4. DESCRIPTION OF THE PROPOSED PROJECT

4.1 Introduction

This section of the Environmental Impact Assessment Report (EIAR) describes the Proposed Project and all its component parts. Consultation with An Bord Pleanála confirmed that the Proposed Project will be subject to a dual consenting process, with development relating to the Proposed Grid Connection being subject to a separate planning application under Section 182A of the Planning and Development Act, 2000, as amended. The current planning application, relating to the Proposed Wind Farm, is being made to An Bord Pleanála under Section 37E of the Planning and Development Act, 2000, as amended. Further detail in relation to the dual consenting process is provided in Chapter 1 of this EIAR.

The development description for the current planning application as appears in the public notices is as follows:

The proposed development will consist of the provision of the following:

1. *8 no. wind turbines with an overall turbine tip height of 185 metres; a rotor blade diameter of 163 metres; and hub height of 103.5 metres, and associated foundations, hard-standing and assembly areas;*
2. *A thirty-year operational life of the wind farm from the date of full commissioning of the wind farm and subsequent decommissioning;*
3. *Underground electrical cabling (33kV) and communications cabling;*
4. *A temporary construction compound;*
5. *A temporary security cabin;*
6. *A meteorological mast with a height of 30 metres and associated foundation and hard-standing area;*
7. *A new gated site entrance on the L61461;*
8. *Junction accommodation works and a new temporary access road off the N83 to the L61461, to facilitate turbine delivery and construction access to the site;*
9. *Upgrade of existing site tracks/ roads and provision of new site access roads, junctions and hardstand areas.*
10. *Upgrade of the existing L61461;*
11. *Spoil Management;*
12. *Site Drainage;*
13. *Tree and hedgerow removal;*
14. *Biodiversity Enhancement measures (including the planting of natural woodland, hedgerows and species rich grassland for new habitat);*
15. *Operational stage site signage; and*
16. *All ancillary works and apparatus.*

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

The Proposed Grid Connection 110kV infrastructure and associated works will be subject to a separate planning application under Section 182A of the Planning and Development Act 2000, as amended, however, it is assessed in this EIAR. A close out letter has been issued to the Board following consultations under the provisions of Section 182E of the Planning and Development Act 2000 as amended (Case Reference ABP-317625-23).

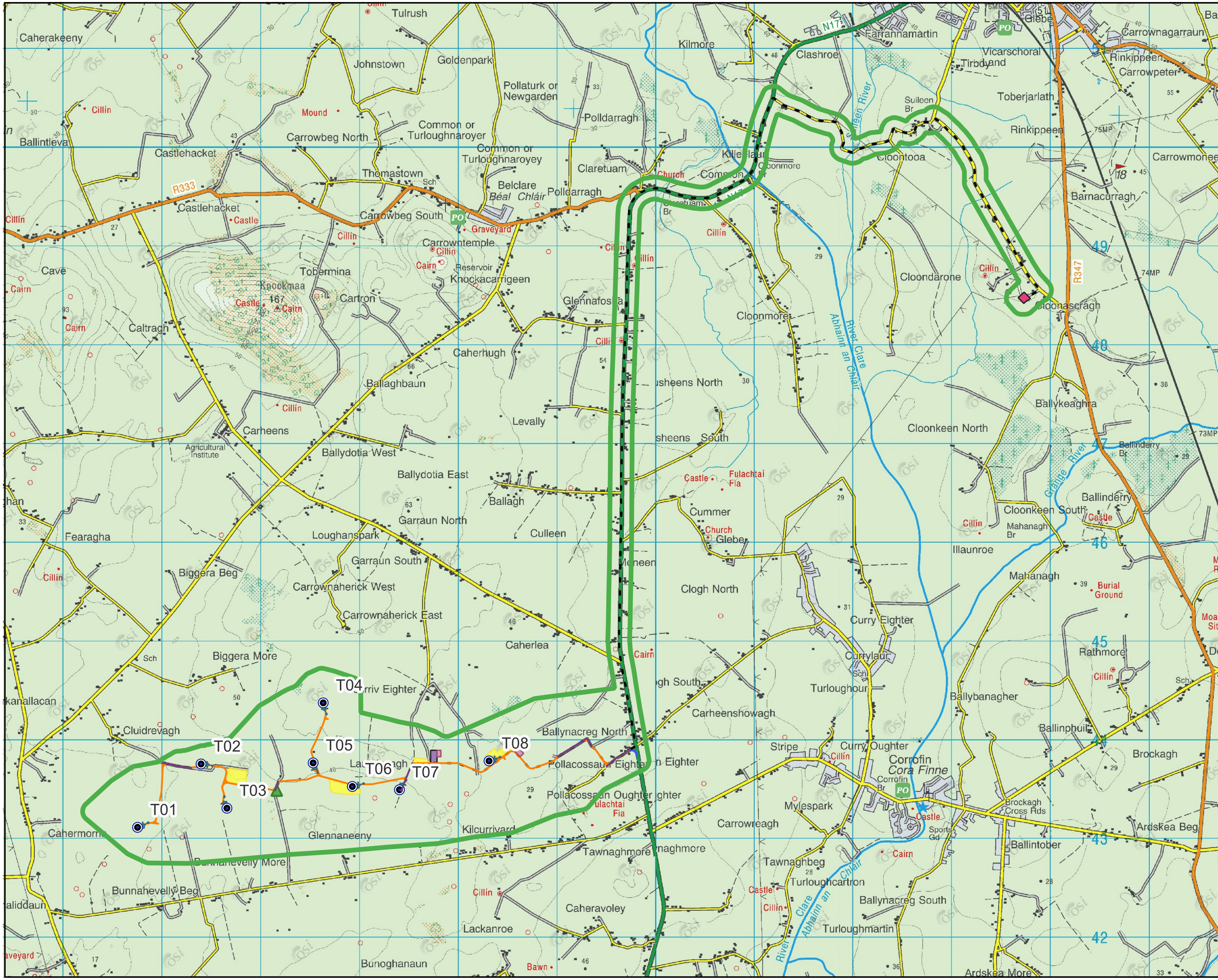
The 'Proposed Project', which encompasses the Proposed Wind Farm (Section 37E) and Proposed Grid Connection (Section 182A) has been assessed within this EIAR. The Proposed Project is located within the EIAR Site Boundary or the 'Site' and measures approximately 944 hectares (ha). The Proposed Project is illustrated on Figure 4-1.

4.2 Proposed Project Layout

The overall layout of the Proposed Project is shown on Figure 4-1, this includes the Proposed Wind Farm site and the Proposed Grid Connection.

The Proposed Project has been designed to minimise potential environmental effects, while at the same time maximising the energy yield from the Proposed Wind Farm. A constraints study, as described in Section 3.2.6 of this EIAR, has been carried out to ensure that turbines and ancillary infrastructure are located in the most appropriate areas of the Site and makes use of the existing access tracks within the Site where appropriate. Similarly, as described in Section 3.2.8 of this EIAR, a route selection constraints study was undertaken to ensure that the most appropriate route for the Proposed Grid Connection underground cabling was selected. The Proposed Wind Farm site layout is shown in Figure 4-2. The Proposed Grid Connection layout is shown in Figure 4-3.

Detailed planning application drawings of the Proposed Wind Farm are included in Appendix 4-1 to this EIAR and drawings of the Proposed Grid Connection are included in Appendix 4-8.



Map Legend

- EIAR Site Boundary
- Proposed Turbine Location
- Proposed Hardstands
- Proposed Met Mast Location
- Proposed Temporary Construction Compound
- Existing Roads For Upgrade
- Proposed New Roads
- Temporary Road
- Spoil Management Areas
- Proposed Internal 110kV Substation
- Proposed 110kV Underground Cabling Route
- Cloon 110kV Substation

Drawing Title	Proposed Project Layout
Project Title	Laurclavagh Renewable Energy Development
Drawn By: KB	Checked By: ÓM
Project No.: 210627	Drawing No.: Figure 4-1
Scale: 1:50,000	Date: 2024-03-11

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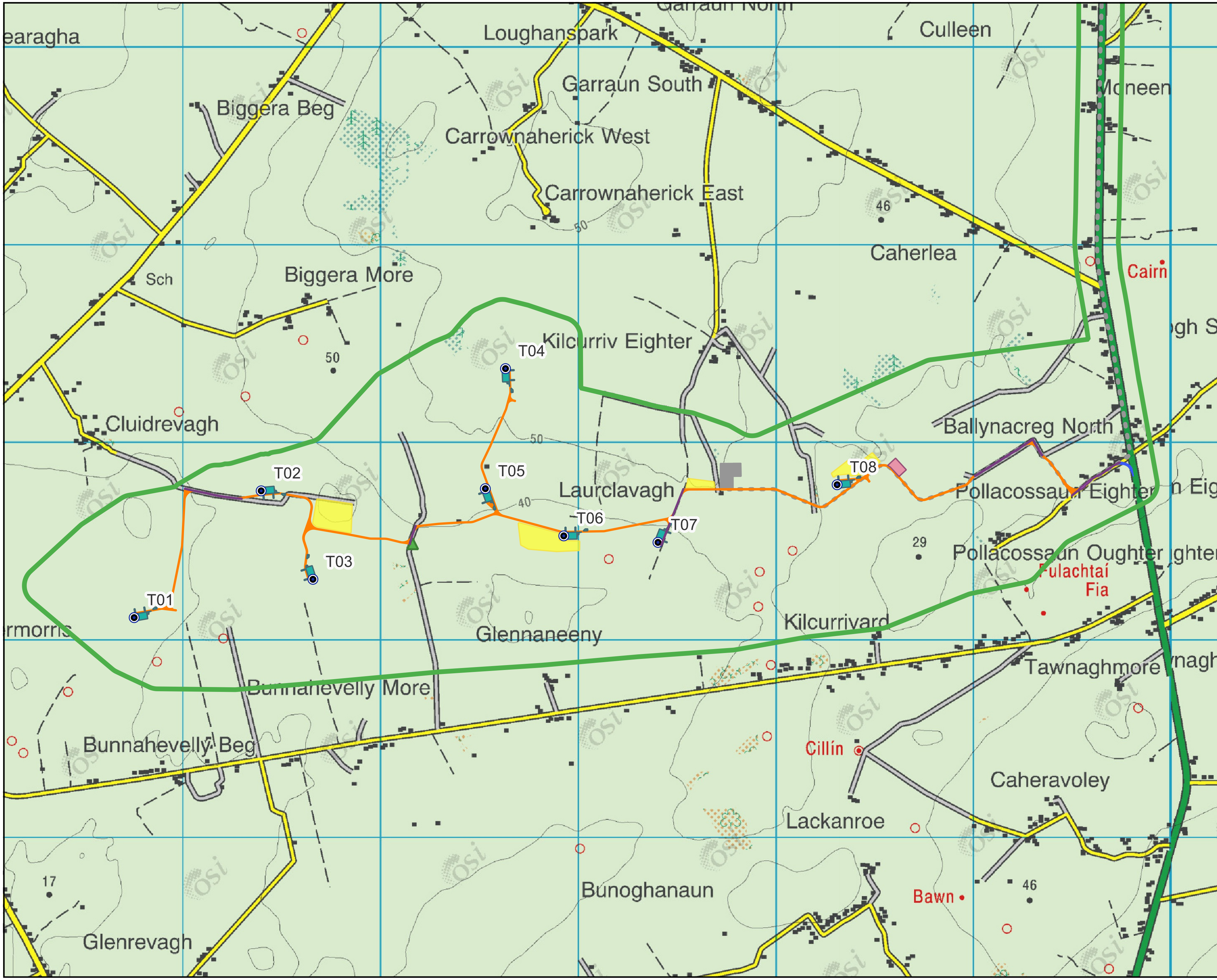

Map Legend

- EIAR Site Boundary
- Proposed Turbine Location
- Proposed Hardstands
- Temporary Construction Compoun
- Proposed Met Mast Location
- Existing Roads For Upgrade
- Proposed New Roads
- Temporary Link Road
- Spoil Management Areas
- Section 182 Infrastructure

N

Drawing Title: Proposed Wind Farm Layout	
Project Title: Laurclavagh Renewable Energy Development	
Drawn By: KB	Checked By: OM
Project No.: 210627	Drawing No.: Figure 4-2
Scale: 1:25,000	Date: 2024-03-11

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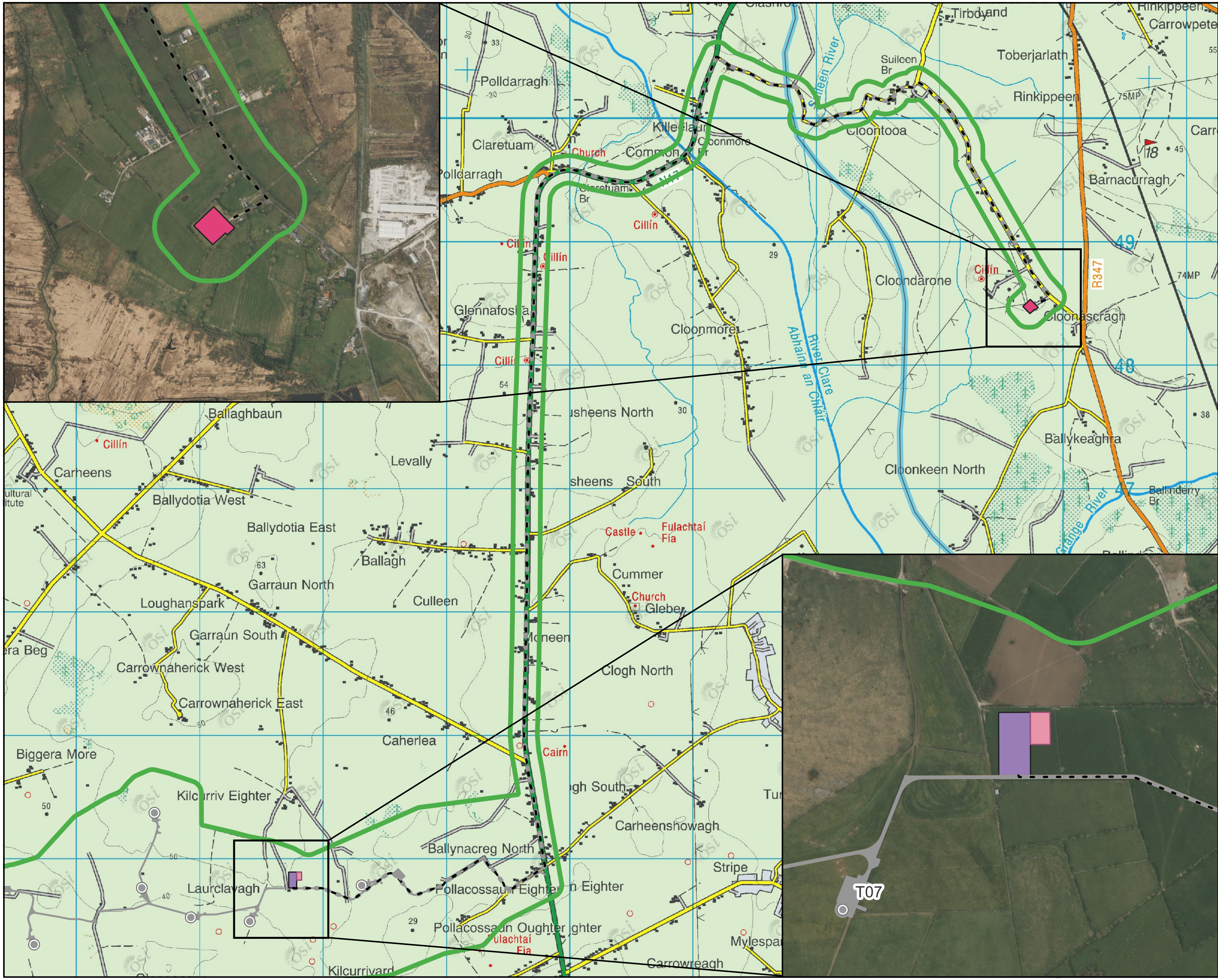

Map Legend

- EIAR Site Boundary
- Proposed 110kV Substation Location
- Temporary Construction Compound
- Proposed Underground Cabling Route
- Cloon 110kV Substation
- Section 37A Infrastructure

N

Drawing Title	Proposed Grid Connection Layout
Project Title	Laurclavagh Renewable Energy Development
Drawn By: KB	Checked By: ÓM
Project No.: 210627	Drawing No.: Figure 4-3
Scale: 1:40,000	Date: 2024-03-07

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4.3 Proposed Project Components

This section of the EIAR describes the components of the Proposed Project. Further details regarding Access and Transportation (Section 4.4), Site Drainage (Section 4.5), Construction Management (Section 4.6) and Construction Methodologies (Section 4.7) are provided subsequently in this chapter.

4.3.1 Proposed Wind Farm

4.3.1.1 Wind Turbines

4.3.1.1.1 *Turbine Locations*

The proposed wind turbine layout has been optimised using wind farm design software (WindPro) to maximise the energy yield from the Proposed Wind Farm 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 finished level of the top of 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 top of foundation level

Turbine	ITM Coordinates		Top of Foundation Elevation (mOD)
	Easting	Northing	
T1	534719	743135	25
T2	535362	743777	33
T3	535624	743329	35
T4	536599	744396	54
T5	536497	743788	43
T6	536894	743549	37
T7	537371	743516	39
T8	538278	743808	40

4.3.1.2 Turbine Locations and Site Investigations

As part of the design process for the Proposed Project, numerous intrusive site investigations were undertaken across the Proposed Wind Farm site, to provide detail and clarity on the nature and extent of subsoils and bedrock as a means of characterising the Proposed Wind Farm site, and provide information on the limestone bedrock. This assisted in providing additional information on the most suitable location for turbines and associated infrastructure.

Apex Geophysics Ltd carried out a Phase 1 Geophysical Investigation on the Proposed Wind Farm site, between the 9th and 12th May 2022, with the purpose being to assess the sub-soil conditions at the proposed turbine bases and at the proposed onsite 110kV substation location. The objectives of the geophysical investigation were to provide information on soil type, thickness and stiffness, depth to and type of bedrock, weathering and excitability of the bedrock, to identify potential karst features and fault/fissure zones within the bedrock and to propose locations for intrusive investigations.

Based on the results of the Phase 1 Geophysical Investigation, recommendations were made for the completion of specific intrusive direct investigations. Apex Geophysics Ltd. subsequently conducted a Phase 2 Geophysical Investigation for the Proposed Wind Farm between the 29th September and 21st November 2022. The objectives of the geophysical investigation were the same as that of the Phase 1 Geophysical assessment. The geophysical investigation consisted of 2D Electrical Resistivity Tomography (ERT), Seismic Refraction profiling and Multi-channel Analysis of Surface Waves to examine the subsoil conditions at 6 no. turbine bases. The results of the above-mentioned geophysical investigations were incorporated into the study methodology for the site investigation works.

Site investigation works were subsequently carried out by Causeway Geotech Ltd. on the Proposed Wind Farm site between March and April 2023. The site investigation works carried out encompassed the following:

- 10 no. boreholes by rotary drilling;
- 7 no. machine dug trial pits;
- Infiltration tests performed in 13 no. trial pits; and
- Indirect CBR tests at 46 no. locations.

Trial pit excavations were carried out to depths ranging between 0.80m and 3.5m. Disturbed samples were taken at standard depth intervals and at a change of stratum. No groundwater strikes were encountered during excavation.

An infiltration/soakaway test was carried out at 13 no. locations. No groundwater strikes were encountered during the completion of these tests, and soakaway was completed.

An indirect CBR test was conducted at 46 no locations using a Dynamic Cone Penetrometer (DCP). The test results showed that the material encountered at test depth was CLAY in all 46 no. locations, and no deviations from the standard methodology were used.

Laboratory testing of soils was also carried out. These tests of soils comprised:

- Soil classification: moisture content measurement, Atterberg Limit tests and particle size distribution analysis, and
- Soil chemistry: pH and water-soluble sulphate content.

Detailed results of all of the above-mentioned surveys are included within Appendix 4-2, 4-3 and 4-4 respectively.

4.3.1.2.1 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 turbine model to be installed on the Proposed Wind Farm site will have the following dimensions:

- Turbine tip height of 185 metres;
- Blade rotor diameter of 163 metres and
- Hub height of 103.5 metres.

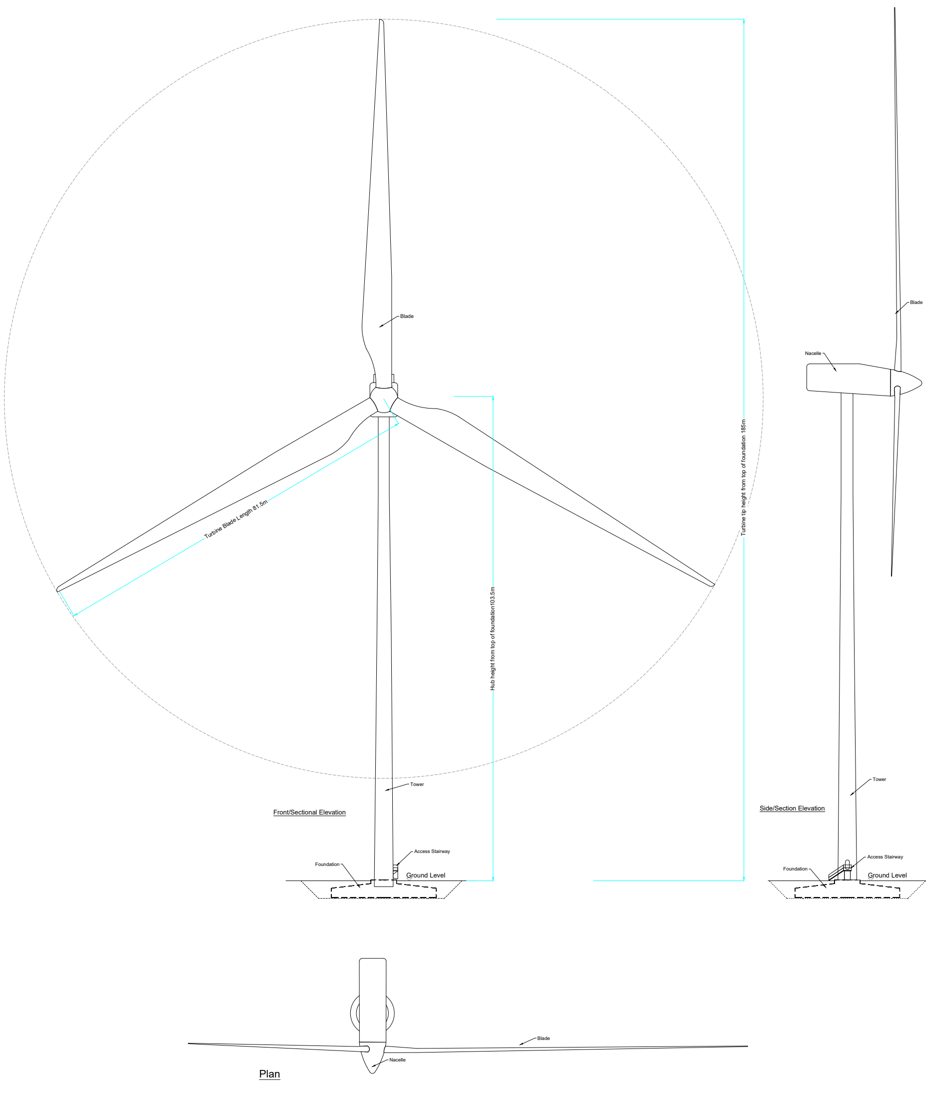
Modern wind turbines from the main turbine manufacturers have evolved to share a common appearance and other major characteristics, with only minor cosmetic differences differentiating one from another. The wind turbines that will be installed on the Proposed Wind Farm will be conventional three-blade turbines, that will be geared to ensure the rotors of all turbines rotate in the same direction at all times.

