and associated proposed peat and spoil placement/reinstatement areas which will be developed at the site.

This peat & 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.

The contents of the peat and spoil management plan and peat stability monitoring programme will be updated in the Construction & Environmental management Plan (CEMP) for the construction phase in line with any planning conditions that may apply.

The peat and spoil management plan contains 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 4 and 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.

It is noted that due to the soft ground nature of the peat terrain it is not possible to completely avoid localised peat movement. Such localised movement is not considered to be an issue in terms of overall peat stability on the site. However, strict adherence to the peat and spoil management plan will minimise the potential for all such peat movements.

2. CONSTRUCTION ACTIVITIES COVERED BY PEAT & SPOIL MANAGEMENT PLAN

2.1 Construction Activities

For the construction phase of the Glenard wind farm the following activities that have the potential for possible peat stability issues are as follows:

(1) Upgrade of existing access tracks (excavate and replace, and floating tracks)

(2) Construction of new excavated roads through peat

(3) Construction of new floating roads over peat

(4) Excavation and placement of arisings

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

(6) 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. The road construction design has taken into account the following key factors:

(1) Buildability considerations

(2) Minimise excavation arisings

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

(4) 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 on the prevailing ground conditions encountered along that length of road.

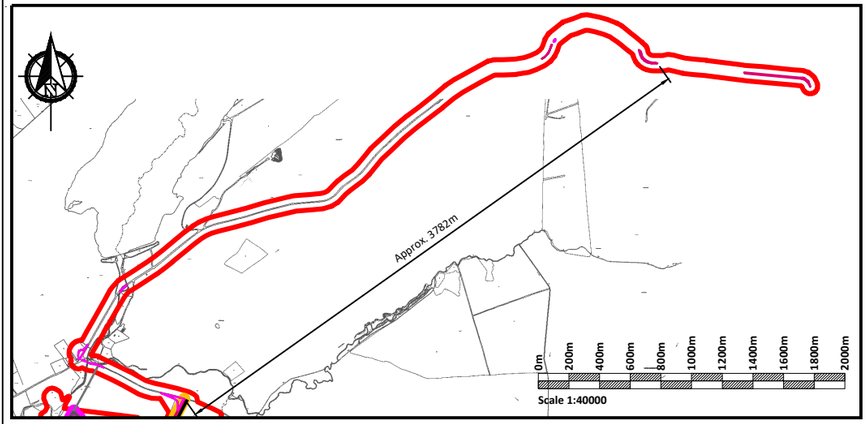
The general road construction techniques to be considered are given in Table 2-1.

It should be noted that this report does not include a detailed design for the access roads on the Glenard wind farm site. This report includes the most suitable type of road construction envisaged for each section of access road based on the ground/site conditions recorded during the site walkovers and ground investigation works. Where floating roads are proposed in this report, a methodology is presented and a confirmatory ground investigation will be carried out prior to construction on site.

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 tracks	Type A	<2.0-2.5	Varies	Upgrade existing excavated access track to the required width and finished with a layer of selected granular fill– Figure 1-1
	Type B	>2.0-2.5	Typically, <5	Upgrade existing floated access track to the required width and finished with a layer of geogrid and stone fill – Figure 1-1
Construction of new excavated roads through peat	Type C	Typically less than 2.0m	Varies	New access road construction technique envisaged for various locations on site – Figure 1-1
Construction of new floating roads over peat	Type D	>2.0	<5	New access road construction technique envisaged for various locations on site – Figure 1-1

Further details on access road construction types A to D are given in Sections 3, 4 and 5 of the report.



TDR AREAS OFFSITE TO THE NORTHEAST OF MAIN ENTRANCE

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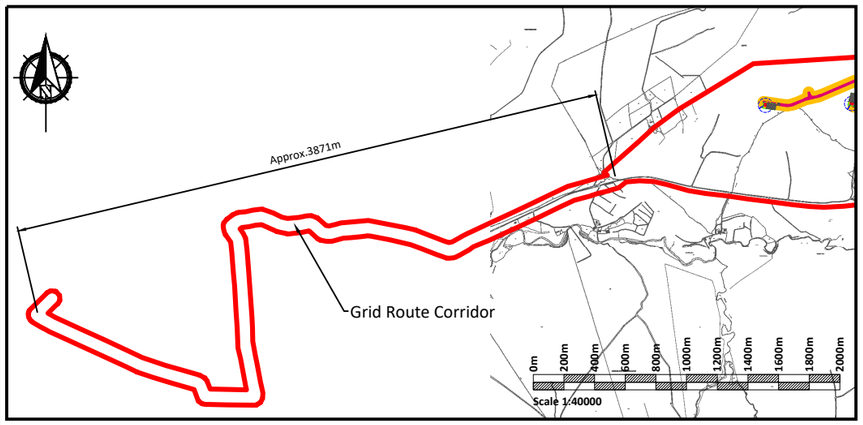

GRID ROUTE OFFSITE TO THE SOUTHWEST CORNER OF MAIN SITE

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Road Type Legend:

- Type A - Upgrade of Existing Excavated Access Tracks
- Type B - Upgrade of Existing Floated Access Tracks
- Type C - New Excavate & Replace Access Road
- Type D - New Floated Access Road
- Side Casting

EIAR Site Boundary
Construction Compound
Side Casting
Repository Area
Proposed Turbine
T4
T5
T3
Existing Access Track to be Upgraded
T6
T2
New Proposed Access Track
T7
T1
T10
T8
Proposed Borrow Pit
T9
Construction Compound
T14
T11
T12
T13
Proposed Substation
T15
Met Mast
Grid Route Corridor

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0m 80m 160m 240m 320m 400m 480m 560m 640m 720m 800m
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FIGURE 2.1 - PLAN DRAWING OF WIND FARM WITH ROAD CONSTRUCTION TYPE

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3. UPGRADE OF EXISTING ACCESS TRACKS – TYPE A & B

Up to 6.6km of existing access track requiring upgrade is present across the Glenard wind farm site and, based on Coillte records, have been in operation for a significant number of years. The existing access tracks were constructed using both excavate and replace and floated construction techniques. Based on the site walkover carried out by FT the existing access tracks were noted as being in relatively good condition. Upgrading works will involve both widening and resurfacing of the existing access track. The proposed locations for upgrading of the existing access tracks on site are shown in Figure 2-1 and cross-section details are shown in Figures 3-1 and 3-2.

Two different types of existing access tracks are present on site which were constructed using both excavate and replace and floated construction techniques (Appendix A – Photos 1 and 2). Upgrading for each is proposed as per details for type A and B respectively.

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 which are discussed in Chapter 4 of the EIAR.

(1) Access road construction will be to the line and level requirements as per design/planning conditions.

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

  (a) Excavation of the widened section of access road will take place to a competent stratum beneath the peat, removing all peat and soft clay 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 track will be overlaid with up to 300mm of selected granular fill.

  (d) A layer of geogrid/geotextile may be required at the surface of the existing access track where the existing track shows signs of excessive rutting, etc.

  (e) For excavations in peat, side slopes will 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.

(3) For upgrading of existing access tracks constructed using a floated construction technique (Figure 3-2) the following guidelines apply:

  (a) The surface of the existing access track will be levelled prior to the placement any geogrid/geotextile, where necessary (to prevent damaging the geogrid/geotextile).

  (b) Where coarse granular fill has been used in the existing access track make-up, a layer of geogrid will be placed on top of the existing access track.

  (c) The geogrid will be overlaid with up to 500mm of selected granular fill.

