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ENVIRONMENTAL IMPACT ASSESSMENT REPORT (EIAR) FOR THE PROPOSED COUMNAGAPPUL WIND FARM, CO. WATERFORD

Volume 2 - Main EIAR

Chapter 2 - Development Description

Prepared for:
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2. DESCRIPTION OF PROPOSED DEVELOPMENT

2.1 Introduction

This chapter of the Environmental Impact Assessment Report (EIAR) describes the proposed site location and components of the Project and provides details on the construction, operation and decommissioning of the Project in compliance with the EIA Directive. This forms the basis of the assessments presented within the EIAR.

This Chapter of the EIAR is supported by Figures in Volume IV, Planning Drawings accompanying the planning application and the following Appendix documents provided in Volume III:

- Appendix 2.1: Construction Environmental Management Plan (CEMP) including:
  - CEMP Appendix A - Traffic Management Plan
  - CEMP Appendix B - Grid Connection Construction Methodology
  - CEMP Appendix C - Peat and Spoil Management Plan
  - CEMP Appendix D - Surface Water Management Plan
- Appendix 2.2: Turbine Delivery Route Assessment

Common terms and acronyms used throughout this EIAR can be found in Chapter 1 - Introduction.

The Proposed Development assessed in this EIAR comprises the following elements:

- The wind farm site (referred to in this EIAR as the '**Site'**);
- The grid connection (referred to in this EIAR as the **'GCR'**);
- The turbine delivery route (referred to in this EIAR as the **'TDR'**).

An overview of the Proposed Development is shown in Figure 2.1. The general layouts of the proposed wind farm site (Site), grid connection (GCR) and turbine delivery route (TDR) are presented in Figures 2.2 to 2.4.

2.2 Overview of the Proposed Development

The development proposed by Coumnagappul Wind Farm Limited (the Applicant) is a 10 no. turbine wind farm and associated infrastructure including internal access tracks, hard standings, permanent meteorological mast, onsite substation, internal electrical and communications cabling, temporary construction compound, drainage infrastructure and all associated works related to the construction of the wind farm as well as measures designed to protect and enhance existing habitats and a connection to the National Electricity Grid (NEG).

On 23rd May 2023 An Bord Pleanála deemed the Proposed Development is eligible as Strategic Infrastructure Development (SID) by way of a notice served under section 37B(4)(a) of the Planning and Development Act 2000 as amended and the application is being made directly to the Board (case ref. ABP-309259-21). The Board are the competent authority for the purposes of the Environmental Impact Assessment (EIA).

A 10-year planning permission and 40-year operational life from the date of commissioning of the entire wind farm (including meteorological mast) is being sought. This reflects the lifespan of modern-day turbines.

A permanent planning permission is being sought for the Grid Connection and substation as these will become an asset of the national grid under the management of EirGrid and will remain in place upon decommissioning of the wind farm.

Coumnagappul Wind Farm has been designed in accordance with the current Section 28 Ministerial Guidelines (section 28 of the Planning and Development Act 2000, as amended), 'Wind Energy Guidelines 2006'. These current national guidelines are subject to targeted review, with the 'Draft Revised Wind Energy Development Guidelines' (draft WEGs) having been published by the Department of Housing, Planning and Local Government in December 2019.

The draft WEGs propose an increase in minimum turbine setback from nearby dwellings, requiring that a turbine should be located no closer than 500m from involved properties and a minimum setback of 4 times the turbine tip height from all third party properties (740 m based on the proposed turbine tip height of 185 m). In this regard, the layout and design of the Coumnagappul wind farm complies with the current Draft Revised Wind Energy Development Guidelines, 2019.

Presented hereunder are the elements of the Proposed Development for which development consent is being sought and all other associated project components subject to EIA but for which planning consent is not being sought within the current application.

Elements of the Proposed Development for which Development Consent is Being Sought

The Proposed Development for which consent is being sought will consist of the following:

- Construction of 10 no. wind turbines with a blade tip height of 185 m, a hub height of 104 m and a rotor diameter of 162 m.
- Construction of permanent turbine foundations and crane pad hardstanding areas and associated drainage;
- Construction of 25.43 km of new internal access tracks and associated drainage infrastructure;
- Upgrading of 2,580 m of existing tracks and associated drainage infrastructure;
- Creation of 1 no. new construction and operation access to the wind farm Site;
- Creation of 1 no. new construction and operation access to the permanent meteorological mast;
- All associated drainage and sediment control including interceptor drains, cross drains, sediment ponds and swales;
- Installation of new watercourse crossings including a 15m single span bridge crossing, an open bottomed culvert and a piped culvert;
- Removal and replacement of existing culverted watercourse and drain crossings along the cable route;
- Construction of 1 no. permanent onsite 110kV electrical substation and associated compound including:
    - Welfare facilities;
    - Electrical infrastructure;
    - Parking;
    - Wastewater holding tank;
    - Rainwater harvesting tank;
    - Security fencing;

- All associated infrastructure, services and site works including excavation, earthworks and spoil management;
- Development of 1 no. on-site borrow pit (150m L X 100m W /X 14m D) and associated ancillary drainage which will also act at a peat /spoil deposition area;
- 2 no. temporary construction compounds and associated ancillary infrastructure including parking;
- Forestry felling of 5.4 ha (53,995m m^2) to facilitate construction and operation of the proposed development;
- Installation of medium voltage electrical and communication cabling underground between the proposed turbines and the proposed on-site substation and associated ancillary works;
- Installation of 22.47 km of high voltage (110kV) and communication cabling underground between the proposed on-site substation and the existing Dungarvan Substation and associated ancillary works. The proposed grid connection cable works will include 6 no. existing watercourse and drain crossings, three of which will be crossed by Horizontal Directional Drilling. The grid also includes the installation of 30 no. pre-cast joint bays.
- Erection of 1 no. permanent meteorological mast to a height of 110m above ground level with a 4m lightning pole on top.
- Temporary enabling works to accommodate turbine delivery
    - Load bearing surfaces and temporary watercourse and drain crossings
    - Temporary removal of road signage, utility poles, bollards and fencing.

Certain temporary accommodation works associated with the Turbine Delivery and the provision of passing opportunities along the local road network are subject to this EIA but for which planning consent is not being sought within the current application. These works to facilitate the delivery of turbine components and haulage to Site are detailed further in Section *1.4.3 Turbine Delivery* and include hedge or tree cutting, relocation of powerlines/poles, lampposts, signage and local road widening. For these locations, works associated with private lands and road infrastructure have been identified and assessed in the EIAR, however, permission for these works will be sought separately with the local Planning Authority (Waterford City and County Council), through consultation and agreement with ESB and also through road opening license as necessary.

