4. DESCRIPTION OF THE PROPOSED DEVELOPMENT

4.1 Introduction

This section of the Environmental Impact Assessment Report (EIAR) describes the development and its component parts which is the subject of a proposed application for planning permission to An Bord Pleanála in accordance with Section 37(e) of the Planning and Development Act 2000, (as amended) ('the Proposed Development'). The Proposed Development comprises:

i. *26 No. wind turbines with a blade tip height of 200m and all associated hard-standing areas.*
ii. *2 No. permanent Meteorological Anemometry Masts with a height of 115 metres and removal of existing meteorological mast.*
iii. *4 No. temporary construction compounds, in the townlands of Bracklin and Grange More.*
iv. *5 No. temporary security cabins at the main construction site entrances as well as at a number of access points around the site, in the townland of Killagh, Grange More and Coolronan.*
v. *2 No. borrow pits located in Carranstown Bog, and in third party land in the townland of Craddanstown; All works associated with the opening, gravel and spoil extraction, and decommissioning of the borrow pits.*
vi. *1 No. 110 kV electrical substation, which will be constructed in the townland of Grange More. The electrical substation will have 2 No. control buildings, a 36 metre high telecom tower, associated electrical plant and equipment, a groundwater well and a wastewater holding tank. All associated underground electrical and communications cabling connecting the turbines and masts to the proposed electrical substation, including road crossings at R156 and local road between Lisclogher and Bracklin Bogs, and all works associated with the connection of the proposed wind farm to the national electricity grid, which will be to the existing Mullingar – Corduff 110 kV overhead line via overhead line.*
vii. *Provision of new internal site access roads with passing bays measuring a total length of 28km and provision/upgrade of existing/new pathways for amenity use measuring a total length of approximately 3.3km and associated drainage.*
viii. *Temporary accommodating works to existing public road infrastructure to facilitate delivery of abnormal loads at locations on the R156 and R161 in the townlands of Doolystown and Moyfeagher;*
ix. *Accommodating works to widen existing site entrances off the R156 into Ballivor and Carranstown Bogs and reopen entrances at Lisclogher and Bracklin Bogs for use as construction site entrances and to facilitate delivery and movement of turbine components and construction materials; Entrances will be used for maintenance and amenity access during the operational period;*
x. *Permanent vertical realignment of the R156 in the vicinity of the site entrance to achieve required sight lines.*
xi. *Construction of permanent site entrances off a local road into Lisclogher and Bracklin Bogs to facilitate a crossing point for turbine components and construction materials and operation/amenity access;*
xii. *Provision of amenity access using existing entrances off the R156 and local roads in the townlands of Bracklin, Coolronan, Clondalee More and Craddanstown;*
xiii. *3 No. permanent amenity carparks in Ballivor Bog (50 car parking spaces), Carranstown (15 car parking spaces) and Bracklin Bog (15 car parking spaces) and the provision of bicycle rack facilities at each location.*

xiv. *All associated site works and ancillary development including access roads, amenity pathways, drainage and signage.*
xv. *A 10-year planning permission and 30-year operational life from the date of commissioning of the entire wind farm.*

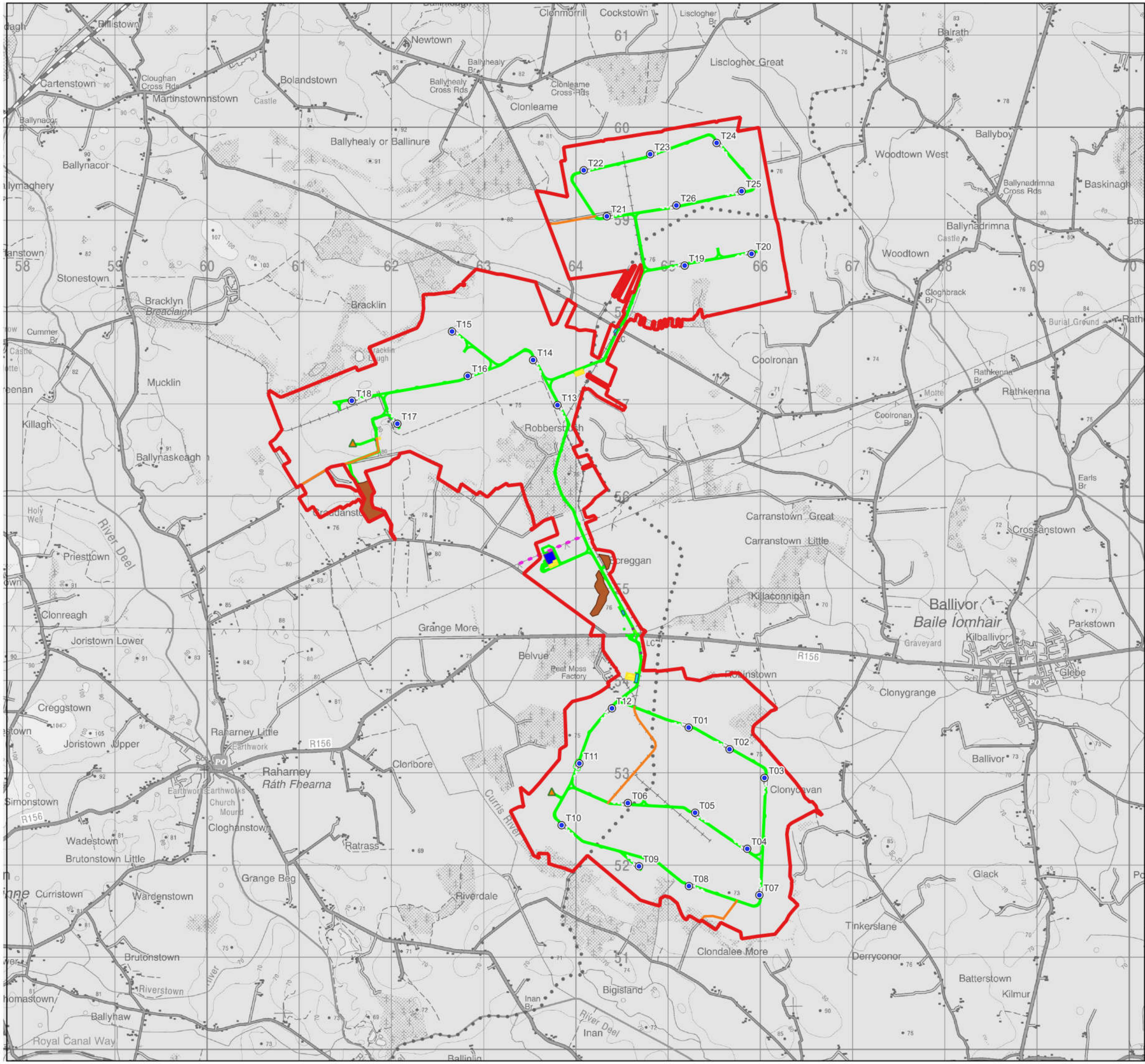
The planning application for the proposed wind farm includes connection to the national electricity grid. All elements of the proposed project, including grid connection and any works required on public roads to accommodate turbine delivery, have been assessed as part of this EIAR.

This application seeks a ten-year planning permission and 30-year operational life from the date of commissioning of the entire wind farm.

4.2 Development Layout

The layout of the Proposed Development has been designed to minimise the potential environmental effects of the wind farm, while at the same time maximising the energy yield of the wind resource passing over the site. A constraints study, as described in Chapter 3: Consideration of Reasonable Alternatives, has been carried out to ensure that turbines and ancillary infrastructure are sited in the most appropriate areas of the site.

The overall layout of the Proposed Development is shown on Figure 4-1. This drawing shows the proposed locations of the wind turbines, electricity substation, construction compounds, borrow pits internal roads layout and the site entrances. Detailed site layout drawings of the Proposed Development are included in Appendix 4-1 to this EIAR.



Map Legend

- Wind Farm Site Boundary
- Proposed Turbine Locations
- Proposed Substation Location
- Proposed Met Mast Locations
- Proposed Internal Roads
- Proposed Grid Connection
- Proposed Construction Compounds
- Proposed Borrow Pit Locations
- Proposed Amenity Paths
- Amenity Carparks
- Proposed Security Cabins

Drawing Title Wind Farm Site Layout	
Project Title Proposed Ballivor Wind Farm	
Drawn By DOS	Checked By KM
Project No. 191137	Drawing No. Figure 4-1
Scale 1:40,000	Date 2023-03-08

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4.3 Development Components

4.3.1 Wind Turbines

4.3.1.1 Turbine Locations

The proposed wind turbine layout has been optimised using wind farm design software (a combination of WAsP and WindPro) to maximise the energy yield from the site, while maintaining sufficient distances between the proposed turbines to ensure turbulence and wake effects do not compromise turbine performance. The ITM Grid Reference coordinates of the proposed turbine locations are listed in Table 4-1 below. The final ground level of the turbine foundations will be determined by the actual ground conditions at each proposed turbine location and may differ slightly from those levels listed in Table 4-1.

Table 4-1 Proposed Wind Turbine Locations and Elevations

Turbine	ITM X	ITM Y	Top of Foundation Levels metre OD
1	665162	753511	75.3
2	665604	753275	73.9
3	665983	752965	73.9
4	665796	752196	72.6
5	665231	752587	73.1
6	664502	752692	72.2
7	665928	751694	72.4
8	665164	751792	72.9
9	664623	752007	74.4
10	663783	752452	74.1
11	663976	753121	75.0
12	664329	753719	78.1
13	663739	757007	73.8
14	663474	757496	74.9
15	662595	757805	78.1
16	662765	757323	74.9
17	662002	756804	79.0
18	661508	757054	77.0

19	665118	758520	73.3
20	665844	758647	73.2
21	664274	759054	73.3
22	664023	759553	75.2
23	664744	759727	75.0
24	665464	759850	75.1
25	665735	759326	73.9
26	665028	759172	73.5

4.3.1.2 Turbine Type

Wind turbines use the energy from the wind to generate electricity. A wind turbine, as shown in Plate 4-1 below, consists of four main components:

- Foundation unit;
- Tower;
- Nacelle (turbine housing);
- Rotor.
- 3 no. blades

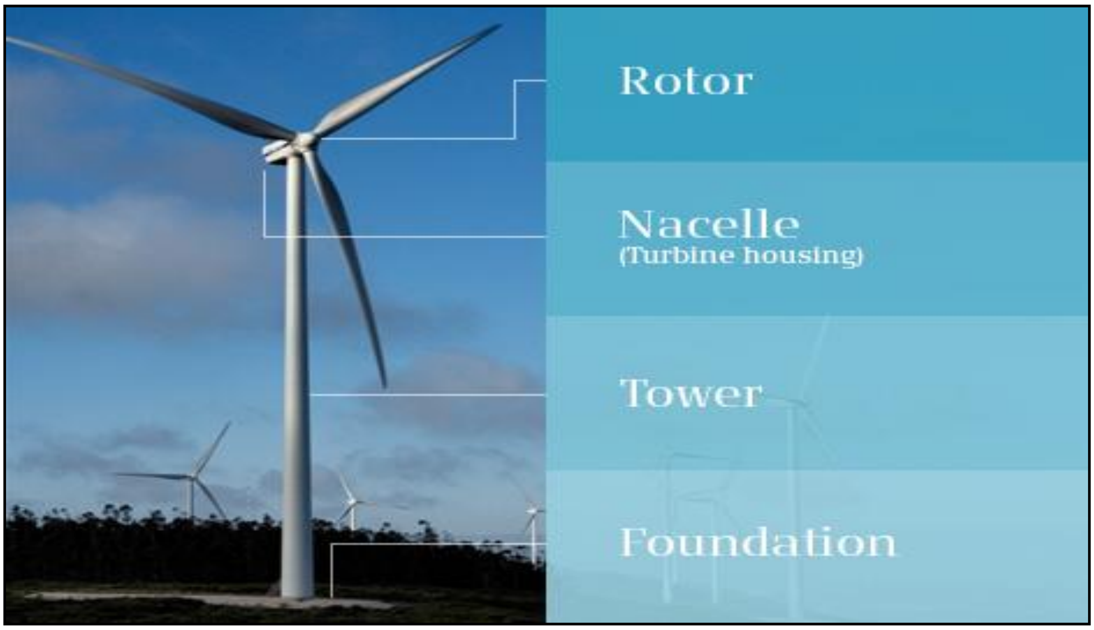


Plate 4-1 Wind Turbine Components

The proposed wind turbines to be installed on the site will have a ground-to-blade tip height, hub height and blade length within the following, limited, ranges:

- Turbine Tip Height –200 metres
- Hub Height –115 metres
- Blade Rotor Diameter: - 170 metres

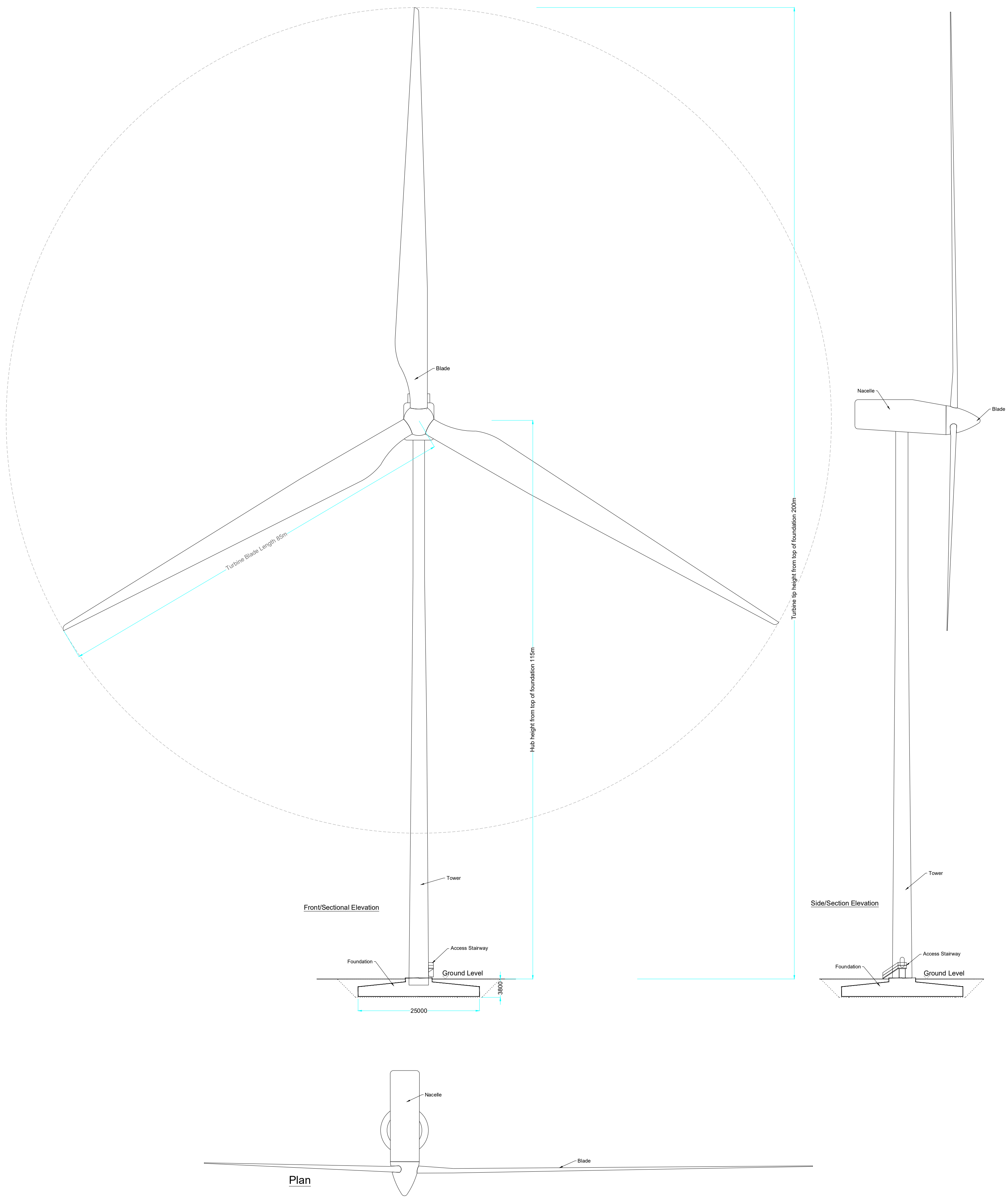
Modern wind turbines from the main turbine manufacturers have evolved to share a common appearance and other major characteristics. The wind turbines that will be installed on the site will be conventional three-blade turbines, which will be geared to ensure the rotors of all turbines rotate in the same direction at all times.

It should also be noted that the assessment of the development footprint of the Ballivor Wind Farm project within this EIAR, is based on the maximum potential footprint for all of the infrastructural elements. This precautionary approach is taken as the assessment of the maximum development footprint will, in the absence of mitigation measures, give rise to the greatest potential for significant effects. Should the development footprint be less than the maximum, the potential for significant effects will also be reduced.

The turbines will be multi-ply coated to protect against corrosion. It is proposed that the turbines would be of an off-white or light grey colour to blend into the sky background. This minimises visual impact as recommended by the following guidelines on wind energy development:

- *Wind Farm Development – Guidelines for Planning Authorities, Department of the Environment, Heritage and Local Government (DoEHLG, 2006);*
- *The Influence of Colour on the Aesthetics of Wind Turbine Generators (ETSU, 1999).*

A drawing detailing the proposed wind turbine is shown in Figure 4-2. The individual components of a geared wind turbine nacelle and hub are shown in Figure 4-3 below. Wind turbine without a gearbox (i.e. direct drive) turbines may also be considered for use in the Proposed Development. This will have no impact on the external design.



Drawing Notes

1. Proposed wind turbines to have a maximum ground to blade tip height of up to 200m.
2. Exact make and model of the turbine to be dictated by a competitive tender process.
3. Ground level represents the top of turbine foundation.

Figure 4-2	
DRAWING TITLE: **Wind Turbine Elevations & Plan**	
PROJECT TITLE: Ballivor Wind Farm, Co. Meath & Co. Westmeath	
DRAWING BY: **Joseph O Brien**	CHECKED BY: **Karen Mulryan**
PROJECT No.: **191137**	DRAWING No.: **191137 - 55**
SCALE: **1:500 @A1**	DATE: **28.03.2023**

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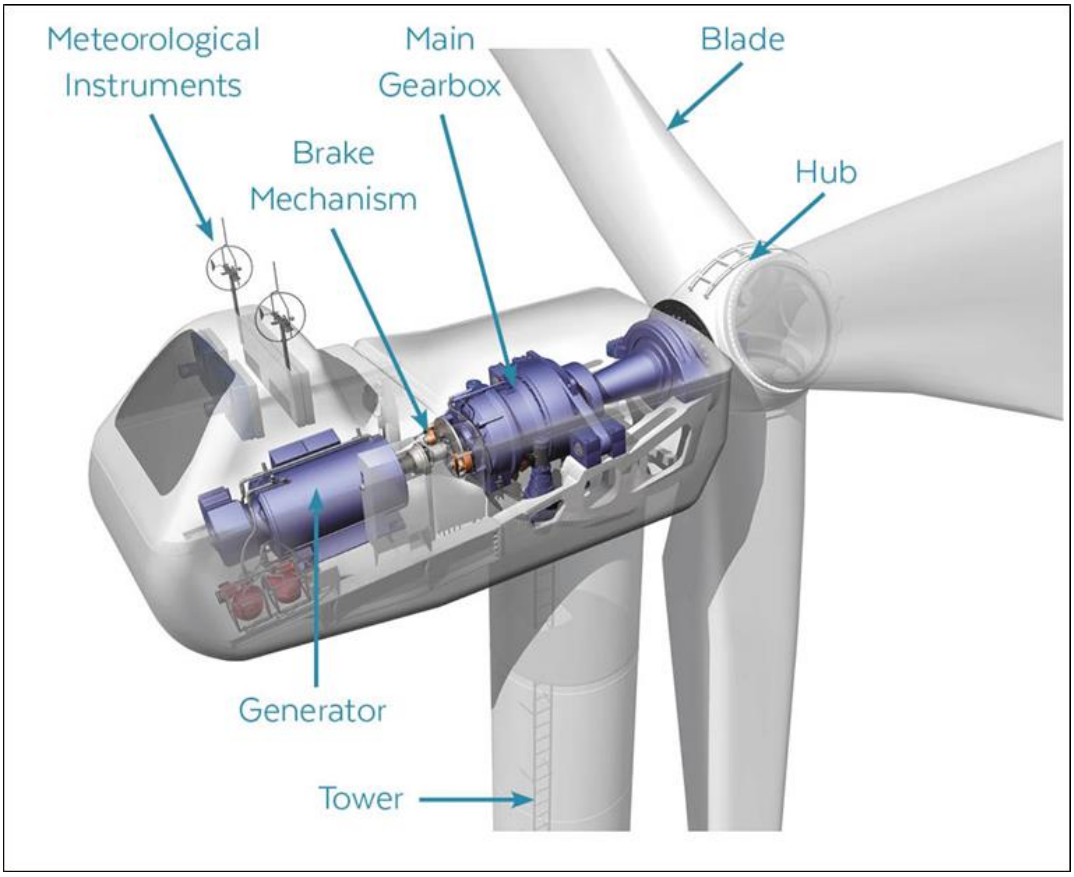


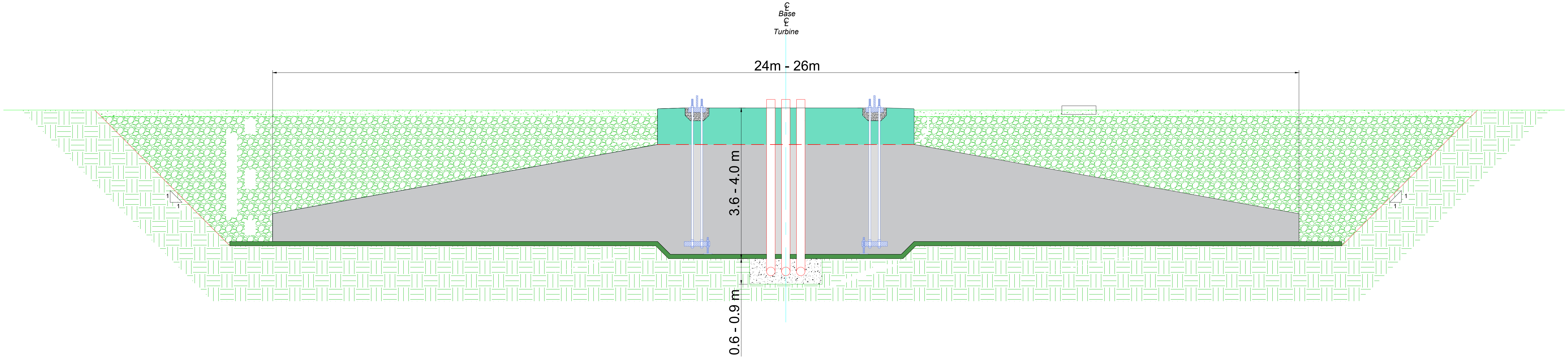
Figure 4-3 Turbine nacelle and hub components

4.3.1.3 Turbine Foundations

Turbine foundations are constructed by excavating peat and soil to sub-formation level. Imported structural fill and blinding is placed and compacted to formation level. A reinforced concrete base is cast in-situ. The turbine foundation transmits any load on the wind turbine into the ground. The approximate horizontal and vertical extent of the turbine foundation will be 26m and 4m respectively, which has been assessed in the EIAR. The top of the base is referred to as 'Top of Foundation Level'. Where ground conditions are unfavourable to excavate and replace, piles will be installed to formation level. Please see Figure 4-4, Figure 4-5 and Figure 4-6 for gravity, bored and piled foundations.

The size of the concrete foundation will be approximately 25 m in diameter, based off current models of this scale, but will depend on the loads specified by the turbine manufacturer selected from the competitive tender process. Please see Figure 4-2 for turbine foundations. After the formation level has been reached, the bottom section of the turbine tower "Anchor Cage" is levelled and reinforcing steel is built up around and through the anchor cage (Plate 4-2 below). The outside of the foundation is shuttered with formwork to allow the pouring of concrete and is backfilled with granular fill to finished surface level (Plate 4-3 below).

Section A-A
Scale 1:100



Plan
Scale: 1:200

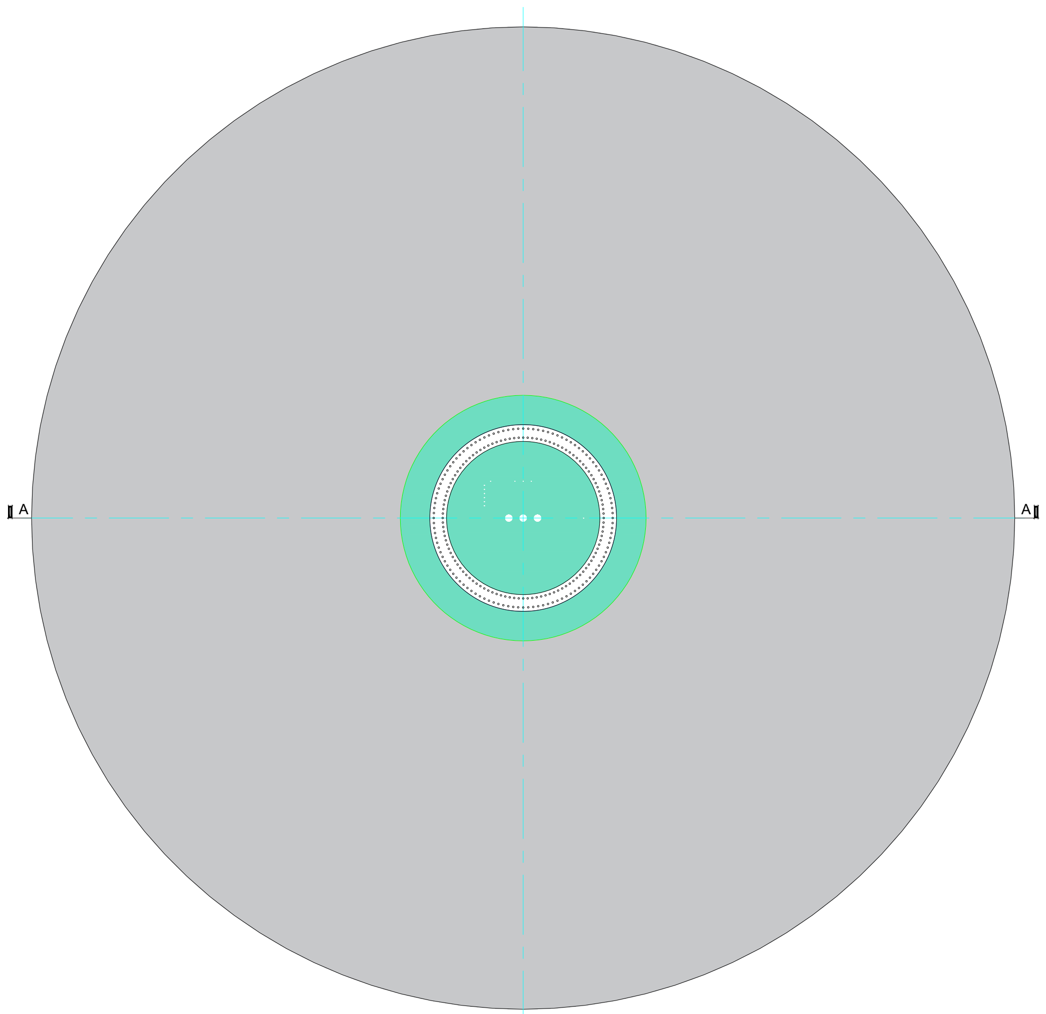


Figure 4-4

DRAWING TITLE:
Gravity Foundations Details

PROJECT TITLE: Ballivor Wind Farm, Co. Meath & Co. Westmeath	
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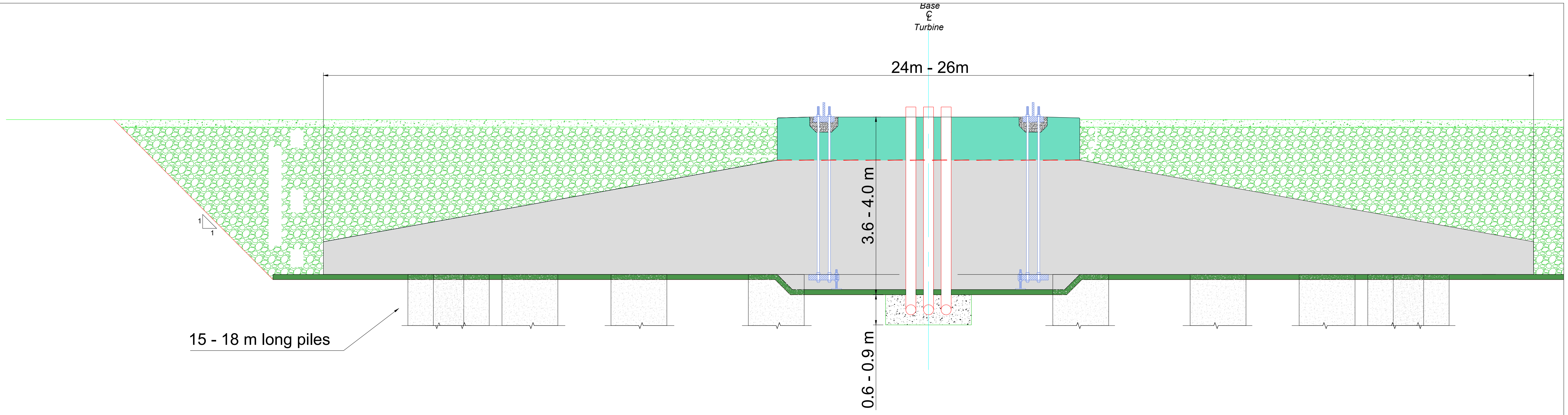

