APPENDIX 4

PEAT AND SPOIL MANAGEMENT PLAN

FEHILY TIMONEY

DESIGNING AND DELIVERING
A SUSTAINABLE FUTURE

CRUMHACH WIND FARM

PEAT AND SPOIL MANAGEMENT PLAN

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PEAT AND SPOIL MANAGEMENT PLAN
CRUMHACH WIND FARM

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

TABLE OF CONTENTS

DRAWINGS

LIST OF APPENDICES

LIST OF TABLES

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.100 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.

This Report was written by Ian Higgins (FT Technical Director, PGeo, MSc in Geotechnical Engineering). Ian is a Technical Director with Fehily Timoney and has over 25 years' experience in geotechnical engineering.

1.2 Project Description

Fehily Timoney and Company (FT) was engaged in March 2024 by MKO to compile a Peat and Spoil Management Plan for Crumhach Wind Farm (the 'Proposed Project').

Where the 'Proposed Project' is referred to this encompasses the entirety of the project for the purposes of this EIA in accordance with the EIA Directive. The Proposed Project is described in detail in Chapter 4 of the EIAR.

Where 'the Site' is referred to, this relates to the primary study area for the EIAR, as delineated by the EIAR Site Boundary and encompasses an area of approx. 1546ha.

Where the 'Proposed Wind Farm' is referred to, this refers to turbines and associated foundations and hard-standing areas, access tracks, temporary construction compounds, onsite 110kV substation, internal underground cabling, onsite LiDAR compounds, peat and spoil management, site drainage, biodiversity enhancement, turbine delivery route (TDR) accommodation works and all ancillary works and apparatus. The Proposed Wind Farm is described in detail in Chapter 4 of the EIAR.

The 'Proposed Turbines' refers to the 17 no. turbines associated with the Proposed Wind Farm as outlined above.

Where the 'Proposed Grid Connection Route' is referred to this encompasses the 110kV underground cabling connecting the proposed onsite 110kV substation to the existing Srananagh 220kV substation, and all ancillary works and apparatus.

The Proposed Project is located on the northwest slopes of the Ox Mountains, located approx. 4.5km south of the village of Dromore West, and approx. 3km southwest of the village of Templeboy in Co. Sligo, at their nearest points.

The Proposed Wind Farm comprises open blanket peatland and commercial forestry underlain by blanket peat with a mainly man-made drainage network.

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 Project.

This peat and spoil management plan also includes a monitoring programme which will be implemented during the construction phase of the wind farm and a contingency plan should peat instability/failure occur at the Site.

As for all construction projects, a detailed engineering construction design will be carried out by the appointed construction stage designer prior to any construction work commencing on the Site. This will take account of the consented project details and any conditions imposed by that consent. This will 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 implemented in full and updated (if required to comply with any planning conditions or requirements of the planning authority) in the Construction & Environmental Management Plan (CEMP) for the construction phase.

This Peat and Spoil Management Plan (PSMP) 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 track, creep movement, or localised erosion type events.

Adherence to the PSMP will reasonably minimise the potential for all such peat movements during construction works. 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.

1.5 Ground Conditions

Ground conditions across the Site are described in the Geotechnical & Peat Stability Assessment Report (FT, 2026).

Ground investigations, in the form of trial pits, were carried out at the Site by Irish Drilling Limited (IDL) under the supervision of FT between 15th and 23rd July 2025.

The ground investigation by IDL comprised 19 no. trial pits and laboratory testing. The trial pits were carried out at various locations across the Site to provide information on the ground conditions, and to investigate the potential to develop borrow pits within the Site.

1.6 Relevant Guidance

The relevant guidance used and referred to throughout this report includes;

- Good Practice during Windfarm Construction (NatureScot, 2024);
- Guidance on Developments on Peatland: Site Surveys (Scottish Government, Scottish Natural Heritage and SEPA, 2017);
- Munro, R, 2004. Dealing with bearing capacity problems on low volume tracks constructed on peat. Roadex II Northern Periphery;
- Scottish Natural Heritage/Forestry Commission Scotland, 2010. Floating Roads on Peat;
- Scottish Natural Heritage, 2015. Constructed Tracks in the Scottish Uplands. Scottish Natural Heritage.

2. CONSTRUCTION ACTIVITIES COVERED BY PEAT AND SPOIL MANAGEMENT PLAN

2.1 Construction Activities

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

(1) Upgrade of existing access tracks (excavate and replace, and floating tracks) including temporary widening of local road to facilitate delivery of turbine components

(2) Construction of new excavated tracks through peat

(3) Construction of floating tracks over peat (will not generate peat and spoil but the methodology for construction is included for completeness)

(4) Excavation and placement of arisings

(5) Excavations in peat for turbine bases, hardstands and 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 Track 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 tracks will need to be constructed. The track construction design has taken into account the following key factors:

(1) Buildability considerations

(2) Maximising use of existing infrastructure

(3) Minimising excavation arisings

(4) Peat Stability

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

(6) Requirement to minimise disruption to peat hydrology

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

The proposed track construction techniques to be considered are given in Table 2.1.

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

construction commencing on Site. These measures are based on available guidance, including 'Constructed Tracks in the Scottish Uplands (Scottish Natural Heritage, 2nd Edition ,2015), Floating Roads on Peat (Scottish Natural Heritage/Forestry Commission Scotland, 2010) and 'Dealing with Bearing Capacity Problems on Low Volume Roads Constructed on Peat (ROADEX II, 2004).

Table 2.1: General Track Construction Techniques

Construction Method		Site Conditions			Comment
	Construction Type	Peat Depth (m)	Length (km)	Slope Inclination (°)	
Upgrade of existing founded access tracks	Type A	-	6.85	Varies	Upgrade existing excavated access tracks to the required width and finished with a layer of selected granular fill – Drawing P23-240-0600-0011
Upgrade of existing floating access tracks	Type B	>2.0	1.35	<3	Upgrade existing floating access tracks to the required width and finished with a layer of selected granular fill – Drawing P23-240-0600-0012
Construction of new excavated tracks through peat	Type C	Normally proposed where less than 1.5m, locally up to 3.0m	4.82	Varies	New access track construction technique envisaged for various locations on site – Drawing P23-240-0600-0013
Construction of new floating tracks over peat	Type D	>2.0	0.28	<3	New access track construction technique envisaged for various locations on site – Drawing P23-240-0600-0014

Further details on access track construction types A to D are given in Sections 3 to 5 of this report.

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

Up to 8.2km of existing access tracks requiring upgrade are present across the Site and have been in operation for a significant number of years. The existing access tracks were constructed using both floating and excavate and replace construction techniques. Based on the site walkover carried out by FT the existing access tracks were noted as being in relatively good condition within the Existing Wind Farm. Upgrade works will involve both widening and resurfacing of the existing access track. The proposed locations for upgrade of the existing access tracks on site are shown in Drawing P23-240-0600-0009 and 0010 and details are shown in Drawing P23-240-0600-0011.

3.1 Upgrading Existing Access Tracks Construction Methodology

This methodology includes procedures that will be included in the construction methodology 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 assessed in Chapter 4 and 9 of the EIAR.

(1) Access track construction will be to the line and level requirements as per design.

(2) For upgrading of existing excavated access tracks (Type A - Drawing P23-240-0600-0011) the following guidelines will be implemented in full:

  (a) Excavation of the widened section of access track 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 track and the widened section of access track where the depth of excavation required exceeds 500mm.

  (c) The surface of the existing access track will be overlaid with up to 150mm of selected granular fill.

  (d) Access tracks will be finished with a layer of capping across the full width of the track.

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

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

  (g) A section of upgraded road runs adjacent to Borrow Pit 1. At this location a 1m high safety berm will be constructed between the road and the borrow pit excavation.

(3) For upgrading of existing access tracks constructed using a floated construction technique (Type B – Drawing P23-240-0600-0012) the following will apply:

  (a) Prior to commencing floating track construction movement monitoring posts will be installed in areas where the peat depth is greater than 2m.

  (b) Construction of track will be in accordance with appropriate design from the designer.

  (c) The surface of the existing access track should be graded/tidied up prior to the placement any geogrid/geotextile, where necessary (to prevent damaging the geogrid/geotextile).

  (d) Where granular fill has been used in the existing access track make-up, a layer of geogrid should be placed on top of the existing access track, extending to the full width of the proposed track.

(e) The geogrid will be overlaid with an average of 500mm of selected granular fill on the widened sections of the floating access track.

(f) 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 (to be confirmed by the designer).

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

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

(i) Following the detailed design of the floated access tracks it may be deemed necessary to include pressure berms either side of the access track 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 track will reduce the likelihood of potential bearing failures beneath the access track.

(j) Following end-tipping suitable machinery will be employed to spread and place the tipped stone over the base geogrid along the line of the track.

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

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

(6) A final surface layer shall be placed over the existing access track, as per design requirements, to provide a track profile and graded to accommodate wind turbine construction and delivery traffic.

(7) At transitions between new floating and existing excavated tracks a length of about 10 to 20m will have all peat excavated and replaced with suitable fill. The surface of this fill will be graded to accommodate wind turbine construction and delivery traffic.

(8) The construction of access tracks in areas of deep peat (greater than 2m) will be inspected on a routine basis (by the Site Manager/Ecological Clerk of Works/Project Geotechnical Engineer) during the works, particularly before/following trafficking by heavy vehicular loads.

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

The excavation of peat and spoil and founding of access tracks on competent stratum below the base of peat for new access tracks will be carried out at various locations on the Site. The proposed locations for new excavated access tracks on the Site are shown in drawing P23-240-0600-0009 and 0010 and details are shown in drawing P23-240-0600-0013.

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

4.1 Excavated Track Construction Methodology

This methodology includes procedures that will 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 assessed in Chapter 4 and 9 of the EIAR.

(1) Prior to commencing the construction of the excavated tracks, movement monitoring posts will be installed in areas where the peat depth is greater than 2.0m, and in areas identified within the peat stability risk assessment (see Geotechnical & Peat Stability Assessment, FT, 2026) as requiring monitoring.

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

(3) Excavation of tracks will be to the line and level given in the design requirements. Excavation will take place to a competent stratum beneath the peat.

(4) Track construction will be carried out in sections of approximately 20m lengths i.e. no more than 20m of access track will be excavated without replacement with stone fill. This length will be reduced to 5m in areas identified within the peat stability risk assessments.

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

  (a) Where Acrotelm (to about 0.3 to 0.4m of peat) is required for landscaping, it 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 designated placement areas.

(6) Once excavated, non-catotelm peat will be temporarily stored in localised areas adjacent to excavations for tracks and hardstands before being placed into the permanent peat storage areas within the borrow pits, in the designated peat and spoil management areas, or reused for landscaping purposes. All peat and spoil management areas will be inspected by the Project Geotechnical Engineer before material is stored in the area. No material is to be sidecast or stored on the in-situ peat on the downslope side of the access tracks.

(7) Excavation side slopes in peat will be not greater than 1 (v): 3 (h). This slope inclination will be reviewed during construction. 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) End-tipping of stone onto the track during the construction/upgrading of the access track will be carefully monitored to ensure that excessive impact loading, which may adversely affect the adjacent peat, is limited.

(9) The new excavated access track will be constructed with an average of 500mm of selected granular fill. Granular fill will be placed and compacted in layers in accordance with the TII Specification for Road Works.

(10) Access tracks will be finished with a layer of capping across the full width of the track.