2.3 Proposed Development Location

These sections describe the lands which make up the Proposed Development.

The Site is wholly located in County Waterford and includes lands in the townlands of Bleantasourmountain, Carrigbrack, Coumnagappul, Glennaneanemountain, Kilkeany, Kilkeany Mountain, Knocavanniamountain and Reanadampaun Commons.

The GCR is wholly located in County Waterford, is 22.47 km in length and passes through the townlands Ballymacmague North, Ballymacmague South, Colligan More, Colliganwood, Eaglehill, Garryclone, Garryduff, Kilcooney, Killadangan, Knockacaharna, Knockboy, Lackandarra Upper, Reanadampaun Commons and Tinalira.

The TDR is 73.2 km in distance, with a short section (10.5 km) located in south County Kilkenny and the remaining sections within County Waterford. Accommodation works associated with the TDR will be within the Townlands of Reanadampaun Commons and Clooncogaile. The TDR passes through the townlands of Adamstown, Ahanaglogh, Ballybrack, Ballycoe, Ballyduff East, Ballyduff West, Ballyhussa, Ballylinch, Ballymacmague North, Ballymacmague South, Ballymountain, Ballynamona, Ballyneety, Ballynevoga, Ballyshonock, Bawnfune, Boolavonteen, Burgery, Butlerstown North, Cahernaleague, Carrickanure, Carrigmoorna, Cloncoskoran, Clooncogaile, Cloone, Colligan More, Colliganwood, Cooltubbrid West, Cullenagh, Currabaha West, Curraghnamaddree, Curraheen, Cushcam, Dooneen, Drumdowney Lower, Dunkitt, Faha, Garrahylish, Garranbaun, Garranmillon Lower, Garranmillon Upper, Garryclone, Garryduff, Glendalligan, Gliddane More, Gortavicary, Gorteens, Gortnalaght, Gracedieu East, Gracedieu West, Graigueshoneen, Granny, Joulterspark, Kealroe, Kilcooney, Kildermody, Killadangan, Killaspy, Killineen East, Killineen West, Killoteran, Kilmacthomas, Kilmurry, Knockahavaun, Knockanage, Knockanpower Upper, Knockboy, Knockhouse Upper, Knocknagranagh, Knockyelan, Lackandarra Lower, Lackandarra Upper, Lacken, Lemybrien, Loughanunna, Mullinabro, Newtown, Newtown, Parkeennaglogh, Rathpatrick, Reanadampaun Commons, Ross, Scrahan, Shanbally, Strangsmill, Tooraneena, Whitfield North and Woodstown.

2.3.1 Wind Farm Development Boundary

The Proposed Development application area (i.e. the red line boundary depicting the land to which the application relates, which includes the Site and associated habitat enhancement lands, TDR accommodation works and GCR) encompasses a land area of 211 ha (2.12 km^2) and is shown on Figure 2.1. The development footprint within the application area of the Proposed Development is 195 ha (1.95 km2) (excluding underground 110 kV grid cable and TDR temporary accommodation works. Refer to Figure 2.2 for details of the overall wind farm layout.

2.3.2 Existing Land use

The proposed wind farm is wholly located in the jurisdiction of Waterford City and County Council, with the turbine array located approximately 15.8 km north of Dungarvan town centre and 14.5 km south east of Clonmel town centre. The nearest settlement is Ballymacarbry, located 5.5 km to the north west of the Site.

The Site is located in a sparsely populated rural context. The current Wind Energy Development Guidelines (2006) prescribe a 500m set back distance of turbines from properties (based on noise effects). The 'Draft Revised Wind Energy Development Guidelines, 2019' outlines a minimum 500m or 4 times tip height set back. The Proposed Development will achieve a minimum separation distance in excess of 740 m (4 times tip height) between the closest dwellings and the proposed turbines. There are 40 properties within 2 km of the turbine array as shown on Figure 2.5, 13 of which are commercial. The closest property to a turbine is located ca. 820 m distance and is roughly equidistant south between turbines T10 and T12. The on-site substation is broadly located within the centre of the Site and is ca. 1.5 km from the nearest residential neighbour, located to the south.

The Site is located within the upland topography of a horse-shoe shaped area formed by the Comeragh Mountains, Milk Hill and Bleantasour Mountain. The Comeragh Mountains are designated a Special Area of Conservation, protected for corrie lakes and their associated watercourses, heath and bog habitats, rocky slopes and the species Slender Green Feather-moss. The Proposed Development is located wholly outside of the SAC, with the closest turbine (T11) located 740 m from the SAC boundary (as shown in Figure 9.4 Volume IV).

The Corine Land Cover database for Ireland (based on interpretation of satellite imagery and national vector mapping data) identifies the following land cover types within the Site: peat bogs, moors and heathland, natural grasslands, coniferous forest, transitional woodland-shrub and pastures. Land use at the site is dominated by agriculture (sheep grazing in rough heathland with some areas or more intensively managed grasslands) with a smaller area of land in conifer plantation (under both private land ownership and ownership of Coillte).

The dominant habitat type within the Site is wet heath. This occurs on shallow peat on the hillslopes. Wet heath grades into dry heath with increased altitude and is found in mosaic with exposed siliceous rock towards the hilltops. Extensive areas of heath habitat have been subjected to regular uncontrolled burning within the upland areas as evidenced by scorching of the ground, poor regeneration of habitat and poorer species diversity within large areas of land within the Site. Large scale burning occurred most recently in September 2022[1]. The lower valley areas comprise improved agricultural grassland in mosaic with smaller areas of dense bracken and scrub. Conifer plantation occurs along a section of the internal access road and comprises mostly Sitka Spruce and Lodgepole Pine.

The Site is intermittently underlain by superficial deposits comprising Blanket Peat, Glacial Till and subordinate linear deposits of Alluvium. These are in turn underlain by a sequence of Upper Devonian conglomerates, mudstones and sandstone. At serval locations across the Site bedrock is exposed at surface as outcrops. Scree deposits, resulting from freeze-thaw weathering of the bedrock, are also frequent, and are typically mapped in areas of higher elevation. The peat deposits within the Site are relatively thin (maximum 0.70 m thick, average thickness 0.15 m).