Plan
Scale: 1:200

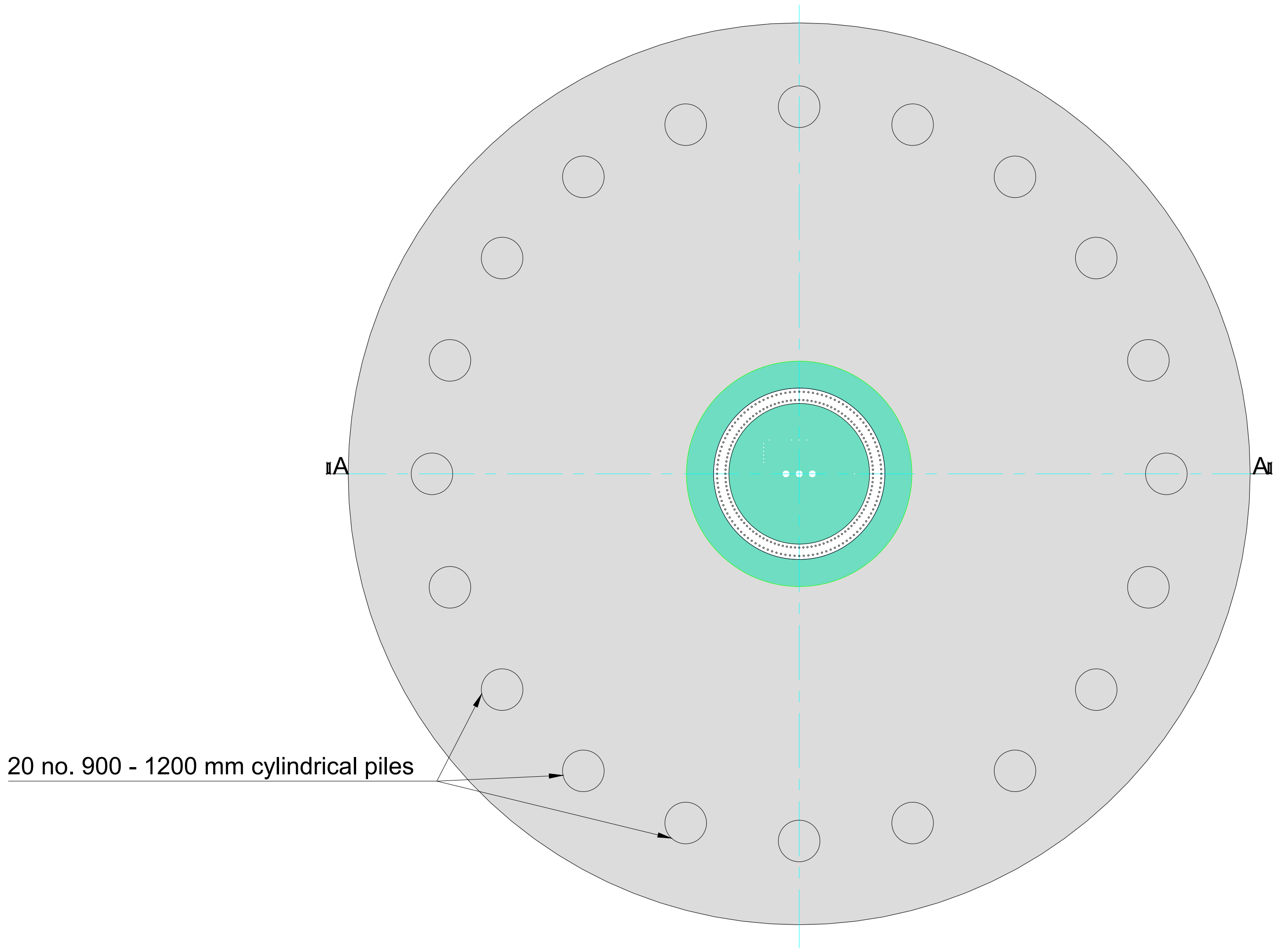

Figure 4-5

DRAWING TITLE: **Bored Pile Foundations Details**	
PROJECT TITLE: Ballivor Wind Farm, Co. Meath & Co. Westmeath	
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SCALE: As Shown @A3	DATE: 23.03.2023

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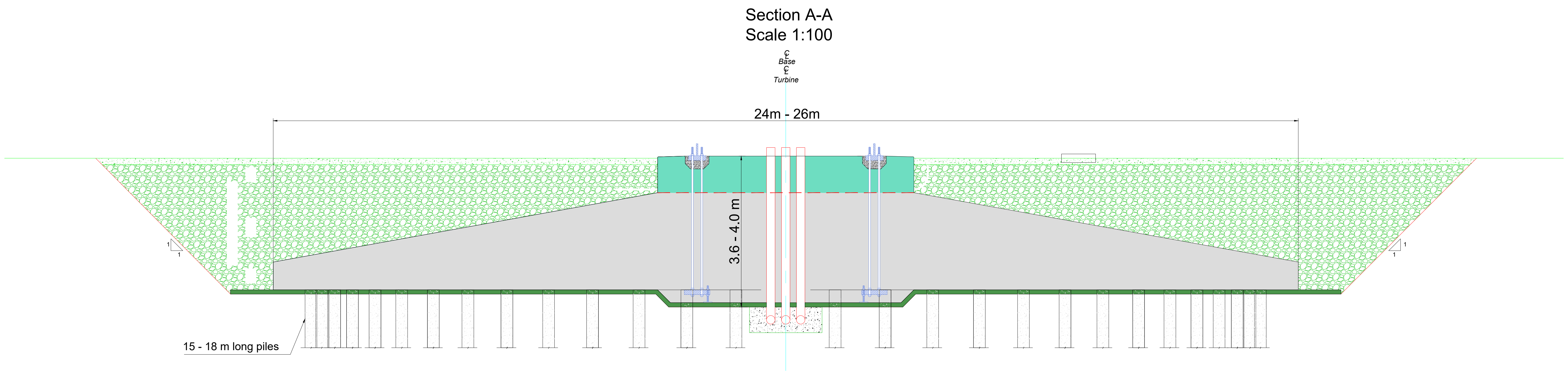

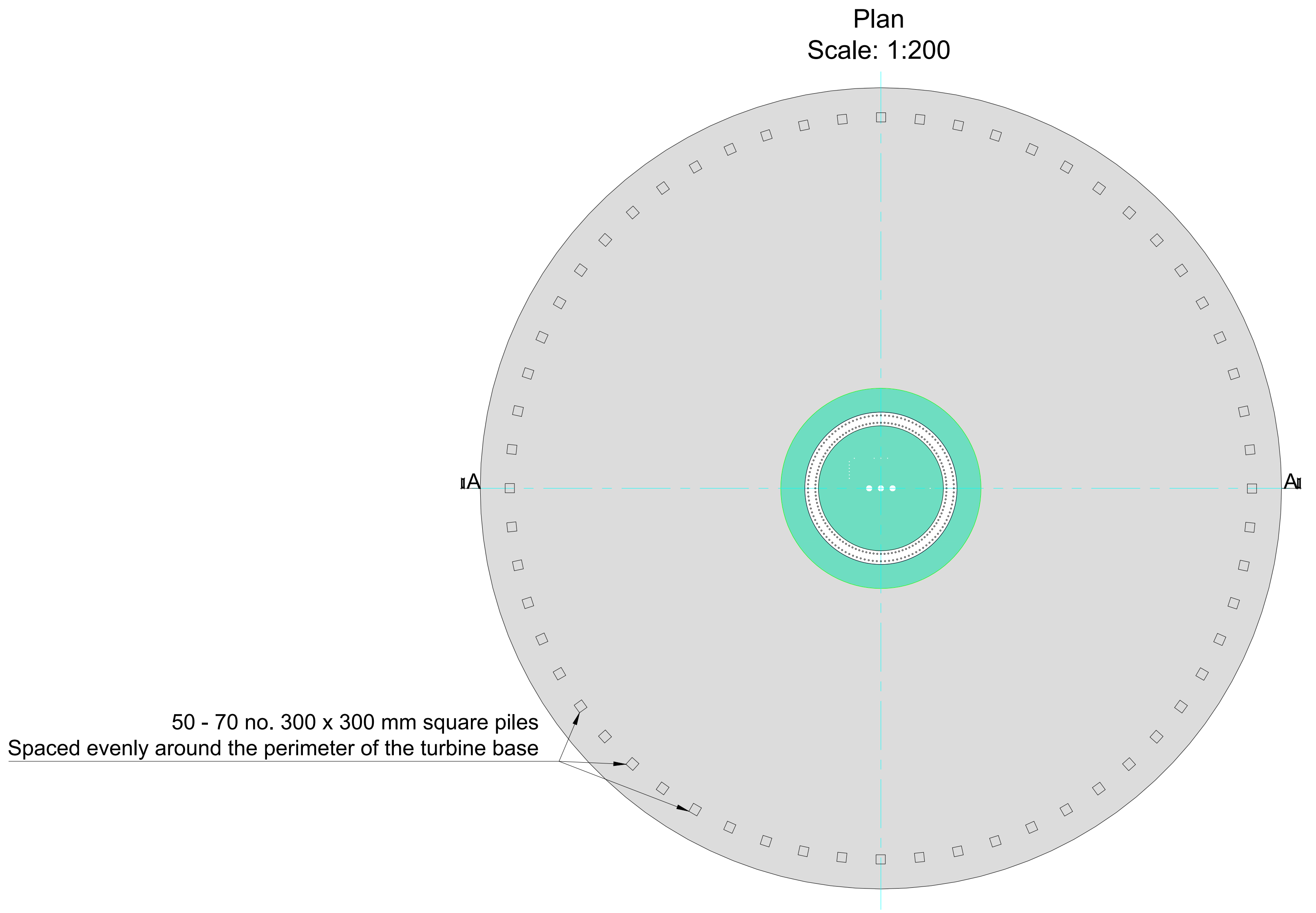

Figure 4-6

DRAWING TITLE:
Driven Pile Foundations Details

PROJECT TITLE: Ballivor Wind Farm, Co. Meath & Co. Westmeath

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Plate 4-2 Turbine Base Anchor Cage

Plate 4-3 Finished Turbine Base

4.3.1.4 Hard Standing Areas

Hard standing areas consisting of levelled and compacted granular fill are required around each turbine base to facilitate access, turbine assembly and turbine erection. The hard-standing areas are typically used to accommodate cranes used in the assembly and erection of the turbine, offloading and storage of turbine components, and generally provide a safe, level working area around each turbine position. The hard-standing areas are extended to cover the turbine foundations once the turbine foundation is in place. The sizes, arrangement and positioning of hard standing areas are dictated by turbine suppliers. The hard-standing area is intended to accommodate a crane during turbine assembly and erection. The proposed hard standing areas are shown on Figure 4-2. The layout represents the full extent of the hard standing areas but may be subject to optimisation according to the turbine supplier's requirements.

4.3.1.5 Assembly Area

Levelled assembly areas will be located on either side of the hard-standing area as shown on Figure 4-2. These assembly areas are required for offloading turbine blades or turbine blade segments, tower sections and hub from trucks until they are ready to be lifted into position by cranes and to assist the main crane during turbine assembly. The exact location and arrangement of assembly areas will be determined in consultation with the selected turbine manufacturer; however, they will be contained within the areas assessed in this EIAR.

4.3.1.6 Power Output

Turbines of the exact same make and dimensions can also have different power outputs depending on the capacity of the electrical generator installed in the turbine nacelle. The range of turbine dimensions already identified will result in a range of power outputs. The resulting individual turbine output will range from 4.5 MW to 6.5 MW. This is considered throughout the EIAR. For the purposes of the power output, a rated output of range has been chosen to calculate the output of the proposed 26-turbine wind farm, which would result in an estimated installed capacity of (117 MW to 169 MW).

Based on an installed capacity range, the Proposed Development therefore has the potential to produce between 300,302 to 433,769 MWh (Megawatt hours) of electricity per year, based on the following calculation:

A x B x C = Megawatt Hours of electricity produced per year

where: A = The number of hours in a year: 8,760 hours

B = The capacity factor, which takes into account the intermittent nature of the wind, the availability of wind turbines and array losses etc. A capacity factor of 28.7%[1] is applied here and corresponds to the average wind capacity factor for the period 2015-2021. Wind Capacity factor for 2022 is not available yet.

C = Rated output of the wind farm: 117 to 169 MW

The MWh of electricity produced by the Proposed Development would be sufficient to supply a range of approximately 70,036 to 101,163 Irish households with electricity per year, based on the average Irish household using 4.2 MWh of electricity (this latest figure is available from the March 2017 CER Review of Typical Consumption Figures Decision)[2].

[1] *Energy in Ireland 2022 Report (Table 34) (SEAI, December 2022). Report available at: https://www.seai.ie/publications/Energy-in-Ireland-2022.pdf.*
[2] *Commission for Regulation of Utilities 2017: Review of Typical Consumption Figures – Decision Paperhttps://www.cru.ie/document_group/review-of-typical-consumption-figures-decision-paper/*

4.3.1.7 Segmented Blades

The wind farm has been designed to accommodate turbines with a blade length of 85m. The designated turbine delivery haul route allows for turbine blade segments of up to 76m and therefore segmented blade technology is proposed for turbines with a blade length of 85m. Whilst the specific turbine will be selected at procurement stage, the haul route assessment has considered a range of segment blade lengths that would be applicable for a turbine with a blade length of up to 85m. Based on a maximum possible segment length of 76m, the delivery scenario is the transfer of a 85m blade delivered to site in 2 segments over 2 no. deliveries, with the longer segment being up to 76m (expected range being 60-70m) and the shorter segment being up to 20m (expected range being 10-20m). These segment lengths are based on the segmented blade technologies currently available on the market, such as the LM 77.4m P blade from General Electric, which is supplied in two segments, a 65.4m root and a 12m tip[3]; however, the exact segment lengths with be determined at procurement based on available options on the market at the time.

Segmented blade technology, whilst not new, is a developing market gaining popularity with suppliers. It allows suppliers to offer longer blades which reduce the cost of energy, whilst also providing for flexibility of site access and reduced transport costs and off-site upgrade areas, compared to other options such as blade lifters. Typically, segmented blades are split into a longer root segment and a shorter tip segment, the two of which are mechanically assembled onsite; however, segments can also be split into a shorter root and longer tip or can include hub and root extenders. Further details on the segmented blade options can be found in the review paper 'The Concept of Segmented Wind Turbine Blades: A Review' by Peeters et al, 2017[4].

4.3.2 Site Roads

4.3.2.1 Road Construction Types

To provide internal access to the development site to connect the wind turbines and associated infrastructure, approximately 28 kilometres of internal access roads will need to be constructed. Fehily Timoney & Company Ltd. (FTC) were appointed to assess the existing ground conditions and specify the type of road required to access all locations on site. The road construction preliminary design has taken into account the following key factors as stated in the FTC Peat and Spoil Management Plan in Appendix 4-2:

1. *Buildability considerations*
2. *Serviceability requirements for construction and wind turbine delivery and maintenance vehicles*
3. *Minimise excavation arisings*
4. *Requirement to minimise disruption to peat hydrology*

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

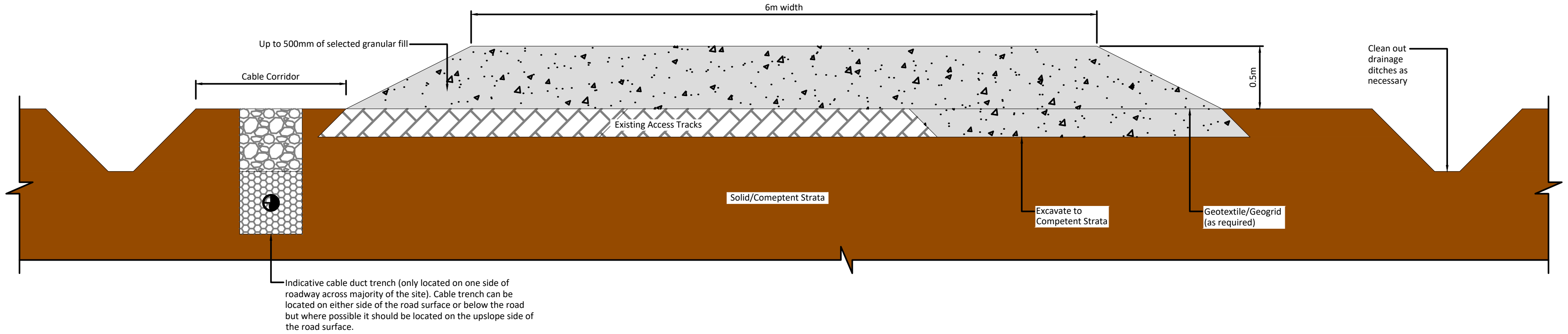
The road construction techniques to be considered are as follows:

---

[3] Details can be seen at https://www.windenergy.org.nz/store/doc/GE-Cyprus-5MW-and-product-overview_Chris-Holsonback-GE.pdf.
[4] *Peeters, M.; Santo, G.; Degroote, J.; Paepegem, W.V. The Concept of Segmented Wind Turbine Blades: A Review.* Energies *2017,* 10*, 1112. https://doi.org/10.3390/en10081112.*

- Construction of New Floating Roads over peat (majority)
- Construction of New Excavated Roads through peat

The construction techniques proposed to be used for the new roads across the site are shown in the FTC Peat and Spoil Management Plan and are included in Section 4.8 below. Cross sections of the road types listed above are shown in Figures 4-7 to Figure 4-10. The construction methodology for each road type is included in Section 4.8 below.



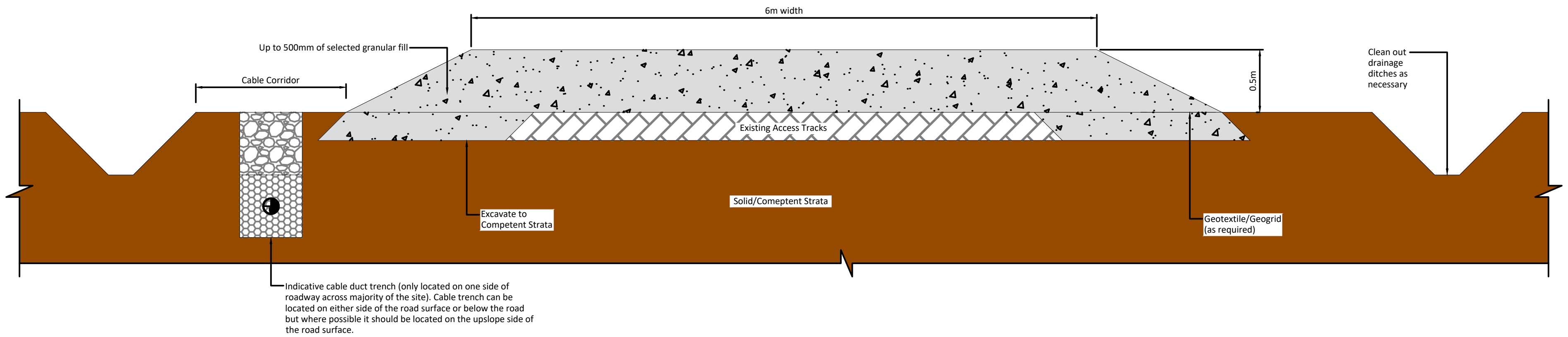


Figure 4-7

DRAWING TITLE:
Upgrade of Existing Excavated Access Roads

PROJECT TITLE:
Ballivor Wind Farm, Co. Meath & Co. Westmeath

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PROJECT No.: 191137	DRAWING No.: 191137 – 59
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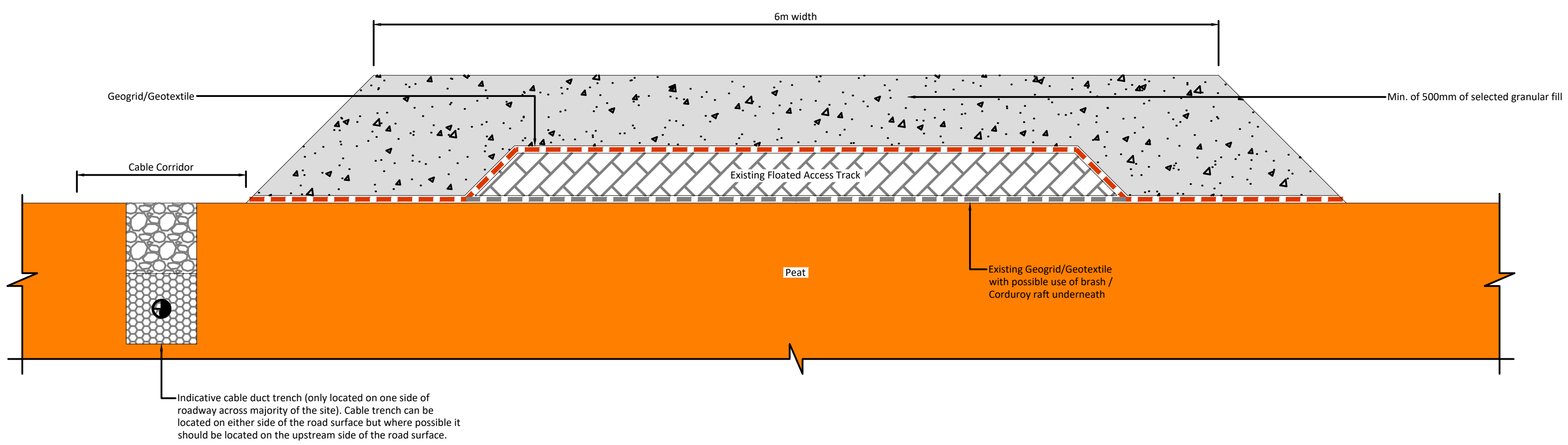

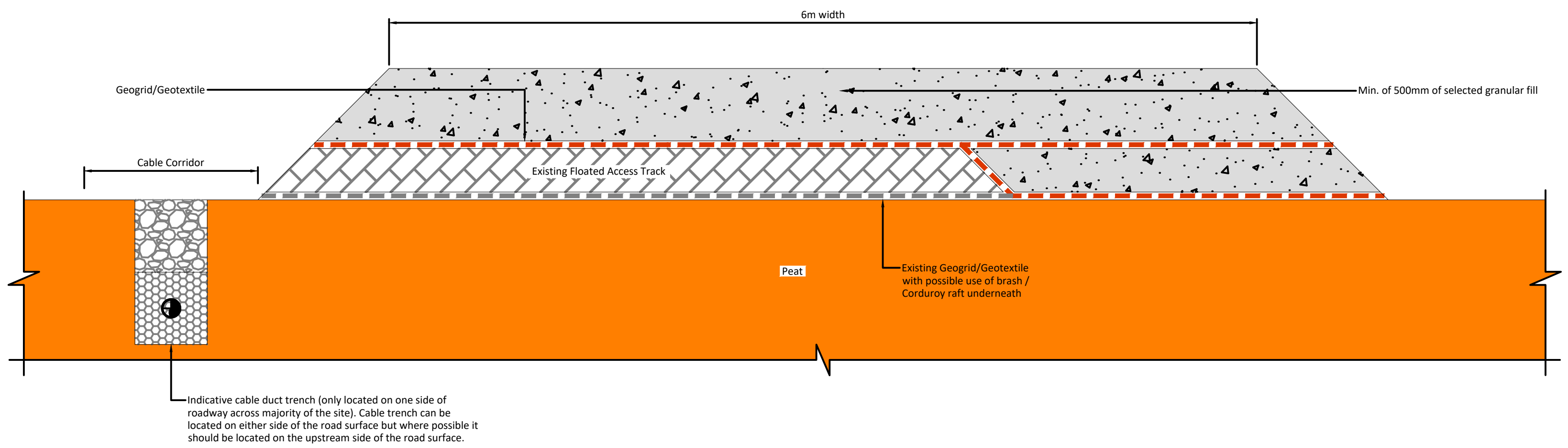

Figure 4-8

DRAWING TITLE:
Upgrade of Existing Floated Access Roads

PROJECT TITLE:
Ballivor Wind Farm, Co. Meath & Co. Westmeath

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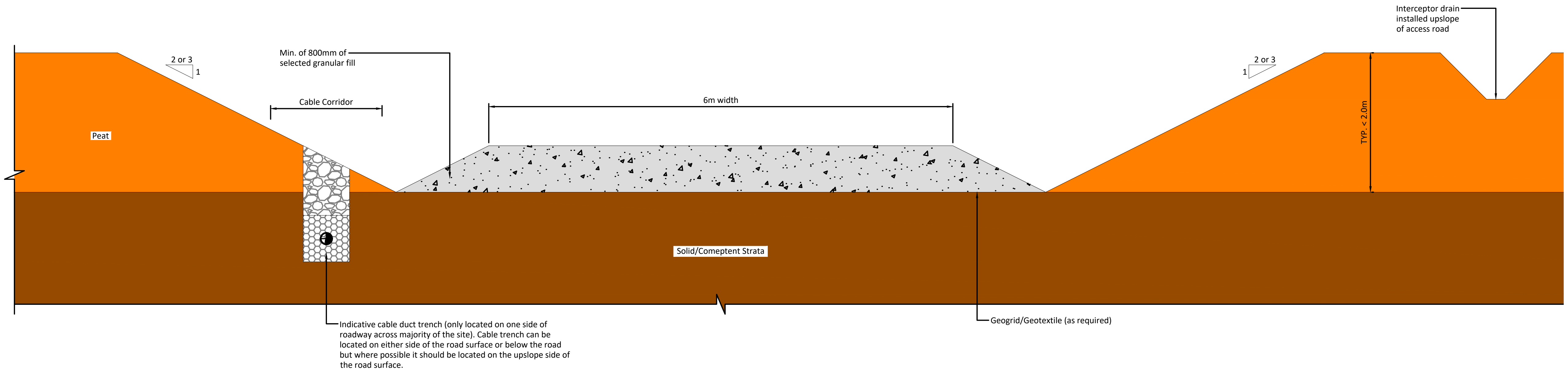

Figure 4-9

DRAWING TITLE:

New Excavate and Replace Access Road

PROJECT TITLE:

Ballivor Wind Farm, Co. Meath & Co. Westmeath

DRAWING BY: POR	CHECKED BY: IH
PROJECT No.: 191137	DRAWING No.: 191137 – 61
SCALE: 1:50 @ A3	DATE: 23.03.2023
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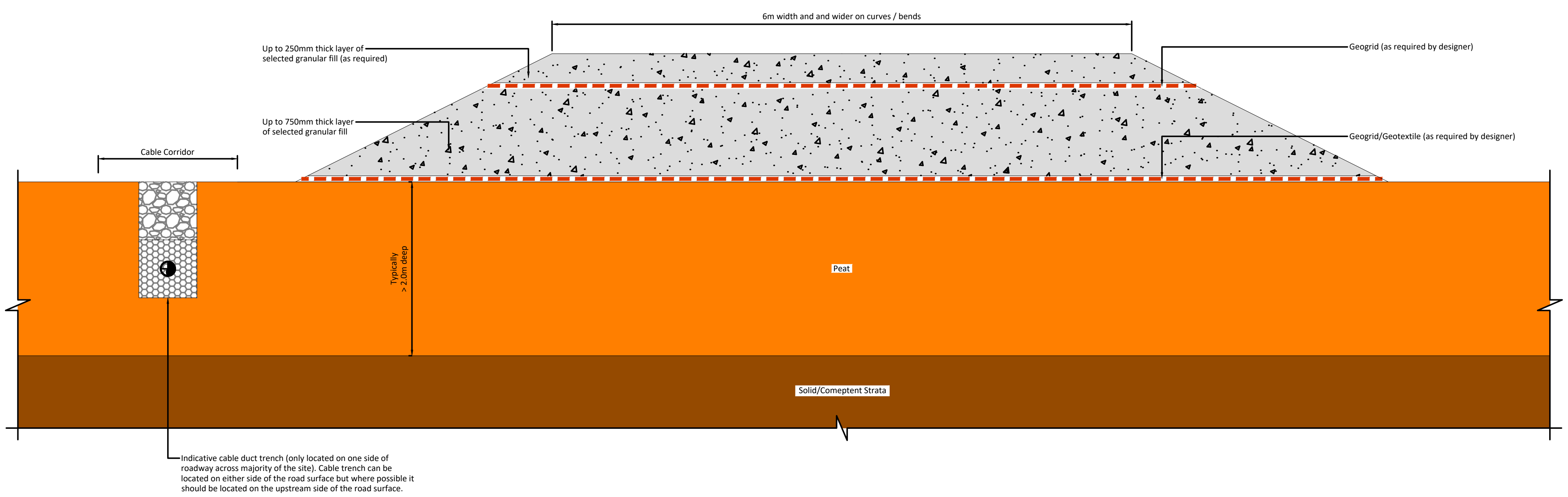

Figure 4-10

DRAWING TITLE:
New Floating Access Road

PROJECT TITLE:
Ballivor Wind Farm, Co. Meath & Co. Westmeath

DRAWING BY: POR	CHECKED BY: IH
PROJECT No.: 191137	DRAWING No.: 191137 – 62
SCALE: 1:50 @ A3	DATE: 23.03.2023
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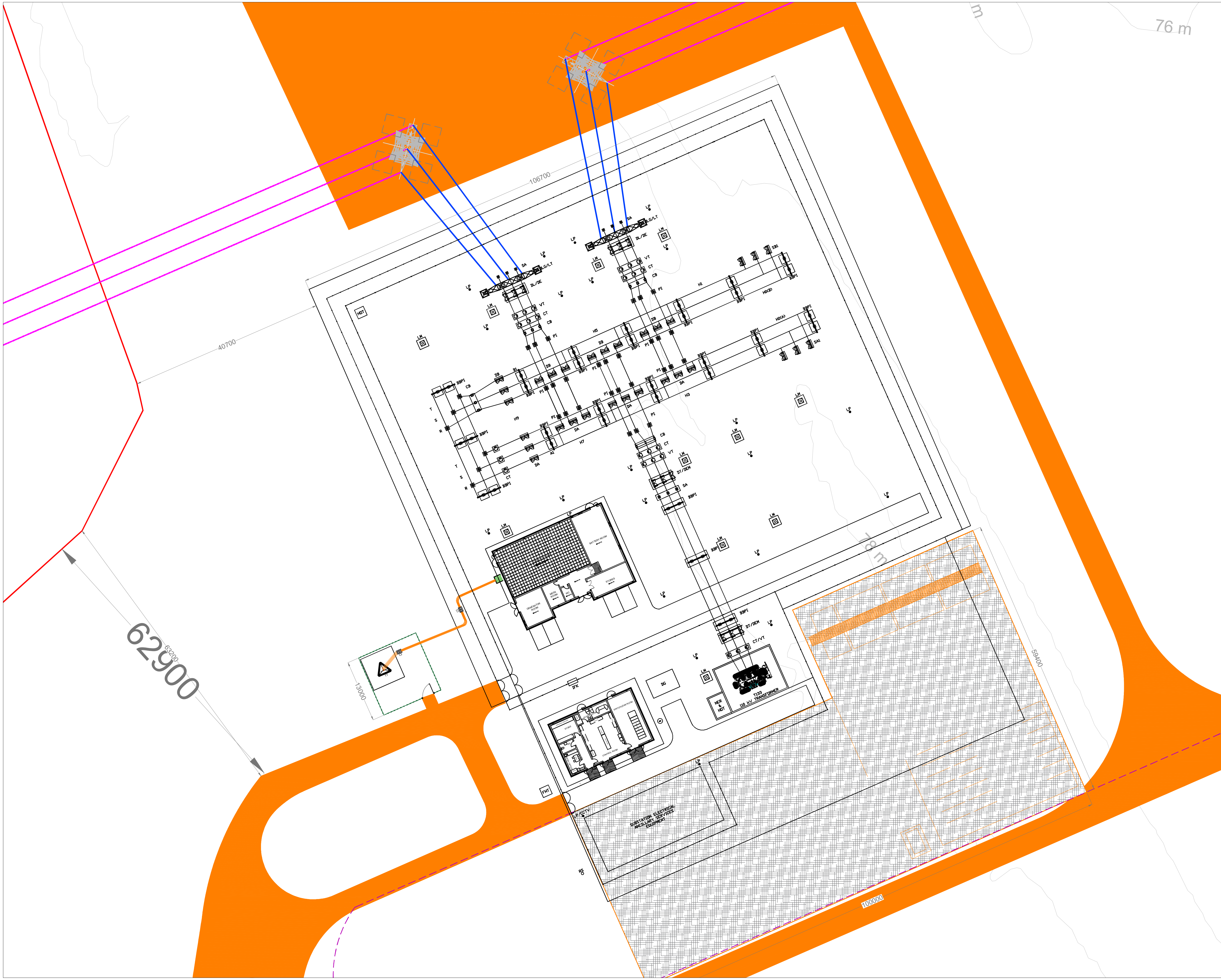
4.3.3 Electricity Substation

It is proposed to construct a 110 kV electricity substation within the site of the Proposed Development as shown in Figure 4-1. The proposed substation site is located in the northwest of Carranstown Bog, in the townland of Grange More within proximity to the existing Mullingar- Corduff 110 kV overhead line which traverses the site. The construction and exact layout of electrical equipment in the onsite electricity substation will be to Eirgrid networks specifications and will be under the ownership of ESB Networks. Access to the substation will be from the R156 to facilitate Eirgrid and ESB Networks during the operational period of the Ballivor Wind Farm and beyond. Upon decommissioning of the wind farm, the 110kV substation within Carranstown Bog will remain insitu and form part of the national grid infrastructure.

