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. Up to 19 no. wind turbines with a generating capacity in excess of 50MW, maximum overall ground to blade tip height of up to 156.5 metres;
II. 1 no. permanent Meteorological Mast up to a maximum height of 110 metres;
III. 1 no. 110kV onsite Electrical substation with 2 no. control buildings with welfare facilities, associated electrical plant and equipment, security fencing and waste water holding tank;
IV. Internal wind farm underground cabling;
V. 110kV underground grid connection cabling;
VI. Upgrade of access junctions;
VII. Upgrade of existing tracks, roads and provision of new site access roads and hardstand areas;
VIII. 3 no. borrow pits;
IX. 2 no. temporary construction compounds;
X. Recreation and amenity works, including marked trails (upgrade of existing tracks and provision of new tracks), picnic, amenity and play areas, car parking and vehicular access;
XI. Site drainage;
XII. Forestry Felling;
XIII. Permanent signage;
XIV. All associated site development and ancillary works

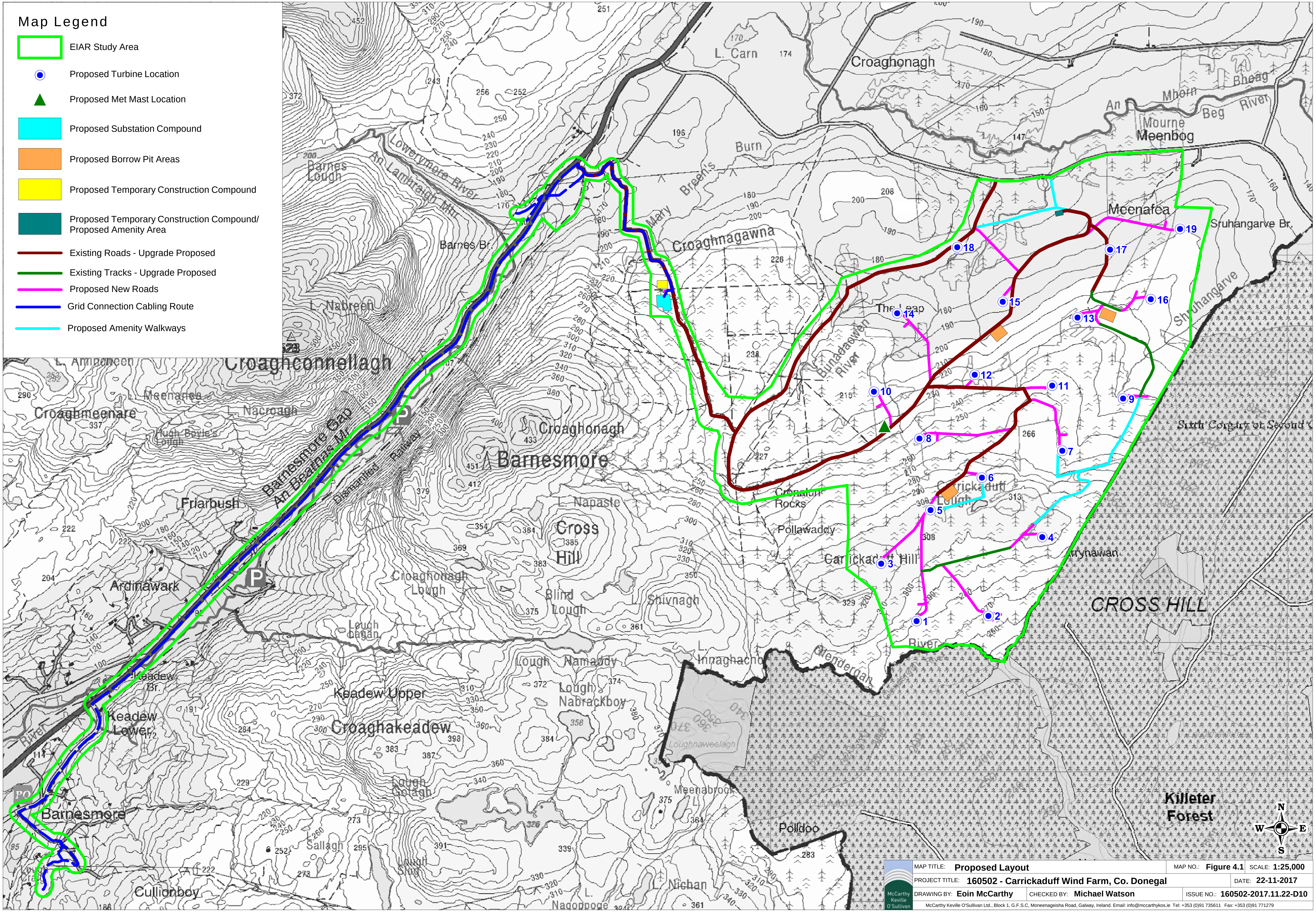
The Proposed Development will have an operational life of 30 years from the date of commissioning of the wind farm.

All elements of the Proposed Development , including grid connection, forestry felling and replanting and any works required on public roads to accommodate turbine delivery, have been assessed as part of this EIAR.

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 Section 3.5.1 of this EIAR, has been carried out to ensure that turbines and ancillary infrastructure are located 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, borrow pits, construction compounds, internal roads layout and the main site entrance. Detailed site layout drawings of the Proposed Development are included in Appendix 4.1 to this EIAR.


Map Legend
EIAR Study Area
Proposed Turbine Location
Proposed Met Mast Location
Proposed Substation Compound
Proposed Borrow Pit Areas
Proposed Temporary Construction Compound
Proposed Temporary Construction Compound/ Proposed Amenity Area
Existing Roads - Upgrade Proposed
Existing Tracks - Upgrade Proposed
Proposed New Roads
Grid Connection Cabling Route
Proposed Amenity Walkways
1
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MAP TITLE: Proposed Layout
MAP NO.: Figure 4.1
SCALE: 1:25,000
PROJECT TITLE: 160502 - Carrickaduff Wind Farm, Co. Donegal
DATE: 22-11-2017
DRAWING BY: Eoin McCarthy
CHECKED BY: Michael Watson
ISSUE NO.: 160502-2017.11.22-D10
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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, ResGen, WindPro and WindFarmer) 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 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	Irish Grid Coordinates		Top of Foundation Elevation (m OD)
	Easting	Northing	
1	207,133	384,174	286.5
2	207,689	384,214	266
3	206,859	384,619	314
4	208,106	384,825	301.5
5	207,241	385,034	303.5
6	207,639	385,286	292
7	208,261	385,494	258.5
8	207,155	385,589	252.5
9	208,732	385,899	232.5
10	206,803	385,952	214
11	208,183	385,999	254.5
12	207,583	386,083	227
13	208,379	386,526	220
14	206,983	386,559	185
15	207,800	386,648	184
16	208,946	386,668	214
17	208,631	387,051	184
18	207,448	387,070	168.5
19	209,173	387,212	196.5

There are 4 no. houses (three inhabited, one derelict) located within one kilometre of the proposed turbine locations. The closest occupied dwelling is a holiday cottage located 750 metres northwest of the nearest proposed turbine location.

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

Plate 4.1 Wind turbine components

The proposed wind turbines will have a tip height of up to 156.5 metres. Within this size envelope, various configurations of hub height, rotor diameter and ground to blade tip height may be used. The exact make and model of the turbine will be dictated by a competitive tender process, but it will not exceed a tip height of up to 156.5 metres. Modern wind turbines from the main turbine manufacturers have evolved to share a common appearance and other major characteristics, with only minor cosmetic differences differentiating one from another. The wind turbines that will be installed on the site will be conventional three-blade turbines, that will be geared to ensure the rotors of all turbines rotate in the same direction at all times. The turbines will be grey matt in colour.

For the purposes of this EIAR, various types and sizes of wind turbines within the 156.5-metre tip height envelope have been selected and considered in the relevant sections of the EIAR to assess the worst-case scenario. Turbine design parameters have a bearing on the assessment of shadow flicker, noise, visual impact, traffic and transport and ecology (specifically birds), as addressed elsewhere in this EIAR. In each EIAR section that requires the consideration of turbine parameters as part of the impact assessment, the turbine design parameters that have been used in the impact assessment are specified.

At the turbine selection stage of the project, pre-construction, new turbines models or variants may be available that were not on the market at the pre-planning and EIAR preparation stage, which would better suit the site and fit within the proposed size envelope. Should this circumstance arise, the specific parameters of the new turbines will be assessed for their compliance with the criteria set out and considered in this EIAR, the relevant guidance in place at the time and any conditions that may be attached to any grant of planning permission that might issue.

A drawing of the of the proposed wind turbine is shown in Figure 4.2. The individual components of a typical geared wind turbine nacelle and hub are shown in Figure 4.3 below.

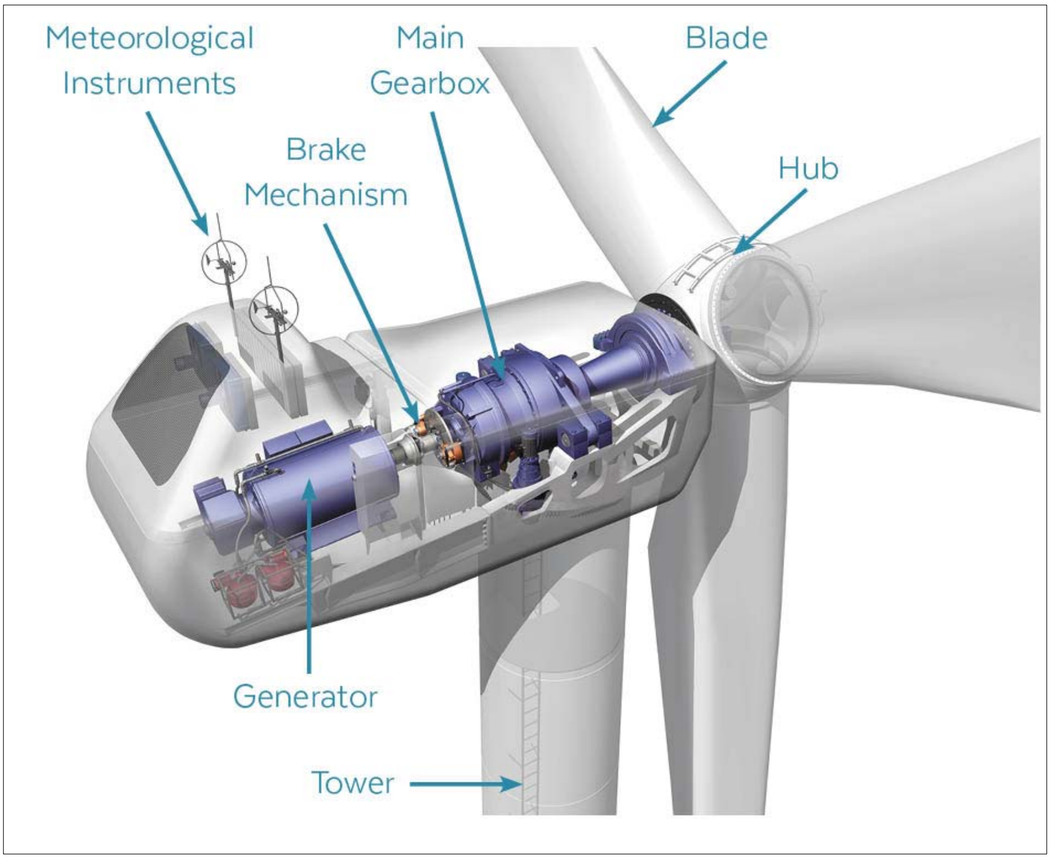


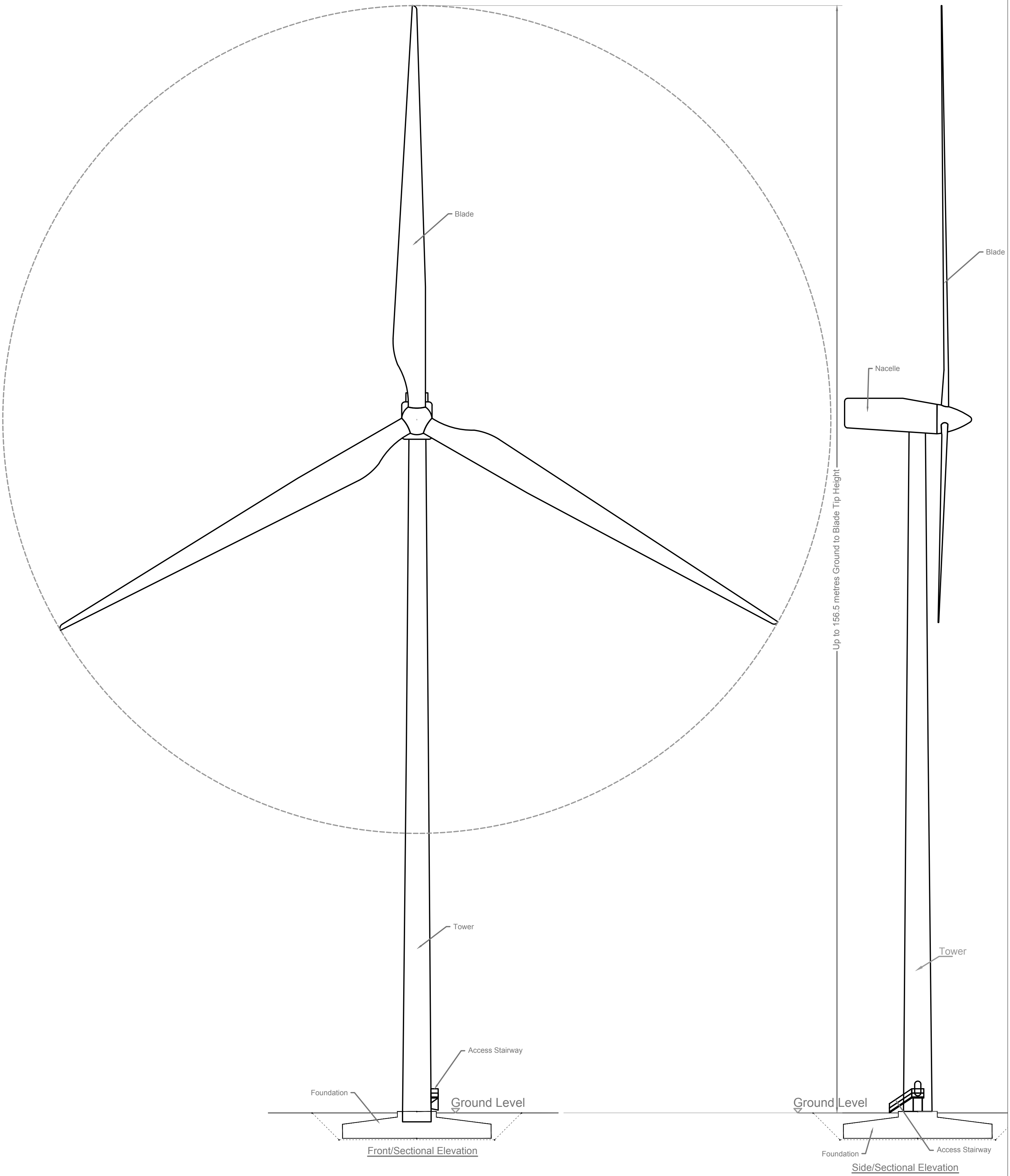
Figure 4.3 Turbine nacelle and hub components

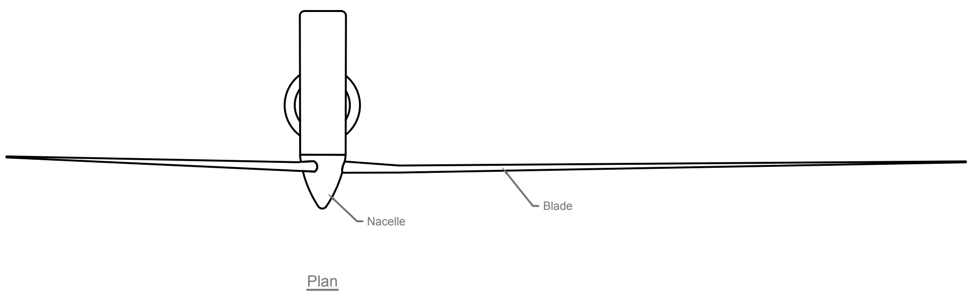
Figure 4.4 shows a typical turbine base layout, including turbine foundation, hard standing area, assembly area, access road and surrounding works area.

4.3.1.3 Turbine Foundations

Each wind turbine is secured to a reinforced concrete foundation that is installed below the finished ground level. The size of the foundation will be dictated by the turbine manufacturer, and the final turbine selection will be the subject of a competitive tender process. Different turbine manufacturers use different shaped turbines foundations, ranging from circular to hexagonal and square, depending on the requirements of the final turbine supplier. The turbine foundation transmits any load on the wind turbine into the ground. The typical horizontal and vertical extent of a turbine's foundation is shown in Figure 4.2.

After the foundation level of each turbine has been formed using piling methods or on competent strata, the bottom section of the turbine tower "Anchor Cage" is levelled and reinforcing steel is then built up around and through the anchor cage (Plate 4.2 below). The outside of the foundation is shuttered with demountable formwork to allow the pouring of concrete and is backfilled accordingly with appropriate granular fill to finished surface level (Plate 4.3 below).





Drawing Notes

1. Proposed wind turbines to have a maximum ground to blade tip height of up to 156.5m.
2. Exact make and model of the turbine to be dictated by a competitive tender process.
3. Installed wind turbine will not exceed maximum size envelope set out above in any blade-length and hub-height configuration.
4. The final ground level will be determined by actual ground conditions and may differ from those stated on the drawings.

Figure 4.2

DRAWING TITLE:

Wind Turbine Elevation & Plan

PROJECT TITLE: Meenbog Wind Farm, Co Donegal

DRAWING BY: Joseph o Brien	CHECKED BY: Michael Watson
PROJECT No.: 160502	DRAWING No.: 0502 - 36
SCALE: 1:500@A3	DATE: 28.11.2017

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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 hardcore 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 shown on the detailed layout drawings included in Appendix 4.1 to this report are indicative of the sizes required, but the extent of the required areas at each turbine location may be optimised on-site depending on topography, position of the site access road, the proposed turbine position and the turbine supplier's exact 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 4.4. These assembly areas are required for offloading turbine blades, tower sections and hub from trucks until such time as they are ready to be lifted into position by cranes and to assist the main crane during turbine assembly. The exact location and number of assembly areas will be determined by the selected turbine manufacturer.

4.3.1.6 Power Output

The Proposed Development will have an estimated generating capacity of approximately 66.5 megawatts (MW). Turbines of the exact same make, model and dimensions can have different power outputs depending on the capacity of the electrical generator installed in the turbine nacelle.

A rated output of 3.5 MW has been assumed throughout this document for various calculations, the exact output of the installed turbine may be less than or greater than this figure, however 3.5 MW represents a reasonable average output for modern turbines within the proposed size envelope. This results in an estimated installed capacity of 66.5 MW. Assuming an installed capacity of 66.5 MW, the Proposed Development therefore has the potential to produce up to 203,889 MWh (megawatt hours) of electricity per year, based on the following calculation:

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

Drawing Notes

1. Typical Layout.
   The dimensions shown are typical dimensions of a turbine hardstand and foundation. The actual dimensions of the hardstand and foundations will be as per the turbine manufacturer's requirments.

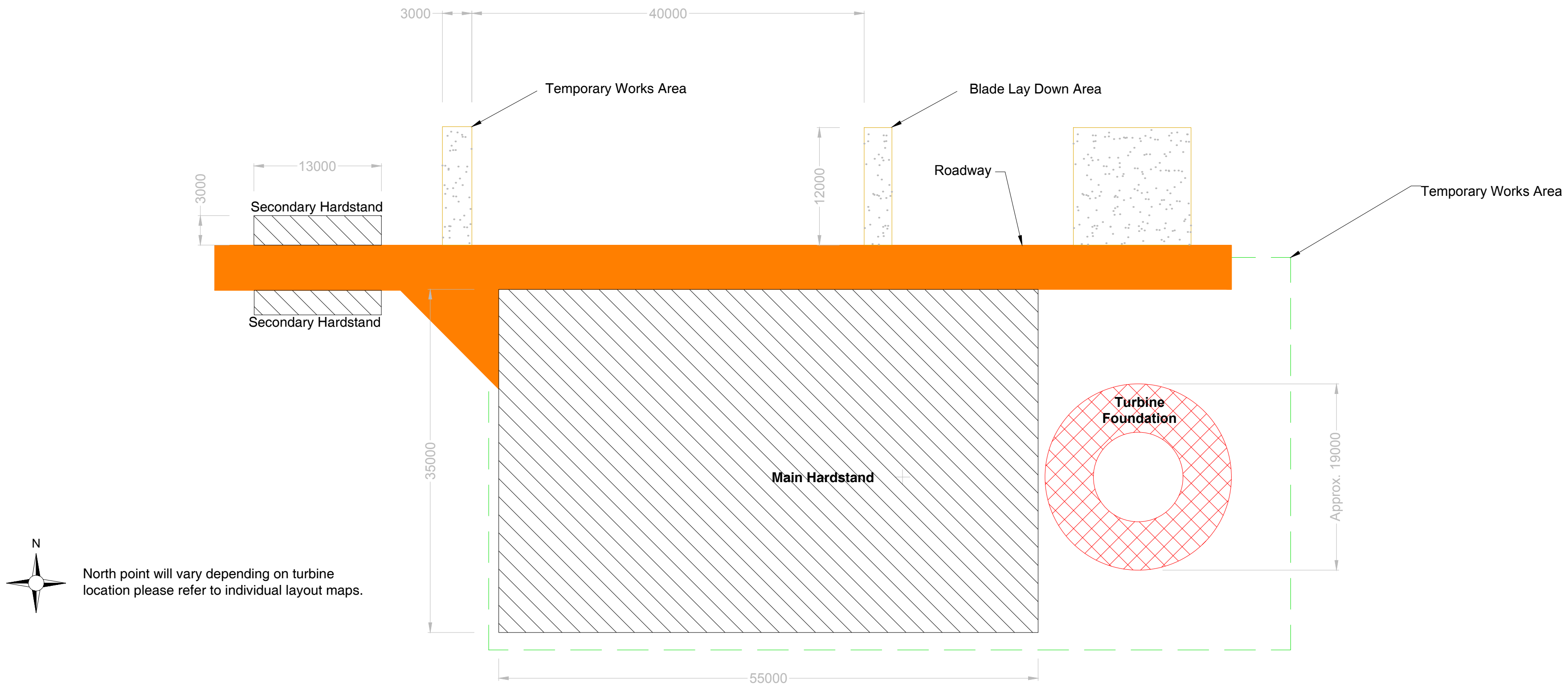

Figure 4.4

DRAWING TITLE:
Typical Turbine Hardstand Layout Standard Detail

PROJECT TITLE:
Meenbog Wind Farm, Co Donegal

DRAWING BY: Joseph o Brien	CHECKED BY: Michael Watson
PROJECT No.: 160502	DRAWING No.: 0502 - 37
SCALE: 1:500@A3	DATE: 28.11.2017

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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 35% is applied here
C = ... Rated output of the wind farm: 66.5 MW

The 203,889 MWh of electricity produced by the Proposed Development would be sufficient to supply 48,545Irish 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).

The 2016 Census of Ireland recorded a total of 84,785 households in Co. Donegal, including vacant houses. Per annum, based on a capacity factor of 35%, the Proposed Development would therefore produce sufficient electricity for the equivalent of 57% of all households in Co. Donegal.

4.3.2 Site Roads

4.3.2.1 Road Construction Types

To provide access within the site of the Proposed Development and to connect the wind turbines and associated infrastructure existing tracks will need to be upgraded and new access roads will need to be constructed. The road construction preliminary design has taken into account the following key factors as stated in the AGEC's *Peat & 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.

4.3.2.1.1 Upgrade of Existing Access Roads or Tracks

The general construction methodology for upgrading of existing sections of excavated and floating roads or tracks, as presented in AGEC's *Peat & Spoil Management Plan* in Appendix 4.2, is summarised below. This methodology includes procedures that are to be included in the construction to minimise any adverse impact on peat stability.

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

2. For upgrading of existing excavated access tracks the following guidelines apply:
    a. The surface of the existing access track should be overlaid with up to 300mm of selected granular fill.
    b. A layer of geogrid/geotextile may be required at the surface of the existing access road (to be confirmed by the designer).
    c. For excavations in peat & spoil, side slopes shall be not greater than 1 (v): 2 or 3 (h). This slope inclination should be reviewed during construction, as appropriate. Where areas of weaker peat are encountered then slacker slopes will be required.

3. For upgrading of existing floated access tracks (Type B – Figure 3) the following guidelines apply:
    a. The typical make-up of the existing floating access roads on site appears to be locally tree brash/trunks laid directly onto the peat surface and/or geotextile overlain by up to 300mm of coarse granular fill/till type (fine granular/cohesive) site won material. It should be noted that there are localised variations in the make-up of the existing floated access tracks on site, frequently no tree brash/trunks were used in the make-up and the presence of a geogrid was also noted in localised sections of the existing track.
    b. The surface of the existing access track should be graded/tidied up prior the placement any geogrid/geotextile, where necessary (to prevent damaging the geogrid/geotextile).
    c. Where coarse granular fill has been used in the existing floated access road make-up, a layer of geogrid should be placed on top of the existing floated access track.
    d. Where fine granular/cohesive type material has been used in the existing floated access road make-up (as is the case on some of the existing access roads in the southeast of the site), a layer of geotextile is likely to be required as a separator layer with a layer of geogrid.
    e. The geogrid may be overlaid with up to 500mm of selected granular fill.
    f. Additional geogrid and granular fill may be required in certain sections of the works (to be confirmed by the designer).

4. The finished road width will be approximately 6m (to be confirmed by the designer).

5. Any road widening works are required where the existing road runs across a slope should be done on the upslope side of the existing access road, where possible.

6. At transitions between floating and existing excavated roads a length of road of about 10 to 20m 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.

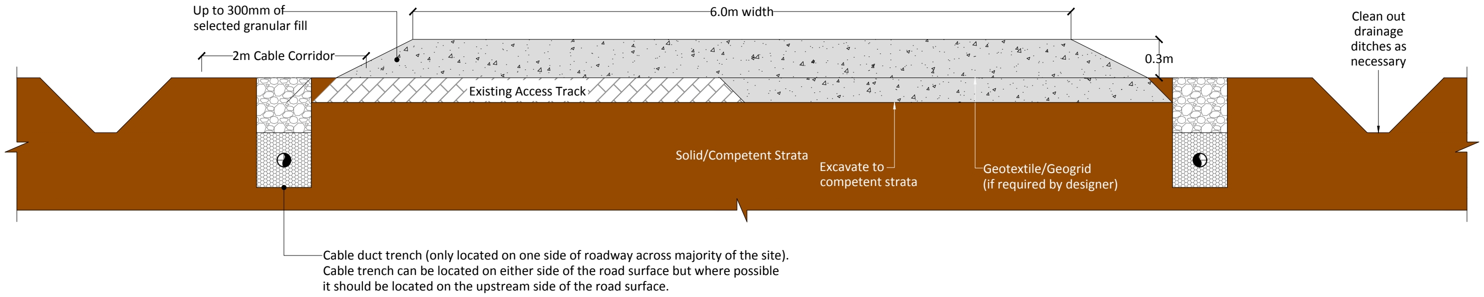
7. A final surface layer shall be placed over the existing access track, as per design requirements, to provide a road profile and graded to accommodate wind turbine construction and delivery traffic.

A typical section of existing excavated road for upgrade is shown in Figure 4.5. A typical section through an existing floating road to be upgraded is shown in Figure 4.6.

4.3.2.1.2 Construction of New Excavated Roads

Excavate and replace type access roads are the conventional method for construction of access roads on peatland sites and the preferred construction technique in shallow peat provided sufficient capacity is available on site for the excavated peat and in areas where topographical conditions restrict the use of floated roads.

The general construction methodology for the construction of excavated roads, as presented in AGEC's *Peat & Spoil Management Plan* in Appendix 4.2, is summarised below. This methodology includes procedures that are to be included in the construction to minimise any adverse impact on peat stability.



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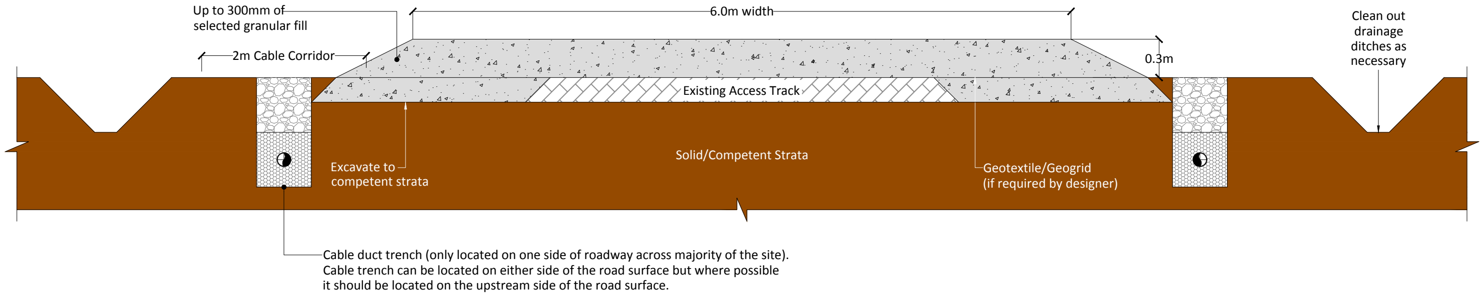

Widen on both sides

Figure 4.5

DRAWING TITLE:
Typical Sections
Road Type A - Upgrade of
Existing Excavated Access Road

PROJECT TITLE:
Meenbog Wind Farm, Co. Donegal

DRAWING BY: **Gerry Kane**	CHECKED BY: **Paul Jennings**
PROJECT No.: **1461**	DRAWING No.: **0502 - 38**
SCALE: **1:50@A3**	DATE: **28.11.2017**
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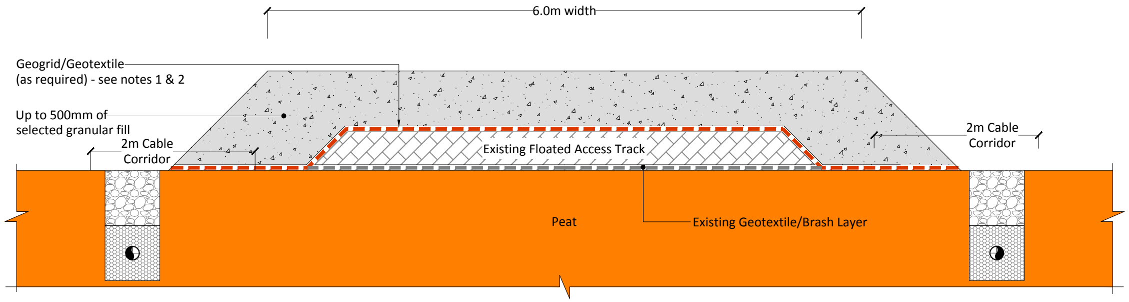
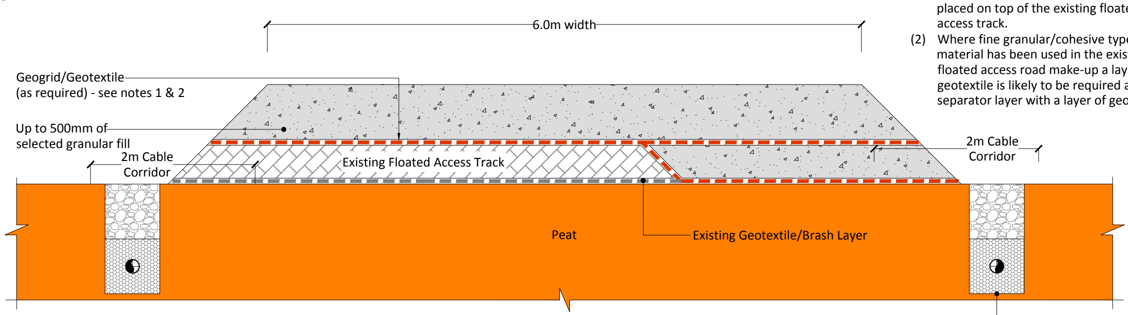


Widen on both sides

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

(2) Where fine granular/cohesive type material has been used in the existing floated access road make-up a layer of geotextile is likely to be required as a separator layer with a layer of geogrid.



Cable duct trench (only located on one side of roadway across majority of the site). Cable trench can be located on either side of the road surface but where possible it should be located on the upstream side of the road surface.

Widen to one side

Figure 4.6	
DRAWING TITLE: **Typical Sections Road Type B - Upgrade of Existing Floated Access Road**	
PROJECT TITLE: Meenbog Wind Farm, Co. Donegal	
DRAWING BY: **Gerry Kane**	CHECKED BY: **Paul Jennings**
PROJECT No.: **1461**	DRAWING No.: **0502 - 39**
SCALE: **1:50@A3**	DATE: **28.11.2017**
OS SHEET No.:	

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1. Prior to commencing road construction movement monitoring posts should be installed in areas where the peat depth is greater than 3m.

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

3. 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 and resident engineer).

4. 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.

5. Excavation of materials with respect to control of peat stability.
    a. Acrotelm (top about 0.3 to 0.4m of peat) is generally required for landscaping, and shall be stripped and temporarily stockpiled for re-use as required. Acrotelm stripping shall be undertaken prior to main excavations.
    b. Where possible, the acrotelm shall be placed with the vegetation part of the sod facing the right way up to encourage growth of plants and vegetation.
    c. All catotelm peat (peat below about 0.3 to 0.4m depth) shall be removed immediately on excavation and transported to designated areas.
    d. Inappropriate side-casting of material is considered one of the main peat stability risks during the construction phase of a wind farm hence designated areas for the placement of excavated peat should be decided prior to construction on site.