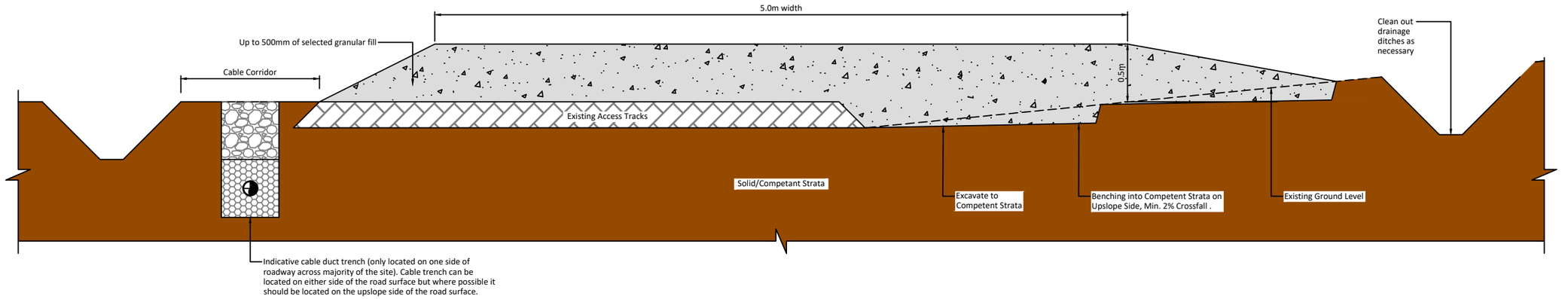
  (d) Additional geogrid and granular fill may be required in certain sections of the works, such as where excessive rutting is noted in the existing track.

(4) The finished road width will have a running width of 5m, with wider sections on bends and at corners as shown on the site layout drawings submitted with the planning application.

(5) Where the ground is sloping across a section of access road (side long ground) any road widening works required will be done on the upslope side of the existing access road, where possible.

(6) At transitions between floating and existing excavated roads a length of road of about 10m will have all peat excavated and replaced with suitable fill. The surface of this fill will be graded so that the road surface transitions smoothly from floating to excavated road.

(7) A final surface layer will be placed over the existing access track and graded to accommodate wind turbine construction and delivery traffic.



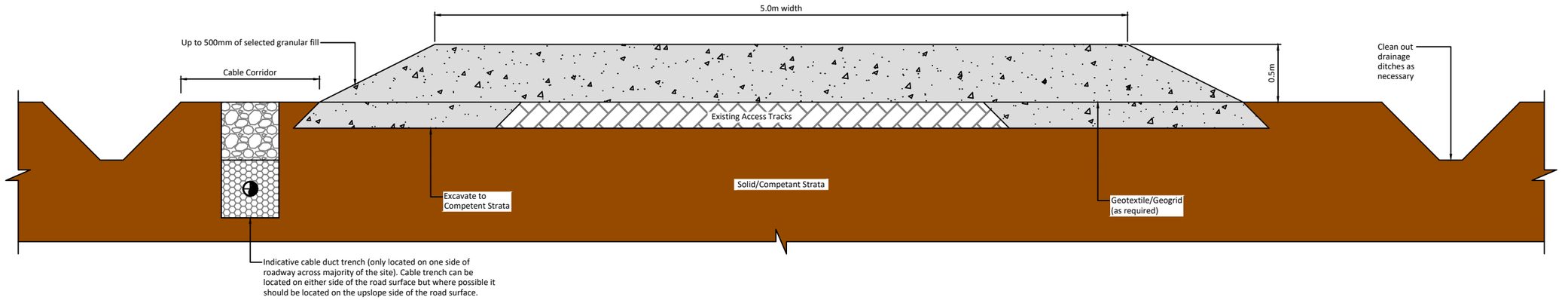


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FIGURE 3.1 - TYPE A - UPGRADE OF EXISTING EXCAVATED ACCESS TRACK

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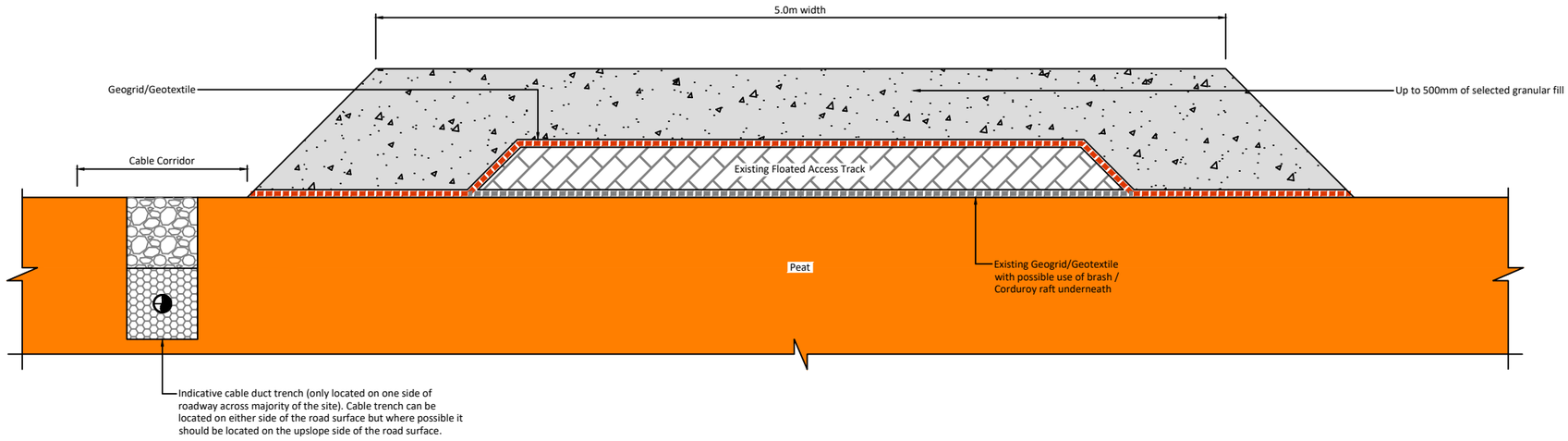

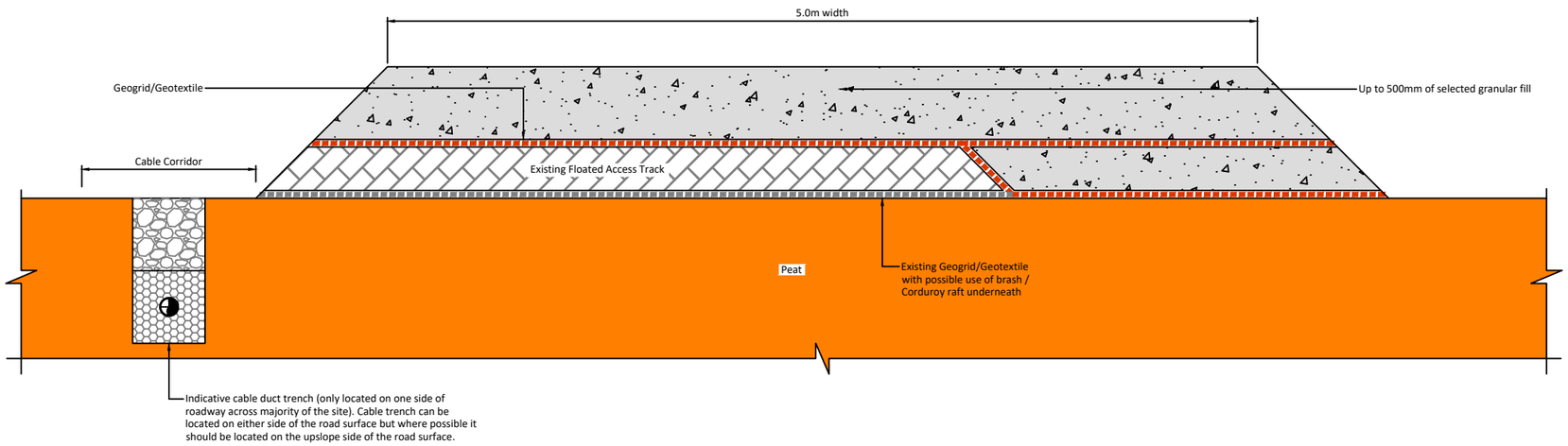

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FIGURE 3.2 - TYPE B - UPGRADE OF EXISTING FLOATED ACCESS TRACKS

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

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 2-1 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 (<2.0-2.5m) 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, which are discussed in Chapter 4 of the EIAR.