For the purposes of this EIAR, the above turbine dimensions have been selected and considered in the relevant sections of the EIAR. 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.

The turbines will be multi-ply coated to protect against corrosion. It is proposed that the turbines would be of a light grey colour to blend into the sky background to minimise visual impact as recommended in the Guidelines and '*The Influence of Colour on the Aesthetics of Wind Turbine Generators'* (ETSU, 1999).

A drawing of the proposed wind turbine is shown in Figure 4-4. Figure 4-4 also shows the turbine base layout, including turbine foundation, hardstanding area, assembly area, access road and surrounding works area.

The individual components of a geared wind turbine nacelle and hub are shown in Figure 4-5 below.



DRAWING TITLE:

Wind Turbine Elevations & Plan

PROJECT TITLE:

Laurclavagh Renewable Energy Development, Co. Galway

DRAWING BY: **JOB**	CHECKED BY: **TH**
PROJECT No.: **210627**	DRAWING No.: **Fig 4-4**
SCALE: **1:500 @A1**	DATE: **08.03.2024**

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Drawing Notes

1. Proposed wind turbines to have a maximum ground to blade tip height of 185m, blade length of 81.5m and hub height of 103.5m

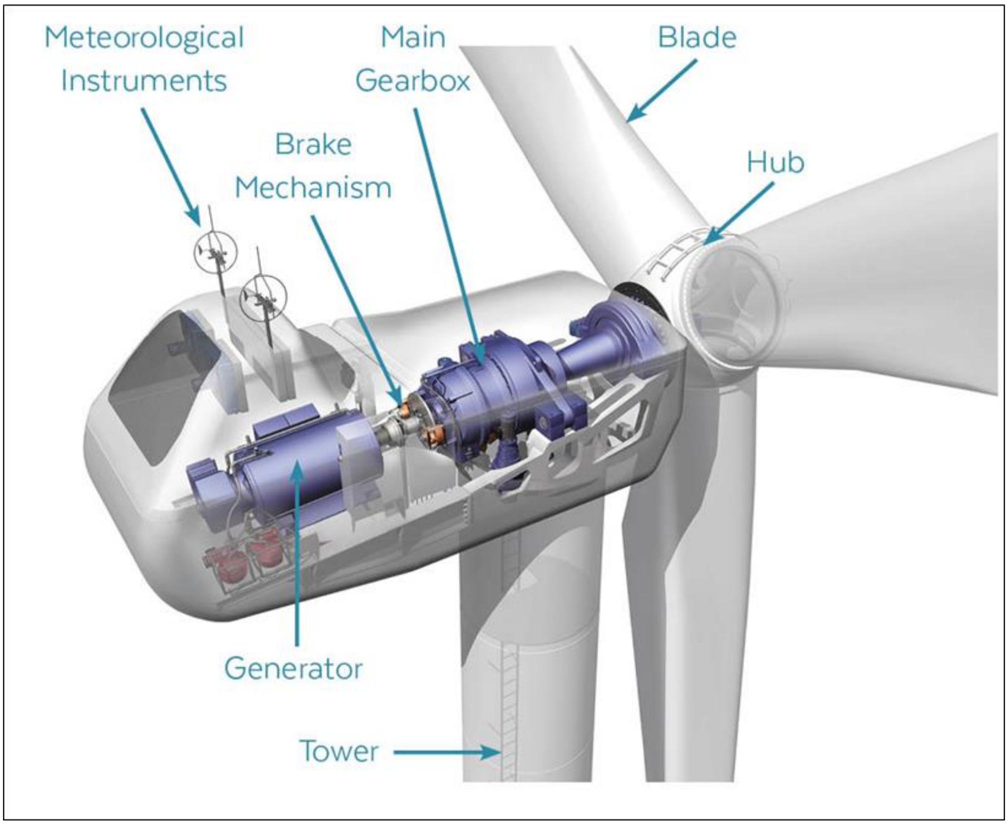
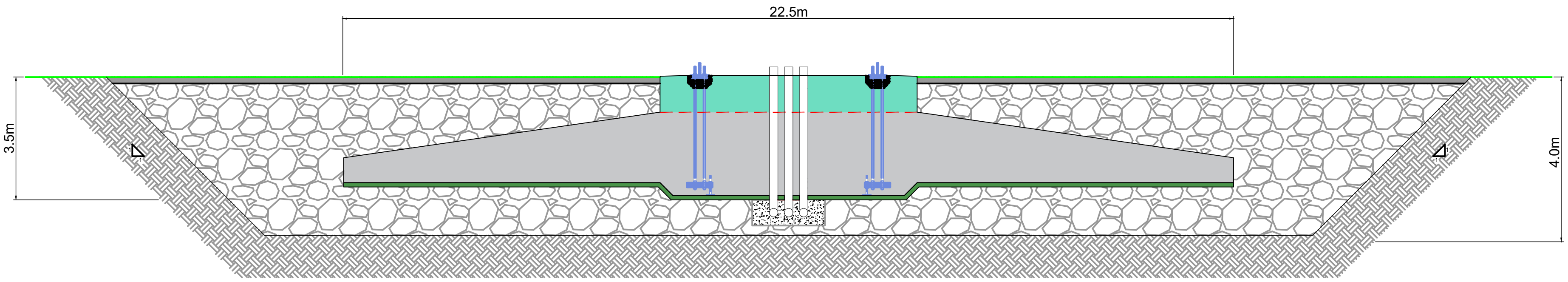


Figure 4-5 Turbine nacelle and hub components.

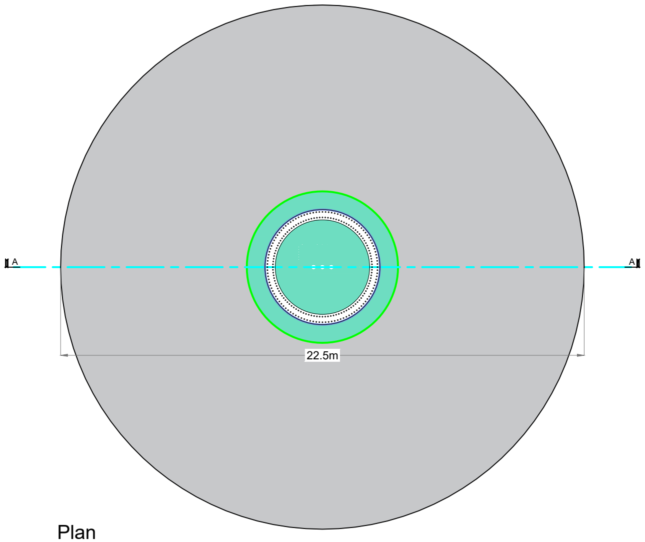
4.3.1.2.2 Turbine Foundations

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 horizontal and vertical extent of the turbine foundation will be 23m and 3 to 3.5m respectively, which has been assessed in this EIAR and is shown in Figure 4-4.

After the foundation level of each turbine has been formed on competent stratum (i.e bedrock or subsoil of sufficient load bearing capacity), the "Anchor Cage" is levelled and reinforcing steel is then built up around and through the anchor cage. 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 4-2 below).



Section A-A
Scale 1:100



Plan
Scale: 1:200

PROJECT TITLE: Laurclavagh Renewable Energy Development, Co. Galway		
DRAWING TITLE: Turbine Foundation		
PROJECT No.: 210627	DRAWING No.: Fig 4-6	SCALE: As Shown @ A3
DRAWN BY: JOB / CHECKED BY: TH	DATE: 07.03.2024	REVISION.: D01

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Plate 4-2 Turbine 'Anchor Cage' and finished turbine base

4.3.1.2.3 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 used to accommodate cranes used in the assembly and erection of the turbine, offloading and storage of turbine components, and 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. All crane hardstand areas will be designed taking account of the loadings provided by the turbine manufacturer and will consist of a compacted stone structure. The crane hardstands will be constructed in a similar manner to the excavated site roads. The precise sizes, arrangement and positioning of hard standing areas are informed by the turbine manufacturers. The proposed hard standing areas are illustrated in the detailed drawings included in Appendix 4-1 of this report. The extent of the required areas at each turbine location may be optimised on-site depending on topography, position of the Proposed Wind Farm site access road, the proposed turbine position and the turbine supplier's exact requirements. A detailed drawing of the hardstanding area has been included as Figure 4-4.

4.3.1.2.4 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 extent of the area required for the assembly areas is shown on Figure 4-4 and the detailed drawing in Appendix 4-1.

4.3.1.2.5 Generating Capacity

Modern wind turbine generators currently have a typical generating capacity in the 4 to 7 MW range, with the generating capacity continuing to evolve upwards as technology improvements are achieved by the turbine manufacturers. Turbines of the exact same make, model and dimensions can have different generating potential depending on the capacity of the electrical generator installed in the turbine nacelle. The exact generating capacity of the installed turbine will be designed to match the wind regime on the Proposed Wind Farm site and will be determined by the selected manufacturer.

For the purposes of this EIAR, a rated output of 7 MW has been chosen to calculate the potential generating capacity of the proposed 8-turbine renewable energy development, which would result in an estimated installed capacity of 56MW.

Assuming an installed capacity of 56 MW, the Proposed Wind Farm therefore has the potential to produce up to 171,696 MWh (megawatt hours) of electricity per year, based on the following calculation:

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

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

B = ... The capacity factor, which takes into account the intermittent nature of the wind, the availability of wind turbines and array losses etc. A capacity factor of 35%[1] is applied here

C = ... Rated output of the wind turbines: 56 MW

The 171,696 MWh of electricity produced by the Proposed Wind Farm would be sufficient to supply approximately 40,880 Irish households with electricity per year, based on the average Irish household using 4.2 MWh of electricity[2] (this latest figure is available from the March 2017 CER Review of Typical Consumption Figures Decision Paper).

The 2022 Census of Ireland recorded a total of 68,021 occupied households in Co. Galway. Per annum, based on a capacity factor of 35%, the Proposed Project would therefore produce sufficient electricity for the equivalent of 60% of all households in Co. Galway (including Galway City).

4.3.1.3 Site Roads

4.3.1.3.1 *Road Construction Types*

To provide access within the Proposed Wind Farm site and to connect the wind turbines and associated, infrastructure, existing roads and tracks will need to be upgraded and new access roads will need to be constructed. The road construction design has taken into account the following key factors:

1. *Buildability considerations;*
2. *Making use of existing infrastructure where possible;*
3. *Minimising excavation arisings;*
4. *Serviceability requirements for construction and wind turbine delivery and maintenance vehicles;*

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

The Proposed Wind Farm site makes use of the existing road network insofar as possible. It is proposed to upgrade approximately 1.5 kilometres of existing roads and tracks, and to construct approximately 6.4 kilometres of new access road on the Proposed Wind Farm site. It is proposed to construct passing bays along the proposed access road network in order to allow construction traffic to safely pass each other while travelling in opposite directions. Areas such as wide junctions and proposed hardstands will be used as passing bays throughout the construction phase of the Proposed Wind Farm site.

Upgrade of Existing Access Roads or Tracks

As noted above, approximately 1.5km of existing roads and access tracks will be upgraded as part of the Proposed Wind Farm construction phase. The existing tracks onsite were constructed using the excavate and replace construction technique, therefore proposed road widening will be founded on competent stratum. Cross section details of the upgrade of existing roads are shown as Figure 4-7. Details on the construction methodology for the upgrading of existing tracks and roads is outlined below in Section 4.7.1.2.2

It is proposed to reinstate the L61461 Local Road post construction to its original running width by re-constructing the stone wall, which will be in character with what exists along the L61461 pre-

[1] [1]https://www.eirgridgroup.com/site-files/library/EirGrid/ECP-2-2-Solar-and-Wind-Constraints-Report-Area-I-v1.0.pdf
[2] *March 2017 CER (CRU) Review of Typical Consumption Figures Decision Paper* https://www.cru.ie/document_group/review-of-typical-consumption-figures-decision-paper/

construction. A detailed drawing of this is included within the planning drawings associated with this EIAR and Planning Application

Construction of New Excavated Roads

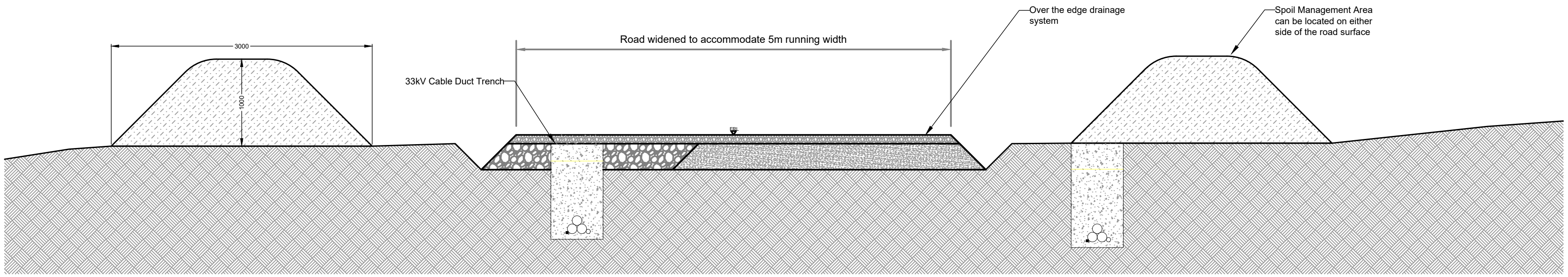
As noted above, approximately 6.4km of new roads will be constructed in order to facilitate the Proposed Project. Due to the ground conditions, new access tracks proposed on site are proposed to be founded and located on competent stratum. The typical make-up of the founded access tracks is a stone thickness of c. 500mm. A section of a new excavated road is also shown in Figure 4-8.

Where underground services are to be traversed during the construction of new roads throughout the Proposed Wind Farm site, roads will be constructed taking in line with the methodologies detailed below in Section 4.7.1.2.1.

The general construction methodology for construction of new excavated roads is summarised below in Section 4.7.1.2.1:

Project Design Drawing Notes

1. Widening can occur to either side of existing roads dependent on site conditions.
2. Depths of road fill to vary dependent on site conditions.
3. The cabling may be placed on either side of the roads, on both sides of theroad or within the road. The exact configuration of the underground cabling willbe set by the requirements of the electrical designers at detailed design stage.
4. Drawings issued are for planning application purposes only.
5. Drawings not to be used for construction/contract conditions.
6.
7. Do not scale off this drawing. Figured metric dimensions only should be taken off this drawing.
8. All contractors, whether 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.
9. 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 these drawings



Existing Excavated Road Widening Cross Section
1:50

PROJECT TITLE: **Laurclavagh Renewable Energy Development, Co. Galway**			
DRAWING TITLE: **Upgrade of Existing Excavated Access Roads Section**			
PROJECT No.: **210627**		DRAWING No.: **Fig 4-7**	SCALE: **1:50 @ A3**
DRAWN BY: **JOB**	CHECKED BY: **TH**	DATE: **08.03.2024**	REVISION: P01

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Project Design Drawing Notes

1. Widening can occur to either side of existing roads dependent on site conditions.
2. Depths of road fill to vary dependent on site conditions.
3. The cabling may be placed on either side of the roads, on both sides of theroad or within the road. The exact configuration of the underground cabling willbe set by the requirements of the electrical designers at detailed design stage.
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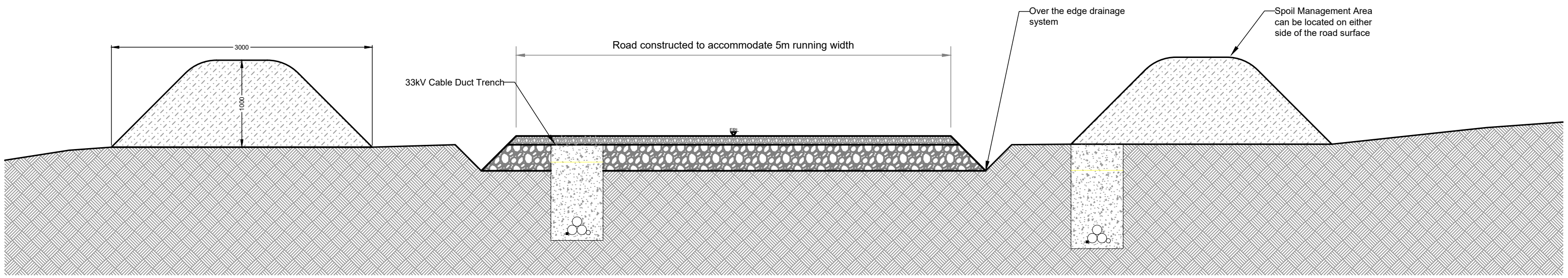
7. Do not scale off this drawing. Figured metric dimensions only should be taken off this drawing.
8. All contractors, whether main or sub-contractors, must visit the site and are responsible for taking and checking any and all dimensions and levels that relate to the works.
9. The use of or reliance 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 these drawings



Excavated Road Cross Section
1:50

PROJECT TITLE: **Laurclavagh Renewable Energy Development, Co. Galway**		
DRAWING TITLE: **New excavate and replace access road section**		
PROJECT No.: 210627	DRAWING No.: Fig 4-8	SCALE: 1:50 @ A3
DRAWN BY: JOB / CHECKED BY: TH	DATE: 07.03.2024	REVISION.: P01

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4.3.1.4 Underground Electrical (33kV) and Communications Cabling

Each turbine will be connected to the on-site 110kV substation (part of the Proposed Grid Connection) via underground 33 kV (kilovolt) electricity cabling. Fibre-optic cables will also connect each wind turbine and the met mast to the onsite 110kV substation. The electricity and fibre-optic cabling connecting to the onsite 110kV substation compound will be run in cable ducts approximately 1.2 metres beneath ground level, along the sides of roadways and/or under the roadways. The route of the cable ducts will follow the access track to each turbine location and are illustrated on the site layout drawings included as Appendix 4-1, the exact number and configuration of cable ducting may vary within the cabling trench. Figure 4-9 below shows two variations of a standard cable trench, one for off-road trenches and one for on-road trenches. The cabling may be placed on either side of the roads, on both sides of the road and/or within the road. The exact configuration of the underground cabling will be set by the requirements of the electrical designers at detailed design stage.

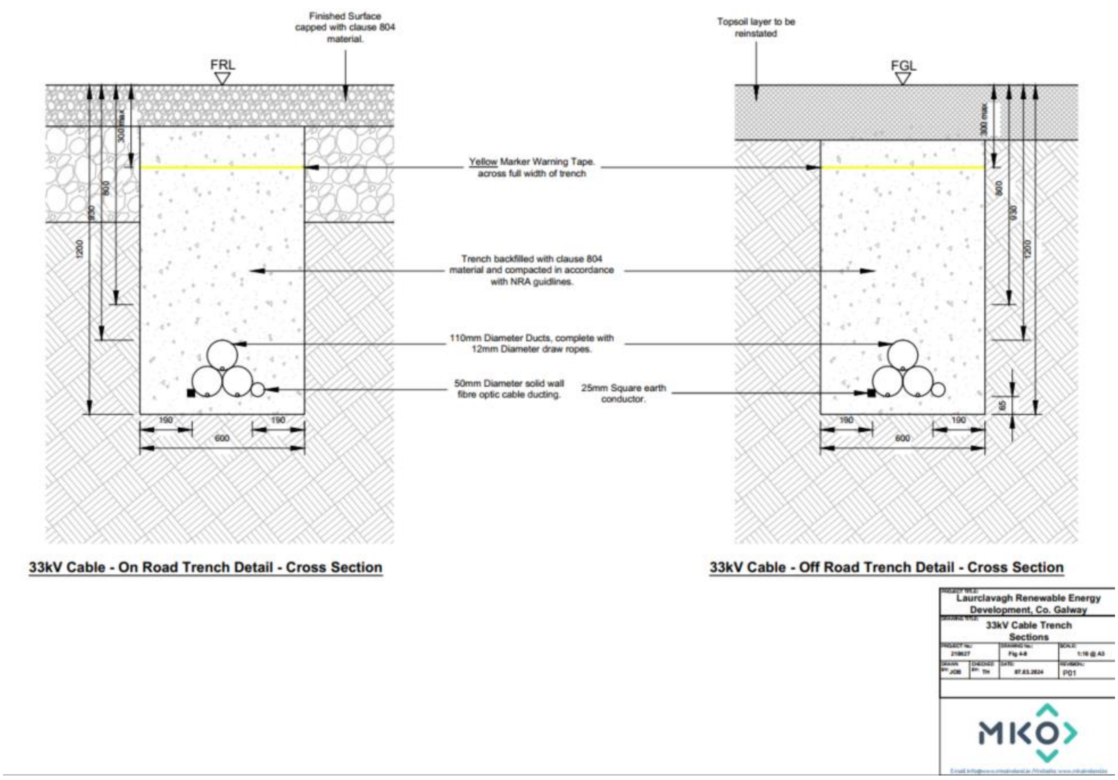
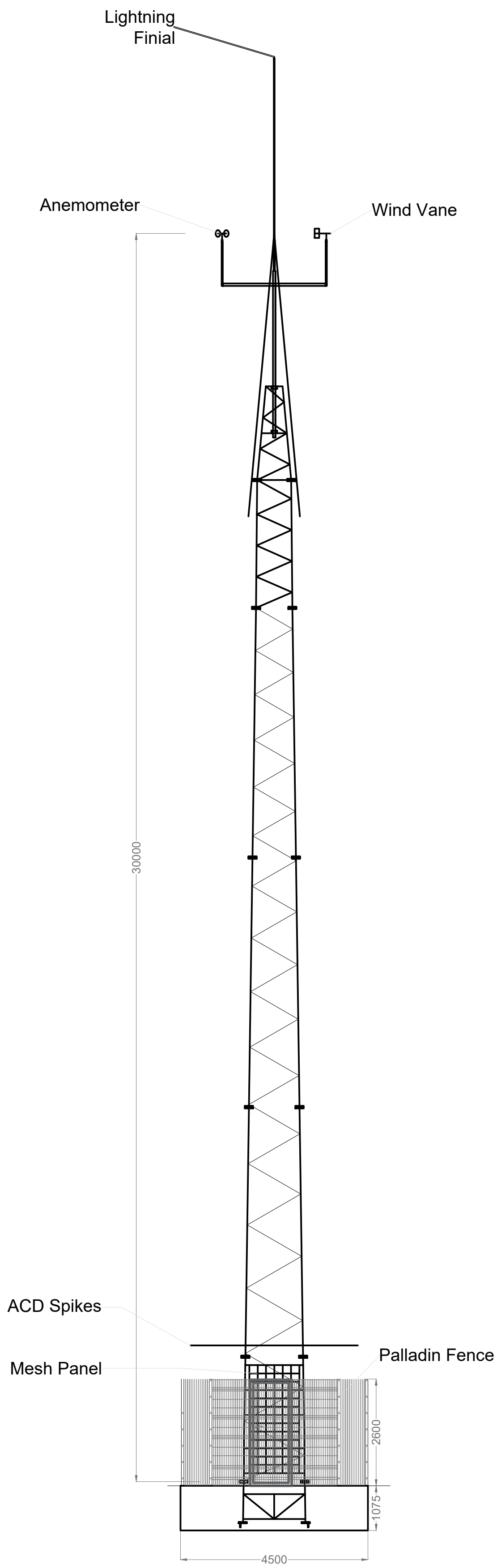


Figure 4-9 Cable trench cross section detail.