6. Where relatively steep peat slopes are encountered along with relatively deep peat (i.e. typically greater than 1.0m) 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.

7. 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.

8. The surface of the excavated access road should be overlaid with up to 750mm of selected granular fill.

9. A layer of geogrid/geotextile may be required at the surface of the competent stratum (to be confirmed by the designer).

10. At transitions between floating and excavated roads a length of road of about 10 to 20m 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.

11. 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.

A typical section of a new excavated road is shown in Figure 4.7

4.3.2.1.3 Construction of New Floating Roads

In a number of areas across the site of the Proposed Development it will be necessary to construct floating roads over peat. It should be noted that these locations should be confirmed by the project designer at the detailed design stage.

A detailed stability analysis should be carried out by the designer where it is proposed to install floating access roads over the peat prior to any construction work commencing on site.

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

The general construction methodology for the construction of floating, as presented in AGEC's *Peat and Spoil Management Plan* in Appendix 4.2, is summarised below. This methodology includes procedures that are to be included in the construction to minimise any adverse impact on peat stability.

1. Prior to commencing floating road construction movement monitoring posts should be installed in areas where the peat depth is greater than 3m.

2. Floating road construction shall be to the line and level requirements as per design/planning conditions.

3. Base geogrid to be laid directly onto the existing peat surface along the line of the road in accordance with geogrid provider's requirements.

4. Construction of road to be in accordance with appropriate design from the designer.

5. The typical make-up of the new floated access road is 1000mm of selected granular fill with 2 no. layers of geogrid with possibly the inclusion of a basal layer of tree trunks/brash

6. 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 2 to 5m wide pressure berm (typically 0.5m in height) either side of the access road will reduce the likelihood of potential bearing failures beneath the access road.

7. The finished road width will be approximately 6m (to be confirmed by the designer).

8. 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.

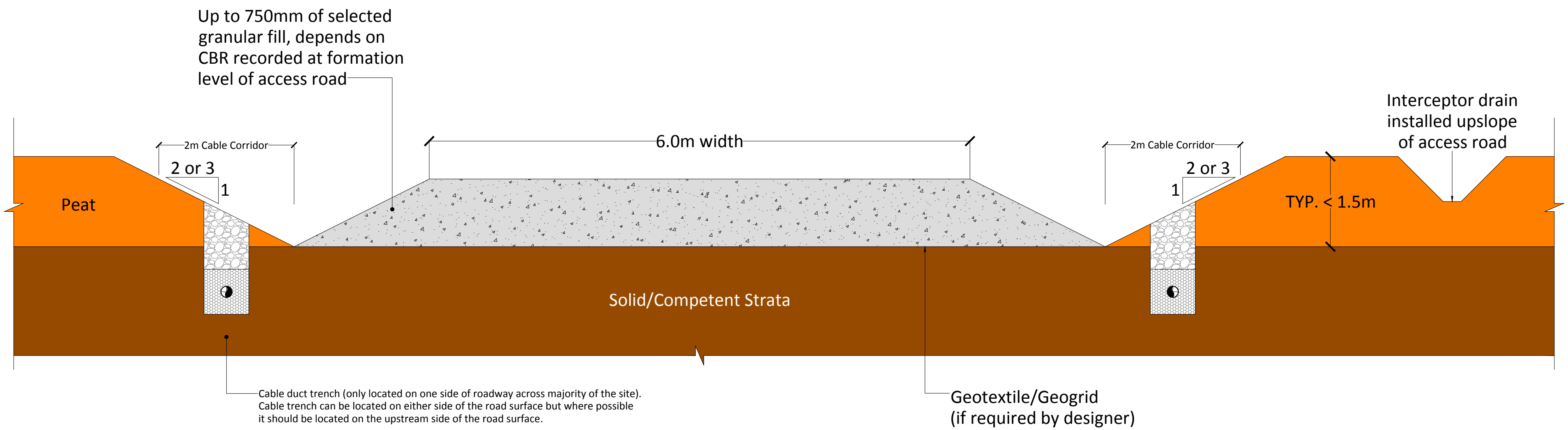

Figure 4.7

DRAWING TITLE:

Typical Section
Road Type C - New Excavate & Replace Access Road

PROJECT TITLE:

Meenbog Wind Farm, Co. Donegal

DRAWING BY: **Gerry Kane**	CHECKED BY: **Paul Jennings**
PROJECT No.: **1461**	DRAWING No.: **0502 - 40**
SCALE: **1:50@A3**	DATE: **28.11.2017**
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9. 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.

10. 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.

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

12. 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.

A typical section of a new floating road is shown in Figure 4.8.

4.3.3 Borrow Pits

4.3.3.1 Description

It is proposed to develop 3 No on-site borrow pits as part of the Proposed Development. It is proposed to obtain the majority of all rock and hardcore material that will be required during the construction of the proposed development from the on-site borrow pits. All 3 No borrow pits are located adjacent to existing site roads. Usable rock may also be won from other infrastructure construction including the substation and the turbine base excavations.

Borrow pit No. 1 located approximately 140 metres northeast of Turbine No. 5, measures approximately 8,960m^2 in area and is intended to supply hardcore materials for the construction of the turbines in the southwest of the site and access roads thereto. Borrow pit No. 2 located approximately 140 metres south of Turbine No. 15, measures 8,960m^2 in area and is intended to supply hardcore materials for the construction of turbines in the centre of the site, access roads thereto and the westernmost construction compound. Borrow pit No. 3 is located approximately 170 metres west of Turbine No. 3, measures 8,960m^2 in area and is intended to supply hardcore materials for the construction of the turbines in the northeast of the site of the Proposed Development, access roads thereto and the easternmost construction compound that will become the amenity area.

All borrow pits are shown on Figure 4.1 and on the detailed site layout drawings included as Appendix 4.1 to this EIAR. Figures 4.9 to 4.11 below shows detailed sections through the proposed borrow pits. The borrow pits will, on removal of all necessary and useful rock, be reinstated with excavated peat and subsoils as described in Section 4.3.4 below.

Post-construction, the borrow pits areas will be permanently secured and a stock-proof fence will be erected around the borrow pit areas to prevent access to these areas. Appropriate health and safety signage will also be erected on this fencing and at locations around the fenced area.

Hardcore materials will be extracted from the borrow pit, principally by means of rock breaking. Depending on the hardcore volume requirements, blasting may also be used as a more effective rock extraction method, capable of producing significant volumes

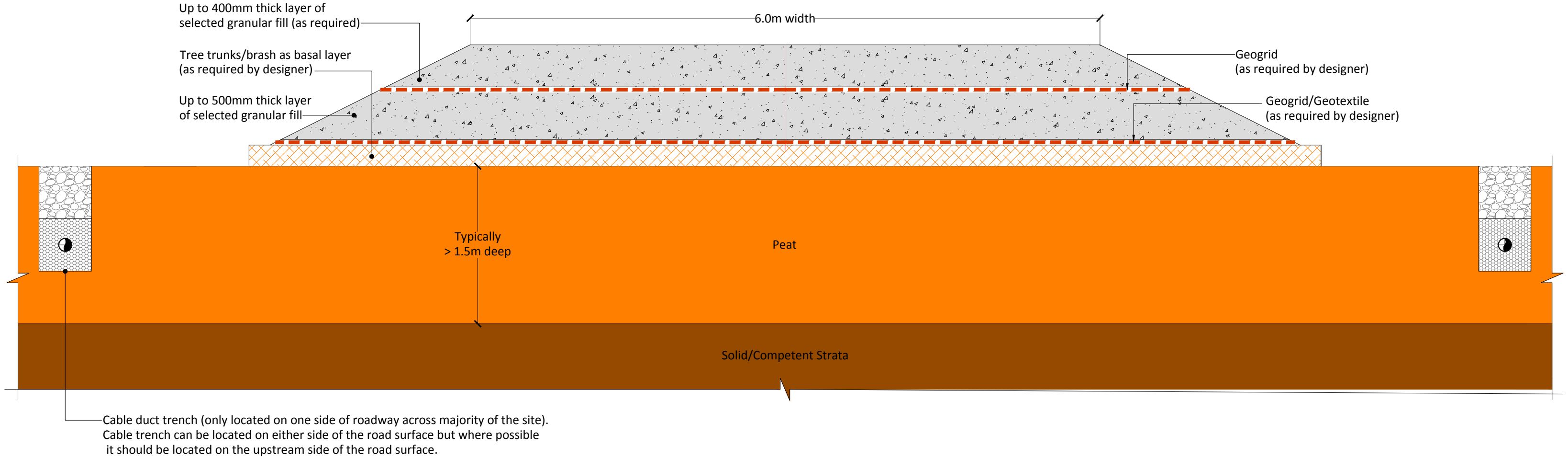


Figure 4.8

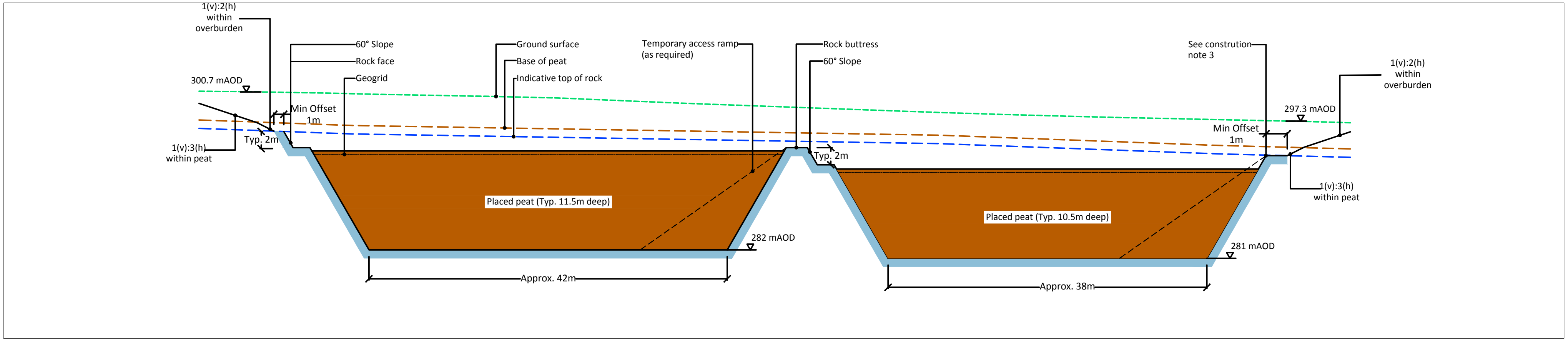
DRAWING TITLE:

Typical Section Road Type D - New Floated Access Road

PROJECT TITLE: Meenbog Wind Farm, Co. Donegal

DRAWING BY: **Gerry Kane**	CHECKED BY: **Paul Jennings**
PROJECT No.: **1461**	DRAWING No.: **0502 - 41**
SCALE: **1:50@A3**	DATE: **28.11.2017**
OS SHEET No.:	

agec geotechnical engineering consultants



Section A-A, Scale 1:500

FOR INFORMATION

Construction Notes:

(1) Exposed rock slopes formed at shallower inclinations (typically 60°) with face left irregular with declivities to promote re-vegetation and provide a naturalistic appearance.

(2) Rock buttress between cells of placed peat.

(3) Footprint of quarry should be optimised to avoid areas of deeper peat.

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

(5) Geogrid placed to strengthen surface of placed peat, as required.

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

(7) The location of the rock buttresses shown for the borrow areas are indicative only and may change subject to local conditions encountered on site during construction.

(8) The method of excavation of the rock and depth to top of rock within each of the borrow areas will need to be determined from a ground investigation. The ground investigation shall comprise rotary core drilling with associated engineering logging including rock quality designation and strength testing, as required.

(9) Further guidelines on the construction of the borrow areas is included within Section 7.4 of the Peat Management Plan.

Scale 1:1,500

N

Figure 4.9

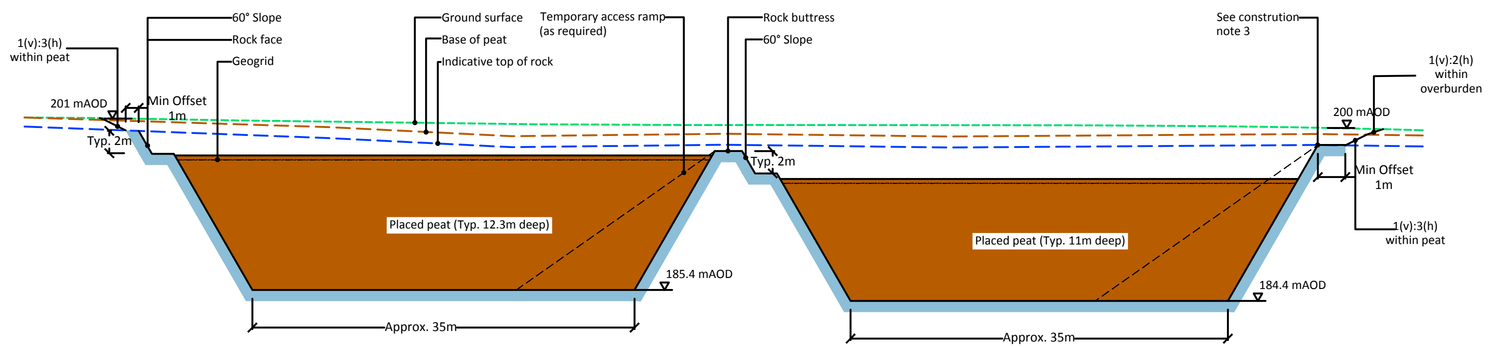
DRAWING TITLE: **Borrow Pit 1 Layout & Section**

PROJECT TITLE: Meenbog Wind Farm, Co. Donegal

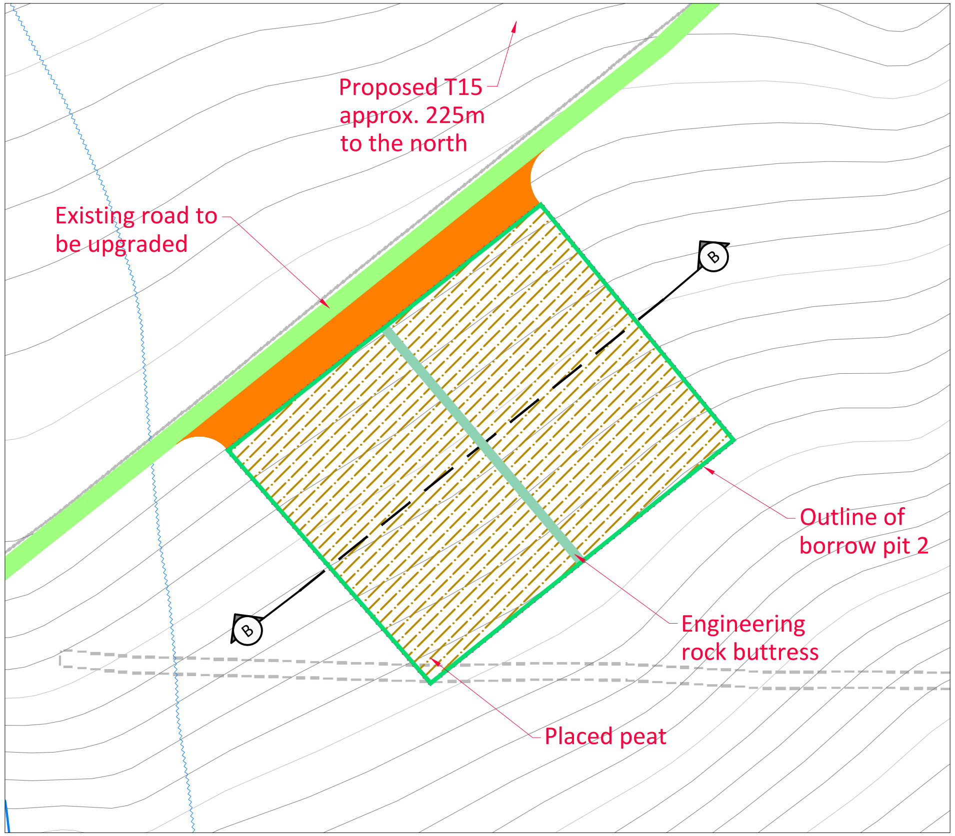
DRAWING BY: Paul O' Reilly	CHECKED BY: Gerry Kane
PROJECT No.: 1461	DRAWING No.: 0502 - 32
SCALE: As Shown @ A3	DATE: 28.11.2017

OS SHEET No.: 0397,0398,0399,0400,0401,0423,0424,0425,0426,0427,0450,0451,0452, 0453, 0454, 0478, 0479, 0480, 0481, 0482, 0506, 0507,0508, 0509, 0535, 0536

agec geotechnical engineering consultants



Section B-B, Scale 1:500



Scale 1:1,500

FOR INFORMATION

Construction Notes:

(1) Exposed rock slopes formed at shallower inclinations (typically 60°) with face left irregular with declivities to promote re-vegetation and provide a naturalistic appearance.
(2) Rock buttress between cells of placed peat.
(3) Footprint of quarry should be optimised to avoid areas of deeper peat.
(4) In-situ rock slope formed at stable inclinations to suit local rock conditions.
(5) Geogrid placed to strengthen surface of placed peat, as required.
(6) Localised deepening of quarry floor to suit extraction operations, as required.
(7) The location of the rock buttresses shown for the borrow areas are indicative only and may change subject to local conditions encountered on site during construction.
(8) The method of excavation of the rock and depth to top of rock within each of the borrow areas will need to be determined from a ground investigation. The ground investigation shall comprise rotary core drilling with associated engineering logging including rock quality designation and strength testing, as required.
(9) Further guidelines on the construction of the borrow areas is included within Section 7.4 of the Peat Management Plan.

Figure 4.10

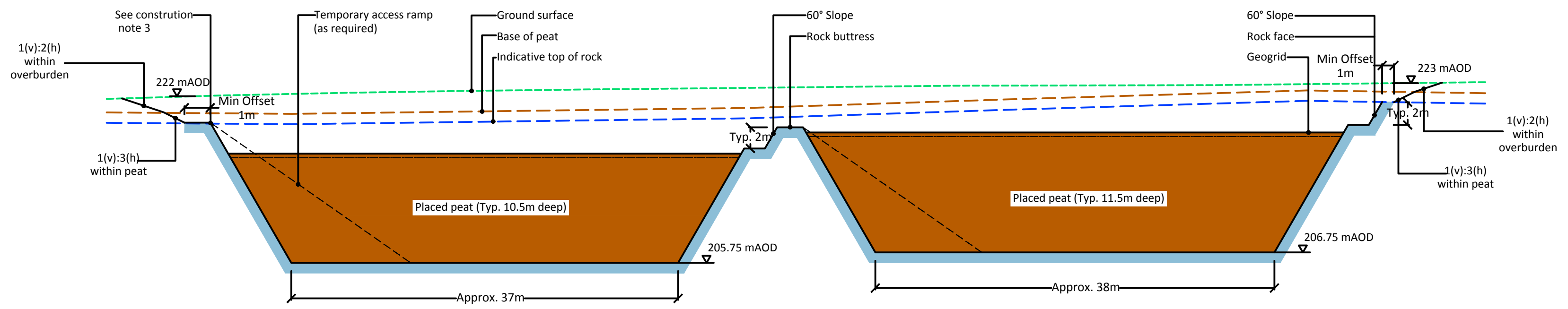
DRAWING TITLE:
Borrow Pit 2 Layout & Section

PROJECT TITLE: Meenbog Wind Farm, Co. Donegal

DRAWING BY: Paul O' Reilly	CHECKED BY: Gerry Kane
PROJECT No.: 1461	DRAWING No.: 0502 - 33
SCALE: As Shown @ A3	DATE: 28.11.2017

OS SHEET No.: 0397,0398,0399,0400,0401,0423,0424,0425,0426,0427,0450,0451,0452, 0453, 0454, 0478, 0479, 0480, 0481, 0482, 0506, 0507,0508, 0509, 0535, 0536

agec geotechnical engineering consultants



Section C-C, Scale 1:500

FOR INFORMATION

Construction Notes:

(1) Exposed rock slopes formed at shallower inclinations (typically 60°) with face left irregular with declivities to promote re-vegetation and provide a naturalistic appearance.

(2) Rock buttress between cells of placed peat.

(3) Footprint of quarry should be optimised to avoid areas of deeper peat.

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

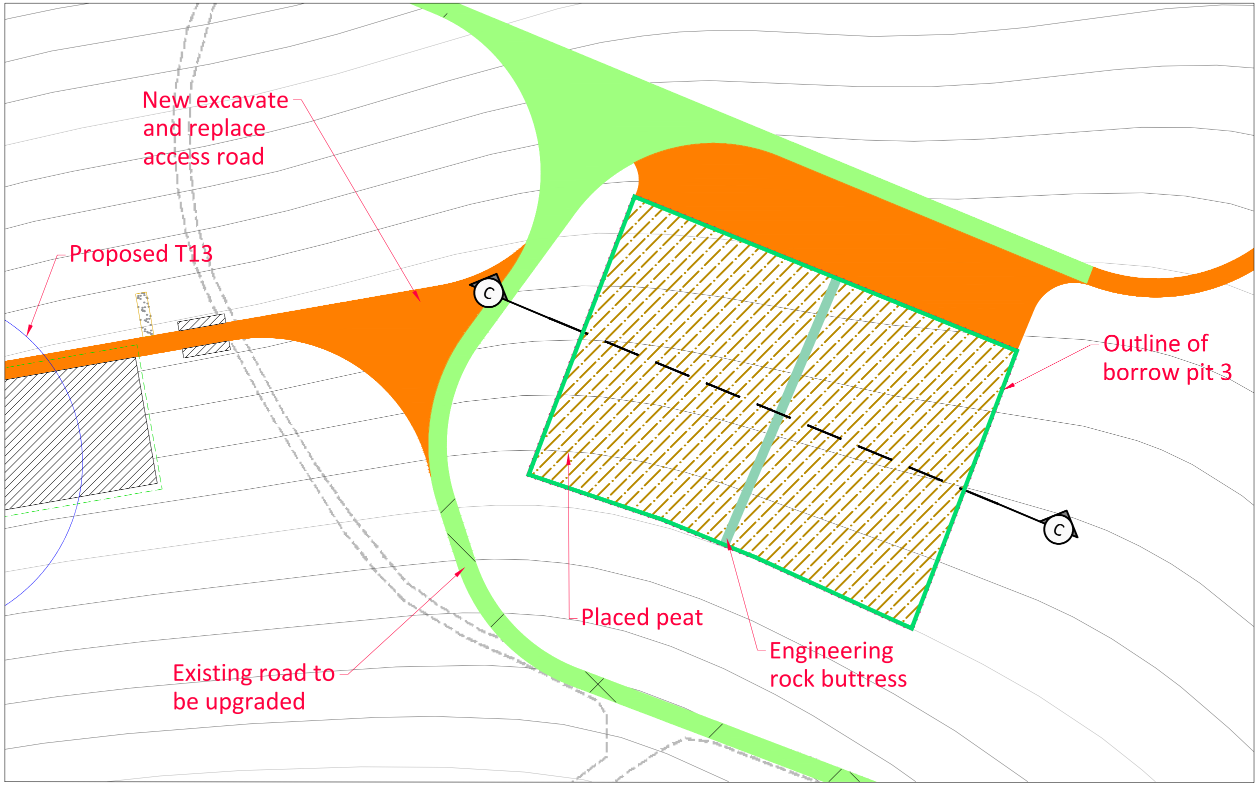
(5) Geogrid placed to strengthen surface of placed peat, as required.

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

(7) The location of the rock buttresses shown for the borrow areas are indicative only and may change subject to local conditions encountered on site during construction.

(8) The method of excavation of the rock and depth to top of rock within each of the borrow areas will need to be determined from a ground investigation. The ground investigation shall comprise rotary core drilling with associated engineering logging including rock quality designation and strength testing, as required.

(9) Further guidelines on the construction of the borrow areas is included within Section 7.4 of the Peat Management Plan.



Scale 1:1,500

N

Figure 4.11

DRAWING TITLE: **Borrow Pit 3 Layout & Section**

PROJECT TITLE: Meenbog Wind Farm, Co. Donegal	
DRAWING BY: Paul O' Reilly	CHECKED BY: Gerry Kane
PROJECT No.: 1461	DRAWING No.: 0502 - 34
SCALE: As Shown @ A3	DATE: 28.11.2017
OS SHEET No.: 0397,0398,0399,0400,0401,0423,0424,0425,0426,0427,0450,0451,0452, 0453, 0454, 0478, 0479, 0480, 0481, 0482, 0506, 0507,0508, 0509, 0535, 0536	

geotechnical engineering consultants

of rock in a matter of milliseconds. Blasting will only be carried out after an appropriate method of notifying any potentially sensitive local residents has been submitted to and agreed with the Planning Authority.

The two proposed extraction methods are detailed below.

4.3.3.2 Rock Extraction Methods

The extraction of rock from the borrow pit is a workstage of the Proposed Development which will be a temporary operation run over a short period of time relative to the duration of the entire project. As described above, there is a layer of overburden present at the borrow pit location, which will be stripped back and stockpiled using standard track mounted excavators. Two extraction methods have been assessed for breaking out the useful rock below; rock breaking and blasting.

4.3.3.2.1 Rock Breaking

Weathered or brittle rock can be extracted by means of a hydraulic excavator and a ripper attachment. This is a common extraction methodology where fragmented rock is encountered as it can be carefully excavated in layers by a competent operator. In areas where rock of a much higher strength is encountered and cannot be removed by means of excavating then a rock breaking methodology may be used. Where rock breaking is required, a large hydraulic 360-degree excavator with a rock breaker attachment is typically used. Given the power required to break out tight and compact stone at depth, the machines are generally large and in the 40-60 tonne size range. Even where rock might appear weathered or brittle at the surface, the extent of weathering can quickly diminish with depth resulting in strong rock requiring significant force to extract it at depths of only a few metres.

A large rock breaking excavator progressively breaks out the solid rock from the ground in the borrow pit area. The large rock breaker is typically supported by a smaller rock breaker which can often be in the 30-40 tonne size range, and works to break the rocks down to a size that they can be fed into a crusher.

The extracted broken rock is typically loaded into a mobile crusher using a wheeled loading shovel, and crushed down to the necessary size of graded stone required for the on-site civil works. The same wheeled loader takes the stone from the crusher conveyor stockpile, and stockpiles it elsewhere away from the immediate area of the crusher until it is required elsewhere on the site of the Proposed Development.

4.3.3.2.2 Rock Blasting

Where blasting is used as an extraction method, a mobile drilling rig is used to drill vertical boreholes into the area of rock that is to be blasted. The drilling rigs used are normally purpose built, self-propelled machines, designed specifically for drilling blast boreholes. A drilling rig working for 3-4 days would typically drill the necessary number of boreholes required for a single blast. The locations, depth and number of boreholes are determined by the blast engineer, a specialist role fulfilled by the blasting contractor that would be employed to undertake the duties.

The blast engineer would then arrange for the necessary quantity of explosive to be brought to site to undertake a single blast. The management of explosives onsite and the actual blasting operation would be agreed in advance with and supervised by An Gardaí Siochána. The blast engineer sets the explosives in place in the boreholes, sets the charges, and fires the blast. The blast takes only a matter of milliseconds, but may be perceived to take longer as blast noise echoes around the area.

A properly designed blast should generate rock of a size that can be loaded directly into a mobile crusher, using the same wheeled loader description outlined above. From that point on, the same method is used for processing the rock generated from a blast, as would be used to process rock generated by rock breaking. It would be likely that a drilling rig would recommence drilling blast holes for the next blast as soon one blast finished. The potential impacts associated with noise are assessed in Chapter 11 Noise.

4.3.4 Peat and Spoil Management Plan

4.3.4.1 Quantities

The quantity of peat and (spoil), requiring management on the site of the Proposed Development has been calculated, as presented in Table 4.2 below. These quantities were calculated by Applied Ground Engineering Consultants Ltd (AGEC) as part of the *Peat and Spoil Management Plan* in Appendix 4.2 of this EIAR.

Table 4.2 Peat and Spoil Volumes Requiring Management

Development Component	Area (m^2) (approx.)	Peat Volume (m^3) (approx.)	Spoil Volume(m^3) (approx.)
19 no. Turbines and Hardstanding Areas	17,860	100,900	25,695
2 no. Construction Compound Platform	7,140	15,975	2,710
1 no. Substation Platform & Building	4,480	31,350	6,275
Access Roads	154,125	42,150	10,950
3 no. Borrow Pits	26,880	55,125	33,750
Grid Connection Cable Trench	5,370	-	5,075
Total		**246,075**	**84,745**
Total Peat & Spoil to be managed		**330,820**	

4.3.4.2 Peat and Spoil Usage in Restoration of Borrow Pits

Once the required volume of rock has been extracted from the borrow pit areas, it is intended to reinstate these areas with peat and overburden excavated from the works areas of the Proposed Development.

As rock is being extracted from the borrow pit, upstands of rock will be left in place, depending on the type of rock, to act as intermediate retaining buttresses. Where this is not achievable, stone buttresses will be constructed within the borrow pit. The upstands or buttresses will form individual restoration areas within the borrow pit which will be filled once the required volume of rock has been extracted from each individual area. The buttresses will be wide enough to allow construction traffic access for the tipping of peat into the individual cells.

A temporary access track, will be placed around the perimeter of the borrow pit area to allow for the tipping of peat over the edge of the borrow pit area.

Where possible, the acrotelm peat that has been excavated and not retained for reinstatement and landscaping works will be stored with the vegetated side facing up so as to promote the growth of vegetation across the surface of the stored peat within the borrow pit area.

4.3.4.2.1 Placement of Peat & Spoil alongside Access Roads

In some areas of the site of the Proposed Development site it is possible and environmentally sustainable to place excavated materials close to the excavation areas, in particular roads and around turbine areas. The following recommendations/best practice guidelines for the placement of peat and spoil alongside the access roads will be taken into account during the construction of the proposed development:

- The potential spoil repository locations identified are alongside the proposed and existing excavated access roads with cross slopes of less than 10 degrees.
- The peat & spoil placed adjacent to the proposed and existing excavated access roads should be restricted to a maximum height of 1.0m over a 3m wide corridor on both sides of the access roads. It should be noted that the designer should define/confirm the maximum restricted height for the placed peat & spoil.
- The placement of excavated peat & spoil is to be avoided without first establishing the adequacy of the ground to support the load. The placement of peat & spoil within such areas will likely 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 ground then no material shall be placed on to the surface.
- Where practical, it should be ensured that the surface of the placed peat & spoil is shaped to allow efficient run-off of surface water. Where possible, shaping of the surface of the placed peat and spoil should be carried out as placement of peat & spoil progresses. This will reduce the likelihood of debris run-off and ensure stability of the placed peat & spoil.
- Finished/shaped side slopes in the placed peat & spoil shall be not greater than 1 (v): 2 or 3 (h). This slope inclination will be reviewed during construction, as appropriate. Where areas of weaker peat & spoil are encountered then slacker slopes will be required.
- Where possible, the acrotelm shall be placed with the vegetation part of the sod facing the right way up to encourage growth of plants and vegetation at the surface of the placed peat & spoil within these placement areas.
- 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 prior to construction works commencing on site.
- Supervision by a geotechnical engineer or appropriately competent person is recommended for the works.
- An interceptor drain should be installed upslope of the designated peat placement areas to divert any surface water away from these areas. This will help ensure stability of the placed peat and reduce the likelihood of debris run-off.
- All the above mentioned general guidelines and requirements should be confirmed by the designer prior to construction.

The management of excavated peat and overburden and the methods of placement and/or reinstatement are described in detail in AGEC's *Peat and Spoil Management Plan* in Appendix 4.2 of this EIAR.

4.3.5 Onsite Electricity Substation

It is proposed to construct one onsite electricity substation within the site of the Proposed Development as shown in Figure 4.1. The proposed substation site is located within an area of forestry and includes a perimeter landscaped berm, which will screen it from view from the N15 National Primary Road, located approximately 1,180 metres west of the substation at its nearest point.

The footprint of the proposed onsite electricity substation compound measures approximately 4,480 square metres, and will include a wind farm control building 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 3.3.8 below.

The layout of the proposed onsite substation is shown on Figure 4.12. The substation compound will be surrounded by an approximately 2.4 metre high steel palisade fence (or as otherwise required by ESB), and internal fences will also segregate different areas within the main substation. A 5 metre berm will be placed along the eastern and northern perimeter to screen the substation. The construction and exact layout of electrical equipment in the onsite electricity substation will be to Eirgrid/ESB networks specifications.

4.3.5.1 Wind Farm Control Building

Two wind farm control buildings will be located within the substation compound. Control Building 1 will measure 19.1 metres by 10.7 metres and 6.8 metres in height, will be located in the western half of the substation compound. Control Building 2 will be located in the centre of the substation compound and will measure 18.2 metres by 10.7 metre by 6.8 metres in height. Layout and elevation drawings of the control building are included in Figure 4.13 and Figure 4.14.

The wind farm control buildings will include staff welfare facilities for the staff 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 harvest rainwater from the roofs of the buildings, and if necessary, bottled water will be supplied for drinking.

It is proposed to manage wastewater from the staff welfare facilities in the control buildings by means of a sealed storage tank, with all wastewater being tankered off site by permitted 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 (p.e. ≤ 10)*' 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.