(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 1.5m.

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

(3) Excavation will take place to a competent stratum beneath the peat.

(4) 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.

(5) Once excavated, peat will be placed within the borrow pit or the peat and spoil repository.

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

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

  (b) Where possible, the acrotelm will 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) will be transported immediately on excavation to the borrow pit or to the designated peat repository.

(7) Side slopes in peat will 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 of up to 1000mm of selected granular fill. Granular fill to be placed and compacted in layers in accordance with the TII Specification for Road Works.

(9) A layer of geogrid/geotextile may be required at the surface of the competent stratum should excessive rutting be noted in the track.

(10) At transitions between floating and excavated roads a length of road of about 10 to 20m will have all peat excavated and replaced with suitable fill. The surface of this fill will be graded so that the road surface transitions smoothly from floating to excavated road.

(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 will be placed over the excavated road and will be graded to accommodate wind turbine construction and delivery traffic.

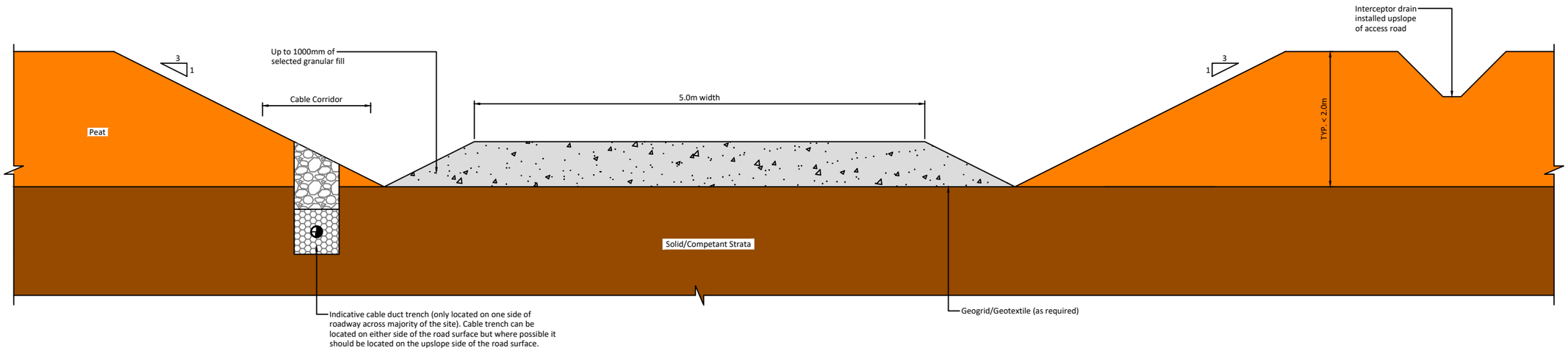

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FIGURE 4.1 - TYPE C - NEW EXCAVATE AND REPLACE ACCESS ROAD

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5. CONSTRUCTION OF NEW FLOATED ROADS OVER PEAT– TYPE D

It will be necessary to construct floating roads over peat in localised areas across the site. The use of new floated access tracks will be limited on site to areas of flatter terrain. The proposed locations for the new floating access roads on site are shown in Figure 1-1 and details are shown in Figure 5-1.

For any areas where floating roads are proposed (Figure 2-1), a confirmatory inspection will be carried out by a suitably qualified engineer, such as the Project Geotechnical Engineer, along with the Project Hydrologist in advance of the construction, to reconfirm that there are no localised areas of weak/saturated peat, evidence of blocked drains, or evidence of existing peat instability.

Floating roads minimise impact on the peat, particularly peat hydrology. As there is no excavation required no peat arisings are generated. However, where the underlying peat has insufficient bearing capacity or due to topographic restrictions an excavate and replace type access road may be more suitable (see Section 6).

5.1 Floating 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, which are discussed in Section 4.7 of the EIAR.

Note: Details of geogrid arrangement will be provided by the specialist geogrid provider/designer. Geogrid is a synthetic material used to reinforce soils and fill materials.

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

(2) Base geogrid will be laid directly onto the existing peat surface along the line of the road in accordance with geogrid provider's requirements.

(3) The make-up of the new floated access road will be up to 1,200mm thickness of selected granular fill with 2 no. layers of geogrid with the inclusion of a geotextile separator, where necessary.

(4) Granular fill will be placed in layers and compacted in accordance with the TII Specification for Road Works, Series 600 (2013).

(5) During construction of the floated access roads it may be deemed necessary to include pressure berms either side of the access road in some of the deeper peat areas. The inclusion of a 2 to 5m wide pressure berm (typically 0.5m in height) either side of the access road will reduce the likelihood of potential bearing failures beneath the access road.

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

(7) Stone delivered to the floating road construction areas will be end-tipped onto the constructed floating road. Direct tipping of stone onto the peat will not be carried out.

(8) To avoid excessive impact loading on the peat due to concentrated end-tipping all stone delivered to the floating road will be tipped over a minimum length of 10m of constructed floating road.

(9) Where it is not possible to end-tip over a 10m length of constructed floating road then dumpers delivering stone to the floating road will carry a reduced stone load (not greater than half full) until such time as end-tipping can be carried out over a 10m length of constructed floating road.

(10) Following end-tipping a suitable bulldozer will be employed to spread and place the tipped stone over the base geogrid along the line of the road.

(11) A final surface layer will be placed over the full width of the floating road to provide a road profile and graded to accommodate wind turbine construction and delivery traffic.

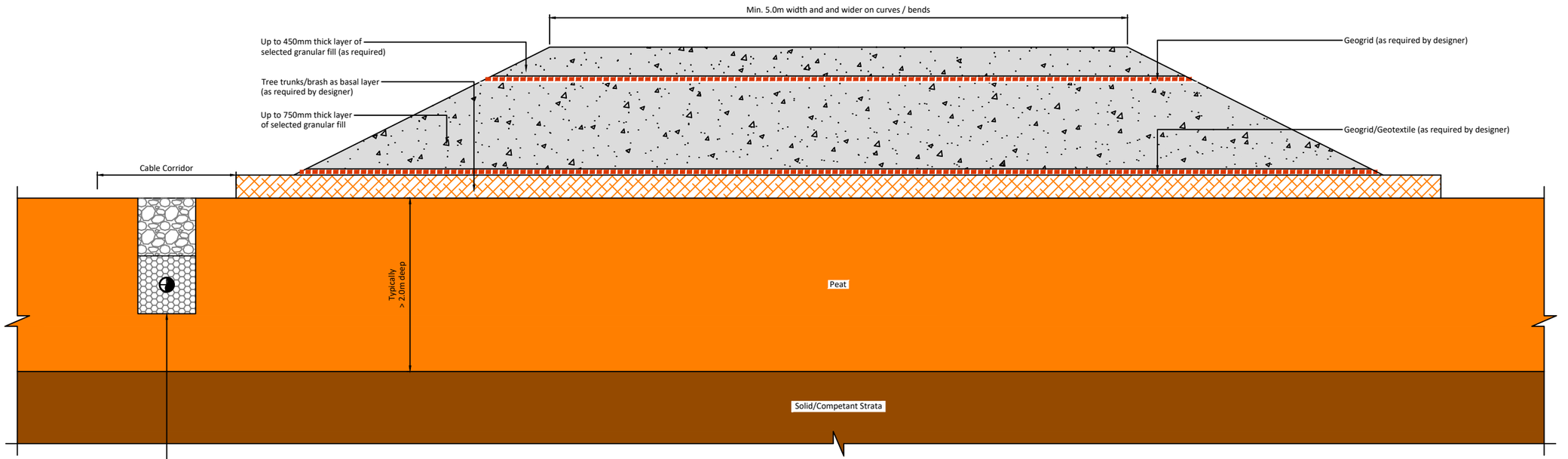

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FIGURE 5.1 - TYPE D - NEW FLOATED ACCESS ROAD

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Notes:

1) Floated access road detail may comprise 500 to 750mm stone fill, layer of geotextile & 1 to 2 layers of geogrid.
2) Excavated access road detail may comprise up to 500mm stone & layer of geotextile (depending on ground conditions encountered).

