FEHILY TIMONEY

CONSULTANTS IN ENGINEERING,
ENVIRONMENTAL SCIENCE & PLANNING

PEAT & SPOIL MANAGEMENT PLAN

PROPOSED SUBSTATION, UNDERGROUND CABLING & ACCESS ROADS TO KNOCKNAMORK RENEWABLE ENERGY DEVELOPMENT

Prepared for: **MKO Ltd**

Date: **July 2022**

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PEAT AND SPOIL MANAGEMENT PLAN

PROPOSED SUBSTATION, UNDERGROUND CABLING & ACCESS ROADS TO KNOCKNAMORK RENEWABLE ENERGY DEVELOPMENT

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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 the proposed substation, underground cabling and access roads to the Knocknamork Renewable Energy Development. The purpose of this report is to provide a Peat and Spoil Management Plan for the construction phase of the Proposed Development. The report describes how peat and spoil which will be excavated from infrastructure locations such as the substation platform and access 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 Proposed Development site and proposed peat and spoil placement/reinstatement areas which will be developed at the Proposed Development 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.95 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 in March 2021 by McCarthy Keville O'Sullivan on behalf of Knocknamork Ltd. to compile a Peat and Spoil Management Plan for the proposed substation, underground cabling and access roads to the Knocknamork Renewable Energy Development (the "Proposed Development").

The Proposed Development site is located approximately 3km northwest of Ballyvourvey, Co. Cork.

The site is located on the border between Co. Cork and Co. Kerry. The surrounding landscape is hilly with land-use comprising forestry and poor quality agricultural land.

The Proposed Development is described in detail 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 Proposed Development.

This peat and spoil management plan also includes a monitoring programme which will be implemented during the construction phase of the Proposed Development 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 the relevant chapter of 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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Legend:

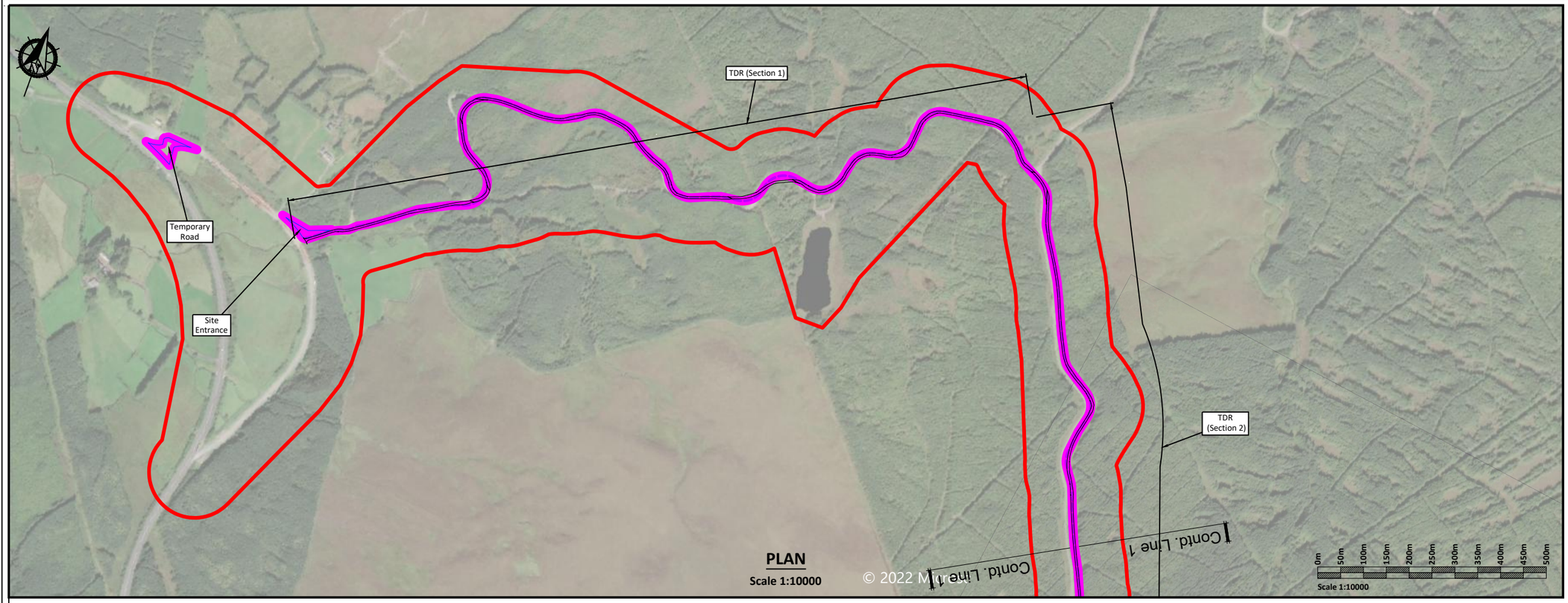
- EIAR Planning Boundary
- Proposed Access Track
- Turbine Delivery Route (TDR)
- Underground Cabling 33kV
- Underground Cabling 110 kV
- 33kV Underground Cabling in Permitted Development
- Permitted Development

Road Type Legend:

Type A - Upgrade of Existing Excavated Access Tracks

Type B - New Excavate & Replace Access Road

Type C - New Excavate & Replace Road Alongside Existing Access Road



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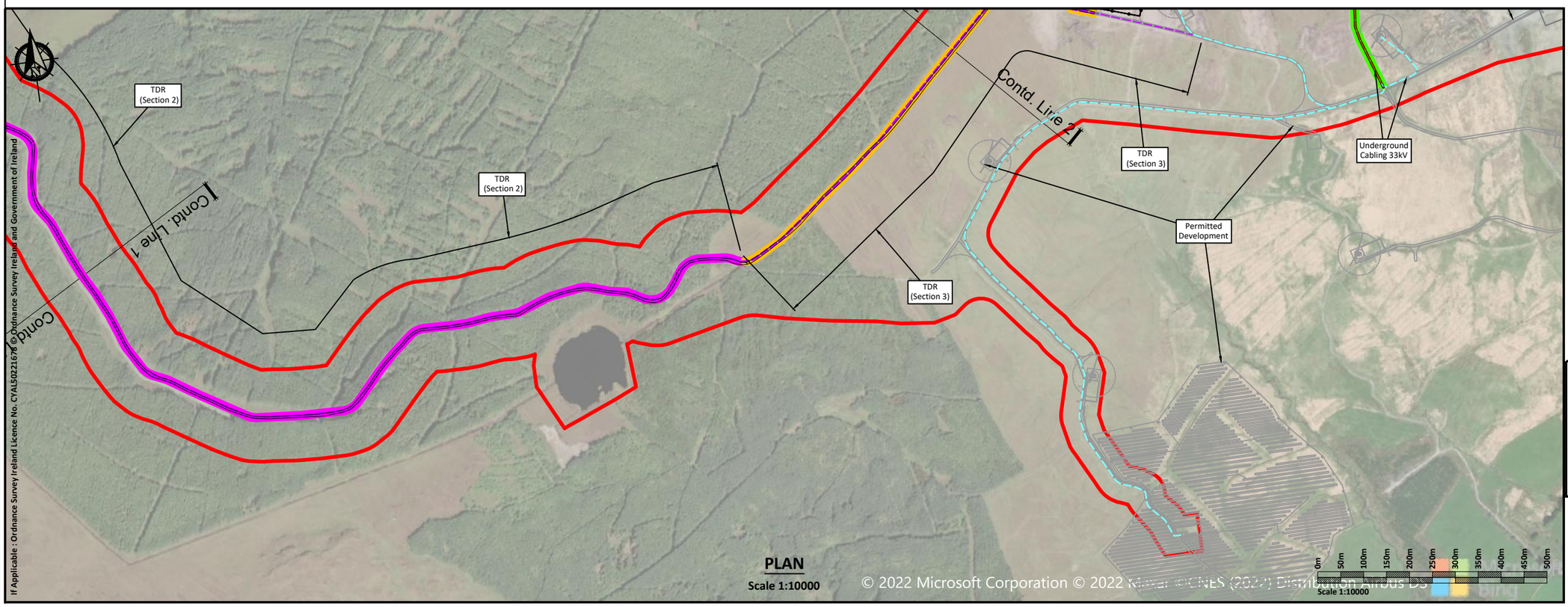

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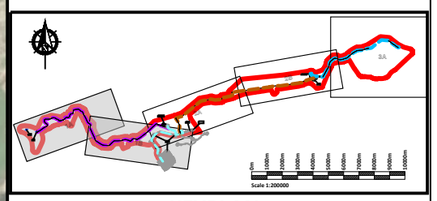

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ROAD CONSTRUCTION TYPES PLAN SHEET 1 OF 3

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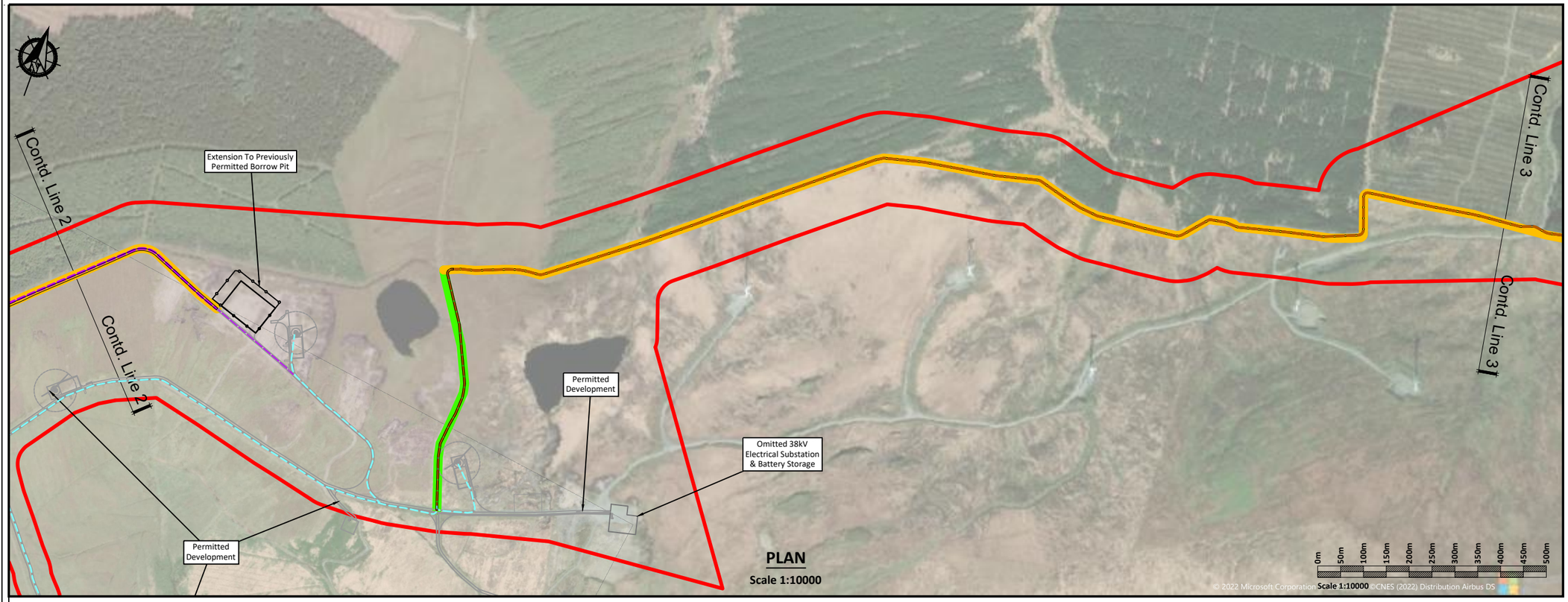

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Legend:

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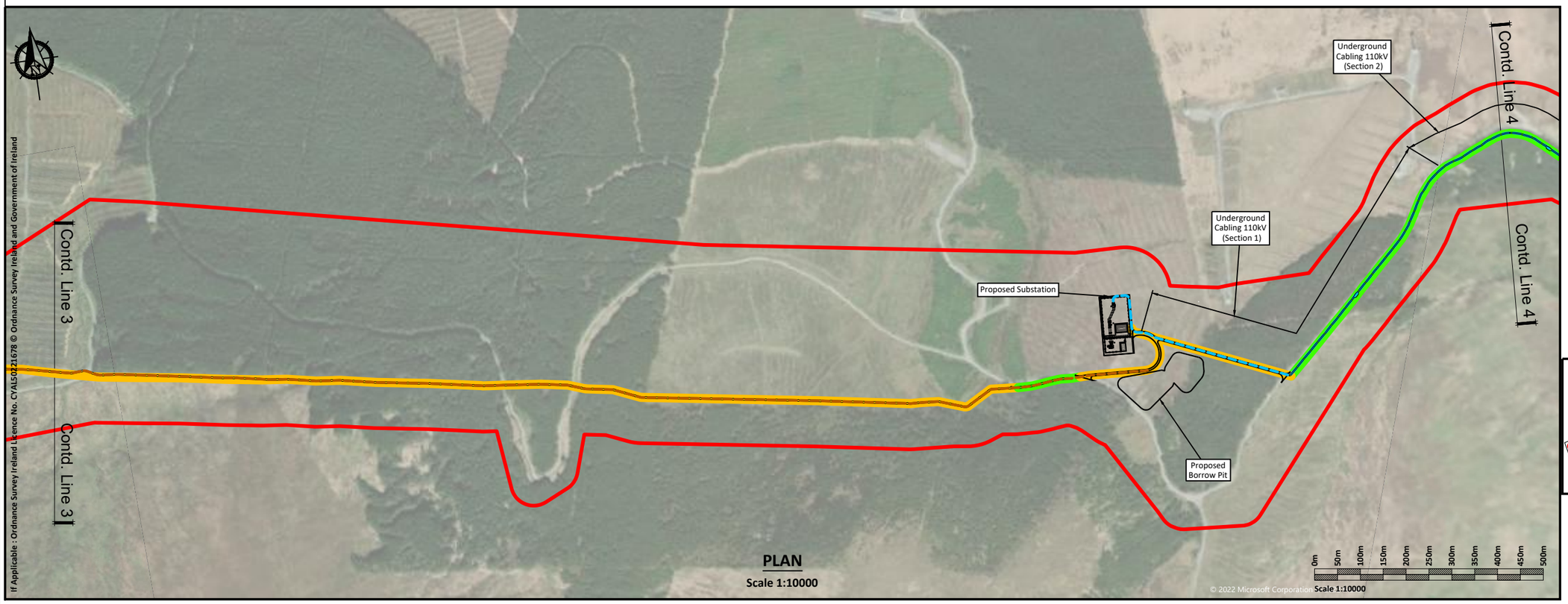
Road Type Legend:

Type A -
Upgrade of Existing Excavated Access Tracks

Type B -
New Excavate & Replace Access Road

Type C -
New Excavate & Replace Road Alongside Existing Access Road



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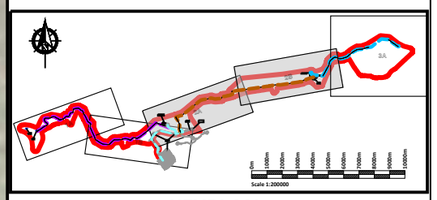

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ROAD CONSTRUCTION TYPES PLAN SHEET 2 OF 3

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Underground Cabling 110kV (Section 2)

Underground Cabling 110kV (Section 3)

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Contd. Line 4

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0m 50m 100m 150m 200m 250m 300m 350m 400m 450m 500m
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Legend:

- EIAR Planning Boundary
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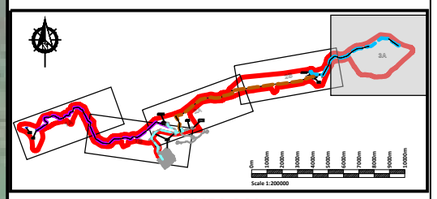
Road Type Legend:

Type A -
Upgrade of Existing
Excavated Access Tracks

Type B -
New Excavate &
Replace Access Road

Type C -
New Excavate & Replace
Road Alongside Existing
Access Road



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ROAD CONSTRUCTION TYPES PLAN SHEET 3 OF 3

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2. CONSTRUCTION ACTIVITIES COVERED BY PEAT AND SPOIL MANAGEMENT PLAN

2.1 Construction Activities

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

(1) Upgrade of existing access roads (excavate and replace roads)
(2) Construction of new excavated roads through peat
(3) Excavation and placement of arisings
(4) Stripping of peat and overburden for borrow pits
(5) Excavations in peat for substation platform
(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 Proposed Development site and to connect the associated infrastructure existing roads will need to be upgraded and new access roads will need to be constructed. The road construction preliminary design 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 Proposed Development 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.

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	Typically, less than 1m, locally up to 3.25m	Varies	Upgrade existing excavated access roads along the TDR 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 3.0m	Varies	New access road construction technique envisaged for various locations on site – Figure 1-1
Construction of new excavated road alongside existing road	Type C	Typically, less than 1.5m	Varies	New access road construction technique envisaged along 33kV and 110kV underground cabling – Figure 1-1

Further details on access road construction types A to C are given in Sections 3 and 4 of this report.

3. UPGRADE OF EXISTING ACCESS ROADS – TYPE A AND TYPE C

Up to 6km of existing access roads requiring upgrade are present across the Proposed Development site and have been in operation for a number of years. The existing access roads were constructed using the excavate and replace construction technique. 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 and Figure 3-2.