Project Design Drawing Notes

1. Drawings issued are for planning application purposed only.
2. Drawings not to be used for construction/contract conditions.
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4. Do not scale off this drawing. Figured metric dimensions only should be taken off this drawing.
5. All contractors, weather main or sub-contractors, must visit the site and are responsible for taking and checking any and all dimensions and levels that relate to the works.
6. The use of or reliance upon this drawing shall be deemed to be acceptance of these conditions of use unless otherwise agreed in writing, such written agreement to be sought from and issued by the copyright holder to the use or reliance upon this drawings.
7. Exact location of cable/joint bay in the road curtilage to be subject to ESB specifications and agreement with Donegal County Council.
8. Layout and arrangements of substation buildings and electrical equipment is shown indicatively and for illustration purposes only as final specifications of buildings and electrical equipment is to be dictated by Eirgrid/ESB networks requirements
9. Internal electrical cable trench may be installed on either side of site roads.

Drawing Legend

- Existing Road to be Upgraded
- Internal Electrical Cable Trench
- Proposed Underground Grid Connection Cabling in to Meenbog Wind Farm Substation
- Proposed Underground Grid Connection Cabling out of Meenbog Wind Farm Substation
- Berm

N

Figure 4.12

DRAWING TITLE:

Site Substation Layout

PROJECT TITLE: Meenbog Wind Farm, Co. Donegal

DRAWING BY: Joseph O Brien	CHECKED BY: Michael Watson
PROJECT No.: 160502	DRAWING No.: 0502 - 23
SCALE: 1:500 @A3	DATE: 28.11.2017

OS SHEET No.: 0397,0398,0399,0400,0401,0423,0424,0425,0426,0427,0450,0451,0452,0453,0454,0478,0479,0480,0481,0482,0506,0507,0508,0509,0535,0536

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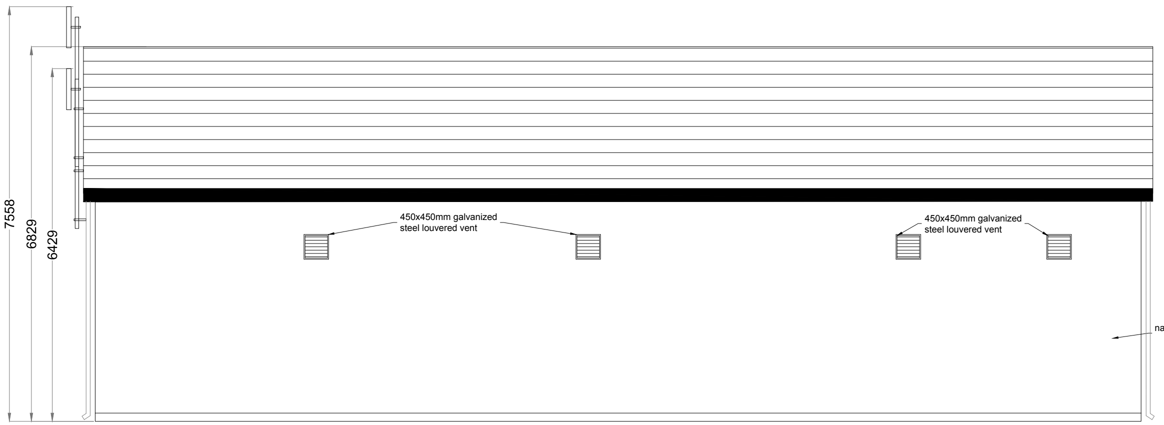
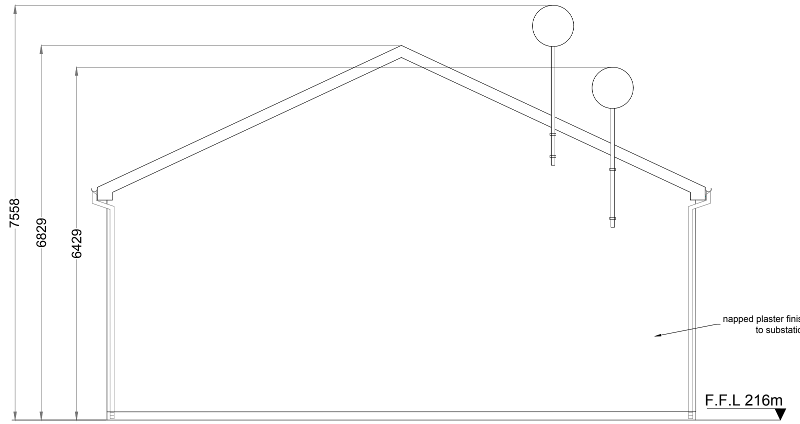
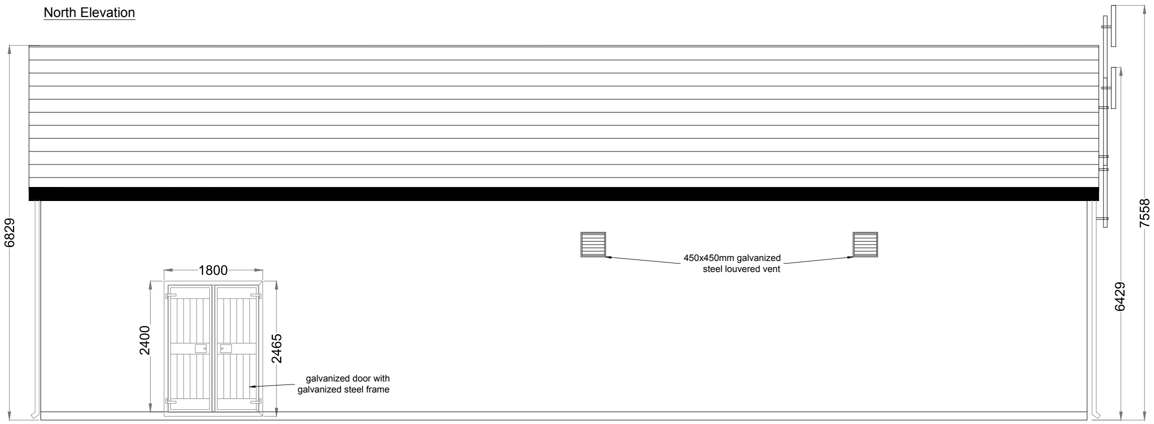


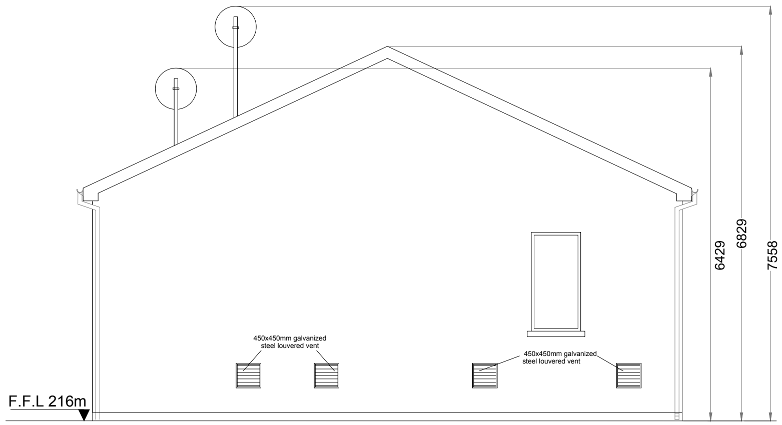
North Elevation



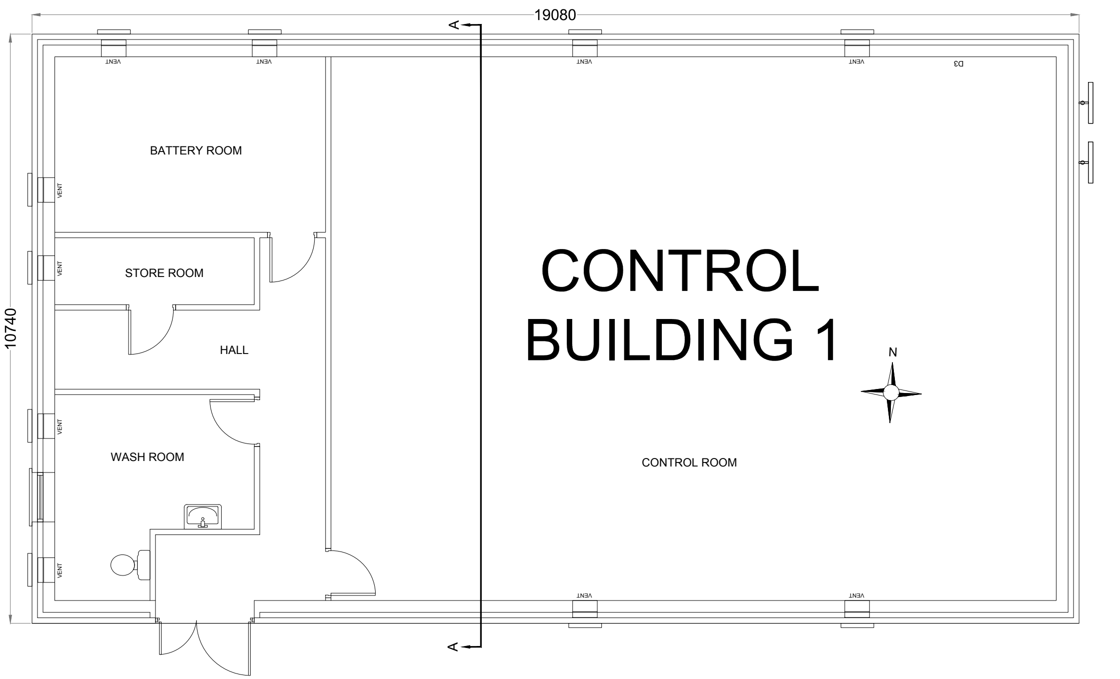
East Elevation

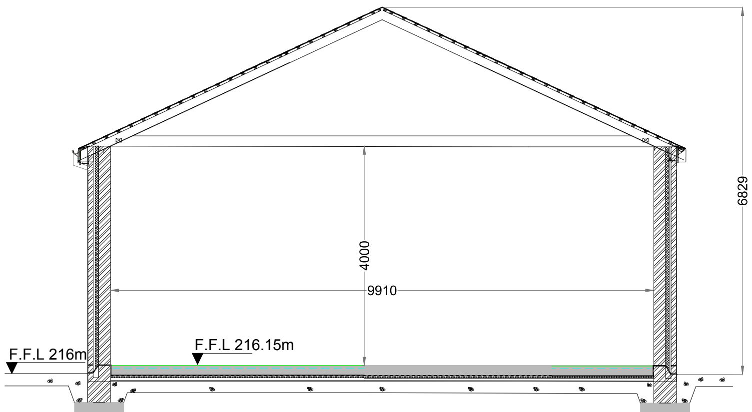


South Elevation



West Elevation





SECTION A-A

Figure 4.13

DRAWING TITLE:
Site Substation Control Building 1 Elevations & Section

PROJECT TITLE:
Meenbog Wind Farm, Co. Donegal

DRAWING BY: Joseph O Brien	CHECKED BY: Michael Watson
PROJECT No. 160502	DRAWING No. 0502 - 30
SCALE: 1:100 @A3	DATE: 28.11.2017

McCarthy Keville O'Sullivan

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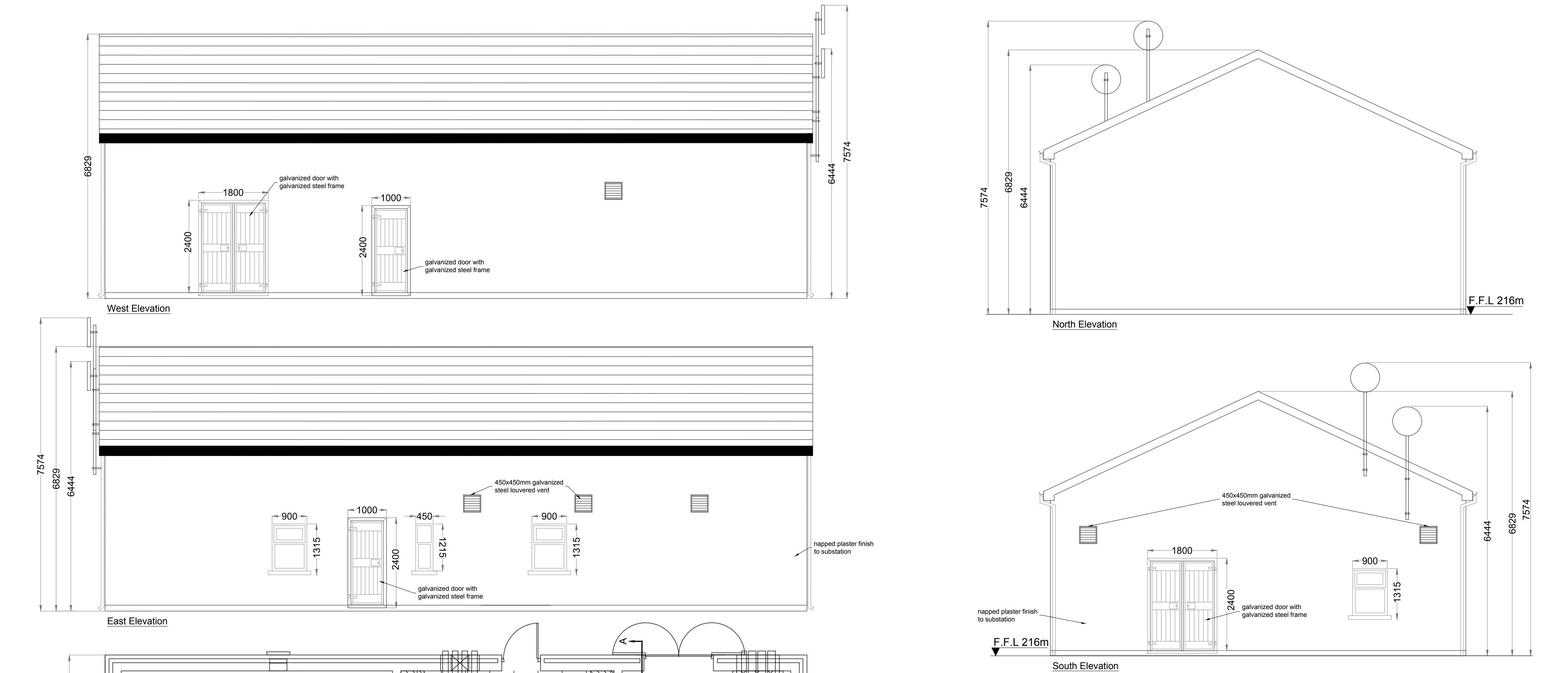
Fax: +353 91 771279



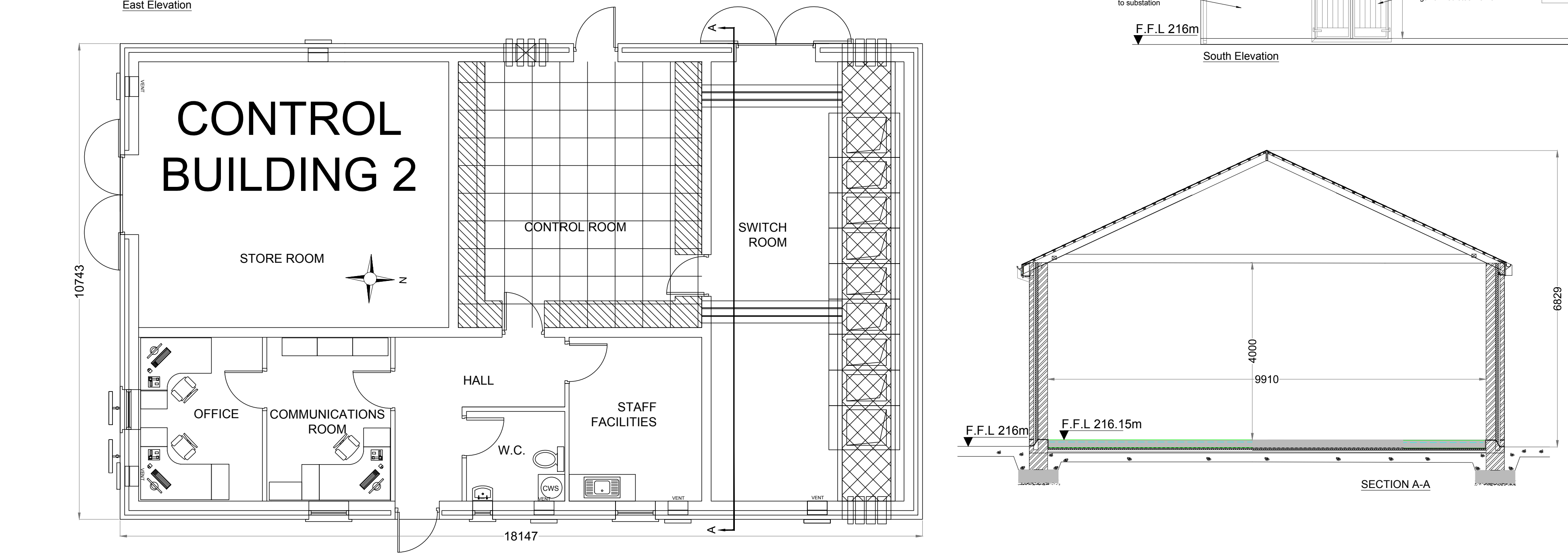


Figure 4.14

DRAWING TITLE:
Site Substation Control Building 2 Elevations & Section

PROJECT TITLE:
Meenbog Wind Farm, Co. Donegal

DRAWING BY: Joseph O Brien	CHECKED BY: Michael Watson
PROJECT No.: 160502	DRAWING No.: 0502 - 31
SCALE: 1:100 @A3	DATE: 28.11.2017

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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.

4.3.6 Site Cabling

Each turbine will be connected to the on-site electricity substation via an underground 20 or 33 kV (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 1.3 metres below the ground surface, along the sides of roadways. The route of the cable ducts will follow the access track to each turbine location, and are visible on the site layout drawings included as Appendix 4.1 to this report. The position of the cable trench relative to the roadways is shown in section in Figure 4.5 to Figure 4.8 above. Figure 4.15 below shows two variations of a typical cable trench, one for off-road trenches (to be installed on areas of soft ground that will not be trafficked) and one for on-road trenches (to be used where trenches run along or under a roadway).

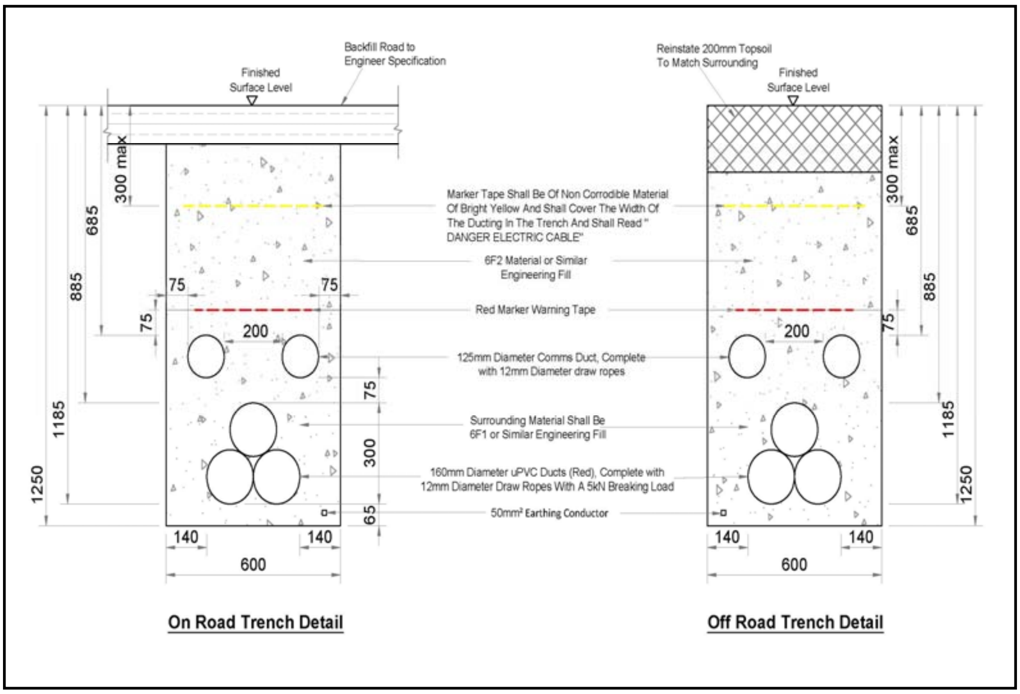


Figure 4.15 Cable trench cross section detail

Cable trenches will be developed and ducting installed to Eirgrid/ESB specifications.

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 runoff 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.

4.3.7 Grid Connection Cabling

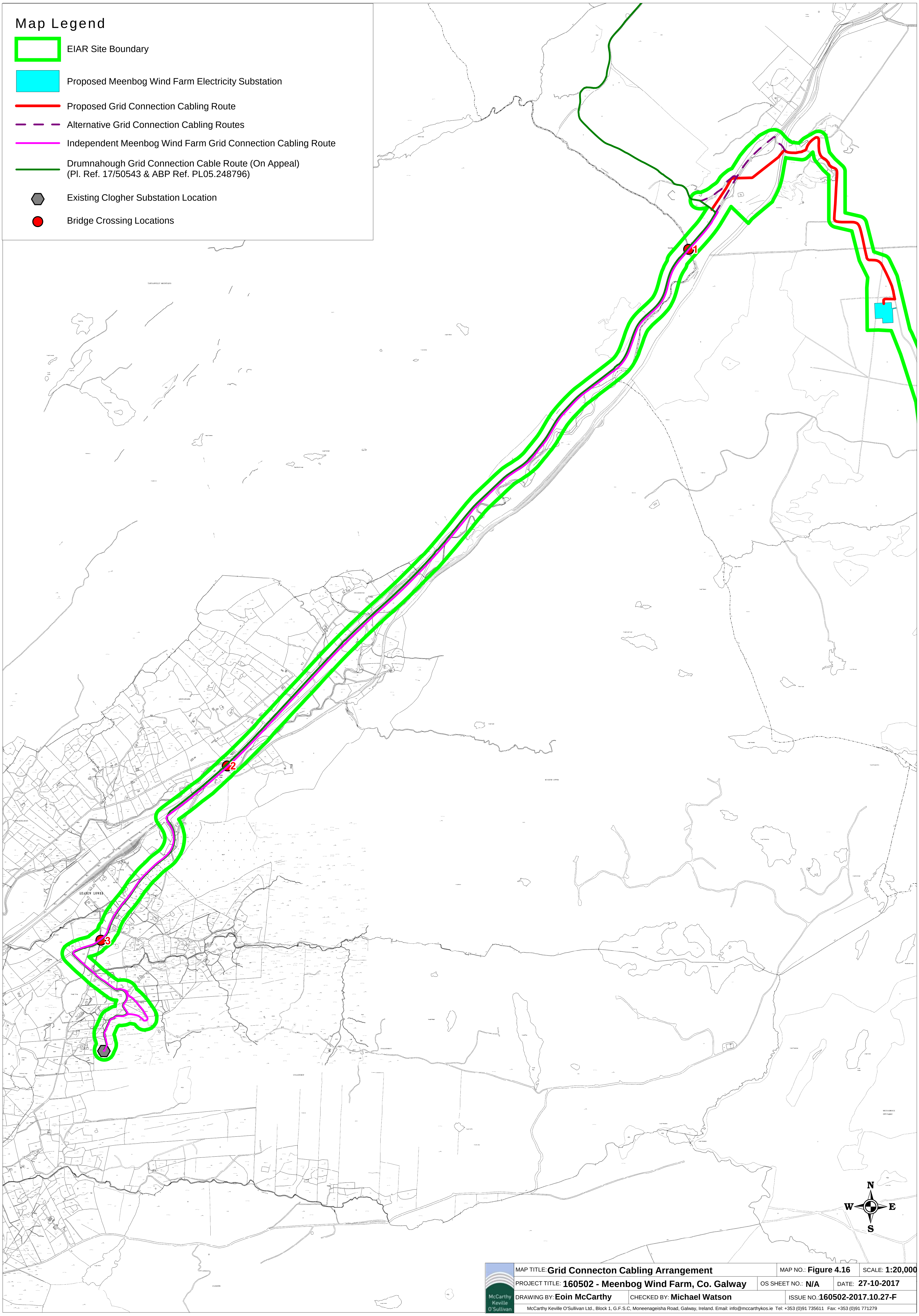
A connection between the site of the Proposed Development and the national electricity grid will be necessary to export the electricity generated. The planning application for the Proposed Development includes permission for 110kV grid connection cabling, as shown in the site layout drawings in Appendix 4.1. It is intended that the Proposed Development will connect to the national grid via the existing Clogher 110 kV Electricity Substation (Clogher Substation), located in the townland of Cullionboy, Co. Donegal. The Clogher Substation is located approximately 6.2 kilometres southwest of the proposed development at its closest point.

The current application seeks permission for underground cabling to link with the underground grid connection cabling from the Drumnahough substation, currently proposed under Pl. Ref 17/50543, ABP Ref. PL05E.248796 ("the Drumnahough Cable"). This is the preferred method of connection to Clogher substation, however, an independent underground cabling connection from the Proposed Development to the Clogher substation is also assessed in this EIAR.

The routes generally follow the existing roads except for a section of approximately 300m southeast of the N15 and 230m northwest of the N15 that will cross cut over bog, grassland and scrub habitats to facilitate directional drilling, under the N15 and a tributary of the Lowerymore River, and to link with the Drumnahough cable. The habitats will be fully restored following completion of the works and measures will be in place to avoid any impacts on any watercourses. The proposed cable construction methodology, including proposals for water crossings, is described in Section 4.8.6 below.

While a variety of grid connection routes are assessed within this EIAR, the method of connection to the national grid that is included as part of the currently proposed planning permission application is to create an underground cabling link between the proposed Meenbog Wind Farm substation and the Drumnahough cable. This underground cabling link will originate from the proposed substation and run northwest along the proposed wind farm access track for approximately 1.65 km before turning southwest off the track for approximately 300 metres and will then cross under the N15 National Road corridor via a directionally-drilled duct (directional drilling is detailed in Section 4.8.6.7 below). The cabling link will emerge on private lands northwest of the N15, where it will link into the Drumnahough cable approximately 300m south west of the N15 crossing point. The underground connection between the Dromnahough cable and the proposed substation will be a looped connection (i.e. two cables).

Another method of connection to the national grid is to install a double circuit (two separate cable's) to run north-east along the N15 National Road, from the Drumnahough cable, for approximately 0.6 km before turning into the site of the Proposed Development entrance and access road in the townland of Croaghonagh and connecting to the onsite substation after approximately 1.7km. This method of connection does not form part of this planning application but is assessed within this EIAR. This route was not brought forward as part of this planning application due to Donegal County Council not being supportive of providing the underground cabling within the public road corridor.



Map Legend
EIAR Site Boundary
Proposed Meenbog Wind Farm Electricity Substation
Proposed Grid Connection Cabling Route
Alternative Grid Connection Cabling Routes
Independent Meenbog Wind Farm Grid Connection Cabling Route
Drumnahough Grid Connection Cable Route (On Appeal)
(Pl. Ref. 17/50543 & ABP Ref. PL05.248796)
Existing Clogher Substation Location
Bridge Crossing Locations
1
2
3
N
W
E
S
MAP TITLE: Grid Connecton Cabling Arrangement
MAP NO.: Figure 4.16
SCALE: 1:20,000
PROJECT TITLE: 160502 - Meenbog Wind Farm, Co. Galway
OS SHEET NO.: N/A
DATE: 27-10-2017
DRAWING BY: Eoin McCarthy
CHECKED BY: Michael Watson
ISSUE NO. 160502-2017.10.27-F
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A separate independent connection for the Proposed Development to the Clogher substation is also provided for in this EIAR. This underground cable which extends the eastern cable of the double circuit from the N15 in the townland of Cashelnaveen to connect to Clogher substation. From Cashelnaveen the cable will continue along the N15 for approximately 5 kilometres before turning onto the L-2595 and continuing south in the townland of Cullionboy. The final section of the cable route is located within agricultural land. This separate grid connection cabling route between Cashelnavean and the Clogher substation does not form part of this planning application but is assessed as part of this EIAR.

The general alignment of the grid connection cabling routes, assessed as part of this EIAR, is shown on Figure 4.16. The detailed arrangement of the cabling routes is shown in the grid connection layout drawings included as Appendix 4.1a. The proposed cable construction methodology, including proposals for water crossings, is described in Section 4.8.6 below.

Two alternative cable route options are possible for the final section of the cable connection, close to the Clogher substation in the townland of Cullionboy however only one option will be constructed subject to agreements with Eirgrid regarding their preferred connection location and local landowners. However, both options are assessed in this EIAR.

Option 1 is to continue along the local road in the townland of Cullionboy and access the Clogher substation at its site entrance. Option 2 is to diverge off this local road and traverse approximately 150 metres of private lands (generally disturbed agricultural lands) and access the substation at its northern boundary. The options are shown on Figure 4.17.

The exact final detail and specifications of the grid connection route for the Proposed Development will ultimately be decided by ESB/EirGrid.

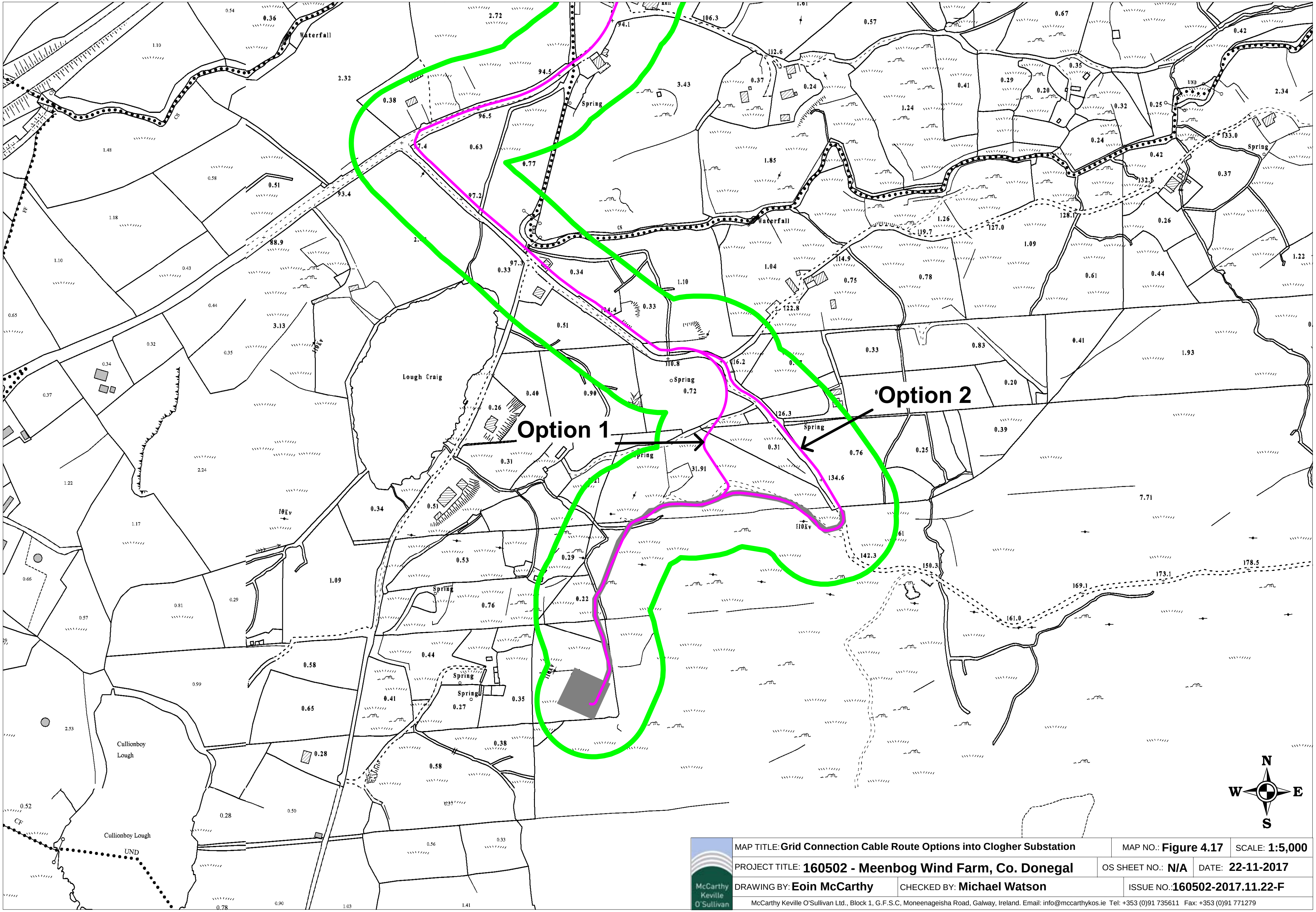
4.3.8 Anemometry Mast

One permanent anemometry mast is proposed as part of the Proposed Development. The anemometry masts will be equipped with wind monitoring equipment at various heights. The masts will be located at E206,885 N385,678 as shown on the site layout drawing in Figure 4.1. The mast will be a slender structure up to 110 metres in height. The mast will be a free-standing structure. The mast will be constructed on a hard-standing area sufficiently large to accommodate the crane that will be used to erect the mast, adjacent to an existing track. The typical design of the proposed anemometry mast is shown in Figures 4.18.

4.3.9 Temporary Construction Compounds

A temporary construction compound measuring approximately 60 metres by 80 metres and 4,800 square metres in area is proposed for the western section of the site of the Proposed Development, adjacent to the existing access road in an area that has been partially cleared of trees. The location of the proposed construction compound is shown on the site layout drawing in Figure 4.1.