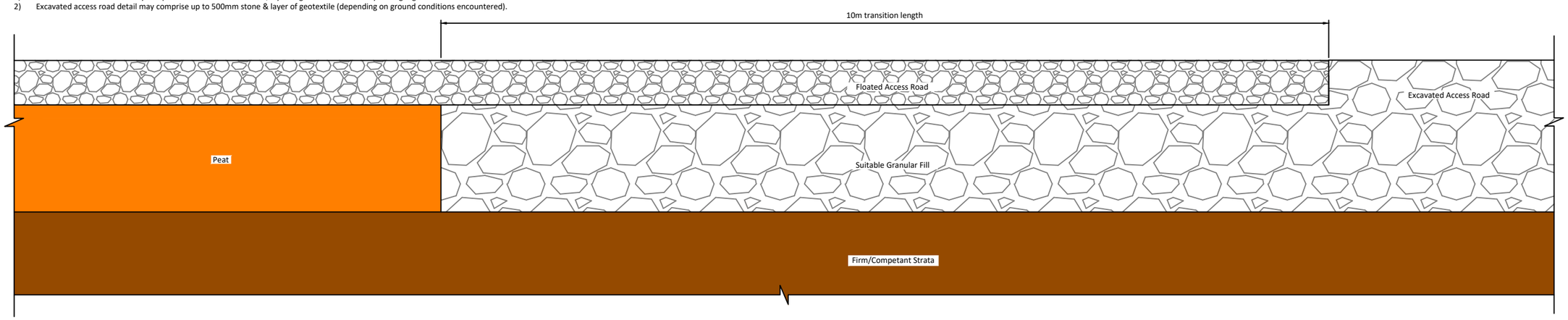

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FIGURE 5.2 - TRANSITION DETAIL

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Notes:

1) Spoil material will spread to a depth not exceeding 1m in height.
2) See section 7.4 of the Peat & Spoil Management Plan.
3) Indicative locations are given for drainage measures such as drainage ditches.

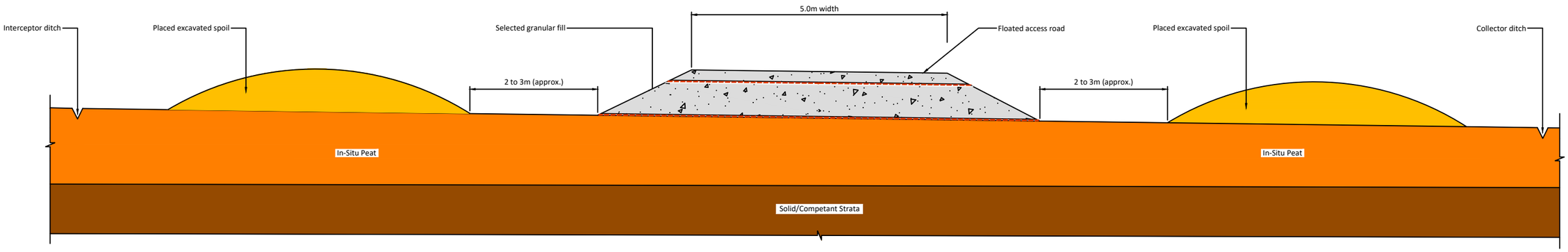

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FIGURE 5.3 - PEAT & SPOIL PLACEMENT ALONGSIDE INFRASTRUCTURE ELEMENTS - TYPICAL DETAILS

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6. 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/proposed floating access track, the ditch will need to be filled prior to upgrading/constructing the access track. It should be noted that the stability of a floating access road is notably reduced by the presence of adjacent ditches/excavations. The ditch will be filled with suitable drainage stone. As applicable, a perforated pipe will be laid into a 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) No excavations (e.g. drainage, peat cuttings) will be carried out within 5m distance of a completed floated access road edge, or at a distance determined following site inspection by the Contractor. The presence of excavations can destabilise the road. Temporary excavations, where required, will be excavated in short lengths and backfilled as soon as practicable.

(4) No stockpiling of materials will take place on or adjacent to floated access roads so as to avoid bearing failure of the underlying peat.

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

(6) Due to the nature of floating road construction, it is necessary to monitor the settlement/movement of the road. It is recommended that survey points are located along the road at 10m intervals in areas of deep peat (greater than 2m). These survey points will be surveyed on a weekly basis and more frequently depending on the level of construction activities in the area.

(7) The construction and upgrading of access roads in areas of deep peat (greater than 2.0-2.5m) will be inspected (by the Site Manager/Ecological Clerk of Works/Project Geotechnical Engineer) on a routine basis during the works, particularly before/following trafficking by heavy vehicular loads.

(8) In the event of excessive vertical displacement of the road during/following construction then remedial measures will be required to ensure the stability of the road. This would include:

  (a) Introduction of pressure berms either side of the road (that is 2 to 5m wide by 0.5m deep stone layer).

  (b) Where peat is relatively shallow (<2.0-2.5m) then excavate peat and replace with suitable fill.

  (c) Slowing the rate of construction.

(9) Settlement of a floated access road is expected and will be in the order of several 100mm in the deeper peat areas; as such it will be necessary to re-level the road at convenient intervals during the construction works. The magnitude and extent of settlement is likely to be greater in areas of deeper peat with the rate of settlement reducing over time. Prior to completion of the construction works measures will be taken to re-level the road, as necessary.

7. EXCAVATION AND STORAGE OF PEAT AND SPOIL

7.1 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 will be transported immediately on excavation to the borrow pit (see Figure 7-1), to the Peat Repository or to designated spoil areas alongside the access roads (Figure 2.1).

(2) Further details on the construction and reinstatement of the borrow pit are given in Section 7.4.

(3) Further details on the placement of excavated material to designated spoil areas alongside the access roads are given in Section 7.5.

(4) Some of the peat in particular the acrotelm (upper layer of the peat) excavated during construction will be used for landscaping purposes around turbine bases and hardstands.

7.2 Summary of Peat and Spoil Volumes on Site

A summary of the excavated peat volumes calculated for the Glenard wind farm site are given in Table 7-1.

Table 7.1: Summary of Excvated Peat and Spoil Volumes on Site

Infrastructure Element [1]	Dimensions	Peat Volume (m^3) [3]	Spoil (non-peat) Volume (m^3) [3] & [4]	Comment
15 no. Turbines and Hardstands	28m diameter excavation footprint for turbine foundation with 55 x 35m hardstand area.	135,000	35,000	Hardstanding area and foundation footprint
Access Roads(16.3km in total)	Assumed 5m running surface with 6m wide development footprint.	200,000	13,000	Excludes proposed floating sections of access road where no excavation of peat will take place (see Figure 2-1)
Substation	Approx.190 x 130m footprint.	35,000	5,000	-
Meteorological Mast	20 x 15m hardstanding area.	600	100	-
Temporary Construction Compounds	Hardstanding areas of 60 x 100m and 45 x 70m.	10,000	1,900	Hardstanding areas
Borrow Pit	1 no. borrow pit.	35,000	17,000	Borrow pit footprint
	Total =	**415,600m^3**	**72,000m^3**	**Total =487,600m^3 (peat and spoil volume)**

Note (1) The location of the infrastructure elements on site are shown on Figure 2-1.

Note (2) Amenity tracks across the site have not been considered as there is no excavation anticipated at these locations.