The Site is located within the Colligan and Nier river waterbody catchments, and the Proposed Development will require infrastructure crossings of tributaries of the Colligan river (both as part of the internal turbine access roads and the grid connection). There is no historical flooding associated with these watercourses at the Site and the Site is not located within a flood zone. There are several large drains, predominantly associated with townland boundaries, within the Site. Of particular note are the larger drains associated with the Coumnagappul townland and the neighbouring Knocavanniamountain, Carrigbrack and Tooreenmountain townlands.

There are no known archaeological records within the Site with the exception of the redundant records WA014-044 near T7 and WA014-042 near T2. There is a Cairn (WA014-043) located adjacent to the red line boundary near T2 and there are several Fulacht Fia records located south of T11 immediately adjacent to the red line boundary.

There are several archaeological features located adjacent to the GCR and TDR, including ringforts and enclosures, a children's burial ground and NIAH buildings such as the Master McGrath Monument adjacent to R672 junction with the N72 road.

The GCR will be predominantly contained within the public road corridor throughout its length with the exception of the start and finish points where the cables will be terminated in the existing network substation at Dungarvan and the proposed onsite substation which is located within the Site, and one horizontal directional drilling (HDD) in private lands required at approximate ITM Coordinate: 621231.261, 608261.270 to cross a waterbody due to the need to take the cable route off road at an existing a bridge, located on a 90-degree bend in the road, which has insufficient cover to accommodate the cable. This HDD crossing will be entirely within private lands which comprise agricultural grasslands, and will be under the Skeheens Stream (EPA name: COLLIGAN_010).

[1] https://www.irishexaminer.com/news/munster/arid-40953893.html

Similarly, the TDR will be confined to the public road corridor with the exception of locations where temporary accommodation works (mainly comprising laying of load bearing surface, verge widening and furniture/pole removal) will be required in private lands to facilitate the delivery of oversized loads.

2.3.3 Land Ownership

A small portion of the Site is owned by Coillte and is in forestry use. However, the majority of the Site is located on lands under third-party private ownership. These landowners have consented to the application for the Proposed Development. Letters of consent accompany the planning application.

2.3.4 On-site Wind resource

The layout of the proposed wind farm has been designed to minimise potential environmental impacts, while at the same time maximising the energy yields of the wind resource passing over the site. Available wind speed is a key factor in determining the economic viability of potential wind energy locations. The Sustainable Energy Authority of Ireland (SEAI) Wind Speed Atlas[2] displays onshore wind speeds at between 20 and 150 metres above ground level, based on 2013 data. The atlas identifies the Site as having an average wind speed range of 8.6 m/s to 9.6 m/s at 150 m above ground level.

A temporary meteorological mast, 80m in height, was erected at the proposed Coumnagappul Wind Farm Site in June 2019 (ITM Coordinates E-625004.2844, N-608093.7932). Wind speed monitoring from this mast has recorded average wind speeds of 8.3 m/s.

2.3.5 Other Wind farms

Operational/Permitted

There are three operational wind developments located within 20 km of the proposed Coumnagappul Wind Farm. Figure 2.6 illustrates the location of existing wind farms within 20 km of the Site.

Table 2-1: Wind Energy Developments within 20km of the Proposed Development

Wind Farm Name	Number of turbines	Distance and Direction from proposed site	Status
Tierney Single Turbine	1	5.1km west of Site	Operational Privately owned operational (since 2015) single 150 kW turbine (hub height 30 m, tip height 44 m)
Kilnagrance Single Turbine	1	14km east of Site	Operational Privately owned (KWT Energy Ltd) operational (since 2016) single turbine with a 60 m tip height
Woodhouse Wind Farm	8	17.2km west of Site	Operational

[2]https://www.seai.ie/technologies/seai-maps/wind-atlas-map/

Wind Farm Name	Number of turbines	Distance and Direction from proposed site	Status
			Woodhouse Wind Farm (ESB) is an operational wind farm (since 2015) and was constructed in 2 phases comprising a total of 8 no. wind turbines with a 126 m tip height (45m blade length).
Knocknamona Wind Farm	8	17.6 km west of Site	Permitted Was granted permission in September 2022 (PL93.309412) and is located immediately south of the existing Woodhouse Wind Farm. The Knocknamona Wind Farm will comprise 8 no. wind turbines with a 146.3 m tip height.
Dyrick Hill Wind Farm	12	7.9 km southwest of Site	Proposed (at planning) Proposed private development (EMPower) submitted for planning in June 2020 (Case reference: PA93.317265) comprising a 12-turbine array with a 185m tip height.

2.4 Site Infrastructure

2.4.1 Wind Farm

The proposed wind farm will consist of 10 no. wind turbine generators (WTG's), a 110 m meteorological mast, 1 no. borrow pit/spoil management area and 1 no. 110kV substation compound along with ancillary civil, drainage and electrical infrastructure.

2.4.1.1 Wind Turbine Description

The final choice of turbine model is anticipated to be a Vestas V162 model wind turbine. This turbine model has been included for the purposes of EIAR and planning approval. The Vestas (Model : V162 6.0 – 7.2MW) is a conventional three-blade horizontal axis turbine. Schematic drawings of the candidate turbine accompany the planning application. The plans and particulars are precise and provide specific dimensions for the V162 turbine structures which have been used in this assessment. The turbine specification will have a hub height of 104 m and a rotor diameter of 162 m with a tip height of 185 m.

Turbine Layout

The proposed wind farm layout reflects the outcome of iterative engineering and environmental constraints assessments carried out during the wind farm design process aimed at eliminating or minimising adverse effects on the environment and considered *inter alia* risks to sensitive habitats, presence of known or potential archaeological features, risk to sensitive species, assessment of ground conditions and optimisation of cut-fill balance as part of design and existing drainage patterns and water catchment characteristics. The layout has been designed to minimise the potential environmental effects of the wind farm while at the same time maximising the energy yield of the wind resource passing over the Site.

The design rationale and evolution of the wind farm layout is described in Chapter 3 - Site Selection and Alternatives.

Turbine location co-ordinates in Irish Transverse Mercator (ITM) are detailed in Table 2-2:

Table 2-2: Turbine Coordinates

Turbine No. [Note 1]	ITM Easting	ITM Northing
T1	623836.95	610086.77
T2	624450.33	610262.63
T4	623765.98	609473.64
T5	624338.34	609616.17
T6	624985.13	609593.52
T7	624817.24	608984.47
T8	624437.82	608381.42
T10	624745.33	608019.25
T11	625248.04	607863.24
T12	623727.27	608212.24

Note 1: numbering is not sequential. This is due to turbines being removed from the array during constraints assessment and design iteration. See Chapter 3 for further details.