The construction compound will consist of temporary site offices, staff facilities and car-parking areas for staff and visitors. The layout of this construction compound is shown on Figure 4.19. Construction materials and turbine components will be brought directly to the proposed turbine locations following their delivery to the site.


Option 1
Option 2
Lough Craig
Cullionboy Lough
Waterfall
Spring
N
E
S
W
MAP TITLE: Grid Connection Cable Route Options into Clogher Substation
MAP NO.: Figure 4.17
SCALE: 1:5,000
PROJECT TITLE: 160502 - Meenbog Wind Farm, Co. Donegal
OS SHEET NO.: N/A
DATE: 22-11-2017
DRAWING BY: Eoin McCarthy
CHECKED BY: Michael Watson
ISSUE NO.: 160502-2017.11.22-F
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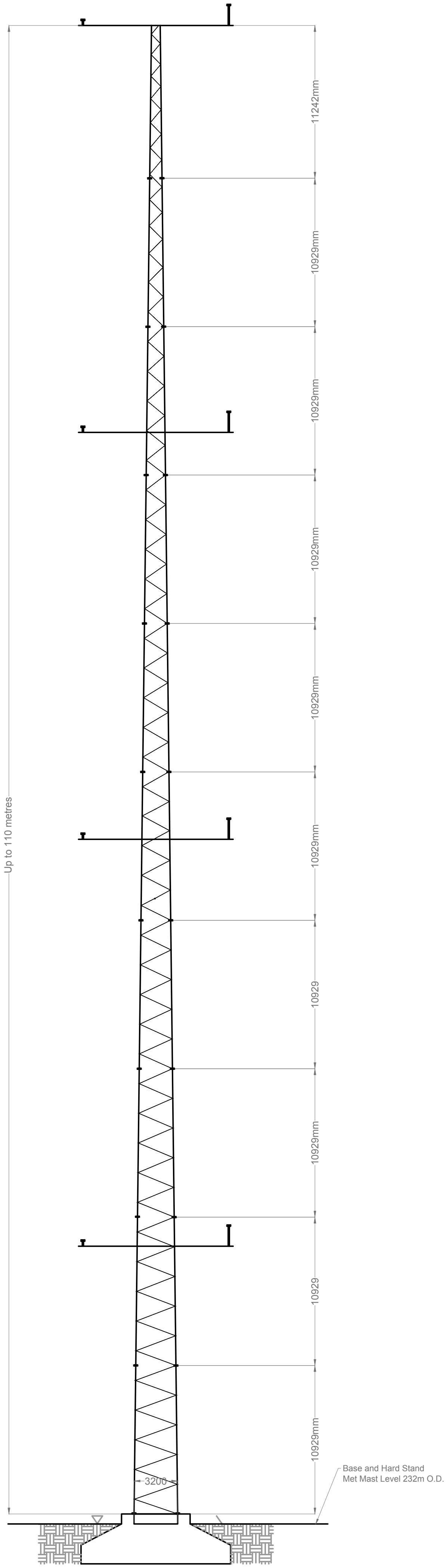
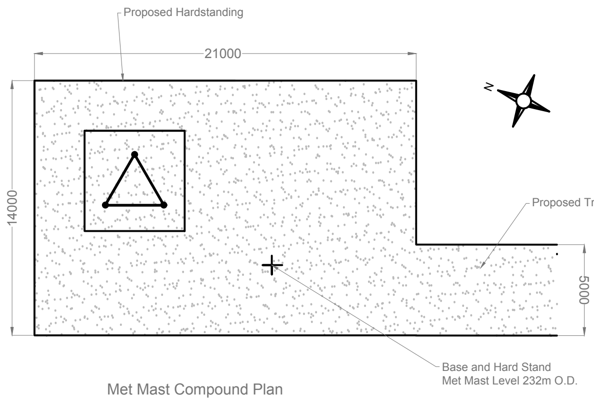
Drawing Notes

The final ground level will be determined by actual ground conditions and may differ from those stated on the drawings.



Met Mast Compound Elevation



Met Mast Compound Plan

Figure 4.18

DRAWING TITLE: **Met Mast Free Standing Mast**	
PROJECT TITLE: Meenbog Wind Farm, Co. Donegal	
DRAWING BY: **Joseph O Brien**	CHECKED BY: **Michael Watson**
PROJECT No. **160502**	DRAWING No. **0502 - 35**
SCALE: **1:300@A3**	DATE: **28.11.2017**

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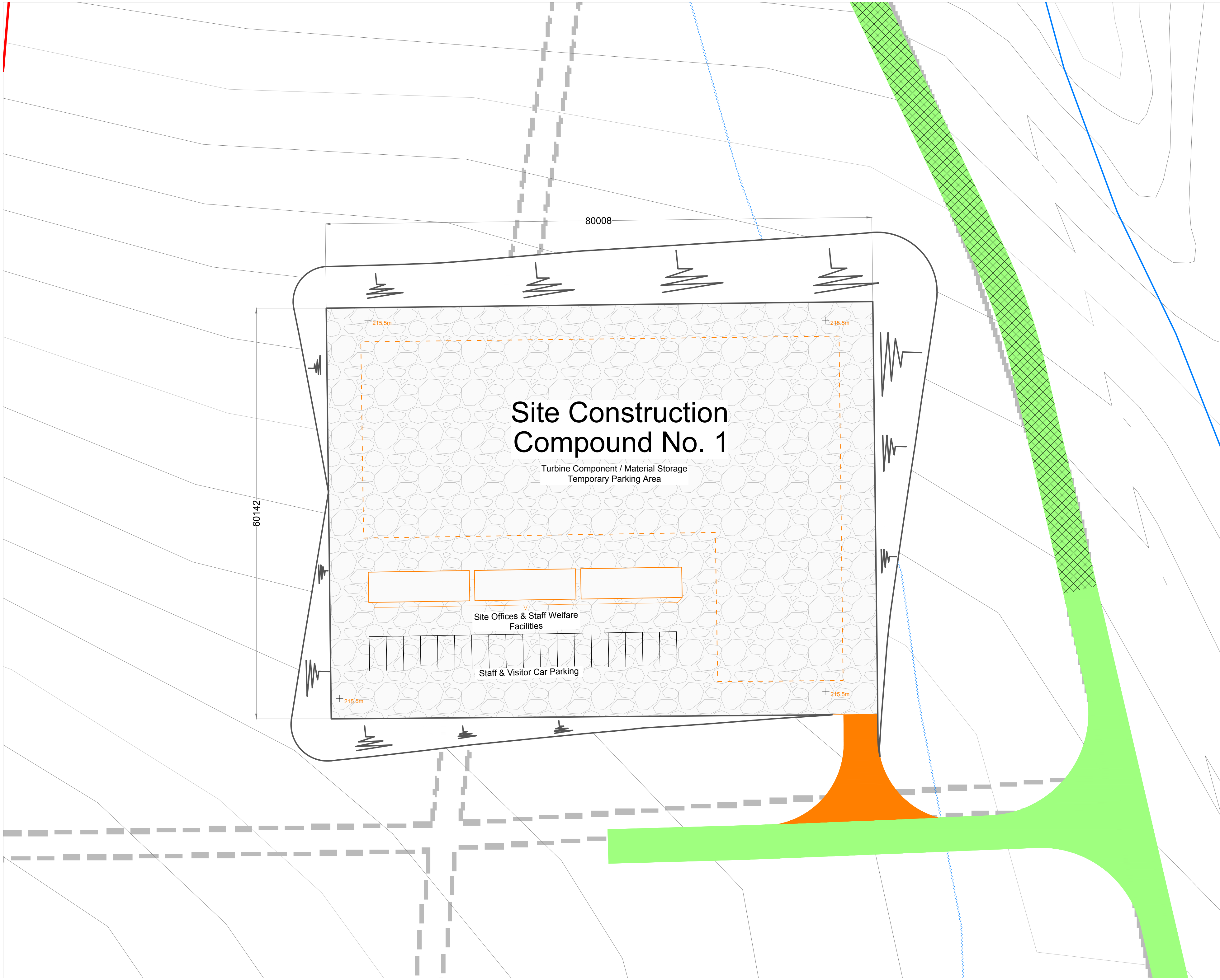

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7. Layout plans show typical Turbine rotor diameter as per turbine drawing.
8. Final levels may vary depending on local ground conditions.
9. Internal electrical cable trench may be installed on either side of site roads.

Drawing Legend

- Planning Application Site Boundary
- Existing Road to be Upgraded
- Existing Floating Road to be Upgraded
- Proposed Road
- River/Stream
- River/Stream 50m Buffer

N

Figure 4.19

DRAWING TITLE:

Temporary Construction Compound 1

PROJECT TITLE:

Meenbog Wind Farm, Co. Donegal

DRAWING BY: Joseph O Brien	CHECKED BY: Michael Watson
PROJECT No.: 160502	DRAWING No.: 0502 - 21
SCALE: 1:500 @A3	DATE: 28.11.2017

OS SHEET No.: 0397,0398,0399,0400,0401,0423,0424,0425,0426,0427,0450,0451, 0452, 0453, 0454, 0478, 0479, 0480, 0481, 0482, 0506, 0507, 0508, 0509, 0535, 0536

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Temporary port-a-loo toilets located within a staff portacabin will be used during the construction phase. Wastewater from staff toilets will be directed to a sealed storage tank, with all wastewater being tankered off site by permitted waste collector to wastewater treatment plants.

There will be a second construction compound located adjacent to an existing road in the eastern end of the site of the Proposed Development. This temporary compound will measure approximately 60 metres by 40 metres and 2,400 square metres in area. This temporary construction compound will include staff facilities and a temporary port-a-loo and is also shown in Figure 4.1. The layout of this construction compound is shown in Figure 4.20.

Once the Proposed Development has been commissioned, the construction compound will serve as part of the amenity and recreation proposal, described in Section 4.4 below.

4.3.10 Tree Felling and Replanting

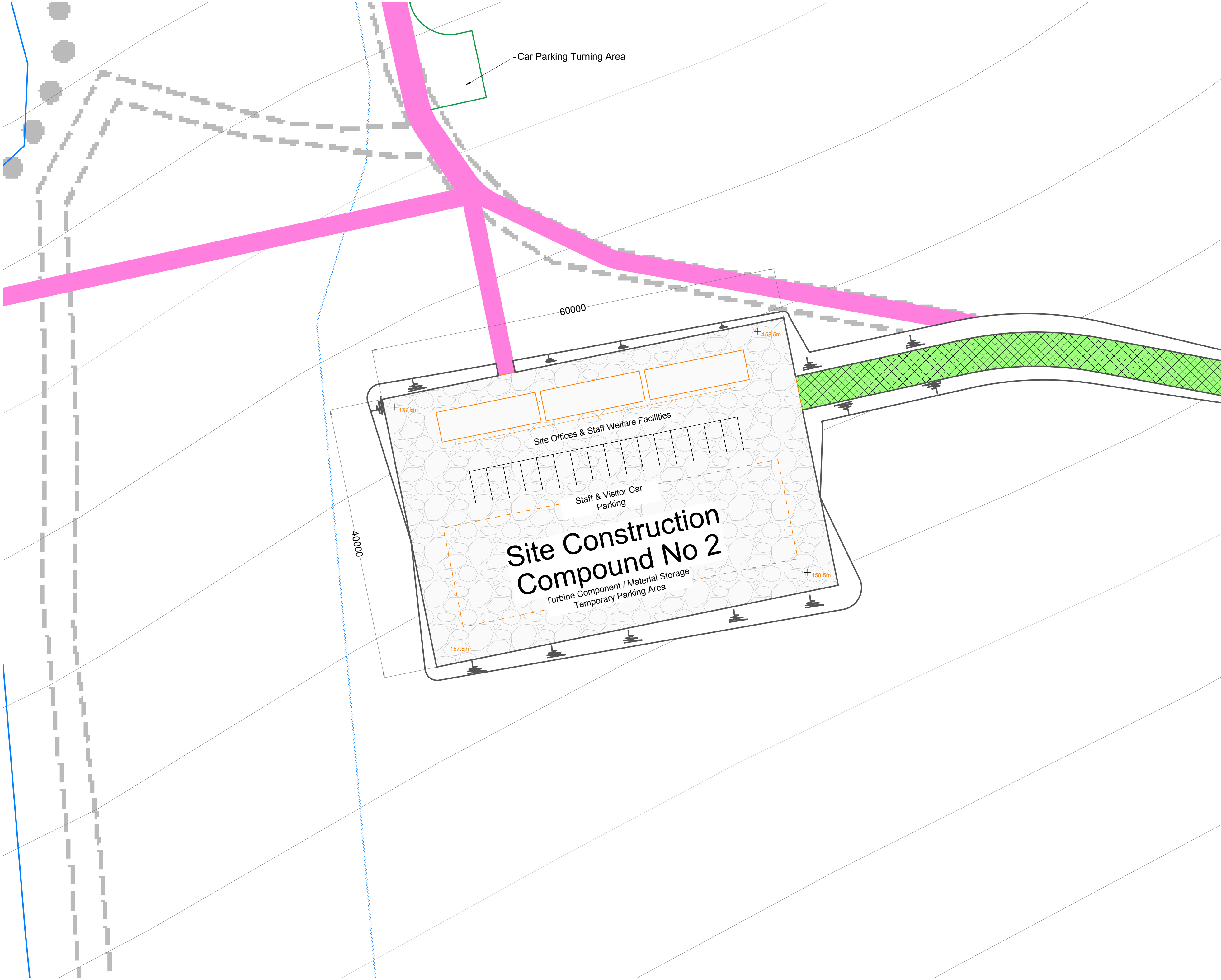
4.3.10.1 Tree Felling

The majority of the site of the Proposed Development site currently comprises a commercial coniferous forestry plantation, with approximately 91 percent of the site under commercial forestry. As part of the Proposed Development, tree felling will be required within and around the development footprint to allow the construction of turbine bases, access roads and the other ancillary infrastructure. Along sections of access road in forested areas, an area of approximately three times the width of the access road will be felled. Turbulence felling will also be required in the vicinity of turbine locations, the purpose of which is to avoid turbulence that can be created by the forest canopy and which can affect the performance and efficiency of the turbines.

The layout of the Proposed Development has been overlain on the felling plan for the site. Pending a grant of planning permission, it is anticipated that the construction of the Proposed Development would commence sometime during 2019. In calculating the total amount of tree felling required for the Proposed Development therefore, it is assumed that the areas scheduled for felling up to and including 2018 will have been cleared prior to its construction.. Areas within the footprint of the Proposed Development that have already been felled or that are due to be felled up to 2018, will not be replanted to minimise the amount of felling required to make way for the Proposed Development. It should also be noted that all forestry on the site of the Proposed Development was originally planted as a commercial crop, and will be felled irrespective of whether it proceeds or not.

A total of 43 hectares of forestry will have to be felled within and around the t footprint of the Proposed Development. An additional 30.6 hectares of trees will be required to be felled around proposed turbine locations in order to prevent these trees causing a turbulence effect. The total amount of tree felling required on the site is therefore 73.6 hectares or 9.6% of the currently forested area. Figure 4.21 shows the extent of the area to be felled as part of the Proposed Development. All felling required as part of the Proposed Development is located within areas that are scheduled to be felled from 2018 onwards as part of the established felling plans for the site.

The tree felling activities required as part of the Proposed Development will be the subject of two Limited Felling Licence (LFL) applications to the Forest Service, as per the Forest Service's policy on granting felling licenses for wind farm developments. The policy requires that a copy of the planning permission for the Proposed



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4. Do not scale off this drawing. Figured metric dimensions only should be taken off this drawing. All dimensions in millimeters unless otherwise stated.
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6. The use of or reliance upon this drawing shall be deemed to be acceptance of these conditions of use unless otherwise agreed in writing, such written agreement to be sought from and issued by the copyright holder to the use or reliance upon this drawing.
7. Layout plans show typical Turbine rotor diameter as per turbine drawing.
8. Final levels may vary depending on local ground conditions.

Drawing Legend

- Existing Floating Road to be Upgraded
- River/Stream
- River/Stream 50m Buffer
- Proposed Amenity Track

N

Figure 4.20

DRAWING TITLE:
Temporary Construction Compound 2

PROJECT TITLE:
Meenbog Wind Farm, Co. Donegal

DRAWING BY: **Joseph O Brien**	CHECKED BY: **Michael Watson**
PROJECT No.: **160502**	DRAWING No.: **0502 - 22**
SCALE: **1:500 @A3**	DATE: **28.11.2017**

OS SHEET No.: **0397,0398,0399,0400,0401,0423,0424,0425,0426,0427,0450,0451, 0452, 0453, 0454, 0478, 0479, 0480, 0481, 0482, 0506, 0507, 0508, 0509, 0535, 0536**

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Map Legend

- EIAR Site Boundary
- Proposed Development Footprint
- Proposed Permanent Felling Area (43ha)
- Proposed Temporary Felling Area (30.6ha)

MAP TITLE: **Proposed Felling Areas Map**		MAP NO.: **Figure 4.21**	SCALE: **1:22,500**
PROJECT TITLE: **160502 - Meenbog Wind Farm, Co. Donegal**		OS SHEET NO.: **N/A**	DATE: **09-11-2017**
DRAWING BY: **Eoin McCarthy**	CHECKED BY: **Michael Watson**	ISSUE NO.: **160502-2017.11.09-F**	

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Development be submitted with the felling licence applications; therefore the felling licenses cannot be applied for until such time as planning permission is obtained for the Proposed Development.

One LFL will be applied for to cover felling required around the footprint of the Proposed Development footprint, for example along access roads and at turbine bases. A second LFL will be applied for to cover turbulence felling.

Tree felling, within commercial forestry plantations north of the site of the proposed development, will also be required as part of the *Hen Harrier Habitat Enhancement Plan* outlined in Section 7.6.3 and included as Appendix 7.7 of this EIAR. These areas will be felled, replanted and manged as set out in the *Hen Harrier Habitat Enhancement Plan* and therefore further replanting areas are not required.

4.3.10.2 Tree Planting

In line with the Forest Service's published policy on granting felling licences for wind farm developments, areas cleared of forestry for turbine bases, access roads, and any other wind farm-related uses will have to be replaced by replanting at an alternative site.

The Forest Service policy requires replanting on a hectare for hectare basis for the footprint of the turbines and the other infrastructure developments. In the case of the area to undergo turbulence felling, there is a requirement for replanting on a hectare for hectare basis plus an additional 10%.

The 43 hectares that will be felled for the footprint of the turbines and the other infrastructure will be replanted on a hectare for hectare basis. The 30.6 hectares to be felled for turbulence felling and an additional 3.1 hectares or 10% of the 30.6 hectares, will also have to be planted. A total of 76.7 hectares of forestry will therefore be replanted as a condition of any felling licence that might issue in respect of the proposed wind farm development. Replanting is a requirement of the Forestry Act and is primarily a matter for the statutory licensing processes that are under the control of the Forest service.

The Forest Service policy states that where turbulence felling is necessary, a 'short rotation forestry' (SRF) approach will be made a condition of the felling licence. The SRF approach recommends the use of lodgepole pine or another suitable species as the replanting choice. The north coastal variety of lodgepole pine is preferred because it is unlikely to reach ten metres in height, the height at which the trees would again have to be felled to prevent turbine turbulence effects, over the 30-year lifetime of the wind farm project. In accordance with the Forest Service policy and requirements, the 30.6 hectares that will be felled for turbulence felling, will be replanted in the same location with the north coastal variety of lodgepole pine or similar species.

The replacement replanting of the remaining 46.1 hecatres of forestry can occur anywhere in the State subject to licence. Four potential replanting areas, listed in Table 4.3, have been identified for assessment purposes, with a combined availability of 48.35 hectares. These lands have been granted Forest Service Technical Approval for afforestation, and these or similarly approved lands will be used for replanting should the proposed wind farm receive planning permission. A description of the proposed replanting lands and an assessment of the potential impacts including cumulative impacts associated with afforestation at this location are provided in Appendix 4.3 of this EIAR.

Table 4.3 Proposed Replanting Lands

Location No.	Property Name	Location	Technically Approved Area (hectares)
1	Ballyduff Beg	Co. Clare	14.15
2	Molougha	Co. Clare	12.5
3	Claraghatlea North	Co.Cork	18.77
4	Glantane Beg	Co.Cork	2.93
Total Area Available			48.35

4.3.11 Site Activities

4.3.11.1 Environmental Management

All proposed activities on the site of the Proposed Development will be provided for in an environmental management plan. A Construction and Environmental Management Plan (CEMP) has been prepared for the Proposed Development, and is included in Appendix 4.4 of this EIAR. The CEMP includes details of drainage, peat and overburden management and waste management. It is intended that the CEMP would be updated prior to the commencement of the development, to include all 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.

4.3.11.2 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. The fuel bowser, a double-axle custom-built refuelling trailer will be re-filled off site, and will be towed around the site by a 4x4 jeep 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 used during all refuelling operations.

4.3.11.3 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. When concrete is delivered to site, only the chute of the delivery truck will be cleaned, using the smallest volume of water necessary, before leaving the site. Concrete trucks will be washed out fully at the 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 (http://www.siltbuster.com/sheets/RCW.pdf) 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 can be disposed of off-site at an appropriate 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 washout area

The areas are generally 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. 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 are often carried out outside normal working hours in order 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 a high 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 so as 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 discussed with suppliers before work starts, agreeing routes, prohibiting on-site washout and discussing 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.

4.3.11.4 Concrete Pouring

Because of the scale of the main concrete pours that will be required to construct the Proposed Development , the main pours will be planned days or weeks in advance. Special procedures will be adopted in advance of and during all concrete pours to minimise the risk of pollution. These may 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 while placing concrete.
- Ensuring that excavations are sufficiently dewatered before concreting begins and that dewatering continues while concrete sets.
- Ensuring that covers are available for freshly placed concrete to avoid the surface washing away in heavy rain.
- Disposing of surplus concrete after completion of a pour in agreed suitable locations away from any watercourse or sensitive habitats.

4.3.11.5 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, because this would transfer the pollutants to the haul roads and generate polluted runoff or more dust. Water bowser movements will be carefully monitored, as the application of too much water may lead to increased runoff.

4.3.11.6 Vehicle Washing

Wheels or vehicle underbodies are often washed before leaving sites to prevent the build-up of mud on public (and site) roads. A wheelwash facility will be provided. The site roads will be well finished with compacted hardcore, and so the public road-going vehicles will not be travelling over soft or muddy ground where they might pick up mud or dirt.

A road sweeper will be available if any section of the public roads were to be dirtied by trucks associated with the proposed development.

4.4 Access and Transportation

4.4.1 Site Entrance

It is proposed to access the site of the Proposed Development via the N15 National Primary Route and an existing quarry and forestry road in the townland of Croaghonagh. This entrance will be widened to facilitate the delivery of the construction materials and turbine components. The site entrance was subject to Autotrack assessment to identify the turning area required, as described in Section 14.1 of the Traffic and Transport Assessment. Appropriate sightlines will be established to the north and south of the proposed site entrance for the safe egress of traffic. The proposed works will result in a permanent upgrade of this current site access from the N15 National Primary Route, which will also form the entrance to the Proposed Development during the operational phase. The site entrance location is shown in Figure 4.1, and included in the detailed layout drawings in Appendix 4.1.

The delivery of all turbine and construction materials to the site will be via the site entrance off the N15. From here, the vehicles will use the internal site roads to access the proposed infrastructure locations within the site. An outline Traffic Management Plan is included in the CEMP in Appendix 4.4 of this EIAR.

There are two additional, existing site entrances located in the north east of the site. The entrance that is located approximately 590 metres northeast of Turbine No.18 will be used during the construction phase for the egress of empty construction vehicles such as empty concrete delivery trucks and during the operational phase of the proposed development to provide access to the eastern half of the site for routine maintenance vehicles along with continuing its current use of timber extraction under normal felling operations. The other site entrance, located approximately 260m north of the easternmost construction compound, is proposed to provide access, for the public to the recreation and amenity area and walkways during the operational phase of the proposed development. Detailed layouts of these access junctions are also included in Appendix 4.1.

4.4.2 Turbine and Construction Materials Transport Route

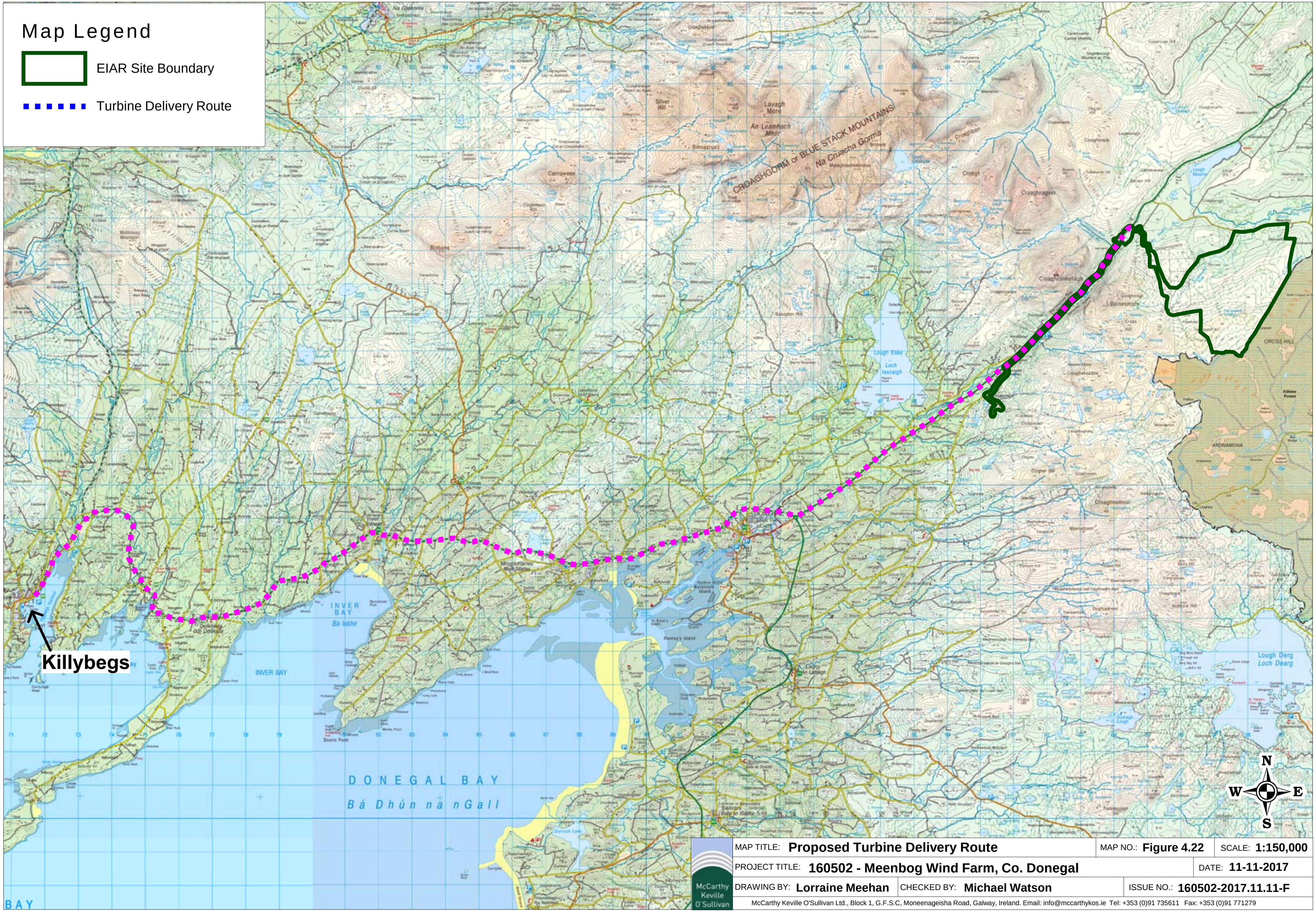
The proposed turbine transport route from Killybegs to the site of the Proposed Development is shown on Figure 4.22. From Killybegs the turbines will be transported northeast on the R263 Regional Road before turning right on to the N56 National Secondary Road and continuing east, then turning left onto the N15 National Primary Road and continuing northeast towards the entrance to the site.

All deliveries of turbine components and construction materials to the site of the Proposed Development will only be by way of the proposed transport route outlined in Figure 4.22. The number of construction vehicles that will be generated during the construction phase of the Proposed Development are outlined as part of the traffic and transport assessment in Section 14 of this EIAR.

4.4.3 Traffic Management

A turbine with a blade length of 61.7 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 67.6 metres, including the blade which overhangs the back of the vehicle. The total length of the tower transporter is 46.7 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 of the Proposed Development will be smaller than the design test vehicles. The turbine delivery vehicles have been modelled accurately in the Autotrack assessments for the site access junctions, as detailed in Section 14.1 of this EIAR.

The need to transport turbine components on the public roads is not an everyday occurrence in the vicinity of the site of the Proposed Development. However, the procedures for transporting abnormal size loads on the country's roads are well established. While every operation to transport abnormal loads is different and requires careful consideration and planning, escort vehicles, traffic management plans, drive tests, road marshals and convoy escorts from the Garda Traffic Corps are all measures that are regularly employed to gets unusual loads from origin to destination. With over 275 No. wind farms already built and operating in Ireland (Republic and Northern Ireland combined, as per latest available figures on www.iwea.com), transport challenges are something the wind energy industry and specialist transport sector has become particularly adept in finding solutions to.



Map Legend
EIAR Site Boundary
Turbine Delivery Route
Killybegs
INVER BAY
DONEGAL BAY
Bá Dhún na nGall
CROAGHGORM or BLUE STACK MOUNTAINS
Na Cruacha Gorma
Lough Eske
Loch Iascaigh
Lough Derg
Loch Dearg
N
W
E
S
MAP TITLE: Proposed Turbine Delivery Route
MAP NO.: Figure 4.22
SCALE: 1:150,000
PROJECT TITLE: 160502 - Meenbog Wind Farm, Co. Donegal
DATE: 11-11-2017
DRAWING BY: Lorraine Meehan
CHECKED BY: Michael Watson
ISSUE NO.: 160502-2017.11.11-F
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A preliminary traffic management plan has been prepared as set out in the CEMP in Appendix 4.4 of the EIAR. Prior to the construction of the Proposed Development, a detailed traffic management plan will be prepared by the haulage company and submitted to Donegal County Council for approval. The plan will include:

- A delivery schedule.
- Details of works or any other minor alteration identified.
- A dry run of the route using vehicles with similar dimensions.

The deliveries of turbine components to the site may be made in convoys of three to five vehicles at a time, 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 public 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. All deliveries comprising abnormally large loads where required will be made outside the normal peak traffic periods, usually at night, to avoid disruption to work and school-related traffic.

Prior to the Traffic Management Plan being finalised, a full dry run of the transport operation along the proposed route will be completed using vehicles with attachments to simulate the dimensions of the wind turbine transportation vehicles. This dry run will inform the traffic management plan for agreement with Donegal County Council. All turbine deliveries will be provided for in a transport management plan which will have to be prepared in advance of the construction stage, when the exact transport arrangements are known, delivery dates confirmed and escort proposals in place. Such a transport management plan is typically submitted to the Planning Authority for agreement in advance of any abnormal loads using the local roads, and 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.

4.5 Community Gain Proposal

4.5.1 Background

The Proposed Development has the potential to have significant benefits for the local economy, by means of job creation, landowner payments and commercial rate payments. An important part of wind farm development which Planree Ltd. has been at the forefront of developing is its Community Benefit Package. The concept of directing benefits from wind farms to the local community is promoted by the National Economic and Social Council (NESC) and the Irish Wind Energy Association (IWEA) among others. While it may be simpler and easier to put a total fund aside for a wider community area, Planree Ltd. is endeavouring to develop new ways to direct increased gain towards the local community with particular focus on those living closest to the Proposed Development .

The applicant company has given careful consideration to the issue of community gain arising from the Proposed Development, if permitted and constructed. Community gain from significant development proposals, including wind farms, whilst a relatively recent approach, is now a common consideration for developers and, indeed, planning authorities. This approach recognises that, with any significant wind farm proposal, the locality in which the site is situated is making a significant contribution towards helping achieve national renewable energy and climate change targets, and the local community should derive some benefit from accommodating such a development in their locality.

Community gain proposals can take a number of forms, generally depending on the nature and location of the proposed development and the nature and make-up of the local community. In some instances, funds are paid by the developer, either annually or as a one-off payment, to a community fund that is administered by a voluntary committee. These funds may then be used for a variety of projects, such as environmental improvements, local amenities and facilities, voluntary and sporting groups and clubs, educational projects and energy efficiency improvement works.

4.5.2 The Proposal

The Community Benefit Package which is being proposed for this project has been directed by feedback from ongoing consultation with the local community and through feedback/comment forms completed from the public consultation letters and events held in February and September 2017. The public consultation process for the Proposed Development is summarized in Section 2.6. Those spoken to in the local area felt that the project should bring with it real and tangible benefits for the local community and that these should be developed at an early stage from operation of the wind farm. It was also felt that there should be an opportunity for households in the area to receive a return from the project and that those closest to the Proposed Development should benefit most. In terms of developing a Community Benefit Package which would address these high-level aspirations, Planree Ltd. are proposing the schemes presented below.

4.5.2.1 Qualifying Projects & Initiatives

The types of projects and initiatives that could be supported by such a Community Gain proposal could include youth, sport and community facilities, schools, educational and training initiatives, and wider amenity, heritage, and environmental projects. An example of projects that could be supported by the proposed development is a recreation and amenity facility which will be incorporated into the design of the proposed wind farm. This proposal has been put forward by a local group, The Meenbog Community Group, formed for the specific purpose of delivering their vision for their community. The proposal is outlined in detail in section 4.6 below.