The footprint of the proposed onsite electricity substation compound measures approximately 11,600 $m.^2$ It will include two control buildings, a 36m telecom tower (Figure 4-16) and the electrical components necessary to consolidate the electrical energy generated by each wind turbine and export that electricity from the wind farm to the national grid. Further details regarding the connection of the onsite substation to the national electricity grid are provided in Section 4.3 and 4.8 below.

The layout of the proposed onsite substation is shown on Figure 4-11. Sections and elevations of the proposed substation are shown in Figure 4-12. The substation compound will be surrounded by an approximately 2.6-metre-high steel palisade fence as shown in Figure 4-13 (or as otherwise required by Eirgrid), and internal fences will also segregate different areas within the main substation. The construction and exact layout of electrical equipment in the onsite electricity substation will be to Eirgrid networks specifications.



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7. All dimensions in millimeters unless otherwise stated.
8. Electrical cable trench location will be constructed as per engineer specifications

Drawing Legend

- Planning Application Boundary
- Proposed Road
- Electrical Cable Trench

N

Figure 4-11

DRAWING TITLE: **Substation Layout**	
PROJECT TITLE: **Ballivor Wind Farm, Co. Meath & Co. Westmeath**	
DRAWING BY: **Joseph O Brien**	CHECKED BY: **Karen Mulryan**
PROJECT No.: **191137**	DRAWING No.: **191137 - 70**
SCALE: **1:500 @ A2**	DATE: **23.03.2023**
OS SHEET No.: 2635, 2636, 2637, 2638, 2705, 2706, 2707, 2708, 2774, 2775, 2776, 2777, 2842, 2843, 2844, 2845	

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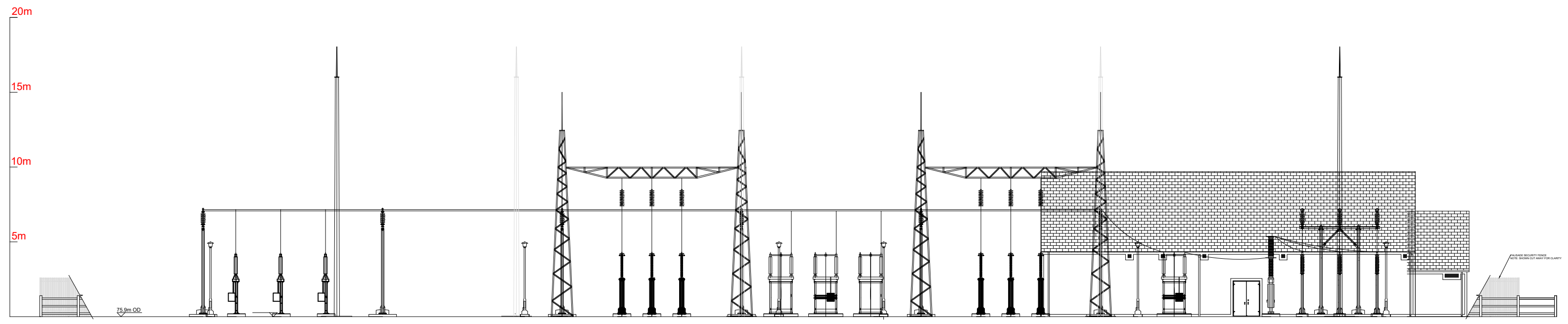
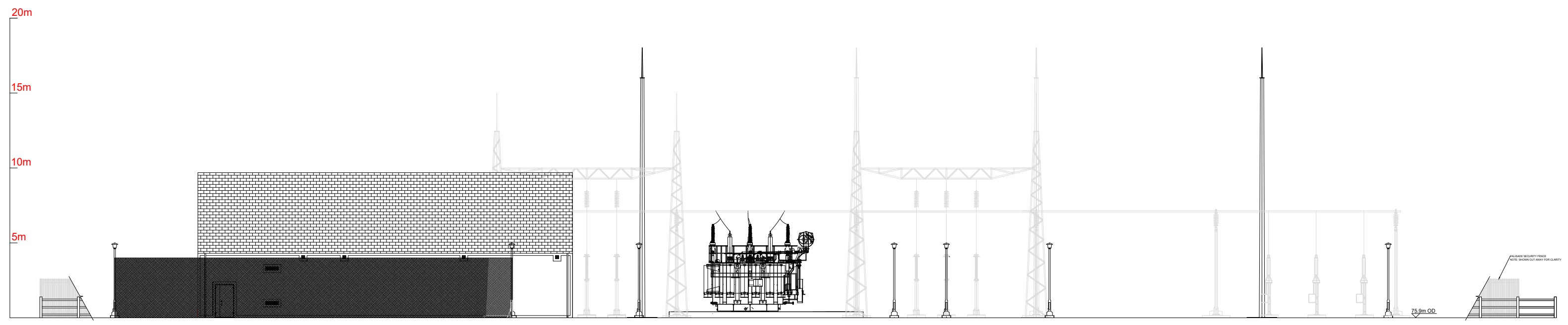
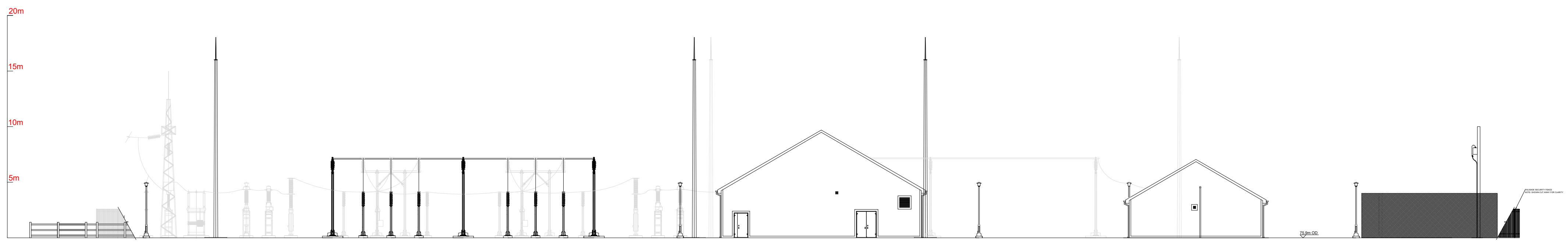


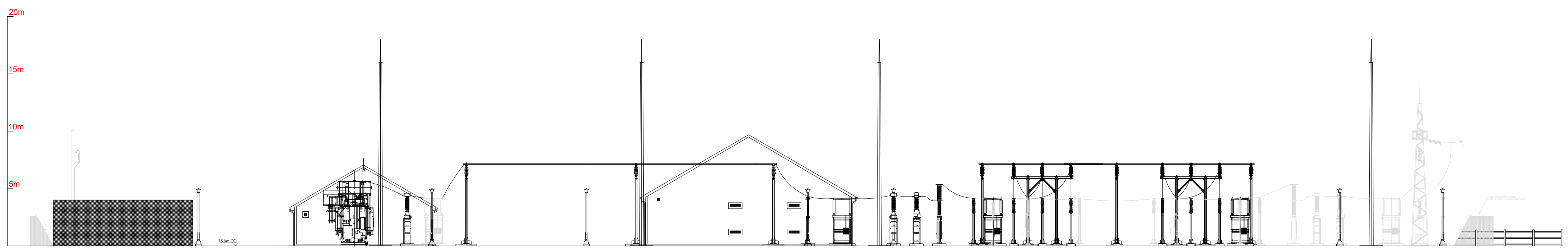
SECTION VIEW A - A



SECTION VIEW B - B



SECTION VIEW C - C



SECTION VIEW D - D

NOTES:

1. ALL DIMENSIONS NOTED ARE IN MM
2. DRAWING IS FOR PLANNING PURPOSES ONLY
3. POSITION AND QUANTITIES OF LIGHTNING MASTS & LAMP POSTS ARE INDICATIVE AND SUBJECT TO CHANGE DURING DETAILED DESIGN PHASE
4. POSITION OF 110 kV AIS EQUIPMENT IS SUBJECT TO CHANGE DURING DETAILED DESIGN PHASE
5. RURAL SUPPLY POSITION INDICATIVE. FINAL POSITIONING TO BE AGREED WITH ESB NETWORKS.
6. USE OF LINE TRAPS FOR OVERHEAD LINE CONNECTION IS TO BE CONFIRMED BY SYSTEM OPERATOR.

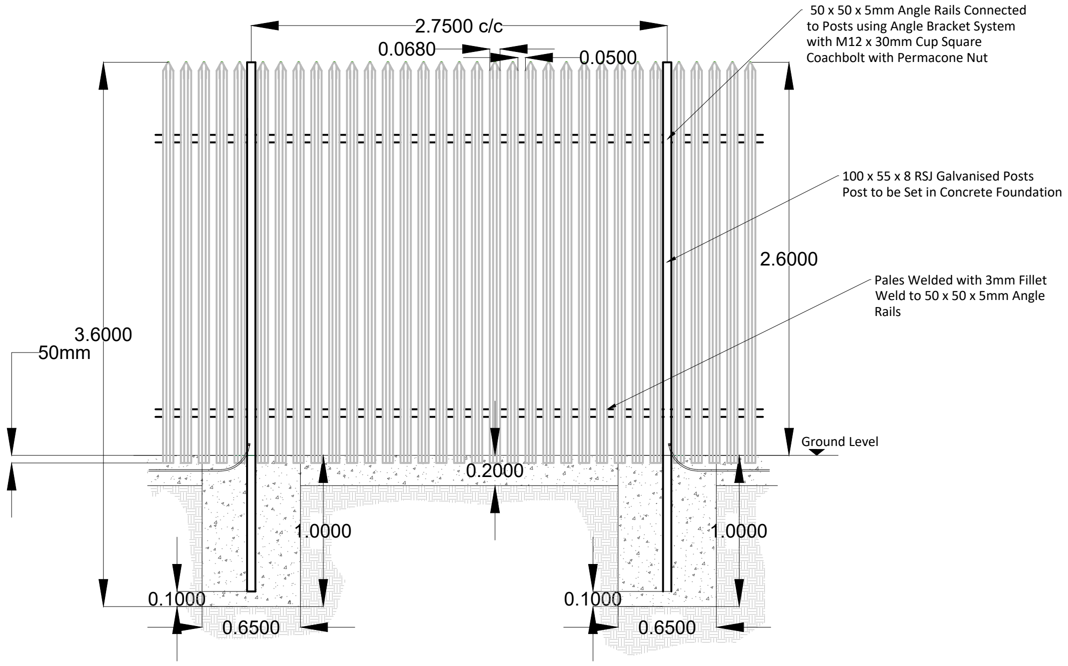
Figure 4-12

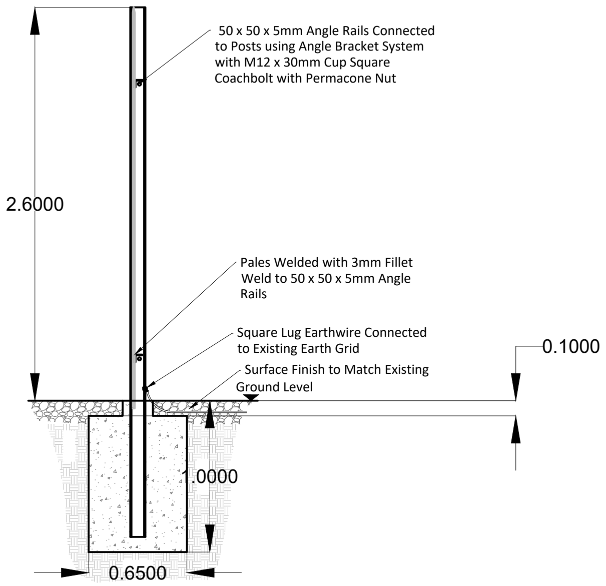
DRAWING TITLE:
Substation Sections

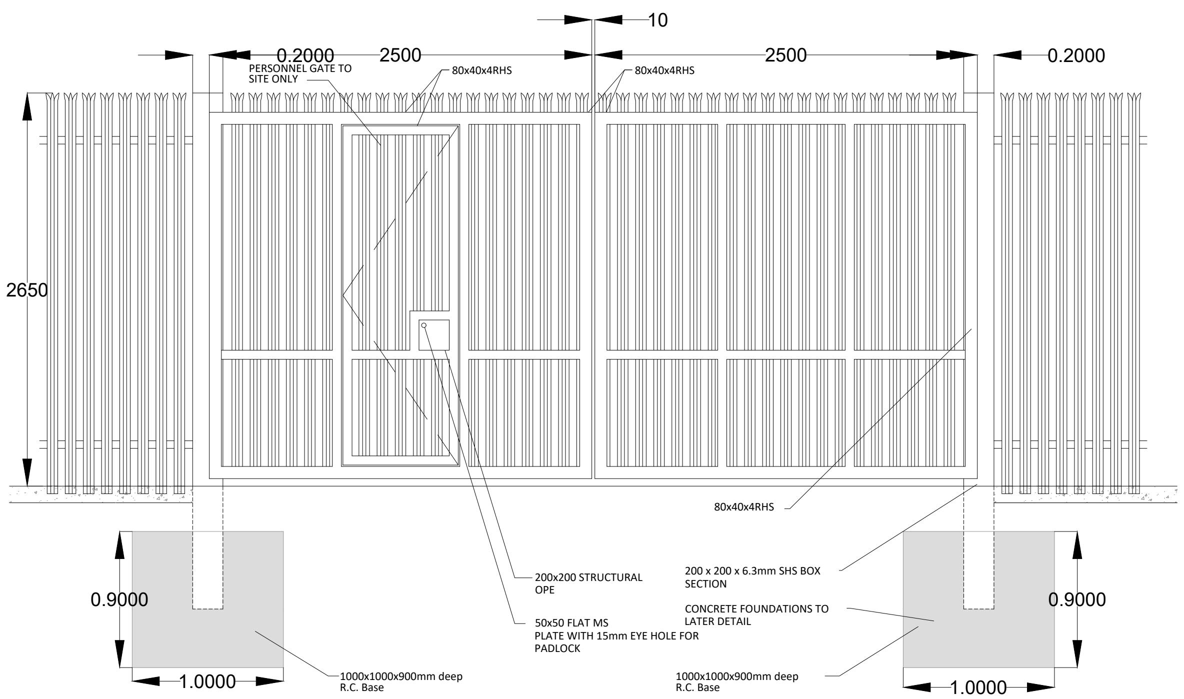
PROJECT TITLE:
Ballivor Wind Farm, Co. Meath & Co. Westmeath

DRAWING BY: **BS**	CHECKED BY: **JMcD**
PROJECT No: **191137**	DRAWING No: **191137 - 72**
SCALE: **1:500_2 @ A3**	DATE: **23.03.2023**

Bord na Móna







- All drawings are to be read in conjuction with all relevant Specifications, Bills of Quantities, Architectural, Services and Engineering drawings.

- Gates & Fencing to be power coated finished to RAL 6005

- All levels are in metres related to Ordinance Datum.

- Any discrepancies between these documents shall be brought to the attention of the Engineer.

- Drawings are not to be scaled.

- Drawing is for planning purposes only

- All dimensions are in millimetres, unless noted otherwise.

Figure 4-13

DRAWING TITLE: **Palisade Fence And Gate Details**	
PROJECT TITLE: **Ballivor Wind Farm, Co. Meath & Co. Westmeath**	
DRAWING BY: BS	CHECKED BY: JMcD
PROJECT No: 191137	DRAWING No: 191137 - 78
SCALE: 1:50 @ A3	DATE: 23.03.2023

Bord na Móna

4.3.3.1 Wind Farm Control Buildings

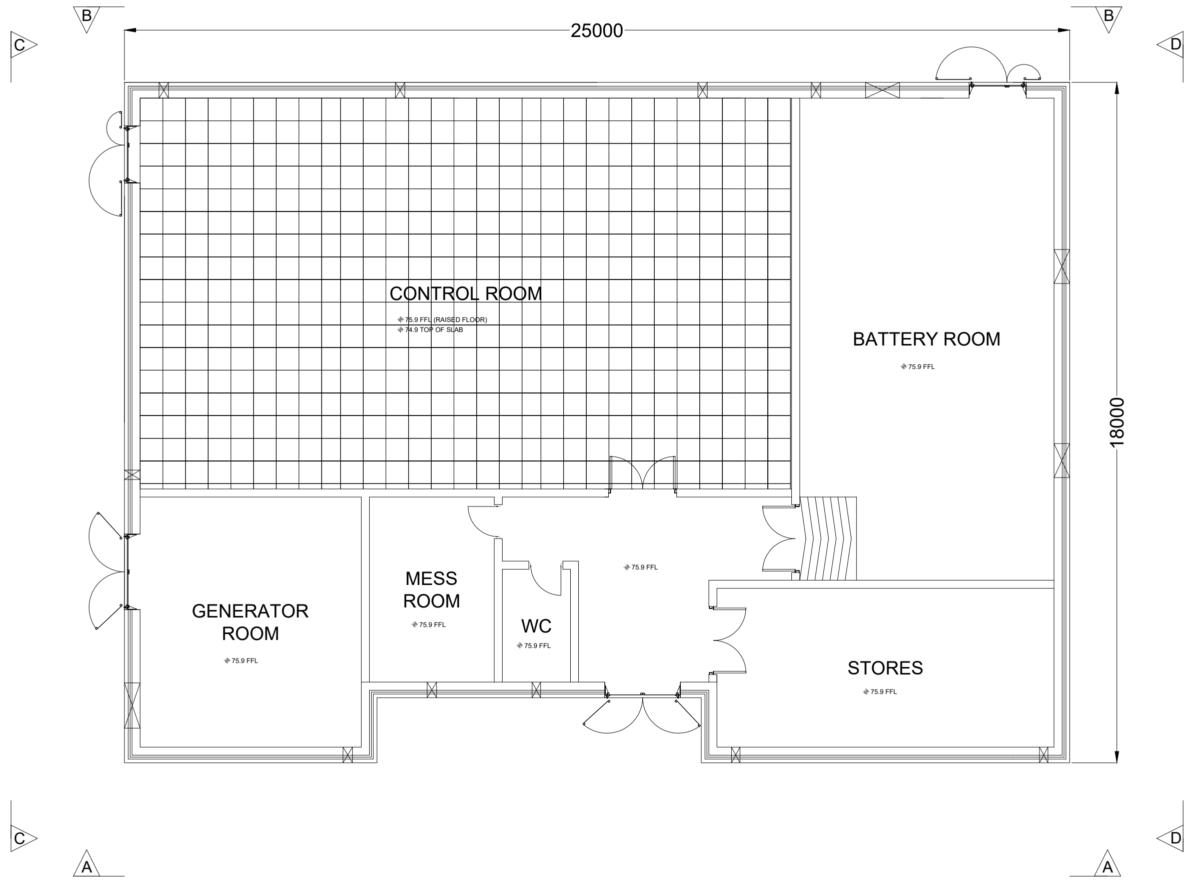
Two substation control buildings will be located within the substation compound. The Transmission Asset Owner (TSO) Control Building will measure approximately 25 metres by 18 metres and approximately 9.7 metres in height. The Independent Power Provider (IPP) Control Building will measure approximately 19 metres by 12 metres and approximately 7 metres in height. The layouts of the control buildings are shown on Figure 4-14 and Figure 4-15.

The wind farm control buildings will include staff welfare facilities that will work on the Proposed Development during the operational phase of the project. Toilet facilities will be installed with a low-flush cistern and low-flow wash basin. Due to the specific nature of the Proposed Development, there will be a very small water requirement for occasional toilet flushing and hand washing and therefore the water requirement of the Proposed Development does not necessitate a potable source. It is proposed to install a groundwater well adjacent to the substation in accordance with the Institute of Geologists Ireland, *Guide for Drilling Wells for Private Water Supplies* (IGI, 2007). The well will be flush to the ground and covered with a standard manhole. A pump house is not currently envisaged as an in-well pump will direct water to a water tank within the roof space of the control building (subject to final design). Bottled water will be supplied for drinking, if required.

It is proposed to manage wastewater from the staff welfare facilities in the control buildings by means of a sealed storage tank, with all wastewaters being tankered off site by an appropriately consented waste collector to wastewater treatment plants. It is not proposed to treat wastewater on-site, and therefore the EPA's 2009 *'Code of Practice: Wastewater Treatment and Disposal Systems Serving Single Houses'* (EPA, 2009) does not apply. Similarly, the EPA's 1999 manual on *'Treatment Systems for Small Communities, Business, Leisure Centres and Hotels'* also does not apply, as it too deals with scenarios where it is proposed to treat wastewater on-site.

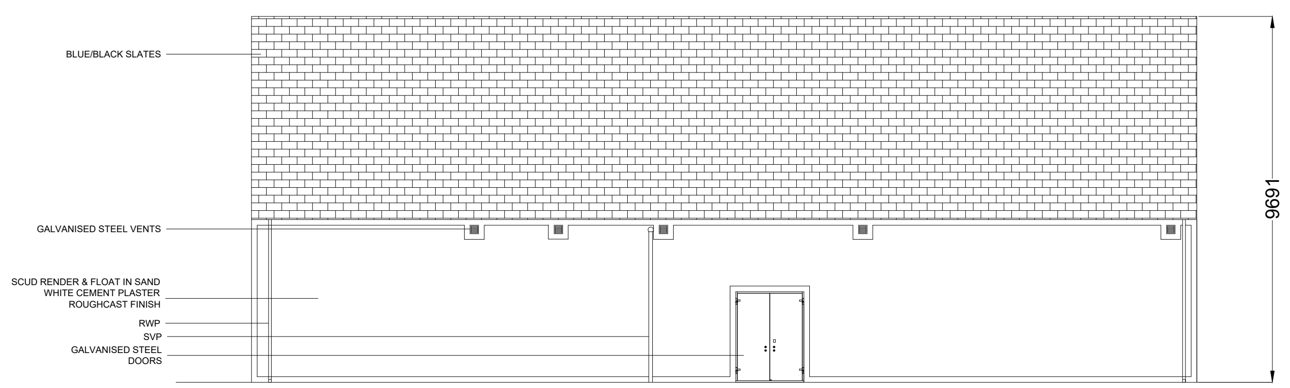
Such a proposal for managing the wastewater arising on site has become almost standard practice on wind farm sites, which are often proposed in areas where finding the necessary percolation requirements for on-site treatment would be challenging and has been accepted by numerous Planning Authorities and An Bord Pleanála as an acceptable proposal.

The proposed wastewater storage tank will be fitted with an automated alarm system that will provide sufficient notice that the tank requires emptying. Full details of the proposed tank alarm system can be submitted to the Planning Authority in advance of any works commencing on-site. The wastewater storage tank alarm will be part of a continuous stream of data from the sites' turbines, wind measurement devices and electricity substation that will be monitored remotely 24 hours a day, 7 days per week. Only waste collectors holding valid waste collection permits under the Waste Management (Collection Permit) Regulations, 2007 (as amended), will be employed to transport wastewater away from the site. When the final destination of the materials is known following the appointment of a permitted contractor, this information can be submitted to the Planning Authority if necessary.

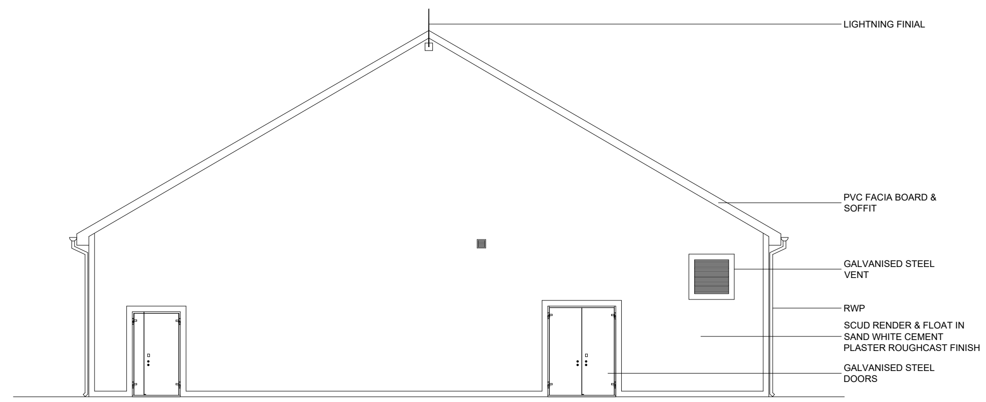


NOTES:

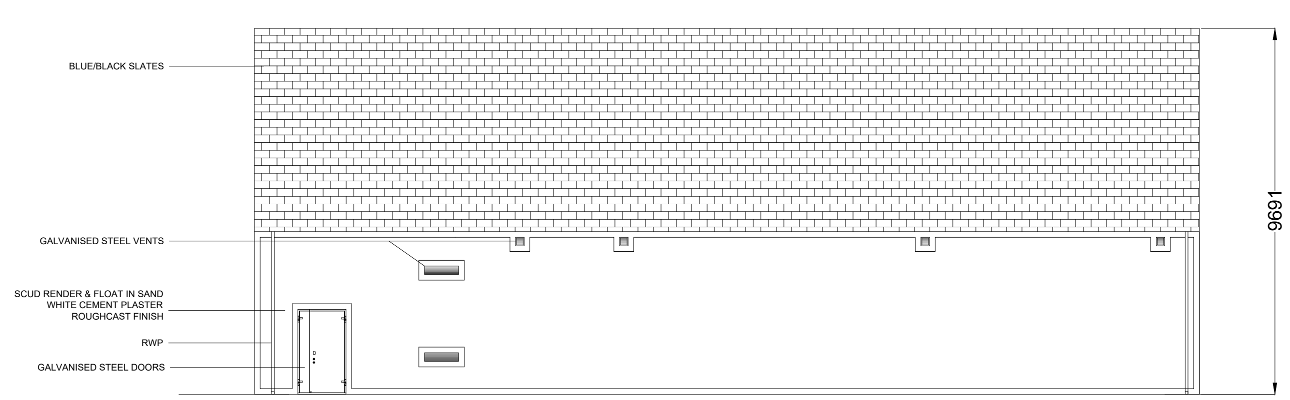
1. ALL DIMENSIONS NOTED ARE IN MM
2. DRAWING IS FOR PLANNING PURPOSES ONLY
3. INTERNAL ROOM LAYOUT TO BE AGREED WITH EIRGRID
4. ALL BUILDING MATERIALS ARE TO BE APPROVED BY THE ASSIGNED CERTIFIER AND SHALL BE IN ACCORDANCE WITH REGULATION & EIRGRID SPECIFICATION REQUIREMENTS
5. GENERATOR ROOM VENT SIZE SUBJECT TO DETAILED DESIGN