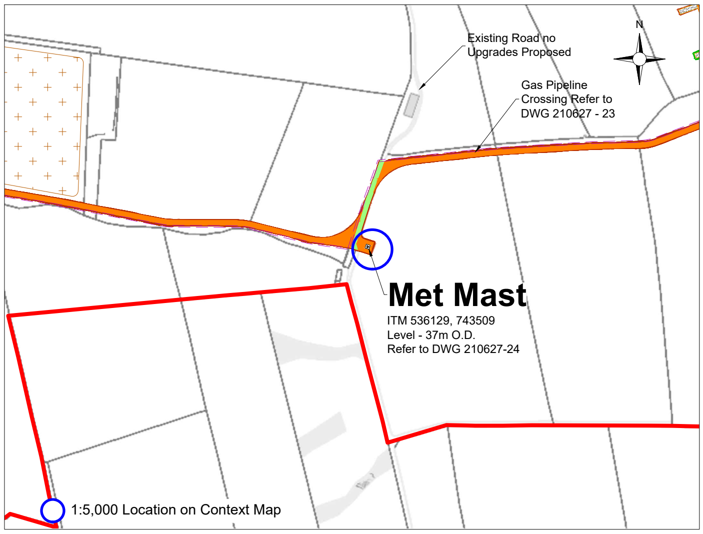
Clay plugs (water flow barrier) will be installed at regular intervals of not greater than 50 metres along the length of the trenches where required to prevent the trenches becoming conduits for runoff water. Backfill material will be compacted in layers with approved engineer's specified material, which may be imported onto the Proposed Wind Farm site should sufficient volumes of suitable material not be encountered during the excavation phase of the proposed infrastructure.

4.3.1.5 Meteorological Mast

One metrological (met) mast is proposed as part of the Proposed Wind Farm. The met mast will be equipped with wind monitoring equipment at various heights. The proposed met mast will be located at E536128 N743508 (ITM) as shown on the Proposed Wind Farm site layout drawing in Figure 4-2. The mast will be a free-standing slender lattice structure 30 metres in height. The mast will be constructed on a hard standing area sufficient to accommodate the equipment that will be used to erect the mast. The proposed meteorological mast is shown in Figure 4-10.



Mast Elevation
Scale: 1:100



Scale: 1:200

Note:

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

PROJECT TITLE: Laurclavagh Renewable Energy Development, Co. Galway			
DRAWING TITLE: Met Mast			
PROJECT No.: 210627	DRAWING No.: Fig 4-10	SCALE: As shown @ A3	
DRAWN BY: JOB	CHECKED BY: TH	DATE: 07.03.2024	REVISION.: D01

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4.3.1.6 Temporary Construction Compound

A temporary construction compound measuring approximately 4,030 square metres in area will be located in the eastern section of the Proposed Wind Farm site, along the road and just east of T8. the location of the proposed construction compound is shown on the Proposed Wind Farm site layout drawing in Figure 4-2. The layout of this construction compound is shown on Figure 4-11.

The construction compound will consist of a bunded refuelling and containment area for the storage of lubricants, oils and site generators etc, and full retention oil interceptor, waste storage area, temporary site offices, staff facilities and car-parking areas for staff and visitors. Temporary port-a-loo toilets and 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 also be a water supply on site for hygiene purposes, by way of a temporary storage tank.

Construction materials and turbine components will be brought directly to the proposed use and turbine locations following their delivery to the Proposed Wind Farm site.

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7. Layout plans show Turbine rotor diameter as per turbine drawing.
8. Final levels may vary depending on local ground conditions.

Drawing Legend

- Planning Application Boundary
- Proposed Road
- Cut
- Fill

PROJECT TITLE: **Laurclavagh Renewable Energy Development, Co. Galway**

DRAWING TITLE: **Temporary Construction Compound**

PROJECT No.:	DRAWING No.:	SCALE:
210627	Fig 4-11	1:500 @ A3

DRAWN BY:	CHECKED BY:	DATE:	REVISION.:
JOB	TH	07.03.2024	D01

OS SHEET No.: 2878, 2879, 2880, 2881, 2947, 2948, 2949, 2950, 3017, 3018, 3019, 3020, 3085, 3086, 3087, 3088

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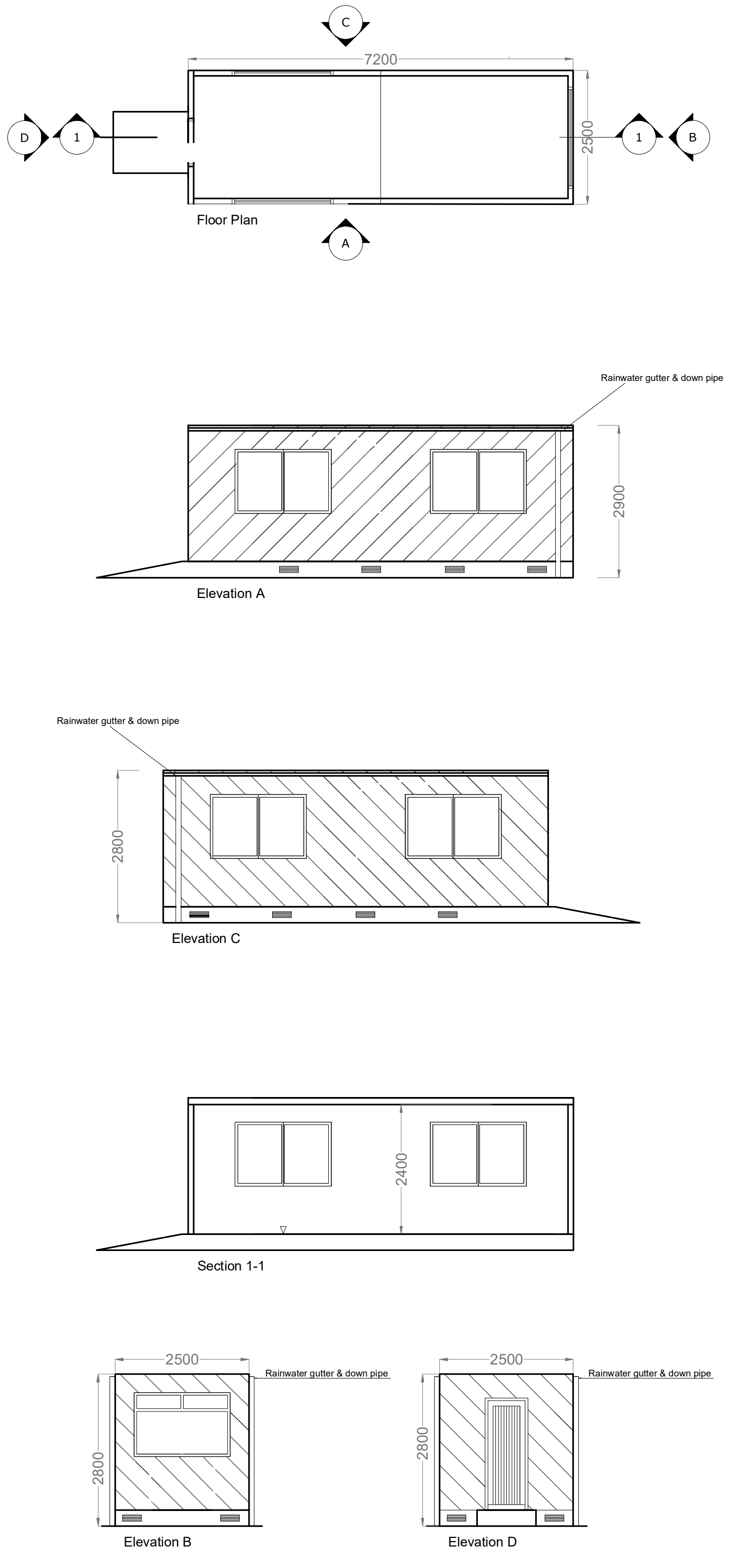
4.3.1.7 Temporary Security Cabin

A temporary security cabin will be located on a layby off the new proposed access road, just inside the Proposed Wind Farm site entrance off the L61461 Local Road.



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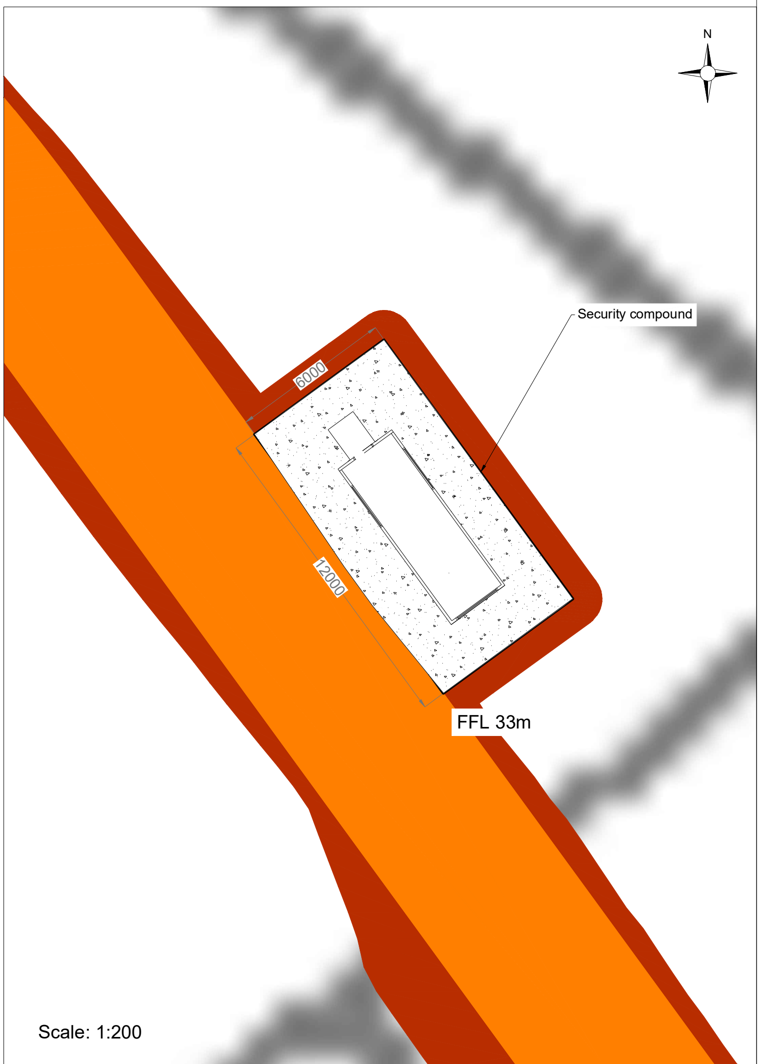

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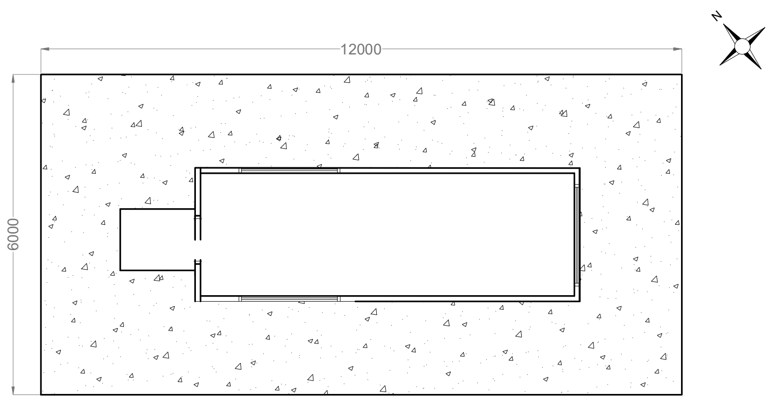

Security Compound Layout

Scale: 1:100

PROJECT TITLE:
Laurclavagh Renewable Energy Development, Co. Galway

DRAWING TITLE:
Standard Security Cabin & Compound

PROJECT No.:	DRAWING No.:	SCALE:
210627	Fig. 4-12	As shown @ A3

DRAWN BY:	CHECKED BY:	DATE:	REVISION.:
JOB	TH	27.02.2024	D01

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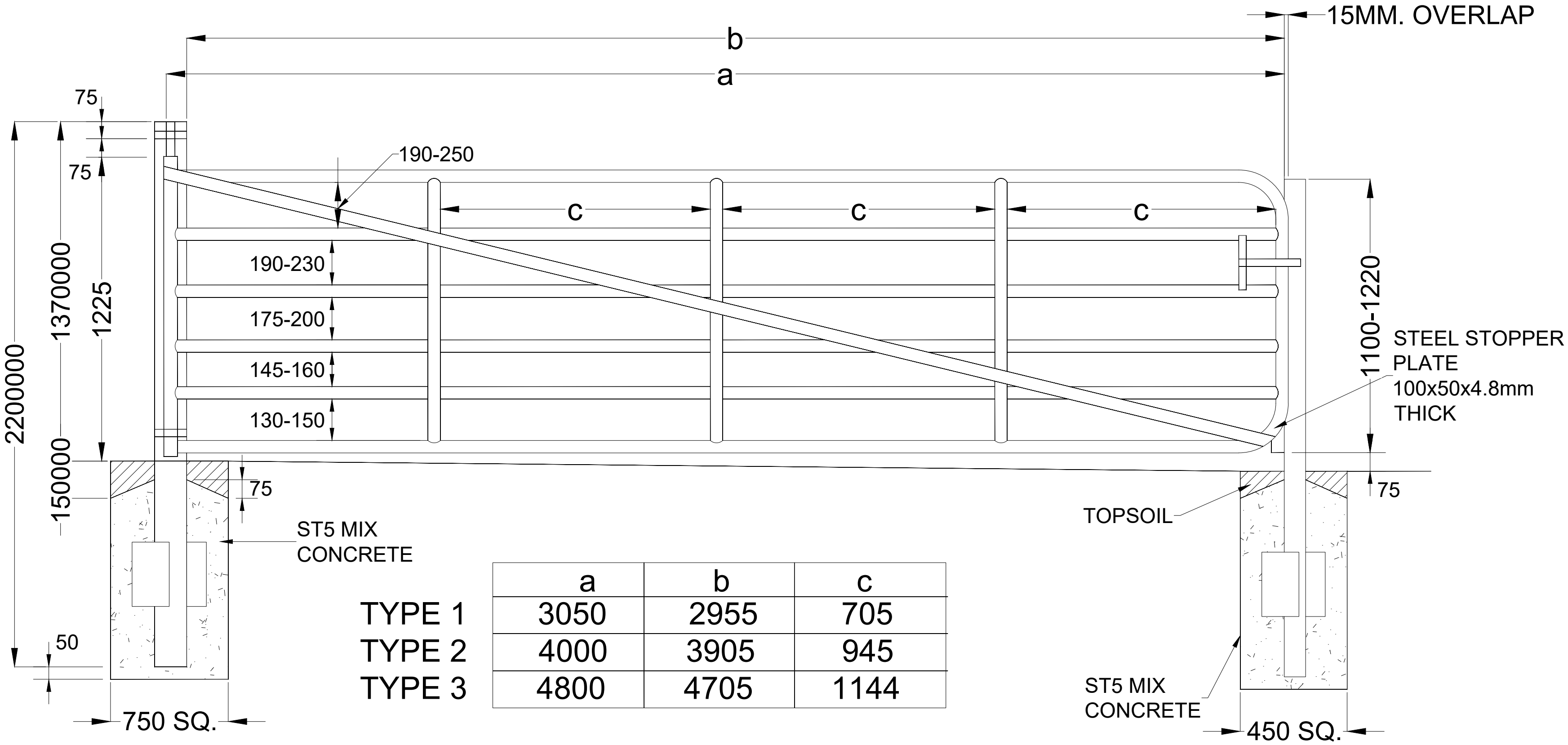

	a	b	c
TYPE 1	3050	2955	705
TYPE 2	4000	3905	945
TYPE 3	4800	4705	1144

Figure 4-13

PROJECT TITLE:
Laurclavagh Renewable Energy Development, Co. Galway

DRAWING TITLE:
Security Gate Detail

PROJECT No.:	DRAWING No.:	SCALE:
210627	210627 - 27	1: 20 @ A3

DRAWN BY:	CHECKED BY:	DATE:	REVISION.:
JOB	TH	05.03.2024	D01

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4.3.1.8 Hedgerow Removal and Replanting

There will be removal of approx. 1800m of linear habitat (hedgerow/treeline) to accommodate the footprint of the Proposed Project, including turbines and associated bat buffers, wind farm roads and other key infrastructure. This will be offset through the replanting of 3600m of hedgerow habitat within the Proposed Project site which will provide a 100% net gain of linear habitat. The hedgerows will be replanted within the suitable areas depicted in Figure 3-1 of Appendix 6-4. .

The below listed species, which were identified as being locally present during the detailed habitat surveys undertaken or identified as being suitable native species found within the wider local area, will be used in the species composition. The species selected will maximise flowering times throughout the year as well as berry availability later in the year as detailed in Table 4-2.

- Hawthorn (Crataegus monogyna)
  - Proportion of hedgerow mix: 75%
  - Age class to be planted: combination of whips and advanced nursery stock (10cm – 12 cm girth trees) to increase structure diversity.
- Hazel (Corylus avellana)
- Blackthorn (Prunus spinosa)
- Guelder rose (Viburnum opulus)
- Goat Willow (Salix caprea)
  - Proportion of hedgerow mix: 25%
  - Age class to be planted: Whips predominantly

Table 4-2 Hedgerow species flowering periods

Species	Blossoming Period
Willow	March - April
Blackthorn	March - April
Whitethorn/Hawthorn	May - June
Guelder Rose	May - July

4.3.2 Proposed Grid Connection

As discussed above in section 4.1, the Proposed Grid Connection will be subject to a separate planning application under Section 182A of the Planning and Development Act, 2000, as amended. The Proposed Grid Connection is detailed in Appendix 4-8 of this EIAR.

4.3.2.1 Onsite 110 kV Substation

It is proposed to construct an onsite 110 kV substation within the Proposed Wind Farm, as shown in Figure 4-1, Figure 4-2 and Figure 4-3. The proposed onsite 110kV substation is located within agricultural land and will be accessed via the Proposed Wind Farm access roads.

The footprint of the proposed onsite 110kV substation compound measures approximately 8,230 square metres in area and will include 2 no. control buildings and the onsite 110kV substation components necessary to consolidate the electrical energy generated by each wind turbine, and export that electricity from the onsite 110kV substation to the national grid. The layout and elevations of the proposed onsite 110kV substation are shown on Figure 4-13 and 4-14. The construction and exact layout of electrical equipment in the onsite 110kV substation will be to EirGrid / ESB Networks specifications.

Further details regarding the connection between the onsite110kV substation and the national electricity grid are provided in Section 4.3.2.4 below.

The onsite 110kV substation compound will include steel palisade fencing (approximately 2.6 metre high or as otherwise required by ESB), and internal fences will also segregate different areas within the main substation.

4.3.2.2 Wind Farm Control Buildings

Two wind farm control buildings will be located within the onsite 110kV substation compound. The Independent Power Producer (IPP) Control Building will measure approximately 19 metres by 11 metres and 7 metres in height. It will be located at the western edge of the onsite 110kV substation compound. The EirGrid Control Building will be located towards the centre of the onsite 110kV substation compound and will measure approximately 25 metres by 18 metre and 8.5 metres in height. Layout and elevation drawings of the control buildings are included in Figure 4-15 and Figure 4-16.

The wind farm control buildings will include staff welfare facilities for 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 onsite 110kV substation, there will be a very small water requirement for occasional toilet flushing and hand washing and therefore the water requirement of the Proposed Grid Connection does not necessitate a potable source. It is proposed to either harvest rainwater from the roofs of the buildings or, alternatively, install a groundwater well adjacent to the onsite 110kV substation in accordance with the Institute of Geologists Ireland, *Guide for Drilling Wells for Private Water Supplies* (IGI, 2007). The well will be flush to the ground and covered with a standard manhole. A pump house is not required as an in-well pump will direct water to a water tank within the roof space of the control building. Bottled water will be supplied for drinking, if required.

It is not proposed to treat wastewater on site. Wastewater from the staff welfare facilities in the control buildings will be managed by means of a sealed storage tank, with all wastewater being tankered off site by permitted waste collector to a licenced wastewater treatment plant.

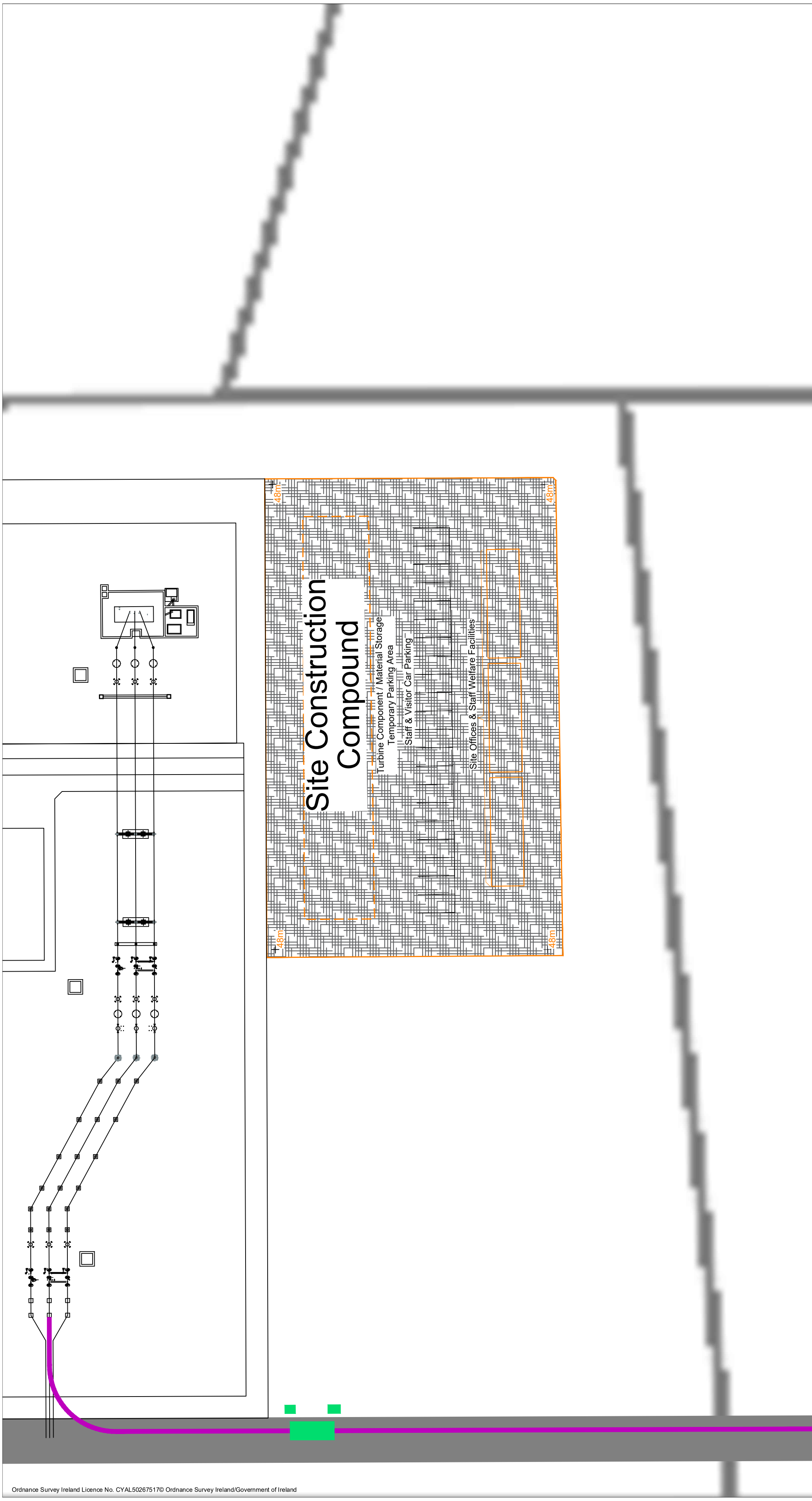
Such a proposal for managing the wastewater arising on site has become almost standard practice on wind farm sites, which are often proposed in areas where finding the necessary percolation requirements for on-site treatment would be challenging and has been accepted by numerous Planning Authorities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

The proposed wastewater storage tank will be fitted with an automated alarm system that will provide sufficient notice that the tank requires emptying. Full details of the proposed tank alarm system can be submitted to the Planning Authority in advance of any works commencing on-site. The wastewater storage tank alarm will be part of a continuous stream of data from the Proposed Wind Farm site's turbines, wind measurement devices and onsite 110kV 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 onsite 110kV substation underground storage tank.