The Community Fund Committee will set the final qualifying criteria for projects and initiatives seeking funding from the Community Gain Fund over the lifespan of the Proposed Development.

4.5.2.2 Financial Contributions

The community benefit scheme is proposed to be funded as follows:

- It is intended that wind farm developer will make an initial contribution of €6,250 per MW upon commissioning of the proposed wind farm. Based on an installed capacity of 66.5 MW , this initial payment could total €415,625. This amount would then be immediately available through the liaison committee to local groups and organisations through grants.

- Further payments of €1,250 per MW will be paid into the fund annually over the estimated 30 year operational period of the wind farm, which would result in further annual payments of approximately €85,000 per annum and a total of approximately €2.5 Million in local funding over the 30 year project lifespan.

The number and size of grant allocations will be decided by a Community Fund liaison committee with various groups and project benefiting to varying degrees depending on their funding requirement.

4.5.2.3 Community Fund Liaison Committee

Planree Ltd. proposes that the community fund will be managed by a Community Fund Liaison Committee to ensure all grants applications are considered and awarded in an open, fair and transparent manner. It is proposed that the committee would consist of three local independent members of the community, three elected representatives such as TD's or County Councillors from the area surrounding the site of the Proposed Development, a representative from the applicant company and a staff member from Donegal County Council who would provide administrative support to the running of the committee.

The proposed members of the committee are as follows:

1. Community representative No. 1
2. Community representative No. 2
3. Community representative No. 3
4. Elected Representative No. 1
5. Elected Representative No. 2
6. Elected Representative No. 3
7. Wind farm developer representative
8. Donegal County Council representative

Such a proposed committee structure will ensure all activities of the committee are conducted in an open and transparent manner, and the Community Fund Initiative can make a significant contribution to the development of social and community infrastructure and services in the local communities surrounding the site of the Proposed Development , while giving the local community a high degree of control over the causes, initiatives and projects that will be supported.

Following established models for such Community Fund Initiatives, Donegal County Council would be expected to be responsible for administration of the community fund. The liaison committee will advise Donegal County Council on the operation of the fund, but Donegal County Council will retain executive authority over the fund.

This is considered to be an appropriate mechanism to deliver community gain in this particular case, providing a tangible benefit directly to community interests and groups in the area.

In the event of there not being a sufficient number of identifiable community groups located directly within the vicinity of the Proposed Development to take advantage of the community benefit scheme, an alternative approach would be for the developer/operator of the Proposed Development to subsidise the energy bills of dwellings within a specified distance of the ollowing commissioning. This will be a matter for the local community and the Community Fund Liaison Committee to consider further in the future, should the Proposed Development secure planning permission.

4.5.3 Funding Support

It is proposed that the Community Fund Committee should set the final qualifying criteria for projects and initiatives seeking funding from the Community Gain Fund, to ensure the local community have a large influence in determining how their local area should benefit from the Proposed Development's community gain fund. Some examples of funding supports that could be provided by the Community Fund Committee are outlined below.

4.5.3.1 Community and Voluntary Group Fund

A dedicated annual fund could be made available through the Community Gain Fund for local community groups and voluntary organisations to support their efforts and initiatives in the local communities around the Proposed Development . The types of projects and initiatives that could be supported by such a Community Gain proposal could include youth, sport and community facilities, schools, educational and training initiatives, and wider amenity, heritage, and environmental projects.

The Community Fund Committee will set the final qualifying criteria for projects and initiatives seeking funding from the Community Gain Fund. The number and size of grant allocations will be decided by a Community Fund liaison committee with various groups and projects benefiting to varying degrees depending on their funding requirement.

4.5.3.2 Renewable Energy Fund for Local Residents

As referred to in this EIAR above, the Proposed Development will make a significant contribution towards helping achieve national renewable energy and climate change targets. For a strategic wind farm project of the scale proposed, a portion of the Community Gain Fund could be dedicated to local residents living within an agreed range of any proposed wind turbine through a Renewable Energy Fund. Such a proposal could see direct payments being made to local residents from the Renewable Energy Fund on an annual basis to cover the cost of their annual electricity bill from a renewable energy supplier of their choosing, and may fund some renewable energy upgrades to their properties to improve energy efficiency, install domestic renewable energy technologies such as heat pumps or solar panels, and overall make them less reliant on fossil-fuel.

4.6 Recreation and Amenity Proposals

4.6.1 Introduction

The Proposed Development and all its associated infrastructure creates a unique opportunity to develop a safe, family-orientated, off-road recreation and amenity area for use by members of the local and wider community alike. Parts of the site of the Proposed Development and proposed infrastructure will be developed and promoted for use as a cycling, walking, picnicking and trail-running activities. This proposal is based on the ideas brought forward from discussions with the Meenbog Community Group. The site's proximity to Donegal Town, Ballybofey/Stranorlar and Letterkenny, and the N15 public road puts a very large potential user group within easy access of the proposed site. A portion of the overall Community Gain Fund, will be dedicated to the provision and promotion of the recreational and amenity proposals on completion of the wind farm infrastructure works.

The recreational and amenity proposals for the site of the Proposed Development follow an emerging international trend to make wind farm sites accessible to the general public by providing recreation opportunities that complement the wind farm development. Although the site consists of a commercial forestry plantation, the site has a secluded and isolated feel, which adds to the attractiveness and potential of the area as a recreation location.

The recreation and amenity facilities proposed for the Proposed Development are intended to appeal to walkers, cyclists, trail runners and other recreational users, and are outlined in the below.

4.6.2 Recreation and Amenity Facilities

The proposed recreation and amenity facilities consist of a series of marked walkways, complimented by waypoint signage, and visitor facilities in the form of a car park, play areas, barbeque area, picnic area and community garden, each of which are detailed in the below. The following proposals should be read in conjunction with Figure 4.23 which maps the proposed recreation and amenity proposals for the site of the Proposed Development.

4.6.2.1 Amenity Area Entrance and Carpark

Access to the amenity area and walkways will be via the L6554 local road in the townland of Meenbog. It is proposed to use an existing site entrance, as shown on Figure 4.1, for public access to the site and associated amenity facilities during the operational phase. This existing entrance and track will be upgraded to ensure adequate visibility splays and safe access and egress for passenger vehicles or cyclists. A timber post and rail fence will be erected around the site entrance and a lockable steel barrier or gate will be erected across the access road. This detail is shown in Figure 4.24. This entrance will not be used to provide access or egress for construction plant or vehicles during the construction or operational phase of the Proposed Development .

A visitor car park will be constructed on the eastern side of the amenity access track, the detail of which is shown in Figure 4.25. The surface dressing of this car park will be level and compacted Clause 804 stone and would accommodate up to 15 vehicles.

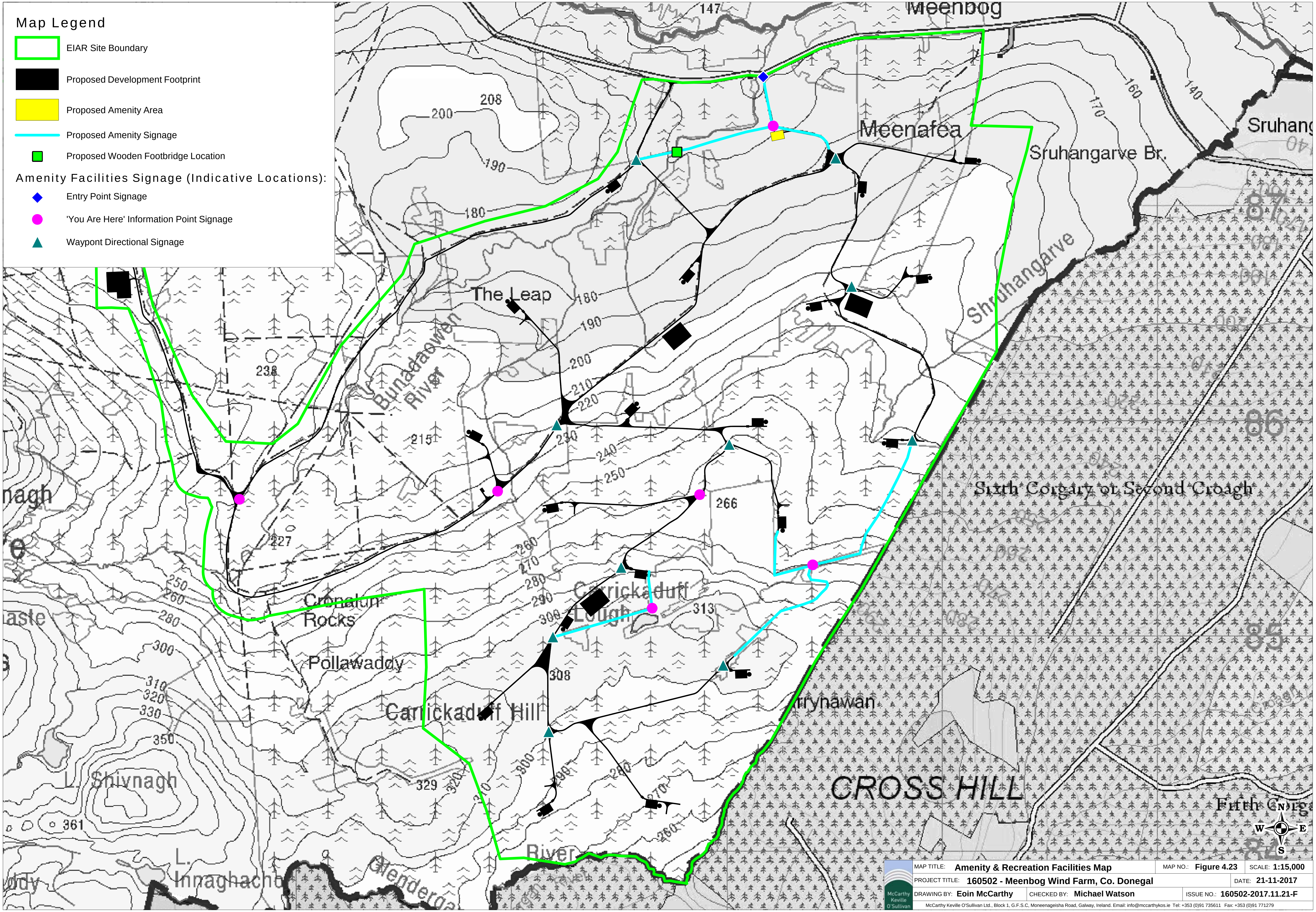
The car park would act as a landing point or trailhead for recreation and amenity users arriving at the site. The car park would provide a safe and easily accessible landing point, allowing visitors to orientate themselves on the site or demount bicycles from cars.

4.6.2.2 Amenity Area

At the end of the construction phase of the Proposed Development the easternmost construction compound will be repurposed into an amenity area for recreational users. This area will include a play zone, a ball zone, a barbeque area and a covered picnic area. This amenity area will also include a community garden which will be cultivated and maintained by the local community. Plans, elevations and section drawings of the proposed amenity area and covered picnic area are shown in Figure 4.26 and Figure 4.27 respectively.

4.6.2.3 Amenity Walkways

It is proposed to open sections of the wind farm site roads, in combination with proposed new gravel walkways, as marked trails for walkers, cyclists, trail runners and general outdoor recreation. Three separate sections of proposed new gravel walkways are proposed, forming a number of looped trails within the site of the proposed wind farm development. In total, there will be approximately 3.75 kilometres


Map Legend
EIAR Site Boundary
Proposed Development Footprint
Proposed Amenity Area
Proposed Amenity Signage
Proposed Wooden Footbridge Location
Amenity Facilities Signage (Indicative Locations):
Entry Point Signage
'You Are Here' Information Point Signage
Waypont Directional Signage
Meenbog
Meenafea
Sruhangarve Br.
Shruhangarve
The Leap
Bunadaowen River
Sixth Corgary or Second Croagh
Carrickaduff Lough
Cronalaght Rocks
Pollawaddy
Carrickaduff Hill
L. Shivnagh
L. Innaghachola
CROSS HILL
MAP TITLE: Amenity & Recreation Facilities Map
MAP NO.: Figure 4.23
SCALE: 1:15,000
PROJECT TITLE: 160502 - Meenbog Wind Farm, Co. Donegal
DATE: 21-11-2017
DRAWING BY: Eoin McCarthy
CHECKED BY: Michael Watson
ISSUE NO.: 160502-2017.11.21-F
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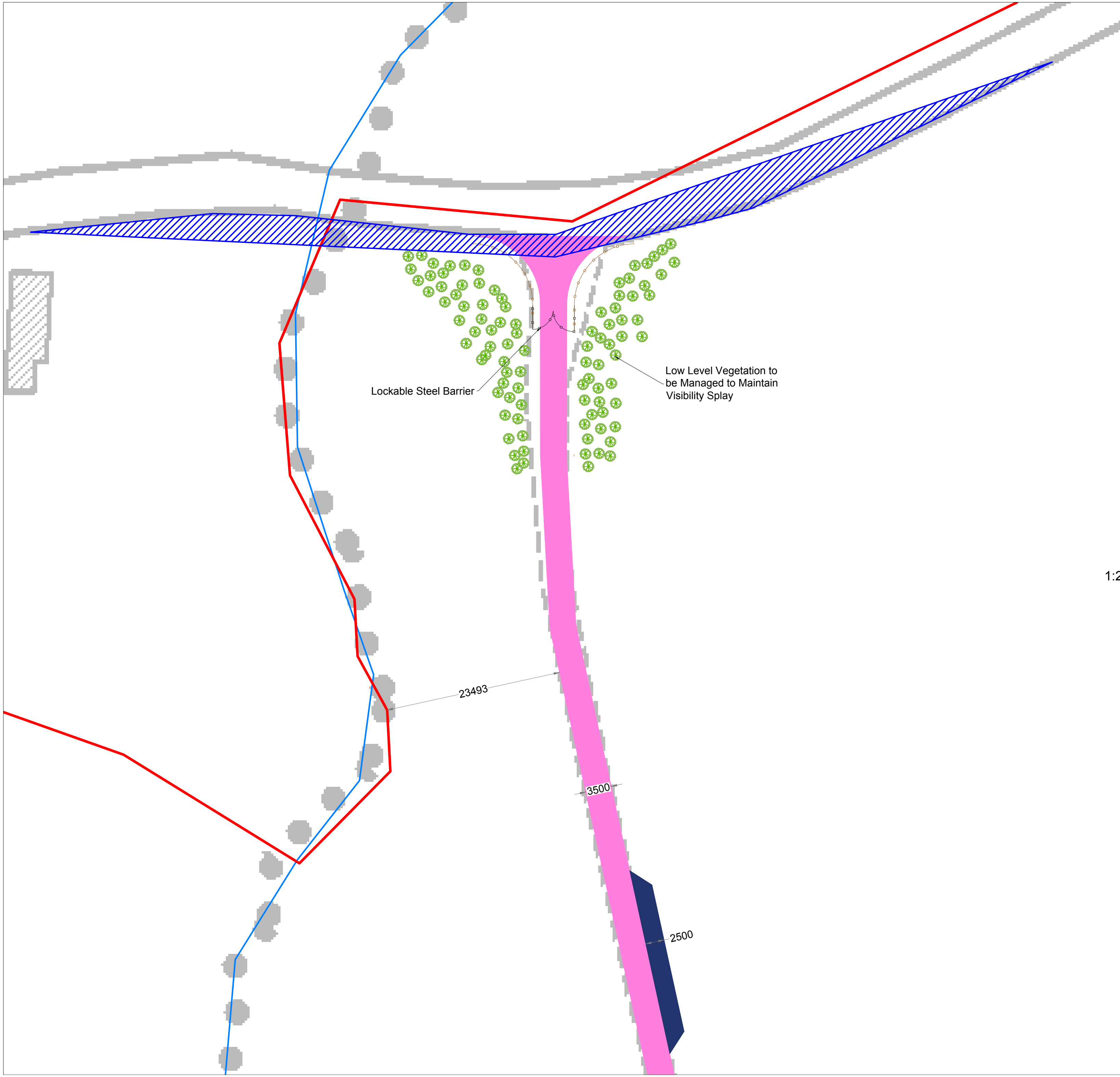

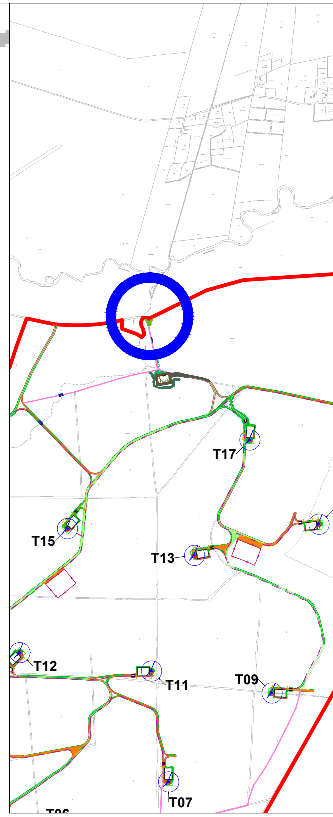

1:25,000 Location Context Map

Drawing Legend

- Planning Application Boundary
- Proposed Amenity Walkway
- Passing Bay
- River/Stream
- Wooden Fence
- Trees
- Visibility Splay

N

Figure 4.24

DRAWING TITLE:

Amenity Area Plan - Entrance

PROJECT TITLE:

Meenbog Wind Farm, Co. Donegal

DRAWING BY: **Joseph O Brien**	CHECKED BY: **Michael Watson**
PROJECT No.: **160502**	DRAWING No.: **0502 - 62**
SCALE: **1:500 @ A3**	DATE: **28.11.2017**

OS SHEET No.: 0397,0398,0399,0400,0401,0423,0424,0425,0426,0427,0450,0451,0452, 0453, 0454, 0478, 0479, 0480, 0481, 0482, 0506, 0507,0508, 0509, 0535, 0536

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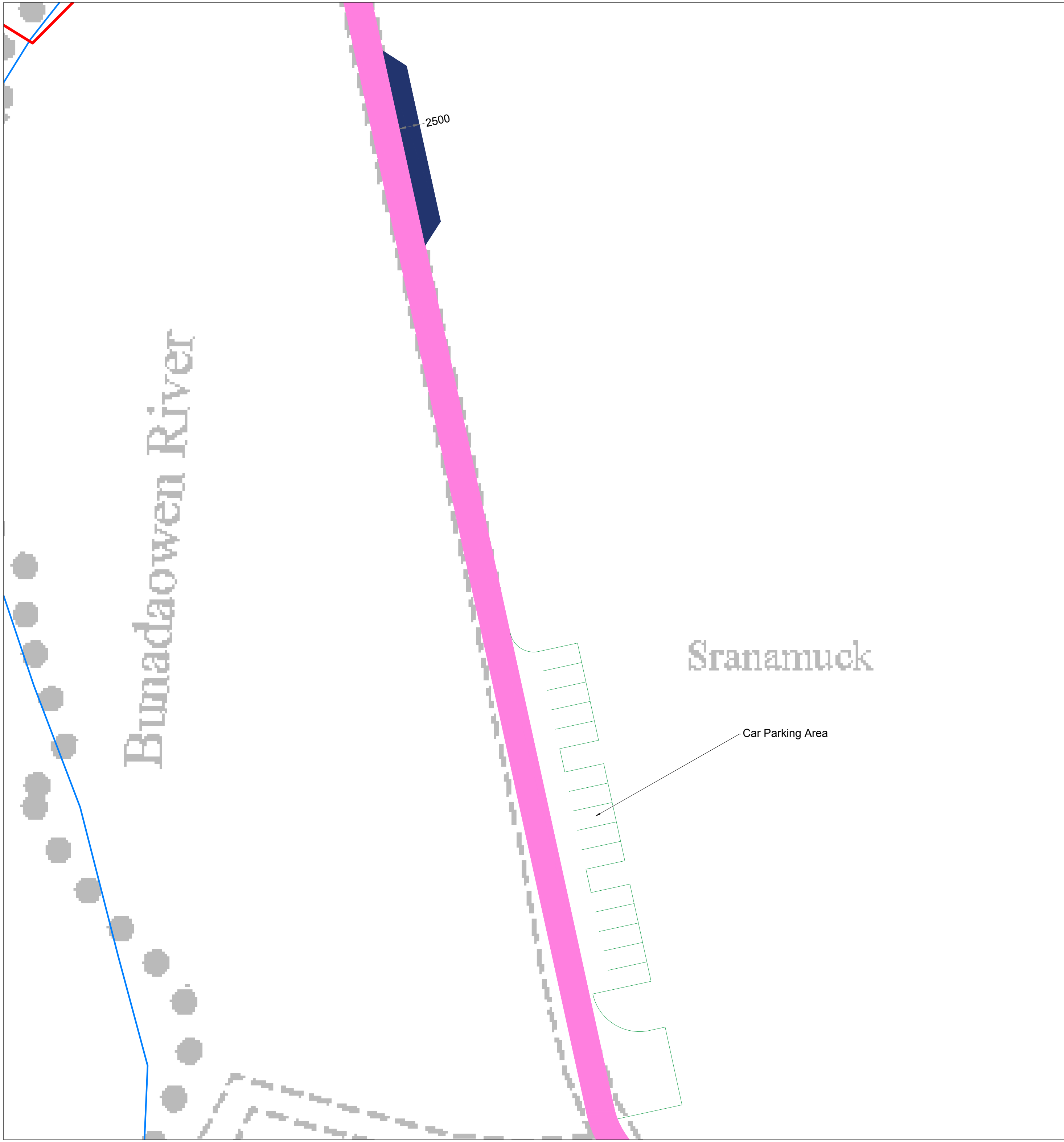

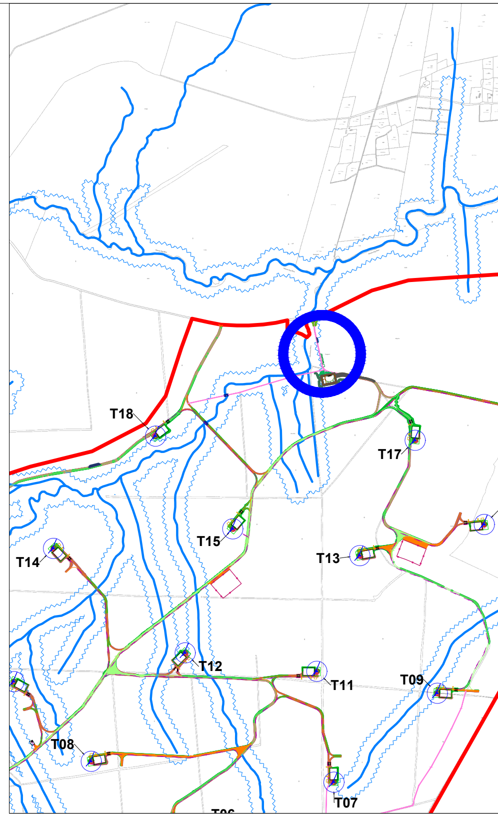

1:25,000 Location Context Map

Drawing Legend

- Planning Application Boundary
- Proposed Amenity Walkway
- Passing Bay
- River/Stream

N

Figure 4.25

DRAWING TITLE:

Amenity Area Plan - Car Parking Facility

PROJECT TITLE:

Meenbog Wind Farm, Co. Donegal

DRAWING BY: **Joseph O Brien**	CHECKED BY: **Michael Watson**
PROJECT No.: **160502**	DRAWING No.: **0502 - 63**
SCALE: **1:500 @ A3**	DATE: **28.11.2017**

OS SHEET No.: 0397,0398,0399,0400,0401,0423,0424,0425,0426,0427,0450,0451,0452, 0453, 0454, 0478, 0479, 0480, 0481, 0482, 0506, 0507,0508, 0509, 0535, 0536

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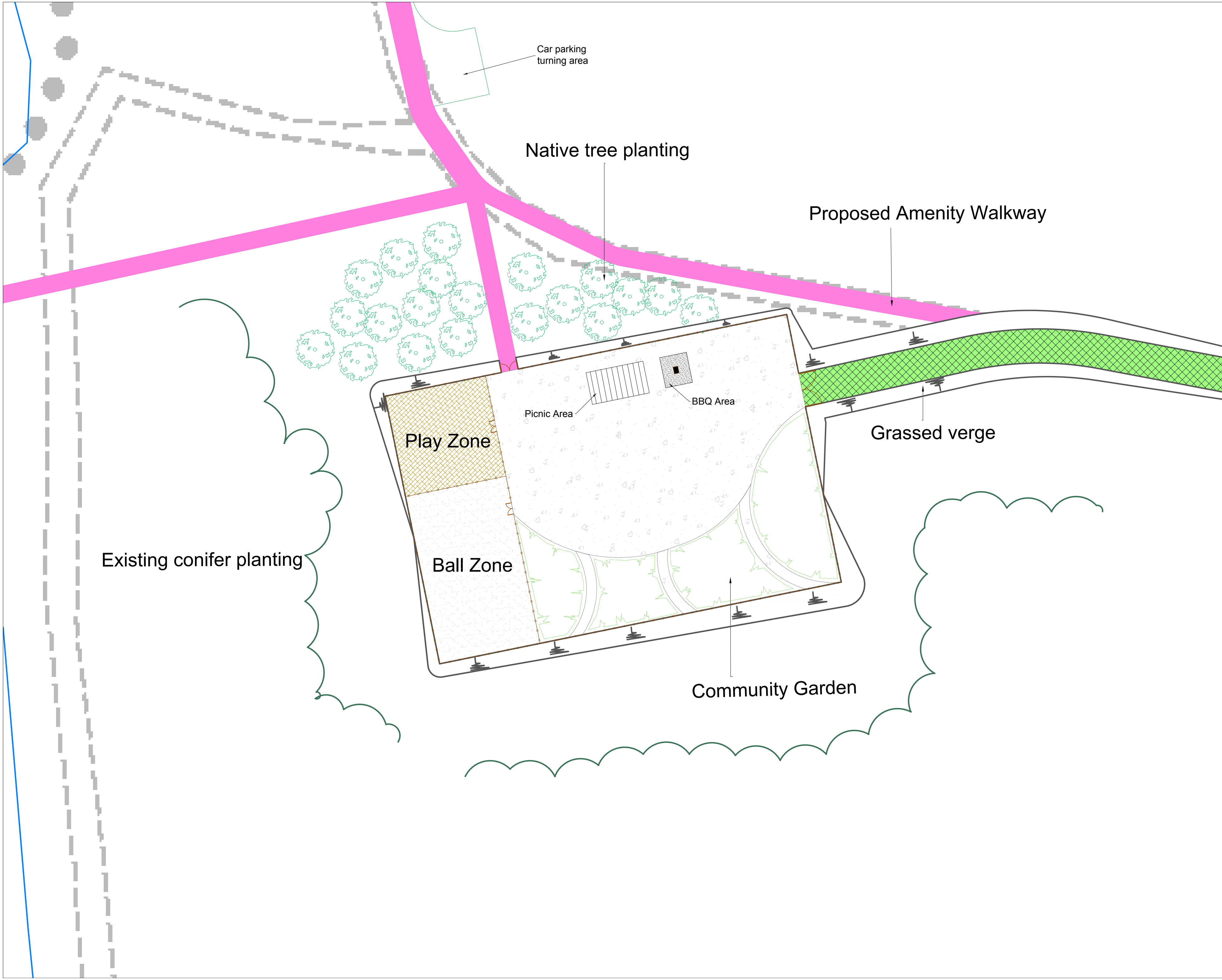

Drawing Legend

- Existing Floating Road to be Upgraded
- Proposed Amenity Walkway
- River/Stream
- Wooden Fence
- Compacted Gravel
- Bark Chipping
- Tarmacadam

N

Figure 4.26

DRAWING TITLE:

Amenity Area Plan - Picnic Area

PROJECT TITLE:

Meenbog Wind Farm, Co. Donegal

DRAWING BY: **Joseph O Brien**	CHECKED BY: **Michael Watson**
PROJECT No.: **160502**	DRAWING No.: **0502 - 64**
SCALE: **1:500 @ A3**	DATE: **28.11.2017**

OS SHEET No.: 0397,0398,0399,0400,0401,0423,0424,0425,0426,0427,0450,0451,0452, 0453, 0454, 0478, 0479, 0480, 0481, 0482, 0506, 0507,0508, 0509, 0535, 0536

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Note
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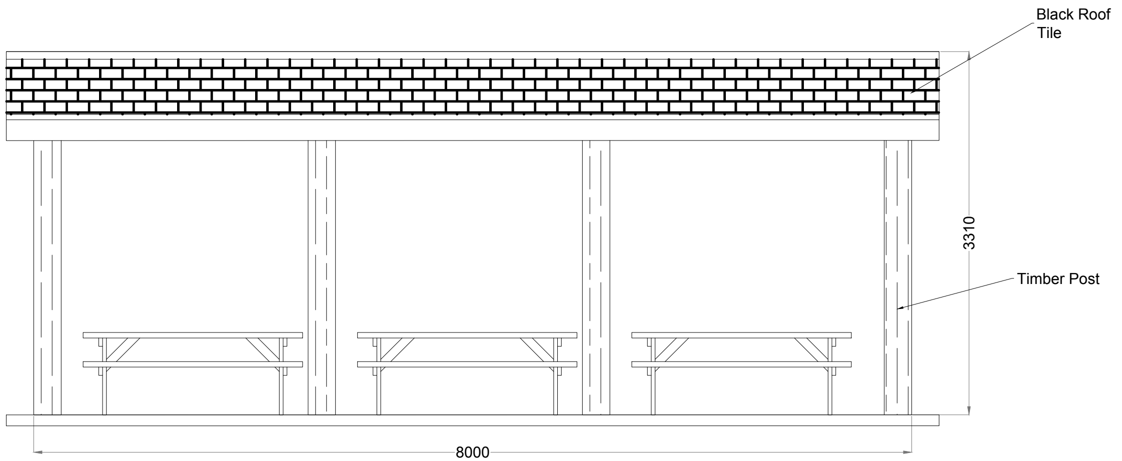
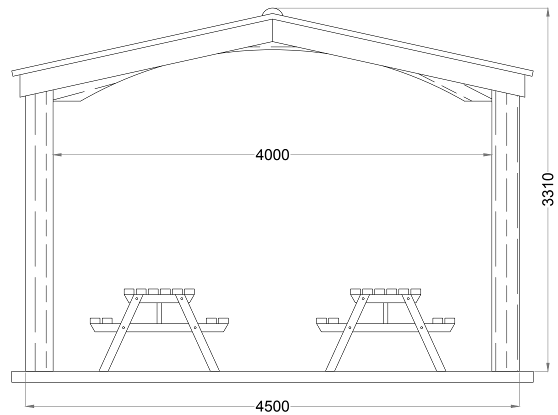
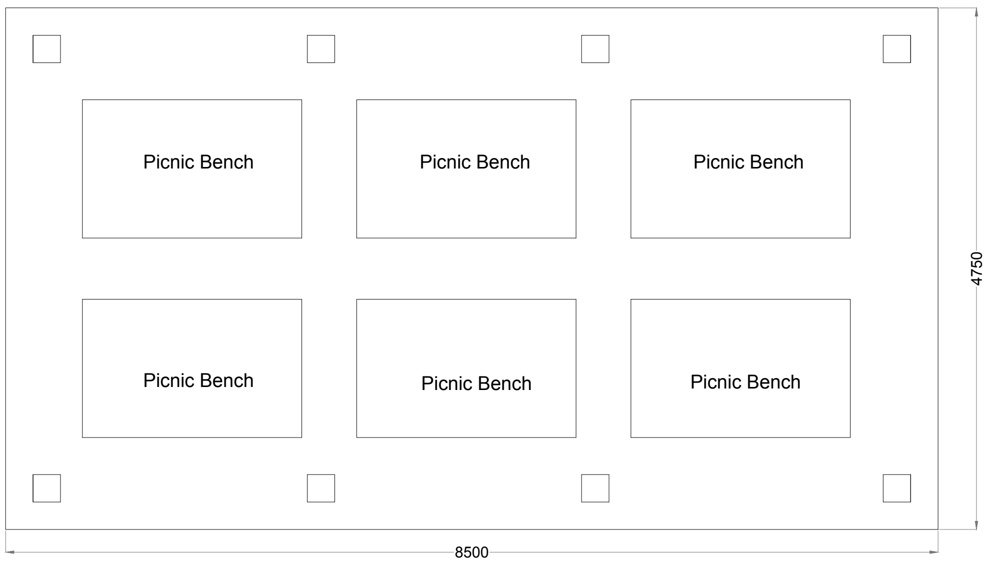
exact details to be confirmed



North/South Elevation



East/West Elevation



Floor Plan View

Typical Image

Figure 4.27

DRAWING TITLE:
Picnic Area Elevations

PROJECT TITLE:
Meenbog Wind Farm, Co. Donegal

DRAWING BY: **Joseph O Brien**	CHECKED BY: **Michael Watson**
PROJECT No.: **160502**	DRAWING No.: **0502 -65**
SCALE: **1: 50 @ A3**	DATE: **28.11.2017**

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of amenity walkways constructed and linking into wind farm site roads. The proposed walkways are shown on Figure 4.23. All marked walkways will be 2.5 metres in width, constructed in the same manner as the proposed new floating road sections, as described in Section 4.3.2 above, and will correspond to National Trails Office Class 3 Walking Trails standard, or better.

The walkway will cross the Bunadaowan River to connect to the existing site road approximately 190 metres north of Turbine No. 18. A wooden footbridge will be constructed at this crossing point. A typical plan view and elevations of the type of wooden footbridge proposed is shown in Figure 4.28.