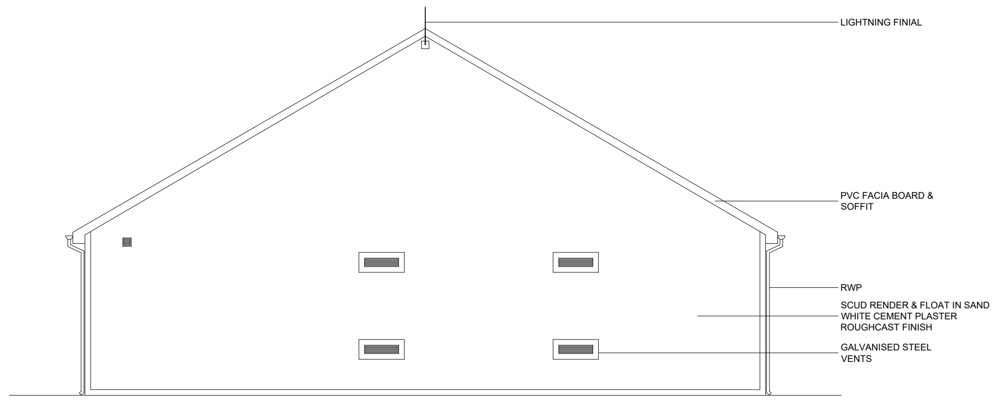
SECTION VIEW A - A



SECTION VIEW C - C



SECTION VIEW B - B



SECTION VIEW D - D

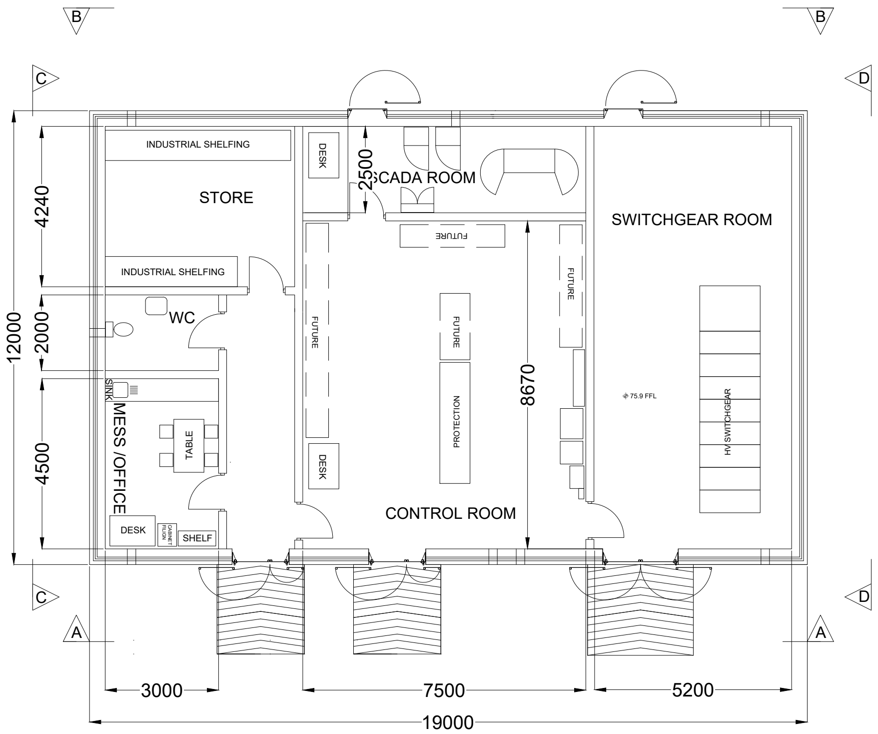
Figure 4-14

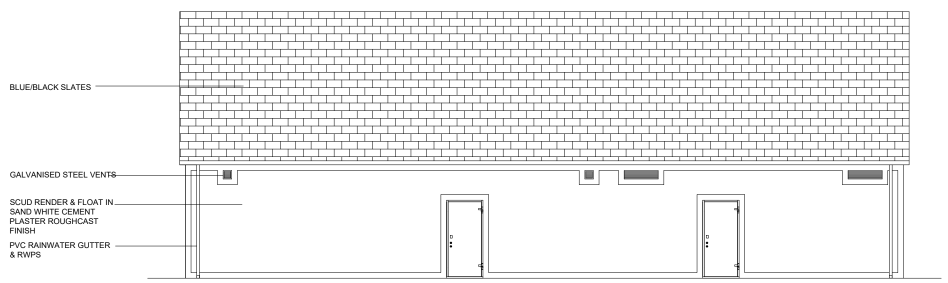
DRAWING TITLE: **TSO Control Building**	
PROJECT TITLE: **Ballivor Wind Farm, Co. Meath & Co. Westmeath**	
DRAWING BY: **BS**	CHECKED BY: **JMcD**
PROJECT No.: **191137**	DRAWING No.: **191137 - 73**
SCALE: **1:200 @ A3**	DATE: **23.03.2023**

Bord na Móna

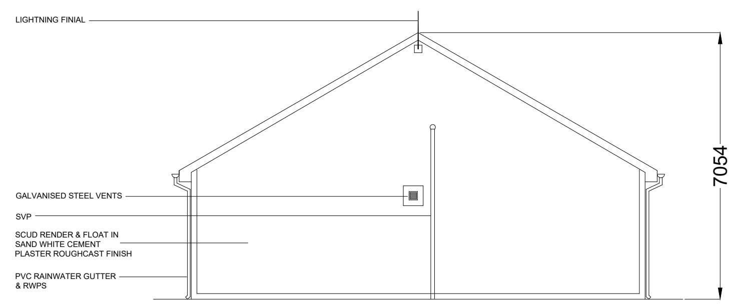
NOTES:

1. ALL DIMENSIONS NOTED ARE IN MM
2. DRAWING IS FOR PLANNING PURPOSES ONLY
3. PANEL LAYOUT & DIMENSIONS ARE INDICATIVE.
4. APPARATUS IN RED LINE DEPICTS FUTURE DEVELOPMENT
5. ALL BUILDING MATERIALS ARE TO BE APPROVED BY THE ASSIGNED CERTIFIER AND SHALL BE IN ACCORDANCE WITH REGULATION & SPECIFICATION REQUIREMENTS

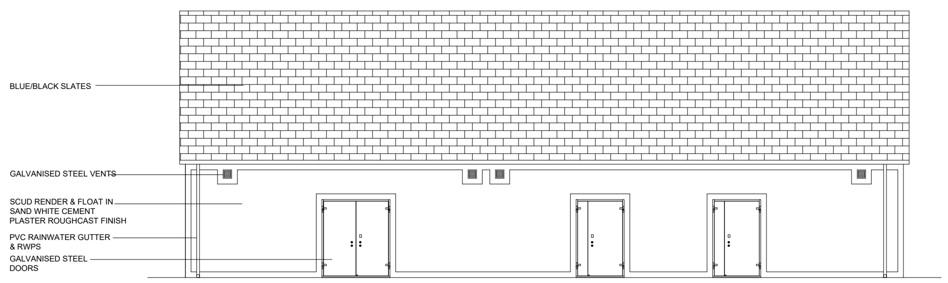




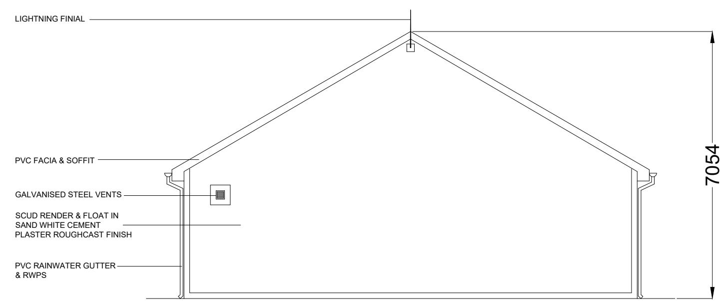
SECTION VIEW A - A



SECTION VIEW C - C



SECTION VIEW B - B



SECTION VIEW D - D

Figure 4-15

DRAWING TITLE: **IPP Control Building**	
PROJECT TITLE: **Ballivor Wind Farm, Co. Meath & Co. Westmeath**	
DRAWING BY: BS	CHECKED BY: JMcD
PROJECT No.: 191137	DRAWING No.: 191137 - 74
SCALE: 1:200 @ A3	DATE: 23.03.2023

Bord na Móna

4.3.4 Site Cabling

Each turbine will be connected to the on-site electricity substation via an underground 33kV (kilovolt) electricity cable. Fibre-optic cables will also connect each wind turbine to the wind farm control building in the onsite substation compound. The electricity and fibre-optic cables running from the turbines to the onsite substation compound will be run in cable ducts approximately 1.2 metres below the ground surface, along the sides of or underneath the internal roadways. The route of the cable ducts will follow the access track to each turbine location. The indicative position of the cable trench relative to the roadways is shown in section in Figure 4-7 to Figure 4-10 above.

Clay plugs will be installed at regular intervals of not greater than 50 metres along the length of the trenches to prevent the trenches becoming conduits for water. While the majority of the cable trenches will be backfilled with native material, clay subsoils of low permeability will be used to prevent conduit flow in the backfilled trenches. This material will be imported onto the site should sufficient volumes not be encountered during the excavation phase of roadway and turbine foundation construction.

4.3.5 Grid Connection

A connection between the Proposed Development and the national electricity grid will be necessary to export electricity on to the national grid. This connection from the proposed onsite substation to the national grid will occur within the vicinity of the proposed substation, via a new overhead line which will connect into the existing Mullingar-Corduff 110 kV transmission line located approximately 35m north of the proposed substation within the development site boundary. Approximately 35m of overhead line and two lattice loop in/loop out masts will be required to connect from the proposed substation to the existing overhead line. The proposed lattice masts will be located within the Application Site. Each mast will have a footprint of approximately 140m^2 and an overall height of 12–15m. They will be lattice steel structures with cross-arms which can extend over the base footprint and internal bracing. The exact final detail and specifications of the grid connection method for the Proposed Development will ultimately be decided by ESB/EirGrid.

4.3.6 Rural (Local) Electricity Supply

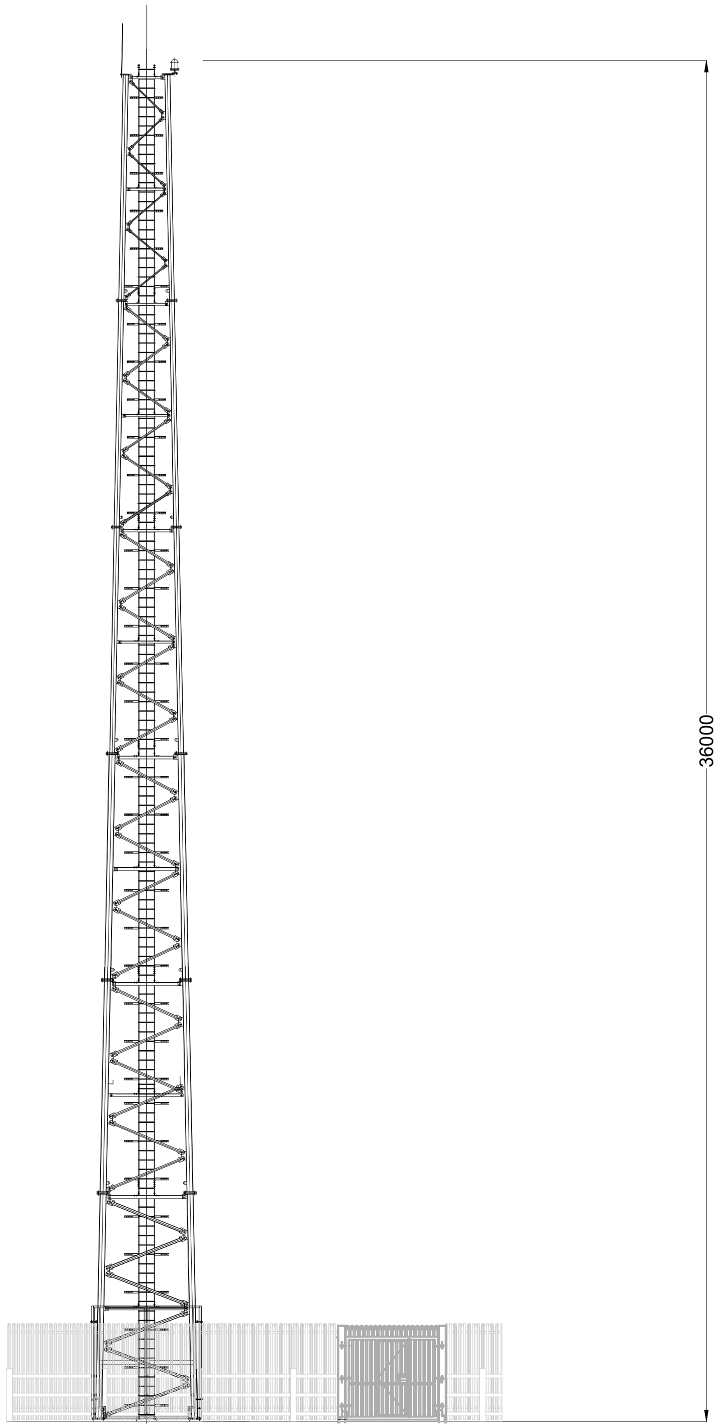
A rural/local electricity supply will be required as a back-up power supply to the proposed substation for light, heat and power purposes. A rural/local supply pole is located within Carranstown Bog, approximately 10m from the proposed substation location. The rural/local supply will be designed and constructed by ESB Networks. The exact source of supply is to be confirmed by ESB Networks, however, the supply will enter the site by either MV overhead line or MV cable. The rural/local supply will have an associated step-down transformer (i.e., MV to LV) and will enter the substation building by underground cable and terminate onto the control building AC distribution board.

4.3.7 Anemometry Mast

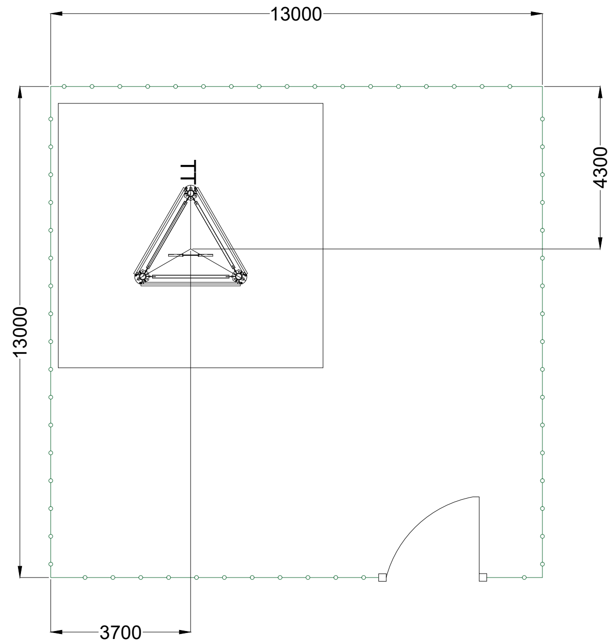
Two permanent anemometry masts (met masts) are included in the design of the Proposed Development. The anemometry masts will be equipped with wind monitoring equipment at various heights. The masts will be located at ITM X661518, Y756596 and ITM X 663677, Y752816 as shown on the site layout in Figure 4-1 and will be slender structures 115 metres in height. The masts will be free-standing structures normally constructed with a reinforced concrete gravity foundation designed to cater for the mast loadings. A hard-standing area sufficiently large to accommodate the installation crane that will be constructed adjacent to an existing track. The typical design of the proposed anemometry masts is shown in Figure 4-17.

NOTES:

1. ALL DIMENSIONS NOTED ARE IN MM
2. DRAWING IS FOR PLANNING PURPOSES ONLY
3. EQUIPMENT/STRUCTURE DETAILS ARE INDICATIVE AND WILL BE FINALISED DURING DETAILED DESIGN
4. DETAILED DESIGN SHALL BE CARRIED OUT IN LINE WITH SYSTEM OPERATOR AND ASSET OWNER SPECIFICATIONS



TELCOM TOWER STRUCTURE VIEW



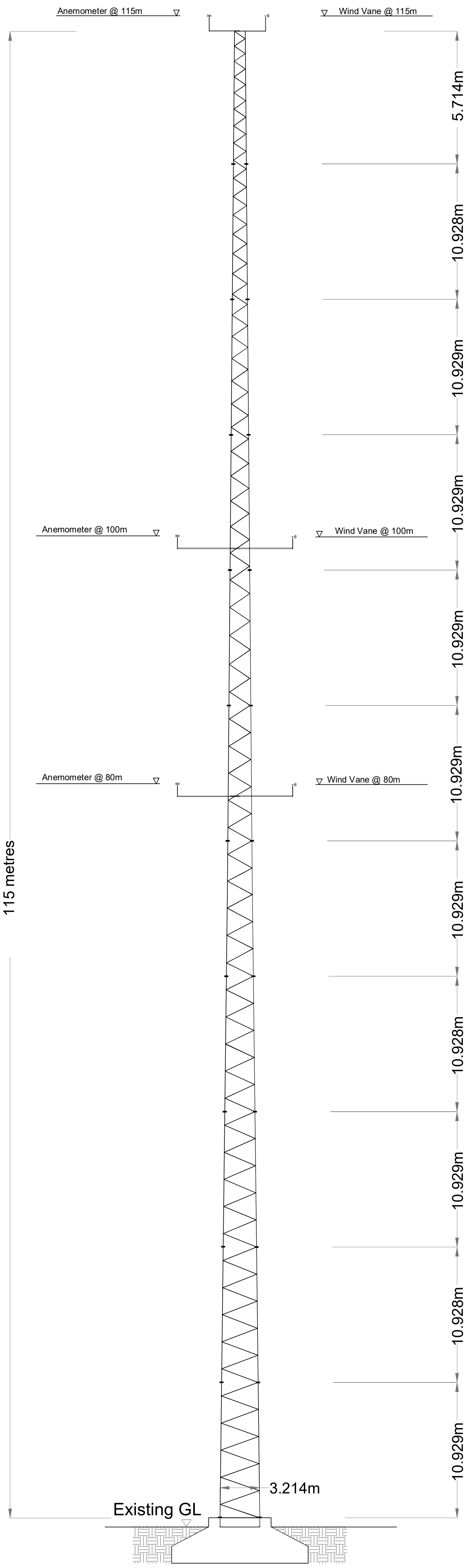
TELCOM TOWER COMPOUND

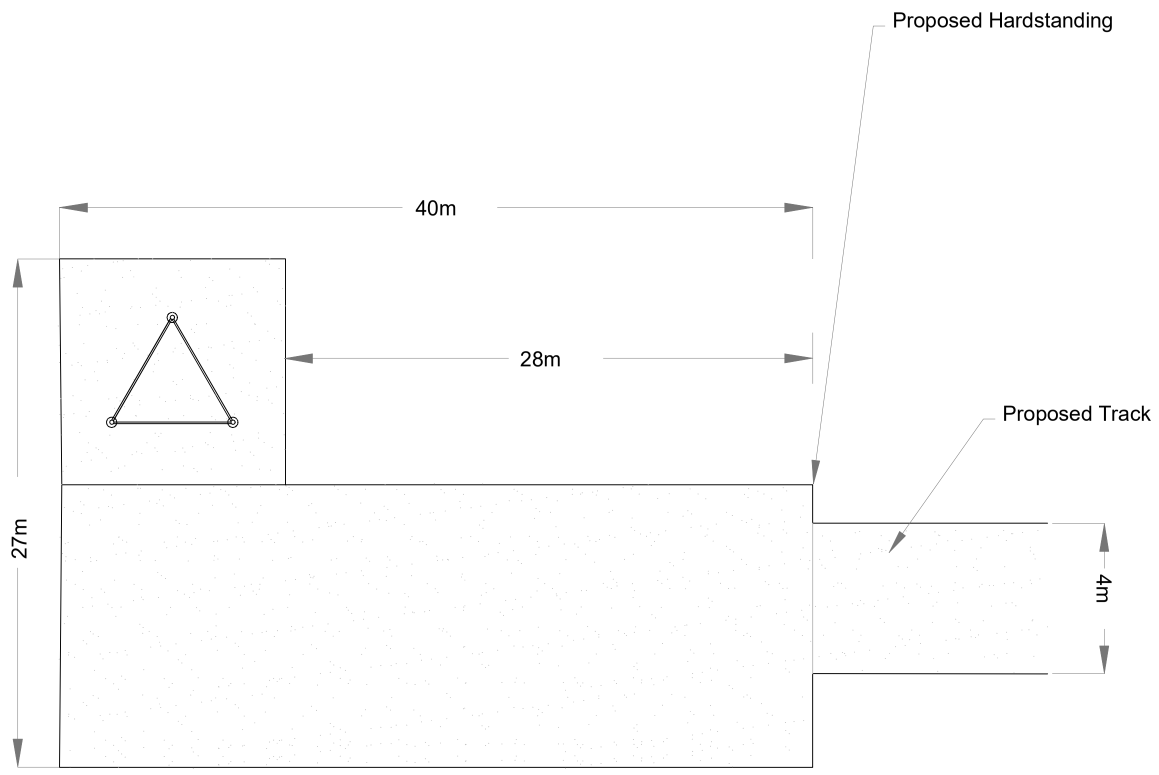
Figure 4-16	
DRAWING TITLE: **36m High Telecom Tower**	
PROJECT TITLE: **Ballivor Wind Farm, Co. Meath & Co. Westmeath**	
DRAWING BY: **BS**	CHECKED BY: **JMcD**
PROJECT No.: **191137**	DRAWING No.: **191137 - 80**
SCALE: **1:200 @ A3**	DATE: **23.03.2023**

Bord na Móna

Note:

1. Met Mast exact detail may differ depending on the selected manufacturer.
2. Finished level of the mast to match ground conditions.
3. Mast/foundation orientation to be confirmed with met mast supplier.
4. Earthing and ducting requirements to be confirmed with met mast supplier and forwarded to foundation designer





Met Mast Compound Plan

Figure 4-17	
DRAWING TITLE: Met Mast	
PROJECT TITLE: Ballivor Wind Farm, Co. Meath & Co. Westmeath	
DRAWING BY: BS	CHECKED BY: JMcD
PROJECT No: 191137	DRAWING No: 191137 - 82
SCALE: 1:200 @ A1	DATE: 23.03.2023

Bord na Móna

4.3.8 Temporary Construction Compounds

Four temporary construction compounds are proposed as part of the Proposed Development; one main compound at Ballivor bog, one sub-station compound, and two (2) smaller compounds. They will be located in the townlands of Grange More and Bracklyn.

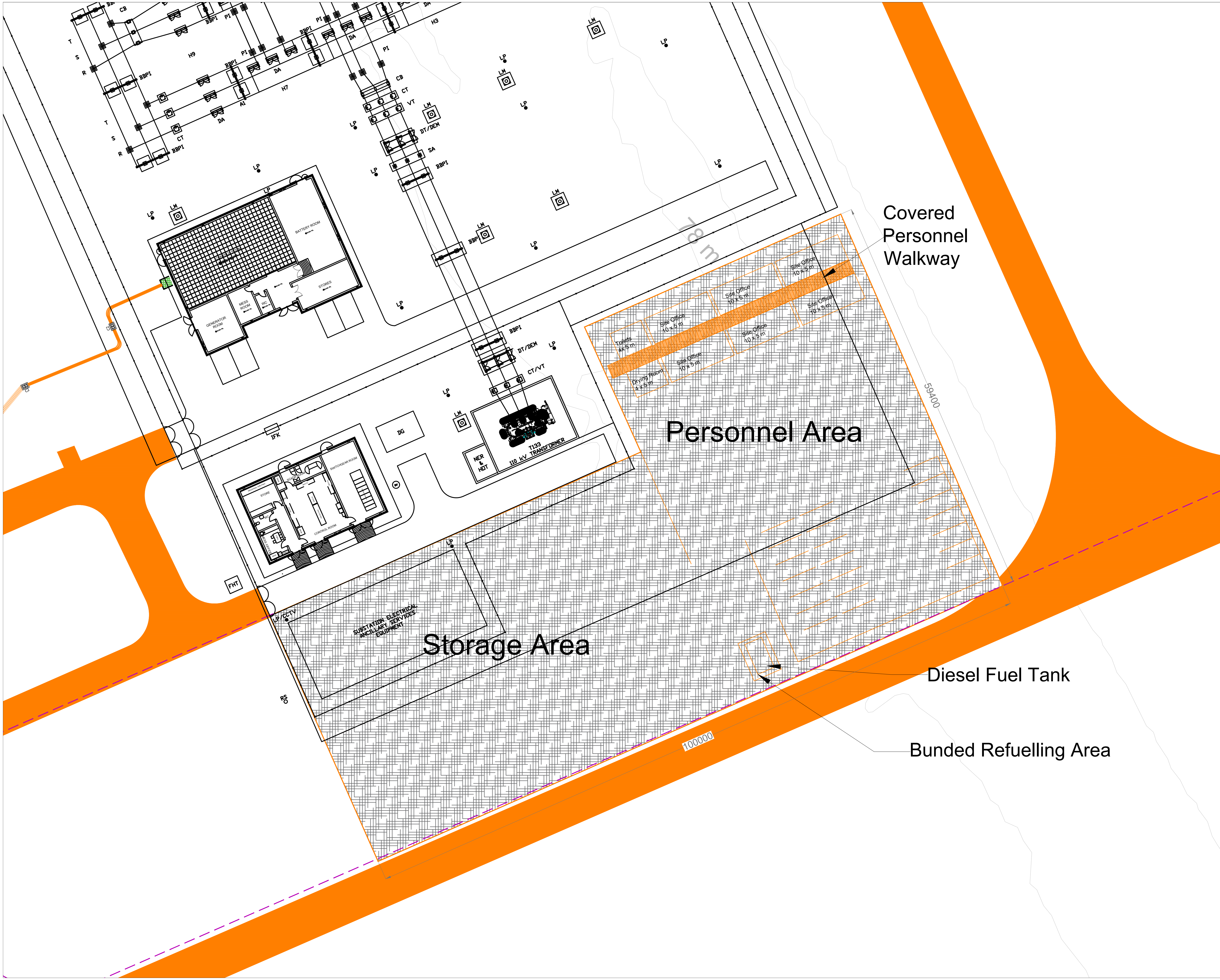
Table 4-2 Temporary Construction Compound Scales

Compound No.	Bog	Scale	Total Area
1	Ballivor Bog (north)	130m by 70m	9,100m^2
2	Bracklin Bog (west)	40m x 25m	1,000m2
3	Bracklin Bog (east)	100m by 50m	5,000m^2
4	Carranstown Bog (substation)	100m by 50 – 60 m	4,800m^2

The location of the proposed construction compounds is shown on the site layout drawing in Figure 4-1.

The construction compounds will consist of temporary site offices, staff welfare facilities, storage areas, and car-parking areas for staff and visitors. The layout of the construction compound is shown on Figure 4-18 to Figure 4-21.

Temporary toilets will be used during the construction phase as part of the welfare facilities for site staff and visitors. Wastewater from toilets will be directed to a sealed storage tank, with all wastewater tankered off site by an appropriately consented waste collector to wastewater treatment plants.