The turbines will have a multiple painted coating to protect against corrosion. The V162 has a light grey coloured finish to blend into the sky background. All surfaces will have a matt non-reflective finish. This minimises visual impact, as recommended by the following guidelines on wind energy development:

- "Wind Energy Development – Planning Guidelines" (2006), Department of the Environment, Heritage and Local Government;
- "The Influence of Colour on the Aesthetics of Wind Turbine Generators," ETSU W/14/00533/00/00
- PAN 45, The Scottish Office Environment Department;
- PPG22, Department of the Environment - Welsh Office;
- Technical Advice Note 8, Welsh Assembly, 2005.

It is proposed to install lighting on the turbines in accordance with the Irish Aviation Authority (IAA) requirements for aviation visibility purposes. The lighting configuration and type will be in accordance with the International Civil Aviation Organisation (ICAO) obstacle light requirements.

Turbine Tower and Foundation

The turbine will be anchored to a foundation. Following detailed site investigations, it has been determined that the wind turbine foundations at Coumnagappul will be standard shallow reinforced concrete base pad foundations. The turbine foundations will be circular in shape and will be 25 m in diameter and 4 m in depth.

The turbine foundations will be constructed using standard reinforced concrete construction techniques. Detailed construction methodologies for turbine foundations are provided in the CEMP in Appendix 2.1 of Volume III.

Turbine foundations will be designed to Eurocode Standards. Foundation loads will be provided by the wind turbine supplier, and factors of safety will be applied to these in accordance with European design standards:

- EN 1992-1-1: Eurocode 2: Design of concrete structures.
- BS EN 61400-1:2005: Wind Turbines Design Requirements.

Once completed, a portion of the foundation (30 m^2 concrete plinth with 4m access area around that for further access and maintenance) will be above ground. The tower will be bolted to the turbine foundation.

The turbine will comprise a full tubular steel tower or a hybrid concrete/ steel tower. The hybrid towers consist of a concrete bottom part with a transition piece towards a tubular steel top. The concrete part is made of precast high strength concrete rings, and the tubular steel top is made of flange joined steel sections. Full steel tower comprises fully of flange joined steel sections.

The tower will be delivered to the Site in four sections as follows:

Component	Aprox. Length (m)	Aprox. Weight (t)
Base	19	80.
Mid 1	25	77
Mid 1	30	67
Top	30	57

Once the turbine components arrive on site they will be placed on the hardstand and lay down areas prior to assembly. The towers will be delivered in sections and each blade will be delivered in a separate delivery. Once there is a suitable weather window the turbine will be assembled.

It is anticipated that each turbine will take approximately 3 to 4 days to erect (depending on the weather), requiring two cranes. Finally, the turbines will be commissioned and tested.

The first (base) section is bolted to a steel frame, which is cast into the turbine concrete foundation. The upper sections of the tower are bolted to the lower ones in sequence. The base of the tower is approximately 5 m in diameter, tapering to approximately 3 m where it is attached to the nacelle. The first floor of the tower is approximately 3 m above ground level it is accessed by a galvanised steel staircase and a steel hatch door which will be kept locked except during maintenance. Access to the top platform in the tower is by a ladder or service lift. Access to the nacelle from the top platform is by ladder. Access to the transformer room in the nacelle is controlled with an interlock.

In summary the works will be carried out as follows:

- The extent of the excavation will be marked out.
- Around the perimeter of the foundation formation a shallow drain will be formed and settlement pond.
- The base of the foundations will be excavated to competent bearing strata.
- Excavated soil will be managed in accordance with the Soil Management Plan, within the CEMP Appendix 2.1.
- A layer of concrete blinding will be laid approximately 75 mm thick directly on top of the newly exposed formation.
- Formwork and reinforcement will be fixed.
- Ductwork will be installed as required for cables, and formwork erected around the steel cage.
- Concrete will be placed using a concrete pump and compacted using vibrating pokers.
- Upon completion of the concreting works the foundation base will be covered against precipitation.
- Steel shutters will be used to pour the upper plinth section.
- Once the concrete is set the earthing system is put in place and the foundation is backfilled with suitable material.
- The foundation will be backfilled with a cohesive material, where possible using the material arising during the excavation.

Turbine Blades and Hub/Nacelle

The turbine blades comprise fibreglass reinforced epoxy, carbon fibres and solid metal tip. The blades are 79.35 m in length with a width (maximum chord length) of 4.3 m. The swept area of the blades is 20,612 m^2.

The turbines will have a cut in wind speed of 3 m/s and cut out speed of 25 m/s. Turbine rotor rotation is in a clockwise direction. The turbine begins generating electricity at a wind speed of 3 m/s, with rated power generation at wind speeds of approximately 12 to 14 m/s.

The dynamic operation range (the rate at which the blades rotate) of the Vestas V162 is 4.3 -12.1 revolutions per minute (rpm) which will be influenced by wind speed.

The cast iron hub supports the three blades and transfers the reaction loads to the nacelle which houses the generating components of the wind turbine including the generator and gearbox, electrical components and control unit. These convert the rotation of the blades to generator rotation.

A yaw mechanism turns the nacelle and blades into and out of the wind. A wind vane on the nacelle controls the yaw mechanism.

The blade bearings allow the blades to operate at varying pitch angles. Based on the prevailing wind conditions (determined by the wind vane), the blades are continuously positioned to optimise the pitch angle with the pitch range being -5° to 95°.

The turbines are equipped with an aerodynamic brake. Stopping the turbine is done by full feathering the three blades (individually turning each blade).

A glass fibre reinforced polyester hood covers the nacelle. The turbines are equipped with a Lightning Protection System (LPS) earthing and isolation to help protect the wind turbine against the physical damage caused by lightning strikes. Additionally the turbines can be equipped with a Fire Suppression System. The turbine can also be equipped with an Ice Detection and Anti-Icing System.

Turbine Transformer and Wind Farm Power Output

The Vestas V162 has flexible power output ratings of 6.0 MW, 6.2 MW, 6.8 MW and 7.2 MW. The range of installed capacity has been fully assessed in the Air and Climate chapter with respect to emissions calculations and in the Noise Chapter with respect to maximum sound power level.