4.3.2.3 Substation Temporary Construction Compound

A temporary construction compound measuring approximately 2,610 square metres in area will be located adjacent to the eastern boundary of proposed onsite 110kV substation. This construction compound will consist of temporary site offices, staff facilities and car-parking areas for staff and visitors. Temporary port-a-loo toilets and 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 also be a water supply on site for hygiene purposes, by way of a temporary storage tank. The temporary construction compound will also include a bunded refuelling and containment area for the storage of oil, lubricants and site generators etc, and full retention oil interceptor.

The location of the proposed construction compound is shown on the Proposed Grid Connection layout drawing in Figure 4-3. The layout of this construction compound is shown in Figure 4-16.



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7. Exact location of cable/joint bay in the road curtilage to be subject to ESB/EirGrid specifications and agreement with Galway County Council.

Drawing Legend

- Underground Electrical Cabling Route
- S37 Infrastructure
- Joint Bay

N

PROJECT TITLE: Laurclavagh Renewable Energy Development, Co. Galway

DRAWING TITLE: Temporary Construction Compound for Substation

PROJECT No.: 210627	DRAWING No.: Fig 4-18	SCALE: 1:500 @ A3
DRAWN BY: JOB / CHECKED BY: OM	DATE: 07.03.2024	REVISION.: P01

OS SHEET No.: 2811, 2812, 2813, 2814, 2879, 2880, 2881, 2882, 2948, 2949, 2950, 2951, 3018, 3019, 3020, 3021

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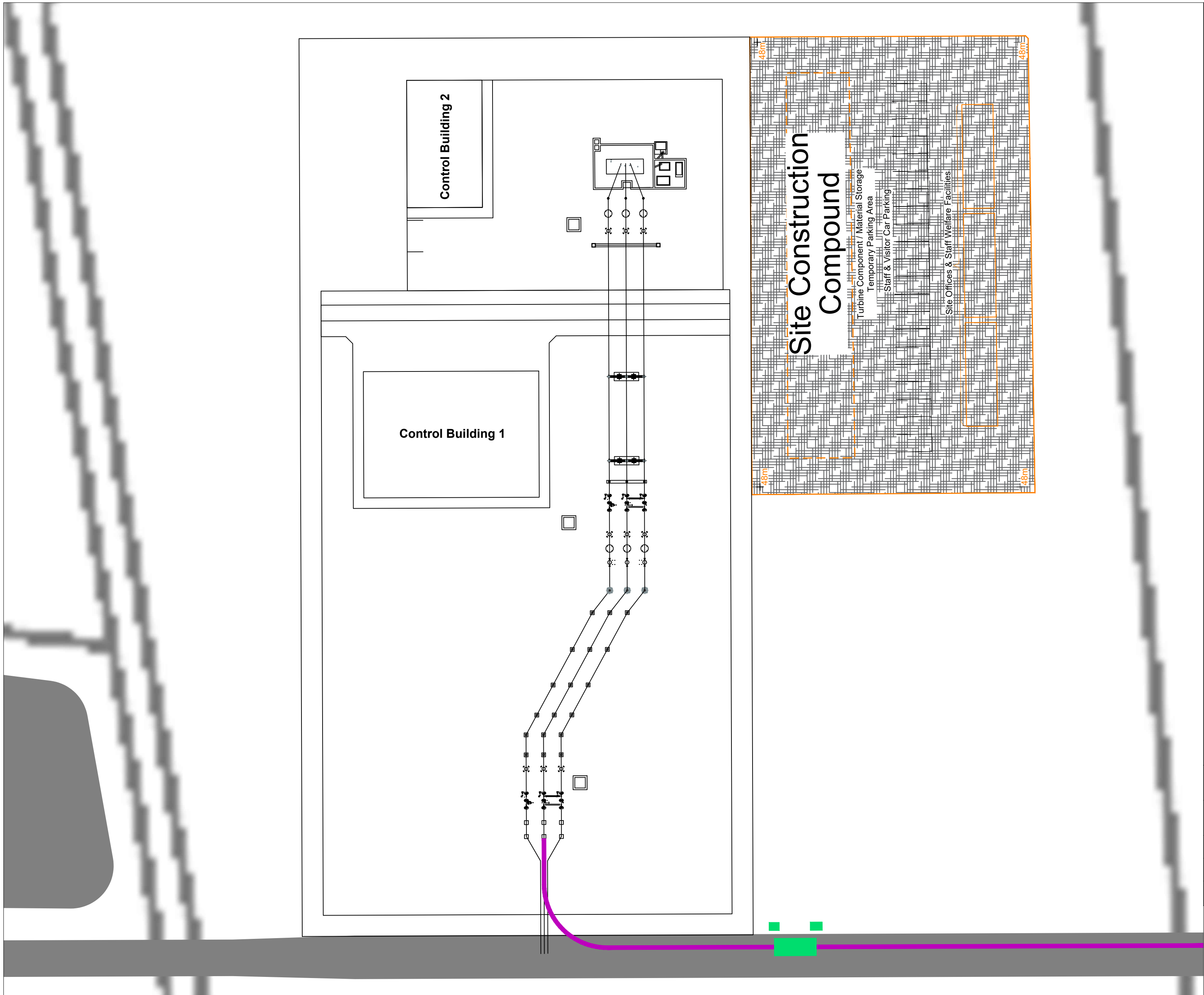

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7. Exact location of cable/joint bay in the road curtilage to be subject to ESB/EirGrid specifications and agreement with Galway County Council.

Drawing Legend

- Underground Electrical Cabling Route
- S37 Infrastructure
- Joint Bay

N

PROJECT TITLE: **Laurclavagh Renewable Energy Development, Co. Galway**

DRAWING TITLE: **Onsite 110kV Substation Drawing Layout**

PROJECT No.:	DRAWING No.:	SCALE:
210627	Fig 4-14	1:500 @ A3

DRAWN BY:	CHECKED BY:	DATE:	REVISION.:
JOB	OM	07.03.2024	P01

OS SHEET No.: 2811, 2812, 2813, 2814, 2879, 2880, 2881, 2882, 2948, 2949, 2950, 2951, 3018, 3019, 3020, 3021

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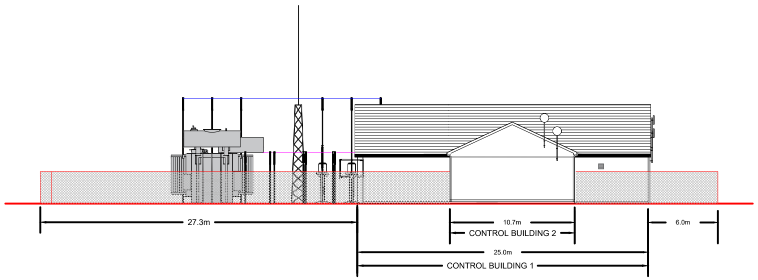
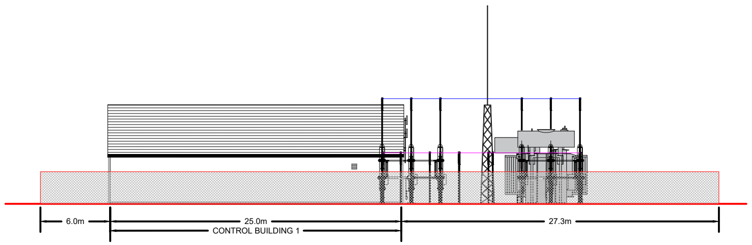
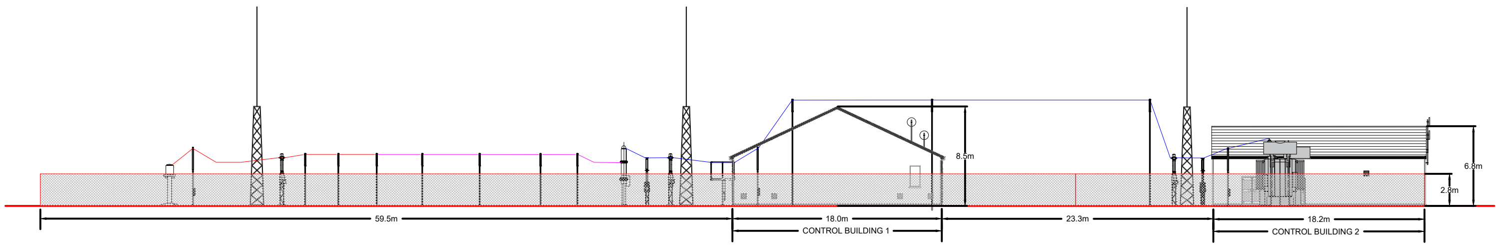


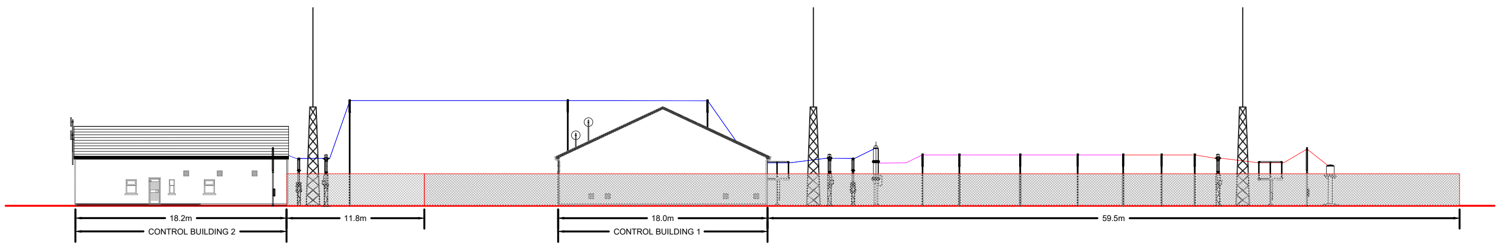
NORTH ELEVATION



SOUTH ELEVATION



EAST ELEVATION



WEST ELEVATION

PROJECT TITLE: **Laurclavagh Renewable Energy Development, Co. Galway**			
DRAWING TITLE: **Onsite 110kV Substation Drawing Elevations**			
PROJECT No.: **210627**		DRAWING No.: **Fig 4-15**	SCALE: **1:200 @ A1**
DRAWN BY: **JOB**	CHECKED BY: **OM**	DATE: **07.03.2024**	REVISION.: P01

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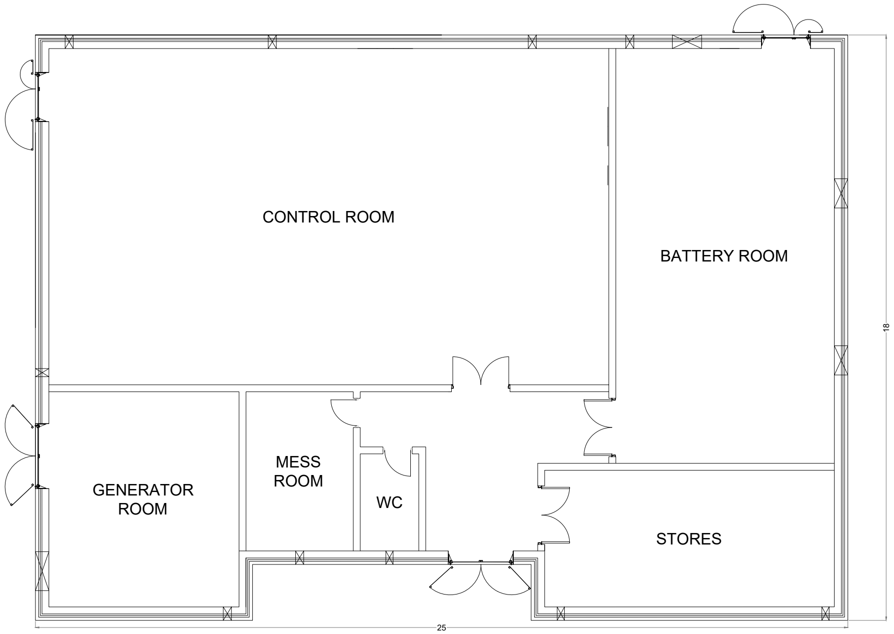
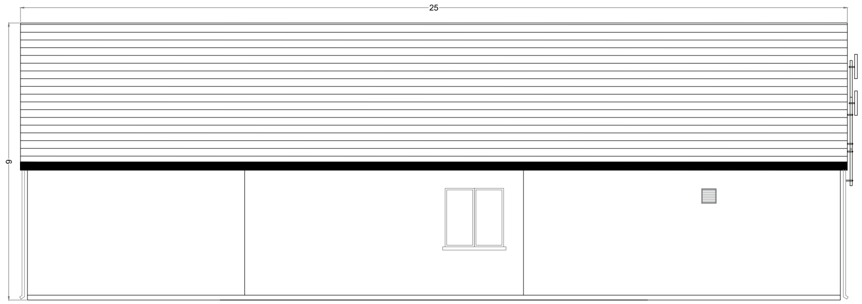
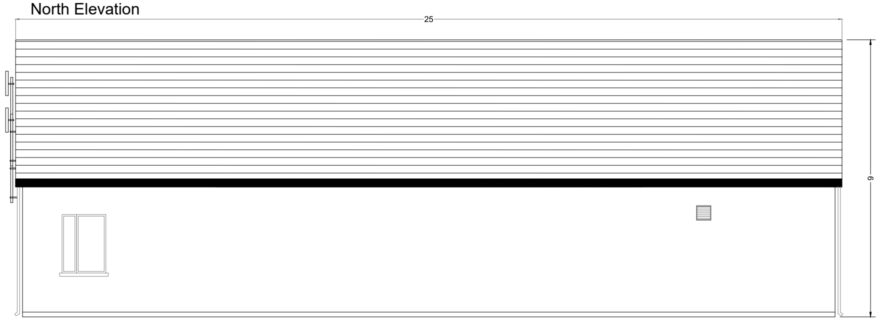
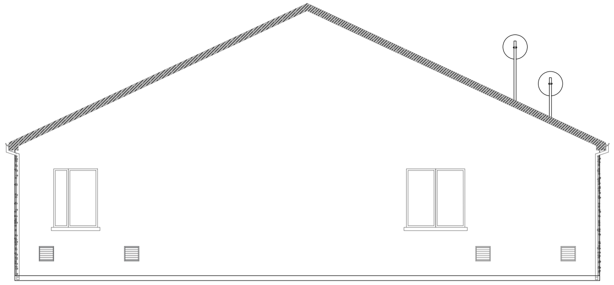




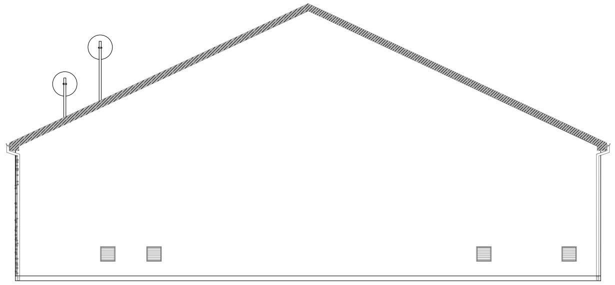
North Elevation



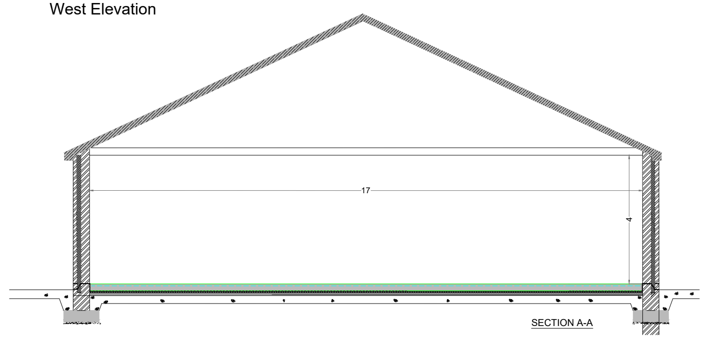
South Elevation



East Elevation



West Elevation



SECTION A-A

PROJECT TITLE: Laurclavagh Renewable Energy Development, Co. Galway		
DRAWING TITLE: Control Building 1 Elevations & Section		
PROJECT No.: 210627	DRAWING No.: Fig 4-16	SCALE: 1:100 @ A2
DRAWN BY: JOB / CHECKED BY: OM	DATE: 08.03.2024	REVISION.: P01

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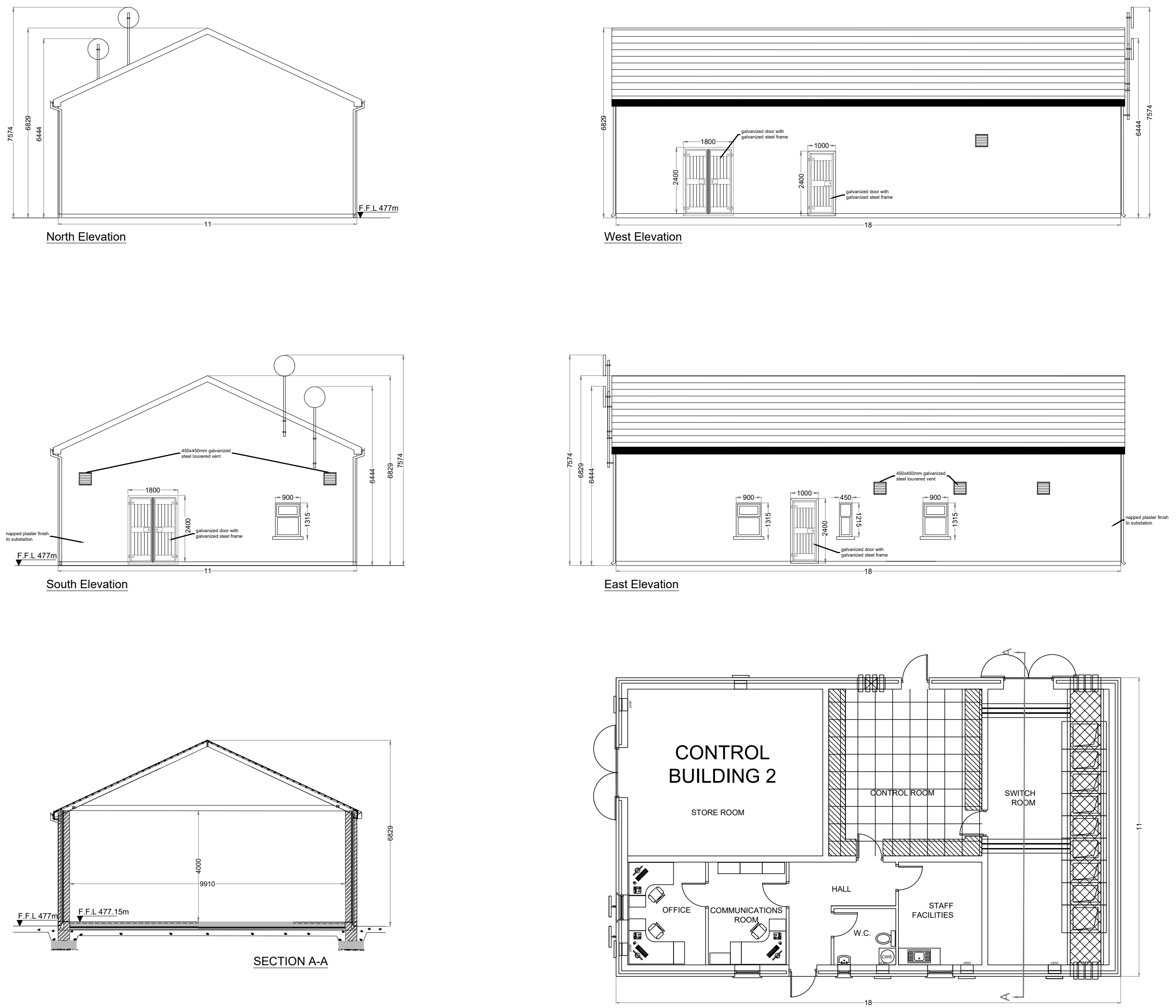

PROJECT TITLE: Laurclavagh Renewable Energy Development, Co. Galway			
DRAWING TITLE: Control Building 2 Elevations & Section			
PROJECT No.: 210627	DRAWING No.: Fig 4-17	SCALE: 1:100 @ A2	
DRAWN BY: JOB	CHECKED BY: OM	DATE: 07.03.2024	REVISION.: P01

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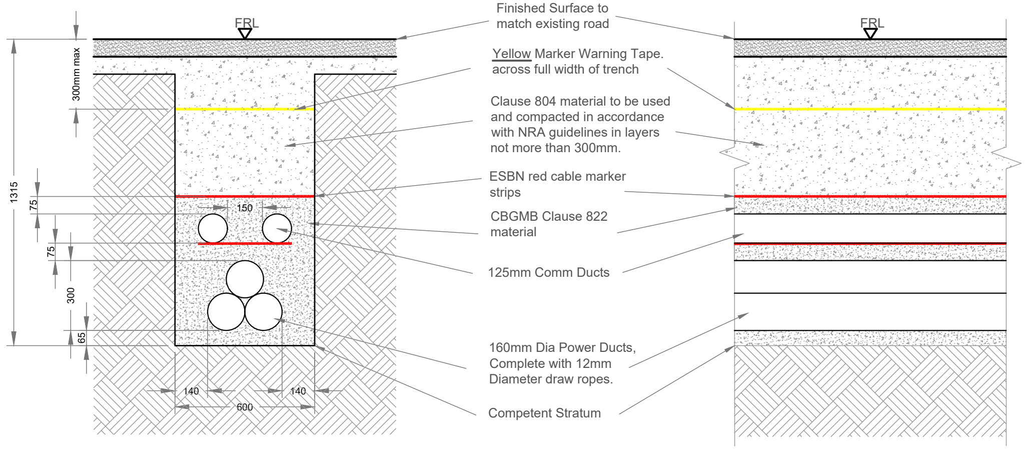
4.3.2.4 Underground Electrical Cabling Route

It is proposed to connect the onsite 110 kV substation within the Proposed Wind Farm site to the existing 110 kV Cloon substation near Tuam, Co Galway via 110 kV underground cabling . The underground electrical cabling route is illustrated in Figure 4-3. The underground cabling route is approximately 14.3km in length and is located primarily within the public road corridor, with a short section of the route (approximately 2.1km) located within the Proposed Wind Farm access road.

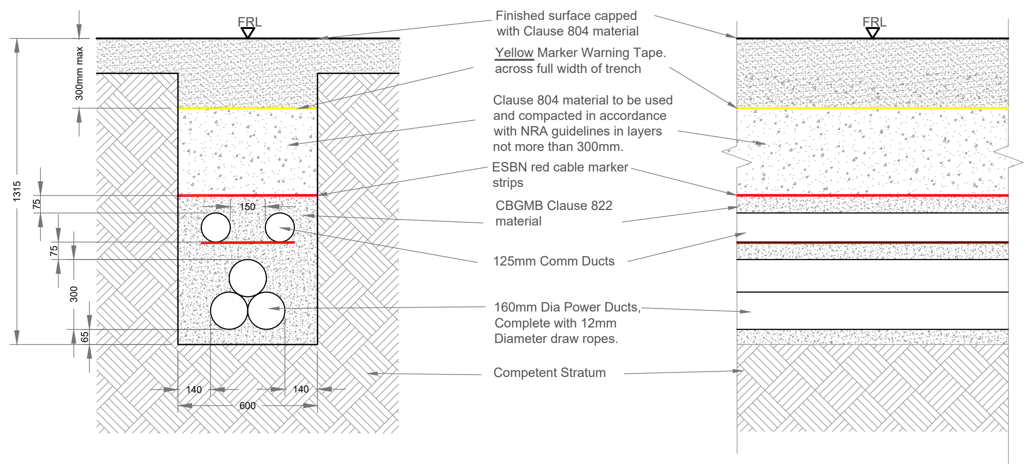
The underground cabling route will originate at the proposed onsite 110kV substation and run east and south for approximately 2.1km through the Proposed Wind Farm access road towards the L61461 Local Road. The cabling route continues underneath the L61461 Local Road for approximately 0.3km before following the N83 National Road. Upon joining the N83, the cabling will travel north in the verge of the road for approximately 5.5km before travelling east/southeast along the L6141 Local Road for 4.1km before turning right into the existing 110kV Cloon Substation compound in the townland of Cloonascragh.