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7. All dimensions in millimeters unless otherwise stated.
8. Electrical cable trench location will be constructed as per engineer specifications

Drawing Legend

- Planning Application Boundary
- Proposed Road
- Electrical Cable Trench

N

Figure 4-18

DRAWING TITLE:
Temporary Construction Compound 1

PROJECT TITLE:
Ballivor Wind Farm, Co. Meath & Co. Westmeath

DRAWING BY: **Joseph O Brien**	CHECKED BY: **Karen Mulryan**
PROJECT No.: **191137**	DRAWING No.: **191137 - 63**
SCALE: **1:500 @ A3**	DATE: **23.03.2023**

OS SHEET No.: 2635, 2636, 2637, 2638, 2705, 2706, 2707, 2708, 2774, 2775, 2776, 2777, 2842, 2843, 2844, 2845

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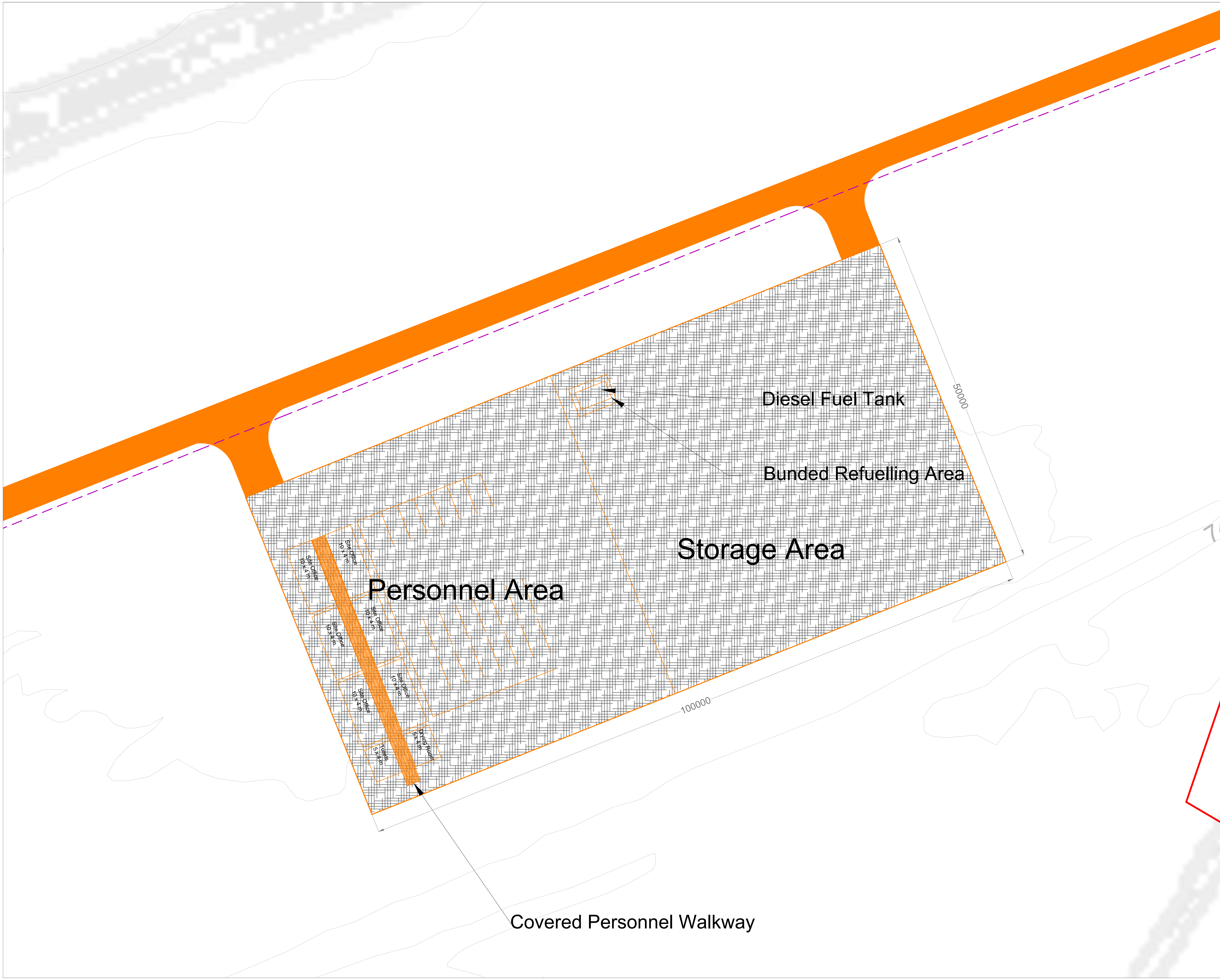

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7. All dimensions in millimeters unless otherwise stated.
8. Electrical cable trench location will be constructed as per engineer specifications

Drawing Legend

- Planning Application Boundary
- Proposed Road
- Electrical Cable Trench

N

Figure 4-19

DRAWING TITLE:
Temporary Construction Compound 2

PROJECT TITLE:
Ballivor Wind Farm, Co. Meath & Co. Westmeath

DRAWING BY: **Joseph O Brien**	CHECKED BY: **Karen Mulryan**
PROJECT No.: **191137**	DRAWING No.: **191137 - 64**
SCALE: **1:500 @ A3**	DATE: **23.03.2023**

OS SHEET No.: 2635, 2636, 2637, 2638, 2705, 2706, 2707, 2708, 2774, 2775, 2776, 2777, 2842, 2843, 2844, 2845

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7. All dimensions in millimeters unless otherwise stated.
8. Electrical cable trench location will be constructed as per engineer specifications

Drawing Legend

- Planning Application Boundary
- Proposed Road

N

Figure 4-20

DRAWING TITLE:
Temporary Construction Compound 3

PROJECT TITLE:
Ballivor Wind Farm, Co. Meath & Co. Westmeath

DRAWING BY: **Joseph O Brien**	CHECKED BY: **Karen Mulryan**
PROJECT No.: **191137**	DRAWING No.: **191137 - 65**
SCALE: **1:500 @ A3**	DATE: **23.03.2023**

OS SHEET No.: 2635, 2636, 2637, 2638, 2705, 2706, 2707, 2708, 2774, 2775, 2776, 2777, 2842, 2843, 2844, 2845

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7. All dimensions in millimeters unless otherwise stated.
8. Electrical cable trench location will be constructed as per engineer specifications

Drawing Legend

- Proposed Road
- Electrical Cable Trench

N

Figure 4-21

DRAWING TITLE: **Temporary Construction Compound 4**	
PROJECT TITLE: **Ballivor Wind Farm, Co. Meath & Co. Westmeath**	
DRAWING BY: **Joseph O Brien**	CHECKED BY: **Karen Mulryan**
PROJECT No.: **191137**	DRAWING No.: **191137 - 66**
SCALE: **1:500 @ A3**	DATE: **23.03.2023**
OS SHEET No.: 2635, 2636, 2637, 2638, 2705, 2706, 2707, 2708, 2774, 2775, 2776, 2777, 2842, 2843, 2844, 2845	

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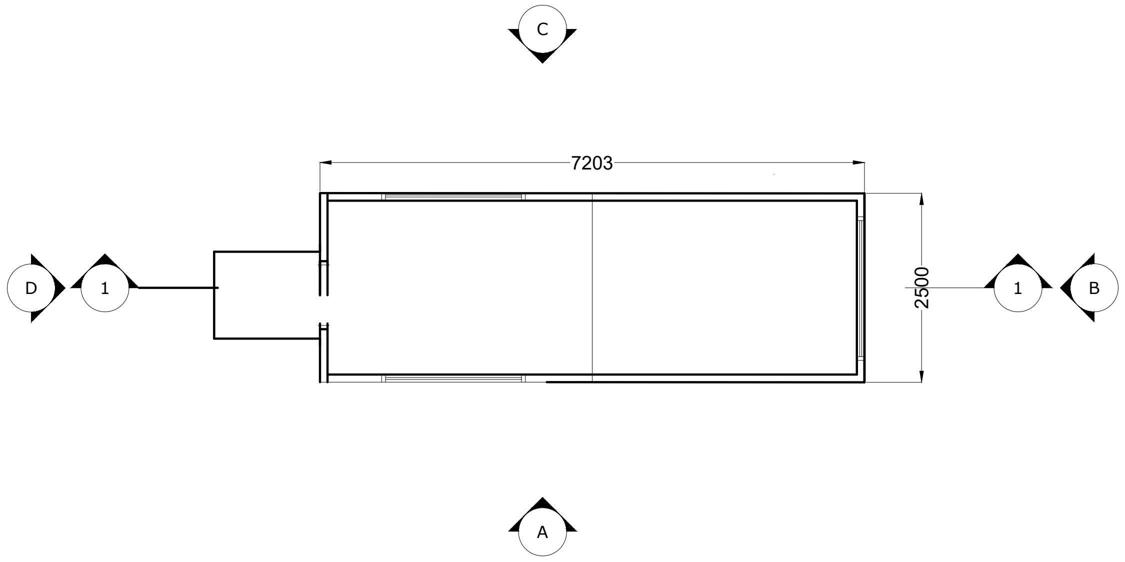
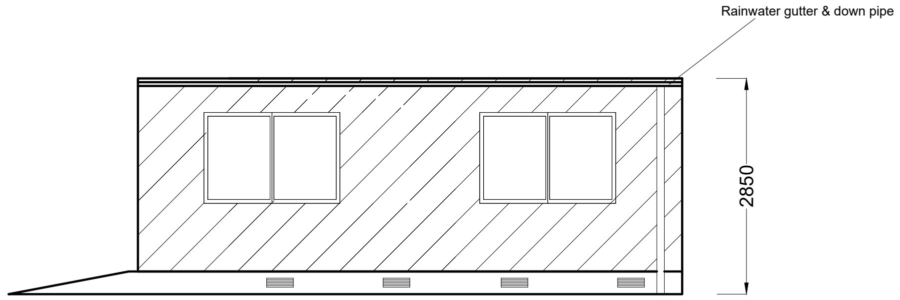
4.3.9 Temporary Security Cabins

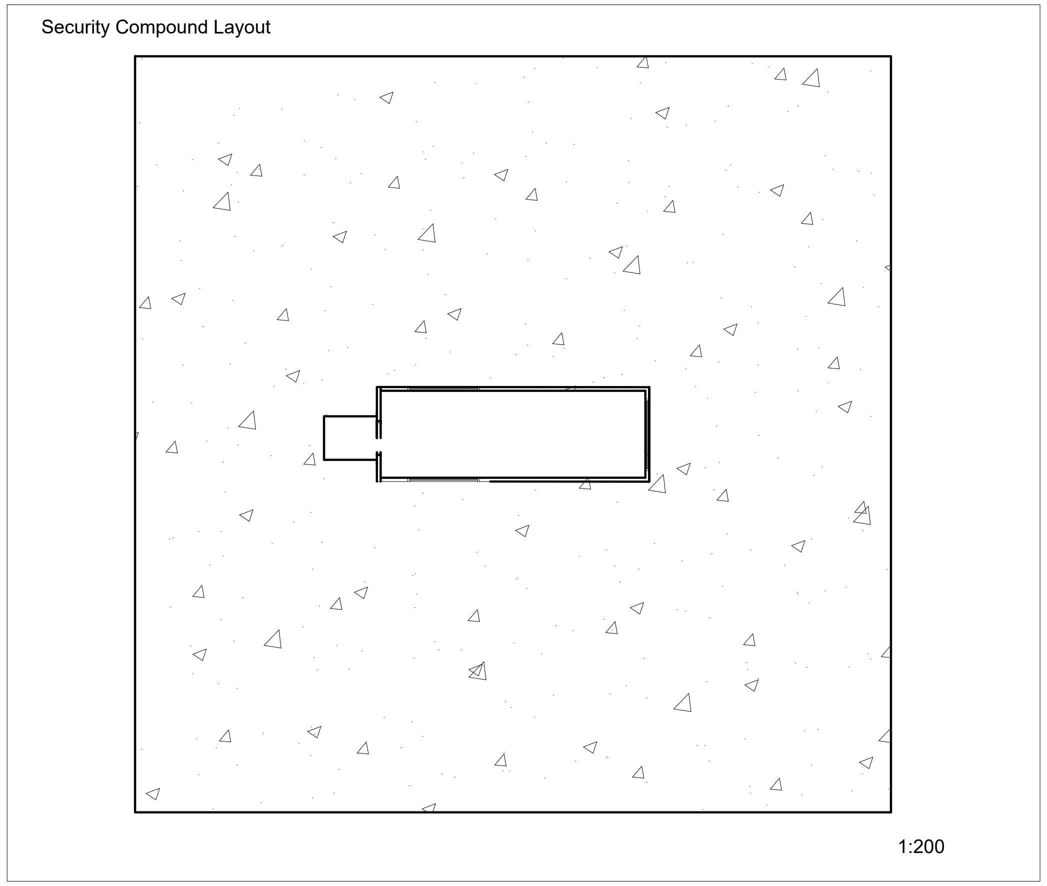
Five temporary security cabins will be installed within the site for the duration of the construction phase of the Proposed Development. The security cabins will be located close to the proposed temporary and permanent site entrances and at crossing points on local roads from one bog to another.

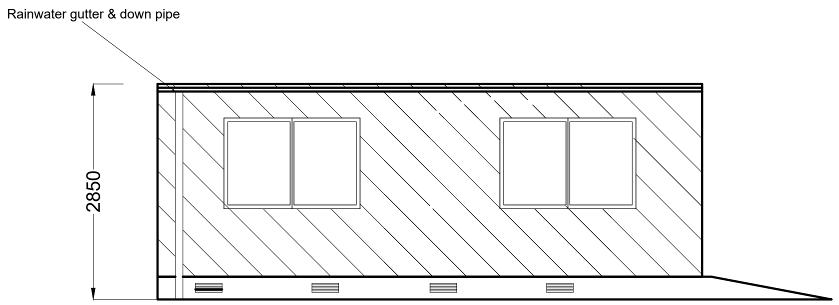
The security cabins will be prefabricated structures measuring approximately 7.2 metres by 2.5 metres and 2.85 metres in height. The cabins will serve as the check in and check out point for staff and visitors during the construction phase. The temporary cabins will be removed as part of the post-construction reinstatement works of the wind farm development. The layout and sections of a security cabin is shown on Figure 4-22 and the locations are shown in Figure 4-1.



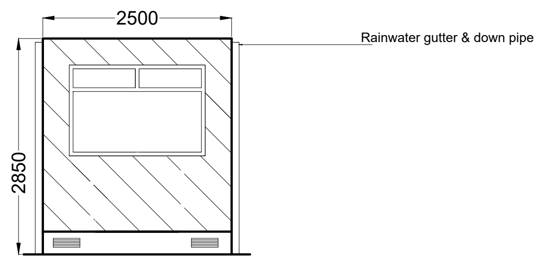


Elevation A

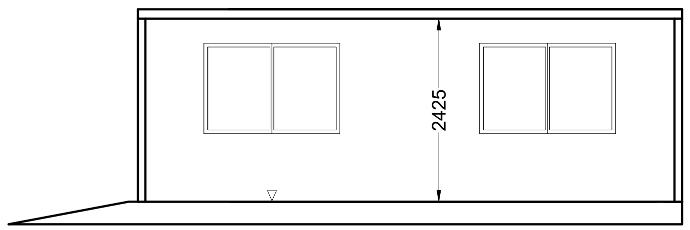




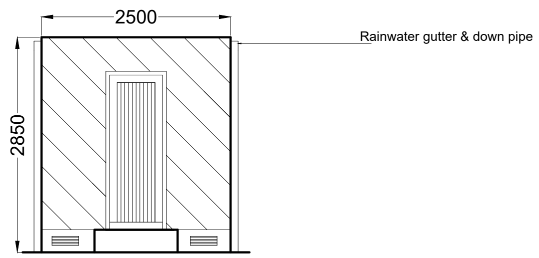
Elevation C



Elevation B



Section 1-1



Elevation D

Figure 4-22

DRAWING TITLE:
Standard Security Cabin Detail

PROJECT TITLE:
Ballivor Wind Farm, Co. Meath & Co. Westmeath

DRAWING BY: Joseph O Brien	CHECKED BY: Karen Mulryan
PROJECT No.: 191137	DRAWING No.: 191137 - 91
SCALE: 1:100 @ A3	DATE: 23.03.2023

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4.3.10 Borrow Pits

It is intended to obtain significant volumes of crushed stone that will be required for the construction of the Proposed Development from two proposed onsite borrow pits.

Borrow Pit No. 1a is located in Carranstown Bog west of a proposed access track and the Bord na Móna railway line, approximately 440m southeast of the proposed 110kV substation. It measures approximately 52,700 m2 in total.

Borrow pit 1b is a smaller pit located approximately 80m east of borrow pit 1a, approximately 440m from the proposed 110kV substation.

Access to borrow pit 1a and 1b will be via internal roads constructed in the same manner as excavated turbine roads (see section 4.8 below), and measure 15m and 45m, respectively. Post-construction, both borrow pits in Carranstown will be reinstated with excavated peat or spoil as described in Section 4.3.12 below; however, the access roads to both pits will be retained.

Borrow Pit No. 2 is located on third party land immediately south of the Bracklin Bog boundary. It is located approximately 700 m southwest of Turbine No. 17 and 440m south of the proposed Bracklin Bog Met Mast and measures approximately 57,800 m^2.

Access and use permission from the landowner have been sought and agreed. Please see Appendix 2-3 for Landowner Consent details. Initial access to the borrow pit field will be via the landowners farm access track off the local road 800m south of Bracklin Bog. This existing farm access track will be upgraded. From the borrow pit area, an access road connecting it to Bracklin Bog will be constructed; approximately 50m will be constructed through pastureland via the excavated road method and approximately 120m will be floated (over an existing drain). Please see section 4.8 below for the excavated road and floated road constriction methodologies. Once complete, machinery access to and from the borrow pit area during its construction, use and reinstatement will be via internal roads only, i.e. no local road use will be required by heavy goods vehicles for the purpose of transporting stone. Occasional employee access to the borrow pit and occasional movement of empty machinery to and from borrow pit may require use of the local road. Post-construction phase, the offsite borrow pit area and any construction access works will be permanently graded over and allowed to reseed.

Please see Figure 4-1 for borrow pit locations and Figures 4-23 to Figure 4-25 for plan and cross section details of all proposed borrow pits.

The extraction of material from the borrow pits is a construction stage of the Proposed Development which will be a temporary operation run over a short period of time. No rock breakers or blasters are proposed for extracting material from these borrow pits. However, it is likely that processing and crushing of cobbles and boulders will be required at all borrow pits to achieve the grading requirements for use in construction.

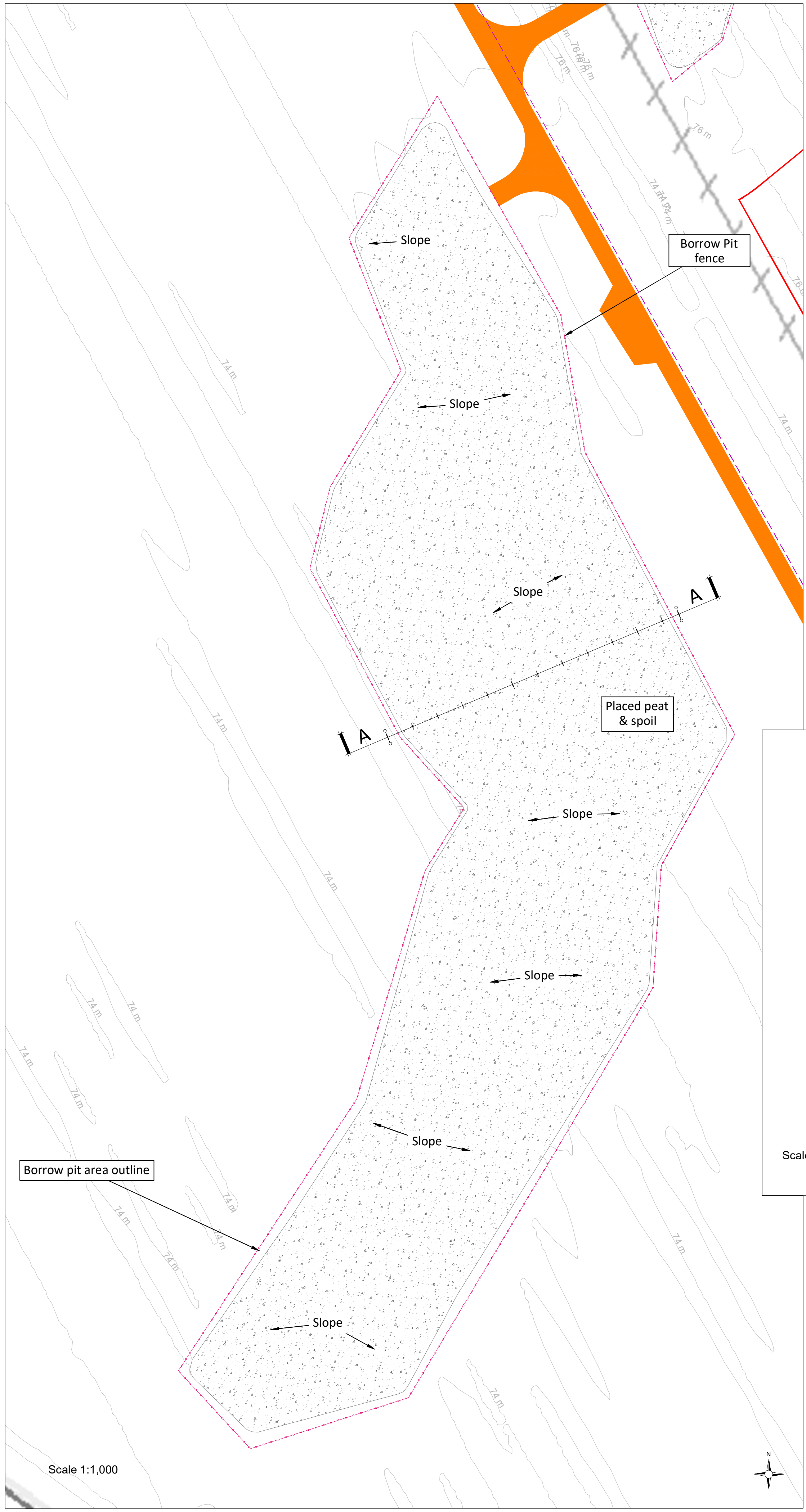
The estimated volume to be extracted from the borrow pits for the construction of the Proposed Development is up to 674,000 m^3 and detailed in Table 4-2 below. The figures presented are the anticipated maximum volumes; however, the actual volumes to be removed from the borrow pits will be confirmed at the time of construction and following detailed pre-construction site investigation works.

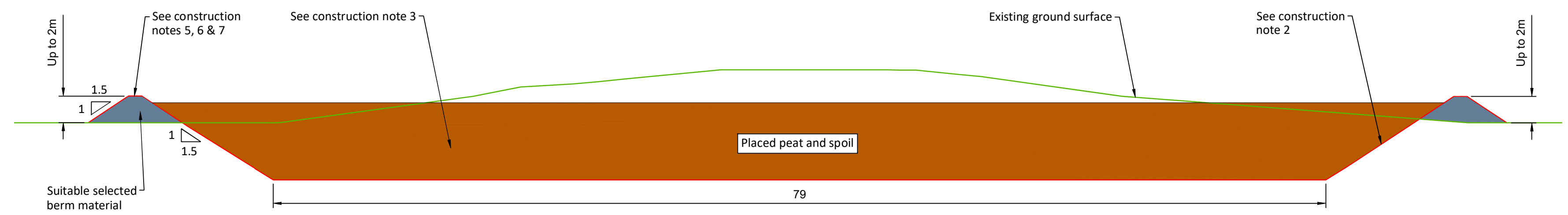
In addition to the sand, gravel, cobbles and boulder material to be extracted from the borrow pits, it is anticipated that engineering fill and higher quality, surfacing granular fill and sand will be sourced from local, authorised quarries. 16 quarries located within 50 km of the Proposed Development have been selected for the purposes of assessment throughout this EIAR. The locations of these quarries are shown in Figure 4-26.

Extraction from borrow pits will be from above and below the water table. Where extraction is above the water table, refuelling areas may be provided within the pit to allow for ease of work. The refuelling area will consist of a concrete slab upon which the fuel bowser will sit. This slab is designed to retain any fuel spillage which would fall to the center of the slab. Drainage is via an interceptor. An oil spill kit will be stationed there also.

The construction of the borrow pits will follow a standard sequence as follows;

1. Prior to work commencing, scan for hidden services will be carried out and services will be relocated where required.
2. The working area will be cordoned off using temporary fencing.
3. Extraction plant and vehicles on low loaders will be mobilised to site.
4. Topsoil will be removed to a designated location within the borrow pit extents to be stored.
5. A designated impermeable re-fuelling area will be constructed (within the pit for dry working, outside the pit for wet working).
6. Material will be extracted using excavators. No rock ripping or blasting will be carried out at any borrow pits.
7. Excess peat will be sidecast and landscaped.
8. Other extracted materials deemed unsuitable for re-use will be reinstated within the borrow pits.
9. Material will be processed to crush cobbles and boulders.
10. The processed material will be stockpiled in designated areas.
11. A temporary access track will be constructed to tie in with the internal road infrastructure.
12. Processed material will be loaded into lorries and transported to deposition location.
13. Temporary excavation side slopes will be designed by a geotechnical engineer.
14. Upon completion, all faces of excavation will be constructed to safe permanent side slopes to be designed by a geotechnical engineer.
15. Topsoil will be replaced and reseeded.
16. Extraction plant and vehicles on low loaders will be demobilised via. internal site roads and main site entrance.





Construction Notes Borrow Pit:

(1) It is proposed to construct the borrow pit so that the base of the borrow pit is below the level of the adjacent section of access road.
(2) Slopes within the excavated formed around the perimeter of the borrow pit will be formed at stable inclinations to suit local in-situ conditions.
(3) Infilling of the peat & spoil should commence at the back edge of the borrow pit and progress towards the borrow pit entrance/buttress. Leaving in place upstands/segments of intact ground which will help to retain the placed peat & spoil and will allow the borrow pit to be developed and infilled in cells.
(4) A buttress is required at the downslope edge of the borrow pit to safely retain the infilled peat and spoil. The height of the buttresses constructed should be greater than the height of the infilled peat & spoil to prevent any surface peat & spoil run-off. A buttress up to 2m (approx.) in height is likely to be required.
(5) The buttress will be founded on competent strata. The founding stratum for the buttress should be inspected and approved by the project geotechnical engineer.
(6) In order to prevent water retention occurring behind the buttresses, the buttresses should be constructed of coarse boulder fill with a high permeability.
(7) The surface of the placed peat & spoil should be shaped to allow efficient run-off of surface water from the placed arising's.
(8) Control of groundwater within the borrow pit may be required and measures will be determined as part of the ground investigation programme.
(9) All the above-mentioned general guidelines and requirements should be confirmed by the designer prior to construction.
(10) Further guidelines on the construction of the borrow pit are included within Section 7.4 of the Peat & Spoil Management Plan

DRAWING TITLE: **Borrow Pit 1 Layout & Sections**	
PROJECT TITLE: **Ballivor Wind Farm, Co. Meath & Co. Westmeath**	
DRAWING BY: Joseph O Brien	CHECKED BY: Karen Mulryan
PROJECT No.: 191137	DRAWING No.: 191137 - 67
SCALE: As Shown @ A1	DATE: 28.03.2023

Figure 4-23

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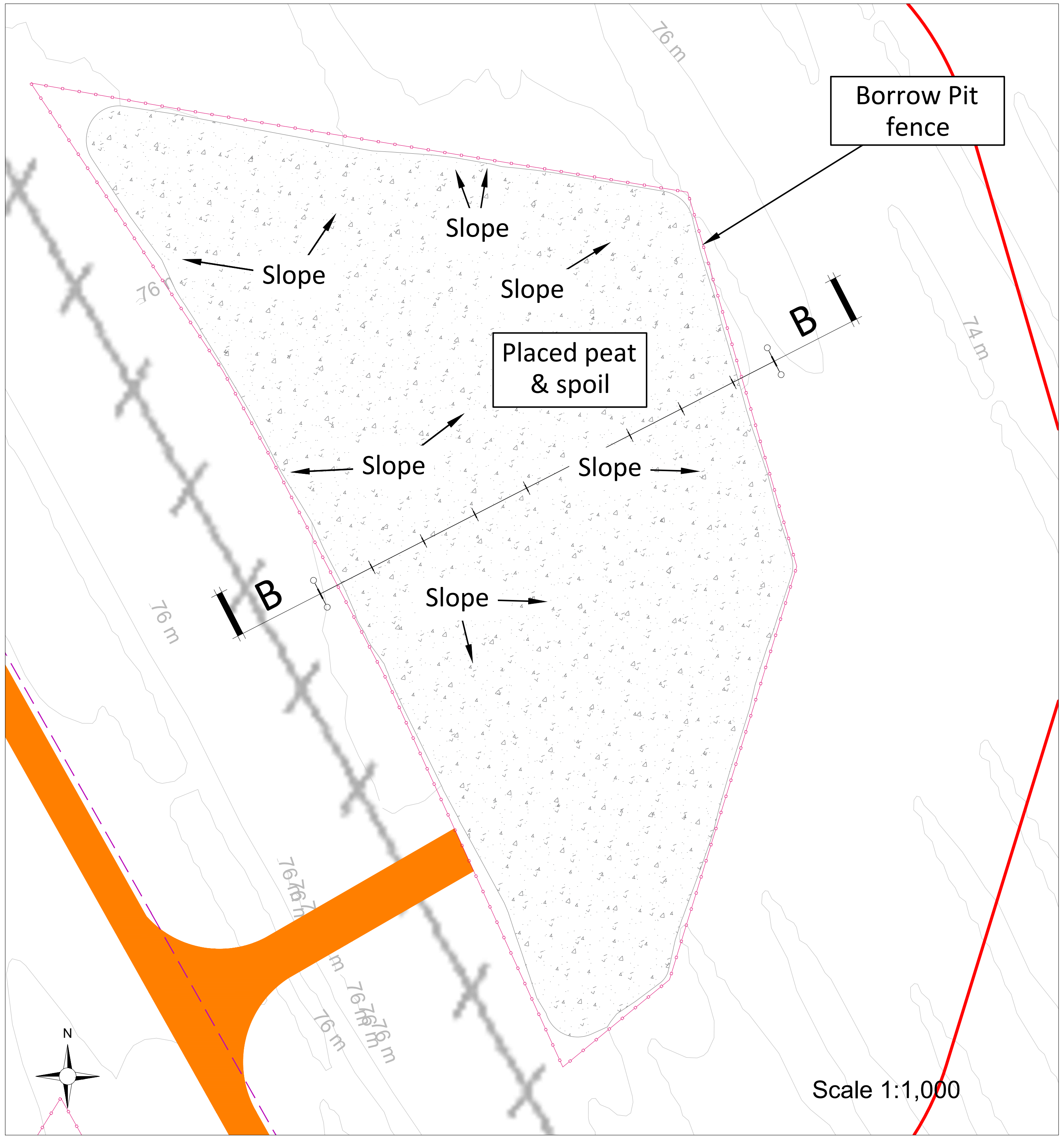

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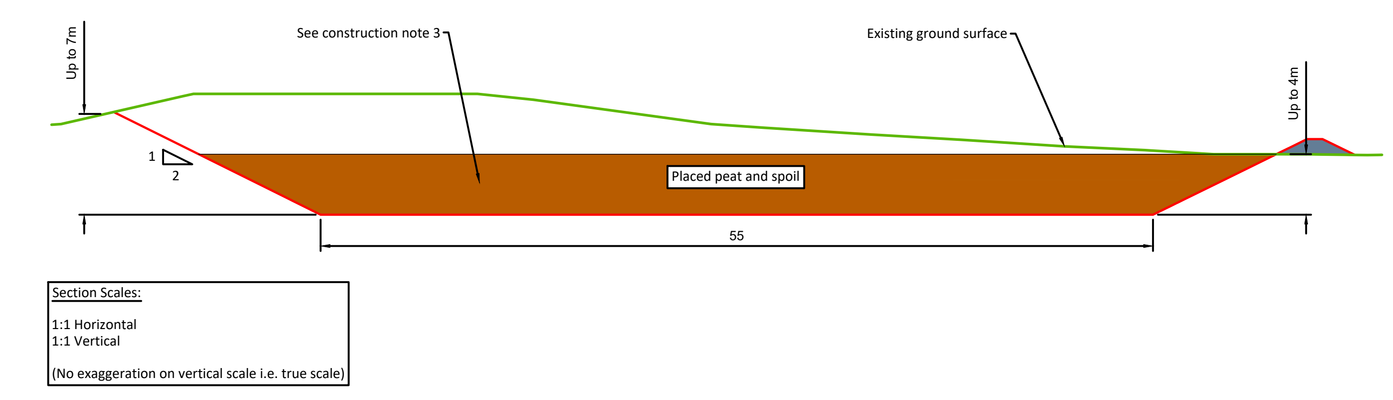

Scale 1:500

Construction Notes Borrow Pit:

(1) It is proposed to construct the borrow pit so that the base of the borrow pit is below the level of the adjacent section of access road.
(2) Slopes within the excavated formed around the perimeter of the borrow pit will be formed at stable inclinations to suit local in-situ conditions.
(3) Infilling of the peat & spoil should commence at the back edge of the borrow pit and progress towards the borrow pit entrance/buttress. Leaving in place upstands/segments of intact ground which will help to retain the placed peat & spoil and will allow the borrow pit to be developed and infilled in cells.
(4) The surface of the placed peat & spoil should be shaped to allow efficient run-off of surface water from the placed arising's.
(5) Control of groundwater within the borrow pit may be required and measures will be determined as part of the ground investigation programme.
(6) All the above-mentioned general guidelines and requirements should be confirmed by the designer prior to construction.
(7) Further guidelines on the construction of the borrow pit are included within Section 7.4 of the Peat & Spoil Management Plan

Figure 4-24

DRAWING TITLE:
Borrow Pit 1a Layout & Sections

PROJECT TITLE:
Ballivor Wind Farm, Co. Meath & Co. Westmeath

DRAWING BY: Joseph O Brien	CHECKED BY: Karen Mulryan
PROJECT No: 191137	DRAWING No: 191137 - 68
SCALE: As Shown @ A3	DATE: 28.03.2023

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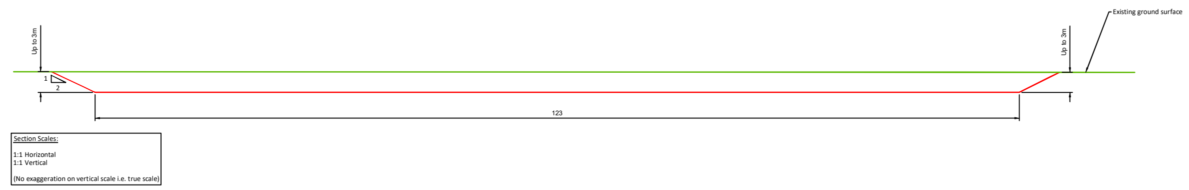