3.1 Upgrading Existing Access Roads 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 design/planning conditions.

(2) For upgrading of existing excavated access roads (Type A - Figure 3-1) and construction of excavated road alongside existing roads (Type C – Figure 3-3) the following guidelines apply:

  (a) Excavation of the widened section of access road should take place to a competent stratum beneath the peat (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) Access roads to be finished with a layer of capping across the full width of the road

  (d) 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).

  (e) 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. Should areas of weaker peat be encountered then slacker slopes (1v:4h) will be required to ensure stability.

(3) The finished road width will have a running width of 5m (TDR), with wider sections on bends and corners. The finished width on the sections of excavated road alongside existing roads along the 110kV underground cabling will be 2.5m and along the 33kV underground cabling will be 3m.

(4) On side long sloping ground any road widening works required will be done on the upslope side of the existing access road, where possible.

should be located on the upstream side of the road surface.

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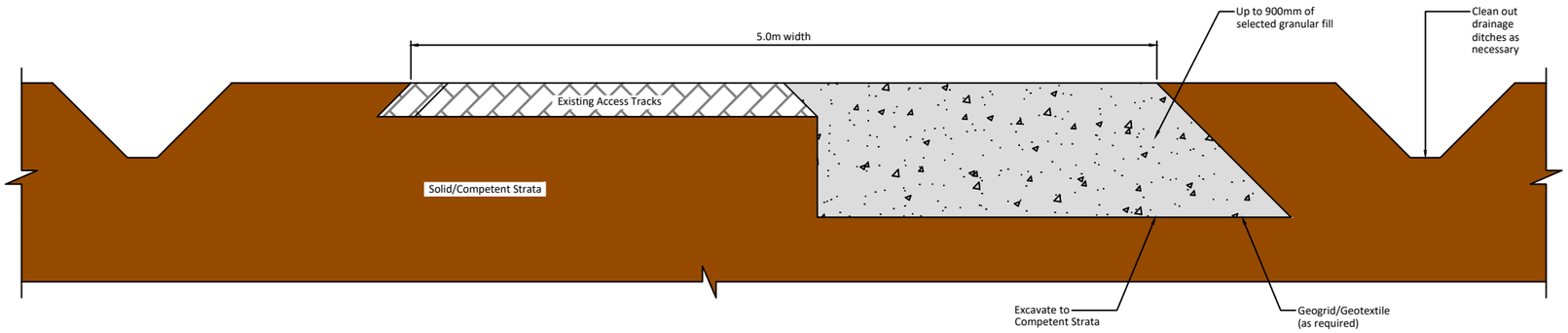

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TYPE A - UPGRADE OF EXISTING ACCESS TRACKS

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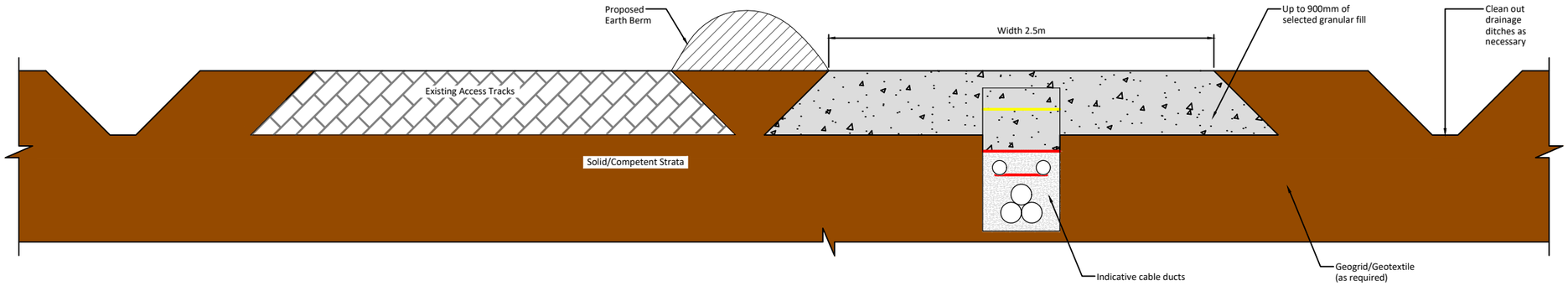
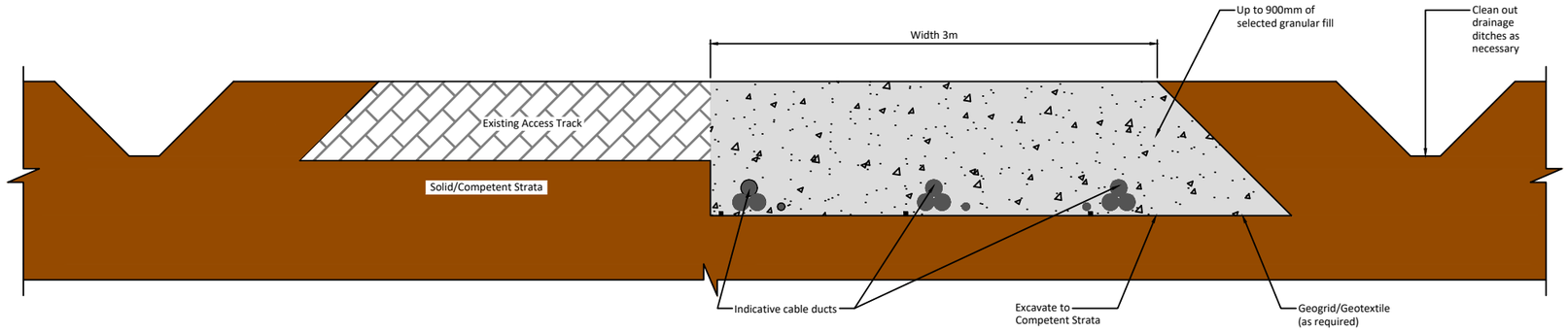


110 kV underground cabling route



33kV underground cabling route.