The turbine will have a transformer located within the tower. The turbine transformer will step up the voltage to either 20kV or 33kV to reduce the electrical loss on the cabling connector circuits that connect to the site substation via a network of underground medium voltage cable circuits to be located adjacent to the proposed site track network.

The Proposed Development will have an Export Capacity (MEC) ranging from 60.0 MW to 72.0 MW depending on the power rating employed. This range of generation capacity has been used to calculate the power output of the proposed Coumnagappul Wind Farm 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 % is applied here[3]*.*

C = Rated capacity of the wind farm: 60.0 –72.0 MW

The proposed wind farm has the potential to produce between approximately 7,358 MWh (megawatt hours) and 8,830 MWh of electricity per year over the 40 year lifetime of the Proposed Development.

The electricity produced by the proposed wind farm would be sufficient to supply between approximately 43,800 – 52,560 Irish households with electricity per year (depending on MEC), based on the average Irish household using 4.2 MWh of electricity (this figure is taken from the March 2017 Commission for Energy Regulation (CER) Review of Typical Consumption Figures Decision Paper and Commission for Regulation of Utilities Energy and Water Monitoring Report for 2021).

[3] EirGrid in their All-Island Generation Capacity Statement (2017-2026) estimates a capacity factor of approximately 31% for onshore wind. The capacity factor applied for the proposed wind farm is greater than the EirGrid estimation as a result of improvements in turbine technology and the good wind flows at the site. The proposed turbine type allows for the use of fewer, taller turbines with an increased efficiency and in return greater economic benefit to the consumer.

2.4.1.2 Site Access and Internal Road Infrastructure

Site Access

Coumnagappul Wind Farm will have one primary site entrance accessed from the local Seapark road (off the L5119) which will be used for construction, operation and decommissioning. The access is via an existing Coillte Forestry access, which will be upgraded to facilitate the delivery of turbine components. All loads including turbine towers, turbine blades and trucks with materials will enter the Site via this access. The proposed grid connection export cable will exit the Site through this access point. This access point will also be used for construction and operation vehicles and will be used by both HGV's and LGV's.

The general local road speed limit applies of 80 kph. The minimum sightline distance for an 80 kph road is 160 m in line with Transport Infrastructure Ireland (TII) standards (TII Publication DN-GEO-03060). It is proposed to widen the existing access and clear forestry and vegetation within the 160m visibility splays in both directions to facilitate the over-sized turbine delivery vehicles entering the Site at this point. The detail is shown on P2360-0101-0003 planning application drawing included with the planning application. Visual obstructions 1.05m above ground level will be removed to achieve 'Y' visibility distances in both directions of 160m in accordance with TII design specifications.

The on-site substation will be located within the Wind Farm Site and will be accessed via new internal access tracks.

The permanent meteorological mast will be accessed from the local road network to the south of the Site and will be used solely for works associated with the construction, operation and decommissioning of the meteorological mast.

The locations of the Site entrance and access to the meteorological mast is shown on Figure 2.2, Volume IV and on Planning Drawing P2360-0100-0002.

The access has been selected with consideration for safety of public road users and construction staff and to ensure that it can be constructed to comply with the requirements of both Waterford City and County Council and TII design requirements for direct accesses.

Locations of passing bays along the TDR and haul routes on the local road L5119 to the unclassified local Seapark road at the Site entrance have been identified and are discussed further in Chapter 14.

Wind Farm Internal Access Tracks

The internal access track serving the wind farm will comprise 25.43 km of new road infrastructure, with an additional a small section of existing forestry road and agricultural track which will be upgraded for 2,580 m in length (refer to Figure 2.2, Volume IV).

The proposed internal site track layout will permit access for vehicles during the construction phase, for maintenance during the operational phase and for vehicles to decommission the turbines at the end of the life of the Proposed Development.

The proposed new internal access tracks will be founded on suitable substrate, noting that depths to bedrock within the Site are shallow (refer to Chapter 11 Land, Soils and Geology).

All access tracks will be 5 m wide along straight sections and wider junctions and turning areas as required as shown on accompanying planning application drawings in accordance with wind turbine manufacturer requirements for the wind turbines of this size. The existing forestry track is approximately 4.5 m in width and will be widened by approximately 1m, with an additional widening at the bend where the new internal access road deviates from the existing track. The existing agricultural track is approximately 3 m in width and will be widened by approximately 2.5 m. Access to the met mast will not be altered.

Access track formation will consist of a minimum 500mm hardcore on geo-textile membrane. The proposed construction methodology for newly constructed tracks is as follows:

- The formation will be prepared to receive the geotextile membrane.
- A well graded aggregate stone will be placed and compacted in layers to minimum 500mm depth.
- A layer of compacted Cl 804 material will be placed on top to provide a suitable running surface.
- Surplus excavated material will be placed along the side of sections of the tracks in suitable locations as identified in the Soil Management Plan (within the CEMP in Appendix 2.1) and where appropriate dressed to blend in with surrounding landscaping and partially obscure visibility of the track during operation.

The stone required for the construction of the internal access roads will be sourced from within the Site borrow pit and from licenced quarries in the vicinity of the Proposed Development. The location of licensed quarries and haulage routes are identified in Chapter 14: Traffic and Transportation and in Figure 14.3, Volume IV.

Floating roads will not be required for this site based on the results of ground investigation and geotechnical walkover assessments.

Further details on access track construction are provided in the CEMP in Appendix 2.1, Volume III.

Internal access track drawings are presented in 100-Series planning application drawings.

A drainage system will be installed adjacent to the internal access tracks. Existing drainage infrastructure will be maintained and upgraded where necessary. Existing drainage channels will be upgraded to the same standard as the proposed drainage infrastructure in accordance with the drainage design and Surface Water Management Plan (within the CEMP in Appendix 2.1).

Existing forest track and farm track drainage will be maintained and upgraded as required to meet the requirements of the proposed wind farm drainage design. SuDS design approach will ensure that existing drainage patterns will be maintained. Surface water runoff from the existing forestry track and farm track discharges to the two adjacent streams (which are tributaries of the Colligan River: Colligan_010).

Drainage ditches will be formed, within the excavated width and along the sides of the internal access tracks.

Drainage infrastructure will be constructed in parallel with the access track construction.

Hardstand and Laydown Area

Each wind turbine will have an associated turbine hardstand area and temporary laydown area adjacent to the foundation to accommodate the delivery and temporary storage of the turbine components prior to their erection and to support the cranes during erection.