Construction Notes Borrow Pit:

(1) It is proposed to construct the borrow pit so that the base of the borrow pit is below the level of the adjacent section of access road.
(2) Slopes within the excavated formed around the perimeter of the borrow pit will be formed at stable inclinations to suit local in-situ conditions.
(3) Control of groundwater within the borrow pit may be required and measures will be determined as part of the ground investigation programme.
(4) All the above-mentioned general guidelines and requirements should be confirmed by the designer prior to construction.
(5) Further guidelines on the construction of the borrow pit are included within Section 7.4 of the Peat & Spoil Management Plan

Figure 4-25

DRAWING TITLE:
Borrow Pit 2 Layout & Sections

PROJECT TITLE:
Ballivor Wind Farm, Co. Meath & Co. Westmeath

DRAWING BY: **Joseph O Brien**	CHECKED BY: **Karen Mulryan**
PROJECT No.: **191137**	DRAWING No.: **191137 - 69**
SCALE: **As Shown @ A1**	DATE: **28.03.2023**

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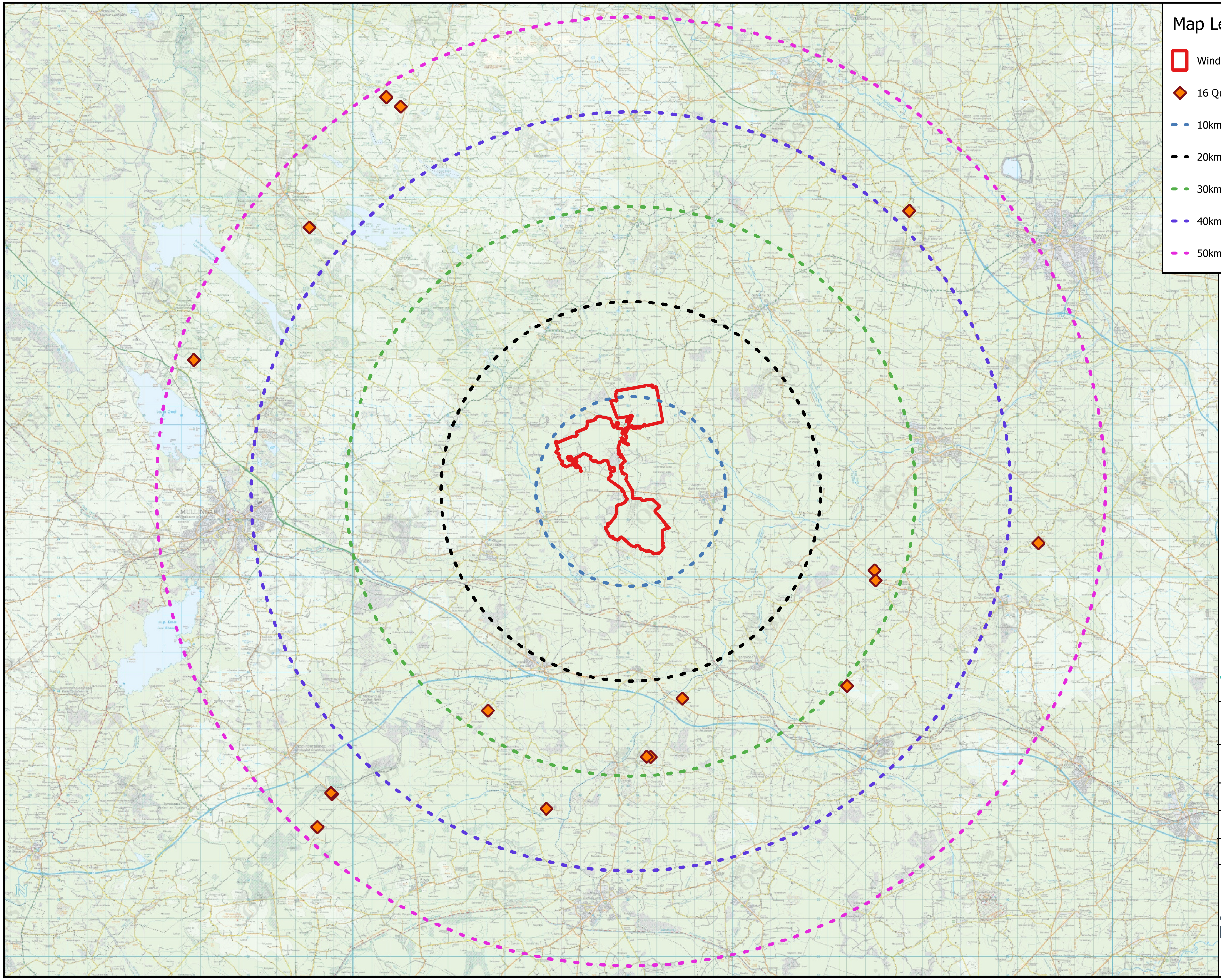

Map Legend

- Wind Farm Site Boundary
- 16 Quarries
- 10km Zone
- 20km Zone
- 30km Zone
- 40km Zone
- 50km Zone

N

Drawing Title: Quarries within 50km of the Wind Farm Site	
Project Title: Proposed Ballivor Wind Farm	
Drawn By: Karen Mulryan	Checked By: Eoin McCarthy
Project No.: 191137	Drawing No.: Figure 4-26
Scale: 1:260,000	Date: 02.02.2023

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4.3.11 Sand and Stone Requirements

The volumes of granular fill (sand and stone) required for the construction of the Proposed Development, outlined in Table 4-2 below, have been estimated based on the Proposed Development footprint, the anticipated excavation levels to suitable formation or suitable subgrade, and the proposed final levels for the infrastructure components. Construction grade granular fill and higher quality, final surfacing fill (including sand) will both be required for the construction of the Proposed Development. Granular fill volumes have been estimated using the following methodology:

- The peat beneath the substation, all proposed hardstanding areas including temporary construction compounds will be excavated and replaced with construction grade granular fill up to the existing ground level.
- Roads will generally be constructed as floating roads except in areas with shallow peat and highly trafficked areas (e.g. site entrances and access roads in and out of borrow pits).
- The hardstanding areas and roads will be constructed to the 100 year flood level. Roads will generally comprise approximately 650mm of granular fill and approximately 150 mm of final surfacing layer (or capping). Geotextiles separators will be placed on the subgrade and geogrids will be installed within the road build-up.
- The proposed substation compound will be constructed to approximately 76 metres OD. The peat and unsuitable soil excavated beneath the substation footprint will be replaced with select granular fill in accordance with Eirgrid requirements. The final 250 mm shall comprise capping material.
- The internal site underground cable trenches will be approximately 1200mm in depth. The cable trench will be backfilled up to approximately 600mm with sand, within which the ducting will be placed. Suitable materials from the excavations of the trenches will be reinstated to form the final layer of the trench.

Table 4-3 outlines the volumes of both the construction grade and surfacing granular fill required.

Table 4-3 Granular Fill Volumes Required

Development Component	Area (m^2) (approx.)	Stone Fill Required (m^3)
Turbine no. 1	531	2,423
Turbine no. 2	531	2,423
Turbine no. 3	531	2,423
Turbine no. 4	531	2,423
Turbine no. 5	531	3,120
Turbine no. 6	531	2,423
Turbine no. 7	531	3,120
Turbine no. 8	531	3,120
Turbine no. 9	531	2,423
Turbine no. 10	531	2,423
Turbine no. 11	531	2,423

Development Component	Area (m^2) (approx.)	Stone Fill Required (m^3)
Turbine no. 12	531	3,120
Turbine no. 13	531	2,423
Turbine no. 14	531	2,423
Turbine no. 15	531	2,423
Turbine no. 16	531	3,120
Turbine no. 17	531	2,423
Turbine no. 18	531	3,120
Turbine no. 19	531	2,423
Turbine no. 20	531	2,423
Turbine no. 21	531	2,423
Turbine no. 22	531	2,423
Turbine no. 23	531	2,423
Turbine no. 24	531	2,423
Turbine no. 25	531	2,423
Turbine no. 26	531	2,423
26. Turbines and hardstanding areas	74,074	366,196
Access Roads including amenity	6,900	267,581
Substation	15,250	51,469
Met Masts	1,400	3,675
Cable route and grid connection	Overground-minimal	7,300
Temporary Construction Compounds and Security Cabin Compounds	20,600	19,600
Sub Total	45,600	349,625
Totals (m^3) (including 25% contingency factor)		**717,291**

4.3.12 Peat and Spoil Management Plan

4.3.12.1 Quantities

The approximate quantity of peat and non-peat material (spoil) requiring management on the site of the Proposed Development has been calculated, as presented in Table 4-3 below. These quantities were calculated by FTC as part of the Peat and Spoil Management Plan in Appendix 4-2 of this EIAR.

Table 4-4 Approximate Peat and Spoil Volumes Requiring Management

Development Component	Peat Volume (m^3)	Spoil Volume (m^3)
26 no. Turbines and Hardstanding Areas	376,900	95,000
Access Roads	2,600	5,100
Substation	49,585	5,490
Met Masts	3,500	504
Temporary Construction Compounds and Security Cabin Compounds	20,000	8,000
Borrow Pits	98,400	53,880
Cable route and grid connection	12,500	-
Sub Total	**550,400**	**180,730**
Total Peat and Spoil to be managed (m^3)		**732,000**

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

4.3.12.2 Peat and Spoil Management

The site which is generally flat consists predominantly of bare, locally re-vegetated cutaway peat and shallow peat with an established drainage network. The site has been harvested by Bord na Móna using mechanical harvesting equipment. Bord na Móna has experience managing peat in similar terrain, both during peat production operations and during wind farm construction projects, particularly Mountlucas, Bruckana, Cloncreen, Derrinlough (under construction) and Oweninny wind farms. These projects have demonstrated safe and effective methods for peat management and storage. The proposed methodology as outlined in the Peat and Spoil Management Plan is summarised below.

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

- All excavated peat and non-peat will be placed/spread alongside the proposed infrastructure elements on site, where possible.
- The peat and spoil placed adjacent to the proposed infrastructure elements should be restricted to a maximum height of 1m over a 10m wide corridor on both sides 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 within the indicated parameters.
- The placement of excavated peat and spoil is to be avoided without first establishing the adequacy of the ground to support the load. The placement of peat and spoil within the placement areas may require the use of long reach excavators, low ground pressure machinery and possibly bog mats in particular for drainage works.
- Where there is any doubt as to the stability of the peat surface then no excavated spoil shall be placed on to the peat surface. The risk of peat instability is reduced by not placing any loading onto the peat surface.
- 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.
- Finished/shaped side slopes in the placed peat and spoil shall be not greater than 1 (v): 2 (h) 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.
- All placed spoil will be allowed to revegetate naturally from the extensive seed source of the plants that have already colonised in the area. Alternatively, if significant areas of bare spoil are still evident after a 3 year period and possibly in addition, seeding of the placed spoil could be carried out which would aid in stabilising the placed spoil in the long term.
- 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 if required.
- An interceptor drain should be installed upslope of the designated spoil placement areas to divert any surface water away from these areas. This will help ensure stability of the placed spoil and reduce the likelihood of debris run-off.
- All the above-mentioned general guidelines and requirements will be confirmed by the designer prior to construction.

4.3.13 Site Activities

4.3.13.1 Environmental Management

All proposed activities on the site of the Proposed Development will be provided for in an Construction and Environmental Management Plan (CEMP). A CEMP has been prepared for the Proposed Development and is included in Appendix 4-3 of this EIAR. The CEMP sets out the key environmental considerations to be taken into account by the contractor during construction of the Proposed Development. The CEMP also details the mitigation and monitoring measures to be implemented in order to comply with the environmental commitments outlined in the EIAR. The contractor will be contractually obliged to comply with all such measures. It is intended that the CEMP would be updated prior to the commencement of the development, to include any additional mitigation measures, conditions and or alterations to the EIAR and application documents that may emerge during the course of the planning process and would be submitted to the Planning Authority for written approval in advance of commencement of any construction works on site.

4.3.13.2 Refuelling

Wherever possible, vehicles will be refuelled off-site. This will be the case for regular, road-going vehicles. However, for construction machinery that will be based on-site continuously, a limited amount of fuel will have to be stored on site in bunded areas.

On-site refuelling of machinery will be carried out at dedicated refuelling locations using a mobile double skinned fuel bowser or fuel truck. The fuel bowser/truck will be re-filled off site and will be transported to where machinery is located. It is not practical for all vehicles to travel back to a single refuelling point, given the size of the cranes, excavators, etc. that will be used during the construction of the proposed wind farm. The 4x4 jeep will also carry fuel absorbent material and pads in the event of any accidental spillages. The fuel bowser will be parked on a level area in the construction compound when not in use.

Only designated trained and competent operatives will be authorised to refuel plant on site. Mobile measures such as drip trays, spill kits and fuel absorbent mats will be available and will be used when required during all refuelling operations.

4.3.13.3 Concrete Deliveries

Only ready-mixed concrete will be used during the construction phase, with all concrete being delivered from local batching plants in sealed concrete delivery trucks. The use of ready-mixed concrete deliveries will eliminate any potential environmental risks of on-site batching.

Before leaving site, washing of the delivery truck will be minimised and restricted to designated wash out areas. Concrete trucks will be washed out fully at the off-site batching plant, where facilities are already in place.

The small volume of water that will be generated from washing of the concrete lorry's chute will be directed into a temporary lined impermeable containment area, or a Siltbuster-type concrete wash unit or equivalent. This type of Siltbuster unit catches the solid concrete and filters and holds wash liquid for pH adjustment and further solids separation. The residual liquids and solids will be removed off-site by an appropriately authorised waste collector for disposal at an authorised waste facility. Where temporary lined impermeable containment areas are used, such containment areas are typically built using straw bales and lined with an impermeable membrane. Two examples are shown in Plates 4-4 and 4-5 below.

Plate 4-4 Concrete washout area

Plate 4-5 Concrete Wash Out Area

The areas are covered when not in use to prevent rainwater collecting. In periods of dry weather, the areas can be uncovered to allow much of the water to be lost to evaporation. At the end of the concrete pours, any of the remaining liquid contents will be tankered off-site and transported to an appropriately authorised facility. Any solid contents that will have been cleaned down from the chute will have solidified and can be broken up and disposed of along with other construction waste.

Due to the volume of concrete required for each turbine foundation, and the requirement for the concrete pours to be continuous, deliveries may be carried out outside normal working hours to limit the traffic impact on other road users, particularly peak period school and work commuter traffic. Such activities are limited to the day of turbine foundation concrete pours, which are normally complete in a single day per turbine.

The risks of pollution arising from concrete deliveries will be further reduced by the following:

- Concrete trucks will not be washed out on the site but will be directed back to their batching plant for washout.
- Site roads will be constructed to the required standard to allow transport of the turbine components around the site, and hence, concrete delivery trucks will be able to access all areas where the concrete will be needed. No concrete will be transported around the site in open trailers or dumpers to avoid spillage while in transport. All concrete used in the construction of turbine bases will be pumped directly into the shuttered formwork from the delivery truck. If this is not practical, the concrete will be pumped from the delivery truck into a hydraulic concrete pump or into the bucket of an excavator, which will transfer the concrete to the location where it is needed.
- The arrangements for concrete deliveries to the site will be agreed with suppliers before work starts, agreeing routes, prohibiting on-site washout and to agree emergency procedures.
- Clearly visible signage will be placed in prominent locations close to concrete pour areas specifically stating washout of concrete lorries is not permitted on the site.

4.3.13.4 Concrete Pouring

Given the scale of the turbine base concrete pours which form part of the Proposed Development, the pours will be planned approximately 1 week in advance. Special procedures will be adopted in advance of and during all concrete pours to minimise the risk of pollution. These will include:

- Using weather forecasting to assist in planning large concrete pours and avoiding large pours where prolonged periods of heavy rain is forecast.
- Restricting concrete pumps and machine buckets from slewing over watercourses (including drains and ditches) while placing concrete.
- Ensuring that excavations are sufficiently dewatered before concreting begins and that dewatering continues while concrete sets.
- Ensuring that covers are available, and used, when necessary, for freshly placed concrete to avoid the surface washing away in heavy rain.
- Surplus concrete after completion of a pour will be taken off-site and disposed of at an appropriately authorised facility.

4.3.13.5 Dust Suppression

In periods of extended dry weather, dust suppression may be necessary along haul roads to ensure dust does not cause a nuisance. If necessary, water will be taken from stilling ponds in the site's drainage system and will be pumped into a bowser or water spreader to dampen down haul roads and site compounds to prevent the generation of dust. Silty or oily water will not be used for dust suppression. Water bowser movements will be monitored to limit increased runoff.

4.3.13.6 Vehicle Washing

Wheels or vehicle underbodies are often washed before leaving sites to prevent the build-up of mud on public (and site) roads. Site roads will already be constructed before other road-going trucks begin to make regular or frequent deliveries to the site (e.g., with steel or concrete). The site roads will comprise granular fill, and so the public road-going vehicles will not be travelling over soft or muddy ground where they might pick up mud or dirt.

However, in the interest of best practice wheel wash facilities will be provided. Figure 4-27 includes typical details of a proposed self-contained wheel wash system for use during the construction phase of works. A wheel wash will be located at each of the construction and delivery entrances as shown on the site layout drawings included as Appendix 4-1.

The contractor will be responsible for ensuring that all vehicles egressing the site have used the wheel wash facilities. However, a road sweeper will be made available by the contractor for the cleaning of public roads in the event that they are dirtied by trucks associated with the Proposed Development.

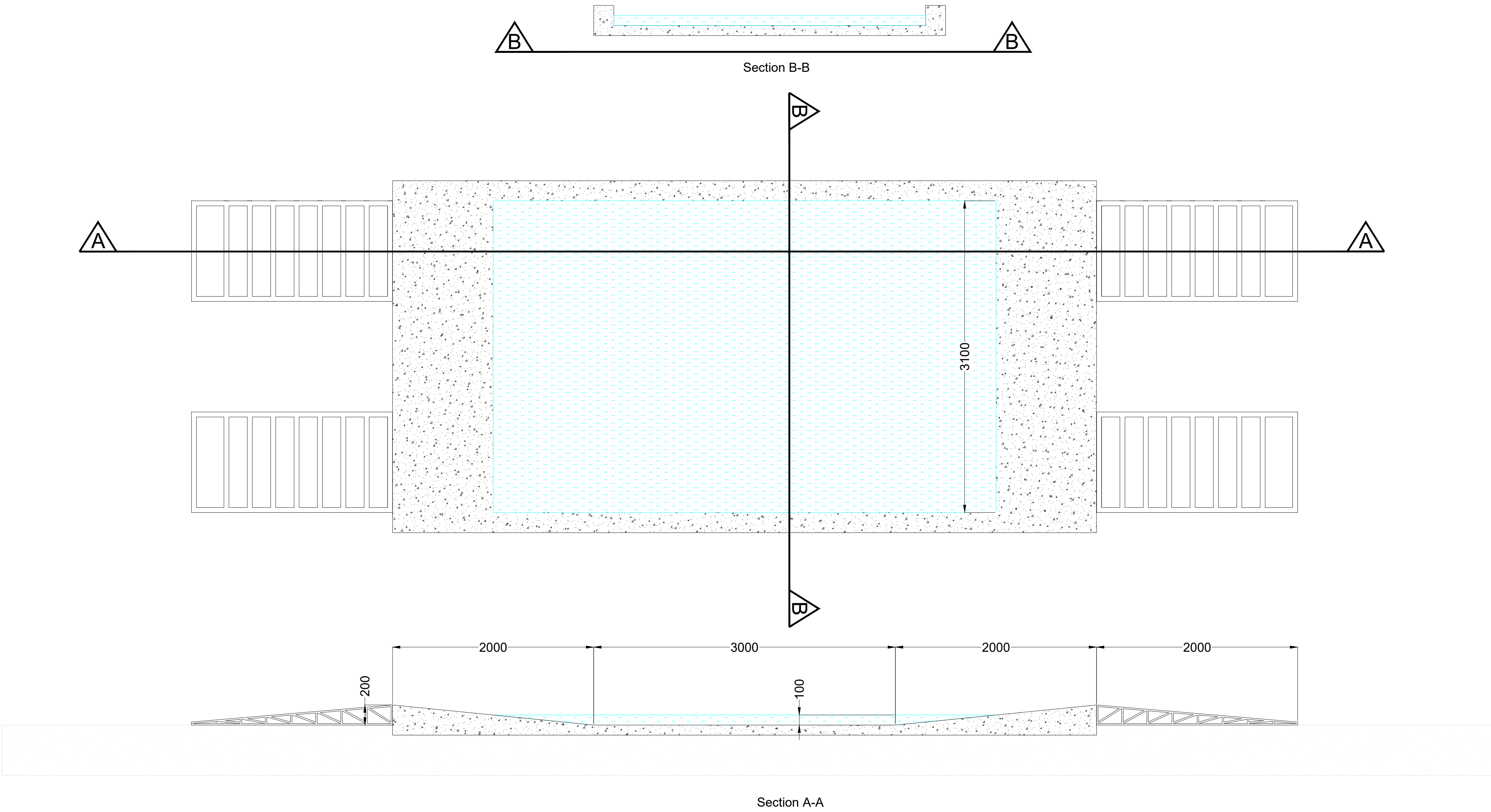

Figure 4-27

DRAWING TITLE:

Wheel Wash Detail

PROJECT TITLE: Ballivor Wind Farm, Co. Meath & Co. Westmeath	
DRAWING BY: Joseph O Brien	CHECKED BY: Karen Mulryan
PROJECT No.: 191137	DRAWING No.: 191137 - 96
SCALE: 1:50 @ A3	DATE: 23.03.2023

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4.3.13.7 Waste Management

The CEMP, Appendix 4-3 of this EIAR, provides a waste management plan (WMP) which outlines the best practice procedures during the demolition, excavation and construction phases of the project. The WMP will outline the methods of waste prevention and minimisation by recycling, recovery and reuse at each stage of construction of the Proposed Development. Disposal of waste will be seen as a last resort.

The Waste Management Act 1996 and its subsequent amendments provide for measures to improve performance in relation to waste management, recycling and recovery. The Act also provides a regulatory framework for meeting higher environmental standards set out by other national and EU legislation.

The Act requires that any waste related activity has to have all necessary licenses and authorisations. It will be the duty of the Waste Manager on the site of the development to ensure that all contractors hired to remove waste from the site have valid Waste Collection Permits. It will then be necessary to ensure that the waste is delivered to a licensed or permitted waste facility. The hired waste contractors and subsequent receiving facilities must adhere to the conditions set out in their respective permits/licenses and authorisations.

Prior to the commencement of the development, a Construction Waste Manager will be appointed by the Contractor. The Construction Waste Manager will be in charge of the implementation of the objectives of the plan, ensuring that all hired waste contractors have the necessary permits/licenses and authorisations and that the waste management hierarchy is adhered to. The person nominated must have sufficient authority so that they can ensure everyone working on the development adheres to the management plan.

The WMP will provide systems that will enable all arisings, movements and treatments of construction waste to be recorded. This system will enable the contractor to measure and record the quantity of waste being generated. It will highlight the areas from which most waste occurs and allows the measurement of arisings against performance targets. The WMP can then be adapted with changes that are seen through record keeping.

4.3.14 Site Entrances

Turbine Component Entrances

There are 2 no. main site entrances proposed for the delivery of turbine components to the site. These two main entrances are located on the R156 and provide access and delivery of components into Ballivor Bog to the south, and into Carranstown Bog and on to the remaining bogs to the north. These existing entrances will be widened to facilitate the delivery to site of turbine components. The entrance locations are depicted on Figure 4-1 and can be described as follows:

- Widening of existing site entrance off the R156 into Ballivor Bog in the townland of Grange More;
- Widening of existing site entrance off the R156 into Carranstown Bog in the townland of Grange More.

In addition to the above, in order to deliver turbine components into Lisclogher Bog, an entrance will be inserted at Bracklin Bog onto a local road and an opposing entrance will be inserted into Lisclogher Bog. This will facilitate the direct travel of components from Bracklin Bog to Lisclogher Bog across the local road, thus minimising road and traffic impacts as the components will travel through Carranstown and Bracklin bogs rather than the local road network and cross the narrow road into Lisclogher Bog. This local road network will not be used to facilitate access for components to these bogs.

General Construction Entrances

The northern component entrance into Carranstown Bog will also facilitate the delivery of construction materials (e.g. stone, steel, concrete) and construction staff to Carranstown, Bracklin and Lisclogher Bogs. Adjacent to the southern entrance, a new construction entrance will be constructed for all non-component vehicles. Following construction, the northern entrance will be narrowed to provide permanent access to accommodate light goods vehicles (LGVs) for maintenance work and private vehicles belonging to recreational visitors using the amenity carpark at Carranstown Bog. The general constriction entrance into Ballivor Bog at the south will be retained for the operational phase for amenity and maintenance use. The larger component entrance will be reinstated and revegetated for the operational phase. Should replacement components be required during the lifetime of the development, the component entrances will be reopened to facilitate HGV and oversize component access to the site.

As discussed above, entrances will be inserted into Bracklin and Lisclogher Bogs to facilitate the movement of turbine components from Bracklin to Lisclogher Bog. These entrances will also be used to facilitate the direct travel of construction vehicles from Bracklin Bog to Lisclogher Bog across the local road. This local road network will not be used for general construction traffic to these bogs. For the operational period, these entrances will be upgraded to permanent site entrances for public amenity use and a permanent carpark will be provided off the Bracklin entrance.

Access to borrow pit no. 2 in Craddanstown is proposed via an initial use of an existing third party entrance and track, which will be upgraded, off a local road through a farmyard, 800m south of Bracklin Bog. At the commencement of the construction phase, machinery will enter the farmyard to the borrow pit area to commence construction of a temporary road from the pit area into Bracklin Bog. Once this temporary road is complete, access from the local road will not be required except for occasional employee access to the borrow pit and occasional movement of machinery from and to the borrow pit. The track and pit will be reinstated and reseeded during the construction phase.

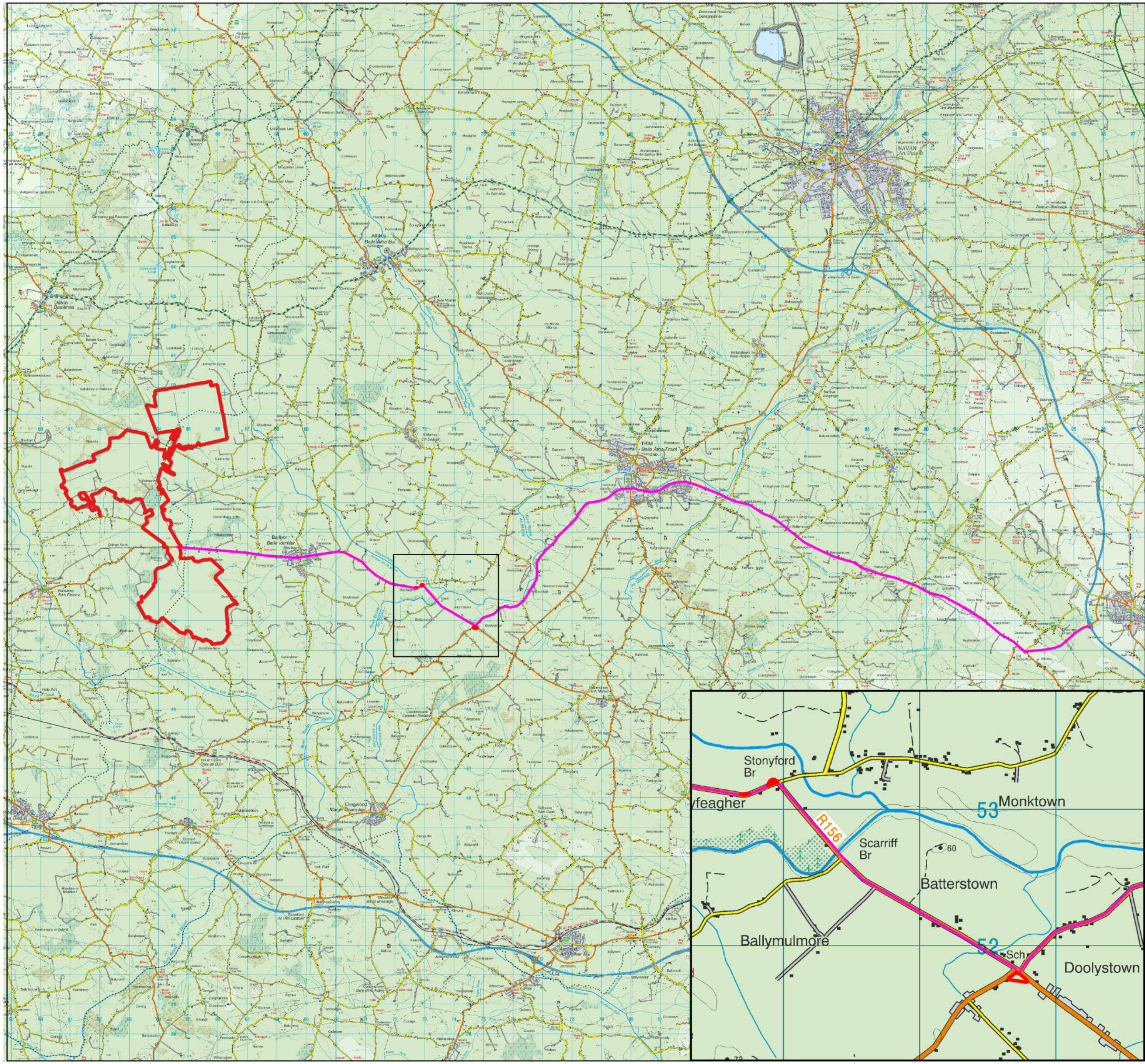
4.3.15 Turbine Component Transport Route

There are a range of ports within the island of Ireland that have proven capability to accept and store large wind turbine components. These ports include Cork, Foynes, Galway and Dublin ports. Furthermore, subsequent access to the national motorway network during transportation from these ports has been demonstrated. The facilities within the ports and access to and from the ports is continually being upgraded as part of general improvements. It is on this basis that it is not foreseen that this project will require any material change to the port selected should the project be consented and enter into the construction phase.