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) It should be noted that the excavated rock volume is not included in the total volume quoted above in Table 7-1, see the cut-fill assessment in Section 12 of this report for further details.

7.3 Summary of Peat and Spoil Storage Volumes on Site

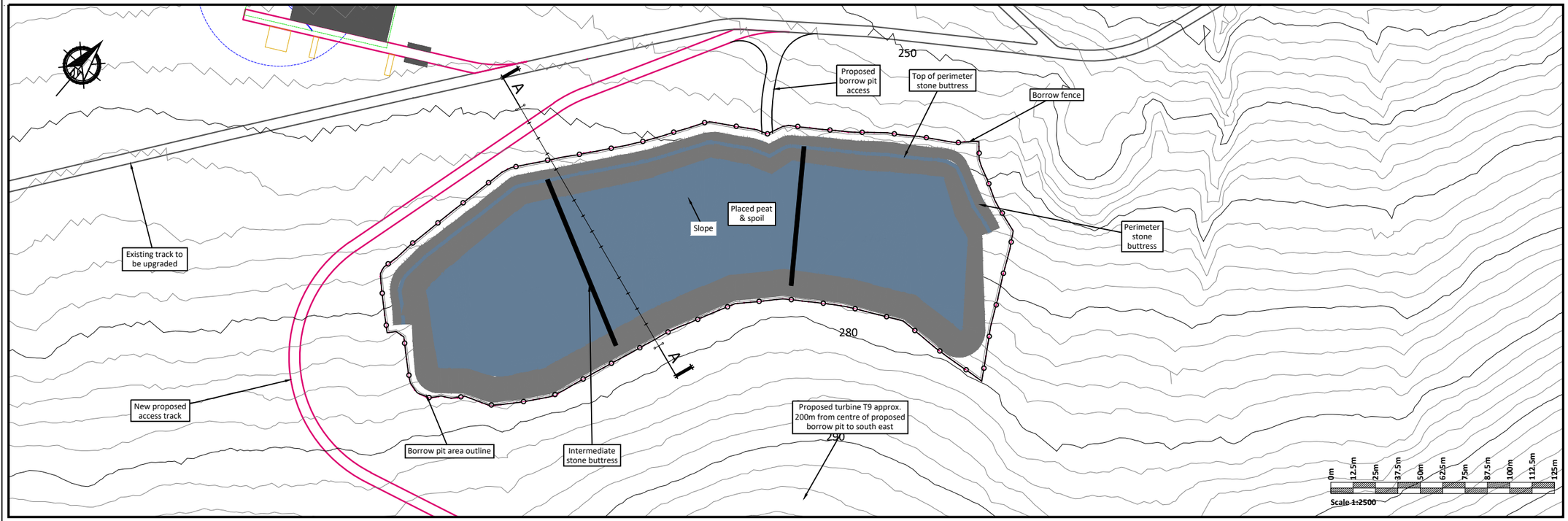
A summary of the peat and spoil placement/reinstatement areas at the Glenard wind farm site are given in Table 7-2.

Table 7.2: Summary of Peat and Spoil Placement/Reinstatement Areas on Site

Location (1)	Peat and Spoil Volume (m^3)	Comment
Borrow Pit	400,000	See Figure 7-1 for further details
Peat Repository	65,000	1m in height across repository area. See Section 7.6 for further details
Peat and spoil placement alongside designated access roads	10,000	1m in height and 10m wide corridor on both sides of the access road, only where topography is typically flat. See Section 7.5 of the report and Figure 2-1 for further details
Landscaping (2)	15,000	It is estimated that approximately 1,000m^3 of peat will be required for landscaping purposes at each of the 15 no. turbine locations
Total =	**490,000m^3**	

Note (1) The location of the proposed borrow pits at the site are shown on Figure 7-1.

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



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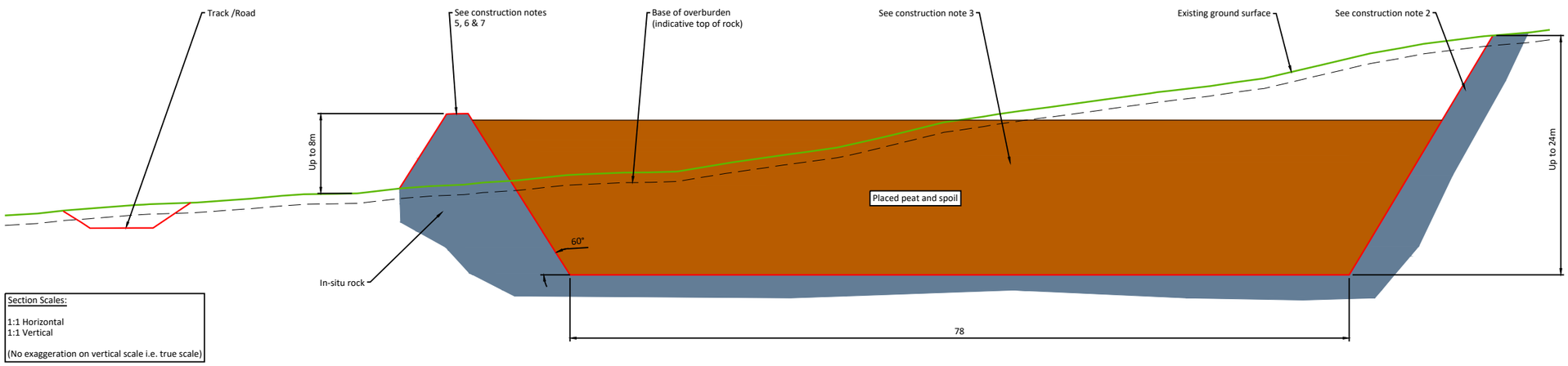

Section A - A

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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 will 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 will be greater than the height of the infilled peat & spoil to prevent any surface peat & spoil run-off. A buttress up to 8m (approx.) in height is likely to be required.

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

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

(7) The surface of the placed peat & spoil will 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 will 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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Date - 10.12.21

FIGURE 7.1 - BORROW PIT - PLAN AND CROSS SECTIONS DETAILS

Drawn - POR

Checked - IH

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Friday 10 December 2021

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7.4 Guidelines for the Construction and Reinstatement of Borrow Pit

One location has been identified as a borrow pit and is shown on Figure 7-1. The average peat depth within the development footprint of the borrow pit is generally less than 1m .

Upon removal of the rock from the borrow pit, it is proposed to reinstate the borrow pit using excavated peat and spoil within cells located inside the borrow pit. The excavated rock from the borrow pit 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 pit in a way which will allow the excavated peat and spoil to be placed safely within it. 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.

It should be noted that there are significant excavation works required in order to develop this borrow pit at the site. Excavation works will be undertaken and supervised by an experienced contractor and suitably qualified personnel. The text below provides some design and construction guidelines for the borrow pit.

Figure 7-1 shows typical construction details for the borrow pit.

The borrow pit will 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 confirmatory ground investigation carried out at the proposed borrow pit. The ground investigation will comprise rotary core drilling with associated engineering logging including rock quality designation and strength testing, as required. Ground investigation undertaken adjacent to the borrow pit indicate that the upper surface of the bedrock can be excavated, however breaking and blasting is likely to be required at depth.

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

(3) It is likely that it will be possible to excavate the rock from the borrow pit 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.

(4) 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. 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 pit will be inspected by the Project Geotechnical Engineer 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) Infilling of the peat and spoil will commence at the back edge of the borrow pit and progress towards the borrow pit entrance/rock buttress. Excavation and infilling of the borrow pit will need to be sequenced and programmed. Leaving in place upstands/segments of intact rock which will help to retain the placed peat and spoil and will allow the borrow pit to be developed and infilled in cells.

(7) 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 will be greater than the height of the infilled peat and spoil to prevent any surface peat and spoil run-off. A buttress up to 8m (above existing ground level) in height will be required.