(11) A layer of geogrid/geotextile may be required at the surface of the competent stratum where cohesive material is present to prevent mixing of the underlying material with the granular fill.

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

(13) Where slopes of greater than 5 degrees are encountered along with relatively deep peat (i.e., greater than 2m) and where it is proposed to construct the access track 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.

(14) Where the above is not possible, a specific Risk Assessment Method Statement (RAMS) from the contractor will be produced, detailing how the downslope works will be undertaken, including that all plant would operate from the already constructed section of track, with no loading of the peat on the downslope slope and limiting the length of ground to be stripped/excavated at any one time. Movement monitoring posts (as described in the Peat & Spoil Management Plan, Section 8.1) will also be installed downslope of the works area to allow for ongoing monitoring during the construction works.

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

(16) The construction and upgrading of access tracks in areas of deep peat (greater than 2m) will be inspected on a routine basis (by the Site manager/Ecological Clerk of Works/Project Geotechnical Engineer) during the works, particularly before/following trafficking by heavy vehicular loads.

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

The use of new floated access tracks will be limited on site to areas of flatter terrain, i.e., less than a 3-degree slope. The proposed locations for floating tracks across the Site are shown in drawing P23-240-0600-0009 and 0010 and details shown in drawing P23-240-0600-0014. Floating tracks are not proposed on areas of significant sidelong ground (>5 degrees).

A confirmatory stability analysis will be carried out by the designer where it is proposed to install floating access tracks over the peat prior to any construction work commencing on the Site.

Floating tracks 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 track may be more suitable (see Section 6), although this is not anticipated at the location of the floated tracks.

5.1 Floating Track Construction Methodology

This methodology includes procedures that will 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 assessed in Chapter 4 and 9 of the EIAR.

Note: Details of geogrid arrangement will be provided by the specialist geogrid provider/designer.

(1) Prior to commencing floating track construction movement monitoring posts will be installed in areas where the peat depth is greater than 2m and will be placed at 10m intervals along these sections.

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

(3) Construction of track will be in accordance with appropriate design from the designer.

(4) The make-up of the new floated access track is an average of 1,000mm of selected granular fill with 2 no. layers of geogrid with possibly the inclusion of a geotextile separator (drawing P23-240-0600-0014).

(5) Granular fill will be placed and compacted in layers in accordance with the TII Specification for Road Works.

(6) Following the detailed design of the floated access tracks it may be deemed necessary to include pressure berms either side of the access track 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 track will reduce the likelihood of potential bearing failures beneath the access track.

(7) The finished track width will be a minimum of 5m, with wider sections on bends and corners.

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

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

(10) Where it is not possible to end-tip over a 10m length of constructed floating track then dumpers delivering stone to the floating track 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 track.

(11) 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 track.

(12) A final surface layer will be placed over the full width of the floating track, as per design requirements, to provide a track profile and graded to accommodate wind turbine construction and delivery traffic.

6. GENERAL CONSTRUCTION GUIDELINES FOR ACCESS TRACKS

The following general construction guidelines will be implemented for the access tracks on the 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. 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 track then it will be necessary to ensure that this drainage is not affected by settlement of the upgraded access track. 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 track edge, or at a distance determined following site inspection. The presence of excavations can destabilise the track. Temporary excavations will be excavated in short lengths and backfilled as soon as practicable.

(4) Floating tracks will not be constructed on areas of sidelong ground.

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

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

(7) Due to the nature of floating track construction, it will be necessary to monitor the settlement/movement of the track. Survey points will be located along the track at 10m intervals in areas of deep peat (greater than 2m). These survey points will be surveyed on a weekly basis, and more frequently when construction activities are ongoing in the area.

(8) The construction and upgrading of access tracks in areas of deep peat (greater than 2m) will be inspected on a routine basis during the works, particularly before/following trafficking by heavy vehicular loads.

(9) In the event of excessive vertical displacement of the track during/following construction then mitigation measures will be required to ensure the stability of the track. This will include:

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

  (b) Where peat is relatively shallow then excavate peat and replace with suitable fill.

  (c) Slowing the rate of construction.

(10) Settlement of a floated access track is expected and will likely be in the order of several 100mm in the deeper peat areas; as such it will be necessary to re-level the track at convenient intervals during the 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 works, the track will be re-levelled using crushed stone.

7. EXCAVATION AND STORAGE OF PEAT AND SPOIL

7.1 Excavation and Storage of Arisings Methodology

This methodology includes procedures that will 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 assessed in Chapter 4 and 9 of the EIAR.

(1) All excavated peat and spoil will be transported to one of the 3 no. borrow pits (see drawing P23-240-0600-0015 to 0017) or to one of the designated peat and spoil management areas around turbine locations.

(2) Further details on the construction and reinstatement of the 3 no. borrow pits are given in Section 7.5.

(3) Further details on the placement of excavated material to designated peat and spoil management areas close to turbines are given in Section 7.6.

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

(5) Sufficient storage space has been provided across the site for the peat and spoil volumes that will be generated from the Proposed Project.

7.2 Summary of Peat and Spoil Volumes on Site

A summary of the excavated peat and spoil volumes calculated for the Proposed Project is given in Table 7-1.

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

Infrastructure Element [1]	Proposed Dimensions	Peat Volume (m^3) [2]	Spoil (non-peat) Volume (m^3) [2] and [3]	Comment
17 no. Turbines and Hardstands	27m diameter excavation footprint for turbine foundation with 55 x 35m hardstand area.	69,000	111,000	Hardstanding area and foundation footprint
Access tracks	Proposed 5m running surface with 6-8m wide development footprint.	20,000	26,000	
Temporary Construction Compounds/Lidar Compounds	Hardstanding area of 90 x 70m.	2,500	1,500	Hardstanding areas
Substation	Hardstanding area of 165 x 80m	20,000	3,500	
Borrow Pits	3 no. borrow pits.	9,000	41,000	Borrow pit footprint
Proposed Grid Connection Cable Trench	41.6km in length along public road corridor.	5,400	14,600	Spoil to be transported to an appropriate licenced facility for disposal [6].
	Total =	**125,900m^3**	**197,600m^3**	**Total = 323,700m^3 (peat and spoil volume) [4, 5]**

Note (1) The location of the infrastructure elements on the Site are shown on Drawing P23-240-0600-0005.

Note (2) A factor of 10% (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) The excavated spoil volumes have been determined based on a cut-fill assessment carried out for the Site, see Section 13 of this report for further details.

Note (4) It should be noted that the excavated rock volume from the borrow pits is not included in the total volume quoted above in Table 7.1, see the cut-fill assessment in Section 13 of this report for further details. It is assumed that the excavated rock volume will be re-used on the Site as part of the construction works for the development and hence will not require reinstatement on site.

Note (5) A proportion of the material excavated at turbines and hardstands will be rock that can be reused in the works. An estimate of 20,000m^3 of reusable rock has been assessed. This is not included in the volumes quoted above.

Note (6) The total peat/spoil volumes from the Proposed Grid Connection Route is quantified as 50,000m^3. Of this total, 10,100m^3 is comprised of road make up material which will be sent to an appropriately licensed facility. The remaining spoil volume of 39,100m^3 will either be managed in the identified peat and spoil management areas within the Proposed Wind Farm or sent to an appropriately licensed facility. Given the length of the Proposed Grid Connection underground cabling route, it is assumed that approximately 50% (c. 20,000m^3) of the spoil generated during the construction of the Proposed Grid Connection will be managed in the Proposed Wind Farm, which is identified in Table 7.1 above, and the remaining volume will be sent to an appropriately licensed facility. This is dependent on the road makeup at locations along the underground electrical cabling route and the distance from the underground electrical cabling route to the Proposed Wind Farm, the main contractor will determine the appropriate location for management of arisings from the Grid Connection underground electrical cabling route.

7.3 Summary of Peat and Spoil Management Areas on Site

A summary of the proposed peat and spoil management areas at the Site is 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
Peat and Spoil Management Areas	171,250	1.25m in height across specific areas shown in Drawing P23-240-0600-0009 and 0010. See Section 7.5 of the report and Drawing P23-230-0600-0018 for further details.
Borrow Pits	135,000	See Drawings P23-240-0600-0015 to 0017 for further details
Landscaping (2)	27,100	It is estimated that 1,000m^3 of peat will be required for landscaping purposes and 500m^3 of spoil as ballast backfill to turbines at each of the 17 no. turbine locations. A further 1,600m^3 of material is proposed for reuse in the landscaping of turbines around the areas where turbines will be removed from the Existing Wind Farm.
Total =	**334,350m^3(3)**	

Note (1) The location of the proposed borrow pits at the site are shown on Drawing P23-230-0600-0005.

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

Note (3) A further 20,000m^3 of rock excavated from the turbines and hardstands will be reused within the Proposed Project.

7.4 Summary of Stone Volume Requirements

Table 7.3 below summarises the stone volume requirement for the Proposed Project, excluding the final blinding layer which will come from an external source.

Table 7.3: Summary of Stone Volume Requirements

Infrastructure Element (1)	Typical Dimensions	Stone Volume (m^3) (2)	Comment
17 no. Turbines and Hardstands	27m diameter excavation footprint for turbine foundation with 55 x 40m finished hardstand surface.	135,000	Hardstanding area and foundation footprint. Allowance included for mini-crane pads and blade finger hardstands associated with the main hardstand, plus allowance for side slopes in areas of fill.

Infrastructure Element (1)	Typical Dimensions	Stone Volume (m^3) (2)	Comment
Access tracks (including cabling)	Assumed 5m running surface with 6m wide development footprint. Typical stone depth of 0.75m.	97,000	Allowance includes for widening on bends, at junctions, laybys, and tie-ins to hardstands.
Substation	Hardstanding area of 165 x 80m	22,000	
Temporary Construction Compounds/Lidar Compounds	Hardstanding area of 40 x 20m.	5,500	
Proposed Grid Connection Cable Trench	-	40,000	
Borrow Pits	3 no. borrow pits.	-	
	Total =	**299,500m^3**	

Notes

Note (1) A contingency factor of 10% has been applied to the volumes to allow for expected bulking upon excavation and to allow for a variation in ground conditions across the Site.

Note (2) It should be noted that the volumes given in Table 7-3 are subject to confirmatory design.

7.5 Construction and Reinstatement of Borrow Pits

Three number locations have been identified as borrow pits and are shown on Drawing P23-240-0600-0009 and 0010. The peat depth within the development footprint of the borrow pits is less than 1.0m. The borrow pit locations were selected based on the shallow depth of peat and overburden and accessibility from the existing forestry tracks. Bedrock within the borrow pits will be a mixture of schist and amphibolite, as well as sandstone, based on GSI mapping, the findings of the site walkover and the results of the intrusive ground investigation.

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

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

Drawings P23-240-0600-0015 to 0017 show proposed construction details for the borrow pits.

The borrow pits will be constructed as follows:

(1) Peat and overburden will be removed and temporarily stored in localised areas adjacent to the borrow pit locations before being placed into the permanent peat/spoil storage area within the borrow pit, or within the peat/spoil storage area at T12.

(2) 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 pits. The ground investigation will comprise rotary core drilling with associated engineering logging including rock quality designation and strength and durability testing. From site observations of rock exposures and the results of the intrusive ground investigation breaking is most likely to be suitable to remove the rock, however at depth some blasting may also be required in Borrow Pit 1.

(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 track. As excavation progresses into the back edge of the borrow pit, localised deepening of the borrow pit floors may be required depending on extraction operations.