It is proposed that the large wind turbine components will be delivered to site via the M3, exiting at Junction 6 onto the R125 before turning northwest onto the R154 Trim Road. The delivery route enters Trim town before turning south onto the R161 for approximately 7.5km where it meets the R156. The delivery route continues west for approximately 11.1km along the R156 through Ballivor Village before reaching the proposed site entrances off the R156. The proposed route is shown on Figure 4-28. All deliveries of turbine components to the site will only be by way of the proposed transport route detailed in Figure 4-28.

Construction Materials Transport Route

Other construction materials will also be delivered to the site via the selected haul routes that will be determined based on the source of the construction material which will be included in the Traffic Management Plan for the Proposed Development. Traffic movements generated by the Proposed Development are discussed in in Section 14.1 of Chapter 14, Material Assets.



Map Legend

- Wind Farm Site Boundary
- Accomodation Works Areas
- Proposed Turbine Delivery Route

Drawing Title Turbine Delivery Route & Accomodation Works Areas	
Project Title Proposed Ballivor Wind Farm	
Drawn By DOS	Checked By KM
Project No. 191137	Drawing No. Figure 4-28
Scale 1:125,000	Date 2023-03-28

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4.3.15.2 Turbine Delivery Route Accommodation Works

Temporary road widening works will be undertaken along the haul route at two locations to facilitate turbine component delivery and parking/storage:

- Junction between the R156 and the R161 approximately 6.5km southwest of Trim: The junction accommodation works will comprise the road-widening within third-party land in order to facilitate turning of delivery vehicles carrying turbine components and other abnormal loads, from the R161 onto the R156 as well as the provision of off-road parking and storage facilities. The proposed widening will measure 3,751m^2 and the area of land take measure 5,375 m^2.
- East of Ballivor Village on the R156: Accommodating works will be required on the R156 approximately 3.6km east of Ballivor Village. Here, road-widening within third-party land will be required in order to facilitate turning west of delivery vehicles carrying turbine components and other abnormal loads, toward Ballivor Village on the R156. The land take will also provide off-road parking and storage facilities. The proposed accommodation works area on the road will measure 1,809m^2 and the area of land take for the proposed parking and storage facilities will measure 6,770m^2.

The proposed road widening works will be constructed as per the general construction methodology for new excavated roads as outlined in Section 4.8 below. The locations of these proposed accommodation works are shown in Figure 4-1 and the works area are shown on Figure 4-28 above. Temporary fencing will be installed at temporary road widening and parking/storage locations. This fencing will be removed to facilitate turbine component delivery and replaced following each delivery.

Following the completion of the construction phase of the Proposed Development, the temporary road widening locations and parking/storage areas will be covered with a layer of topsoil and reseeded. These locations would only be used again in the event that an oversized delivery was required for wind turbine maintenance purposes.

Additional temporary works in the form of signage and bollard removal, lowering of traffic islands, roundabout lowering at locations along the R125, R154, R156 and R161 are required and to allow for oversailing of turbine components. These works will be reinstated once turbine components have been delivered to site and have been agreed in principle with Meath County Council.

4.3.15.3 Other Road Accommodating Works

4.3.15.3.1 *Proposed Permanent Road Improvement Works at R156*

On the R156 in between the proposed component entrances to Ballivor and Carranstown Bogs, existing visibility is currently impacted by a trough and rise in the road. An assessment of the vertical alignment shown indicates that a 44m section of the R156 impedes on required sightlines and as a result, a maximum reduction of approximately 0.47m for 44m along the R156 is required in this area. This proposed work will be undertaken prior to any construction phase works and will be retained for the operational phase and beyond. This proposed lowering of the road section will enhance the road safety for both construction and operational phase users as well as local road users of the R156. The vertical alignment will be designed and agreed with Westmeath County Council prior to the construction of the Proposed Development.

4.3.15.4 Traffic Management

A turbine with a maximum blade segment length of 76 metres has been used in assessing the traffic impact of the Proposed Development. The blade transporter for such a turbine blade would have a total vehicle length of 81.4 metres, including the blade which overhangs the back of the vehicle. The total length of the tower transporter is 49.6 metres with the axles located at the front and rear of the load with no overhang. The vehicles used to transport the nacelles will be similar to the tower transporter. All other vehicles requiring access to the site will be smaller than the design test vehicles.

The turbine delivery vehicles have been modelled in the swept path assessments for the site, as detailed in Chapter 14: Material Assets of this EIAR.

The need to transport a wind turbine blade or blade segment measuring up to 76 metres on the public roads is not an everyday occurrence in the vicinity of the site of the Proposed Development. However, procedures for transporting abnormal size loads on the country's roads are well established. Escort vehicles, traffic management plans, test runs, road marshals and convoy escorts from the Garda Traffic Corps will be used to transport the components from the delivery port to site.

A detailed Traffic Management Plan (TMP) will be provided specifying details relating to traffic management and included in the Construction Environmental Management Plan (CEMP) prior to the commencement of the construction phase of the Proposed Development. The TMP will be agreed with the local authority and An Garda Síochána prior to construction works commencing on site.

The deliveries of turbine components to the site will be made in convoys of three to five vehicles and mostly at night when roads are quietest. Convoys will be accompanied by escorts at the front and rear operating a "stop and go" system. Although the turbine delivery vehicles are large, they will not prevent other road users or emergency vehicles passing, should the need arise. The delivery escort vehicles will ensure the turbine transport is carried out in a safe and efficient manner with minimal delay or inconvenience for other road users.

It is not anticipated that any section of the local road network will be closed during transport of turbines, although there will be some delays to local traffic at pinch points. During these periods, it may be necessary to operate local diversions for through traffic.

Prior to the construction of the Proposed Development a test run of the proposed transport operation along the proposed route will be completed using vehicles with attachments to simulate the dimensions of the turbine components. Following this test run, the Traffic Management Plan will be reviewed and updated with the haulage company when the final transport arrangements are known, delivery dates confirmed and escort proposals in place. The plan will then be submitted to Meath and Westmeath County Council for agreement in writing in advance of any abnormal loads using the local roads. The plan will provide for all necessary safety measures, including a convoy and Garda escort as required, off-peak turning/reversing movements and any necessary safety controls.

4.4 Community Benefit Proposals

Bord na Móna presently operate three wind farm community gain schemes at its wind farms in Mountlucas, Bruckana, and Oweninny Phase 1. The first of these schemes were established in 2014 thanks to the help and cooperation of the communities surrounding the wind farms. The Community Gain Schemes for Mountlucas, Bruckana Oweninny Phase 1 Wind Farms were set up on the basis of community involvement and public consultation.

The original Community gain schemes consists of a fixed level of funding (based on the installed capacity of the wind farm) that is made available each calendar year for community led projects in the local area. A 'near neighbour' scheme was established for residents in the vicinity of the Bruckana, Cloncreen and Mountlucas wind farms.

Bord na Móna is proposing to replicate its Community Gain Scheme model for Ballivor Wind Farm. The fund will be available for the lifetime of the project and will look to support the local community, through funding of projects and services, as required. A description of the Community Benefit proposal is outlined below and in the 'Ballivor Wind Farm Community Report' which is contained in Appendix 2-2.

4.4.1 Community Gain and Near Neighbour Scheme

In addition to employment during the construction and operational phases of the Proposed Development and annual rates that will be paid to the local authority by the developer, a range of other benefits associated with the development will be provided to the local community through the annual Community Gain Scheme. The aim of this scheme is to provide financial assistance to local communities and not-for-profit organisations around the development. In order to be eligible for funding, projects must fall within the thematic areas of: Amenities, Community Facilities, Culture/Heritage, Energy Efficiency/Improvements, Education and Recreation/Health. A key criterion is that the projects and initiatives will benefit the communities surrounding the wind farm.

The Near Neighbour Scheme will offer electricity bill payers living within a prescribed distance of a wind turbine an annual contribution towards their electricity usage. In addition to the electricity contribution payment, the Scheme will also offer participants a contribution towards the completion of energy measures on the property and/or education support. This is in line with existing near neighbour schemes that are active at other Bord na Móna Powergen Wind Farms.

The value of the fund for the Community Gain and Near Neighbour Schemes will be directly proportional to the installed capacity and energy produced at the site, which based on current proposals, will be in excess of €10 million over the lifetime of the project.

4.4.2 Renewable Energy Participation Scheme/Community Ownership

The Renewable Electricity Support Scheme (RESS) is a Government of Ireland initiative that provides support to renewable electricity projects in Ireland. RESS is a pivotal component of the Programme for Government and the Climate Action Plan 2021 and 2023 and is a major step in achieving Ireland's target of at least 80% renewable electricity by 2030. One of the key objectives of RESS is to provide an Enabling Framework for Community Participation through the provision of pathways and supports for communities to participate in renewable energy projects.

RESS 1 was the first Renewable Electricity Support Scheme run by the Government of Ireland and concluded in 2020. RESS 2 was run in 2022 and concluded in June 2022. The successful projects in RESS 2 represent a potential increase of nearly 20% in Ireland's current renewable energy generation capacity. They will be delivered between 2023 and 2025. A public consultation was opened in 2022 to refine the Terms and Conditions developed for RESS 2 with a limited and specific set of changes for RESS 3. This consultation closed in December 2022.

Each of the RESS processes outline a set of requirements relating to the distribution of funds, including community benefit funds. If the proposed development utilises the RESS model, then any community benefit stipulations outlined in the finalised RESS model will have to be incorporated into the operation of the wind farm and will be of enduring benefit to the local community.

The Programme for Government commits to holding RESS auctions at frequent intervals throughout the lifetime of the scheme.

4.5 Amenity Pathways and Carparks

The Proposed Development will provide approximately 28km of internal road network, which is intended for amenity use (walkways and cycleways) when the wind farm becomes operational. The roads will be re-purposed following construction to form the amenity pathways, in addition to being used for maintenance access during operation. The amenity pathways will be surfaced with a granular material.

An additional 3.3 km (approximately) of a dedicated amenity link is also proposed in the form of new and upgraded tracks along in Ballivor Bog and at existing entrances into Lisclogher and Bracklin Bogs to provide a greater variety of walking loops. These amenity pathways and additional connections are discussed and shown on the Ballivor Amenity Map Appendix 4-4 and are illustrated in Figure 4-1. The additional connections will be 3 metres in width and will be constructed using a similar methodology as outlined in Section 4.8 below.

Three new public car parks will also be provided for recreational use during the operational stage. The car parks will be located along the proposed existing southern access off the R156 into Ballivor Bog, the northern access off the R156 into Carranstown Bog and off the local road which runs northwest–southeast between Lisclogher and Bracklin Bogs. The location and configuration of the proposed car parks are shown in Appendix 4-1. The main car park will be located in Ballivor and will accommodate approximately 50 vehicles; the Carranstown car park will accommodate approximately 15 vehicles. The Bracklin car park will provide parking for approximately 15 vehicles. Each car park will also provide bicycle rack facilities for those who want to cycle to the area and then utilise the amenity loops for walking.

4.6 Site Drainage

4.6.1 Introduction

The drainage design for the proposed wind farm development has been prepared by Hydro Environmental Services (HES), and by the firm's principal, Mr. Michael Gill. The drainage design has been prepared based on experience of the project team on other wind farm sites in peat-dominated environments, and the best practice guidance documents referred to in the References section of the EIAR.

The protection of the watercourses within and surrounding the site, and downstream catchments that they feed is important to establish the most appropriate drainage proposals for the Proposed Development. There is an existing drainage system and surface water discharges from the site which are regulated by the Environmental Protection Agency (Licence Ref. P0501-01). The drainage design for the Proposed Development has been planned with the intention of having no negative impact on the water quality of the site and its associated rivers and lakes, and consequently no impact on downstream catchments and ecological ecosystems. The assessment of potential impacts on hydrology and hydrogeology due to the construction, operation and decommissioning of the Proposed Development is included in Chapter 9: Hydrology and Hydrogeology.

No routes of any natural drainage features will be altered as part of the Proposed Development. Turbine locations and associated new roadways were designed to avoid natural watercourses with existing roads to be used wherever possible. There will be no direct discharges to any natural watercourses, with all drainage waters being dispersed as overland flows. All discharges from the proposed works areas will be made over vegetation filters at an appropriate distance from natural watercourses. Buffer zones around the existing natural drainage features have been used to inform the layout of the Proposed Development.

4.6.2 Existing Drainage Features

The surface of the cutover bog is drained by a network of parallel field drains that are typically spaced every 15 - 20m. The field drains are approximately 0.5 - 1.5m deep and in most areas, they intercept the mineral subsoil underlying the peat. These field drains mostly feed into larger main drains which drain the bogs towards the outfall locations. There are a number of shorter cross drains (sometimes piped below ground in lower lying areas) which intersect the small field drains. There are various outfalls on the bog boundaries. All of the bogs are gravity drained. Surface water draining from the site is routed via settlement ponds (in accordance with the IPC licence requirements) prior to discharge into off-site drainage channels, streams and rivers.

4.6.3 Drainage Design Principles

Runoff control and drainage management are key elements in terms of mitigation measures to reduce potential effects on downstream surface water bodies. Drainage management with the proposed site will be risk based, and will employ various methods, building on the existing drainage systems within the proposed site. The main tenet of the proposed drainage plan is ensuring to 'keep clean water clean' by avoiding unnecessary or significant disturbance to existing drainage features, minimising any works in or around artificial drainage features, and diverting clean surface water flow around excavations, construction areas and temporary storage areas through the construction of interceptor drains. Where possible (depending on orientation), existing field drains can be used as interceptors drains. Otherwise new interceptors drains will be excavated and they will outfall to field drains downstream of the works areas.

The second method involves collecting main construction areas i.e. from turbine base/hardstand areas, construction compounds, and the substation, and routing that water through new proposed temporary wind farm settlement ponds (or stilling ponds) prior to controlled release into the existing field drain network. There will be no discharges to the existing field drains without prior treatment from main construction areas.

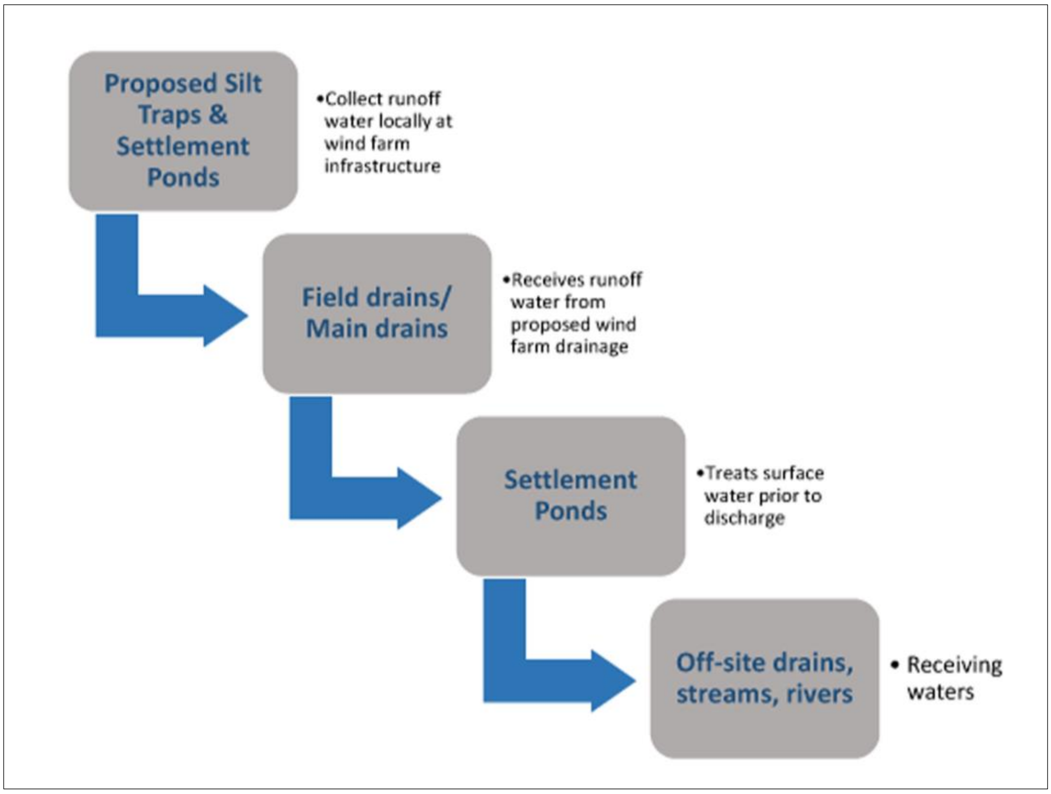
Within the Proposed Development layout there are section of proposed floating road between turbine infrastructure. In these sections, and depending on intermediate topography, a collector drain (dirty water system as described above) may be used during construction stage, or over the edge (OTE) drainage will occur. Over the edge drainage allows runoff from access tracks to flow into local field drains and be managed via the existing site drainage system. OTE drainage will only occur where topography allows, and it is only proposed in areas of low risk and remote from outfall locations (at least 150m from bog outfall locations. Silt traps and check dams will be installed in field drains downstream of OTE drainage areas, and these will provide attenuation and treatment of dirty water.

During the construction phase, all runoff from works areas (i.e., dirty water) will be attenuated and treated prior to being released within the proposed site. All drainage outfall from the proposed site is routed through existing settlement ponds that remain in-situ from the previous site use.

4.6.4 Drainage Design

A preliminary drainage design for the proposed wind farm, incorporating all principles and measures outlined in this drainage design description, has been prepared, and is included in the drainage figures included in Appendix 4-1 to this EIAR. The proposed wind farm drainage process flow is shown on Figure 4-30. The drainage design employs the various measures further described below.

Figure 4-29 Proposed Wind Farm Drainage Process Flow



During the construction phase, all runoff from main works areas will be attenuated and treated prior to being released within the proposed site. All drainage outfall from the proposed site is routed through existing settlement ponds that remain in-situ from the previous site use.

The Proposed Development drainage will not significantly alter the existing drainage regime at the proposed site. Moreover, the proposed drainage system will be fully integrated into the existing bog drainage systems. Existing field drains and main drains will be routed under/around proposed access tracks using culverts as required.

The elements of interaction with existing drains will be as follows:

- Interceptor drains will convey clean runoff water around works areas to the existing downstream drainage system (field drains and main drains). Where required, interceptor drains will be installed in advance of any construction works commencing. This will ensure that clean water is kept clear by diverting surface water flow around excavations, construction areas and temporary storage areas. Where possible (depending on orientation), existing field drains can be used as interceptors drains;
- Collector drains will be used to intercept and collect runoff from construction areas (from turbine base/hardstand areas, construction compounds, and the substation). During the construction phase temporary settlement ponds will be used to attenuate and treat runoff from the construction areas (from turbine base/hardstand areas, construction compounds, and the substation) and treated water will then discharge into existing field drains and main drains. Temporary settlement ponds will be removed at the end of the construction phase (end of high risk period), and wind farm runoff will discharge into existing field drains and main drains;

- During the construction phase, temporary silt traps (silt fences) will be used as an additional water protection measures around the existing bog drainage network, particularly where works are proposed within 50m of a natural watercourse. The silt fences will be placed in the existing drains downstream of construction works, and the associated construction area run-off water will be diverted into proposed interceptor drains, or culverted under/across the works area;
- During the construction phase, dewatering silt bags will also be used as required. They can be used downgradient of turbine bases, where temporary pumping is required. Discharge from dewatering silt bags will flow into settlement ponds and treated water from settlement ponds will outfall to existing field drains and main drains;
- Within the proposed site layout there are section of proposed floating road between turbine infrastructure. In these sections, and depending on intermediate topography, a collector drain (dirty water system as described above) may be used during construction stage, or over the edge (OTE) drainage will occur. Over the edge drainage allows runoff from access tracks to flow into local field drains and be managed via the existing site drainage system. OTE drainage will only occur where topography allows, and it is only proposed in areas of low risk and remote from outfall locations (at least 150m from bog outfall locations. Silt traps and check dams will be installed in field drains downstream of OTE drainage areas, and these will provide attenuation and treatment of dirty water; and,
- Culverts will be required where site roads and proposed hardstands cross the main bog drainage networks. These will be installed with a minimum gradient to reduce the entrainment of suspended solids. All culverts will be inspected regularly and maintained where appropriate. Culverts will remain in-situ during the Operational Phase of the Proposed Development.

4.6.4.1 Interceptor Drains

Interceptor drains will be installed upgradient of main works areas to collect surface flow runoff and prevent it reaching excavations and main construction areas of the site. The drains will be used to divert upslope runoff around the works area to a location where it can be redistributed over the ground surface as sheet flow. This will minimise the volume of potentially silty runoff to be managed within the construction area. Where possible (depending on orientation), existing field drains can be used as interceptors drains

The interceptor drains will be installed in advance of any main construction works commencing. The material excavated to make the drain will be compacted on the downslope edge of the drain to form a diversion dike. On completion of the construction phase works, it is envisaged that the majority of the interceptor drains will be removed, with the exception being where original field drains were used. At that stage (i.e., after the construction phase is complete), there will be no open excavations or large areas of exposed ground that are likely to give rise to large volumes of potentially silt-laden run off. Any areas in which works were carried out to construct roads, turbine or met mast bases or hardstands, will have been built up with large grade hardcore, which even when compacted in place, will retain sufficient void space to allow water to infiltrate the subsurface of these constructed areas. It is not anticipated that roadways or other installed site infrastructure will intercept ground-conveyed surface water runoff to any significant extent that would result in scouring or over-topping or spill over. Where the drains are to be removed, they will be backfilled with the material from the diversion dike. Interceptor drains may have to be retained in certain locations, for example where roadways are to be installed on slopes, to prevent the roadways acting as conduits for water that might infiltrate the roadway sub-base. In these cases, interceptor drains would be maintained in localised areas along the roadway with culverts under the roadway, which would allow the intercepted water to be discharged to vegetation filters downgradient of the roadway. Similarly, in localised hollows where water is likely to be funnelled at greater concentrations than on broader slopes, interceptor drains, and culverts may be left in situ following construction.

Interceptor drains will be installed horizontally across slopes to run in parallel with the natural contour line of the slope. Intercepted water will travel along the interceptor drains to areas downgradient of works areas, where the drain will terminate at a settlement pond/field drain (see Section 4.6.4.4). Across the entire length of the interceptor drains, the design elevation of the water surface along the route of the drains will not be lower than the design elevation of the water surface in the outlet at the level spreader.

4.6.4.2 Collector Drains

Collector drains (or swales) are shallow drains that will be used to intercept and collect run off from the main construction areas of the site during the construction phase (i.e., from turbine base/hardstand areas, construction compounds, and the substation). Drainage swales will remain in place to collect runoff from roads and hardstanding areas of the Proposed Development during the operational phase. A swale is an excavated drainage channel located along the downgradient perimeter of construction areas, used to collect and carry any sediment-laden runoff to a sediment-trapping facility and stabilised outlet. Swales are proven to be most effective when a dike is installed on the downhill side. They are similar in design to interceptor drains and collector drains described above.

Collector drains will be installed downgradient of the main works areas to collect surface flow runoff where it might have come into contact with exposed surfaces and picked up silt and sediment. Swales will intercept the potentially silt-laden water from the excavations and construction areas of the site and prevent it reaching natural watercourses. Collected water will travel along the collector drains to areas downgradient of the main works areas, where the drain will terminate at a settlement pond and outfall to a field drain (see Section 4.6.4.4).

Collector drains will be installed in advance of any main construction works commencing. The material excavated to make the swale will be compacted on the downslope edge of the drain to form a diversion dike.

4.6.4.3 OTE Drainage

As stated above, drainage management with the proposed site will be risk based. Within the proposed site layout there are sections of proposed floating road between turbine infrastructure. In these sections, and depending on intermediate topography, a collector drain (dirty water system as described above) may be used during construction stage, or over the edge (OTE) drainage will occur. Over The Edge (OTE) drainage allows runoff from access tracks to flow into local field drains and be managed via the existing site drainage system. OTE drainage will only occur where topography allows, and it is only proposed in areas of low risk and remote from outfall locations (at least 150m from bog outfall locations). Silt traps and check dams will be installed in field drains downstream of OTE drainage areas, and these measures will provide attenuation and treatment of any arising dirty water. In addition, all drainage water from the bogs will travel along field drains, and main drains, and then into existing settlement ponds prior to outfall from the proposed site into surrounding receiving waters.

4.6.4.4 Check Dams

Drainage gradients within the proposed site are generally low, and as such the use of and spacing between check dams is less frequent than on hillside sites.

The velocity of flow in the interceptor drains and collector drains will be controlled by check dams, which will be installed at regular intervals along the drains to ensure flow in the drain is non-erosive. Check dams will also be installed in some existing artificial drainage channels that will receive waters from works areas of the site.

Check dams will restrict flow velocity, minimise channel erosion and promote sedimentation behind the dam. The check dams will be installed as the interceptor drains are being excavated. Check dams may also be installed in some of the existing field drains on the proposed site, downstream of where drainage swales connect in.

The proposed check dams will be made up of straw bales or stone, or a combination of both depending on the size of the drainage swale it is being installed in. Where straw bales are to be used, they will be secured to the bottom of the drainage swale with stakes. Clean 4 to 6-inch stone will be built up on either side and over the straw bale to a maximum height of 600 mm over the bottom of the interceptor drain. In smaller channels, a stone check dam will be installed and pressed down into place in the bottom of the drainage swale with the bucket of an excavator.

The check dams will be installed at regular intervals along the interceptor drains to ensure the bottom elevation of the upper check dam is at the same level as the top elevation of the next down-gradient check dam in the drain. The centre of the check dam will be approximately 150 mm lower than the edges to allow excess water to overtop the dam in flood conditions rather than cause upstream flooding or scouring around the dams.

Check dams will not be used in any natural watercourses, only artificial drainage channels (field drains) and interceptor/collector drains. The check dams will be left in place at the end of the construction phase to limit erosive linear flow in the drainage swales during extreme rainfall events.

Check dams are designed to reduce velocity and control erosion and are not specifically designed or intended to trap sediment, although sediment is likely to build up. If necessary, any excess sediment build up behind the dams will be removed. For this reason, check dams will be inspected and maintained regularly to insure adequate performance during construction. Maintenance checks will also ensure the centre elevation of the dam remains lower than the sides of the dam.

4.6.4.5 Silt Bags

Dewatering silt bags allow the flow of water through them while trapping any silt or sediment suspended in the water. The silt bags provide a passive non-mechanical method of removing any remaining silt contained in the potentially silt-laden water collected from works areas within the site.

Dewatering silt bags are also used where water is pumped temporarily from excavations (e.g., turbine bases). Water is pumped into the silt bags, and then arising discharge is filtered through the silt bag fabric and flows into local collector drains.

Dewatering silt bags can also be used as an additional filtration measure downgradient of stilling ponds, wherever it is deemed appropriate, throughout the site. The water will flow, via a pipe, from the stilling ponds into the silt bag. The silt bag will allow the water to flow through the geotextile fabric and will trap any of the finer silt and sediment remaining in the water after it has gone through the previous drainage measures. The dewatering silt bags will ensure that there will be no loss of peaty silt into any field drain/main drain.

The dewatering silt bag that will be used will be approximately 3 metres in width by 4.5 metres (see Plate 4-6 and Plate 4-7 below) in length and will be capable of trapping approximately four tonnes of silt. The dewatering silt bag, when full, will be removed from site by a waste contractor with the necessary waste collection permit/license, who will then transport the silt bag to an appropriate, fully licensed waste facility.

Plate 4-6 Silt Bag with water being pumped through

Plate 4-7 Silt bag under inspection

4.6.4.6 Silt Fences

Silt fences will be installed as an additional water protection measure around existing watercourses in certain locations, particularly where works are proposed within the 50-metre buffer zone of a stream.

Silt fences will be installed as single, double or a series of triple silt fences, depending on the space available and the anticipated sediment loading. The silt fence designs follow the technical guidance document *'Control of Water Pollution from Linear Construction Projects'* published by CIRIA (No. C648, 1996).

Silt fence material will comprise Terrastop™ Premium material, and silt fences will be installed as per the manufacturers guidelines. Silt fences will be inspected on a regular basis to ensure that they are operating effectively.

4.6.4.7 Peat Ditch Silt Traps

Silt traps will be installed in field drains downstream of drainage outfalls from works areas. The purpose of the silt traps is to capture silt by means of slowing water flow within the field drains. The existing field drains have a low gradient already, and with the installation of local silt traps drainage water from the wind farm works will be filtered and treated on its onward journey towards the existing settlement ponds.

The peat ditch silt traps will be constructed using stacked timber logs, or marine plywood. These can also be covered in geotextile to enhance filtration. The majority of peat ditch silt traps will be left in-situ following toe construction phase.

4.6.4.8 Temporary Stilling Ponds/Settlement Ponds

Temporary stilling ponds/settlement ponds will be used to attenuate runoff from main works areas (i.e., from turbine base/hardstand areas, construction compounds, and the substation) of the site during the construction phase. The purpose of the temporary stilling ponds is to intercept runoff potentially laden with sediment and to reduce the amount of sediment leaving the disturbed area by reducing runoff velocity. Reducing runoff velocity will allow larger particles to settle out in the stilling ponds, before the run-off water is discharged to field drains/main drain within the proposed site.

Stilling ponds will be located towards the end of collector drains, close to where the treated water will be discharged to field drains/main drains.

During the construction phase, a water level indicator such as a staff gauge will be installed in each stilling pond with marks to identify when sediment is at 10% of the stilling pond capacity. Sediment will be cleaned out of the still pond if it exceeds 10% of pond capacity. Stilling ponds will be inspected weekly and following rainfall events. Inlet and outlets will be checked for sediment accumulation and anything else that might interfere with flows.

Temporary stilling ponds (at main works areas) will be removed at the end of the construction phase. They will not be needed beyond that point, as there is an existing drainage system, and boundary settlement ponds already located within each bog.

During the operational phase all drainage water leaving the proposed site will drain via field drains, main drains, and be treated in the existing settlement ponds prior to outfall.

4.6.5 Cable Trench Drainage

Cable trenches are typically constructed in short, controlled sections, thereby minimising the amount of ground disturbed at any one time and minimising the potential for drainage runoff to pick up silt or suspended solids. Each short section of trench is excavated, ducting installed and bedded, and backfilled with the appropriate materials, before work on the next section commences. This operation normally occurs over a period of 2-4 hours.