(8) The rock buttress will be founded on mineral soil or bedrock i.e. competent strata. The founding stratum for the rock buttress will be inspected and approved by the Project Geotechnical Engineer.

(9) In order to prevent water retention occurring behind the buttresses, the buttress will be constructed of coarse boulder fill with a high permeability. The buttress will be constructed of well graded granular rock fill of about 100mm up to typically 500mm in size. Alternatively, drains will be placed through the buttresses to allow excess water to drain.

(10) The rock buttress will 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 will be constructed between 45 to 60 degrees.

(11) The use of temporary access ramps and long reach excavators during the placement of the excavated peat and spoil will be required.

(12) The surface of the placed peat and spoil will be shaped to allow efficient run-off of surface water from the placed arising's.

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

(14) An interceptor drain will be installed upslope of the borrow pit. This drain will divert any surface water away from the borrow pit and hence prevent water from ponding and lodging in the reinstated area.

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

(16) A settlement pond will be required at the lower side/outfall location of the borrow pit.

(17) Supervision by the Project Geotechnical Engineer or appropriately competent person is required for the works.

(18) All the above mentioned general guidelines and requirements will included in the Contractor's method statement prior to construction of the borrow pit.

7.5 Designated Peat Placement Areas alongside the Access Roads

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

(1) The potential peat placement area location identified is alongside the proposed access roads in the north of the site close to the construction compound where the topography is typically flat. The placement of peat alongside the access roads will be restricted to areas where the peat depth is less than 3m.

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

(3) The peat placed adjacent to the new proposed access roads will be restricted to a maximum height of 1m over a 10m wide corridor on both sides of the access road (see Figure 7-2).

(4) The placement of excavated peat will not take place until the adequacy of the ground to support the load is confirmed by the Project Geotechnical Engineer. The placement of peat and spoil within the placement areas will require the use of long reach excavators, low ground pressure machinery and bog mats, where necessary, particularly for drainage works.

(5) Where there is any doubt as to the stability of the peat surface then no material will 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 will be shaped to allow efficient run-off of surface water. Where possible, shaping of the surface of the peat and spoil will 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 will be not greater than 1 (v): 3 (h). 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 will 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 will be sidecast in buffer zones adjacent to watercourses.

(10) Movement monitoring instrumentation will be required adjacent to the access road where peat has been placed. The locations where monitoring is required will be identified by the Project Geotechnical Engineer.

(11) Supervision by the Project Geotechnical Engineer is required 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.

7.6 Designated Peat Repository

The location of the Peat Repository is shown on Figure 7.3.

The repository area will be constructed as follows:

(1) A maximum height of 1m of peat will be placed in the Repository.

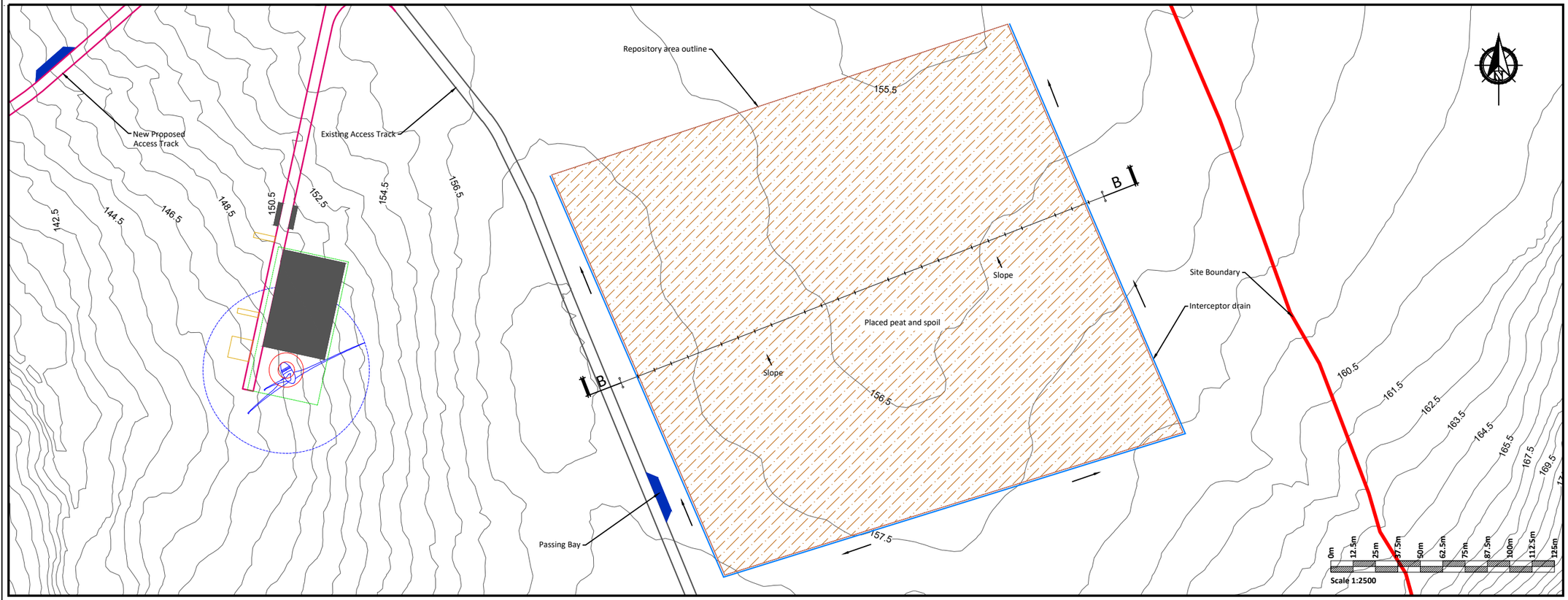
(2) An interceptor drain will be installed around the perimeter of the Repository. The drain will divert any surface water away from the Repository and hence prevent water from ponding in the area.

(3) The surface of the placed peat will be shaped to allow efficient run-off of surface water. Where possible, shaping of the surface of the peat will be carried out as placement of peat within the peat repository progresses. This will reduce the likelihood of debris run-off and ensure stability of the placed peat.

(4) The edge of the stored peat will be shaped at a slope of 1 (v): 5 (h). it is recommended that more intact peat (Acrotelm) is used to form this slope. Where possible, the acrotelm will 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.

(5) Low ground pressure machinery and bog mats will be required to place the peat in the Repository.

(6) Supervision by the Project Geotechnical Engineer is required for the construction of the Repository.



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Construction Notes Repository Areas:

(1) An interceptor drain will also be installed upslope of the repository areas.

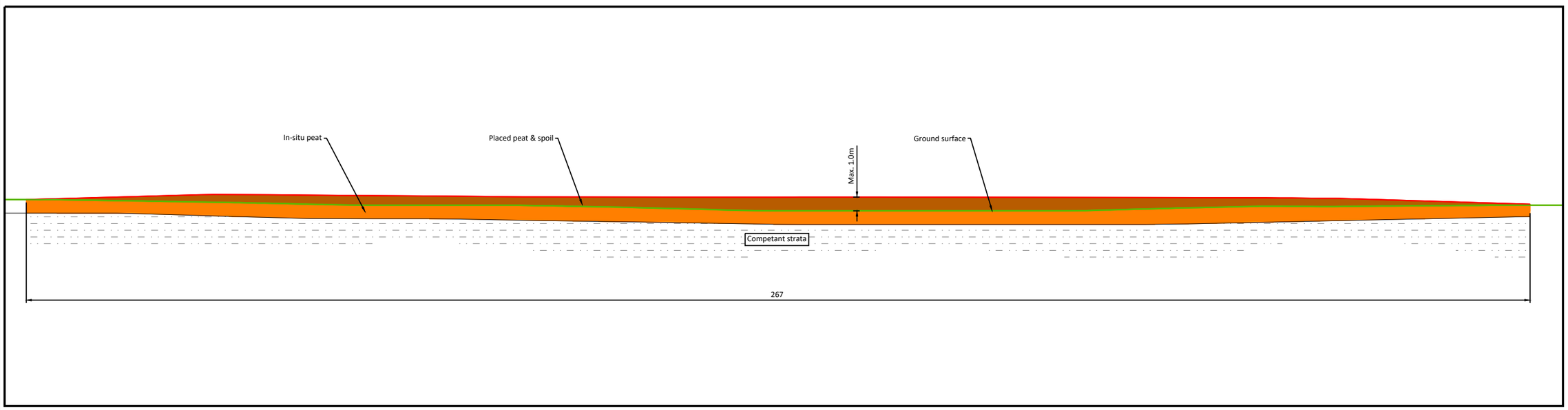
(2) A silting pond will be required at the lower side of the repository areas.