(4) A temporary ramp will be formed to provide access and egress for construction vehicles at Borrow Pit 1. The proposed locations of the ramps are shown on drawing P23-240-0600-0015. These ramps will be backfilled with spoil back to the current ground level once the borrow pit is completed.

(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 (45 degrees, 1(v):1(h)). Exposed sections of the rock slopes will be left with irregular faces and declivities to promote re-vegetation and provide a naturalistic appearance. Slopes within the overburden will be formed at 1(v):2(h).

(6) The stability of the rock faces within the borrow pits 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, in line with best practice guidelines.

(7) It will be necessary to construct rock buttresses founded on in-situ rock within Borrow Pit 1 to create individual cells (up to 3 no.). The cells will be opened in sequence and filled as needed. The rock buttresses will be constructed of coarse crushed rock fill from the borrow pit excavation, placed and compacted in layers. The founding stratum for each rock buttress will be inspected and approved by the Project Geotechnical Engineer.

(8) The rock buttress will be constructed in stages to allow infilling of peat and spoil within cells. The buttress will be constructed of coarse crushed rock fill and placed and compacted in suitable layers to form a buttress of sufficient stability to retain the placed peat and spoil.

(9) The rock buttress will be wide enough (up to 4m) to allow construction traffic access for tipping and grading during the placement of the excavated peat and spoil. The permanent side slopes of the rock buttresses will be constructed at between 40 to 60 degrees.

(10) The internal rock buttress will be founded on bedrock i.e., competent strata. The founding stratum for the rock buttress will be inspected and approved by the Project Geotechnical Engineer.

(11) 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, allowing the borrow pit to be developed and infilled in cells. 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.

(12) In order to prevent water retention occurring behind the buttress, 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. In addition, drains will be placed through the buttress to allow surface water to drain from the surface of the placed peat/spoil. These drains will be 150mm diameter flexible plastic drainage pipe or equivalent.

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

(14) The surface of the placed peat will be shaped following backfill using excavators to allow efficient run-off of surface water from the placed arisings towards the perimeter of the borrow pit. The surface of the placed peat will have a maximum grade of 2°.

(15) An interceptor drain will also be installed around the perimeter of the borrow pits. 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) Temporary control of groundwater within the borrow pits will be required and measures will be determined as part of the ground investigation programme. A temporary pump and suitable outfall location will be required during construction.

(17) A settlement pond will be constructed at the lower side/outfall location of the borrow pits and is shown on the drainage drawings.

(18) 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 peat and spoil within the borrow pit.

(19) Supervision by the Project Geotechnical Engineer is required for the development of the borrow pits.

(20) All the above-mentioned requirements will be implemented by the Contractor during construction.

7.6 Designated Peat and Spoil Management Areas

The following commitments for the placement of peat within permanent clearfell areas around 6 no. turbines, in an area to the south of the substation, and at 4 no. locations in the open peatland in the western part of the site will be implemented during construction. These areas have been selected based on a combination of the depth of peat, the recorded peat strength in the area and the slope angle. A check of peat stability in each area was also undertaken, allowing for the additional loading from 1.25m of stored peat, and these results are included on the Peat Stability Assessment Report (FT, 2026).

(1) Excavated peat will be placed/spread across the designated areas. These locations are shown in Drawing P23-240-0600-0009 and 0010.

(2) The peat placed within the areas shown on Drawing P23-240-0600-0009 and 0010 will be restricted to a maximum height of 1.25m. Weak/liquified peat will be placed within the proposed borrow pits and not stored within these areas. Spoil can be placed to a maximum depth of 1.5m in the storage area at T12.

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

(4) 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.

(5) It will be ensured that the surface of the placed peat will be shaped to allow efficient run-off of surface water. Shaping of the surface of the peat will be carried out as placement of peat within the peat placement area progresses. This will reduce the likelihood of debris run-off and reduce the risk of instability of the placed peat.

(6) Finished/shaped side slopes in the placed peat will be not greater than 1 (v): 4 (h). This slope inclination will be reviewed during construction, as appropriate.

(7) The acrotelm will be placed on the finished surface 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.

(8) Movement monitoring instrumentation will be placed around the areas where peat has been placed. The locations where monitoring is required will be identified by the Project Geotechnical Engineer on site.

(9) Supervision by the Project Geotechnical Engineer will be carried out for the works.

(10) 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.

(11) All the above-mentioned general guidelines and requirements will be undertaken by the Contractor during construction.

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

The turbine bases will be founded on competent founding strata which will require excavation through peat and soft overburden.

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

8.1 Methodology

This methodology includes procedures that will 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 assessed in Chapters 4 and 9 of the EIAR.

(1) With respect to placement of arisings from excavations the commitments given in Section 7 will be followed.

(2) All excavations within peat will be adequately supported or peat slopes are to be battered to a safe slope inclination typically of 1 (v): 4 (h). This slope inclination will be reviewed during construction, as appropriate. Where areas of weaker peat are encountered then slacker slopes will be provided.

(3) Excavations will be kept reasonably free from water at all times. Water will 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 the temporary construction drainage system for treatment, as described in Chapter 4 and 9 of the EIAR.

9. EXCAVATIONS FOR UNDERGROUND CABLES

A connection between the Crumhach Wind Farm and the national electricity grid will be necessary to export electricity. It is proposed that the Crumhach Wind Farm will connect to the national grid via an existing substation (Srananagh) located in Collooney to the west of the proposed wind farm development. The Proposed Grid Connection Route is 41.6km in length and will follow existing and proposed tracks and the public road corridor.

The Proposed Grid Connection Route 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 within the footprint of the access tracks and TDR. The grid connection route will encounter peat, till derived from Metamorphic Rock, till derived from Namurian sandstones and shales and localised pockets of alluvium and will be constructed on solid ground to EirGrid specifications.

9.1 Methodology

This methodology includes procedures that will 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 assessed in Chapters 4 and 9 of the EIAR.

(1) With respect to placement of arisings from excavations the guidelines given in Section 8 will be followed.

(2) All excavations within peat will be adequately supported or peat slopes will be battered to a safe slope inclination typically of 1 (v): 4 (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) 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.

(4) Excavations will be kept reasonably free from water at all times.

(5) Any overburden excavated from the cable trench will be transported to the borrow pits or peat management areas for storage or sent for disposal to an appropriately licensed facility. Any pavement materials containing tar will be transported to an authorised waste facility.

10. GENERAL MEASURES FOR GOOD CONSTRUCTION PRACTICE

To minimise the risk of construction activity causing potential peat instability the Construction Method Statements (CMS) for the project will also implement (as a minimum), the general measures below together with the specific measures above.

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

(2) 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, which is at the crest or toe of the slope.

(4) Installation and regular monitoring of geotechnical instrumentation during construction in areas of possible poor ground, such as deeper peat deposits (see Section 11).

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

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

(7) Routine inspection of wind farm site by the Contractor and Project Geotechnical Engineer will be undertaken and will include an assessment of ground stability conditions (e.g., cracking, excessive floating track 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 track at staggered intervals at locations where the peat depth is greater than 2m. Additional monitoring locations will be provided at infrastructure locations with deeper peat deposits. Details of sighting posts are given below.

(1) A line of sighting posts will comprise:

- (a) A line of wooden stakes (proposed to be 1 to 1.5m long) placed vertically into the peat to form a straight line.
- (b) The sighting line will comprise 6 no. posts at 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 track 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 is deemed useful by the Project Geotechnical Engineer.

(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 Proposed Wind Farm 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 (Contractor/Engineer/Designer).

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 will 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 will 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.

12.3 Check Barrages

Whilst it is not anticipated from the analysis undertaken that a peat slide will occur on the 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 will comprise well-graded coarse rock pieces from about 300mm up to 1000mm.

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

The check barrage will fill the entire channel width of the watercourse up to a height of 3 to 4m with a crest width of at least 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 the existing access tracks on the Proposed Wind Farm 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 will 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 will be removed as soon as any measures to prevent further peat sliding is agreed with all parties (Contractor/Engineer/Designer).

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 Proposed Project. The cut & fill assessment is graphically presented on Drawing P23-240-0600-0019 and 0020.

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

- ∀ Plan drawings of the Proposed Wind Farm showing an outline of cut & fill earthworks at all infrastructure elements (Drawing P23-240-0600-0019 and 0020)
- ∀ Preliminary cut & fill earthwork volumes (see Table 13-1 of this report)

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

A summary of the cut & fill earthwork volumes is given in Table 13.1.

13.1 Commentary on Earthworks Volumes

It will be noted that the earthwork volumes given in Table 13.1 are estimates and subject to detailed design. This section of the report should be read in conjunction with Sections 7.2 and 7.3 of the report which summarises 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 323,700m^3. This material will be excavated and placed/reinstated to the borrow pits, with 171,250m^3 stored across clearfell areas near turbines, 135,000m^3 backfilled into the borrow pits and 27,100m^3 used for landscaping around the turbines.

2) The estimated quantity of available rock within the borrow pit is 92,500m^3. Conservative assumptions were made in estimating the quantity of rock available in the borrow pits.

3) Note a number of assumptions were made during the cut & fill assessment, see Appendix A. A bulking factor of 10% has been applied to the excavation volumes.

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	Stone Volume Requirements	Comment
		Cut (m^3)	Cut (m^3) (3)	Cut (m^3)	(m^3)	
17 no. Turbines and Hardstands	27m diameter excavation footprint for turbine foundation with 95 x 35m hardstand area	69,000	111,000	20,000	135,000	Hardstanding area and turbine foundation footprint
Access tracks	Proposed 5m running surface with 6-8m wide development footprint	20,000	26,000	-	97,000	
Various Infrastructure Locations	Includes substation, 3 no. construction compounds, Lidar locations	22,500	5,000	-	27,700	-
Proposed Grid Connection (5)	41.6km in length along public roads	5,400	14,600		40,000	All stone for trench backfill to be imported
Borrow Pits	3 no. Borrow Pits	9,000	41,000	95,000		Estimated potential rock volume from borrow pits is 9**5,000m³**.
	Total =	**125,900**	**197,600**	**115,000**	**299,700**	

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 13.1 are subject to confirmatory design.
Note (5) An additional 20,000m^3 of spoil is estimated to require disposal off-site as part of the Proposed Grid Connection works.

14. REFERENCES

Munro, R, 2004. Dealing with bearing capacity problems on low volume roads constructed on peat. Roadex II Northern Periphery.

Scottish Natural Heritage/Forestry Commission Scotland, 2010. Floating Roads on Peat.

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Good Practice during Windfarm Construction (NatureScot, 2024).

Guidance on Developments on Peatland: Site Surveys (Scottish Government, Scottish Natural Heritage and SEPA, 2017.