Once the turbine components arrive on site they will be placed on the hardstand and lay down areas prior to assembly. The towers will be delivered in sections and each blade will be delivered in a separate delivery. Once there is a suitable weather window the turbine will be assembled.

A turbine hardstanding area consists of a main crane pad hardstanding of 57 m x 192 m with a number of additional smaller hardstandings that act as set down and assembly areas, located as shown on the accompanying planning drawings. This area will accommodate a main crane and an assist crane during the assembly of the turbine, as well as during occasional maintenance periods during operation. It will also facilitate parking for operation and maintenance staff.

A turbine hardstanding area will be constructed at the base of each turbine to provide a solid area for the installation crane that will be used to erect the turbine and for the assembly of the turbine.

Hard standing formation will consist of a minimum 500mm hardcore on geo-textile membrane. The construction methodology for hard standings will be as follows:

- The formation will be prepared to receive the geotextile membrane.
- Stone (either sourced within the site or locally from licensed quarries) will be placed and compacted in layers to minimum 500mm depth.
- Drainage ditchs will be formed, within the excavated width and along the sides of the hard standing.
- Surplus topsoil will be placed along the side of the hard standing (avoiding any existing land drains) and dressed to blend in with surrounding landscaping.

Watercourse Crossings Within the Site

Within the Site there are three watercourse crossings, as set out in Table 2-3 below. It is proposed to install one single-span bridge and one open-bottomed box culvert crossing and one piped culvert. The proposed crossing designs have been designed in line with Inland Fisheries Ireland (IFI) requirements for salmonid watercourses as included in their 2016 'Guidelines on Protection of Fisheries During Construction Works in and Adjacent to Waters' and TII 2008 'Guidelines for the Crossing of Watercourses During the Construction of Road Schemes'. Details of proposed crossing structures are presented in 0500-Series planning application drawings.

The plant which will be used in the construction of the watercourse crossings will include:

- Excavators;
- Dump Trucks;
- Mobile Crane;
- Concrete Truck and Pump;
- Hand Compactor;
- Smooth Rollers;
- Pumps.

Table 2-3: River Crossings within the Wind Farm Site

Watercourse Name	Coordinates: ITM	Width at Base	Width at top of bank	Bank Height	Depth of Water	Type of Crossing
Watercourse Crossing 4 - Skeheens Stream (COLLIGAN_010)	622466.431, 609322.014	2500mm	4000mm	600mm	c. 100mm	Open-bottomed box Culvert to replace existing river ford on forest access track. The river comprises a cobble, gravel, silt and boulder substrate upstream and downstream of the ford. Flows are characterised by riffles and glides.
Watercourse Crossing 5 - Knockavanniamountain Stream tributary of the Colligan River (COLLIGAN_010)	624882.65, 609163.46	1200mm	1800mm	450mm	Ponding Water	Piped Culvert Small stream comprising boulder cobble and gravel.
Watercourse Crossing 6 - Colligan River (COLLIGAN_010)	624241.28, 608601.32	2600mm - 3000mm	3300mm - 3500mm	450mm - 600mm	c. 100mm	Clear Span Bridge c. 15m in length High energy watercourse with bed substrate comprising boulder cobble and gravel.

Bottomless Culvert and Piped Culvert Construction Methodology

Culverts will be made of precast units which will be sized specific to the hydraulic capacity required relative to the characteristics of the watercourse to be crossed. The crossing angle for the culverts will be set out in relation to road alignment and the existing watercourse channel. The project engineer will determine the required gradient of the culvert. Standard details for piped and bottomless culverts are provided in Planning Drawings P2360-0300-0019 and P2360-0501-0002.

The access road on the approach to the channel will be completed to a formation level which is suitable for the passing of plant and equipment required for the installation of the culvert crossings.

The culverts will be installed on-line (i.e. within the existing channel) and the works will be carried out under dry conditions in accordance with IFI (2016) ' *Guidelines on protection of fisheries during construction works in and adjacent to waters*'. The watercourse flow will be diverted by overpumping or by fluming the flow as appropriate in order to facilitate construction of the culvert in dry conditions. The installation of the culvert will take place in low flow conditions. Mitigation for the protection of sensitive biological receptors when fluming / overpumping are presented in Chapter 9 – Biodiversity.

For piped culvert, the bed of the watercourse will be taken down to the desired levels to create a suitable platform for laying the culvert. The pipe culvert will be lifted into place with excavator with a lifting mechanism / crane and will have an invert level 500 mm below the existing watercourse bed level. The embedded section will be allowed to fill naturally.

For bottomless box culvert, the base will be excavated to rock or competent ground with a mechanical excavator with the foundation formed in-situ using a semi-dry concrete lean mix foundation and concrete panels. The base will be excavated along the stream bank with no instream works required. The bottom plate of the culvert will be bolted to the foundation on both sides of the watercourse. The top section of the culvert will be bolted together and lifted into position and bolted to the two bottom sections. Once the culvert is in position stone backfill will be placed and compacted against the culvert up to the required level above the foundations. A concrete beam will then be shuttered, fixed and poured along the two shoulders of the culvert. When the concrete beams are cured the filling and compaction of the road will be completed.

The culverts will be such that it will not prevent fish passage.

Clear Span Bridge Details and Construction Methodology

The bridge will be installed on-line (i.e. within the existing channel) and the works will be carried out under dry conditions in accordance with IFI (2016) ' *Guidelines on protection of fisheries during construction works in and adjacent to waters*'. The watercourse flow will be diverted by overpumping or by fluming the flow as appropriate in order to facilitate construction in dry conditions. The installation will take place in low flow conditions. Mitigation for the protection of sensitive biological receptors when fluming / overpumping are presented in Chapter 9 – Biodiversity.

A ground investigation (GI) for the Coumnagappul site was undertaken by Ground Investigations Ireland (GII) between 7th December 2022 and 24th January 2023. It was concluded that the ground conditions at the river crossing are good, comprising dense to very dense GRAVEL and very stiff SILT and CLAY. There are no signs of slope instability at the site.