To efficiently control drainage runoff from cable trench works areas, excavated material is stored on the up-gradient side of the trench and is temporarily sealed/smoothed over, using the back of the excavator bucket. Should any rainfall cause runoff from the excavated material, the material is therefore collected and contained in the downgradient cable trench. Excess subsoil is removed from the cable trench works area immediately upon excavation, and in the case of the Proposed Development, would be transported to one of the on-site borrow pit storage areas or used for landscaping and reinstatements of other areas elsewhere on site.

4.6.6 Site and Drainage Management

4.6.6.1 Preparative Site Drainage Management

All materials and equipment necessary to implement the drainage measures detailed above, will be brought on-site in phases as they are required during the construction phase. A sufficient number of straw bales, clean drainage stone, terram, stakes, etc. will be kept on site at all times to implement the drainage design measures as necessary. The drainage measures detailed in the above will be installed prior to, or at the same time as the works they are intended to drain.

4.6.6.2 Pre-emptive Site Drainage Management

The works programme for the groundworks part of the construction phase of the project will take account of weather forecasts and predicted rainfall. Large excavations, large movements of overburden or large-scale overburden or soil stripping will be suspended or scaled back if heavy rain is forecast. The extent to which works will be scaled back or suspended will relate to the amount of rainfall forecast.

4.6.6.3 Reactive Site Drainage Management

The final drainage design prepared for the Proposed Development prior to commencement of construction will have to provide for reactive management of drainage measures. The effectiveness of drainage measures designed to minimise runoff entering works areas and capture and treat silt-laden water from the works areas, will be monitored continuously by the environmental clerk of works or supervising hydrologist on-site. The environmental clerk of works or supervising hydrologist will respond to changing weather, ground or drainage conditions on the ground as the project proceeds, to ensure the effectiveness of the drainage design is maintained. This may require the installation of additional check dams, interceptor drains or swales as deemed necessary on-site.

In the event that works are giving rise to siltation of watercourses, the environmental clerk of works or supervising hydrologist will stop all works in the immediate area around where the siltation is evident.

The source of the siltation will be identified and additional drainage measures such as those outlined above will be installed in advance of works recommencing.

4.6.7 Drainage Maintenance

An inspection and maintenance plan for the drainage system onsite will be prepared in advance of commencement of any works. Regular inspections of installed drainage features will be necessary, especially after heavy rainfall, to check for blockages, and ensure there is no build-up of standing water within the system where it is not intended. The inspection of the drainage system will be the responsibility of the environmental clerk of works or the supervising hydrologist. The drainage inspection and maintenance plan are included in the CEMP in Appendix 4-3 of this EIAR.

Check dams will be inspected and maintained weekly during the construction phase of the project to insure adequate performance. Maintenance checks will also ensure the centre elevation of the dam remains lower than the sides of the dam. Any excess sediment build-up behind check dams will be removed.

Drainage swales (interceptor and collector drains) will also be inspected for evidence of erosion along the length of the swale. If evidence of erosion is detected, additional check dams will be installed to limit the velocity of flow in the channel.

Peat ditch silt traps will be inspected and maintained monthly during the construction phase of the project to insure adequate performance. Any excess sediment build-up behind silt traps will be removed.

A water level indicator such as a staff gauge or level marker will be installed in each temporary stilling ponds with marks to identify when sediment is at 50% of the ponds capacity. Sediment will be cleaned out of the stilling pond when it exceeds 50% of pond capacity. Stilling ponds will be inspected weekly during the construction phase of the project and following rainfall events. Inlet and outlets will be checked for sediment accumulation and impediments to flow. Any excess sediment build-up behind inlets and outlets will be removed.

An annual drainage inspection will be completed during the operational phase.

4.7 Construction Management

4.7.1 Construction Timing

It is estimated that the construction phase will take approximately 24 to 30 months from starting onsite to the commissioning of the wind farm. The commencement of works where the removal of vegetation is required, or where works take place in sensitive breeding habitats (such as birch scrub and emergent wetland vegetation), will be scheduled to occur outside the bird breeding season (1st of March to 31st of August) to avoid any potentially significant effects on nesting birds. Construction may commence from September to March so that construction activities are ongoing by the time the next bird breeding season comes around and can continue throughout that bird breeding season.

Construction activities will be carried out during normal daytime working hours (i.e. weekdays 0700 – 1900hrs and Saturdays 0700 – 1400hrs). However, to ensure that optimal use is made of good weather period or at critical periods within the programme (i.e. concrete pours) or to accommodate delivery of large turbine component along public routes it could be necessary on occasion to work outside of these hours. Any such out of hours working will be agreed in advance with the Local Authorities.

4.7.2 Construction Sequencing

The construction phase is estimated to take approximately 24 to 30 months and the works can be broken down into three main overlapping phases, 1) civil engineering works: 18 months, 2) electrical works: 18 months, and 3) turbine erection and commissioning: 9 months. The main task items under each phase are outlined below.

Civil Engineering Works

- Permanent vertical realignment by 0.47m along 44m of the R156 at main site entrances
- Establish site entrance(s).
- Clear and hardcore area for construction compound, temporary site offices. Install same.
- Construct new site roads (permanent and temporary), drainage ditches and culverts.
- Extract materials from onsite and adjacent borrow pits.
- Construct remaining new site roads and hard-standings and crane pads.
- Construct the substation, control buildings and groundworks for the substation compound.
- Excavate/pile for turbine and met mast bases. Store soil/peat locally for backfilling and re-use. Place blinding concrete to turbine bases and met masts. Fix reinforcing steel and anchorage system for tower section. Construct shuttering. Fix any ducts etc. to be cast in. Pour concrete bases. Cure concrete. Remove shutters after 1-2 days.

Electrical Works

- Construct bases/plinths for transformer.
- Excavate trenches for site cables, lay cables and backfill. Provide ducts at road crossings.
- Install external electrical equipment at substations.
- Install transformer at compound.
- Erect stock proof and palisade fencing around substation area.
- Install internal collector network and communication cabling.
- Construct grid connection.

Turbine Erection and Commissioning

- Backfill tower foundations and cover with suitable material.
- Erect towers, nacelles, rotors and blades and met masts.
- Complete electrical installation.
- Install met masts and decommission and remove existing mast.
- Commission and test turbines.
- Complete site works; reinstate site.
- Remove temporary site offices. Provide any gates, landscaping, signs etc. which may be required.

The phasing and scheduling of the main construction task items are outlined in Table 4-5 below.

Table 4-5 Indicative Construction Schedule

ID	Task Name	Task Description	Month 1-3	Month 3-6	Month 6-9	Month 9-12	Month 12-15	Month 15-18	Month 18-24	Month 24-30
1	Site Health and Safty									
2	Vertial Realignment of R156									
3	Site Compounds	Site Compounds, site access, fencing, gates								
4	Borrow pits	Access/site roads to borrow pits, borrow pit excavation, landscaping, fencing								
5	Site Roads	Construction/upgrade of roads, install drainage measures, install water protection measures								
6	Turbine Hardstands	Excavate/pile for turbine bases where required								
6	Turbine Foundations	Fix reinforcing steel and anchorage system, erect shuttering, concrete pour								
7	Substation Construction and Electrical Works	Construct substation, underground cabling, grid connection								
8	Backfilling and Landscaping									
9	Turbine Delivery and Erection									
10	Substation Commissioning									
11	Turbine Commissioning									

4.7.3 Construction Phase Monitoring and Oversight

The requirement for a Construction and Environmental Management Plan (CEMP) to be prepared in advance of any construction works commencing on any wind farm site and submitted for agreement to the Planning Authority is now well-established. The proposed procedures for the implementation of the mitigation measures outlined in the CEMP and their effectiveness and completion is typically audited and reported on in a Construction and Environmental Management Plan Audit Report. The CEMP Audit Report lists all mitigation and monitoring measures prescribed in the planning documentation, all conditions attached to the grant of planning permission and any further mitigation measures proposed during the detailed design stage. The first assessment is a Yes/No question, *has the mitigation measure been employed on-site or not?* Following confirmation that the mitigation measure has been implemented, the effectiveness of the mitigation measures must be subject to regular review and audit during the construction stage of the project. If remedial actions are required to improve the effectiveness of the mitigation measure, these are notified to the site staff during the audit site visit, and in writing by way of the circulation of the audit report. The construction site manager is given a timeframe to complete the remedial works.

The Contractor will be responsible for implementing the mitigation measures specified in the EIAR and compiled in the Audit Report which is included in the CEMP. The Contractor will also be responsible for ensuring that all construction staff understand the importance of implementing the mitigation measures. The implementation of the mitigation measures will be overseen by the environmental clerk of works or supervising hydrogeologists, environmental scientists, ecologists or geotechnical engineers, depending on who is best placed to advise on the implementation. The system of auditing referred to above ensures that the mitigation measures are maintained for the duration of the construction phase, and into the operational phase where necessary.

4.8 Construction Methodologies

4.8.1 Turbine and Met Mast Foundations

Foundations for wind turbines may be of the gravity or piled type. Trial pitting and peat probing has been carried out at each of the turbine base locations to determine the approximate depth of excavation and fill required (refer to Section 4.3.11 and Section 4.3.12). The pile toe level will depend on the ground conditions at each location. These will be established by detailed ground investigations prior to the construction of the Proposed Development. The final dimensions of foundations will be determined by pre-construction structural design calculations.

Each of the turbines and met masts will have a reinforced concrete base. Overburden will be stripped off the foundation area to a suitable formation using excavators and will be placed across the site as close to the excavation as practical. A five-metre-wide working area will be required around each turbine base, with the sides of the excavations battered to stable temporary slopes. Material excavated to create the working area will be stored locally for later reuse in backfilling the working area around the turbine foundation. The excavated material will be surrounded by silt fences to ensure sediment-laden run-off does not occur.

The soil at sub-formation level will be approved by an engineer in accordance with the turbine and mast manufacturer's requirements. Imported structural granular fill will be placed and compacted between suitable sub-formation level and formation level. Drainage measures will be installed to protect the formation by forming an interceptor drain around the perimeter of the base with a pump and sump to remove ground and surface water from the base of the excavation.

An embankment approximately 600 mm high will be constructed around the perimeter of each turbine base and a fence will be erected to prevent construction traffic from driving into the excavated hole and to demarcate the working area. All necessary health and safety signage will be erected to warn of deep excavations etc. Access to and from excavated bases will be formed by excavating a pedestrian walkway to 1:12 grade. Approximately 100 mm of blinding concrete will be placed at formation level .

The turbine anchor cage components are delivered to site and assembled in situ. An excavator or crane with suitable approved lifting equipment will be used to unload sections of the anchor cage and reinforcing steel. The anchor cage is positioned in the middle of the turbine base and is assembled accordingly. When the anchor cage is in final position it is checked and levelled by using an appropriate instrument. The anchor cage is positioned 250mm – 300mm from formation level by use of adjustable legs. Reinforcement bars are then placed around the anchor cage, first radial bars, then concentric bars, shear bars and finally the superior group of bars. Earthing material is attached during the steel foundation build up. The level of the anchor cage will be checked prior to the concrete pour.

Formwork to concrete bases will be propped/supported. Concrete for bases will be poured using a concrete pump. Each base will be poured in three stages.

- Stage 1: the concrete is poured and vibrated in the centre of the anchor cage to bring the concrete up to the required level inside the cage.
- Stage 2: the centre of the steel foundation is poured and vibrated to the required level.
- Stage 3: the remaining concrete is poured around the steel foundation to the required finished level. After the concrete has set sufficiently the top surface of the concrete surface is finished with a power float.

Once the base has sufficient curing time it will be backfilled with suitable fill up to the finished ground level and finished with the original material that was excavated.

4.8.2 Site Roads and Crane Pad Areas

The construction methodologies for the road types and crane pad areas described below. Straight sections of proposed roadways will require a running width of approximately 6 metres to accommodate the transportation of large turbine components. Corners and junctions will be locally wider to allow the vehicles to manoeuvre around bends. The proposed new roadways will include passing bays to facilitate traffic passing around the site. The site access roads will be battered to safe permanent side slopes of 1V:2H. All site access roads will comply with the turbine supplier's requirements. Where Bord na Móna rail is in place, the proposed internal wind farm roads will be floated over them to preserve them insitu.

4.8.2.1 Construction of New Floating Roads

Floating access roads are the predominant road construction type proposed for the site. The use of new floated access tracks will be limited on site to areas of flatter terrain with slopes typically less than 5°.

The general construction methodology for floating roads, as presented in the Peat and Spoil Management Plan in Appendix 4-2, is summarised below.

i. *Prior to commencing floating road construction movement monitoring posts should be installed in areas where the peat depth is greater than 2.0m.*
ii. *Floating road construction shall be to the line and level requirements as per design/planning conditions.*
iii. *Base geogrid to be laid directly onto the existing peat surface along the line of the road in accordance with geogrid provider's requirements.*
iv. *Construction of road to be in accordance with appropriate design from the designer.*
v. *The typical make-up of the new floated access road is up to 1,200mm of selected granular fill with 2 no. layers of geogrid with possibly the inclusion of a geotextile separator. This may vary depending on designer requirements.*
vi. *Following the detailed design of the floated access roads it may be deemed necessary to include pressure berms either side of the access road in some of the deeper peat areas. The inclusion of a 5m wide pressure berm (typically 1m in height) either side of the access road will reduce the likelihood of potential bearing failures beneath the access road.*
vii. *The finished road surface width will be approximately 6m (to be confirmed by the designer).*
viii. *Stone delivered to the floating road construction shall be end-tipped onto the constructed floating road. Direct tipping of stone onto the peat shall not be carried out.*
ix. *To avoid excessive impact loading on the peat due to concentrated end-tipping all stone delivered to the floating road shall be tipped over at least a 10m length of constructed floating road.*
x. *Where it is not possible to end-tip over a 10m length of constructed floating road then dumpers delivering stone to the floating road shall carry a reduced stone load (not greater than half full) until such time as end-tipping can be carried out over a 10m length of constructed floating road.*
xi. *Following end-tipping a suitable bull-dozer shall be employed to spread and place the tipped stone over the base geogrid along the line of the road.*
xii. *A final surface layer shall be placed over the floating road, as per design requirements, to provide a road profile and graded to accommodate wind turbine construction and delivery traffic.*

4.8.2.2 Construction of New Excavated Roads

The general construction methodology for the construction of excavated roads, as presented in the Peat and Spoil Management Plan (Appendix 4-2), is summarised below and illustrated in in Plate 4-8.

i. *Prior to commencing the construction of the excavated roads movement monitoring posts should be installed in areas where the peat depth is greater than 2.0m.*
ii. *Interceptor drains should be installed upslope of the access road alignment to divert any surface water away from the construction area.*
iii. *Excavation of roads shall be to the line and level given in the design requirements. Excavation should take place to a competent stratum beneath the peat (as agreed with the site designer).*
iv. *Road construction should 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 unless otherwise agreed with the site designer or resident engineer on site.*
v. *All excavated peat shall be placed/spread alongside the excavations.*
vi. *Side slopes in peat 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 are encountered then slacker slopes will be required. Battering of the side slopes of the excavations should be carried out as the excavation progresses.*
vii. *The surface of the finished excavated access road will be 1.2m above existing ground level.*
viii. *A layer of geogrid/geotextile may be required at the surface of the competent stratum (to be confirmed by the designer).*
ix. *At transitions between floating and excavated roads a length of road of about 10m shall have all peat excavated and replaced with suitable fill. The surface of this fill shall be graded so that the road surface transitions smoothly from floating to excavated road.*
x. *Where slopes of greater than 5 degrees are encountered along with relatively deep peat (i.e. greater than 1.5m) and where it is proposed to construct the access road perpendicular to the slope contours it is best practice to start construction at the bottom of the slope and work towards the top, where possible. This method avoids any unnecessary loading to the adjacent peat and greatly reduces any risk of peat instability. It should be noted that slopes greater than 5 degrees are not envisaged on site.*
xi. *A final surface layer shall be placed over the excavated road, as per design requirements, to provide a road profile and graded to accommodate wind turbine construction and delivery traffic.*

Plate 4-8 Internal roads under construction using the excavate and replace method. Source Bord na Móna.

Plate 4-9 Internal road under construction demonstrating laying of geogrid/geotextile. Source Bord na Móna.

4.8.2.3 Crane Hardstands

All crane pads will be designed taking account of the loadings provided by the turbine manufacturer and will consist of a compacted stone structure. The crane hardstands will be constructed in a similar manner to the excavated site roads and will measure in accordance with the turbine manufacturer's requirements. Where an excavated crane hardstand cannot be used due to the depth of peat, the hardstand will be supported by using reinforced concrete piles as per the methodology outlined for piled foundations discussed above. Please see Figure 4-2 for crane hardstands.

4.8.3 Cable Trenching

The transformer in each wind turbine is connected to the substation by buried electrical cables. The ground is trenched typically using a mechanical excavator. The top layer of soil is removed and saved so that it is replaced on completion. The electrical cables from wind turbines to the substation will be run in ducts approximately 1.2m below the ground surface. These cables will be installed within the cutaway peatlands and will cross the R156 and the local road between Lisclogher and Bracklin bogs in order to connect to the substation in Carranstown Bog. Trench details can be seen in Plate 4-10. On completion, the ground will be reinstated as described in Section 4.3.12.2

Plate 4-10 Typical Cable Trench View left, reinstated trench, right. Source Bord na Móna.

4.8.4 Grid Connection

The Proposed Development will connect to the existing national grid via a proposed 110kV substation which will be sited in the north-western part of the Carranstown bog, from where a loop in– loop out connection to the existing Mullingar-Corduff 110kV overhead line (OHL) with be constructed. A transmission cable will be required to connect from the proposed substation to the existing overhead line.

Two new loop-in towers will be constructed under the existing 110kV OHL. The existing OHL conductor will be terminated at these two towers in order to facilitate a new OHL loop into the proposed Carranstown 110kV substation. The existing conductor will be removed between the loop in towers with the new connection looped through to the new Carranstown 110kV substation. The new loop in structure locations have been selected based on ground surveys, ground profiles, allowable angles and ruling span checks. The following section outlines the methodology to be followed during construction works of the new loop in tower structures which will be constructed underneath the existing Mullingar-Corduff 110kV overhead line:

i. *The Steel lattice tower sites are scanned for underground services such as cables etc.*
ii. *A foundation c.3m x 3.6m x 3.6m is excavated and the formation levels (depths) will be checked by the onsite foreman See Plates 4-11 and 4-12. The excavated material will be temporarily stored close to the excavation and excess material will be used as berms along the site access roads.*
iii. *To aid construction, a concrete pipe is placed into each excavation to allow operatives level the mast at the bottom of the excavation. The frame of the reinforcing bars will be prepared and strapped to a concrete pipe with spacers as required. The reinforcing bars will be lifted into each excavated foundation using the excavator and chains/slings. The base and body section of each tower will then be assembled next to excavation.*
iv. *Concrete trucks will pour concrete directly into each excavation in distinct stages.*

v. *A third pour for the leg of the tower 1m x 1m and will be 300mm over ground level.*
vi. *Once the main concrete foundation pour is cured after circa five days, metal shuttering is installed to accommodate the placement of concrete around the tower legs. During each pour, the concrete will be vibrated thoroughly using a vibrating poker.*
vii. *Once the concrete is set after the five days the shuttering is removed.*
viii. *The tower foundations will be backfilled one leg at a time with the material already excavated at the location. The backfill will be placed and compacted in layers. All dimensions will be checked following the backfilling process. All surplus excavated material and removed from the tower locations and stored in berms adjacent to the Substation Compound or distributed on site in accordance with approved environmental procedures.*
ix. *The existing overhead line will be de-energised by ESB so work can commence on the construction of the towers.*
x. *An earth mat consisting of copper or aluminium wire will be laid circa 400mm below ground around the tower. This earth mat is a requirement for the electrical connection of the equipment on the tower structure.*
xi. *Once the base section of each tower is completed and the concrete sufficiently cured, it is ready to receive the tower body. Temporary hardstands may be removed and disposed of off site where necessary. See Plate 4-12.*
xii. *A hardstand area for the crane will be created by laying geogrid material on the ground surface and overlaying this geogrid with a suitable grade of aggregate.*
xiii. *A physical barrier (Heras Fence Site Boundary) will be put in place to restrict plant from coming too close to the OHL.*
xiv. *The towers will be constructed lying flat on the ground beside the recently installed tower base.*
xv. *The conductor will be moved off centre using a stay wire and weights to anchor the stay wire to ground.*
xvi. *The tower section will be lifted into place using the crane and guide ropes.*
xvii. *The body sections will be bolted into position.*
xviii. *The conductor will be centred over the towers and held in place. Once the conductor is secured at both ends it is then cut and attached onto each tower. The small section of conductor in between the two towers will be removed and utilised as connector wire for the new towers.*

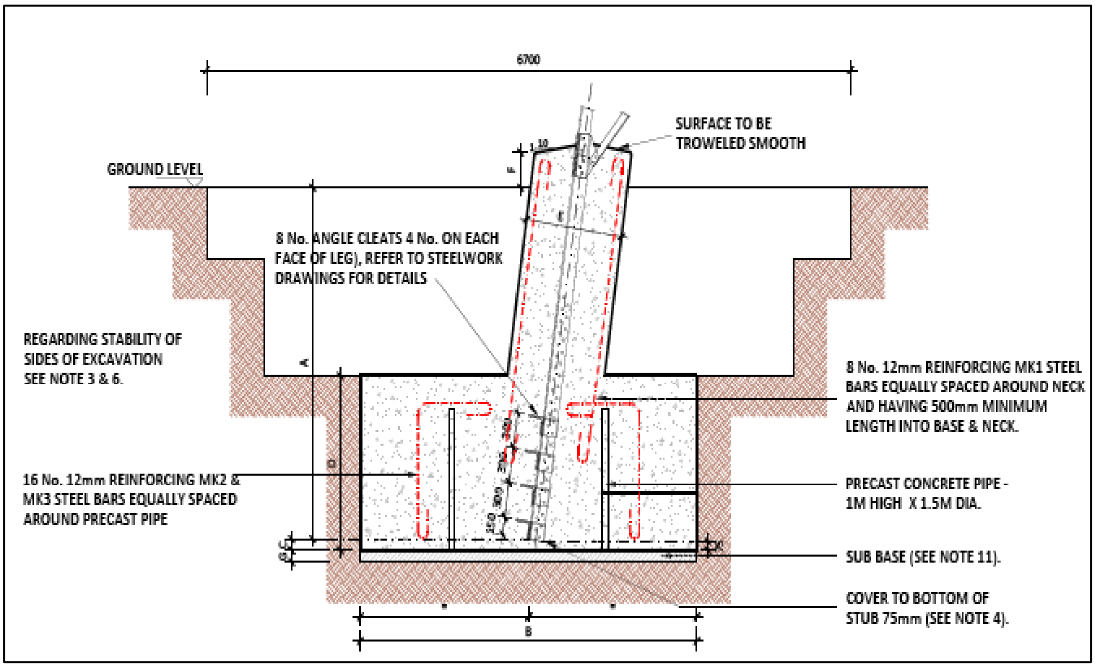


Plate 4-11 Steel lattice tower foundation

Plate 4-12 Steel lattice tower foundation complete

Plate 4-13 Completed End Mast Tower

4.8.5 Anemometry Mast Removal

There is an existing 100m high meteorological mast (Pl. Ref. 16/6259) on Lisclogher which will be decommissioned, disassembled and removed from site as it will no longer be required. The disassembly process will generally follow the sequencing shown on Table 4-6.

Table 4-6 Met Mast Removal Sequencing

Demolition Sequence	Description
Removal of Equipment	Equipment and monitors on the mast will be removed
Removal of hazardous materials	Electrical cabling, solar panels and other remaining electrical equipment
Removal of Mast Structure	Disassemble Mast Structure
Removal of Groundworks	Ground anchors will dug up and removed
Source segregation of material fractions	C&D waste recovery
Transport of materials to authorised facilities	Authorised Waste Collection Permit holders and Waste Facility or Licence holders.

4.8.6 Onsite Electricity Substation and Control Building

Once ground preparation as per the methodology for site roads as described previously is completed, the onsite substation will be constructed by the following methodology:

- The area of the onsite substation will be marked out.
- The topsoil and overburden will be removed down to a sub-formation level approved by a geotechnical engineer.
- Imported structural fill will be placed and compacted between sub-formation level and formation level in accordance with Eirgrid requirements;
- Two control buildings will also be built within the onsite substation compound;
    - The foundations will be excavated down to the level approved by the designer and appropriately shuttered reinforced concrete will be laid over it. An anti-bleeding admixture will be included in the concrete mix;
    - The block work walls will be built up from the footings to DPC level and the floor slab constructed, having first located any ducts or trenches required by the follow on mechanical and electrical contractors;
    - The block work will be raised to wall plate level and the gables and internal partition walls formed. Scaffold will be erected around the outside of the building for this operation;
    - The concrete roof slabs will be lifted into position using a crane;
    - The timber roof trusses will be lifted into position. The roof trusses will be felted, battened, tiled and sealed against the weather.
- The electrical equipment will be installed and commissioned.
- Perimeter fencing will be erected.
- The construction and components of the substation will be to ESB or Eirgrid specifications.

4.8.7 Temporary Construction Compounds

Four temporary construction compounds are proposed as part of the development as discussed in Section 4.3. The construction compounds will be constructed using excavate and replace methods but may be floated or partially floated pending the results of the detailed ground investigations.

- The areas to be used as the compound will be marked out. Drainage runs and associated settlement ponds will be installed around the perimeter;
- The compounds will be constructed using either excavate/replace or floating construction methods;
- A layer of geo-grid will be placed, and granular material will be placed to provide a hardstanding area for site offices and storage containers;
- The compound will be fenced and secured with locked gates if necessary; and,
- Upon completion of the Proposed Development three temporary construction compounds will be decommissioned by covering with landscape fill and topsoil or peat. The compounds at Ballivor Bog and on Bracklin bog (South of the Bracklin/Lisclogher crossing point) will be converted into public carparks for recreational users.

4.9 Operation

The Proposed Development is expected to have a lifespan of approximately 30 years. Planning permission is being sought for a 30-year operation period commencing from the date of full operational commissioning of the wind farm. During the operational period, on a day-to-day basis the wind turbines will operate automatically, responding to inputs from meteorological equipment and control systems to changes in factors such as wind speed and wind direction.

The wind turbines will be interconnected, and data relayed from the wind turbines to an off-site control centre. The meteorological mast will be similarly interconnected. Each turbine will also be monitored off-site by the wind turbine supplier. The monitoring of turbine output, performance, wind speeds, and responses to any key alarms will be monitored at an off-site control centre 24-hours per day.

Each turbine will be subject to a routine maintenance programme involving a number of checks and changing of consumables, including oil changes. Each meteorological mast will be subject to a routine maintenance programme involving a number of checks and changing of instrumentation when required. In addition, there will be a requirement for unscheduled maintenance, which could vary between resetting alarms to major component changes requiring a crane. Typically, maintenance traffic will consist of four-wheel drive vehicles or vans. The electricity substation and site tracks will also require periodic maintenance. Maintenance of the site roads will involve filling potholes and maintaining road edge markers. Drainage maintenance will typically involve cleaning of drainage ditches when required to prevent water backing up.

The Substation would be operational 24 hours per day, 7 days a week throughout the year. Substations be operated remotely and manually. Supervisory operational and monitoring activities will be carried out remotely using a SCADA system, with the aid of computers connected via a telephone modem link. The following maintenance procedures will also be adhered.

- Periodic service and maintenance works which include some vehicle movement.
- For operational and inspection purposes, substation access is required.
- Servicing of the substation equipment will be carried out in accordance with the manufacturer's specifications, which would be expected to entail the following:
  - Six-month service – three-week visit
  - Annual service – six-week visit
  - Weekly visits as required

Occasional technical problems may require maintenance visits by technical staff. During the six-month and annual service visits, some waste (lubricating and cooling oils, packaging from spare parts or equipment, unused paint, etc.) will arise. This will be recorded and removed from the site and reused, recycled or disposed of in accordance with the relevant legislation in an authorised facility.

This means that day-to-day access to the infrastructure by persons and vehicles will be infrequent, only required to undertake minor routine maintenance and inspection.

4.10 Decommissioning

The wind turbines proposed as part of the Proposed Development are expected to have a lifespan of approximately 30 years. Following the end of their service life, the wind turbines may be replaced with a new set of turbines or components, subject to planning permission being obtained, or the Proposed Development may be decommissioned fully. The onsite substation will remain in place as it will be under the ownership of the ESB/EirGrid.

During decommissioning of the Proposed Development, the wind turbines and meteorological masts would be disassembled. All above ground turbine and mast components would be separated and removed off-site for recycling. Turbine and mast foundations would remain underground and would be covered with earth and allowed to revegetate. Leaving the foundations in-situ is considered a more environmentally prudent option, as to remove that volume of reinforced concrete from the ground could result in significant environment nuisances such as noise, dust and/or vibration. Site roadways will be in use as amenity and recreational pathways, and therefore will not be removed during decommissioning. If it were to be confirmed that the roads were not required in the future for any other useful purpose, they could be removed where required. Underground cables, including grid connection, will be removed and the ducting left in place. A decommissioning plan will be agreed with Meath and Westmeath County Council prior to decommissioning the Proposed Development. A Decommissioning Plan is included as Appendix 4-5 of this EIAR.

However, as noted in the Scottish Natural Heritage report (SNH) Research and Guidance on Restoration and Decommissioning of Onshore Wind Farms (SNH, 2013)[5] reinstatement proposals for a wind farm are made approximately 30 years in advance, so within the lifespan of the wind farm, technological advances and preferred approaches to reinstatement are likely to change. According to the SNH guidance, it is therefore:

> *"best practice not to limit options too far in advance of actual decommissioning but to maintain informed flexibility until close to the end-of-life of the wind farm".*

[5] *Welstead, J., Hirst, R., Keogh, D., Robb G. and Bainsfair, R. 2013. Research and guidance on restoration and decommissioning of onshore wind farms. Scottish Natural Heritage Commissioned Report No. 591. Available at: https://www.nature.scot/sites/default/files/2017-07/Publication%202013%20-%20SNH%20Commissioned%20Report%20591%20-%20Research%20and%20guidance%20on%20restoration%20and%20decommissioning%20of%20onshore%20wind%20farms.pdf*