FEHILY TIMONEY

DESIGNING AND DELIVERING
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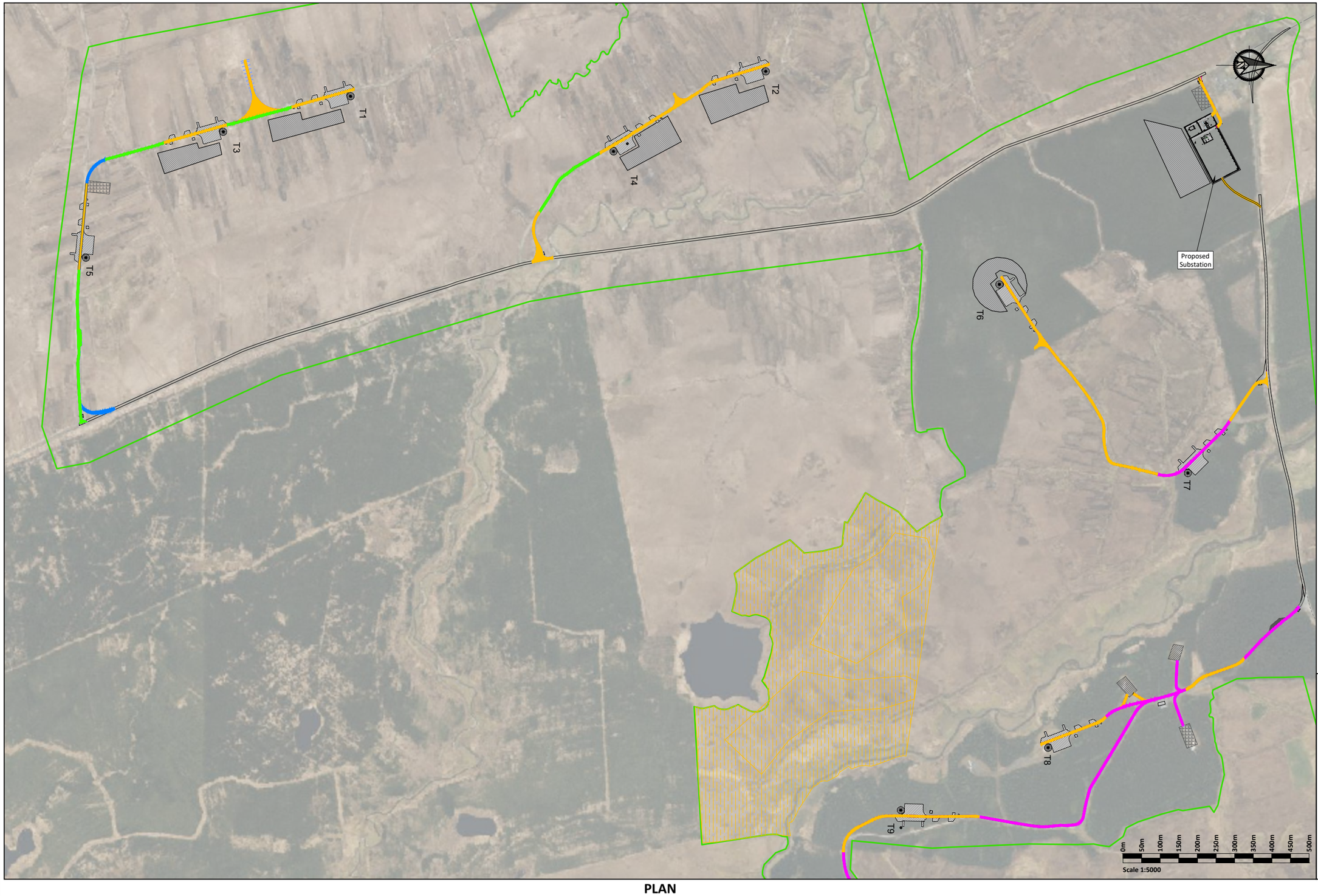
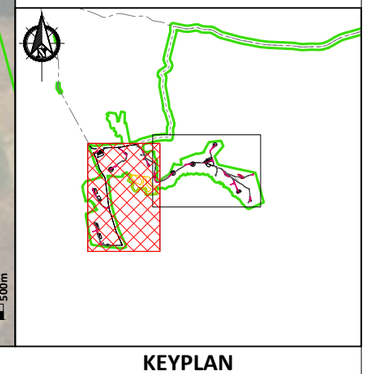
DRAWINGS



Legend:

- EIAR Study Boundary
- Proposed Turbine & Hardstanding
- Proposed Access Track
- Existing Access Track to be Upgraded
- Existing Access Tracks
- Proposed Passing Bay
- Proposed Temporary Compound
- Decommissioned Turbine Area
- Proposed Peat & Spoil Management Areas
- Proposed Borrow Pit
- Proposed Enhancement Area
- 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 Track



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Rev.	Description	App By	Date
P01	FOR INFORMATION	BDH	09.04.26
P02	FOR INFORMATION	BDH	30.06.26

PROJECT
CRUMHACH WIND FARM

CLIENT
MKO

SHEET
ROAD CONSTRUCTION TYPES
PLAN SHEET 1 0F 2

Date 30.06.26	Project number P23-240	Scale (@ A1) 1:5000	
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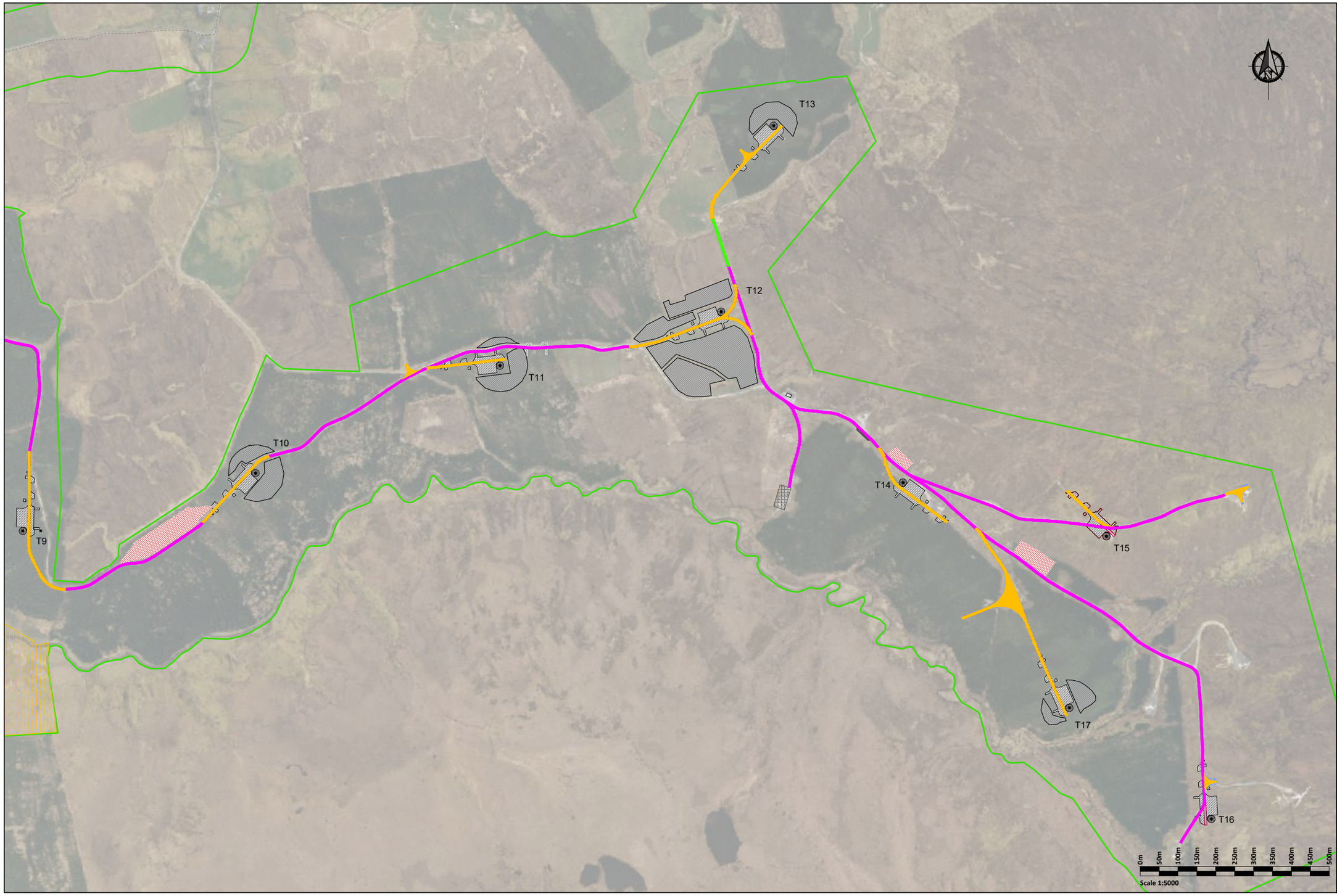
2 July 2026



Legend:

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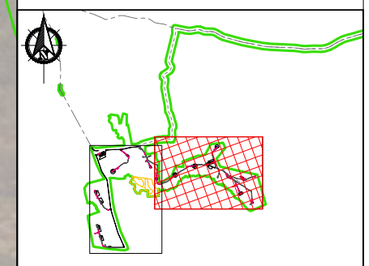
- Type A - Upgrade of Existing Excavated Access Tracks
- Type B - Upgrade of Existing Floated Access Tracks
- Type C - New Excavate & Replace Access Road
- Type D - New Floated Access Track



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KEYPLAN

Scale 1:100000

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P01	FOR INFORMATION	BDH	09.04.26
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PROJECT

CRUMHACH WIND FARM

CLIENT

MKO

SHEET

ROAD CONSTRUCTION TYPES
PLAN SHEET 2 0F 2

Date 30.06.26	Project number P23-240	Scale (@ A1) 1:5000	
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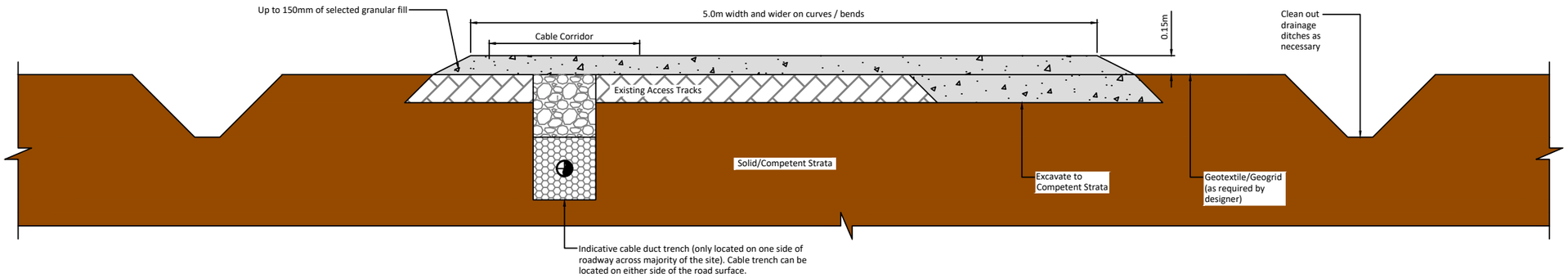
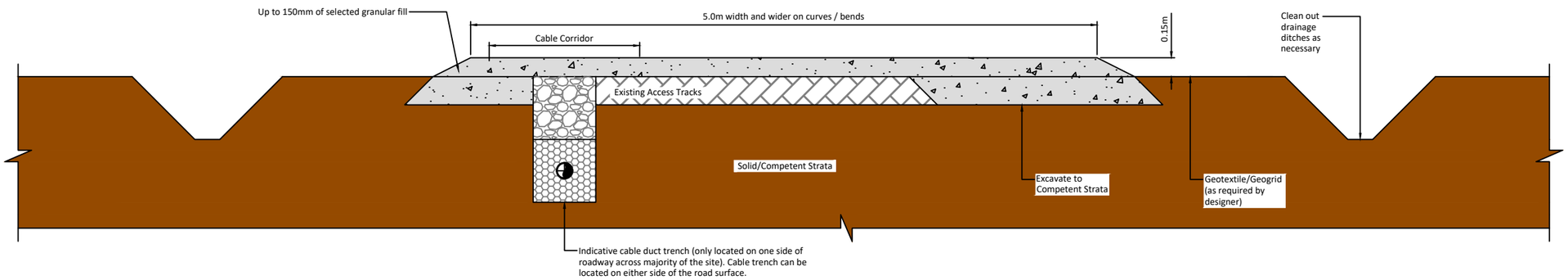
2 July 2026