Foundations for the different elements of the river crossing will likely comprise the following:

- Bridge Structure – bank seat foundation within the underlying GRAVEL deposits; and
- Approach Embankments – founded on the underlying GRAVEL deposits

Foundations: Abutments will be pre-cast concrete sections. The abutments for the bridge will be founded on reinforced concrete pad footings. An excavator will be used to reach the subgrade on which the concrete pads will be founded. From the available GI the gravel subgrade which is anticipated to be located approximately 1.3m below existing ground level. The excavations will be set back a minimum of 2.5m from the banks of the Colligan River. Groundwater was encountered at a depth of 1.8m bgl within the trial pit displaying a moderate flow. Dewatering of the excavations as per the Surface Water Management Plan will likely be required through sump pump or alternative means until completion of the footings. A layer of Class 6N2 fill will be laid as a regulating layer on top of the subgrade. A 75mm thick blinding concrete will be placed over the full extent of the rectangular foundation to produce a clean flat surface for the wet structural foundation concrete. The reinforcement cage for the pad footing will be fixed and tied with bars protruding vertically for subsequent concrete pours. Formwork will be placed around the perimeter of the footing ensuring sufficient concrete cover to the reinforcement. Approximately 18m^3 of concrete will be required for each abutment bank seat pad and will be delivered to site by ready mix trucks. The concrete will be placed in the formwork using a hopper or concrete pump and vibratory poker used to remove air bubbles.

Abutments: Once the pad footing has achieved sufficient strength, the reinforcement for the abutment upstands will be cut, tied and fixed into position. A vertical formwork will be placed around the perimeter of the abutment wall. Each abutment upstand will require approximately 13m3 of concrete which will be placed using a hopper or concrete pump. A vibratory poker will be used to remove any air pockets. Once the formwork has been removed and the concrete has cured, a waterproofing membrane will be applied to the concrete. At the top of the upstands, seatings for the precast deck beams will be prepared at the correct levels.

Deck: The bridge deck will be set above the 1% AEP flood height (100-year event) and will be made up of c. 7 No. precast concrete beams with a span of c.14m. The beams will be precast off site and delivered to site on a flatbed truck. A crane will be used to lift the beams into position onto the seatings formed on top of the abutment upstands. When in place, 2 No. ducts will be placed in the voids between each of the beam webs and mesh reinforcement placed above them. Cement Bound Granular Mixtures B (Cl 822) will surround the ducts and be compacted in accordance with Cl813.10 and Table 8/4 of TII Specification of Roadworks. Side forms for the edge parapet beams will be secured and reinforcement for the deck slab and parapet edge beams will be cut, tied and fixed into position with bars protruding vertically from the edge beams for subsequent concrete pours for the concrete parapets. The bridge deck slab and edge beams will be concreted to the finished level. Once the deck slab has reached sufficient strength the abutment walls will be backfilled with a granular fill to road formation level.

Parapets and Deck Topping: The bridge deck parapets will be constructed from reinforced concrete. Reinforcement for the parapets will be fixed to lap with the starter bars from the edge beams. Vertical formwork will be erected and secured in place. An in situ pour will be carried out to cast the parapets to the design height and vibratory poker used. Once the parapets have reached sufficient strength the formwork will be stripped. The deck surfacing is to be formed using an ST1 concrete mix. This will be placed on top of the deck slab with a minimum thickness of 100mm and with a crossfall from the centre of the deck to the parapet to allow water to drain.

Approach Earthworks: It is anticipated that the approach embankments to the bridge structure can be founded directly on top of the dense to very dense gravel. The ground investigation findings indicate that the gravel is encountered between 0.7 (BH-04) and 1.3m bgl (TP-12). Additional depth of excavation may be required where soft spots are encountered. Benching into the existing slopes may also be required due to sloping ground conditions.

Ducts for the later pulling of power and communication cables for the wind farm will be pre-cast into the bridge deck sections.

Construction of the water crossing will be scheduled to align with fisheries seasonal restrictions.

The access road on the approach to the watercourse will be completed to a formation level which is suitable for the passing of plant and equipment required for the installation of the watercourse crossing.

All drainage measures, including check-dams and /or silt traps, along the proposed road will be installed in advance of the works along with the first layer of road construction.

All earthworks adjacent to the crossing locations will be carried out so as to prevent soil entering the watercourse and will be in accordance with the Spoil Management Plan.

Safe access over the stream for this installation will be via a steel walkway & handrail which will span the stream.

Further details on hydrology and drainage are contained in Chapter 12 - Hydrology and Water Quality, the Surface Water Management Plan (SWMP) which is contained in Appendix 2.1 and on accompanying planning application drawings.

Minor Stream / Drain Crossing Construction Methodology

All other minor streams or drains within the Site (which are not identified as Rivers by the EPA in their reporting under the Water Framework Directive) which are crossed by the wind farm infrastructure will be collected by interceptor drains and carried under the road by cross drains. Further details on the locations of such cross drains are provided in the Surface Water Management Plan in Appendix 2.1, Volume III and in the Drainage Drawings presented in 0100 and 0500-Series planning application drawings. The cross drains will be an appropriately sized pipe buried in the sub-base of the road at the necessary invert level to ensure ponding or pooling doesn't occur above or below the cross drain and water can continue to flow as necessary.

For a minor stream/drain crossing the following will be employed:

- The access track construction will finish at least 10m from the nearside bank of the minor stream/drain.
- All environmental mitigation measures, described in detail in Chapter 12 - Hydrology and Water Quality and Chapter 9 - Biodiversity, will be implemented locally in advance of the works, in accordance with the measures outlined in the Surface Water Management Plan (SWMP) in the CEMP in Appendix 2.1.
- The pipe is laid in one lift or in sections using a lifting mechanism attached to an excavator.
- Rock armour headwalls will be constructed where necessary to protect pipe ends and the base of slope embankments on either side of the track.

2.4.1.3 On-Site Electrical Substation and Cabling

An onsite electricity substation will be constructed within the Site as shown in Figure 2.2. This will provide a connection point between the wind farm and the proposed grid connection point at the existing Dungarvan substation.

The dimensions of the substation compounds will be 123 m X 62.8 m and will include a substation control building and electrical components necessary to export the electricity generated from the wind farm to the national grid. The substation compound will be surrounded by a ca. 2.5-metre-high steel palisade fence and internal fences will also be provided to segregate different areas within the main substation compound.

Lighting will be required on site, and this will be provided by lighting poles located around the substation and exterior wall mounted lights on the control buildings.

The control building located within the substation compound will measure 25 m by 18 m and 8.38 m in height. The Independent Power Production (IPP) building will include grid operator control rooms, an office space and welfare facilities for staff during the operational phase of the wind farm and will measure 10.7m by 20.1m and 6.9m in height.