(3) It is important that the surface of the stored spoil be shaped to allow efficient run-off of water from the stored spoil.

(4) Supervision by a geotechnical engineer or appropriately competent person is recommended for the construction of the repository area.

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

(6) Further guidelines on the construction of the repository area are included within Section 7.6 of the Peat & Spoil Management Plan.



Section B - B

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Date - 10.12.21

FIGURE 7.2 - PEAT REPOSITORY - PLAN AND CROSS SECTION DETAILS

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Friday 10 December 2021

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8. 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, temporary construction compounds, 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 spoil overlying the rock.

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, which are covered in .

(1) With respect to placement of arisings from excavations the guidelines given in Section 7 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). Where areas of weaker peat are encountered then slacker slopes will be required.

(3) Excavations will 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.

9. EXCAVATIONS FOR UNDERGROUND CABLES

A connection between the Proposed Development Site and the national electricity grid will be necessary to export electricity. It is proposed that the wind farm will connect to the national grid via an existing substation located in Trillick townland to the west of the proposed wind farm development. The proposed underground cabling route is approximately 8.1km in length and will predominately follow existing 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 metamorphic rocks.

9.1 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 will 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.

10. 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's) for the project take into account, but not be limited only, 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 will be piped over areas specifically assessed as being unsuitable and hence directed into suitable drainage lines See Chapter 4 and 9 of the EIAR.

(2) Avoidance of unstable excavations. All excavations will 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 (>2.5m) (see Section 10).

(5) Site reporting procedures to ensure that working practices are suitable for the encountered ground conditions. Ground conditions to be confirmed by the Project 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 and Project Geotechnical Engineer to include regular assessment of ground stability conditions (e.g. cracking, excessive floating road settlement, disrupted surface, closed-up drains) and drainage conditions (e.g. blocked drains, absence of water in previously flowing drains, springs, etc).

11. INSTRUMENTATION

11.1 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 2m. Details of sighting posts are given below.

(1) A line of sighting posts will 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 will comprise 6 nos. posts at (say) 5m centres that is a line some 25m long.

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

(2) Lines of sighting posts will 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 will be placed down the slope, or at any location where monitoring would be deemed useful.

(3) Each line of sighting posts will be uniquely referenced with each post in the line given a reference. The post reference will 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 will 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 will 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 will be increased.

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

12. CONTINGENCY MEASURES

12.1 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 will be carried out.

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

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

(3) Re-commencement of activities will only start following a cessation of movement and agreement with all parties (Project Geotechnical Engineer, Contractor and Client.

12.2 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 will 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 Project Geotechnical Engineer and stabilisation procedures implemented. The area will be monitored, as appropriate, until such time as movements have ceased.

12.3 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 the borrow pit 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 will be along existing access roads on the wind farm site and/or 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.

13. CUT & 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 & fill assessment is graphically presented in Figure 12-1.

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

- Plan drawings of the entire site showing an outline of cut & fill earthworks at all infrastructure elements (Figure 12-1)
- Cut & fill earthwork volumes based on available ground investigation data (see Table 12-1 of this report)

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

A summary of the cut & fill earthwork volumes is given in Table 12-1.

13.1 Commentary on Earthworks Volumes

It should be noted that the earthwork volumes given in Table 12-1 are indicative and for information purposes only and subject to detailed design following confirmatory ground investigation. This section of the report should be read in conjunction with Sections 7.2 and 7.3 of the report which summarise the peat and spoil volumes for site and the placement/reinstatement areas on site.

In summary the following points are given,

1) The total volume of spoil (peat and non-peat superficial deposits) requiring placement/reinstatement on site is estimated at 487,600m^3. This material will be excavated and placed/reinstated to the borrow pit or placed within the peat and spoil repository area with 10,000m^3 side cast along the proposed entrance access road and 15,000m^3 used for landscaping.

2) An initial ground investigation was undertaken at the borrow pit to define rockhead level, and the estimated quantity of available rock within the borrow pit is 360,000m^3. Conservative assumptions were made in estimating the quantity of rock available in the borrow pits. A confirmatory ground investigation will be undertaken to confirm the assumptions made here

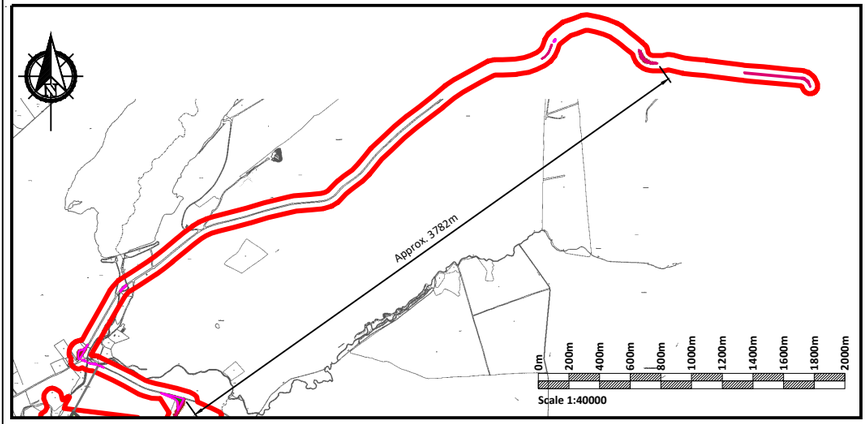
3) Note a number of assumptions were made during the cut & fill assessment, see Appendix B..

Table 13.1: Summary of Cut & Fill Earthworks Volumes

Infrastructure Element	Description	Total Earthwork Volume (1) & (2) – Peat	Earthwork Volume (3) – Estimated non-peat overburden material	Earthwork Volume (4) - Estimated rock volume only	Earthworks Fill Requirements	Comment
		Cut (m^3)	Cut (m^3) (3)	Cut (m^3)	Fill (m^3)	
15 no. Turbines and Hardstands	25m diameter excavation footprint for turbine foundation with 55 x 35m hardstand area	135,000	35,000	-	18,500	Hardstanding area and turbine foundation footprint
Access Roads	5m running surface with 6m wide development footprint	200,000	13,000	-	2,000	Excludes proposed and existing floating sections of access road where no excavation of peat will take place (see Figure 1-1).
Various Infrastructure Locations	Includes substation, 2 no. construction compounds and met mast	45,600	7,000	-		-
Borrow Pit	Borrow Pit	35,000	17,000	370,000	11,500	Estimated potential rock volume from borrow pit is **370,000m^3**. It has been estimated that the total volume of stone required to construct the proposed development will be 370,000m^3, plus that required for the capping layer along roads and at hardstands. The remaining stone will be sourced from existing, fully authorised, off site quarries.
	Total =	**415,600**	**72,000**	**370,000**	**32,000**	