4.6.2.4 Waypoint Signage

Three different forms of information and waypoint signage will be provided across the proposed recreation and amenity area. The proposed locations of the signage are indicated on Figure 4.23.

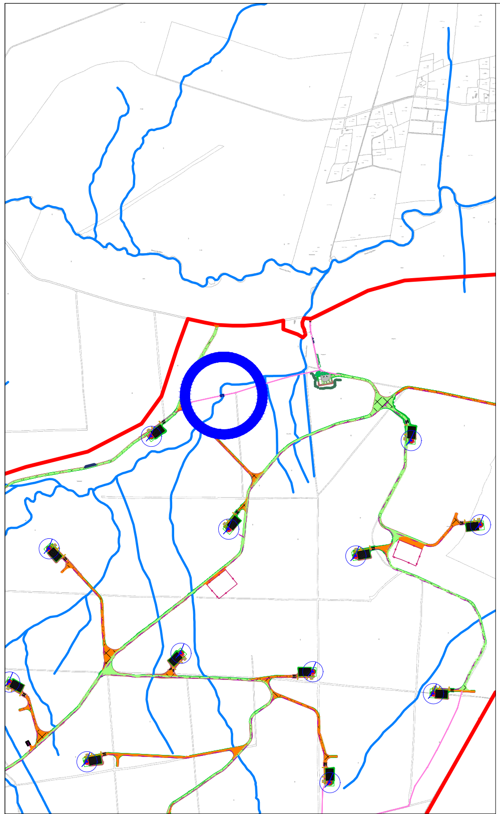
Entry point signage will be provided at various locations, where recreation users could enter the site, all at points on the marked walkways. The entry point information boards will clearly indicate each of the marked trails on a map, as well as outlining the distance, suitability and length of each trail. The signage will also indicate the principles of 'Leave No Trace'. Waypoint map information signage indicating the location of the sign in the context of the overall site will be provided at five locations across the site, which will indicate to users "You Are Here" and outline the options available to them for continuing through the recreation area. Waypoint direction signage will be provided at all junctions or at least at every one kilometre along the trails as reassurance waymarkers, to indicate the recommended direction of travel and distance to trail end and return distance to trailhead, and will be colour coded to indicate the marked trail(s) on the route being followed. Elevation drawings of the proposed typical signage is shown on Figure 4.29.

4.6.3 Access

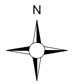
Access to the recreation and amenity area will be primarily via the L6554 for the majority of users. The L6554, in turn, provides access to the N15 to the west and Castlederg to the east. The vehicular access will be gated and access will be managed by local key holders.

4.6.4 Further Potential

The site of the Proposed Development and surrounding area has significant potential as a recreational and amenity resource given the location of the Barnesmore Gap and the presence of a disused railway line which runs to the west of the site. The proposed recreation and amenity proposals outlined above will be provided as part of the Proposed Development , subject to planning permission beinggranted.. It is acknowledged that any investment in the creation of recreation and amenity proposals on the site of the Poposed Development will have to be matched by an ongoing commitment from the wind farm developer to maintain the recreation amenities once they are put in place. The amenity proposals which have been included as part of the Proposed Development can operate as standalone destination amenity walks, however, they would also facilitate and augment any future amenity proposals which may be brought forward in the wider area in the future. For example, it is noted that policy T-P-30 of the County Development Plan encourages the protection of established/historic rail corridors for recreational development.

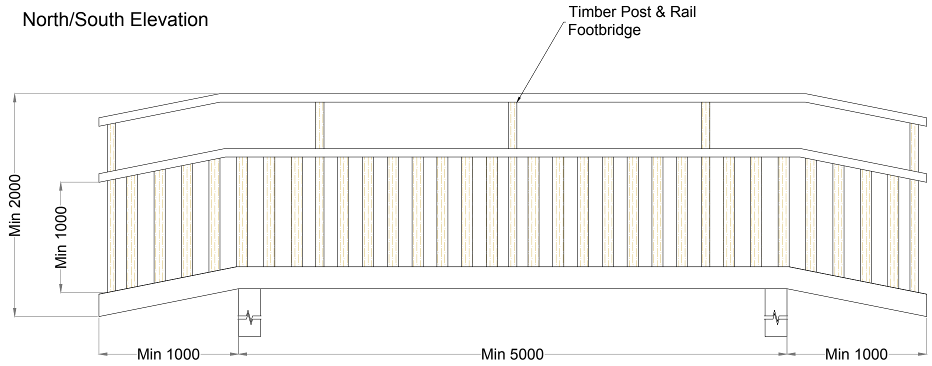


1:25,000 Location Context Map

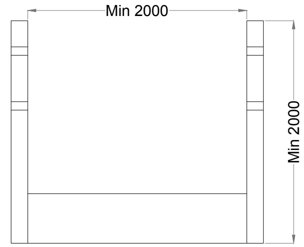


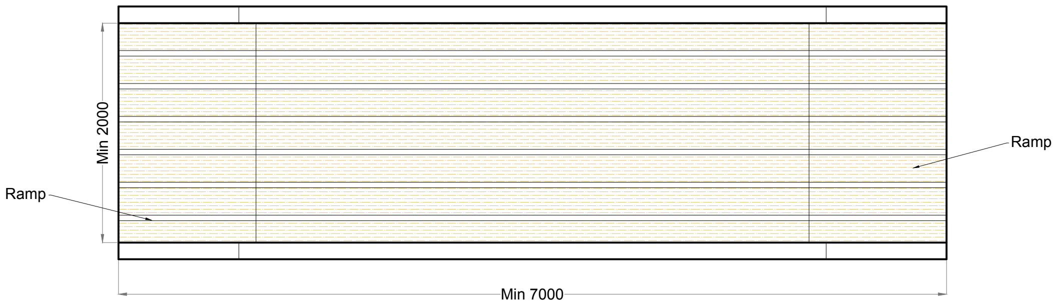
Note
For illustrative purposes only
exact details to be confirmed

North/South Elevation



East/West Elevation





Plan View

Figure 4.28

DRAWING TITLE:

Timber Footbridge Details

PROJECT TITLE:

Meenbog Wind Farm, Co. Donegal

DRAWING BY: **Joseph O Brien**	CHECKED BY: **Michael Watson**
PROJECT No.: **160502**	DRAWING No.: **0502 - 66**
SCALE: **1: 50 @ A3**	DATE: **28.11.2017**

OS SHEET No.: **0397,0398,0399,0400,0401,0423,0424,0425,0426,0427,0450,0451, 0452,0453,0454,0478,0479,0480,0481,0482,0506,0507,0508,0509, 0535, 0536**

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Note
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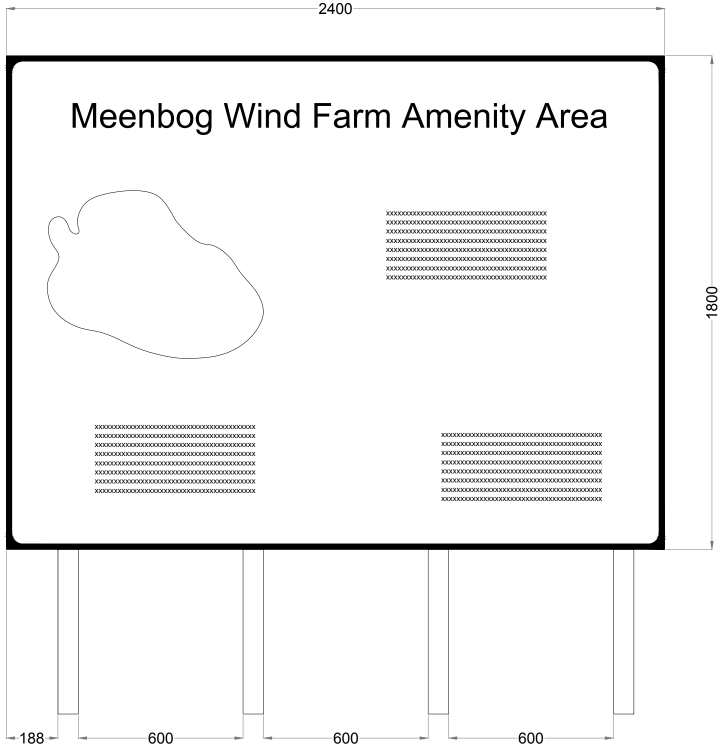
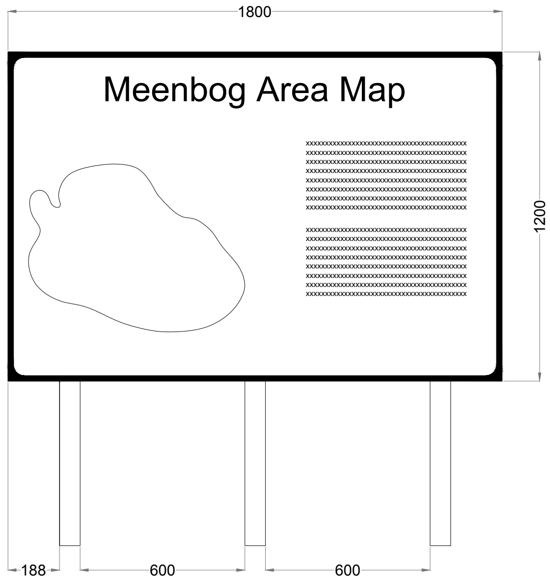
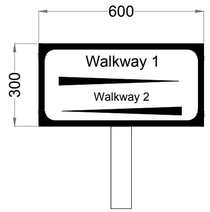


Signage Type A - Waypoint Map Signage



Signage Type B - Entry Point Signage



Signage Type C - Way Point Direction Signage

Figure 4.29

DRAWING TITLE:

Amenity Area Signage

PROJECT TITLE:
Meenbog Wind Farm, Co. Donegal

DRAWING BY: **Joseph O Brien**	CHECKED BY: **Michael Watson**
PROJECT No. **160502**	DRAWING No. **0502 - 67**
SCALE: **1: 20 @A3**	DATE: **28.11.2017**

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4.7 Site Drainage

4.7.1 Introduction

The drainage design for the Proposed Development has been prepared by Hydro Environmental Services Ltd. (HES), and by the firm's principal, Mr. Michael Gill. The protection of the watercourses within and surrounding the site, and downstream catchments that they feed is of utmost importance in considering the most appropriate drainage proposals for the site of the proposed development. The Proposed Development's drainage design has therefore been proposed specifically 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. No routes of any natural drainage features will be altered as part of the Proposed Development and turbine locations and associated new roadways were originally selected to avoid natural watercourses, and existing roads are 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 a minimum of 50m and 100m distance from streams and lakes respectively. Buffer zones around the existing natural drainage features have constrained the layout of the Proposed Development.

4.7.2 Existing Drainage Features

The routes of any natural drainage features will not be altered as part of the Proposed Development. Turbine locations have been selected to avoid natural watercourses. Five new watercourse crossings (including one clear-span bridge crossing, described in Section 4.8.3) and 19 no. potential crossing upgrades will be required as part of the Proposed Development. A wooden footbridge water crossing, as described in Section 4.6.2.3 above, is also required as part of the Proposed Development

There will be no direct discharges to natural watercourses. All discharges from the proposed works areas or from interceptor drains will be made over vegetated ground at a minimum of 50m distance from streams, and 100m distance from lakes, unless otherwise specified in future revisions of the drainage design. Buffer zones around the existing natural drainage features have informed the layout of the Proposed Development, and are indicated on the drainage design drawings.

Where artificial drains are currently in place in the vicinity of proposed works areas, these drains may have to be diverted around the proposed works areas to minimise the amount of water in the vicinity of works areas. Where it may not be possible to divert artificial drains around proposed work areas, the drains will be blocked to ensure sediment laden water from the works areas has no direct route to other watercourses. Where drains have to be blocked, the blocking will only take place after an alternative drainage system to handle the same water has been put in place.

Existing artificial drains in the vicinity of existing site roads will be maintained in their present location where possible. If it is expected that these artificial drains will receive drainage water from works areas, check dams will be added (as specified below) to control flows and sediment loads in these existing artificial drains. If road widening or improvement works are necessary along the existing roads, where possible, the works will take place on the opposite side of the road to the drain.

4.7.3 Drainage Design Principles

Drainage water from any works areas of the site of the Proposed Development will not be directed to any natural watercourses within the site. Two distinct methods will be employed to manage drainage water within the site. The first method involves keeping clean water clean by avoiding disturbance to natural drainage features, minimising any works in or around artificial drainage features, and diverting clean surface water flow around excavations and construction areas. The second method involves collecting any drainage waters from works areas within the site that might carry silt or sediment, to allow attenuation and settlement prior to controlled diffuse release.

The drainage design is intended to maximise erosion control, which is more effective than having to control sediment during high rainfall. Such a system also requires less maintenance. The area of exposed ground will be minimised. The drainage measures will prevent runoff from entering the works areas of the site from adjacent ground, to minimise the volume of sediment-laden water that has to be managed. Discoloured run-off from any construction area will be isolated from natural clean run-off.

A schematic line drawing of the proposed drainage design is presented in Figure 4.30 below.

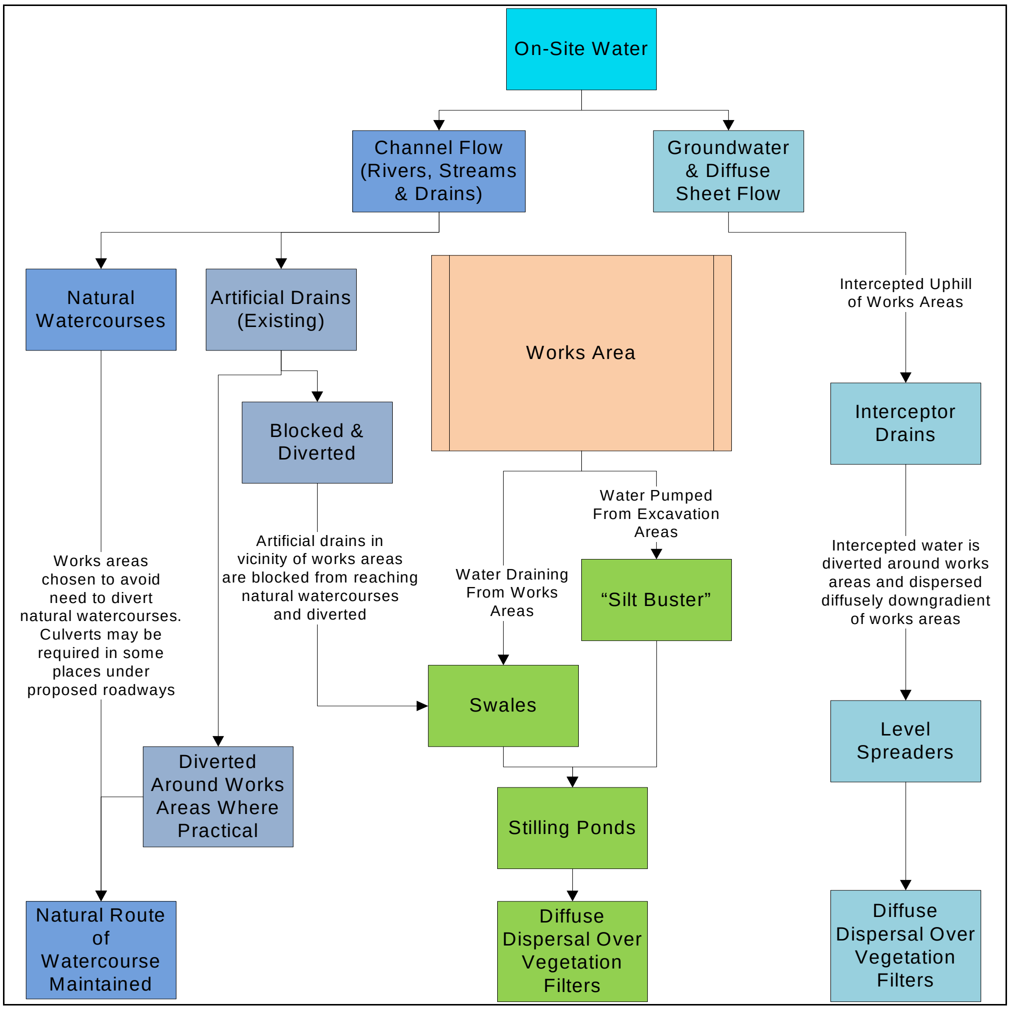


Figure 4.30 Proposed Wind Farm Drainage Process Flow

4.7.4 References

The drainage design has been prepared based on experience of the project team of other wind farm sites in peat-dominated environments, and the number of best practice guidance documents referred to in the References section of the EIAR.

4.7.5 Drainage Design

A detailed drainage design for the Proposed Development , incorporating all principles and measures outlined in this drainage design description, has been prepared, and is included in Appendix 4.1 to this EIAR. The drainage design employs the various measures further described below.

4.7.5.1 Interceptor Drains

Interceptor drains will be installed upgradient of any works areas to collect surface flow runoff and prevent it reaching excavations and construction areas of the site where it might otherwise have come into contact with exposed surfaces and picked up silt and sediment. 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.

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 could be removed. At that stage, 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 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 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 of 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.

Figure 4.31 below shows an illustrative drawing of an interceptor drain.

The velocity of flow in the interceptor will be controlled by check dams (see Section 4.7.5.3 below), which will be installed at regular intervals along the drains to ensure flow in the channel is non-erosive. On steeper sections where erosion risks are greater, a geotextile membrane will be added to the channel.

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 level spreader (see Section 4.7.5.4 below). 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.

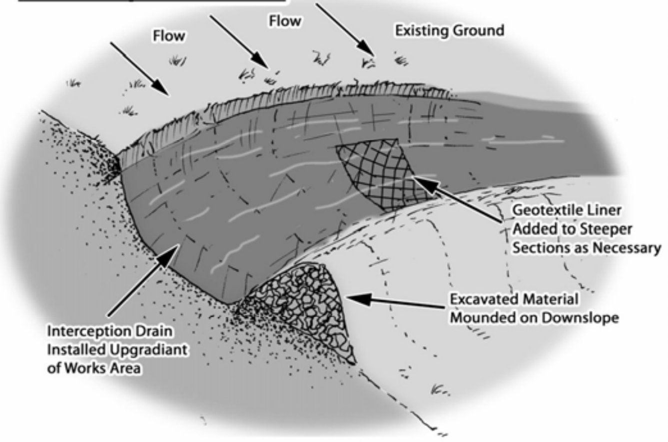
4.7.5.2 Swales

Drainage swales are shallow drains that will be used to intercept and collect run off from construction areas of the site during the construction phase. 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. Figure 4.31, below, shows an illustrative example of a drainage swale.

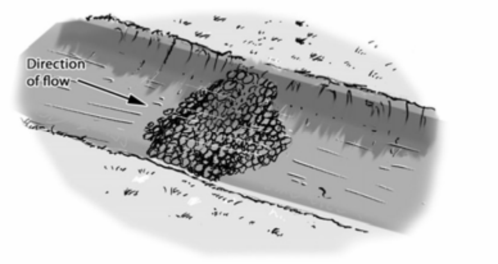
Drainage swales will be installed downgradient of any works areas to collect surface flow runoff where it might have come into contact with exposed surfaces and picked up silt and sediment. Swales will intercept the potentially silt-laden water from the excavations and construction areas of the site and prevent it reaching natural watercourses.

Drainage swales 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.

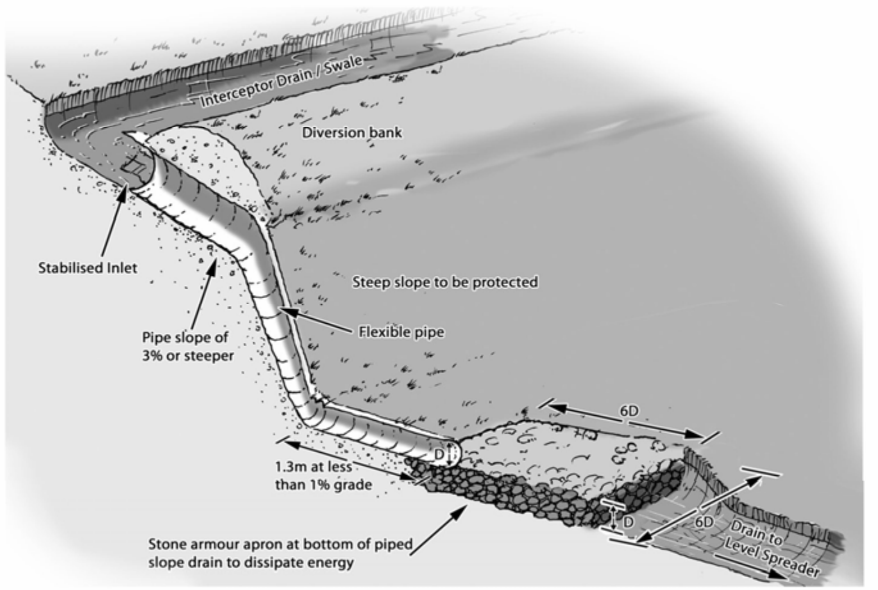
Interceptor Drain



Check Dam (Stone Dam in Drain)

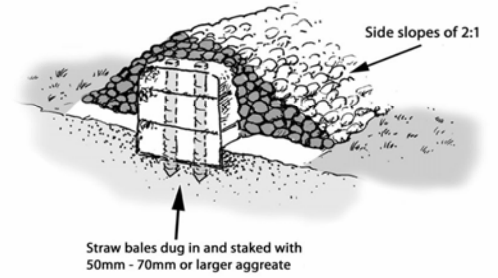


Slope Pipe Drain

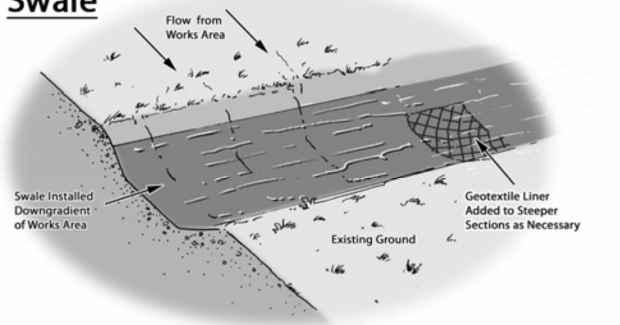


Check Dam

(Straw Bale & Stone Dam - Cross Section)

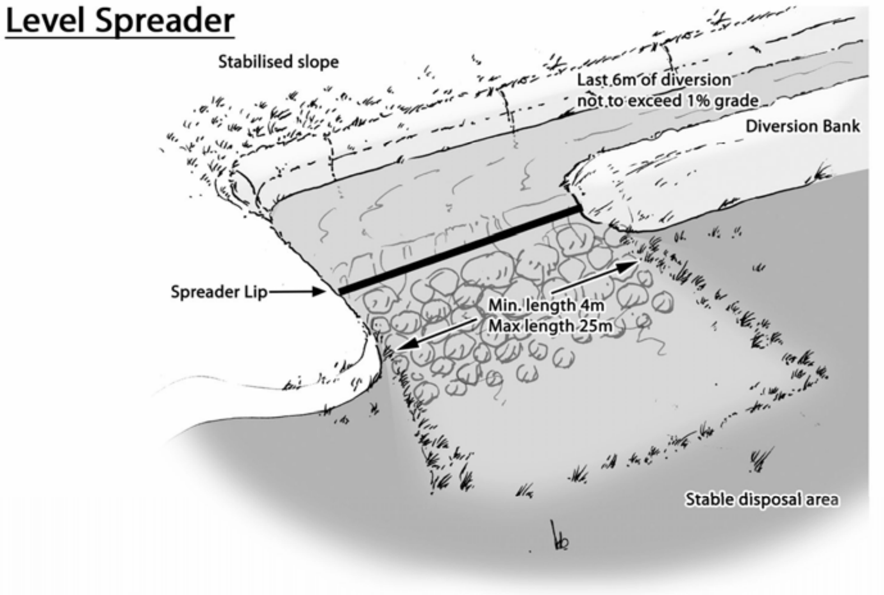


Swale

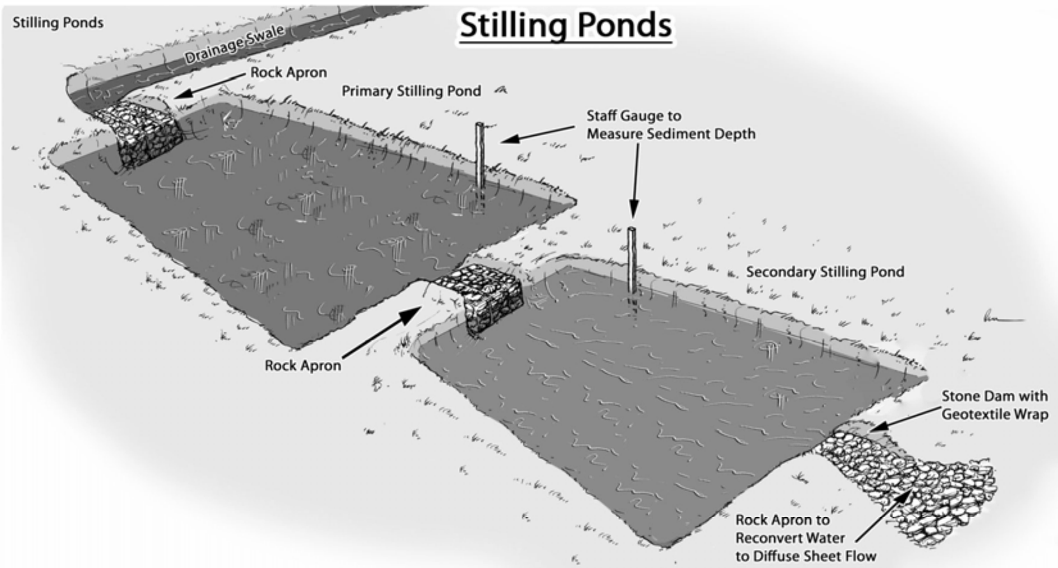


Drainage Design Measures

Level Spreader



Stilling Ponds



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PROJECT TITLE: 160502 - Meenbog Wind Farm, Co. Donegal		OS SHEET NO.: N/A	DATE: 22-11-2017
DRAWING BY: Eoin McCarthy	CHECKED BY: Michael Watson		ISSUE NO.:160502-2017.11.22-F

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4.7.5.3 Check Dams

The velocity of flow in the interceptor drains and drainage swales, particularly on sloped sections of the channel, will be controlled by check dams, which will be installed at regular intervals along the drains to ensure flow in the swale 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 artificial drainage channels on the 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 4-6 inch stone will be built up on either side and over the straw bale to a maximum height of 600mm 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.

Figure 4.31, above, shows illustrative examples of check dams.

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 150mm 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 and interceptor 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. Maintenance checks will also ensure the centre elevation of the dam remains lower than the sides of the dam.

4.7.5.4 Level Spreaders

A level spreader will be constructed at the end of each interceptor drain to convert concentrated flows in the drain, into diffuse sheet flow on areas of vegetated ground. The levels spreaders will be located downgradient of any proposed works areas in locations where they are not likely to contribute further to water ingress to construction areas of the site.

The water carried in interceptor drains will not have come in contact with works areas of the site, and therefore should be free of silt and sediment. The level spreaders will distribute clean drainage water onto vegetated areas where the water will not be reconcentrated into a flow channel immediately below the point of discharge. The discharge point will be on level or only very gently sloping ground rather than on a steep slope so as to prevent erosion. Figure 4.31, above, shows an illustrative example of a level spreader.

The slope in the channel leading into the spreader will be less than or equal to 1%. The slope downgradient of the spreader onto which the water will dissipate will have a grade of less than 6%. The availability of slopes with a grade of 6% or less will determine the locations of level spreaders. If a slope grade of less than 6% is not available in the immediate area downgradient of a works area at the end of a diversion drain, a piped slope drain (see Section 4.7.5.5 below) will be used to transfer the water to a suitable location.

The spreader lip over which the water will spill will be made of a concrete kerb, wooden board, pipe, or other similar piece of material that can create a level edge similar in effect to a weir. The spreader will be level across the top and bottom to prevent channelised flow leaving the spreader or ponding occurring behind the spreader. The top of the spreader lip will be 150mm above the ground behind it. The length of the spreader will be a minimum of four metres and a maximum length of 25 metres, with the actual length of each spreader to be determined by the size of the contributing catchment, slope and ground conditions.

Clean four-inch stone can be placed on the outside of the spreader lip, and pressed into the ground mechanically to further dissipate the flow leaving the level spreader over a larger area.

4.7.5.5 Piped Slope Drains

Piped slope drains will be used to convey surface runoff from diversion drains safely down slopes to flat areas without causing erosion. Once the runoff reaches the flat areas it will be reconverted to diffuse sheet flow. Level spreaders will only be established on slopes of less than 6% in grade. Piped slope drains will be used to transfer water away from areas where slopes are too steep to use level spreaders.

The piped slope drains will be semi-rigid corrugated pipes with a stabilised entrance and a rock apron at the outlet to trap sediment and dissipate the energy of the water. The base of drains leading into the top of the piped slope drain will be compacted and concavely formed to channel the water into the corrugated pipe. The entrance at the top of the pipe will be stabilised with sandbags if necessary. The pipe will be anchored in place by staking at approximately 3-4 metre intervals or by weighing down with compacted soil. The bottom of the pipe will be placed on a slope with a grade of less than 1% for a length of 1.5 metres, before outflowing onto a rock apron.

The rock apron at the outlet will consist of 6-inch stone to a depth equal to the diameter of the pipe, a length six times the diameter of the pipe. The width of the rock apron will be three times the diameter of the pipe where the pipe opens onto the apron and will fan out to six times the diameter of the pipe over its length. Figure 4.31, above, shows a diagrammatic example of a piped slope drain and rock apron.

Piped slope drains will only remain in place for the duration of the construction phase of the Proposed Development . On completion of the works, the pipes and rock aprons will be removed and all channels backfilled with the material that was originally excavated from them.

Piped slope drains will be inspected weekly and following rainfall events. Inlet and outlets will be checked for sediment accumulation and blockages. Stake anchors or fill over the pipe will be checked for settlement, cracking and stability. Any seepage holes where pipe emerges from drain at the top of the pipe will be repaired promptly.

4.7.5.6 Vegetation Filters

Vegetation filters are the existing vegetated areas of land that will be used to accept surface water runoff from upgradient areas. The selection of suitable areas to use as vegetation filters will be determined by the size of the contributing catchment, slope and ground conditions.

Vegetation filters will carry outflow from the level spreaders as overland sheet flow, removing any suspended solids and discharging to the groundwater system by diffuse infiltration.

Vegetation filters will not be used in isolation for waters that are likely to have higher silt loadings. In such cases, silt-bearing water will already have passed through stilling ponds prior to diffuse discharge to the vegetation filters via a level spreader.

4.7.5.7 Stilling Ponds

Stilling ponds will be used to attenuate runoff from works areas of the site of the Proposed Development during the construction phase, and will remain in place to handle runoff from roads and hardstanding areas of the proposed development during the operational phase. The purpose of the 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 redistributed as diffuse sheet flow in filter strips downgradient of any works areas.

Stilling ponds will be excavated/constructed at each required location as two separate ponds in sequence, a primary pond and a secondary pond. The points at which water enters and exits the stilling ponds will be stabilised with rock aprons, which will trap sediment, dissipate the energy of the water flowing through the stilling pond system, and prevent erosion. The primary stilling pond will reduce the velocity of flows to less than 0.5 metres per second to allow settlement of silt to occur. Water will then pass from the primary pond to the secondary pond via another rock apron. The secondary stilling pond will reduce the velocity of flows to less than 0.3 metres per second. Water will flow out of the secondary stilling pond through a stone dam, partially wrapped in geo-textile membrane, which will control flow velocities and trap any sediment that has not settled out. Figure 4.31, above, shows an illustrative example of a stilling pond system.

Water will flow by gravity through the stilling pond system. The stilling ponds will be sized according to the size of the area they will be receiving water from, but will be sufficiently large to accommodate peak flows storm events. The stilling ponds will be dimensioned so that the length to width ratio will be greater than 2:1, where the length is the distance between the inlet and the outlet. Where ground conditions allow, stilling ponds will be constructed in a wedge shape, with the inlet located at the narrow end of the wedge. Each stilling pond will be a minimum of 1-1.5 metres in depth. Deeper ponds will be used to minimise the excavation area needed for the required volume.
The embankment that forms the sloped sides of the stilling ponds will be stabilised with vegetated turves, which will have been removed during the excavation of the stilling ponds area.

Stilling ponds will be located towards the end of swales, close to where the water will be reconverted to diffuse sheet flow. Upon exiting the stilling pond system, water will be immediately reconverted to diffuse flow via a fan-shaped rock apron if there is adequate space and ground conditions allow. Otherwise, a swale will be used to carry water exiting the stilling pond system to a level spreader to reconvert the flow to diffuse sheet flow.

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 when 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.

4.7.5.8 Siltbuster

A "siltbuster" or similar equivalent piece of equipment will be available to filter any water pumped out of excavation areas if necessary, prior to its discharge to stilling ponds or swales.

Siltbusters are mobile silt traps that can remove fine particles from water using a proven technology and hydraulic design in a rugged unit. *The* mobile units are specifically designed for use on construction sites.

The unit stills the incoming water/solids mix and routes it upwards between a set of inclined plates for separation. Fine particles settle onto the plates and slide down to the base for collection, whilst treated water flows to an outlet weir after passing below a scum board to retain any floating material. The inclined plates dramatically increase the effective settling area of the unit giving it a very small footprint on site and making it highly mobile. Figure 4.32 below shows an illustrative diagram of the Siltbuster.