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Rev.	Description	App By	Date
P01	FOR INFORMATION	BDH	09.04.26
P02	FOR INFORMATION	BDH	30.06.26

PROJECT
CRUMHACH WIND FARM

CLIENT
MKO

SHEET
TYPE A UPGRADE OF EXISTING EXCAVATED ACCESS ROAD

Date 30.06.26	Project number P23-240	Scale (@ A3) Scale N/A
Drawn by SK	Drawing Number P23-240-0600-0011	Rev P02
Checked by IH		

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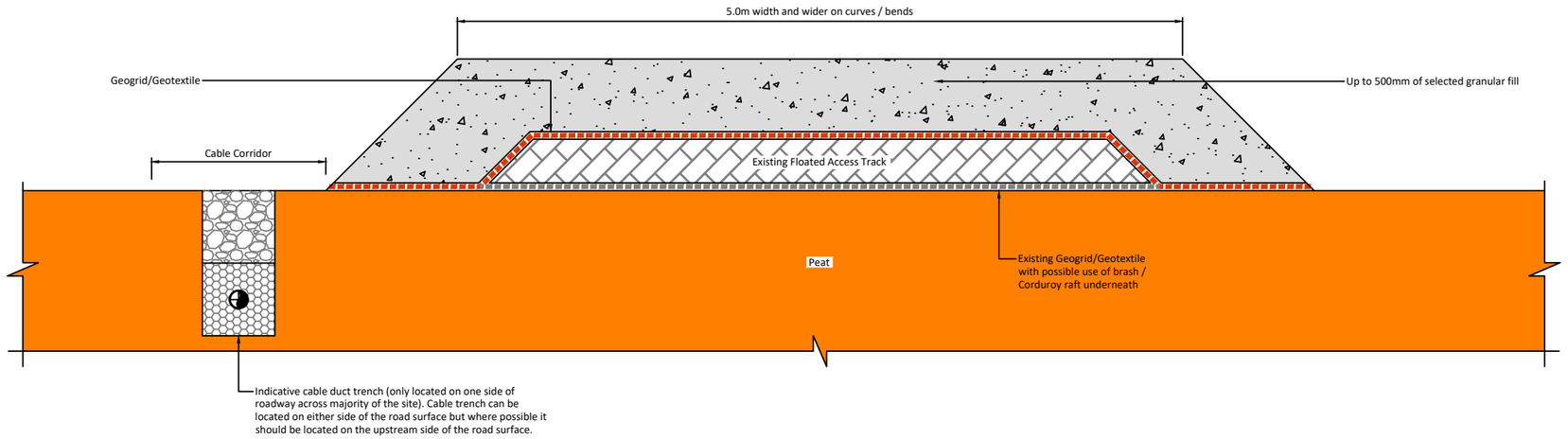
2 July 2026



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P01	FOR INFORMATION	BDH	09.04.26
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PROJECT

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SHEET

TYPE B UPGRADE OF EXISTING FLOATED ACCESS ROAD

Date 30.06.26	Project number P23-240	Scale (@ A3) As Shown	
Drawn by SK	Drawing Number P23-240-0600-0012		Rev P02
Checked by IH			

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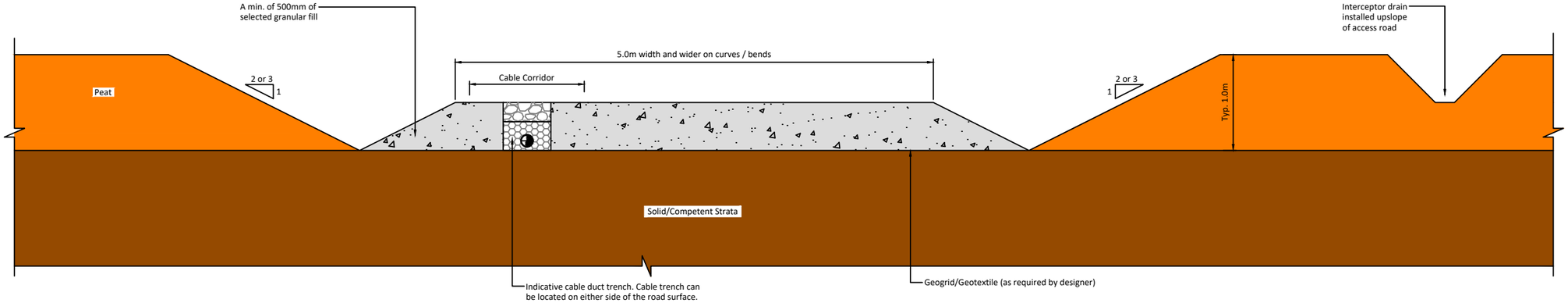
2 July 2026



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P01	FOR INFORMATION	BDH	09.04.26
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PROJECT
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SHEET
TYPE C NEW EXCAVATE AND REPLACE ACCESS TRACK

Date 30.06.26	Project number P23-240	Scale (@ A3) Scale N/A	
Drawn by SK	Drawing Number P23-240-0600-0013		Rev P02
Checked by IH			

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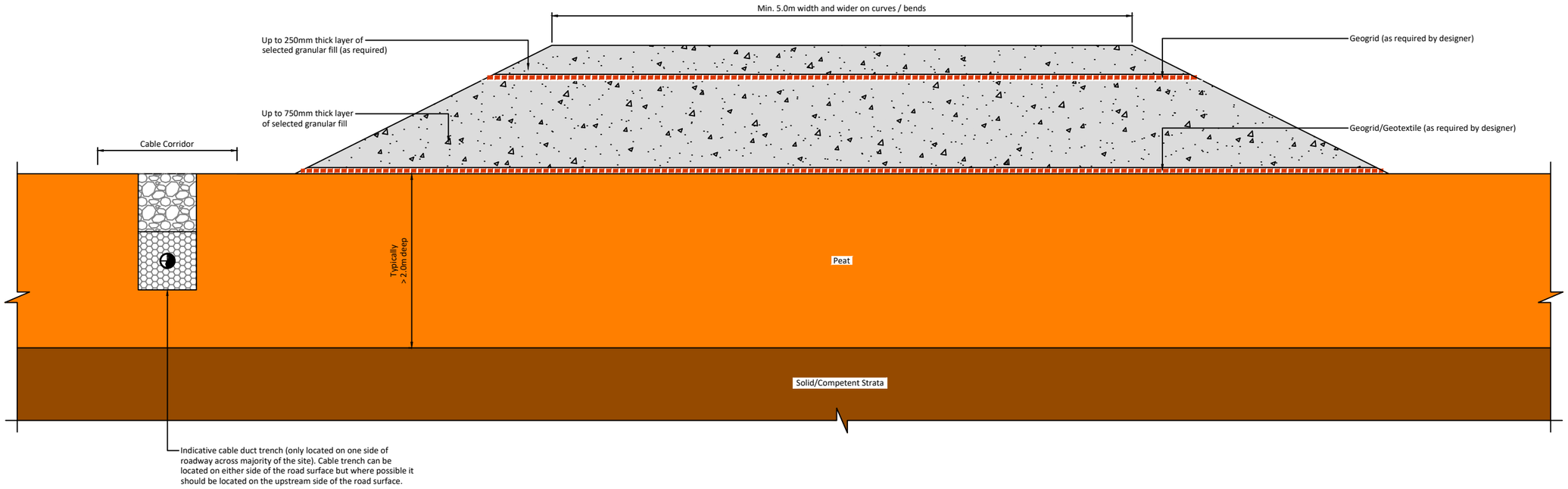
2 July 2026



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PROJECT

CRUMHACH WIND FARM

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SHEET

PEAT AND SPOIL MANAGEMENT AREAS - TYPE D - NEW FLOATED ACCESS TRACK

Date 30.06.26	Project number P23-240	Scale (@ A3) 1:40
Drawn by SK	Drawing Number P23-240-0600-0014 (Sheet set subset 0600)	Rev P02
Checked by IH		

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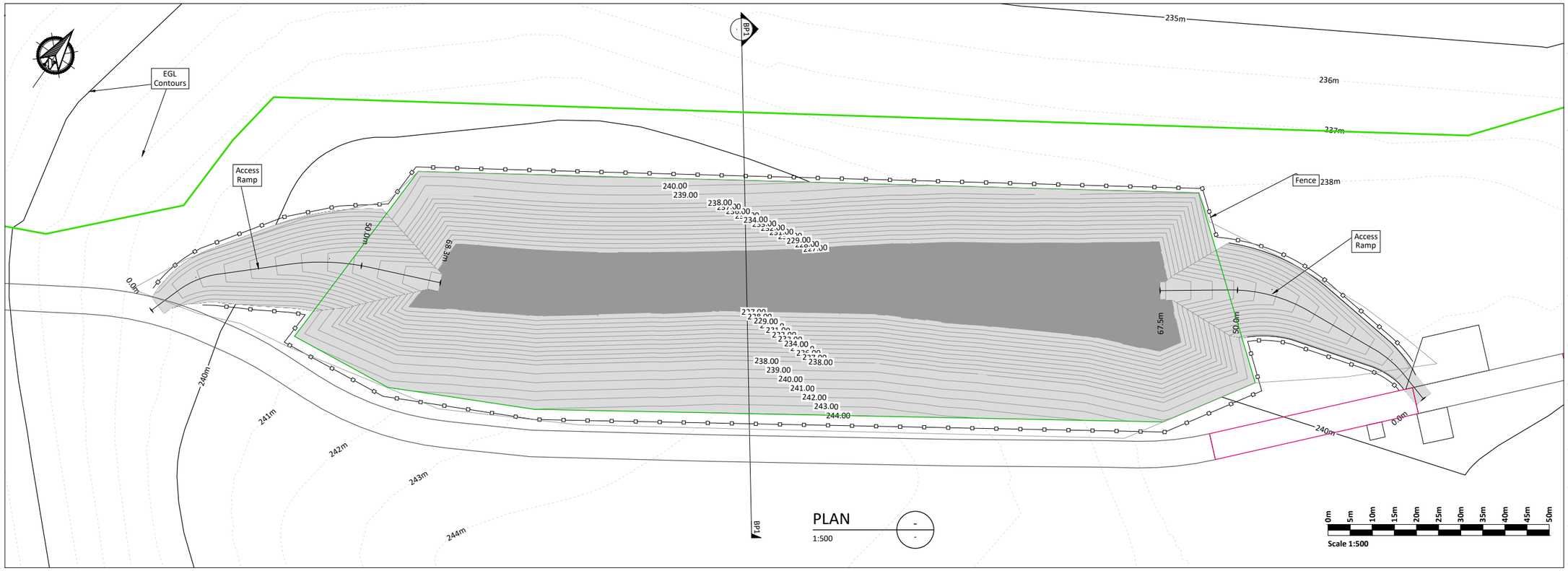


PLAN

1:500

Scale 1:500

0m 5m 10m 15m 20m 25m 30m 35m 40m 45m 50m

Legend:

- EIAR Study Boundary
- Proposed Turbine & Hardstanding
- Proposed Access Track
- Existing Access Track to be Upgraded
- Existing Access Tracks
- Proposed Passing Bay

Borrow Pit Construction Notes:

(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. Excavation and infilling of the borrow pit will need to be sequenced and programmed.