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TYPE C - NEW ROAD ALONGSIDE EXISTING ROAD/UPGRADE OF EXISTING ROAD

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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 Proposed Development 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, which are discussed in 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 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 to the line and level given in the design requirements. 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 temporarily stored in localised areas adjacent to excavations for roads before being placed into the permanent peat storage areas within the borrow pits or reused for landscaping purposes. All temporary storage areas will be upslope of founded roads and will be inspected by a suitably qualified person before material is stored in the area.

(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 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, unless required for landscaping purposes, such as along the 33kV cable route.

(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 1200mm of selected granular fill, depending on the section of road. 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) A final surface layer shall be placed over the excavated road and graded to accommodate construction and delivery traffic.

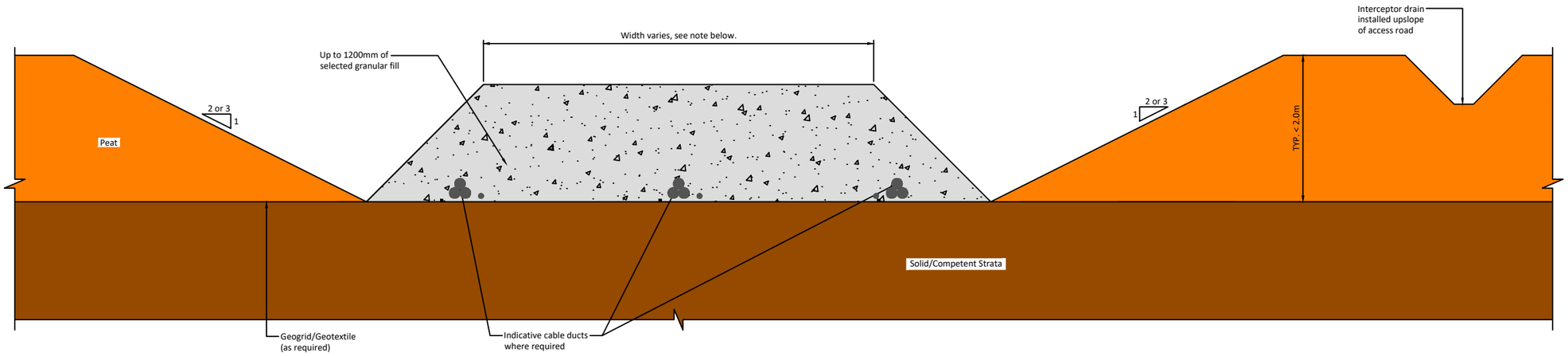
The following general construction guidelines are given for the access roads on site.

(1) 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.

(2) Temporary excavations should be excavated in short lengths and backfilled as soon as practicable.

(3) 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 adjacent peat, is limited.

(4) It is recommended that the construction and upgrading of access roads in areas of deep peat (greater than 2m) is inspected on a routine basis during the works, particularly before/following trafficking by heavy vehicular loads.



Note -
TDR route - width 5m, no underground cabling.
33kV underground cabling route - width 3m.
110 kV underground cabling route - width 2.5m

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TYPE B - NEW EXCAVATE AND REPLACE ACCESS ROAD

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5. EXCAVATION AND STORAGE OF PEAT AND SPOIL

5.1 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 not required for landscaping shall be transported immediately on excavation to either the substation borrow pit or already permitted borrow pit (see Figure 1-1).

(2) Further details on the construction and reinstatement of the substation borrow pit are given in Section 5.4.

(3) Further details on the placement of excavated material to designated temporary peat storage areas alongside the access roads are given in Section 5.5.

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

5.2 Summary of Peat and Spoil Volumes on Site

A summary of the excavated peat and spoil volumes calculated for the Proposed Development site are given in Table 5-1.

Table 5.1: 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)	Comment
Turbine Delivery Route (TDR) plus Site Entrance works	Widening of existing access road to 5m running surface. Construction of new 5m access road. Widening of existing entrance and construction of temporary track from N22.	17,000	2,200	Material to be stored in Permitted Borrow Pit (Increased in size to cater for TDR upgrade).
Access Road for 33kV cabling	Assumed 3m (33kV) and 2.5m (110kV) running surface with 4-5m wide development footprint.	18,000	6,000	Peat on 33kV cable route to be locally sidecast temporarily and used for landscaping once works are complete.
Access Road for 110kV cabling		10,500	2,500	Peat and spoil to be stored in borrow pit adjacent to substation.
Substation Platform	130 x 65m hardstanding area.	19,000	12,000	Peat and spoil to be stored in borrow pit adjacent to substation.
Proposed Borrow Pit	1 no. borrow pit at substation.	3,500	4,800	Excavation of borrow pit will managed to temporarily store overburden within the BP footprint until rock is extracted
Extension to Permitted Borrow Pit	120m x 85m footprint	1,000	2,000	
	Total =	**69,000m^3**	**29,500m^3**	**Total =98,500m^3 (peat and spoil volume) (3)**

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

Note (2) A bulking factor of 10% 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) It should be noted that the excavated rock volume is not included in the total volume quoted above in Table 5-1, see the assessment in Section 11 of this report for further details. It is assumed that the excavated rock volume will be re-used on site as part of the construction works for the development and hence will not require reinstatement on site.

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

A summary of the potential peat and spoil placement/reinstatement areas at the Proposed Development site are given in Table 5-2.

Table 5.2: Summary of Peat and Spoil Placement/Reinstatement Areas on Site

Location (1)	Peat and Spoil Volume (m^3)	Comment
Proposed Borrow Pit	55,000	See Figure 6.1 for further details
Extension to already Permitted Borrow Pit	29,000	Will require a 2m berm along the low side of the permitted borrow pit and an increase in the plan area of the borrow pit. Quoted volume is additional to material to be stored from the already permitted development.
Landscaping (2)	19,000	Peat excavated along the 33kV underground cabling will be locally sidecast for reuse as landscaping following completion of the works. Approximately 1,000m^3 will also be used in the 110kV trench backfill.
Total =	**103,000m^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.