The Siltbuster units are now considered best practice for the management of dirty water pumped from construction sites. The UK Environment Agency and the Scottish Environmental Protection Agency have all recommended/specified the use of *Siltbuster* units on construction projects.

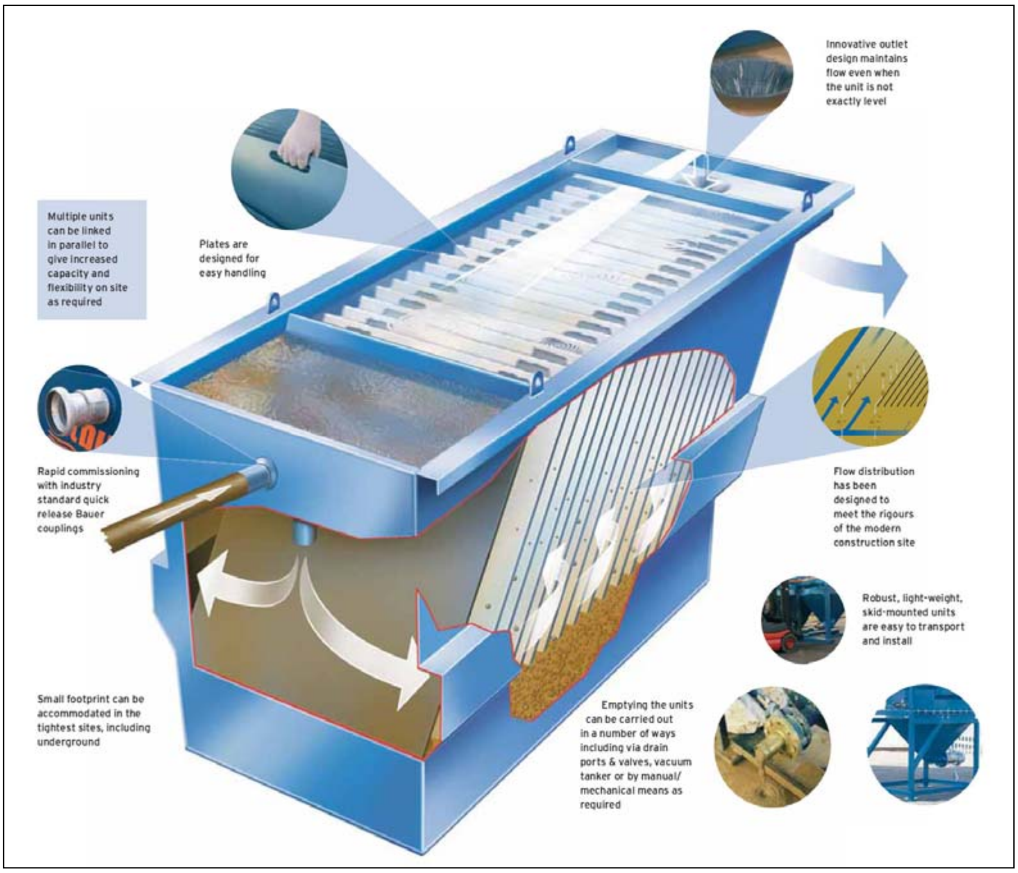


Figure 4.32 Siltbuster

4.7.5.9 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 an additional drainage measure that can be used downgradient of the stilling ponds at the end of the drainage swale channels and will be located, 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 the stream.

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, 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

4.7.5.10 Culverts

A survey of all existing stream culverts and proposed watercourse crossings within the study area boundary was undertaken as part of the assessment. The channel dimensions of proposed stream crossings along with culvert type and dimensions at existing crossings were recorded and this information is shown in Appendix 9.2 of this EIAR. The locations of existing and proposed crossings are shown in Appendix 4.1.

The 100-year flood flow at each existing and proposed crossing location was then estimated using the Institute of Hydrology (Report 124) calculation as shown below along with the relevant growth factor (1.9) for a hundred year return event.

$QBar = 0.00108 \times (AREA)^{0.89} \times (SAAR)^{1.17} \times (SOIL)^{2.17}$

Where,
QBAR is the mean annual flood flow from a rural catchment in m3/s.
AREA is the area of the catchment/site in (km2);
SAAR is the standard average annual rainfall (mm);
SOIL is the soil index

Based on the estimated 100-year flood flow at each crossing location, the adequacy of existing culverts and the minimum required dimension of proposed culverts were assessed. Information relating to the hydraulic assessment including flood estimation calculations, hydraulic adequacy of existing culverts and minimum required culvert dimensions of proposed culverts are shown in Appendix 9.2.

Five new stream culverts are proposed along with 19 no. potential culvert upgrades. Proposed new crossings and crossing upgrades will be the subject of consent applications to the Office of Public Works under Section 50 of the Arterial Drainage Act, 1945. Some culverts may be installed to manage drainage waters from works areas of the proposed development, particularly where the waters have to be taken from one side of an existing roadway to the other for discharge. The size of culverts will be influenced by the depth of the track or road sub-base. In some cases, two or more smaller diameter culverts may be used where this depth is limited, though this will be avoided as they will have a higher associated risk of blockage than a single, larger pipe. In all cases, culverts will be oversized to allow mammals to pass through the culvert.

Culverts will be installed with a minimum internal gradient of 1% (1 in 100). Smaller culverts will have a smooth internal surface. Larger culverts may have corrugated surfaces which will trap silt and contribute to the stream ecosystem. Depending on the management of water on the downstream side of the culvert, large stone may be used to interrupt the flow of water. This will help dissipate its energy and help prevent problems of erosion. Smaller water crossings will simply consist of an appropriately sized pipe buried in the sub-base of the road at the necessary invert level to ensure ponding or pooling doesn't occur above or below the culvert and water can continue to flow as necessary.

All culverts will be inspected regularly to ensure they are not blocked by debris, vegetation or any other material that may impede conveyance.

4.7.5.11 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 or 100m buffer zone of a lake, which is inevitable where existing roads in proximity to watercourses are to be upgraded as part of the proposed development. These areas include around existing culverts, around the headwaters of watercourses, and the proposed locations are indicated on the detailed drainage design drawings included in Appendix 4.1.

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 (Ciria, No. C648, 1996). Up to three silt fences may be deployed in series.

All silt fencing will be formed using Terrastop Premium or equivalent silt fence product.

Site fences will be inspected regularly to ensure water is continuing to flow through the fabric, and the fence is not coming under strain from water backing up behind it.

4.7.6 Borrow Pit Drainage

While surface water will be contained in the borrow pits areas, the design proposal is to control the level of water in the borrow pit area by creating a single point outlet from the basin-like area that will ensure the water does not overtop the pit area. Run-off from the proposed borrow pit areas will be controlled via a single outlet that will be installed at the edge of the borrow pit. The single outfall point will be constructed to handle runoff from the borrow pit and its immediate surrounds. Interceptor drains will already have been installed upgradient of the borrow pit area before any extraction begins.

During the construction phase of the project, it will be necessary to keep the borrow pit area free of standing water while rock is still being extracted. This will be achieved by using a mobile pump, which will pump water into the same series of drains, settlement ponds and level spreader, which will receive the water from the single outlet.

4.7.7 Floating Road Drainage

Where sections of floating road are to be installed instead of excavated roads, cross drains will be installed beneath the road construction corridor to maintain existing clean water drainage paths. Large surface water drainage pipes will be placed at these locations below the level of the proposed road sub-base. These drainage pipes will be extended each side of the proposed road and cable trench construction corridor, along the paths of the existing drains.

With the exception of the installation of cross drains under the floating road corridor, minimal additional drainage will be installed to run parallel to the roads, in order to maintain the natural hydrology of the peatland areas over which the roads will be floated.

4.7.8 Cable Trench Drainage

Cable trenches are typically developed in short 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.

To efficiently control drainage runoff from cable trench works areas, excavated material is stored on the upgradient side of the trench. Should any rainfall cause runoff from the excavated material, the material is 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 pits or used for landscaping and reinstatements of other areas elsewhere on site.

On steeper slopes, silt fences, as detailed in Section 4.7.5.11, above, will be installed temporarily downgradient of the cable trench works area, or on the downhill slope below where excavated material is being temporarily stored to control run-off.

Measures that will be implemented to ensure that directional or horizontal drilling works, underneath watercourse channels, do not have a negative effect on water quality are outlined below, including a blow-out (Frac-out) prevention and contingency plan.

- In order to prevent significant water quality impacts and morphological impacts, trenchless technology will be carried out to install the cable below the watercourse;
- Although no in-stream works are proposed, the drilling works will only be done over a dry period between July and September (as required by IFI for in-stream works) to avoid the salmon spawning season and to have more favourable (dryer) ground conditions;
- The crossing works area will be clearly marked out with fencing or flagging tape to avoid unnecessary disturbance of vegetation;
- A minimum 15 metre vegetative buffer zone will be maintained between the works area and the watercourse;
- There will be no storage of material / equipment or overnight parking of machinery inside the 15m buffer zone;
- Before any ground works are undertaken, double silt fencing will be placed upslope of the watercourse channel along the 15m buffer zone boundary;
- Additional silt fencing or straw bales (pinned down firmly with stakes) will be placed across any natural surface depressions / channels that slope towards the watercourse;
- Silt fencing will be embedded into the local soils to ensure all site water is captured and filtered;
- The area around the bentonite batching, pumping and recycling plant will be bunded using terram (as it will clog) and sandbags in order to contain any spillages;
- Drilling fluid returns will be contained within a sealed tank / sump to prevent migration from the works area;

- Spills of drilling fluid will be clean up immediately and stored in an adequately sized skip before been taken off-site;
- If rainfall events occur during the works, there will be a requirement to collect and treat small volumes of surface water from areas of disturbed ground (i.e. soil and subsoil exposures created during site preparation works);
- This will be completed using a shallow swale and sump down slope of the disturbed ground; and water will be pumped to a proposed percolation area at least 50m from the watercourse
- The discharge of water onto vegetated ground at the percolation area will be via a silt bag which will filter any remaining sediment from the pumped water. The entire percolation area will be enclosed by a perimeter of double silt fencing;
- Any sediment laden water from the works area will not be discharged directly to a watercourse or drain;
- Works shall not take place during periods of heavy rainfall and will be scaled back or suspended if heavy rain is forecasted;
- Daily monitoring of the compound works area, the water treatment and pumping system and the percolation area will be completed by a suitably qualified person during the construction phase. All necessary preventative measures will be implemented to ensure no entrained sediment, or deleterious matter is discharged to the watercourse
- If high levels of silt or other contamination is noted in the pumped water or the treatment systems, all construction works will be stopped. No works will recommence until the issue is resolved and the cause of the elevated source is remedied;
- On completion of the works, the ground surface disturbed during the site preparation works and at the entry and exit pits will be carefully reinstated and re-seeded at the soonest opportunity to prevent soil erosion;
- The silt fencing upslope of the river will be left in place and maintained until the disturbed ground has re-vegetated;
- There will be no batching or storage of cement allowed at the watercourse crossing;
- There will be no refuelling allowed within 100m of the watercourse crossing; and,
- All plant will be checked for purpose of use prior to mobilisation at the watercourse crossing.

Fracture Blow-out (Frac-out) Prevention and Contingency Plan

- The drilling fluid/bentonite will be non-toxic and naturally biodegradable (i.e. Clear Bore Drilling Fluid or similar will be used);
- The area around the drilling fluid batching, pumping and recycling plants will be bunded using terram and/or sandbags to contain any potential spillage;
- One or more lines of silt fencing will be placed between the works area and the adjacent river;
- Spills of drilling fluid will be cleaned up immediately and transported off-site for disposal at a licensed facility;
- Adequately sized skips will be used where temporary storage of arisings are required;
- The drilling process / pressure will be constantly monitored to detect any possible leaks or breakouts into the surrounding geology or local watercourse;
- This will be gauged by observation and by monitoring the pumping rates and pressures. If any signs of breakout occur then drilling will be immediately stopped;

- Any frac-out material will be contained and removed off-site;
- The drilling location will be reviewed, before re-commencing with a higher viscosity drilling fluid mix; and,
- If the risk of further frac-out is high, a new drilling alignment will be sought at the crossing location.

4.7.9 Site and Drainage Management

4.7.9.1 Preparative Site Drainage Management

All materials and equipment necessary to implement the drainage measures outlined above, will be brought on-site in advance of any works commencing. An adequate amount of straw bales, clean stone, terram, stakes, etc will be kept on site at all times to implement the drainage design measures as necessary. The drainage measures outlined in the above will be installed prior to, or at the same time as the works they are intended to drain.

4.7.9.2 Preemptive Site Drainage Management

The works programme for the groundworks part of the construction phase of the Proposed Development will also take account of weather forecasts, and predicted rainfall in particular. 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 directly to the amount of rainfall forecast.

4.7.9.3 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 in so far as is possible. This may require the installation of additional check dams, interceptor drains or swales as deemed necessary on-site. The drainage design may have to be modified on the ground as necessary, and the modifications will draw on the various features outlined above in whatever combinations are deemed to be most appropriate to situation on the ground as a particular time.

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.

4.7.10 Drainage Maintenance

An inspection and maintenance plan for the drainage system onsite will be prepared in advance of commencement of any works on the Proposed Development. Regular inspections of all installed drainage features will be necessary, especially after heavy rainfall, to check for blockages, and ensure there is no build-up of standing water at parts of the systems 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.

If necessary, any excess sediment build up behind check dams will be removed. For this reason, 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 center elevation of the dam remains lower than the sides of the dam.

Check dams will also be inspected weekly during the construction phase of the Proposed Development and following rainfall events to ensure the structure of the dam is still effective in controlling flow. Any scouring around the edges of the check dams or overtopping of the dam in normal flow conditions will be rectified be reinforcement of the check dam.

Drainage swales will be regularly inspected for evidence of erosion along the length of the swale. If any evidence of erosion is detected, additional check dams will be installed to limit the velocity of flow in the channel and reduce the likelihood of erosion occurring in the future.

A water level indicator such as a simple staff gauge or level marker will be installed in each silt trap with marks to identify when sediment is at 50% of the trap's capacity. Sediment will be cleaned out of the silt trap when it exceeds 50% of trap capacity. Silt traps will be inspected weekly during the construction phase of the Proposed Development and following rainfall events. Inlet and outlets will be checked for sediment accumulation and anything else that might interfere with flows.

The frequency of drainage system inspections will be reduced following completion of the construction phase of the Proposed Development . Weekly inspections during the construction phase will be reduced to monthly, bi-monthly and eventually quarterly inspections during the operational phase. The frequency will be increased or decreased depending on the effectiveness of the measures in place and the amount of remedial action required in any given period

4.7.11 Construction Timing

It is estimated that the construction phase of the Proposed Development will take approximately 12-18 months from starting on site to the commissioning of the electrical system. In the interest of breeding birds, construction will not commence during the Breeding Bird season from April to July inclusive. Construction may commence at any stage from August onwards to the end of March, so that construction activities are ongoing by the time the next breeding bird season comes around, and can continue throughout the next breeding season.

4.7.12 Construction Sequencing

The construction phase can be broken down into three main phases, 1) civil engineering works - 10 months, 2) electrical works - 6 months, and 3) turbine erection and commissioning - 8 months. The main task items under each of the three phases are outlined below.

Civil Engineering Works

- Install meteorological masts.
- Clear and hardcore area for temporary site offices. Install same.
- Construct bunded area for oil tanks.
- Construct new site roads and hard-standings and crane pads.
- Construct drainage ditches, culverts etc. integral to road construction.

- Excavate for turbine bases. Place blinding concrete to turbine bases. 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.
- Erect transformers at compound.
- Install Ring Main Units
- Erect fencing at transformer compound.

Turbine Erection and Commissioning
- Erect towers, nacelles and blades.
- Backfill tower foundations and cover with previously stored topsoil.
- Complete electrical installation.
- Grid connection.
- 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 Figure 4.33 below, where 1st January has been selected as an arbitrary start date for construction activities.

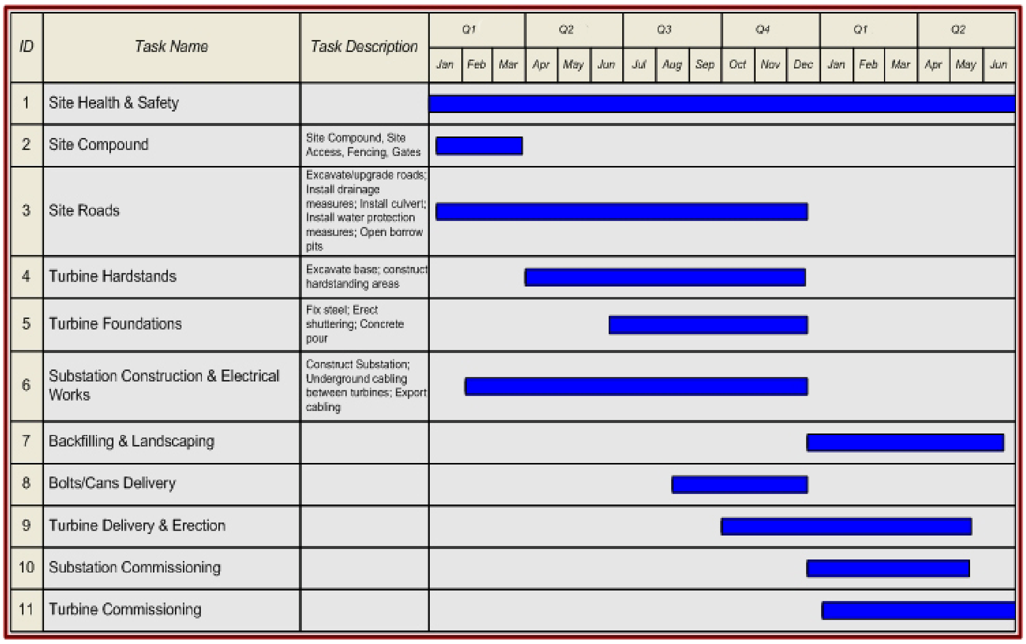


Figure 4.33 Indicative Construction Schedule

4.7.13 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 such a CEMP and their effectiveness and completion is typically audited by way of a

Construction and Environmental Management Plan Audit Report. The CEMP Audit Report effectively lists all mitigation measures prescribed in any of the planning documentation, all conditions attached to the grant of planning permission and any further mitigation measures proposed during the detailed design stage, and allows them to be audited on a systematic and regular basis. The first assessment is a simply 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 has to be the subject of regular review and audit during the full construction stage of the project. If some remedial actions are needed to improve the effectiveness of the mitigation measure, then these are notified to the site staff immediately during the audit site visit, and in writing by way of the circulation of the audit report. Depending on the importance and urgency of rectifying the issue, the construction site manager is given a timeframe by when the remedial works need to be completed.

A Construction Environmental Management Plan (CEMP) has been prepared for the Proposed Development, and is included in Appendix 4.4 of this EIAR. The CEMP includes details of drainage, peat and overburden management, waste management etc, and gives examples of how the above-mentioned Audit Report will function and be presented. It is intended that the CEMP would be updated prior to the commencement of the Proposed Development, to include all mitigations 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.

The on-site construction staff will be responsible for implementing the mitigation measures specified in the EIAR and compiled in the Audit Report. Their implementation 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 Foundations

Each of the turbines to be erected on site will have a reinforced concrete base. Overburden will be stripped off the foundation area to a suitable formation using a 360° excavator, and will be removed to one of the onsite borrow pits. A five metre wide working area will be required around each turbine base, with the sides of the excavated areas sloped sufficiently to ensure that slippage does not occur. 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 formation material will have to be approved by an engineer as meeting the turbine manufacturer's requirements. If the formation level is reached at a depth greater than the depth of the foundation, the ground level will have to be raised with clause 804 or similar hardcore material, compacted in 250 millimetres (mm) layers, with sufficient compacted effort (i.e. compacted with seven passes using 12 tonne roller). Drainage measures will be installed to protect the formation by forming an interceptor drain around the perimeter of the base which will outfall out at the lowest point level spreader or settlement pond.

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.

There will be a minimum of 100 mm of blinding concrete laid on the formation material positioned using concrete skip and 360° excavator to protect ground formation and to give a safe working platform.

The anchor cage is delivered to site in 2 or more parts depending on the turbine type. A 360° excavator 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 a dumpy level. 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 again prior to the concrete pour and during the concrete pour

Formwork to concrete bases will be propped/supported sufficiently so as to prevent failure. Concrete for bases will be poured using a concrete pump. Each base will be poured in three stages. Stage 1 will see the concrete being poured and vibrated in the centre of the anchor cage to bring the concrete up to the required level inside the cage. Stage 2 will see the centre of the steel foundation being poured and vibrated to the required level. Stage 3 will see the remaining concrete being poured around the steel foundation to bring it up to the required finished level. After a period of time when the concrete has set sufficiently the top surface of the concrete surface is to be finished with a power float.

Once the base has sufficient curing time it will be filled with suitable fill up to existing ground level. The working area around the perimeter of the foundation will be backfilled with the original material that was excavated.

4.8.2 Site Roads and Crane Pad Areas

Site roads will be constructed to each turbine base and at each base a crane hard standing will be constructed to the turbine manufacturer's specifications. Tracked excavators will carry out excavation for roads with appropriate equipment attached. The excavations shall follow a logical route working away from the borrow pit locations. Excavated material will be transported back to the borrow pits in haul trucks. A two to three metre wide working area will be required around each hard standing area, with the sides of the excavated areas sloped sufficiently to ensure that slippage does not occur. 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 covered with polythene sheets and surrounded by silt fences to ensure sediment-laden run-off does not occur.

When the formation layer has been reached, stone from the on-site borrow pit shall be placed to form the road foundation. In the event of large clay deposits being encountered in sections of road, a geotextile layer will be required at sub base level. The sub grade will be compacted with the use of a roller. The final wearing course will not be provided until all bases have been poured. This prevents damage to the wearing course due to stone and concrete trucks movements. The road will be upgraded prior to the arrival of the first turbine. All roads will be maintained for the duration of the operation of the Proposed Development.

4.8.3 Proposed Clear-span Bridge Crossing

It is proposed to construct a 5 metre wide clear-span bridge over the Bunadaowen River within the site of the Proposed Development. e. The proposed bridge crossing will form part of the internal site road network, connecting Turbine No. 18 to the eastern half of the site. The crossing location is at Grid Reference E207,672 N387,135, as shown in and the design avoids the need for in-stream works.

The clear-span bridge will be constructed to the specifications of the OPW bridge design guidelines *'Construction, Replacement or Alteration of Bridges and Culverts - A Guide to Applying for Consent under Section 50 of the Arterial Drainage Act, 1945'*, and in consultation with Inland Fisheries Ireland. Abutments will be constructed from precast units combined with in-situ foundations, placed within an acceptable backfill material. A typical design drawing for a pre-cast concrete clear-span bridge is shown in Figure 4.34.

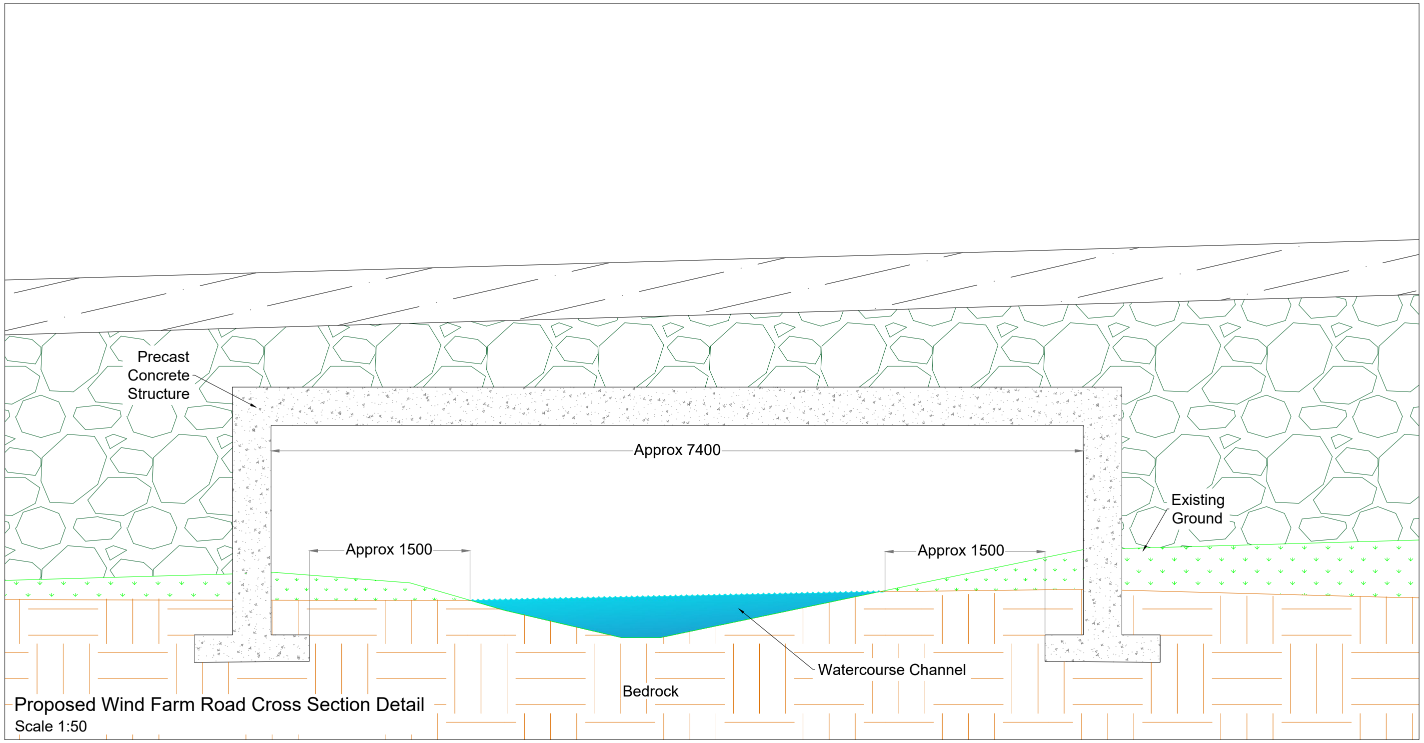
The typical construction methodology for the installation of a pre-cast concrete clear-span bridge is presented below:

- The access road on the approach to the watercourse will be completed to a formation level which is suitable for the passing of plant and equipment required for the installation of the watercourse crossing.
- All drainage measures along the proposed road will be installed in advance of the works.
- Safe access over the stream for this installation will be via a steel walkway & handrail which will span the stream.
- Steel boxes for concrete reinforcement will be constructed in close proximity to the work for ease of installation and will be fixed by competent persons. Steel boxes will be placed into position by a 360 excavator. Concrete will be placed using an excavator or where practical poured from shoot of truck. Banks man will direct truck once on site.
- Concrete plinths will be poured as per structural designers request.
- Precast concrete sections will be delivered to site and off-loaded with a crane into position by guidance of a banksman.
- Once the concrete structure is in position, stone backfill will be placed and compacted against the culvert up to the required level.
- The finished road level will be decided by a Structural Engineer.

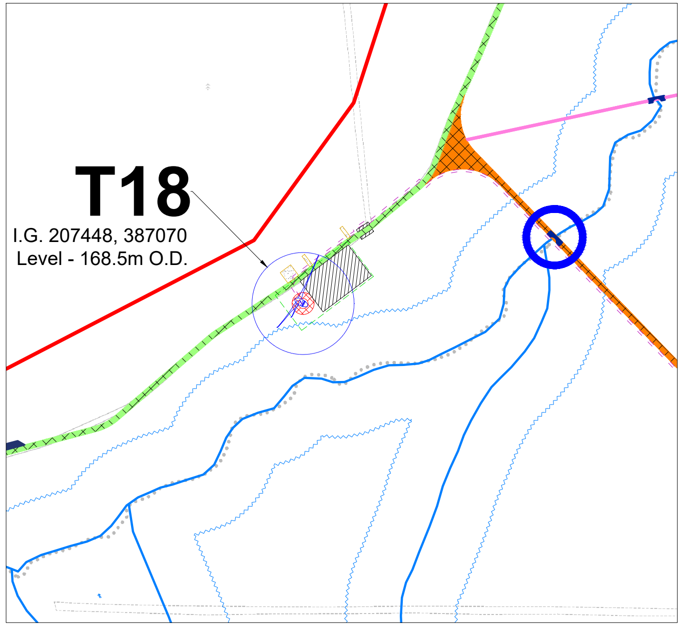
4.8.4 Onsite Electricity Substation and Control Building

Once tree felling as described in Section 4.3.10 is completed, the onsite substation will be constructed by the following methodology:

- The area of the onsite substation will be marked out using ranging rods or wooden posts and the soil and overburden stripped and removed to nearby temporary storage area for later use in landscaping. Any excess material will be sent to one of the on-site borrow pits, for reinstatement purposes.
- The dimensions of the onsite substation area will be set to meet the requirements of the ESB or Eirgrid and the necessary equipment to safely and efficiently operate the permitted wind farms;
- Two control buildings will also be built within the onsite substation compound;



Proposed Wind Farm Road Cross Section Detail
Scale 1:50



1:5,000 Location on Context Map

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Figure 4.34

DRAWING TITLE:
Typical Clear Span Bridge

Meenbog Wind Farm, Co. Donegal

DRAWING BY: Joseph O Brien	CHECKED BY: Michael Watson
PROJECT No.: 160502	DRAWING No.: 0502 - 47
SCALE: As Shown @A3	DATE: 13.12.2017
OS SHEET No.: 0397,0398,0399,0400,0401,0423,0424,0425,0426,0427,0450,0451, 0452,0453,0454,0478,0479,0480,0481,0482,0506,0507,0508,0509, 0535, 0536	

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- The foundations will be excavated down to the level indicated 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 then be raised to wall plate level and the gables & 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 an adequately sized mobile crane;
- The timber roof trusses will then be lifted into position using a telescopic load all or mobile crane depending on site conditions. The roof trusses will then 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.

4.8.5 Temporary Construction Compound

The temporary construction compounds will be constructed as follows:

- The area to be used as the compound will be marked out at the corners using ranging rods or timber posts. Drainage runs and associated settlement ponds will be installed around the perimeter;
- The compound platform will be established using a similar technique as the construction of the substation platform discussed above;
- A layer of geo-grid will be installed and compacted layers of well graded granular material will be spread and lightly compacted to provide a hard area for site offices and storage containers;
- Areas within the compound will be constructed as site roads and used as vehicle hardstandings during deliveries and for parking;
- The compound will be fenced and secured with locked gates if necessary; and,
- Upon completion of the Proposed Development the temporary construction compound will be decommissioned by backfilling the area with the material arising during excavation, landscaping with topsoil as required. (North-Eastern compound will be repurposed as an amenity area as described in Section 4.4 above)

4.8.6 Grid Connection Cable Trench

The underground cable will be laid beneath the surface of the ground and wind farm site and public roads using the following methodology:

- The area where excavations are planned will be surveyed and all existing services will be identified.
- All relevant bodies i.e. ESB, Bord Gáis, Eircom, Donegal County Council etc. will be contacted and all drawings for all existing services sought.
- A traffic management plan, a sample of which is included as Appendix 4.4 of this EIAR, will be set up prior to any works commencing.
- A road opening licence will be obtained where required.
- All plant operators and general operatives will be inducted and informed as to the location of any services.
- A 13 tonne rubber tracked 360-degree excavator will be used to excavate the trench to the dimensions specified in the ESB Networks *"Specification for the*

Installation of Ducts and Structures for Underground Power Cables and Communications Cables".

- All excavated material will be removed to one of the proposed borrow pits for recovery or, if suitable, stock piled and reused for backfilling where appropriate.
- All excavated material not used for backfilling will be removed from site using trucks.
- The trench depth is specified 1250mm and trench support will be installed or the trench sides will be benched or battered back where appropriate.
- Any ingress of ground water will be removed from the trench using submersible pumps.
- A silt filtration system will be used to prevent contamination of any watercourse.
- Once the trench has been excavated a base layer of 15 Newton CBM4 concrete will be installed and compacted. All concrete will be offloaded directly from the concrete truck directly into the trench.
- Ducting will then be placed in the trench as per specification, approved cable ties will be used where required to secure the trefoil ducts together (at 3-metre centres).
- Once the trefoil ducts have been installed couplers will be fitted and capped to prevent any dirt etc. entering the duct. In poor ground conditions the end of the trefoil ducts will be shimmed up off of the bed of the trench to prevent any possible ingress of water dirt. The shims will be removed again once the next length has been connected.
- Extreme care will be taken to ensure that all duct collars (both ends) are clean and in good condition prior to ducts being joined.
- The as built location of the ducting will be surveyed using a total station/GPS.
- 15 Newton CBM4 concrete will be carefully installed so as not to displace the ducting to the underside of the communications duct and compacted as per approved detail. See Plate 3.1.
- Spacers will be used to ensure that the correct cover is achieved at both sides of the trefoil ducting.
- ESB marker board will be fitted above the trefoil ducting.
- The Communication ducts will be fitted and kept to one side of the trench ensuring that the minimum cover is achieved and 15 Newton CBM4 concrete will be placed to the specified cover and compacted, see Plate 4.9.
- ESB red marker board will be installed and the remainder of trench will be backfilled in two compacted layers with approved material (lean mix concrete or clause 804).
- Yellow marker tape will be installed as per approved detail specifications, 300 mm maximum below finished road/ground level.
- The finished surface will be reinstated as per original specification or to the requirements of the land owner/Local Authority as appropriate.
- Marker Posts will denote all changes of direction, road crossings, etc.