(4) The contractor excavating the rock will sequence the borrow pit construction in a way which will allow the excavated peat & spoil to be reinstated safely.

(5) The borrow pit will be developed in cells.

(6) The internal 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.

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

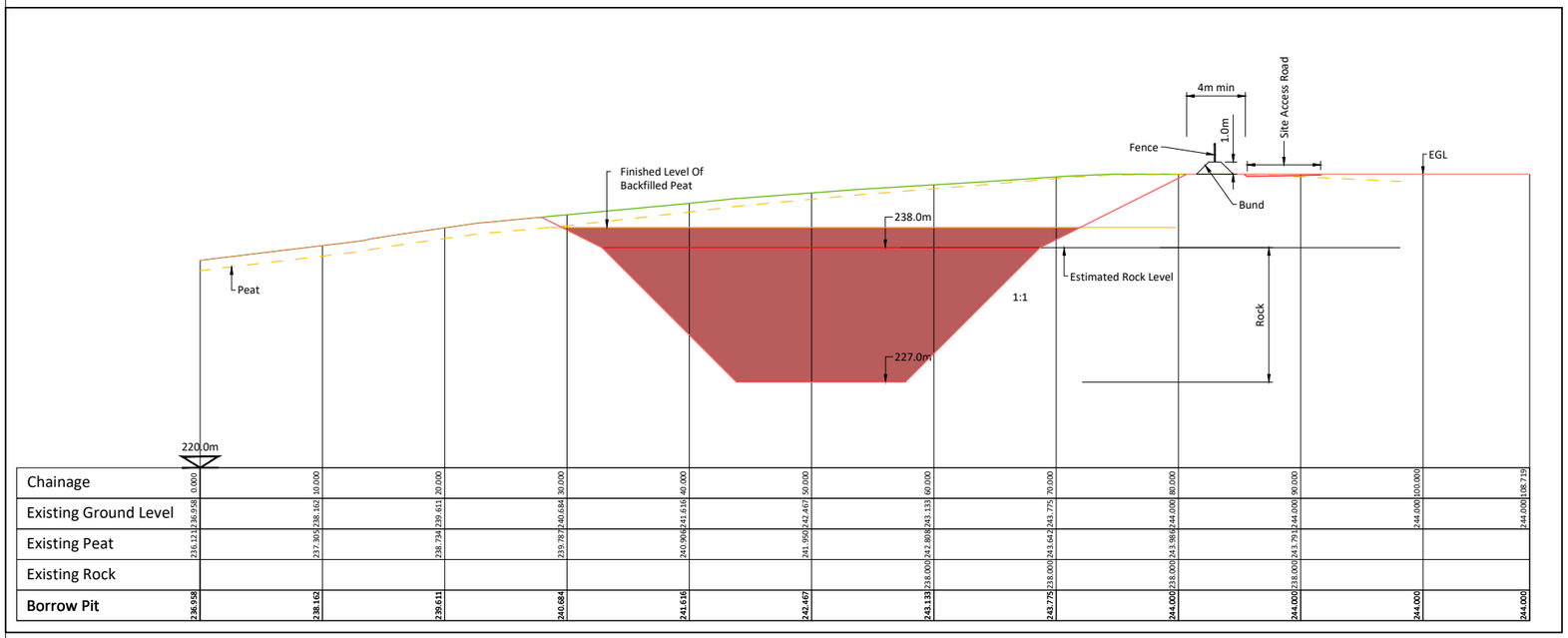
(8) Control of groundwater within the borrow pit will be required and measures will be determined as part of the ground investigation programme.

(9) An interceptor drain will be installed around the upslope side of the borrow pit to capture surface water flow and divert it around the borrow pit.

(10) A perimeter drain will be installed around the individual cells, which will outfall to a settlement pond on the downslope side of the borrow pit (not shown on plan).

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

(12) Further guidelines on the construction of the borrow pit is included within Section 7.5 of the Peat & Spoil Management Plan.



Chainage	0.000	10.000	20.000	30.000	40.000	50.000	60.000	70.000	80.000	90.000	100.000	108.719
Existing Ground Level	236.958	238.162	239.611	240.684	241.616	242.467	243.133	243.775	244.000	244.000	244.000	244.000
Existing Peat	236.123	237.302	238.734	239.787	240.906	241.950	242.808	243.642	243.986	243.792	244.000	244.000
Existing Rock							238.000	238.000	238.000	238.000		
Borrow Pit	**236.958**	**238.162**	**239.611**	**240.684**	**241.616**	**242.467**	**243.133**	**243.775**	**244.000**	**244.000**	**244.000**	**244.000**

SECTION

1:250

BP1

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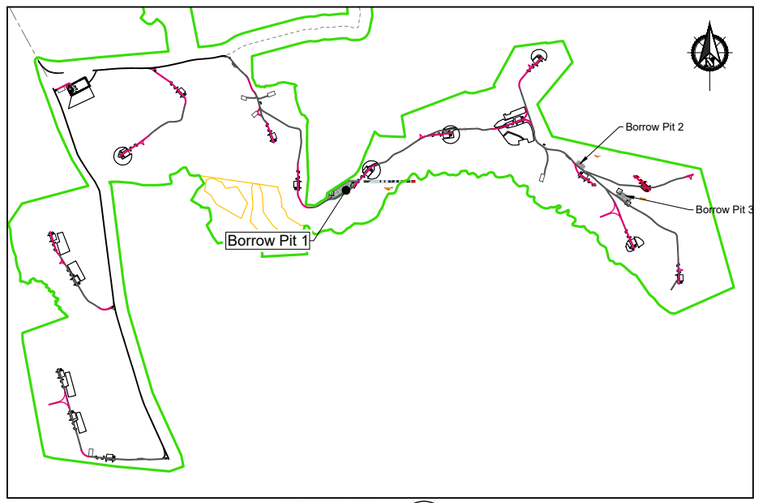

KEY PLAN

1:25000

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P01	FOR INFORMATION	BDH	09.04.26
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PROJECT

CRUMHACH WIND FARM

CLIENT

MKO

SHEET

BORROW PIT 1 PLAN AND SECTION

Date 30.06.26	Project number P23-240	Scale (@ A1) 1:500	
Drawn by SK	Drawing Number P23-240-0600-0015 (Sheet set subset 0600)		Rev P02
Checked by IH			

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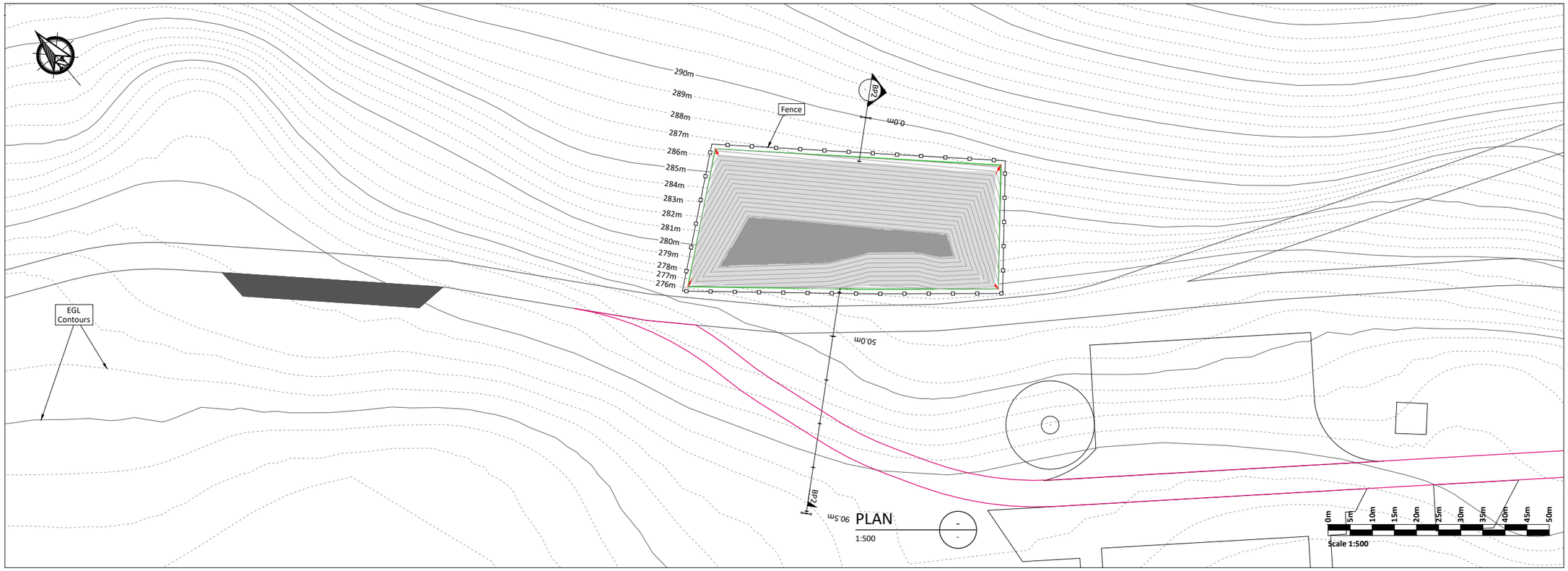

PLAN
1:500
-
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Legend:

- EIAR Study Boundary
- Proposed Turbine & Hardstanding
- Proposed Access Track
- Existing Access Track to be Upgraded
- Existing Access Tracks
- Proposed Passing Bay

Borrow Pit Construction Notes:

(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. Excavation and infilling of the borrow pit will need to be sequenced and programmed.

(4) The contractor excavating the rock will sequence the borrow pit construction in a way which will allow the excavated peat & spoil to be reinstated safely.

(5) The surface of the placed spoil will be shaped to allow efficient run-off of surface water from the placed arising's. The finished surface of the spoil cells will have a maximum grade of 15 degrees.

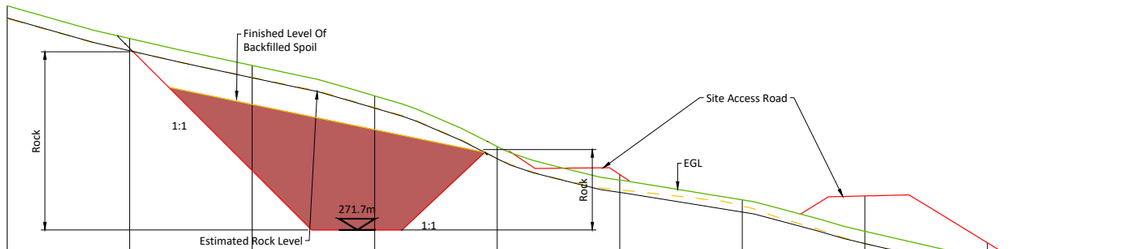
(6) Control of groundwater within the borrow pit will be required and measures will be determined as part of the ground investigation programme.

(7) An interceptor drain will be installed around the upslope side of the borrow pit to capture surface water flow and divert it around the borrow pit.

(8) A perimeter drain will be installed around the individual cells, which will outfall to a settlement pond on the downslope side of the borrow pit (not shown on plan).