The methodology for construction of the Proposed Grid Connection underground cabling is presented in Section 4.7.7 below. The underground cabling route is illustrated in Figure 4-1 and 4-3. 110kV cabling trench cross sections are shown in Figure 4-18.



Option A - Standard 110kV Trench Detail in Road

SCALE 1:20



Option A - Standard 110kV Trench Detail in Off-Road

SCALE 1:20

PROJECT TITLE: Laurclavagh Renewable Energy Development, Co. Galway			
DRAWING TITLE: Option A - 110kV Standard Trench detail			
PROJECT No.: 210627	DRAWING No.: Fig 4-19	SCALE: 1:20 @ A3	
DRAWN BY: JOB	CHECKED BY: OM	DATE: 08.03.2024	REVISION.: P01

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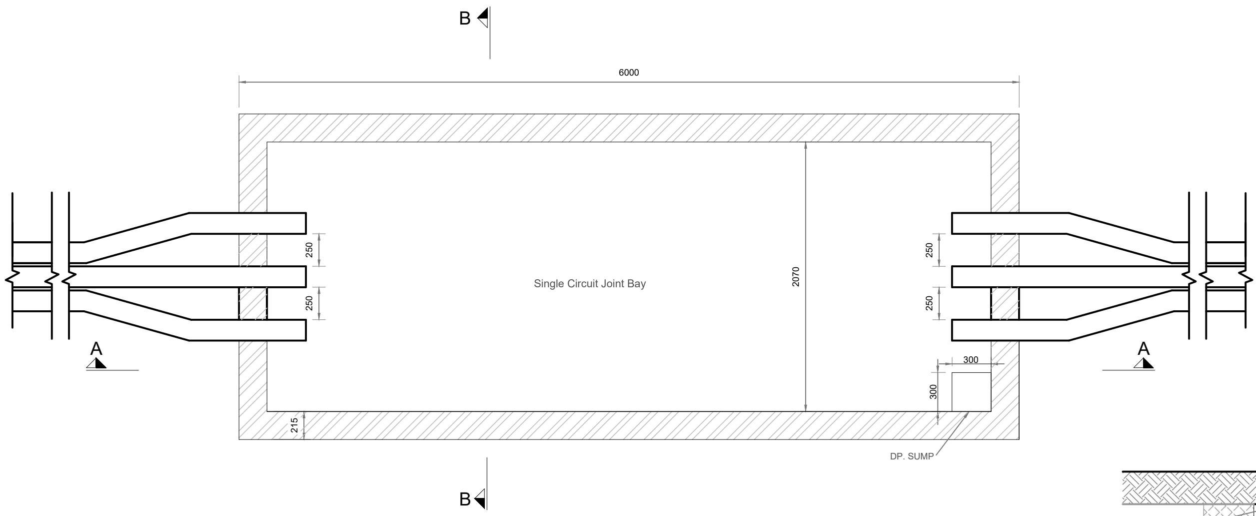
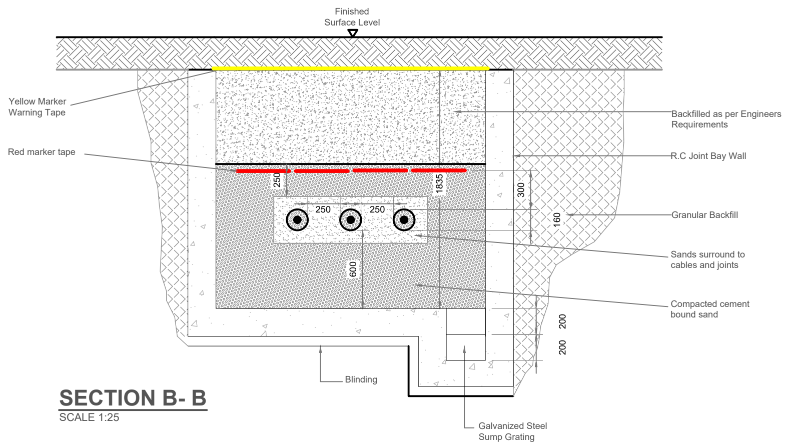
4.3.2.5 Joint Bays

21 no. joint bays are proposed along the Proposed Grid Connection underground cabling route, approximately 600 to 800 metres apart or as otherwise required by ESB/Eirgrid and electrical requirements. There are 3 no. joint bays proposed within the Proposed Wind Farm access roads, 1 no. joint bay is proposed along the existing L61461 Local Road, 11 no. joint bays are proposed along the N83 National Road, and 6 no. joint bays are proposed within the L6141 Local Road. Please see Figure 4-31 for details and section 4.9.2.5 for joint bay construction methodology.



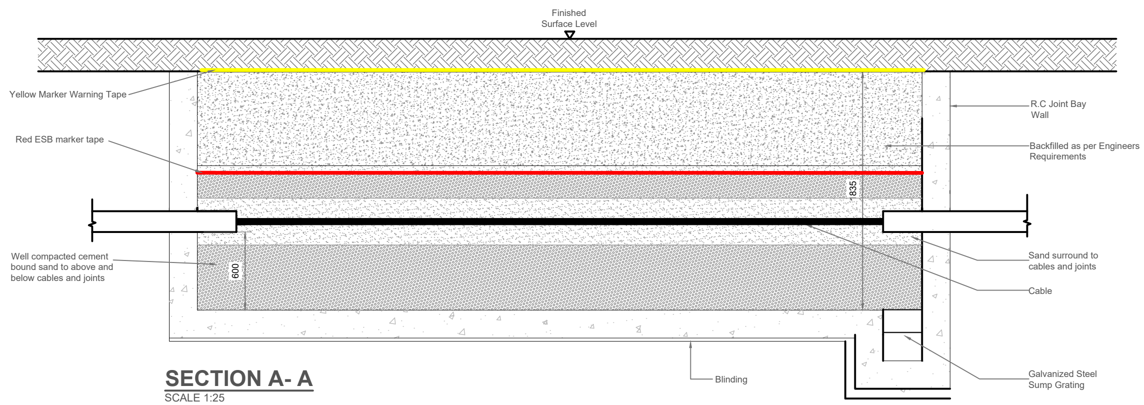
110kV JOINT BAY DETAIL

SCALE 1:25



SECTION B- B

SCALE 1:25



SECTION A- A

SCALE 1:25

PROJECT TITLE: Laurclavagh Renewable Energy Development, Co. Galway		
DRAWING TITLE: 110kV Joint bay detail		
PROJECT No.: 210627	DRAWING No.: Fig 4-20	SCALE: 1:25 @ A2
DRAWN BY: JOB / CHECKED BY: OM	DATE: 07.03.2024	REVISION.: P01

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4.3.2.6 Watercourse and Service Crossings

There are 4 no. identified watercourse crossings along the Proposed Grid Connection underground cabling route, and 1 no. motorway crossing also. All 4 no. watercourse crossings are referenced on EPA/OSI mapping. The construction methodology for the 4 no. EPA/OSI mapped crossings has been designed to eliminate the requirement for in-stream works at these locations. The various crossing methodologies to be employed along the Proposed Grid Connection underground cabling route include the following:

- Type A: Crossing using standard trefoil formation
- Type B: Flatbed formation under bridges/culverts
- Type C: Flatbed Formation over bridges/culverts
- Type D: Horizontal Directional Drilling

A general description of the construction methods employed at watercourse crossings are described in Section 4.7.3 below. An illustration of the proposed crossing methodology at the 4 no. locations is included within the Proposed Grid Connection Infrastructure drawings in Appendix 4-8.

4.3.3 Spoil Management

The predicted spoil burden generated during construction have been calculated and are outlined in Table 4-3 below, along with the crushed stone requirement for the Site.

4.3.3.1 Quantities

The quantity of spoil generated and requiring management on the site of the Proposed Project has been calculated, as presented in Table 4-3 below. In addition, the volume of stone required to build the Proposed Project infrastructure is noted below.

Table 4-3 Spoil and Stone Volumes

Development Component	Spoil Volume(m3) (approx.)	Crushed Stone Requirement (m3) (approx.)
Proposed Wind Farm		
8 no. Turbines and Hardstanding Areas (including foundations)	30,080	23,940
Access Roads (including met mast hardstand and security cabin)	16,623	22,165
Temporary Construction Compound	1,332	1,150
Total	48,035	47,255
Proposed Grid Connection		
Onsite Substation (including temporary construction compound)	5,386	7,120

Development Component	Spoil Volume(m3) (approx.)	Crushed Stone Requirement (m3) (approx.)
Cabling Trench	11,000	5,150
Total	**16,386**	**12,270**
Total	64,421	59,525
Total (including 10% contingency)	70,863	65,480

Note: A contingency factor of 10% has been applied and is included to the excavated spoil volumes above to allow for expected increase in volume upon excavation and to allow for a variation in ground conditions across the Proposed Wind Farm site.

It is considered that any spoil generated by the proposed cabling trench will be removed and either accommodated within the Spoil Management Areas within the Proposed Wind Farm site or transported to a Materials Recovery Facility (MRF) where necessary. Any road material containing tar will be managed separately. Further detail on this can be found in Chapter 15: Traffic and Transport.

There will be a requirement to remove some sections of linear vegetation i.e. treelines and hedgerows to facilitate the Proposed Project infrastructure, however, this will not involve the excavation of tree stumps and as such does not affect the excavation volumes.

The surplus spoil material generated will all be managed locally within the site, as outlined below in Section 4.3.3.2.

4.3.3.2 Spoil Management Areas and Placement of Spoil Alongside Access Roads

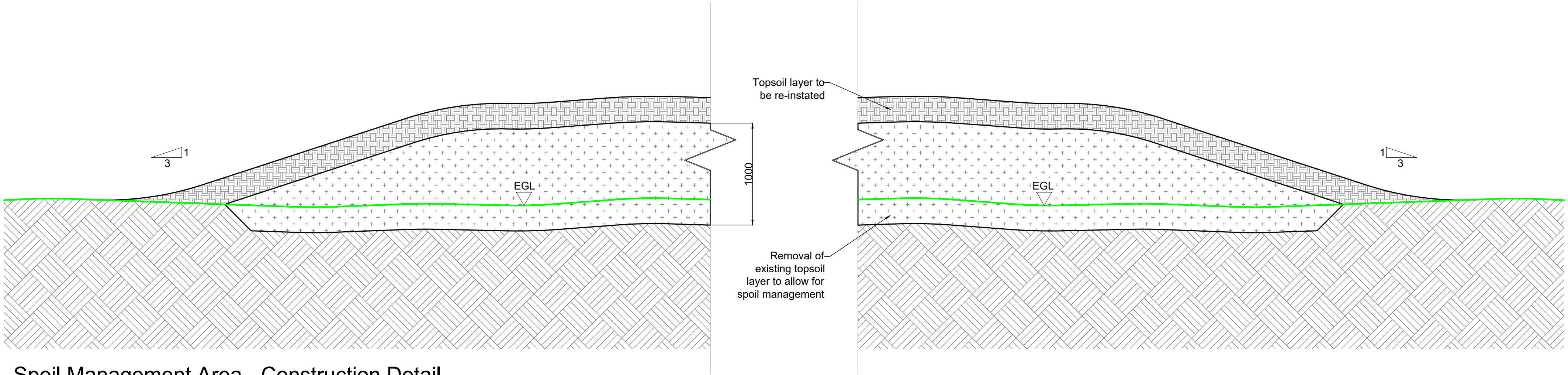
It is proposed to manage any excess overburden generated through construction activities locally within the Site, in identified spoil management areas, as shown in Figure 4-21, and in linear berms along access roads and turbine hardstand areas where appropriate.

The following recommendations and best practice guidelines for the placement of spoil in identified spoil management areas and in linear berms will be adhered to during the construction of the Proposed Project:

The total estimated volume of spoil to be managed following excavations during the construction phase of the Proposed Project is approximately 70,000m^3. It is proposed to manage any excess overburden generated through construction activities locally within the Site, by use of roadside berms where appropriate and grading the remaining spoil across identified spoil management areas, as shown in Figure 4-21 in Chapter 4. Some material arising from the construction of the Proposed Grid Connection underground cabling route will be sent to an appropriate licenced facility. The total capacity of the identified spoil management areas within the Site is approx. 74,000m^3 and therefore, in conjunction with roadside berms, there is more than enough capacity to manage the total volume of spoil requiring management for both the Proposed Wind Farm and the Proposed Grid Connection as detailed in Table 4-3 and Table 4-5 in Chapter 4 of the EIAR. The spoil management areas have been selected based on the locations of spoil generation, areas suitable for spoil management and avoiding environmentally constrained areas.

1. *At the identified spoil management areas, the vegetative top-soil layer will be removed to allow for spoil to be placed and upon reaching the recommended height, the vegetative topsoil layer will be reinstated.*
2. *The identified spoil management areas will be developed in a phased approach, with the topsoil removed and temporarily stockpiled within the defined area while the spoil is being placed. The stockpiled topsoil will then be reinstated over the placed spoil, and the exercise will continue within the same spoil management area until the area is full.*
3. *The placement of spoil will be restricted to a maximum height of 1.0m, subject to confirmation by the Geotechnical Engineer.*
4. *The material will be backfilled into the spoil management areas and will be spread evenly across the area.*
5. *It will be compacted to reduce air voids and reduce the migration paths for infiltration by precipitation. This will reduce the amount of potentially silt laden surface water run-off from these spoil management areas.*
6. *Where practical, the surface of the placed spoil is shaped to allow efficient run-off of surface water. Where possible, shaping of the surface of the spoil will be carried out as placement of spoil within the area progresses. This will reduce the likelihood of debris run-off and ensure stability of the placed spoil.*
7. *Finished/shaped side slopes of the placed spoil will be not greater than 1 (v): 2 (h) in the dedicated spoil management zones and not greater than 1 (v): 1 (h) for linear berms.*
8. *Inspections of the spoil management areas will be made by a Geotechnical Engineer through regular monitoring of the works. The appointed contractor will review work practices at spoil management areas when periods of heavy rainfall are expected so as to prevent excessive dirty water runoff from being generated.*
9. *An interceptor drain will be installed upslope of the identified spoil management areas to divert any surface water away from these areas where necessary.*
10. *Silt fences and double silt-fences will be emplaced down-gradient of spoil management areas and will remain in place throughout the entire construction phase, or until reseeding has been established to a sufficient level.*
11. *The surface of the deposited spoil will be profiled to a gradient to be agreed with the Geotechnical Engineer and vegetated or allowed to vegetate naturally as indicated by the Project Ecologist.*

All the above-mentioned general guidelines and requirements will be confirmed by the Geotechnical Engineer prior to construction.



Spoil Management Area - Construction Detail

Scale 1:40

Figure 4-21

PROJECT TITLE: Laurclavagh Renewable Energy Development, Co. Galway		
DRAWING TITLE: Spoil Management Cross Section Detail		
PROJECT No.: 210627	DRAWING No.: 210627 - 33	SCALE: 1:40 @ A4
DRAWN BY: JOB / CHECKED BY: TH	DATE: 05.03.2024	REVISION.: D01

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4.3.4 Site Activities

4.3.4.1 Environmental Management

All proposed activities on the site of the Proposed Project will be provided for in an environmental management plan. A Construction and Environmental Management Plan (CEMP) has been prepared for the Proposed Project and is included in Appendix 4-5 of this EIAR.

The CEMP sets out the key environmental considerations to be managed by the contractor during construction of the Proposed Project. The CEMP includes details of drainage, spoil management and waste management, and outlines clearly the mitigation measures and monitoring proposals that are required to be adhered to in order to comply with the environmental commitments outlined in the EIAR. In the event planning permission is granted for all elements of the Proposed Project, the CEMP will be updated prior to the commencement of the development, to address the requirements of any relevant planning conditions, including any additional mitigation measures which are conditioned and will be submitted to the Planning Authority for approval.

4.3.4.2 Refuelling

Wherever possible, vehicles will be refuelled off-site, particularly for regular road-going vehicles. On-site refuelling of machinery will be carried out at designated refuelling areas at various locations throughout the Site. Heavy plant and machinery will be refuelled on-site by a fuel truck that will come to the Site as required on a scheduled and organised basis. Other refuelling will be carried out using mobile double skinned fuel bowser. The fuel bowser will be parked on a level area on-site when not in use. All refuelling will be carried out outside designated watercourse buffer zones. Only designated trained and competent operatives will be authorised to refuel plant on-site. Mobile measures such as drip trays and fuel absorbent mats will used during refuelling operations as required. All plant and machinery will be equipped with fuel absorbent material and pads to deal with any event of accidental spillage.

4.3.4.3 Concrete Deliveries

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

Before leaving the site, washing of the delivery truck will be minimised and restricted to designated wash out areas. Wash out will be restricted to the concrete lorry's chute only. Concrete lorries will be washed out fully at the off-site batching plant, where facilities are already in place.

The small volume of water that will be generated from washing of the concrete lorry's chute will be directed into a temporary lined impermeable containment area, or a Siltbuster-type concrete wash unit or equivalent. This type of Siltbuster (or similar)unit catches the solid concrete and filters and holds wash liquid for pH adjustment and further solids separation. The residual liquids and solids will be removed off-site by an appropriately authorised waste collector for disposal at an authorised waste facility. Where temporary lined impermeable containment areas are used, such containment areas are typically built using straw bales and lined with an impermeable membrane. Two examples are shown in Plates 4-3 and 4-4 below.

Plate 4-3 Concrete Washout Area

Plate 4-4 Concrete Washout Area

Alternatively, a Siltbuster-type concrete wash unit or equivalent[3] may be used. 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.

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 initially be constructed with a subgrade and compacted with the use of a roller to allow concrete delivery trucks access all areas where the concrete will be

[3] (https://www.siltbuster.co.uk/sb_prod/siltbuster-roadside-concrete-washout-rcw/)

needed. The final wearing course for the roads will not be provided until all turbine foundations have been poured. 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 foundations 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.

4.3.4.4 Concrete Pouring

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 main pours will be planned days or weeks in advance.

Specific procedures will be adopted in advance of and during all concrete pours to minimise the risk of pollution. These will include:

- Using weather forecasting to assist in planning large concrete pours and avoiding large pours where prolonged periods of heavy rain is forecast.
- Restricting concrete pumps and machine buckets from slewing over watercourses 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.
- 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 (https://www.siltbuster.co.uk/sb_prod/siltbuster-roadside-concrete-washout-rcw/) or equivalent.

4.3.4.5 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/settlement ponds in the Proposed Wind Farm site's drainage system and will be pumped into a bowser or water spreader to dampen down haul roads and temporary construction 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.

4.3.4.6 Vehicle Washing

Wheels or vehicle underbodies are often washed before leaving sites to prevent the build-up of mud on public (and site) roads. It is not anticipated that vehicle or wheel washing facilities will be required as part of the construction phase of the Proposed Project because site roads will be formed before road-going trucks begin to make regular or frequent deliveries to the Site (e.g. with steel or concrete). 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 requires cleaning due to construction traffic associated with the Proposed Project.

4.3.4.7 Waste Management

The CEMP, Appendix 4-5 of this EIAR, provides a waste management plan (WMP) which outlines the best practice procedures during the construction phase of the project. The WMP outlines the methods of waste prevention and minimisation by recycling, recovery and reuse at each stage of construction of the Proposed Project. Disposal of waste will be a last resort.

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

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

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

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

4.4 Site Access and Transportation

4.4.1 Site Entrance

It is proposed to access the Proposed Wind Farm site with the provision of a new entrance off the existing L61461 Local Road. All construction traffic will enter onto the L61461 via a temporary access road off the N83 National Road, as can be seen in Figure 4-1 and 4-2. This temporary access track will be used for ingress of heavy goods vehicles (HGVs) and construction traffic only, and egress will be via the existing L61461 junction with the N83. The access arrangements will include the upgrade of approximately 358m of the L61461 between the proposed new Proposed Wind Farm site entrance and the proposed temporary road. The Proposed Wind Farm site access off the N83 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 Proposed Wind Farm site access for the safe egress of traffic.

It is proposed to access the onsite 110 kV substation which forms part of the Proposed Grid Connection through the above-mentioned Proposed Wind Farm site access arrangements.

The location of the Proposed Wind Farm site access is shown in Figure 4-21. A Traffic Management Plan is included in Chapter 15 and the CEMP in Appendix 4-5 of this EIAR. In the event planning permission is granted for the Proposed Project, the final Traffic Management Plan will address the requirements of any relevant planning conditions, including any additional mitigation measures which are conditioned.

4.4.2 Turbine Component Transport Route

It is proposed that large wind turbine components will be delivered to the Proposed Wind Farm site, from Galway Port, north through Galway city via the Lough Atalia Road, the R339 Wellpark Road, northwest onto the R336 Tuam Road, and north again onto the N83 Galway – Tuam National Road for approximately 19.2km. From the N83, turbine component loads will access the Site via a temporary access road to the west of the N83 for approximately 60m before joining up with the existing L61461 Local Road, which will be upgraded as part of the Proposed Project.

Construction materials such as concrete, and steel will follow the same transport route as the wind turbines from the National Road network to the Proposed Wind Farm site. All construction vehicles entering the Proposed Wind Farm site will enter from the north and south, via the temporary road as indicated on Figure 4-1.

All deliveries of turbine components and other construction materials to the Site will only be via the proposed transport routes outlined in Figure 4-23. No other public road route will be used as part of the construction phase of the Proposed Wind Farm site for the transport of materials.

Due to the nature of the Proposed Grid Connection underground cabling route, the proposed works will be transient in nature along the public road network in which the underground cabling route is proposed. As such, deliveries of construction materials will utilise the surrounding road network along the underground cabling route as it moves along the public road network in which its proposed.

The construction traffic that will be generated during the construction phase of the Proposed Project is outlined as part of the traffic and transport assessment in Section 14.1 of this EIAR.

4.4.2.1 Deliveries of Stone and Ready-Mix Concrete from Quarries

In order to facilitate the construction of the Proposed Project, all rock and hardcore material that will be required during the construction will be sourced from local, appropriately authorised quarries. The quarries that could potentially provide stone and concrete for the Proposed Project are as follows:

1. *Two Mile Ditch Quarry – Stone and concrete*
2. *Coshla Quarries – Stone*
3. *Harrington Concrete & Quarries – Stone and concrete*
4. *Castle Quarry Crushing and Plant Hire Ltd.*
5. *Mortimer Quarries – Stone, Asphalt & Concrete*

The locations of these quarries and ready-mixed concrete (RMC) batching plants together with the proposed routes to the Proposed Wind Farm site are shown in Figure 4-21. The potential routes for general construction materials for the purposes of this assessment, is as per the access routes considered for the turbine plant traffic with the additional following routes:

- N83 from the south

It should be noted that all construction related traffic will be traveling to the Proposed Wind Farm site via the N83 from the south in order to control construction traffic movements and ensure that they are utilising the temporary construction access road. The Site will not be access from the north using the N83.

Deliveries of stone and ready mixed concrete for use in construction of the Proposed Project, are discussed in further detail in Chapter 14 of this EIAR.