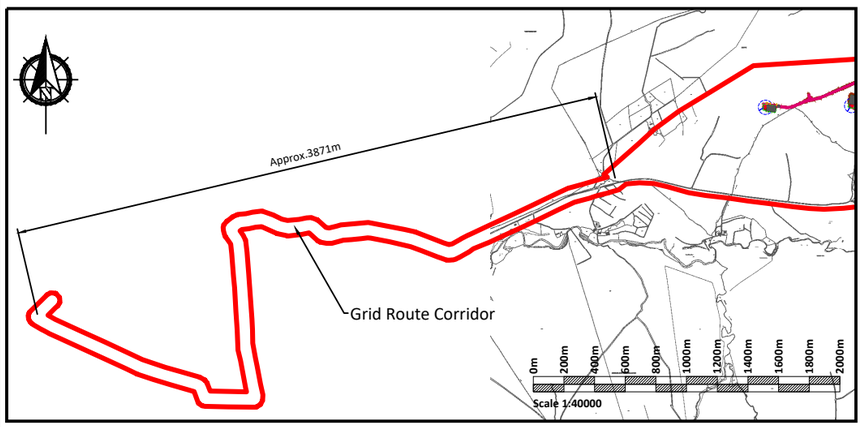
Notes

Note (1) The total earthwork volumes includes peat, non-peat superficial deposits and rock from the borrow pit.
Note (2) The earthwork volumes quoted for the non-peat material were calculated based on the total earthwork volume (peat & non-peat material) minus the peat volumes calculated and presented in Table 7-1 within Section 7.2 of this report.
Note (3) The in-situ rock volume from the borrow pits was estimated based on available ground investigation data to define rockhead level.
Note (4) It should be noted that the earthwork volumes given in Table 12-1 are subject to confirmatory analysis.



TDR AREAS OFFSITE TO THE NORTHEAST OF MAIN ENTRANCE

Scale 1:40000



GRID ROUTE OFFSITE TO THE SOUTHWEST CORNER OF MAIN SITE

Scale 1:40000

If Applicable : Ordnance Survey Ireland Licence No. EN 0001220 © Ordnance Survey Ireland and Government of Ireland

Scale 1:16000

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Cut / Fill Legend:

Areas of Cut

Areas of Fill

Scale (@ A3)
1:16000

Date - 10.12.21

FIGURE 12.1 - PLAN DRAWING OF CUT & FILL EARTHWORKS FOR SITE

Drawn - POR

Checked - IH

Rev - C

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Friday 10 December 2021

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APPENDIX A

Assumptions for Cut & Fill Earthworks Assessment

Assumptions for Cut/Fill Earthwork Assessment

Main Infrastructure Locations

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

Table A1 provides a summary of the dig depths adopted for the cut/fill assessment for the main infrastructure elements at Glenard wind farm.

The assumed excavation footprint for the turbine foundation is the turbine base diameter of 25m plus 1.5m working room all around the base i.e. 28m.

Table A1: 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	644782	931991	1.5	3.0	1.5	1.8
T2	644839	932466	1.6	3.0	1.6	1.9
T3	644684	932840	0.7	3.0	0.7	1.0
T4	644384	933164	2.0	3.0	2.0	2.3
T5	643824	932948	2.1	3.1	2.1	2.4
T6	643953	932577	2.3	3.3	2.3	2.6
T7	644075	932161	0.5	3.0	0.5	0.8
T8	643927	931653	2.0	3.0	2.0	2.3
T9	644356	931516	2.0	3.0	2.0	2.3
T10	643370	931654	2.1	3.1	2.1	2.4
T11	643505	931222	1.9	3.0	1.9	2.2
T12	641736	930910	0.65	3.0	0.65	0.95
T13	642298	930921	2.5	3.5	2.5	2.8
T14	642958	931192	2.2	3.0	2.2	2.5
T15	642589	930617	1.4	3.0	1.4	1.7
Infrastructure Element	**Easting**	**Northing**	**Average Peat Depth (m)**	**Max Dig depth for Infrastructure Element (m) [3] & [4]**		
Substation	643021	930754	1.8	2.1		
Construction Compound 1	644431	933435	2.7	3.0		

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]
Construction Compound 2	643760	931327	0.5	0.8		
Met Mast	643538	930890	1.2	1.5		

Notes

(1) Founding depths for the turbines was assumed to be the average peat depth + 1m to a competent strata. To be confirmed prior to construction following confirmatory 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 and substation the founding depth was assumed to be the average peat depth +0.3m to a competent strata. To be confirmed prior to construction following confirmatory 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 prior to construction following confirmatory 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 & 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 5m in width.
- There are 4 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 as per Figure 3.1. In areas of side long ground/steeper terrain (say greater than 5% gradient), widening of existing tracks will take place on the upslope side of the road as per Figure 3.1. Assumed dig depth to competent strata for both cases is 0.3m below the base of the peat.

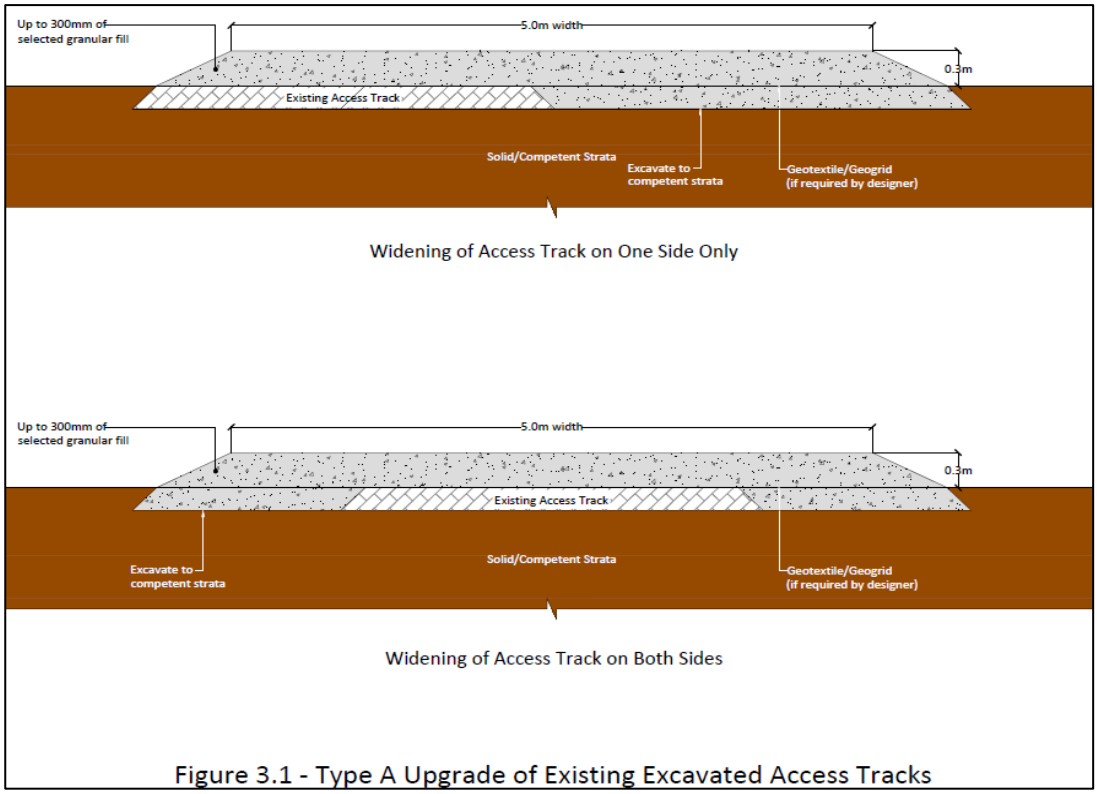

Figure 3.1 - Type A Upgrade of Existing Excavated Access Tracks

- Existing floating type access tracks – minimal/no excavation will be required
- New proposed floating access roads - no excavation will be required
- New proposed excavate and replace type access roads – excavation work will be required. Assumed dig depth to competent strata was 0.3m below the base of the peat

Borrow Pits

The cut/fill assessment for the borrow pit is based on the cross-section drawing (Figure 7-1) included in this report. The borrow pit was 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 & fill earthworks assessment, except for excavations in rock at the borrow pit 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 guidance, such as BS6031 (Code of Practice for Earthworks).

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