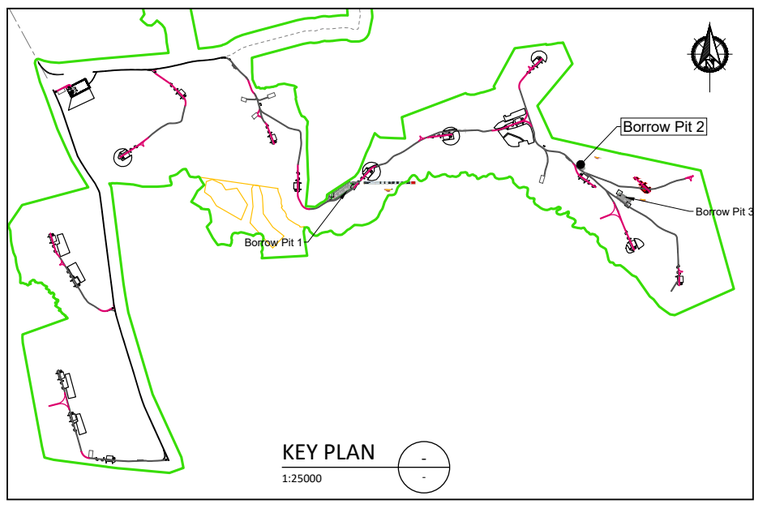
(9) All the above-mentioned general guidelines and requirements will be confirmed by the designer prior to construction.

(10) Further guidelines on the construction of the borrow pit is included within Section 7.5 of the Peat & Spoil Management Plan.



Chainage	0.000	10.000	20.000	30.000	40.000	50.000	60.000	70.000	80.000	90.500
Existing Ground Level	290.000	287.327	285.123	283.644	278.510	275.768	274.156	271.589	269.445	267.893
Existing Peat	288.956	286.313	284.155	281.696	277.551	274.971	273.600	270.602	268.096	266.171
Existing Rock	289.000	286.327	284.123	281.644	277.510	274.768	273.156	270.589	268.445	266.893
Borrow Pit		286.324	276.944	271.700						266.893

SECTION
1:250
BP2
-



KEY PLAN
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P01	FOR INFORMATION	BDH	09.04.26
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PROJECT
CRUMHACH WIND FARM

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SHEET
BORROW PIT 2 PLAN AND SECTION

Date 30.06.26	Project number P23-240	Scale (@ A1) 1:500	
Drawn by SK	Drawing Number P23-240-0600-0016 (Sheet set subset 0600)		Rev P02
Checked by IH			

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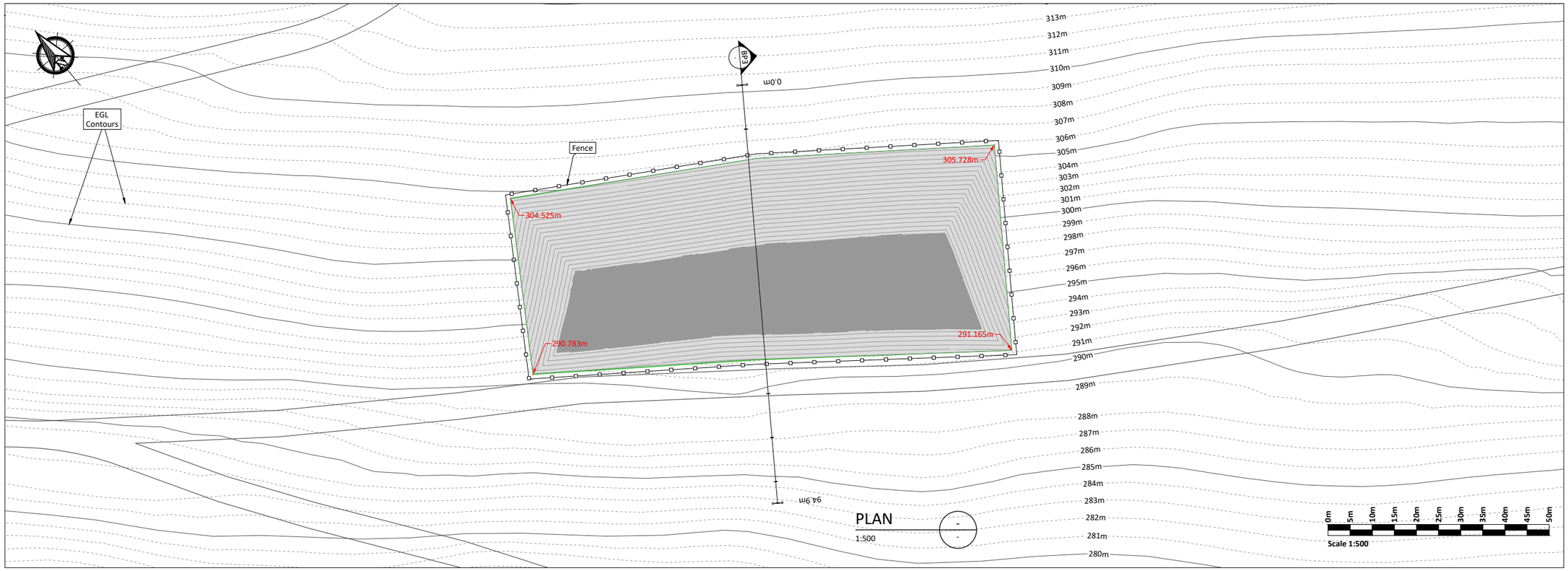


PLAN
1:500

0m 5m 10m 15m 20m 25m 30m 35m 40m 45m 50m
Scale 1:500

Legend:

- EIAR Study Boundary
- Proposed Turbine & Hardstanding
- Proposed Access Track
- Existing Access Track to be Upgraded
- Existing Access Tracks
- Proposed Passing Bay

Borrow Pit Construction Notes:

(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. Excavation and infilling of the borrow pit will need to be sequenced and programmed.

(4) The contractor excavating the rock will sequence the borrow pit construction in a way which will allow the excavated peat & spoil to be reinstated safely.

(5) The surface of the placed spoil will be shaped to allow efficient run-off of surface water from the placed arising's. The finished surface of the spoil cells will have a maximum grade of 15 degrees.

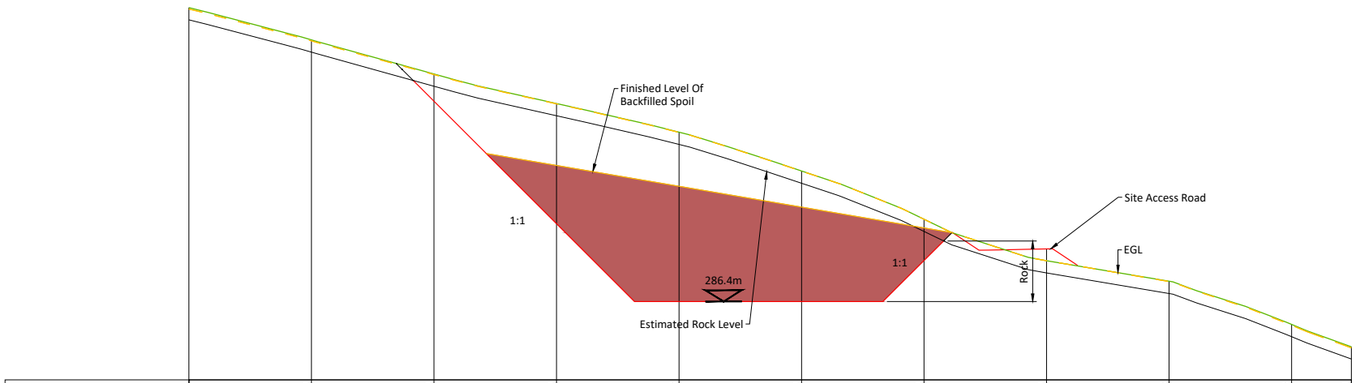
(6) Control of groundwater within the borrow pit will be required and measures will be determined as part of the ground investigation programme.

(7) An interceptor drain will be installed around the upslope side of the borrow pit to capture surface water flow and divert it around the borrow pit.

(8) A perimeter drain will be installed around the individual cells, which will outfall to a settlement pond on the downslope side of the borrow pit (not shown on plan).

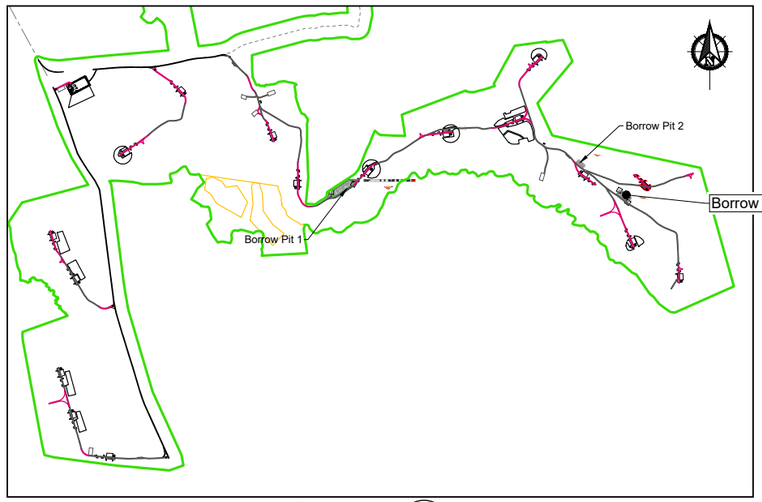
(9) All the above-mentioned general guidelines and requirements will be confirmed by the designer prior to construction.

(10) Further guidelines on the construction of the borrow pit is included within Section 7.5 of the Peat & Spoil Management Plan.



Chainage	0.000	10.000	20.000	30.000	40.000	50.000	60.000	70.000	80.000	90.000	94.879
Existing Ground Level	310.389	307.752	304.969	302.560	300.222	297.054	293.115	289.729	288.052	284.527	282.705
Existing Peat	310.275	307.672	304.922	302.532	300.202	297.041	293.110	289.729	288.025	284.458	282.614
Existing Rock	309.389	306.752	303.969	301.560	299.222	296.054	292.115	288.729	287.052	283.527	281.705
Borrow Pit			302.747	299.761	296.400	296.400	289.750				

SECTION
1:250
BP3
-



KEY PLAN
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PROJECT
CRUMHACH WIND FARM

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SHEET
BORROW PIT 3 PLAN AND SECTION

Date 30.06.26	Project number P23-240	Scale (@ A1) 1:500	
Drawn by SK	Drawing Number P23-240-0600-0017		Rev P02
Checked by IH	(Sheet set subset 0600)		

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2 July 2026

PLAN

Scale 1:1000

Legend:

- EIAR Study Boundary
- Proposed Turbine & Hardstanding
- Proposed Access Track
- Existing Access Track to be Upgraded
- Existing Access Tracks
- Proposed Passing Bay
- Proposed Temporary Compound
- Decommissioned Turbine Area
- Proposed Peat & Spoil Management Areas
- Proposed Borrow Pit
- Proposed Enhancement Area

Construction Peat & Spoil Managment Area Notes:

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

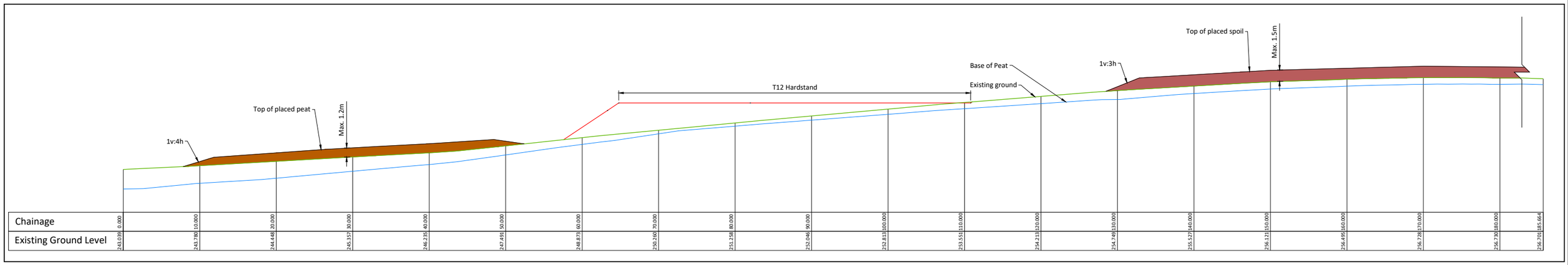
(2) A silting pond will be required at the lower side of the peat repository areas.