4.4.2.2 Turbine Delivery Route Accommodation Works

Works such as road widening are sometimes required along proposed turbine transport routes to accommodate the large turbine components and associated vehicles seeking to access wind farm sites. The proposed transport route for the Proposed Project has been the subject of a route assessment to determine if any works are required along its length. Full details of the assessment are included as part of the traffic impact assessment set out in Section 14.1.8 of this EIAR and summarised below. There are sections on the route where the vertical alignment may require specialist transport vehicles. These sections will be further considered by the appointed transport company following turbine procurement process. Accommodation works will be required at various locations on the national and regional road network between the port of arrival in Galway and the Proposed Wind Farm site. These are detailed below:

Locations in Galway

A swept path analysis was undertaken for the section of the turbine delivery route in Galway City and County between the Galway Harbour and the N83 National Road. These locations are as follows:

- Location 1: R339 signalised junction at Thermo King, and,
- Location 2: R336 Tuam Road junction at Trappers Inn.
- Location 3: N17/N6 Bothar na dTreabh junctions
- Location 4 N83/L61461, proposed temporary access for abnormally sized loads and standard HGVs during construction phase;
- Location 5: Proposed access junction off the L61461 for all traffic during construction and operation.

A swept path analysis was undertaken using Autotrack for the blade and tower transporter vehicles, and while traffic lights and street furniture will require to be removed during the delivery of the large plant, the assessment indicates that the large turbine delivery vehicles will be accommodated at these locations.

In the case of Location 4 (i.e. the temporary road), further details on this are provided in Section 4.4.1 above.

The proposed turbine delivery route is shown in Figure 4-24 and further detailed below.

Map Legend

- EIAR Site Boundary
- Proposed Turbine Location
- Proposed Hardstand Locations
- Proposed Substation
- Temporary Construction Compound
- Existing Roads For Upgrade
- Proposed New Roads
- Temporary Road

Drawing Title	Wind Farm Site Access Locations
Project Title	Laurclavagh Renewable Energy Development
Drawn By: KB	Checked By: ÓM
Project No.: 210627	Drawing No.: Figure 4-22
Scale: 1:25,000	Date: 2024-03-11

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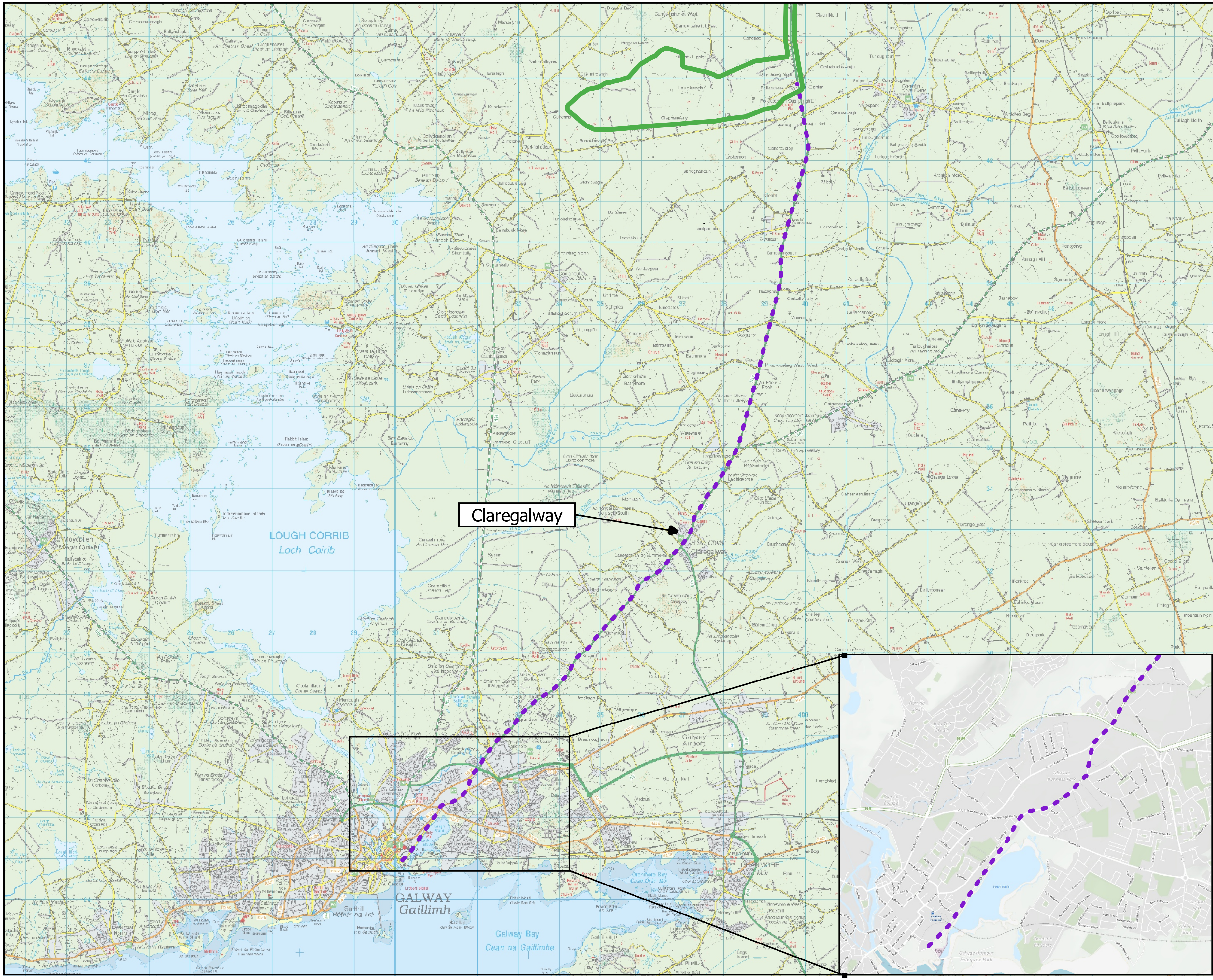

Map Legend

- EIAR Site Boundary
- Proposed Turbine Delivery Route

N

Drawing Title: Turbine Delivery Route	
Project Title: Laurclavagh Renewable Energy Development	
Drawn By: KB	Checked By: OM
Project No.: 210627	Drawing No.: Figure 4-23
Scale: 1:120,000	Date: 2024-01-30

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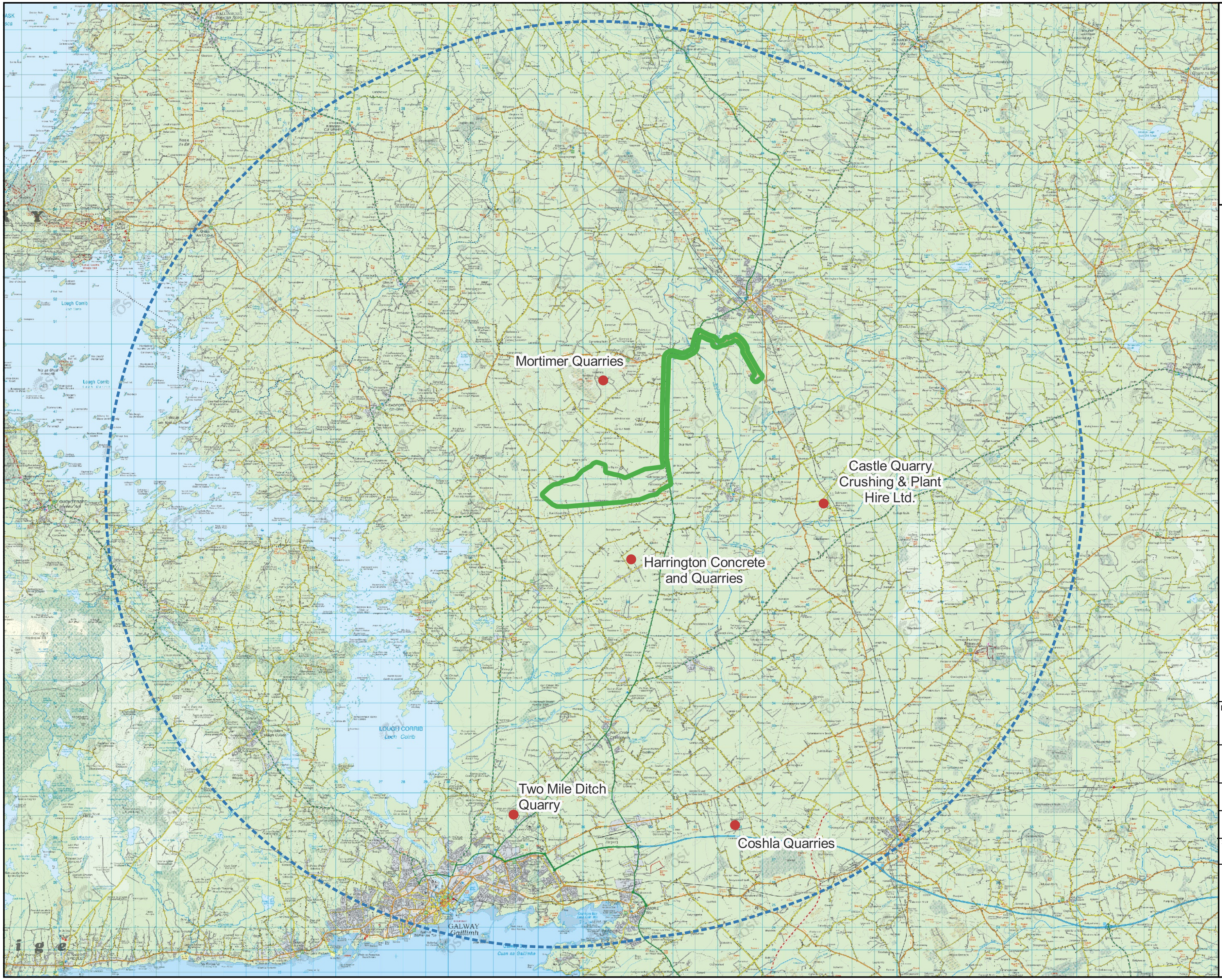

Map Legend

- EIAR Site Boundary
- 20 km Wind Farm site Buffer
- Nearby Quarries

Drawing Title	Local Quarry Locations
Project Title	Laurclavagh Renewable Energy Development
Drawn By: KB	Checked By: ÓM
Project No.: 210627	Drawing No.: Figure 4-24
Scale: 1:220,000	Date: 2024-03-01

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4.4.3 Traffic Management

A turbine with the maximum blade length of 81.5 metres has been used in assessing the traffic impact of the Proposed Project. The blade transporter for such a turbine blade would have a total vehicle length of 86.9 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 Project will be smaller than the design test vehicles. The turbine delivery vehicles have been modelled accurately in the Autotrack assessments for the Proposed Wind Farm 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 Project. 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 deliver oversized loads from origin to destination. With just under 400 No. wind farms already built and operating in Ireland (Republic and Northern Ireland combined, as per latest available figures on www.windenergyireland.com), transport challenges are something the wind energy industry and specialist transport sector has become particularly adept in finding solutions to.

As an alternative solution for transport of turbine blades, alternative delivery systems are available. For example, delivery vehicles fitted with blade adapters may be used in order to navigate the existing roads along the turbine delivery route. Blade adaptors allow the turbine blade to be transported at a suitable angle in order to navigate tight bends or obstacles along the delivery route. Plate 4-4 below shows an example of a blade adapter.

Plate 4-5 Blade adaptor transport system

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 Proposed Wind Farm site may be made in convoys of three to four vehicles at a time, and 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 potential routes 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 the relevant Authorities. All turbine deliveries will be provided for in a Traffic Management Plan which will be finalised in advance of oversized load deliveries, when the exact transport arrangements are known, delivery dates confirmed and escort proposals in place. Such a traffic management plan is typically submitted to the relevant Authorities 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 Site Drainage

4.5.1 Introduction

The drainage design for the Proposed Project has been prepared by Hydro Environmental Services Ltd. (HES). The drainage design has been prepared based on experience of the project team of other wind farm sites, and the number of best practice guidance documents referred to in the Bibliography section of the EIAR.

The protection of groundwater and surface water within and surrounding the Proposed Project site, and downstream catchments that they feed has been of utmost importance in considering the most appropriate drainage proposals for the site of the Proposed Project.

The Proposed Wind Farm site drainage design has therefore been proposed specifically and ensures minimal impact with regards the existing flow regime across the Proposed Wind Farm site, in particular having no negative impact on the water quality of the Site and consequently no impact on downstream catchments and ecological ecosystems. No surface watercourses exist within the site; therefore all surface water/rainfall will infiltrate to ground.

Watercourses are absent within the Proposed Wind Farm site, surface water runoff that will occur at site infrastructure that will need to be recharged locally into subsoils. This recharge water will occur close to source and can infiltrate vertically to groundwater below the Proposed Wind Farm site. There will be no direct discharges to any natural watercourses, with all drainage waters being directed to infiltration areas which will capture any entrained sediment and allow the water to recharge to ground.

As the Proposed Grid Connection underground cabling route, during the Construction phase, is a temporary narrow trench excavated and backfilled along existing roadways, the scale and scope of the drainage measures imposed along the Proposed Grid Connection underground cabling route will be reduced in comparison to the Proposed Wind Farm site drainage. Nonetheless, the mitigation measures incorporated along the Proposed Grid Connection underground cabling route, such as silt fences and the covering of stockpiles during rainfall events will ensure that there are no effects on downstream surface water quality as a result of the Proposed Grid Connection underground cabling route.

4.5.2 Drainage Design Principles

The key principles of drainage design that will be implemented and adhered to as part of the Proposed Project are as follows:

- Keep clean water clean by intercepting it where possible, upgradient of works areas, and divert it around the works areas for discharge/recharge to ground.
- Collect potentially silt-laden runoff from works areas via downgradient collector drains and manage via series of avoidance, source, in-line treatment and discharge to ground via infiltration drains and infiltration areas.
- There is no direct hydraulic connectivity from proposed construction areas to natural watercourses or drains connecting to downstream watercourses.
- Maintain the existing hydrology/hydrogeology of the Site.
- Re-routing existing local drainage pathways as required.
- Daily inspection and recording of surface water management system by on-site clerk of works and immediate remedial measures to be carried out as required and works temporarily ceased if a retained stormwater/sediment load is identified to have the potential to migrate from the Site.

Drainage water from any works areas of the Site 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 via recharge.

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 4-26 below.

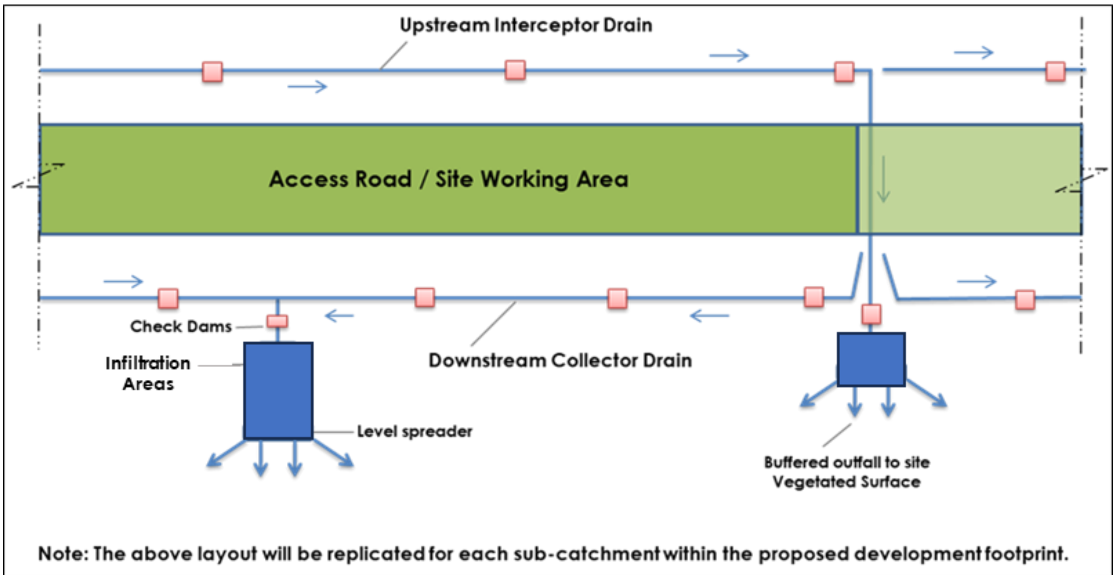


Figure 4-25 Proposed Project Drainage Process Flow

4.5.3 Drainage Design

A drainage design for the Proposed Project, incorporating all principles and measures outlined in this drainage design description, has been prepared, and is included in Appendix 4-6 to this EIAR. The drainage design employs the various measures further described below and is cognisant of the following guidance documents:

- Inland Fisheries Ireland (2016): Guidelines on Protection of Fisheries during Construction Works in and Adjacent to Watercourses;
- Good Practice During Wind Farm Construction (Scottish Natural Heritage, 2010);
- TII (2014) – Drainage Design for National Road Schemes – Sustainable Drainage Options;
- PPG1 - General Guide to Prevention of Pollution (UK Guidance Note);
- PPG5 – Works or Maintenance in or Near Watercourses (UK Guidance Note);
- CIRIA (Construction Industry Research and Information Association) 2006: Guidance on 'Control of Water Pollution from Linear Construction Projects' (CIRIA Report No. C648, 2006);
- CIRIA 2006: Control of Water Pollution from Construction Sites - Guidance for Consultants and Contractors. CIRIA C532. London, 2006; and
- Dublin City Council - Sustainable Drainage Design & Evaluation Guide 2021

4.5.3.1 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 will remain in-situ. Any areas in which works were carried out to construct roads, turbine bases or hardstands, will have been built up with engineered fill, which even when compacted in place, will retain sufficient void space to allow water to infiltrate the subsurface of these constructed areas. It is not anticipated that roadways or other installed site infrastructure will intercept ground-conveyed surface water runoff to any significant extent that would result in scouring or over-topping or spill-over.

The velocity of flow in the interceptor will be controlled by check dams (see Section 4.6.3.4 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 predominantly installed horizontally across slopes to run in parallel with the natural contour line of the slope. Intercepted water will travel along the interceptor drains, pass through piped drains, and onto areas downgradient of works areas where the drain will terminate at a level spreader (see Section 4.5.3.6 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.

4.5.3.2 Collector/Infiltration Drains

Collector/Infiltration drains are drains that will be used to intercept and collect runoff from construction areas of the Site during the construction phase. These swales will remain in place to collect runoff from roads and hardstanding areas of the Proposed Wind Farm site during the operational phase. A collector drain 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. They are similar in design to interceptor drains described above.

Collector/Infiltration 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. All water collected within the drain will ultimately recharge to ground.

4.5.3.3 Infiltration Areas

An infiltration area 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 infiltration areas will be located downgradient of any proposed works areas where possible 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 infiltration area will distribute clean drainage water onto vegetated areas where the water will infiltrate to ground. 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 4-26 above, shows an illustrative example of a level spreader.

4.5.3.4 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 drain is non-erosive.

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.

The proposed check dams will be made up of stone. Clean 4-6 inch stone will be built up on a layer of Terram and secured in place with pairs of stakes. A detail for this is shown on the design drawings.

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.

Check dams will not be used in any natural watercourses, only artificial drainage channels, interceptor drains and swales. 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.

4.5.3.5 Culverts

No surface watercourses have been mapped within the Proposed Wind Farm site. Modelling of potential surface waterflow-paths has been completed based on topography of the Site which has identified potential flow-paths which surface water could take. Where these locations cross proposed or upgraded access roads, culverts have been incorporated into the design.

4.5.3.6 Land Drains

Piped drains will be used to convey surface runoff from collector and interceptor drains safely downslope of the infrastructure. From here, water is dispersed through the level spreaders or to settlement ponds.

The piped 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.

Piped drains will be inspected weekly and following rainfall events. Inlet and outlets will be checked for sediment accumulation and blockage.

4.6 Construction Management

4.6.1 Construction Timing

It is estimated that the construction phase of the Proposed Project will take approximately 18-24 months from commencement of civil works to the full commissioning of the wind turbines. The commencement of works where the removal of vegetation is required, or where works take place in sensitive breeding habitats will be scheduled to occur outside the bird breeding season (1st March to 31st August) to avoid any potentially significant effects on nesting birds. Construction may commence from September to March so that construction activities are ongoing by the time the next bird breeding season comes around and can continue throughout the bird breeding season.

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

4.6.2 Construction Sequencing

The construction phase can be broken down into four main phases, which overlap partially and will take approximately 18-24 months to complete: 1) civil engineering works - 10 months, 2) electrical works including grid connection works - 9-12 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:

- Erect all necessary safety signage.
- Create new entrance(s) and hardcore existing entrances (where required).
- Clear and hardcore area for temporary site offices. Install same.
- Construct bunded area for oil storage.
- Construct new site roads and hard-standings and crane pads.
- Construct drainage ditches, culverts etc. integral to road construction.
- Excavate/pile for turbine bases where required. 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 3-5 days.
- Backfill tower foundations and cover with previously stored granular material.
- Excavate trenches for site cables, lay cables and backfill. Provide ducts at road crossings.
- Complete site works, reinstate site.
- Remove temporary site offices. Provide any gates, landscaping, signs etc. which may be required.

Electrical Works:

- Construct the substation compound hardcore footprint, including ancillary temporary construction compound.
- Establish the temporary construction compound.
- Construct bases/plinths for substation building.
- Install external electrical equipment at substation.
- Install transformer at compound.
- Erect stock proof and palisade fencing around substation area.
- Install internal collector network and communication cabling.
- Establish traffic management.

- Excavate and install pre-cast concrete joint bays.
- Excavate trench for ducting & place ducting, backfill with graded granular fill material, reinstate temporary surface.
- Install cable, including jointing.
- Test installation and carry out permanent reinstatement of carriageway.
- Commission the substation.

Turbine and Met Mast Erection and Commissioning:

- Set up erection crane(s) and deliver components to hardstands.
- Erect towers, nacelles and blades.
- Complete electrical installation.
- Install meteorological mast.
- Commission and test turbines.
- Complete site works and reinstate site.
- Provide any gates, landscaping, signs etc. which may be required.
- Remove temporary site offices.

All relevant Site Health & Safety procedures, in accordance with the relevant Health and Safety Legislation and guidance (listed in Section 5.8.2.1 of this EIAR), including the preparation of the Health & Safety Plan, erection of the relevant and appropriate signage on site, inductions and toolbox talks will take place prior to and throughout the construction phase of the Proposed Project. Further details of on-site health, safety and welfare are included in Chapter 5 of this EIAR.

The phasing and scheduling of the main construction task items are outlined in Figure 4-25 below, where 1st January has been selected as an arbitrary start date for construction activities.

			Year 1				Year 2			
ID	**Task Name**	**Task Description**	**Q1**	**Q2**	**Q3**	**Q4**	**Q1**	**Q2**	**Q3**	**Q4**
1	Site Health and Safty									
2	Grid Connection	Construct grid connection to Athlone 110kV substation								
3	Site Compounds	Site Compounds, site access, fencing, gates								
4	Site Roads	Construction/upgrade of roads, construct underpasses install drainage measures, install water protection measures								
5	Substation and Electrical Works	Constuction substation, underground cabling between turbines								
6	Turbine Hardstands	Excavate/pile for turbine bases where required								
7	Turbine Foundations	Fix reinforcing steel and anchorage system, erect shuttering, concrete pour								
8	Backfilling and Landscaping									
9	Turbine Delivery and Erection									
10	Substation Commissoning									
11	Turbine Commisioning									

Figure 4-26 Indicative Construction Schedule

4.6.3 Construction Phase Monitoring and Oversight

The requirement for a CEMP to be prepared in advance of any construction works commencing on any wind farm development site and submitted for agreement to the Planning Authority is now well-established. The procedures for the implementation of the mitigation measures outlined in the CEMP and their completion is audited by way of a CEMP Audit Report.

The CEMP Audit Report will list all mitigation measures prescribed in any of the planning documentation and all conditions attached to the grant of planning permission 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 adherence to mitigation measures must be the subject of regular review and audit during the full construction stage of the project. If 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 CEMP has been prepared for the Proposed Project and is included in Appendix 4-5 of this EIAR. The CEMP includes details of drainage, overburden management, waste management etc, and describes how the above-mentioned Audit Report will function and be presented. In the event planning permission is granted for the Proposed Project, the CEMP will be updated prior to the commencement of the development, to address the requirements of any relevant planning conditions, including any additional mitigation measures which are conditioned and will 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 the CEMP and compiled in the Audit Report. Their implementation will be overseen by the ECoW 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.