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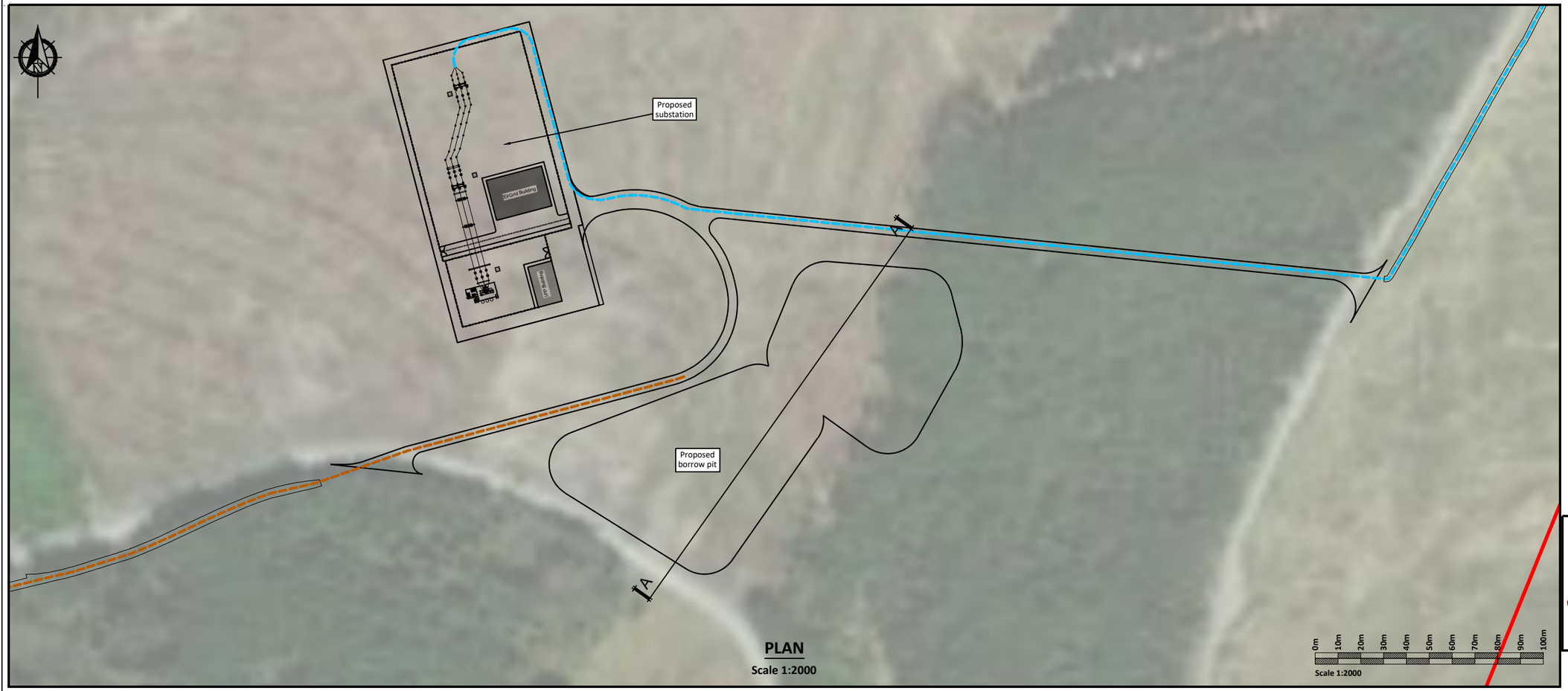

PLAN
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Legend:

- EIAR Planning Boundary
- Proposed Access Track
- Turbine Delivery Route (TDR)
- Underground Cabling 33kV
- Underground Cabling 110 kV
- 33kV Underground Cabling in Permitted Development
- Permitted Development

Borrow Pit Construction Notes:

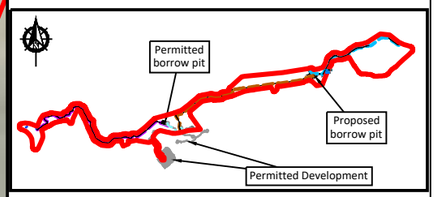
(1) In-situ rock slope formed at stable inclinations to suit local rock conditions.

(2) Localised deepening of quarry floor to suit extraction operations, as required.

(3) The thickness of overburden was based on the trial pits carried out within the footprint of the borrow pit.

(4) Further guidelines on the construction of the borrow areas is included within the Peat Management Plan.

(5) The design of borrow pit shown on this layout in the form of the plan and section has been carried out by Ionic and is shown for schematic purpose.



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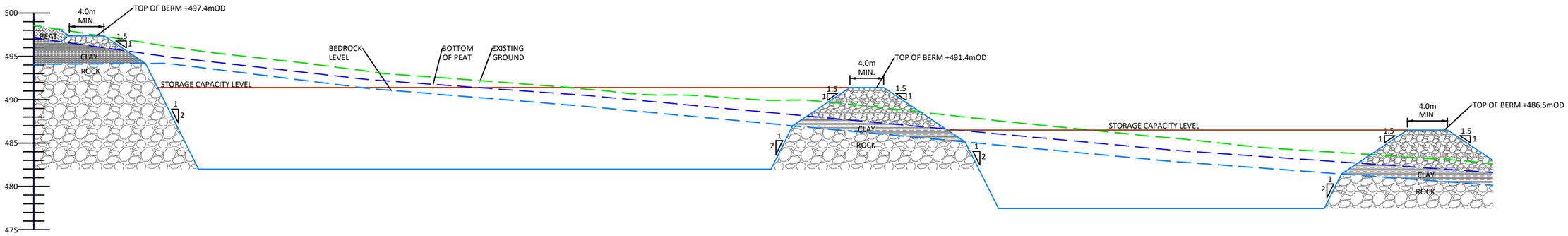