Plate 4.8Typical Cable Trench View

Plate 4.9 Typical Cable Trench View

4.8.6.1 Existing Underground Services

Any underground services encountered along the cable routes will be surveyed for level and the ducting will pass over the service provided adequate cover is available. A minimum clearance of 300 mm will be required between the bottom of the ducts and the service in question. If the clearance cannot be achieved the ducting will pass under the service and again 300 mm clearance between the top of the communications duct and bottom of the service will be achieved. In deeper excavations an additional layer of marker tape will be installed between the communications duct and top level yellow marker tape. If the required separation distances cannot be achieved then a number of alternative options are available such as using steel plates laid across the width of the trench and using 35N concrete surrounding the ESB ducts where adjacent services are within 600mm, with marker tape on the side of the trench. Back fill around any utility services will be with dead sand/pea shingle where appropriate.

4.8.6.2 Joint Bays

Joint bays are pre-cast concrete chambers where lengths of cable will be joined to form one continuous cable. They will be located at various points along the ducting route generally between 600 to 1000 metres intervals or as otherwise required by ESB requirements.

Where possible, joint bays will be located in areas where there is a natural widening/wide grass margin on the road in order to accommodate easier construction, cable installation and create less traffic congestion. During construction the joint bay locations will be completely fenced off and will be incorporated into the traffic management plan. Once they have been constructed they will be backfilled until cables are being installed.

4.8.6.3 Grid Connection Watercourse/Culvert Crossings

The underground cabling route crosses a number of minor culverts throughout its length and 3 no. bridge crossings. The construction methodology has been designed to eliminate the requirement for in-stream works. A general description of the various construction methods employed at culvert and bridge crossings are described in the following paragraphs below. A list of the bridge crossings and the proposed crossing method at each location is provided in Table 4.4 below. The crossing methodologies employed at the remaining 25No. culvert crossings, along the grid connection cable route, will be selected from the suite of watercourse crossing options outlined below, as appropriate, depending on culvert type, depth, size and local ground conditions.

The bridge crossing locations are shown in Figure 4.16. The culvert crossing and bridge crossing locations are also shown on the underground cable route drawings included as Appendix 4.1.

4.8.6.4 Piped Culvert Crossings over Culvert– Option 1

Watercourses will not be directly impacted upon since no instream works or bridge/culvert alterations are proposed. Where sufficient cover exists above the culvert, the trench will be excavated above the culvert and the ducts will be installed in the trefoil arrangement passing over the sealed pipe where no contact will be made with the watercourse. This method of duct installation is further detailed in Figure 4.35.

4.8.6.5 Piped Culvert Crossings under Culvert – Option 2

Where the culvert consists of a socketed concrete or sealed plastic pipe where sufficient cover over the culvert does not exist to accommodate the cable trench, a trench will then be excavated beneath the culvert and cable ducts will be installed in the trefoil arrangement under the sealed pipe.

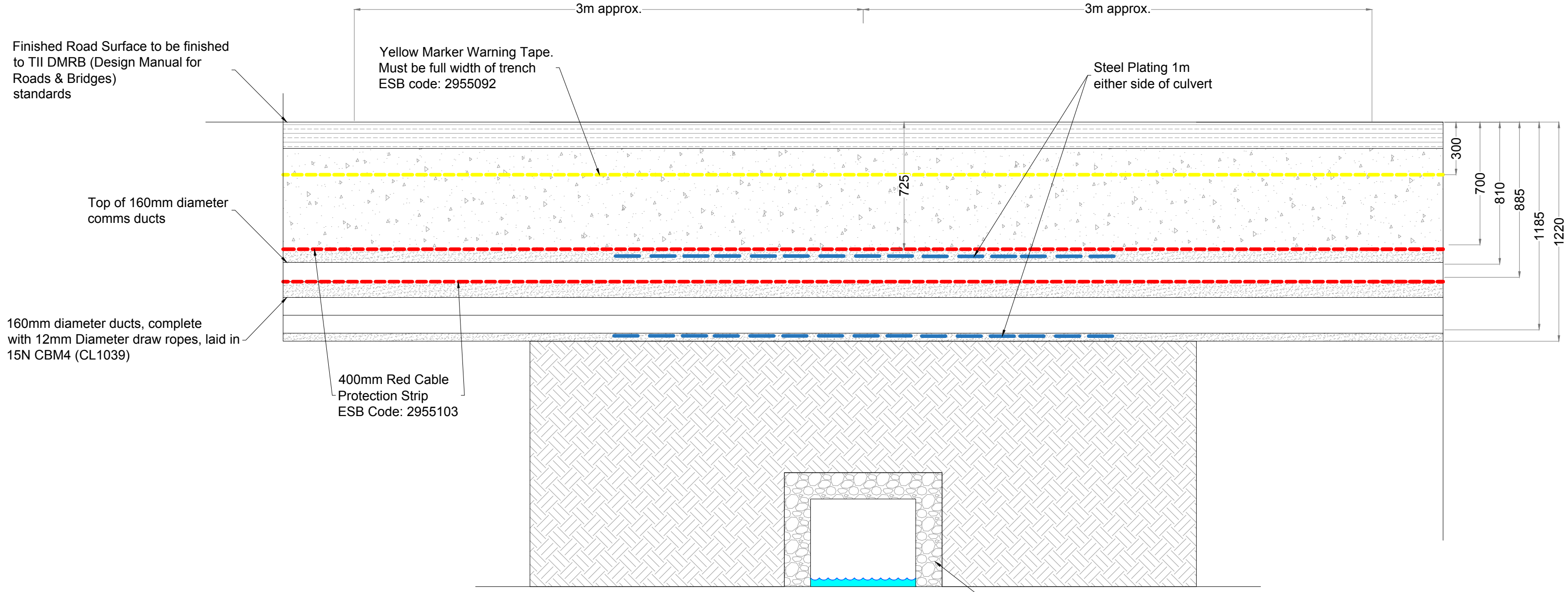
If these duct installation methods cannot be achieved or utilised, the ducts will be installed by alternative means as set out in the following sections. This method of duct installation is further detailed in Figure 4.36.

4.8.6.6 Flatbed Formation over Culverts – Option 3

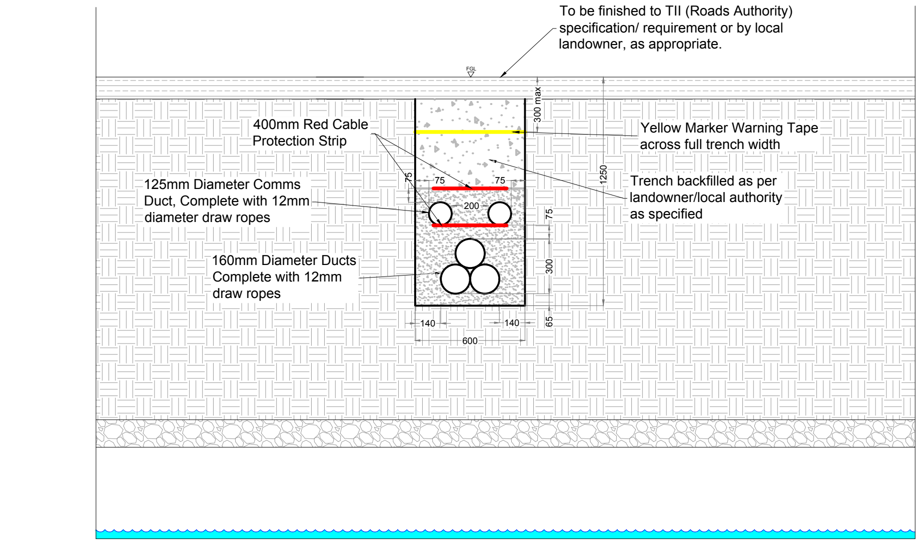
Where cable ducts are to be installed over an existing culvert/bridge where sufficient cover cannot be achieved by installing the ducts in a trefoil arrangement, the ducts will be laid in a much shallower trench the depth of which will be determined by the location of the top of the culvert or the depth that can be achieved in the deck of a bridge structure. The ducts will be laid in this trench in a flatbed formation over the existing culvert/bridge and will be incased in 6mm thick steel galvanized plate with a 35N concrete surround as per ESB Networks specification.

After the crossing over the culvert has been achieved, the ducts will resume to the trefoil arrangement within a standard trench. This method of duct installation is further detailed in Figure 4.37.

Where a bridge or culvert has insufficient deck cover to fully accommodate the required ducts, the ducts can be laid in a flatbed formation partially within the existing road make up. Where this option is to be employed, the ducts will also be encased in steel with a concrete surround as per Eirgrid and/or ESB Networks specifications. In order to achieve cover over these ducts and restore the carriageway of the road, it may be necessary to locally raise the pavement level to fully cover the ducts. The increase road level will be achieved by overlaying the existing pavement with a new wearing



Longitudinal Section at Watercourse Crossing



Cross Section at Watercourse Crossing

Figure 4.35

DRAWING TITLE:

Cable Trench Over Culvert

PROJECT TITLE: Meenbog Wind Farm, Co. Donegal

DRAWING BY: Joseph O Brien	CHECKED BY: Michael Watson
PROJECT No. 160502	DRAWING No. 0502 - 53
SCALE: 1:30 @ A3	DATE: 28.11.2017

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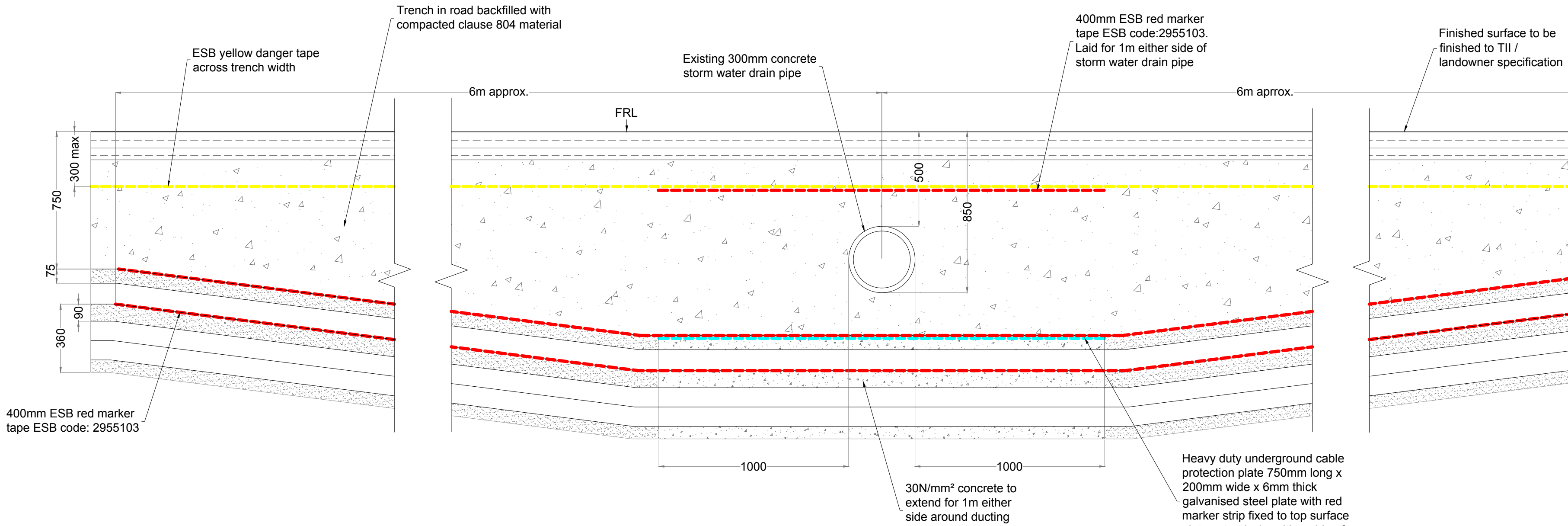
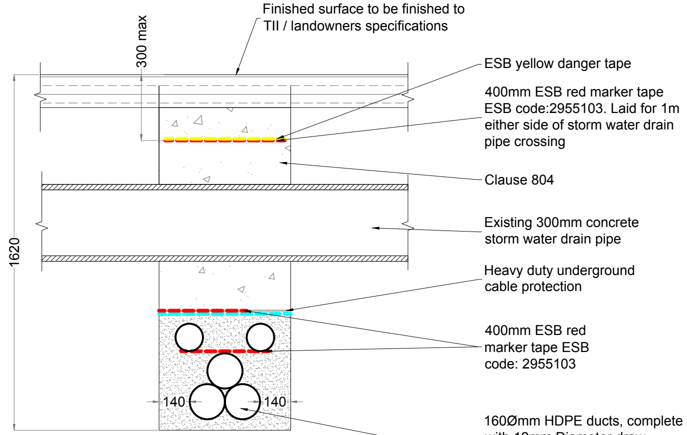


Section A-A

Scale 1:25



Section B-B

Scale 1:25

Figure 4.36

DRAWING TITLE:
Cable Trench Under Piped Culvert

PROJECT TITLE:
Meenbog Wind Farm, Co. Donegal

DRAWING BY: **Joseph O Brien**	CHECKED BY: **Michael Watson**
PROJECT No. **160502**	DRAWING No. **0502 - 54**
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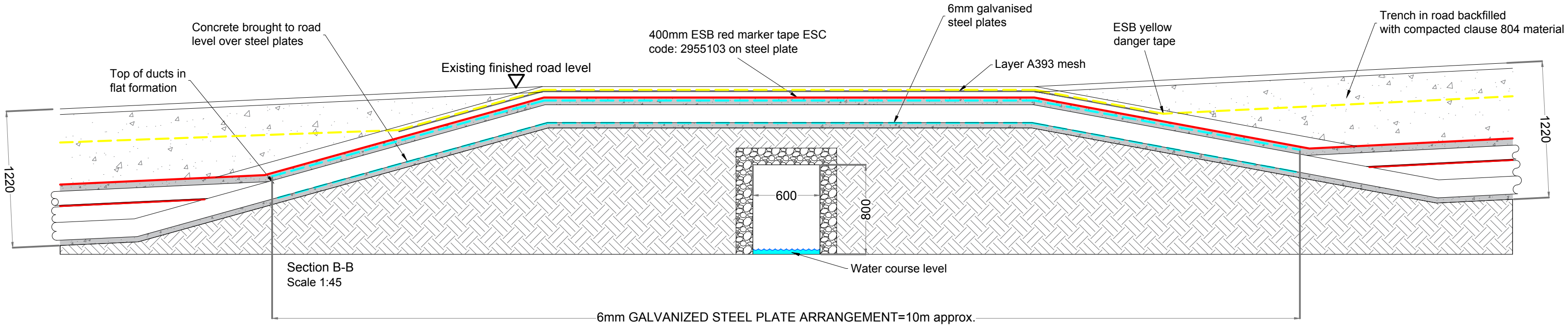

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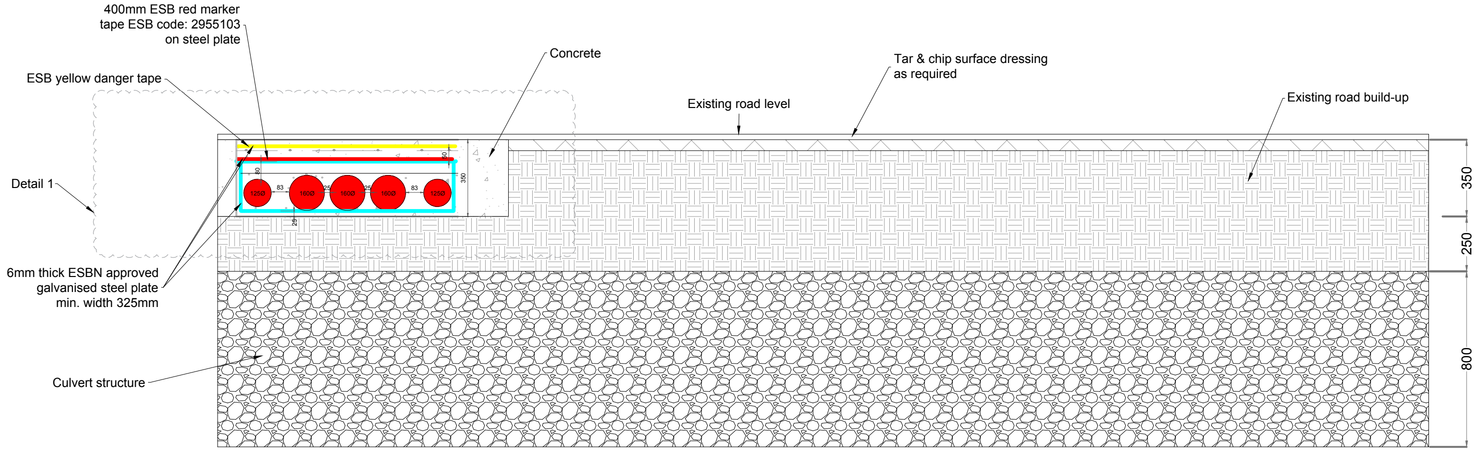

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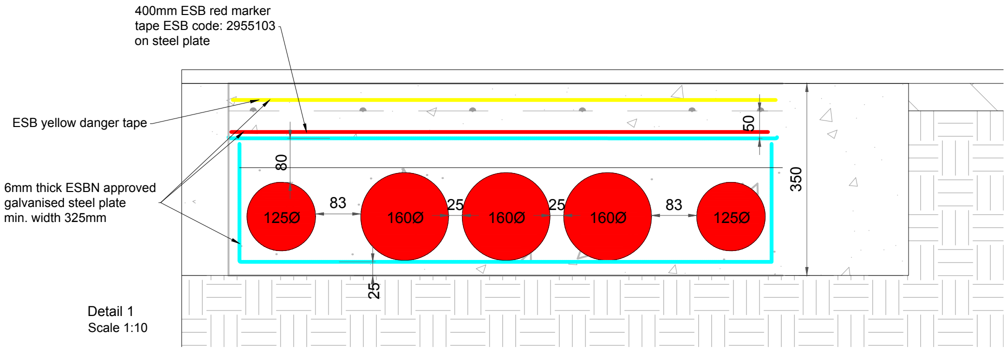

Detail 1
Scale 1:10

Figure 4.37

DRAWING TITLE:

Cable Trench Flatbed Formation Over Culvert

PROJECT TITLE:
Meenbog Wind Farm, Co. Donegal

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PROJECT No. 160502	DRAWING No. 0502 - 55
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course as required. Any addition of a new pavement will be tied back into the existing road pavement at grade. After the crossing over the culvert has been achieved, the ducts will resume to the trefoil arrangement within a standard trench. This method of duct installation is further detailed in Figure 4.38.

The flatbed formation methodology will also be used at bridge structures where there is an existing footpath. The cables will be installed in the same flatbed arrangement where the existing footpath will be excavated to allow for the installation of the cables. The footpath will be reinstated after cable ducts have been installed. Where there is no existing footpath, it is proposed to install a footpath to encase the cable ducts after they have been laid in the flatbed formation.

4.8.6.7 Directional Drilling – Option 4

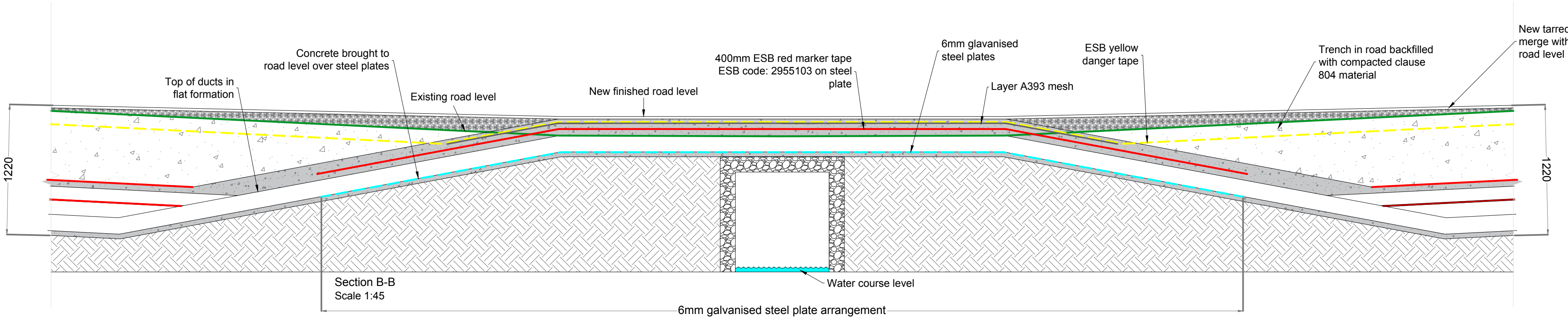
In the event that none of the above methods are appropriate, directional drilling will be utilised.

The directional drilling method of duct installation will be carried out using Vermeer D36 x 50 Directional Drill (approximately 22 tonnes), or similar plant, will be utilised for the horizontal directional drilling at watercourse/culvert crossings listed above. The launch and reception pits will be approximately 0.55m wide, 2.5m long and 1.5m deep. The pits will be excavated with a suitably sized excavator. The drilling rig will be securely anchored to the ground by means of anchor pins which will be attached to the front of the machine. The drill head will then be secured to the first drill rod and the operator shall commence to drill into the launch pit to a suitable angle which will enable him to obtain the depths and pitch required to the line and level of the required profile. Drilling of the pilot bore shall continue with the addition of 3.0m long drill rods, mechanically loaded and connected into position.

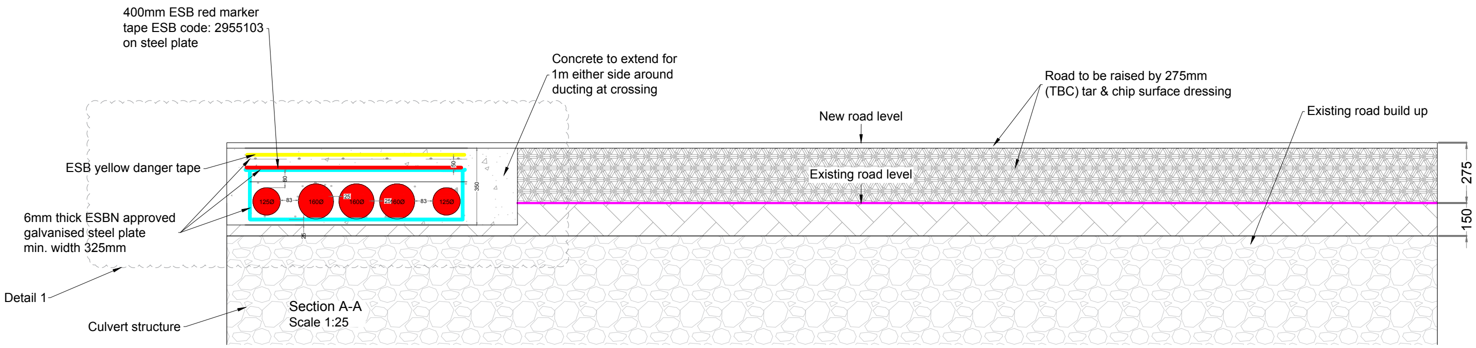
During the drilling process, a mixture of a natural, inert and fully biodegradable drilling fluid such as Clear Bore™ (environmentally friendly product (not toxic to aquatic organisms)) and water is pumped through the centre of the drill rods to the reamer head and is forced into void and enables the annulus which has been created to support the surrounding sub soil and thus prevent collapse of the reamed length. Depending on the prevalent ground conditions, it may be necessary to repeat the drilling process by incrementally increasing the size of the reamers. When the reamer enters the launch pit, it is removed from the drill rods which are then passed back up the bore to the reception pit and the next size reamer is attached to the drill rods and the process is repeated until the required bore with the allowable tolerance is achieved.

The use of a natural, inert and biodegradable drilling fluid such as Clear Bore™ is intended to negate any adverse effects arising from the use of other, traditional polymer-based drilling fluids and will be used sparingly as part of the drilling operations. It will be appropriately stored prior to use and deployed in the required amounts to avoid surplus. Should any excess drilling fluid accumulate in the reception or drilling pits, it will be contained and removed from the site in the same manner as other subsoil materials associated with the drilling process to approved licensed waste facility.

Backfilling of launch & reception pits will be conducted in accordance with the normal specification for backfilling excavated trenches. The directional drilling methodology is further detailed in Figure 4.39.



Section B-B
Scale 1:45



Section A-A
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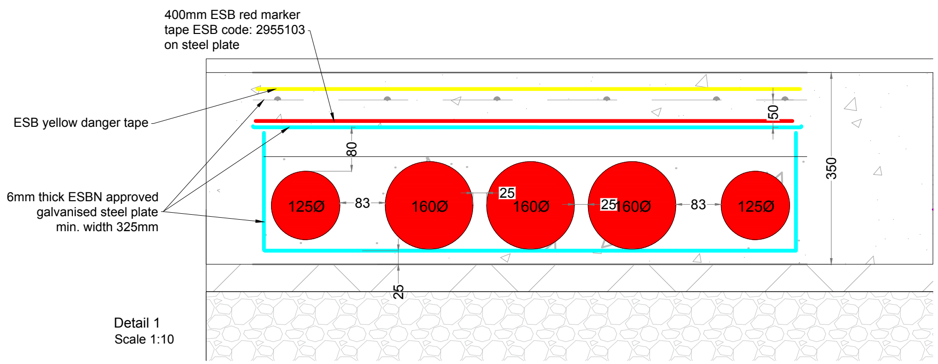

Detail 1
Scale 1:10

Figure 4.38

DRAWING TITLE:
Cable Trench Flatbed at Road Surface Level

PROJECT TITLE: Meenbog Wind Farm, Co. Donegal

DRAWING BY: Joseph O Brien	CHECKED BY: Michael Watson
PROJECT No. 160502	DRAWING No. 0502 - 56
SCALE: As Shown @ A3	DATE: 28.11.2017

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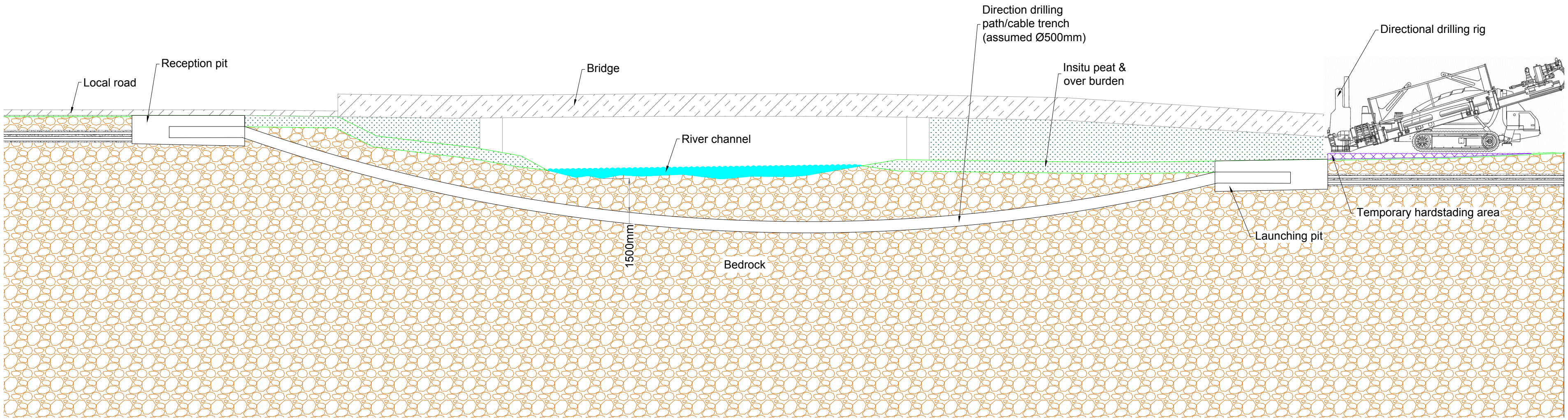

Figure 4.39

DRAWING TITLE:

Directional Drilling

PROJECT TITLE:
Meenbog Wind Farm, Co. Donegal

DRAWING BY: Joseph O Brien	CHECKED BY: Michael Watson
PROJECT No. 160502	DRAWING No. 0502 - 57
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Directional drilling will also occur where the grid connection cabling crosses beneath the N15 National road, as outlined in Section 4.3.7 above.

4.8.6.8 Horizontal Drilling – Option 5

The process of horizontal drilling is carried out by an auger boring machine. The methods employed are similar to directional drilling (a launch and reception pit are required). The drilling pit for horizontal drilling is excavated to a depth greater than that required for directional drilling. This is necessary as the drilling process is horizontal only and cannot drill in a downward direction to get under a watercourse as in the case of directional drilling. Therefore, the drilling pit is excavated to a base level at which the drilling will take place which will be a minimum of 3 metres below the bed of the watercourse. The auger boring machine is mobilised within the drilling pit where an air driven auger cutting head bores through the ground horizontally. The drilled bore is supported by a steel sleeve which is hammered through the opening by air compressors during drilling to avoid collapse. The spoil material passes back through the auger within the steel sleeve and out of the bored channel. The process is continued until the crossing reaches the opposing reception pit on the other side of the watercourse. Electrical ducts will be passed through the sleeves and the steel sleeves will then be removed. The entire excavation will be backfilled as necessary. The horizontal drilling methodology is illustrated in Figure 4.40.

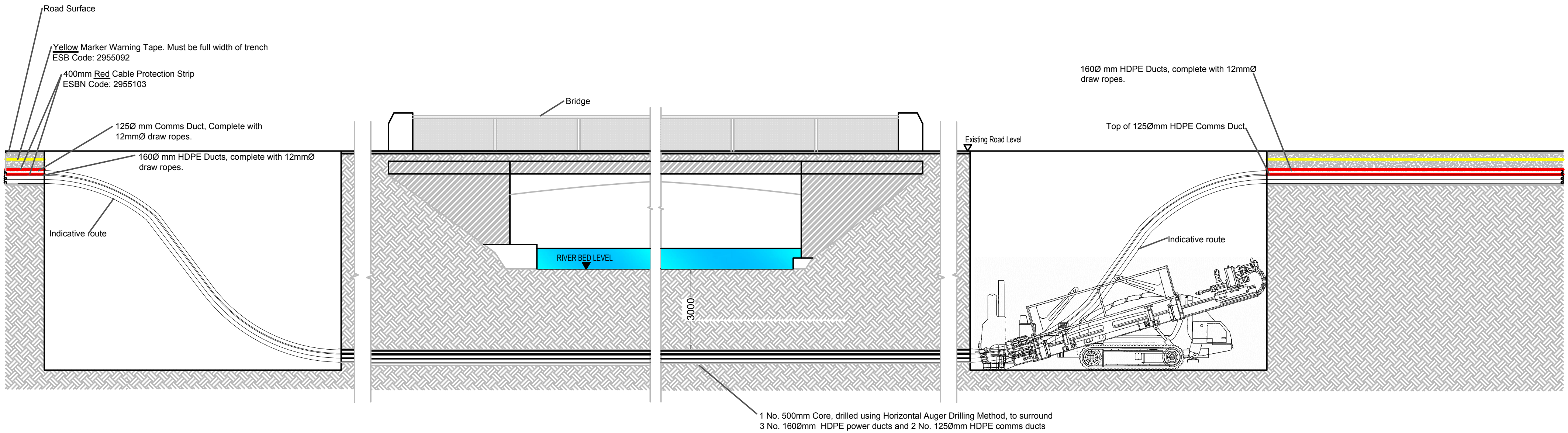

Figure 4.40

DRAWING TITLE:

Horizontal Auger Drilling

PROJECT TITLE:
Meenbog Wind Farm, Co. Donegal

DRAWING BY: **Joseph O Brien**	CHECKED BY: **Michael Watson**
PROJECT No. **160502**	DRAWING No. **0502 - 58**
SCALE: **1: 150 @ A3**	DATE: **28.11.2017**

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Table 4.4 Grid Connection Route Bridge Crossings Methodology

Bridge Crossing no.	Name	Description	Watercourse Crossing Option	Extent of In-stream Works
1	Lowerymore Bridge	The existing bridge consists of a concrete deck which cannot be excavated for a cable trench therefore the cable will be installed under the watercourse by means of directional or horizontal drilling which will ensure that no contact will be made with the watercourse during the works.	Option 4/5	None. No in-stream works required.
2	Lower Keadew Bridge	The existing bridge consists of a concrete deck which cannot be excavated for a cable trench therefore the cable will be installed under the watercourse by means of directional or horizontal drilling which will ensure that no contact will be made with the watercourse during the works.	Option 4/5	None. No in-stream works required.
3	Bransemore Bridge	Stone arch bridgewhich cannot be excavated for a cable trench therefore the cable will be installed under the watercourse by means of directional or horizontal drilling which will ensure that no contact will be made with the watercourse during the works.	Option 4/5	None. No in-stream works required.

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 by means of anemometry equipment and control systems to changes in wind speed and direction.

The wind turbines will be connected together and data relayed from the wind turbines to an off-site control centre. 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. 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 components and site tracks will also require periodic maintenance.

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 useful life, the wind turbines may be replaced with a new set of turbines, 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.

Upon decommissioning of the Proposed Development, the wind turbines would be disassembled in reverse order to how they were erected. All above ground turbine components would be separated and removed off-site for recycling. Turbine foundations would remain in place underground and would be covered with earth and reseeded as appropriate. Leaving the turbine 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 could be in use for purposes other than the operation of the wind farm by the time the decommissioning of the Proposed Development is to be considered, and therefore it may be more appropriate to leave the site roads in situ for future use. 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 Donegal County Council three months prior to decommissioning the Proposed Development . An outline decommissioning plan is contained in the CEMP in Appendix 4.4.