4.7 Construction Methodologies

4.7.1 Proposed Wind Farm

4.7.1.1 Turbine Foundations

Each of the turbines to be erected on site will have a reinforced concrete base. As detailed above in Section 4.3.1.2, numerous intrusive site investigations were undertaken across the Proposed Wind Farm site, to provide detail and clarity on the nature and extent of subsoils and bedrock as a means of characterising the site. This assisted in providing additional information on the most suitable location for turbines and associated infrastructure. Full details and results from the Site investigation works are detailed in Appendix 4-2, 4-3 and 4-4 of this EIAR.

Where the foundation of the turbine is founded on competent strata, overburden will be stripped off the foundation area to a suitable formation using a 360° excavator and will be placed across the Site as close to the excavation as practical. A two-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 sealed using the back of the excavator bucket and 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 be raised with Clause 6F2 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 be pumped to an adjacent settlement pond.

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

4.7.1.2 Site Roads and Hardstand Areas

4.7.1.2.1 *New Site Access Road*

The construction methodology for the proposed new access roads and turbine hardstands is outlined as follows:

- Establish alignment of the new site road from the construction drawings and mark out the centrelines with ranging rods or timber posts;
- The proposed new roads will remain at the same ground level as the existing;
- All drainage measures prescribed in the detailed drainage design for the Proposed Project will be implemented around the works area;
- The road layout has been designed to avoid crossings of natural watercourses where possible;
- Where existing culverts are to be upgraded or extended, the works will be carried out to follow a method statement to be prepared in consultation with Inland Fisheries Ireland;
- The access tracks will be of single-track design with a width of 5m with localised widening at bends and changes in direction. (depending on the location within the Proposed Wind Farm site);
- All excavated material will be managed on-site. Some topsoil will be temporarily stockpiled locally for reuse for landscaping purposes.

- The subsoil will be excavated down to a suitable formation layer of either firm clay or bedrock and managed on-site in the spoil management areas;
- The subsoil will be excavated down to a suitable formation layer of competent stratum;
- The road will be constructed using well-graded imported granular fill, spread and compacted in layers typically of 200mm and a suitable capping layer to provide a homogeneous running surface. The thickness of layers and amount of compaction required will be subject to detailed design by Project Engineer in consultation with the Construction Manager based on the characteristics of the material and the compaction plant to be used;
- The new access roads will be constructed with a camber to aid drainage of surface water;
- Excavations side slopes shall not generally be greater than 1(V): 2 (H), . Design slopes will be informed by the Geotechnical Engineer;
- At bends or steep inclines from the road, reflective snow poles will be erected to warn traffic on dark mornings and evenings that there is a turn in the road or a sharp incline beyond the site road.
- Where underground services are to be traversed during the construction of new roads throughout the Proposed Wind Farm site, they will be traversed as per the methodology as outlined above, as it is not anticipated that any existing services will be encountered when excavating the proposed new site access roads due to the nature of the works.

4.7.1.2.2 Upgrading of Existing Site Access Road

Approximately 1.5km of the existing roads will require upgrading which will comprise widening of the roadway to a total running width of approximately five metres, with wider sections at corners and the laying of a new surface dressing on the existing section of roadway where necessary. It is proposed to reinstate the L61461 Local Road post construction to its original running width by re-constructing the stone wall, which will be in character with what exists along the L61461 pre-construction. A detailed drawing of this is included within the planning drawings associated with this EIAR and Planning Application. The road widening will be undertaken as follows:

- If it is considered that the current road formation level is adequate to support required bearing, then no upgrade or widening works will be completed;
- Otherwise, where required, the subsoil in the existing road verge will be excavated down to a suitable formation layer.
- All drainage measures prescribed in the detailed drainage design for the Proposed Project will be implemented around the works area;
- Well-graded imported granular fill will be spread and compacted in layers up to 200mm to provide a homogeneous running surface. The thickness of layers and amount of compaction required will be decided by the Construction Manager based on the characteristics of the material and the compaction plant to be used. These layers of granular fill will be brought to the same level as the top of the existing road surface;
- A layer of geogrid will be installed directly onto the top of the granular fill layer and the existing road surface where required;
- A layer of finer well graded stone for the running surface will be laid on the geogrid and compacted; and
- Prior to any works commencing on the upgrade of existing roads, the requirement for additional roadside drainage will be considered by the Project Hydrologist in line with the proposals outlined in Section 4 of the CEMP.

4.7.1.3 Temporary Construction Compound

The temporary construction compound 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 as discussed in Section 4.3.2.3 above;
- A layer of geo-grid will be installed where deemed necessary by the designer 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;
- A bunded containment area will be provided within the compound for the storage of lubricants, oils and site generators etc;
- A waste storage area will be provided within the compound;
- The compound will be fenced and secured with locked gates if necessary; and,
- Upon completion of the construction phase of the Proposed Project, the temporary construction compound will be decommissioned and allowed to vegetate naturally.

4.7.1.4 Underground Electrical (33kV) and Communication Cabling

The transformer in each turbine is connected to the onsite 110kV substation through a network of buried electrical cables. The ground is trenched typically using a mechanical excavator. The top layer of soil is removed and saved so that it is replaced on completion. The cables are bedded with suitable material unless the ground conditions are such that no bedding is required. The cables will be laid at a depth that meets relevant national and international requirements and will generally be approximately 1.2m below ground level; a suitable marking tape is installed between the cables and the surface (see Plate 4-6 below). On completion, the ground will be reinstated as previously described above in Section 4.3.2.4. The route of the cable ducts will follow the access track to each turbine location and are shown on the site layout drawings included as Appendix 4-1 of the EIAR. The cabling may be located on either side of the road and/or within the road footprint.

Plate 4-6 Typical Cable Trench View

Where any underground services are encountered along the internal wind farm IPP cabling route, they will be traversed using one of the methods outlined in Section 4.7.2.9.

4.7.2 Proposed Grid Connection

4.7.2.1 Onsite 110kV Substation and Control Buildings

The proposed onsite 110kV substation will be constructed by the following methodology:

- The area of the onsite 110kV substation will be marked out using ranging rods or wooden posts and the soil and overburden stripped and removed to a nearby spoil management area for later use in landscaping. Any excess material will be sent to one of the on-site spoil management areas .
- 2 no. control buildings will be built within the onsite 110kV substation compound;
- The building 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 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 transformer and electrical equipment plinths 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 electrical equipment will be installed and commissioned.
- Perimeter fencing will be erected.
- The construction and components of the onsite 110kV substation will be built to EirGrid specifications.

4.7.2.2 Temporary Construction Compound

The temporary construction compound adjacent to the proposed onsite 110kV substation 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 onsite 110kV substation platform as discussed in Section 4.3.2.3 above;
- A layer of geo-grid will be installed where deemed necessary by the designer 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;
- A bunded containment area will be provided within the compound for the storage of lubricants, oils and site generators etc;
- A waste storage area will be provided within the compound;
- The compound will be fenced and secured with locked gates if necessary; and,

- Upon completion of the construction phase of the Proposed Project, the temporary construction compound will be decommissioned and allowed to vegetate naturally.

4.7.2.3 Underground Cabling (110kV)

The underground cabling works will consist of the installation of ducts in an excavated trench to accommodate power cables, and a fibre communications cables to allow communications between the proposed 110kV onsite substation and the existing 110kV Cloon substation. Further details are included in Appendix 4-8: Grid Connection Infrastructure.

The underground cabling will be laid beneath the surface of the Proposed Wind Farm and the public road using the following methodology:

- Before works commence, updated surveying will take place along the proposed cable route, with all existing culverts identified. All relevant bodies i.e. ESB, Galway County Council, etc. will be contacted and all up to date drawings for all existing services sought.
- When the cable is located on public roads, a traffic management plan will be prepared prior to any works commencing. A road opening licence will be obtained where required and all plant operators and general operatives will be inducted and informed as to the location of any services.
- A tracked 360-degree excavator will then proceed to dig out the proposed trench, typically to a depth of 1200mm, within which the ducts will be laid.
- The cable ducts will be concrete surrounded where they pass under the public road and under drains or culverts.
- Trench supports will be installed, or the trench sides will be benched or battered back where appropriate and any ingress of ground water will be removed from the trench using submersible pumps, fitted with appropriate silt filtration systems, to prevent contamination of any watercourse.
- Once the trench has been excavated, a base-layer will be laid and compacted, comprising Clause 804, or 15 Newton CBM4 concrete as required.
- The ducting will be installed as per specification, with couplers fitted and capped to prevent any dirt etc. entering the duct. In poor ground conditions, the ends of the 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.
- As the works progress, the as-built location of the ducting will be recorded using a total station or GPS.
- As per the associated base-layer (Clause 804 material or 15 Newton CBM4 concrete) will be installed and compacted as per approved detail, with care not to displace the ducting.
- Spacers will be used to ensure that the correct cover is achieved at both sides of the ducting.
- The remainder of the trench will be backfilled in two compacted layers with approved engineer's specified material.
- Yellow marker warning tape will be installed across the width of the trench, at 300mm depth,
- The finished surface is to be reinstated, as per original specification. Off-road cabling may be finished with granular fill to facilitate access to the trench for any potential maintenance that is required during the operational phase of the Proposed Project.

Marker posts will then be placed at regular intervals (generally at joint bays and any change in direction) to denote the location of the underground power cables.

4.7.2.4 Existing Underground Services

Any underground services encountered along the underground cabling route 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 proposed ducting, with marker tape on the side of the trench. Back fill around any utility services will be with dead sand/pea shingle where appropriate, as detailed in Appendix 4-8: Grid Connection Infrastructure.

4.7.2.5 Enabling Works

A preliminary site investigation has been completed to inform overall feasibility of the proposed route. The preliminary investigation included a series of slit trenches at potential conflict points and boreholes at proposed HDD locations. It is noted that further site investigations may be required to gather additional information on the road cover available over existing bridges and culverts with the relevant local authority approval.

4.7.2.6 Site Preparations

Prior to beginning construction work the contractor will scan the proposed route with a cable avoidance tool (CAT), carry out visual inspection of the area and may carryout out further below ground surveys if deemed necessary. If any previously unidentified services are discovered the site engineer will inform the design of the issues and possibly recommend a solution that works with the new constraints.

In some instances, it may be necessary to relocate existing underground services such as water mains or existing cables. In advance of any construction activity, the contractor will undertake additional surveys of the proposed route to confirm the presence or otherwise of any services. If found to be present, the relevant service provider will be consulted with in order to determine the requirement for specific excavation or relocation methods and to schedule a suitable time to carry out works.

If existing low voltage underground cables are found be present, a trench will be excavated, and new ducting and cabling will be installed along the new alignment and connected to the network on either end. The trench will be backfilled with suitable material to the required specification. Warning strip and marking tape will be laid at various depths over the cables as required. Marker posts and plates will be installed at surface level to identify the new alignment of the underground cable, the underground cables will then be re-energised.

In the event that water mains are encountered the water supply will be turned off by the utility so work can commence on diverting the service. The section of existing pipe will be removed and will be replaced with a new pipe along the new alignment of the service. The works will be carried out in accordance with the utility standards.

4.7.2.7 Trenching and Ducting

The proposed cable will be installed in a series of ducts in an excavated trench. Trenching will be achieved using a mechanical excavator. The top layer of soil or road surfacing will be removed and stockpiled separately for reuse. Material stockpiles should be stored at least 15 m back from drains and watercourses on level ground with a silt fence inserted at the base to prevent runoff.

The trench base will be graded and smoothed once the required depth and width is achieved. A layer of bedding material will be placed and compacted to the required specification on the trench floor prior to laying the ducts in trefoil formation.

The ducting surrounds will be carefully backfilled and compacted in accordance with the required specification. Cable protection strips will be placed on compacted material directly above the ducting. A secure cap will be placed at the end of each duct to prevent the ingress of dirt or water.

Ground water and surface water accumulating in the base of trenches will not be pumped directly to roadside drains or watercourses unless it is clean and free from solids. Contaminated water will be either treated onsite prior to discharge or tankered offsite to a suitably licensed disposal facility.

For concrete and asphalt/bitumen road sections, surfaces will be permanently reinstatement in accordance with the specification and to the approval of the local authority and/or private landowners, unless otherwise agreed with local authorities. All trench works carried out in public roadways will be carried out in accordance with *'Guidelines for Opening, Backfilling and Reinstatement of trenches in Public Roads'* and any other conditions imposed by the relevant road authority.

For unsurfaced/grass sections, trenches will be backfilled with suitable excavated material to ground level leaving at least 100 mm topsoil or match existing level at the top to allow for seeding or replace turves as per the specification of the local authority or landowner.

Ducting will be cleaned and tested in accordance with the specification by pulling through a brush and mandrel. A draw rope will be installed in each duct in preparation for cable installation at a later date.

4.7.2.8 Joint Bays

Joint bays are typically 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 800 metres intervals or as otherwise required by ESB/Eirgrid and electrical requirements. Joint Bays are typically 2.5m x 6m x 1.75m pre-cast concrete structures installed below finished ground level.

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. Joint Bays will be located in the non-wheel bearing strip of roadways, however given the narrow profile of local roads this may not always be possible. During construction the joint bay locations will be completely fenced off once they have been constructed, they will be backfilled until cables are being installed. Once the cabling is installed the joint bays will be permanently backfilled with the existing surface re-instated and there will be no discernible evidence of the joint bay on the ground.

In association with Joint Bays, Communication Chambers are required at every joint bay location to facilitate communication links between the onsite 110kV substation and the existing 110kV Cloon substation. Earth Sheath Link Chambers are also required approximately every second joint bay along the cable route. Earth Sheath Links are used for earthing and bonding cable sheaths of underground power cables, installed in a flat formation, so that the circulating currents and induced voltages are eliminated or reduced. Earth Sheath Link Chambers and Communication Chambers are located in close proximity to Joint Bays. Earth Sheath Link Chambers and Communication Chambers will be pre-cast concrete structures with an access cover at finished surface level. The locations of the joint bays and chambers are shown on the Grid Connection Infrastructure in Appendix 4-8.

The precise siting of all Joint Bays, Earth Sheath Link Chambers and Communication Chambers within the planning corridor assessed is subject to approval by ESBN and Eirgrid.

4.7.2.9 Cable Installation and Watercourse/Service Crossings

The installation of cabling normally involves pulling three individual conductors into three separate ducts. The cable pulling winch must be set at a predetermined cut off pulling tension as specified by the designer. The cable will be connected to the winch rope using approved suitably sized and rated cable pulling stocking and swivel or the pulling head fitted by the cable manufacturer. Once the "two sections" of cable are pulled into the joint bay, a jointing container will be positioned over the joint bay and the cable jointing procedure carried out in this controlled environment.

Following the completion of jointing and duct sealing works in the joint bay, place and thoroughly compact cement-bound sand in approximately 200 mm layers to 100mm above the top of the cable joint base to provide vertical support. A cable protection strip will be installed at this depth and the joint bay backfilled with cement-bound sand and reinstated to match surrounding areas.

The Proposed Wind Farm component of the Proposed Project will not require the crossing of any existing streams or watercourses. However, a total of 4 no. existing watercourse crossings and 1 no. Motorway crossing will be traversed along the N83 National Road and the L6141 to cater for the Proposed Grid Connection collector cable and underground cabling route towards the existing Cloon 110kV substation. The locations of the watercourse and motorway crossings are shown on Figure 4-28 and details of each crossing are show in Figures 4-29 – 4-32 below. The watercourse crossing methodologies for the provision of the Proposed Grid Connection underground cabling component at these locations is set out below with the most appropriated option being selected for each crossing. In stream works are not required at any watercourse crossing along the proposed IPP cable route or Proposed Grid Connection underground cabling route.

Should an alternative methodology option listed below be required for individual crossings during the construction process this will be agreed with the relevant authorities including Galway County Council prior to works commencing.

4.7.2.9.1 *Crossing Using Standard Trefoil Formation – Option A*

Watercourses will not be directly impacted upon since no instream works or bridge/culvert alterations are proposed. Where adequate cover exists above a bridge/culvert or where a new bottomless box culvert or clear-span structure has been installed, the standard ESB approved trefoil arrangement will be used where the cable ducts pass over a culvert without any contact with the existing culvert or water course. The cable trench will pass over the culvert in a standard trench.

4.7.2.9.2 *Flatbed Formation Under Bridges/Culverts – Option B*

Where cable ducts are to be installed under an existing bridge/culvert crossing 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 of excavatable material under a bridge. The ducts will be laid in this trench in a flatbed formation over the existing culvert and will be encased in 6mm thick steel galvanized plate with a 35N concrete surround as per ESB Networks specification.

Any addition of a new pavement will be tied back into the existing road pavement at grade. After the crossing under the culvert has been achieved, the ducts will resume to the trefoil arrangement within a standard trench.

4.7.2.9.3 *Flatbed Formation over Bridges/Culverts – Option C*

Where cable ducts are to be installed over an existing bridge/culvert crossing 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 of excavatable material over a bridge. The ducts will be laid in this trench in a flatbed formation over the existing culvert and will be encased in 6mm thick steel galvanized plate with a 35N concrete surround as per ESB Networks specification.

Where a bridge or culvert has insufficient cover depth to fully accommodate the required trench, the ducts can be laid in a flatbed formation partially within the existing road surface. 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 raise the pavement level locally to fully cover the ducts. The increased road level will be achieved by overlaying the existing pavement with a new wearing 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.

4.7.2.9.4 Horizontal Directional Drilling – Option D

Horizontal Directional Drilling (HDD) will be utilised at the following locations:

- WC2 – Bridge Crossing over River Clare
- Crossing under M17 Motorway

The horizontal directional drilling method of duct installation is carried out using Vermeer D36 x 50 Directional Drill (approximately 22 tonnes), or similar plant. The launch and reception pits will be approximately 2.5mm wide, 2.5m long and 2.0m 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 will 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 will 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™ and water is pumped through the centre of the drill rods to the reamer head and is forced in to void and enables the annulus which has been created to support the surrounding subsoil 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 impacts 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 a licensed recovery facility.

Backfilling of launch & reception pits will be conducted in accordance with the normal specification for backfilling excavated trenches. Sufficient controls and monitoring, as listed below, will be put in place during drilling to prevent frack-out, such as the installation of casing at entry points where reduced cover and bearing pressure exits.

- The area around the Clear Bore™ batching, pumping and recycling plants shall be bunded using terram and sandbags in order to contain any spillages;
- One or more lines of silt fences shall be placed between the works area and adjacent rivers and streams on both banks;

- Accidental spillage of fluids shall be cleaned up immediately and transported off site for disposal at a licensed facility; and,

Adequately sized skips will be used for temporary storage of drilling arisings during directional drilling works. This will ensure containment of drilling arisings and drilling flush. This is shown in Figure 4-32.

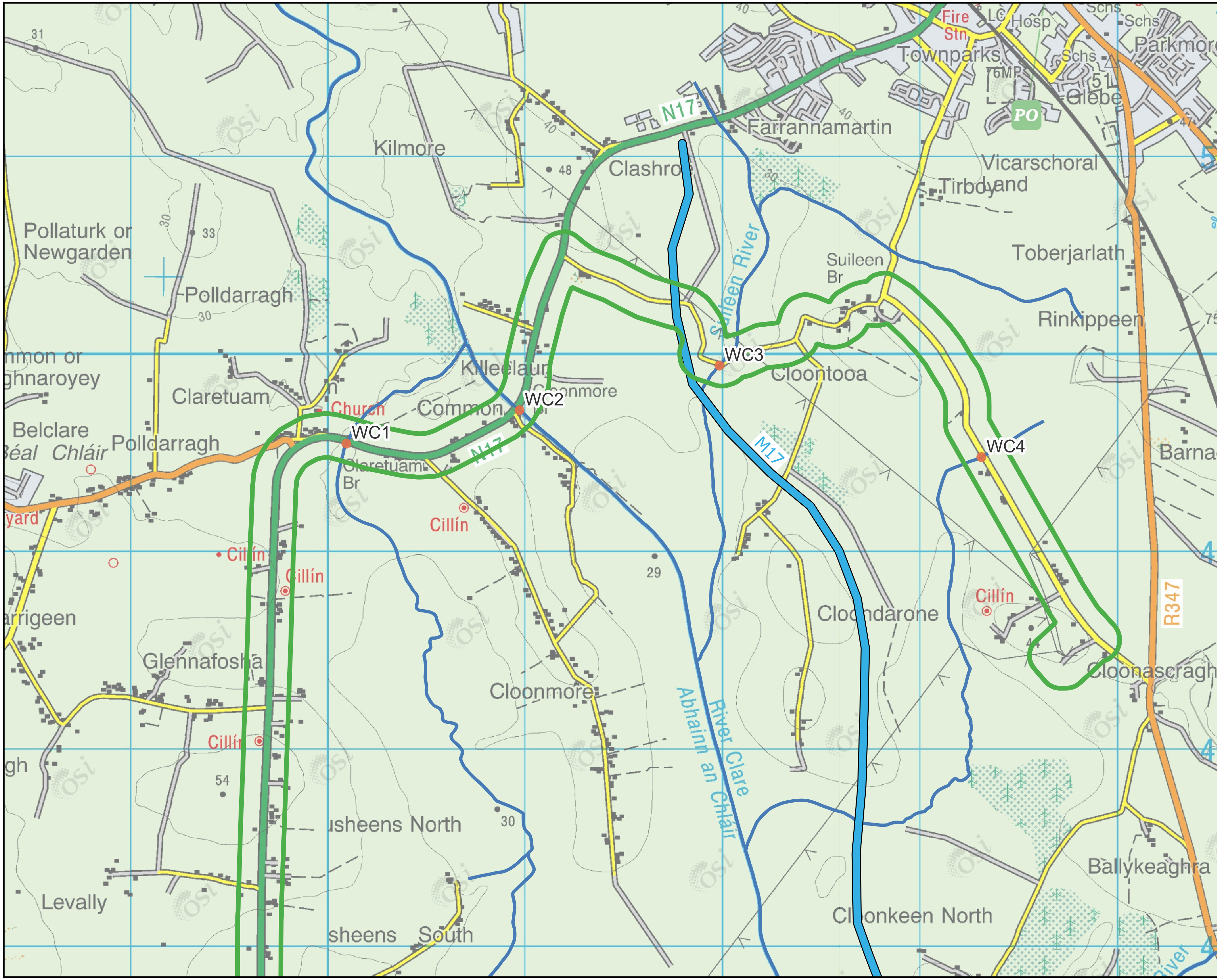
Table 4-4 Culvert Survey Summary and Crossing Methodology

Watercourse Crossing Reference No.	Watercourse Type	Width of Channel (m)	Cover from Road Level to Top of Culvert (m)	Crossing Type Description	Watercourse Crossing Type	Extent of in-channel works
WC1	Double concrete pipe crossing	14.3	0.7	High water levels flowing through this bridge which had a small channel which appeared to be quite overgrown with vegetation. There is sufficient separation distance to accommodate the standard trefoil cable passing over the watercourse without any amendment to the trench or ducting profile	Option A	None. No in-stream works required.
WC2	Clearspan Bridge	11.8	1.25	The River Clare is a fast flowing channel. This existing crossing is along the N83 National Road, with a footpath along the bridge. The original bridge structure appeared to be a stone-arch bridge which had a newer clearspan structure built on top. The laying of cables under the existing watercourse by directional drilling ensures that no contact will be made with the watercourse during the works.	Option D	None. No in-stream works required
WC3	Stone-Arch Bridge	7.5	0	This stone arch bridge passed over a watercourse with stagnant water and a high level of vegetation. There is sufficient cover from the top of the bridge to the road on this watercourse crossing to lay the cables in a flat formation on top of the existing crossing. This scenario ensures that the cable trench will have no impact on the existing bridge structure and watercourse	Option C	None. No in-stream works required

WC4	Concrete Pipe	1	1	Fast-flowing stream, much lower than the existing road level. There is sufficient separation distance to accommodate the standard trefoil cable passing over the watercourse without any amendment to the trench to the trench or ducting profile	Option A	None. No in-stream works required

Table 4-5 Crossing Methodology over Services

Crossing No.	Crossing Type	Cover from Road level to top of bridge	Parapet Wall height above road	Description	Crossing Option	Extent of works on Motorway
MC1	Motorway	N/A	0.8	A wide clearspan bridge with support pillars passes over the M17 Motorway in order to facilitate the continuous passage of the L6141 Local Road. The laying of the Proposed Grid Connection underground cable under the existing M17 motorway was deemed to be the most appropriate option for crossing the M17 Motorway	Option D	None. No works within the road corridor of the M17 motorway.