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BORROW PIT DESIGN

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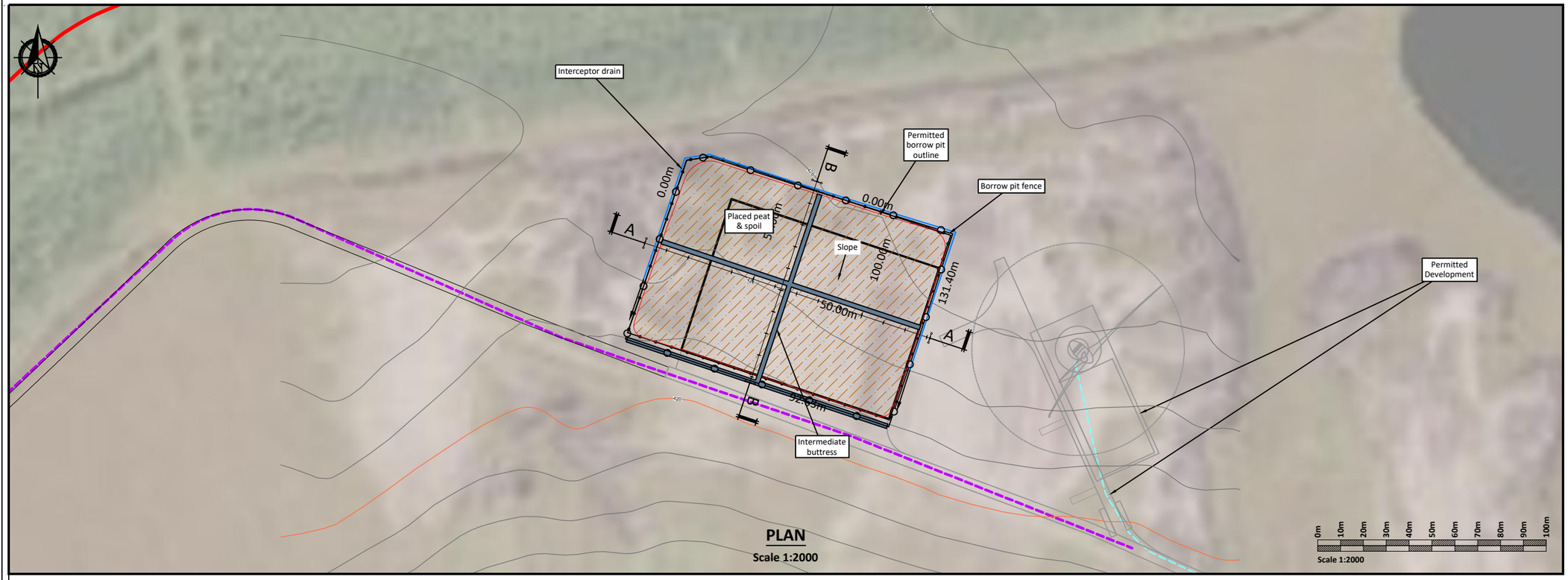
Thursday 14 July 2022



PLAN

Scale 1:2000

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Legend:

- EIAR Planning Boundary
- Proposed Access Track
- Turbine Delivery Route (TDR)
- Underground Cabling 33kV
- Underground Cabling 110 kV
- 33kV Underground Cabling in Permitted Development
- Permitted Development

Construction Notes Repository Areas:

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

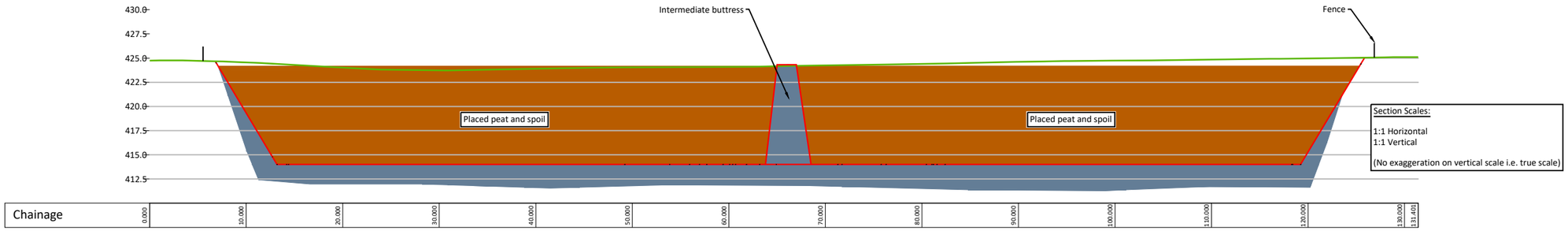
(2) A silting pond will be required at the lower side of the repository areas.

(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 should 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 A-A

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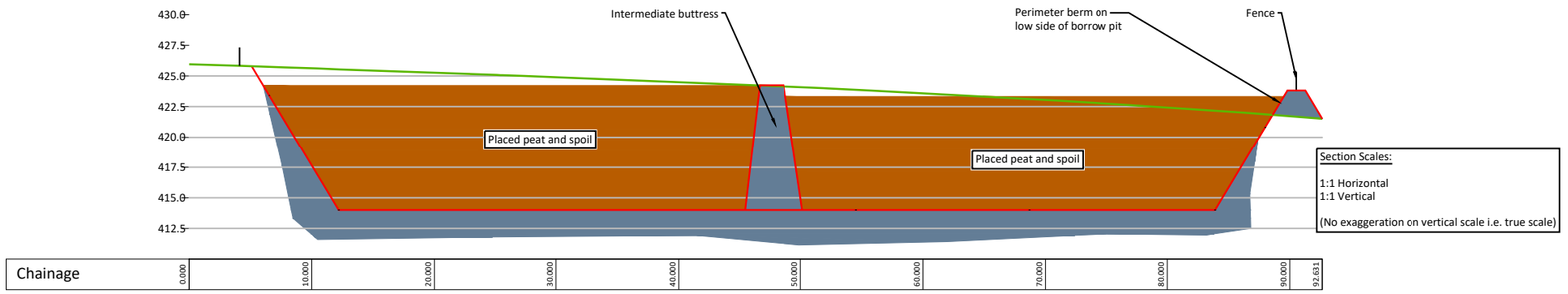
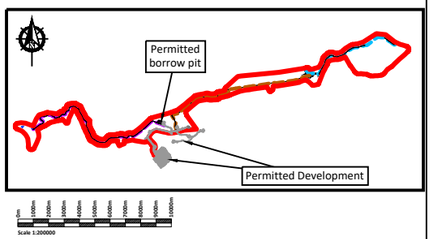