(3) It is important that the surface of the stored peat 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 peat repository area.

(5) All the above-mentioned general guidelines and requirements will be implemented during construction.

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



SECTION D-D

Scale 1:250

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P01	FOR INFORMATION	BDH	09.04.26
P02	FOR INFORMATION	BDH	30.06.26

PROJECT: CRUMHACH WIND FARM

CLIENT: MKO

SHEET: PEAT & SPOIL MANAGEMENT AREAS

Date: 30.06.26	Project number: P23-240	Scale (@ A1): 1:1000	
Drawn by: SK	Drawing Number: P23-240-0600-0018 (Sheet set subset 0600)		Rev: P02
Checked by: IH			

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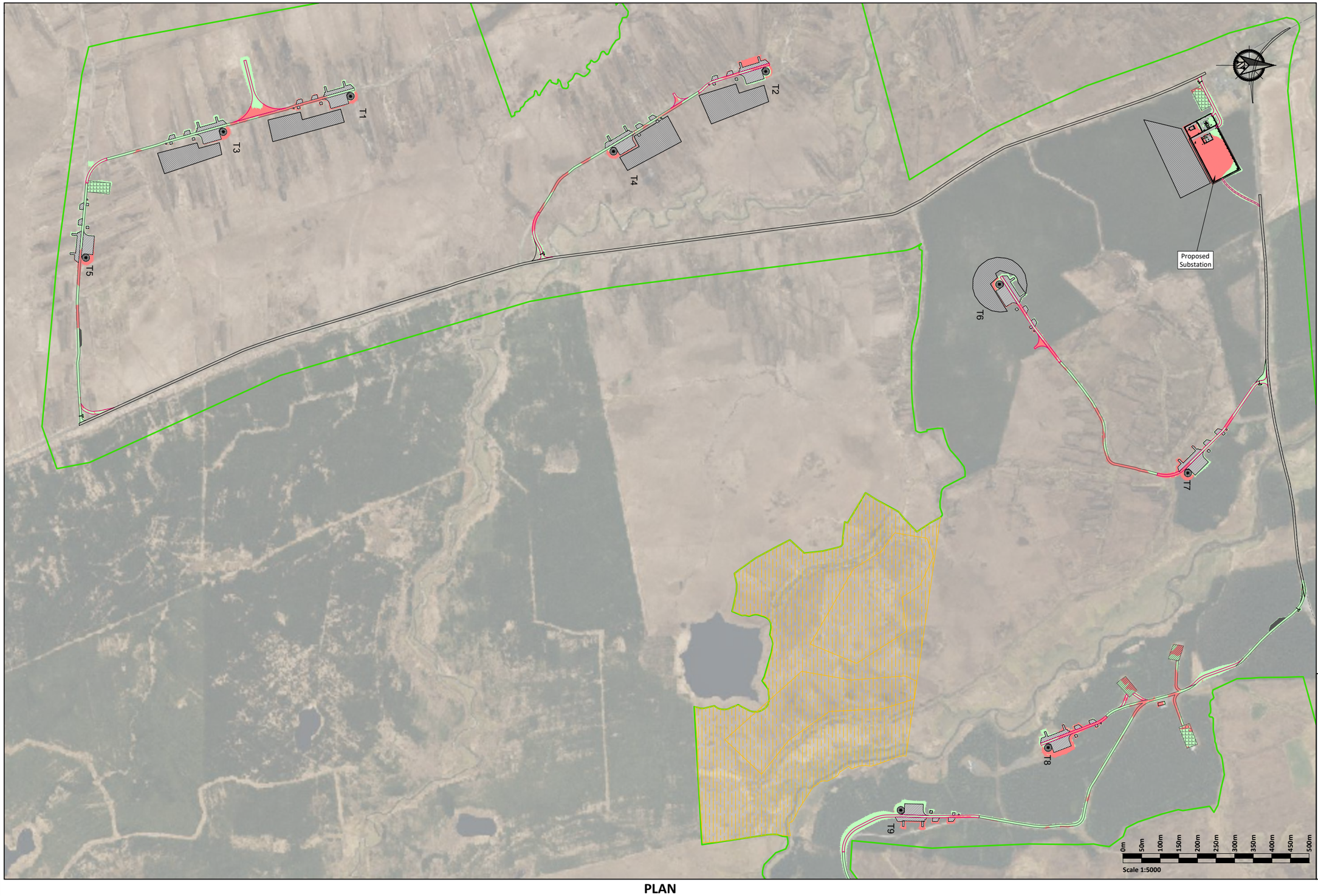
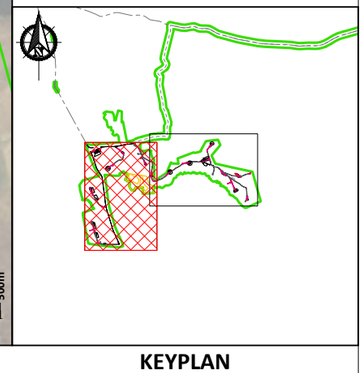
2 July 2026



Legend:

- EIAR Study Boundary
- Proposed Turbine & Hardstanding
- Proposed Access Track
- Existing Access Track to be Upgraded
- Existing Access Tracks
- Proposed Passing Bay
- Proposed Temporary Compound
- Decommissioned Turbine Area
- Proposed Peat & Spoil Management Areas
- Proposed Borrow Pit
- Proposed Enhancement Area
- Earthworks - Fill
- Earthworks - Cut



PLAN

Scale 1:5000

KEYPLAN

Scale 1:100000

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P02	FOR INFORMATION	BDH	30.06.26
P03	FOR INFORMATION	BDH	15.07.26

PROJECT

CRUMHACH WIND FARM

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SHEET

CUT FILL EARTHWORKS PLAN
SHEET 1 OF 2

Date 15.07.26	Project number P23-240	Scale (@ A1) 1:5000	
Drawn by SK	Drawing Number P23-240-0600-0019		Rev P03
Checked by IH	(Sheet set subset 0600)		

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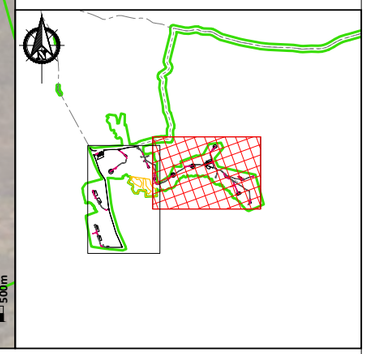
15 July 2026

Legend:

- EIAR Study Boundary
- Proposed Turbine & Hardstanding
- Proposed Access Track
- Existing Access Track to be Upgraded
- Existing Access Tracks
- Proposed Passing Bay
- Proposed Temporary Compound
- Decommissioned Turbine Area
- Proposed Peat & Spoil Management Areas
- Proposed Borrow Pit
- Proposed Enhancement Area
- Earthworks - Fill
- Earthworks - Cut



PLAN
Scale 1:5000

KEYPLAN
Scale 1:100000

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PROJECT
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SHEET
CUT FILL EARTHWORKS PLAN
SHEET 2 OF 2

Date 30.06.26	Project number P23-240	Scale (@ A1) 1:5000	
Drawn by SK	Drawing Number P23-240-0600-0020		Rev P02
Checked by IH	(Sheet set subset 0600)		

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2 July 2026

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DESIGNING AND DELIVERING
A SUSTAINABLE FUTURE

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 assumptions regarding the dig depths adopted for the cut/fill assessment for the main infrastructure elements at the Site.

The assumed excavation footprint for the turbine foundation is the turbine base diameter of 25m, plus 1m of working space around the base.

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]
T01	543507	826746	0.4	3.0	0.4	0.7
T02	543440	827861	1.5	3.0	1.5	1.8
T03	543602	826404	1.8	3.0	1.8	2.1
T04	543655	827452	2.6	3.6	2.6	2.9
T05	543940	826035	1.8	3.0	1.8	2.1
T06	544012	828489	2.8	3.8	2.8	3.1
T07	544519	828995	0.25	3.0	0.25	0.55
T08	545257	828620	0.2	3.0	0.2	0.5
T09	545425	828224	0.2	3.0	0.2	0.5
T10	546041	828377	0.5	3.0	0.5	0.8
T11	546688	828662	0.7	3.0	0.7	1.0
T12	547273	828804	1.0	3.0	1.0	1.3
T13	547412	829297	1.2	3.0	1.2	1.5
T14	547754	828352	0.5	3.0	0.5	0.8
T15	548292	828210	0.5	3.0	0.5	0.8
T16	548570	827462	0.2	3.0	0.2	0.5
T17	548194	827756	0.8	3.0	0.8	1.1
Infrastructure Element	**Easting**	**Northing**	**Average Peat Depth (m)**	**Max Dig depth for Infrastructure Element (m) [3] & [4]**		

Substation	543642	828912	0.2-2.0	2.3		
Construction Compound 1	544224	826048	1.8	Floating		
Construction Compound 2	547440	828280	2.1	Floating		
Construction Compound 3	545217	829009	0.2	0.5		
Construction Compound SS	543562	828967	1.0	Floating		

Notes

(1) Founding depths for the turbines was assumed to be the average peat depth + 1m to a competent stratum. To be confirmed at detailed design stage following confirmatory ground investigation. A minimum dig depth of 4m 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 stratum. To be confirmed at detailed design stage following confirmatory 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 stratum. To be confirmed at detailed design stage 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) 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 confirmatory ground investigation.

Access tracks

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

- 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 track on site.
- For the purpose of the assessment, it is assumed that the existing access tracks on site are 4m in width.
- There are three types of access tracks 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 track. 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 track. Assumed dig depth to competent strata for both cases are 0.3m below the base of the peat.
    - New proposed excavate & replace type access tracks – excavation work will be required. Assumed dig depth to competent strata was 0.3m below the base of the peat.
    - New proposed floating tracks – no excavation will be required.

Borrow Pits

The cut/fill assessment for the borrow pits is based on the cross-section drawings (Drawings P23-240-0600-0015 to 0017) included in this report. The borrow pits were sized to allow for the reinstatement of the excavated peat volume generated on site and to accommodate the estimated site-won stone fill requirements.

General Assumptions

A 1(v): 1(h) configuration for all temporary excavation faces was assumed for the cut & fill earthworks assessment, including in bedrock within the borrow pits. Overburden in the borrow pits will be excavated toa 1(v):2(h) slope.

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