Map Legend

- EIAR Site Boundary
- Watercourses
- Watercourse Crossings
- Proposed Grid Connection Route
- Cloon 110kV Substation

Drawing Title	Cable Route Watercourse Crossings
Project Title	Laurclavagh Renewable Energy Development
Drawn By: KB	Checked By: ÓM
Project No.: 210627	Drawing No.: Figure 4-27
Scale: 1:25,000	Date: 2024-03-06

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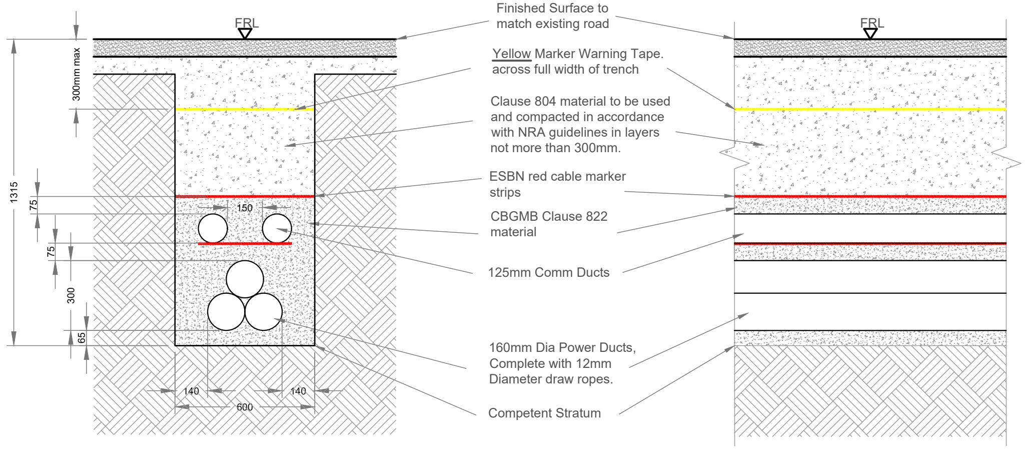
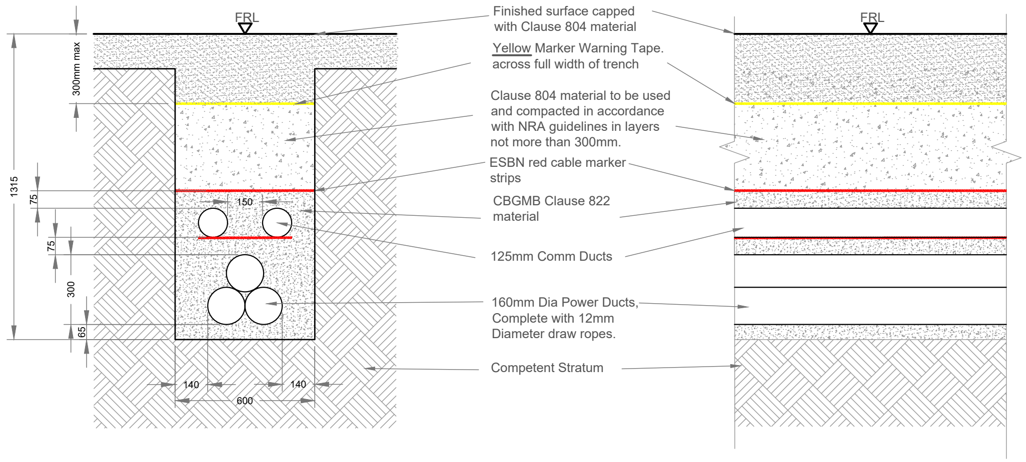


Option A - Standard 110kV Trench Detail in Road

SCALE 1:20



Option A - Standard 110kV Trench Detail in Off-Road

SCALE 1:20

PROJECT TITLE: Laurclavagh Renewable Energy Development, Co. Galway

DRAWING TITLE: Option A - 110kV Standard Trench detail

PROJECT No.: 210627 | DRAWING No.: Fig 4-28 | SCALE: 1:20 @ A3

DRAWN BY: JOB | CHECKED BY: OM | DATE: 07.03.2024 | REVISION.: P01

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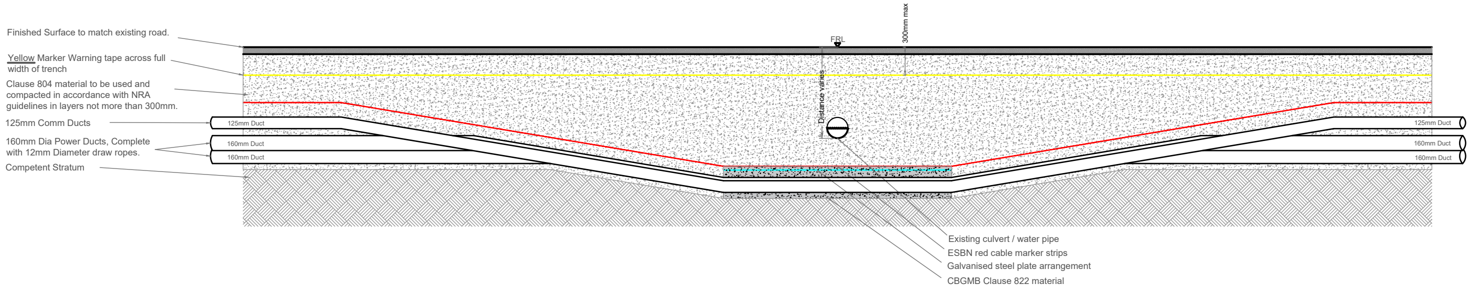
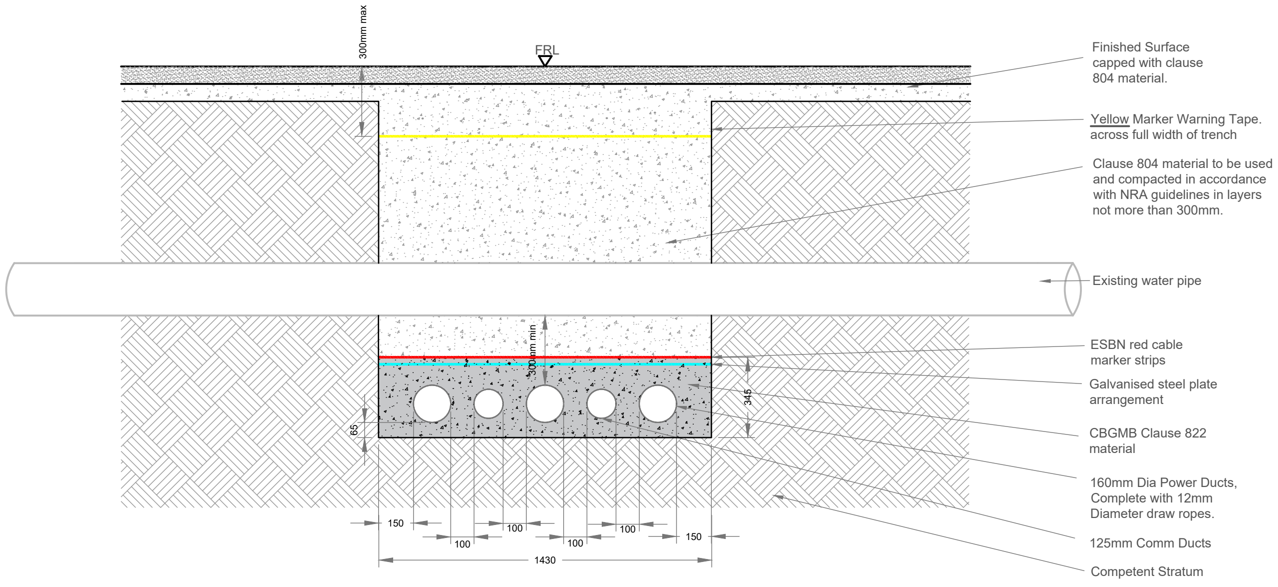


Option B - Flat bed under existing pipe - 110kV

SCALE 1:50



Option B - Flat bed under existing pipe - 110kV

SCALE 1:20

PROJECT TITLE: Laurclavagh Renewable Energy Development, Co. Galway			
DRAWING TITLE: Option B - 110kV Cable Trench Flat Bed Under			
PROJECT No.: 210627	DRAWING No.: Fig 4-29	SCALE: As shown@ A3	
DRAWN BY: JOB	CHECKED BY: OM	DATE: 07.03.2024	REVISION.: P01

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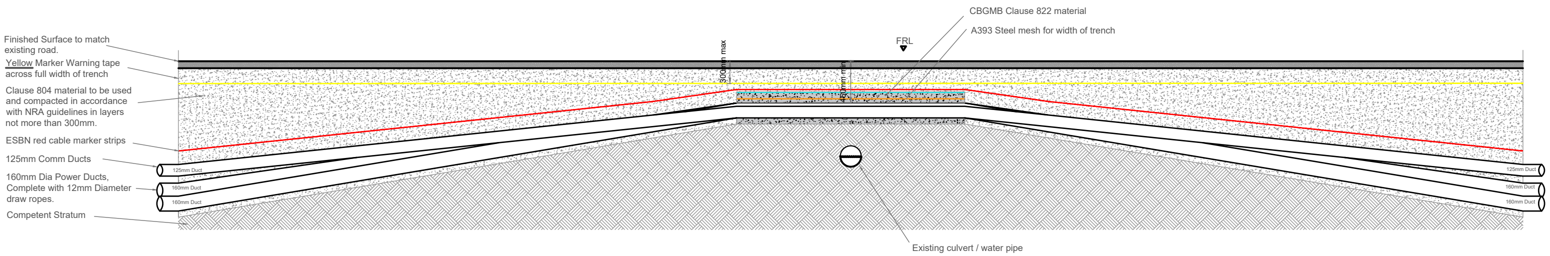
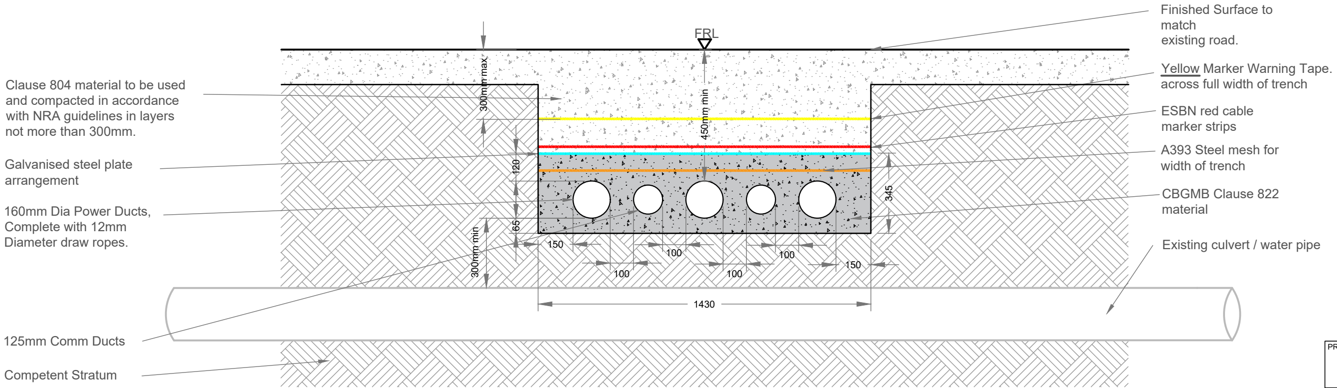


Option C - Flat bed over existing pipe - 110kV

SCALE 1:50



Option C - Flat bed over existing pipe - 110kV

SCALE 1:20

PROJECT TITLE: **Laurclavagh Renewable Energy Development, Co. Galway**

DRAWING TITLE: **Option C - 110kV Cable Trench Flat Bed Over**

PROJECT No.:	DRAWING No.:	SCALE:
210627	Fig 4-30	As shown@ A3

DRAWN BY:	CHECKED BY:	DATE:	REVISION.:
JOB	OM	07.03.2024	P01

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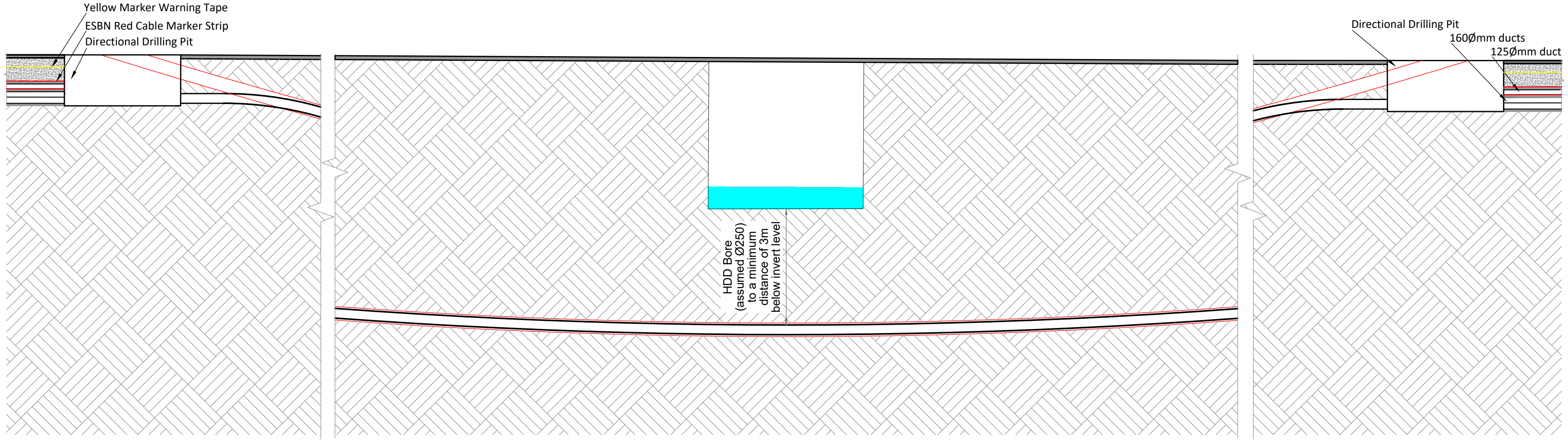
Note:
HDD will be used to cross the motorway as well as watercourse



Standard Horizontal Directional Drill Under Exisitng Watercourse Crossing

SCALE 1:100

PROJECT TITLE: Laurclavagh Renewable Energy Development, Co. Galway		
DRAWING TITLE: Option D - Directional Drill		
PROJECT No.: 210627	DRAWING No.: Fig 4-31	SCALE: 1: 100@ A3
DRAWN BY: JOB / CHECKED BY: OM	DATE: 08.03.2024	REVISION.: P01

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4.8 Community Gain Proposal

4.8.1 Background

The Proposed Project 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 a renewable energy development, which Laurclavagh 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 Wind Energy Ireland (WEI) among others. While it may be simpler and easier to put a total fund aside for a wider community area, Laurclavagh 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 Project.

The applicant company has given careful consideration to the issue of community gain arising from the Proposed Project, 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 Proposed Wind Farm 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 Wind Farm and the nature and make-up of the local community. The nature of the community gain proposal will be subject to discussions with and input from 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 as agreed by the community. 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, energy efficiency improvement works and direct payments to nearby households.

A Community Report is included as Appendix 2-1 to this EIAR, which sets out further detail on the proposals for the Community Benefit Fund.

4.8.2 Renewable Energy Support Scheme

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

The Renewable Energy Support Scheme (RESS) Terms and Conditions, published by the Department of Communications, Climate Action and Environment on in February 2020, make some high-level provisions for how this type of benefit fund will work. Any project which wants to avail of RESS must abide by these broad principles. These include the following:

1. *A minimum of €1,000 shall be paid to each household located within a distance of a 1 kilometre radius from the Project;*
2. *A minimum of 40% of the funds shall be paid to not-for-profit community enterprises whose primary focus or aim is the promotion of initiatives towards the delivery of the UN Sustainable Development Goals, in particular Goals 4, 7, 11 and 13, including education, energy efficiency, sustainable energy and climate action initiatives;*

3. *A maximum of 10% of the funds may be spent on administration. This is to ensure successful outcomes and good governance of the Community Benefit Fund.*
4. *The balance of the funds shall be spent on initiatives successful in the annual application process, as proposed by clubs and societies and similar not-for-profit entities, and in respect of Onshore Wind RESS 1 Projects, on "near neighbour payments" for households located outside a distance of 1 kilometre from the Project but within a distance of 2 kilometres from such Project.*

4.8.3 Community Benefit Fund

Based on the current Renewable Energy Support Scheme (RESS) guidelines, it is expected that for each megawatt hour (MWh) of electricity produced by the wind farm, the project will contribute €2 into a community fund for the first 15 years of operation of the Proposed Project. If this commitment is changed in upcoming Government Policy, the fund would be adjusted accordingly.

Should the Proposed Project be developed under RESS, it would attract a community contribution in the region of approximately €350,000 /year for the local community. The value of this fund would be directly proportional to electricity generated by the wind farm. Under current T&Cs of RESS, the following, the following would be required for Laurclavagh Renewable Energy Development:

- **Direct payments** – to those living closest to the Proposed Wind Farm site. A minimum of €1000 payment per annum for houses within 1km of the Proposed Wind Farm turbines.
- **Support for local groups** – a minimum of 40% per year would be available for local groups, clubs and not for profit organisations that provide services in the local area. This would include services for the elderly, local community buildings, the development of sporting facilities such as all-weather playing pitches etc.
- **Administration costs** – a maximum of 10% of this fund is to be made available for the administration and governance costs of the fund.
- **Energy Efficiency** – the remaining balance of this Community Benefit Fund would be available for the development of energy initiatives to benefit people living in the local area. This is to be provided to not for profit community enterprises every year.

The Community Benefit fund belongs to the local community. The premise of the fund us that it should be used to bring about significant, positive change in the local area. To make this happen, the first task will be to form a benefit fund development working group that clearly represents both the close neighbours to the project as well as nearby communities. The group will then work on designing the governance and structure of a community entity that would administer the Community Benefit Fund.

Should the Proposed Project not be developed under RESS, the Applicant is committing that for each megawatt hour (MWh) of electricity produced by the wind farm, the project will contribute €1 into a community fund for the entire operational life of the Proposed Project. This would equate to an estimated annual fund of €175,000 (using the same formula as above), which across the 30-year operational lifespan would result in funding in the order of €5.25 million to the local community which is a substantial contribution.

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. Initial local suggestions for use of the fund included grants for Castlehackett National School, the construction of footpaths and footpath improvement works, direct payments to nearby households, grants for the retrofitting of houses, local enterprise schemes, planting of native species, and contributions to electrical bills.

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.

4.9 Operation

The Proposed Wind Farm is expected to have a lifespan of approximately 30 years. As part of the Proposed Wind Farm planning application, permission is being sought for a 30-year operation period commencing from the date of full operational commissioning of the Proposed Project. During the operational period, on a day-to-day basis the wind turbines will operate automatically, responding by means of meteorological 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 a central control unit at the on-site 110kV substation which will facilitate off-site remote monitoring of the wind farm. Each turbine will be monitored off-site by the appointed Operations and Maintenance contractor (typically the wind turbine manufacturer) and also a wind farm operations management company. The monitoring of turbine output, performance, wind speeds, and responses to any key alarms will be monitored off-site by both parties 24-hours per day. Regular on-site visual inspections will also be carried out by the wind farm operations management company.

4.9.1 Maintenance

Each turbine will be subject to a routine maintenance programme involving several checks and changing of consumables, including oil changes. In addition, there is often 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 site roads will also require periodic maintenance.

The onsite 110kV substation and site tracks will also require periodic maintenance. The Substation would be operational 24 hours per day, 7 days a week throughout the year. Substations can be operated remotely and manually. Supervisory operational and monitoring activities will be carried out remotely using a SCADA system, with the aid of computers connected via a telephone modem link. The following maintenance procedures will also be adhered.

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

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

It is estimated that 1-2 daily visits will be made to the Site for authorised persons and vehicles to undertake minor routine maintenance and inspection, if and when required. Although the level of activity required for the maintenance of the both the Proposed Wind Farm and Proposed Grid Connection infrastructure is minimal, the impacts associated with traffic volumes for this period are assessed in Chapter 15 Material Assets: Traffic and Transport.

4.9.2 Monitoring

Section 7 of the CEMP sets out a programme of monitoring required for the operational phase of the project. The CEMP should be consulted for detailed information on the monitoring requirements during the operational phase, however a brief summary of the key information is provided below:

- Monthly water sampling and laboratory analysis will be undertaken for the first six months during the operational phase.
- The drainage system will be monitored in the operational phase until such a time that all areas that have been reinstated become re-vegetated and the natural drainage regime has been restored.
- Post-construction bird monitoring will be carried out in accordance with the Bird Monitoring Plan provided in Appendix 7-7.
- Post-construction bat monitoring will be carried out in accordance with the Bat Report recommendations in Appendix 6-2.
- Post-construction linear habitat restoration monitoring following the main growing season (i.e. in September) in a given year for the first five years of growth.
- Monitoring for shadow flicker at sensitive receptors where any exceedance of the shadow flicker limit has been predicted as outlined in Chapter 5.
- Post turbine commissioning noise monitoring will be commenced within 6 months of commissioning the wind farm.

4.10 Decommissioning

The wind turbines proposed as part of the Proposed Wind Farm site are expected to have a lifespan of approximately 30 years. Following the end of their useful life, the equipment may be replaced with a new technology, subject to planning permission being obtained, or the Proposed Wind Farm site may be decommissioned fully.

Upon decommissioning of the Proposed Wind Farm site, the wind turbines will be disassembled in reverse order to how they were erected. The turbines will be disassembled with a similar model of crane that was used for their erection. The turbine components will be separated and removed offsite The turbine materials will be transferred to a suitable recycling or recovery facility. 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 unnecessary environment emissions such as noise, dust and/or vibration.

The underground electrical cabling connecting the turbines to the onsite 110kV substation will be removed from the cable ducts. The cabling will be pulled from the cable ducts using a mechanical winch which will extract the cable and re-roll it on to a cable drum. This will be undertaken at the original cable jointing pits which will be excavated using a mechanical excavator and will be fully re-instated once the cables are removed. The cable ducting will be left in-situ as it is considered the most environmentally prudent option, avoiding unnecessary excavation and soil disturbance. The cable materials will be transferred to a suitable recycling or recovery facility.

Site roadways could be in use for purposes other than the operation of the Proposed Project by the time the decommissioning of the Proposed Wind Farm site is to be considered, and therefore it may be more appropriate to leave the Site roads in situ for future use. It is envisaged that the roads will serve as agricultural roads for local landowners.

The Proposed Grid Connection underground cabling route and onsite 110kV substation will remain in place as it will be under the ownership and control of the ESB and Eirgrid.

A Decommissioning Plan has been prepared (Appendix 4-7) the detail of which will be agreed with the local authority prior to any decommissioning. The Decommissioning Plan will be updated prior to the end of the operational period in line with decommissioning methodologies that may exist at the time and will agree with the competent authority at that time. The potential for effects during the decommissioning phase of the Proposed Project has been fully assessed in the EIAR.

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

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