SECTION B-B

Scale 1:500



KEYPLAN

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Date - 13.07.22

EXTENSION TO PERMITTED BORROW PIT

Drawn - POR

Checked - IH

Rev - C

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Thursday 14 July 2022

5.4 Guidelines for the Construction and Reinstatement of Borrow Pits

It is proposed to develop a borrow pit adjacent to the proposed substation location as well as extending the permitted borrow pit associated with the Renewable Energy Development. These locations are shown on Figure 1-1. The average peat depth within the development footprint of the borrow pits is less than 1.0m.

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 (roads, etc.) associated with the Proposed Development. 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. It also eliminates the need to construct above ground retaining structures which increase the development footprint of the Proposed Development. The text below provides design and construction guidelines for the borrow pits.

Figures 5-1 to 5-2 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) The borrow pit will be stripped and opened in stages. Any peat/spoil stripped from the area initially opened within the borrow pit will be temporarily stockpiled within the remaining footprint of the borrow pit. This material will be placed and sealed to prevent water ingress and shaped to allow for surface water to run off. If required, a berm will be placed on the downslope side of this stockpiled material to retain the material. Any berm will be founded on competent material below the peat.

(3) 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.

(4) 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.

(5) 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.

(6) 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.

(7) 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.

(8) 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.

(9) 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.

(10) 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. 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.

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

(13) Where possible, the surface of the placed peat and spoil should 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. 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) Silting ponds 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.

5.5 Designated Spoil Placement Areas alongside Infrastructure Elements

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

(1) All excavated peat along the proposed 33kV underground cabling route will be temporarily placed/spread alongside the proposed access road, where possible, and then reused as landscaping on either side of the proposed road.

(2) The placement of excavated peat should be restricted to areas where the peat depth is less than 2m.

(3) The peat placed adjacent to the proposed infrastructure elements should be restricted to a maximum height of 1m over a up to 10m wide corridor on the upslope side of the proposed infrastructure elements. It should be noted that the designer should define/confirm the maximum restricted height for the placed peat and spoil.

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

(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) Where practical, it should be ensured that the surface of the placed peat and spoil is shaped to allow efficient run-off of surface water. Where possible, 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 or 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 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) 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.

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

(11) 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.

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

6. EXCAVATIONS IN PEAT FOR SUBSTATION PLATFORM

The works require that the substation platform be founded on competent founding strata which will require excavation through peat and possibly overburden. Excavations for the substation borrow pit will also require the removal of peat and non-peat spoil overlying the rock.

6.1 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 discussed in the CEMP.

(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.

7. EXCAVATIONS FOR UNDERGROUND CABLES

The proposed underground cabling methodologies, including proposals for water crossings on the underground cabling routes are described in the EIAR.

The underground cables will be placed at a uniform level at the base of the excavation for the access roads.

The cable trench route is envisaged to encounter peat and till derived from Devonian sandstones.

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) The proposed underground cabling will be built within the proposed access roads, typically at the base of the peat. A short section of the 110kV underground cabling across an area of peatland will be installed in a trench in the overburden below the peat, using low ground bearing pressure machinery without the construction of an access road.

(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.

8. 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 the Proposed Development by Contractor to include an 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).

9. INSTRUMENTATION

9.1 Movement Monitoring Posts

To monitor possible peat movements, it is proposed to install sighting posts upslope and downslope of the access roads at staggered intervals at locations where the peat depth is greater than 2.0m. Additional monitoring locations may be required at 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 would be 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.

10. CONTINGENCY MEASURES

10.1 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.

10.2 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.

10.3 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.

11. 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 substation platform.

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

- Plan drawings of the substation platform showing an outline of cut & fill earthworks (Figure 11-1)
- Preliminary cut & fill earthwork volumes (see Table 5-1 of this report)

11.1 Commentary on Earthworks Volumes

It should be noted that the earthwork volumes given in Table 11-1 are indicative and for information purposes only. This section of the report should be read in conjunction with Sections 5.2 and 5.3 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) A total of 98,500m^3 of peat and spoil will be generated during the construction of the proposed development. This material will be excavated and placed/reinstated to the borrow pits (substation and main site), with 18,000m^3 of peat temporarily side cast and reused for landscaping along the 33kV connection.

2) A total of 79,500m^3 of stone is required to construct the access roads and substation hardstand across the Proposed Development.

3) Based on the available ground investigation information the estimated quantity of available rock within the substation borrow pit is 41,500m^3. A further 20,000m^3 of rock will be available from the excavation for the substation platform. Additional rock (a further 18,000m^3) will be provided from an expansion of the already permitted borrow pit that is part of the Renewable Energy Development. Conservative assumptions were made in estimating the quantity of rock available in the borrow pits.

4) A bulking factor of 10% has been applied to all peat and spoil excavation volumes to allow for expected bulking upon excavation.

Table 11.1: Summary of Required Stone Volumes

Infrastructure Element	Description	Stone Volume (m^3)	Comment
Substation Platform	130 x 65m hardstand area	16,500	Material sourced from within cutting at platform location.
Access Roads (TDR and cable routes)	Assumed up to 2.5m (110kV), 3m (33kV) and 5m (TDR) running surface with 5-7m wide development footprint	59,000	Material sourced from permitted borrow pit (for the TDR) and substation borrow pit (33kV and 110kV underground cabling routes)
Borrow Pits	Borrow Pit	4,000	Borrow pit perimeter berms
	Total =	**79,500**	

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