Due to the nature of the Proposed Development, there will be a small water requirement for occasional toilet flushing/hand washing with a rainwater harvesting tank adjacent to the control building. A wastewater holding tank will be provided outside the substation compound fence line so that it can be maintained where required without requiring access to the substation compound. The wastewater holding tank will be a sealed storage tank with all wastewater tankered off site as required by an authorised waste collector to a wastewater treatment plant. Only waste collectors holding valid waste collection permits under the Waste Management (Collection Permit) Regulations, 2007, will be employed to transport wastewater away from the site. The proposed wastewater storage tank will be fitted with an automated alarm system that will provide sufficient notice that the tank requires emptying. Potable water will be delivered to site and stored in a holding tank in the substation control building.

The substation compound will also contain external electrical and ancillary infrastructure in the form of the following:

- Cable sealing ends;
- Surge arrestors;
- Cable disconnectors;
- Post insulators;
- Circuit breakers;
- Current and voltage transformers;
- Steel gantry's and cable chairs;
- Power transformers;
- Power quality compensation equipment;
- Concrete plinths and bunds;
- External lighting;
- Lightening protection masts;
- Telecommunications masts;
- Security cameras;
- Palisade fencing and gates.

Lightning protection and telecommunications masts will represent the tallest structures in the compound and will not exceed 18.0m in height.

The proposed substation compound is presented in accompanying planning application drawings.

2.4.1.4 On-Site Electrical Cabling

Electricity generated from wind turbines will be collected at medium voltage (33kV) by an internal circuit of buried cables. This circuit will be terminated at the proposed onsite substation. The internal collector circuit cable routes are shown on the planning application drawings and will follow the alignment of the internal access tracks.

The electricity will be transmitted as a three-phase power supply so there will be three individual conductors (or individual cables) in each cable circuit. The three conductors will each be laid in separate ducts which will usually be laid in a trefoil formation but may also be laid in a flat formation where conditions require it such as where the ducts need to cross an existing structure or culvert in such cases, cable ducts will be cast into the structures to allow the power cables to cross the watercourses under the access tracks.

The design and construction methods associated with the internal wind farm electrical cabling will be similar in nature to that of the 110 kV grid connection cable works as described in Section 2.4.2.

The width of the internal cable trench with a trefoil formation will be 600 mm, a flat formation will require a wider trench width (approximately 1200 mm). The depth of cover to the ducts carrying the cables will be 900 mm to the top of the upper ducts. The depth of trench for the cables will be 1200 mm. The diameter of the ducting will be selected to suit the range of cross-sectional areas of electrical cables and is likely to fall between 100 mm and 200 mm diameter.

Internal cable trench section types associated with on-site electrical cabling are presented in the accompanying planning application drawings.

Further details on cable trench construction methodologies can be found in the CEMP in Appendix 2.1.

2.4.1.5 Meteorological Mast

1 no. permanent meteorological (met) mast will be erected on Site at the location shown in Figure 2.2. The permanent met mast will be of the following general configuration:

- 110 m high lattice steel mast with a shallow concrete foundation, which includes a 4m lightning rod which will extend above the mast structure.

The power source for the permanent met mast will be taken from the ESB overhead line along the local road and will be an underground cable following the access road tot eh met mast and will connect to an electrical kiosk which will be installed within the met mast site.

The met mast installation works will be carried out by a small crew and are described as follows:

- An access track will be extended towards the mast location from the local road as shown on Figure 2.2. The access track will be 3.5m in width. Temporary and permanent drainage infrastructure will be extended, and underground cable power supply will be provided along the new access.
- A small aggregate crane pad of approximately 10m x 10m in size will be constructed in front of the proposed mast location.
- General construction methods for the above access track and hard standing will match those described for wind farm access tracks and hard standings however the dimensions and stone depth requirements of the infrastructure will be considerably less than that required for that serving the wind turbine construction.
- The foundation will be excavated followed by shuttering, steel fixing and finally concrete pouring by ready mix truck. Excavation and concrete operations will be carried out in accordance with the CEMP (Appendix 2.1). The foundation will be 10m x 10m x 1.8m in size.
- Following crane setup, the mast sections will be delivered and unloaded by truck.
- In accordance with an agreed lifting plan, mast sections will be lifted by crane into place. Wind speeds will be monitored at all times during lifting operations by the lead climber and crane operator.
- Mast sections will be bolted together by climbers.
- Following erection of main mast sections, lightning protection and other ancillary components will be fixed to the mast.

Details of the proposed met mast design can be found in the planning application drawings.

2.4.1.6 Borrow Pits and Peat /Spoil Deposition Areas

Civil engineering assessment of the proposed Coumnagappul Wind Farm indicates the requirement for approximately 233,715m^3 of stone fill across the Site to provide fill for the internal access roads, hardstands, upfill to foundations and the temporary compound. Further details are provided in the Peat and Spoil Management Plan.

Table 2-4: Anticipated stone volumes necessary for construction

Infrastructure Element	Typical Dimensions	Stone Volume (m^3)	Average Stone Depth (m)
10 no. Turbines	25m diameter excavation footprint for turbine foundation	2,375	3
10 no. Turbine Hardstands	Hardstand area (7,600m^2)	168,911	0.5
Substation	Assumed 9,288m^2 footprint	22,145	Varies
Access Roads, turning bays and earthworks for Colligan River Crossing	Assumed 5m running surface with 6m wide development footprint for the access roads.	33,009	Varies
Temporary Construction Compound	Footprint of 18,000m^2	6,750	0.3
Met Mast Foundation and Hardstand	Hardstanding area of 16m^2	525	1.5m foundation / 0.3m hardstand area
	Total	233,715	Fill to be sourced from the on-site borrow pit.

Note: A contingency factor of 25% stone volumes to allow for a variation in ground conditions across the Site.

One borrow pit will be excavated as part of the Proposed Development, which will be located in proximity to Turbine T2 and will be 15,000 m^2 in area. The borrow pit will have the capacity to provide 239,580m^3 of Class 1 fill material to an excavated depth of 14 m.

The borrow pit will be excavated only as required. Where rock and fill material is available from the excavation of turbine foundations and internal roads this material will be used first. The use of an on-site borrow pit will reduce the need to transport material to the Site.

Weaker rock will be extracted using a hydraulic excavator and a ripper. Where stronger rock is encountered and cannot be extracted using an excavator, then rock breaking equipment will be employed. This will typically involve the use of a hydraulic excavator with a rock breaker.

Excavated rock will be crushed on site using a mobile crusher and crushed down into the correct grade for use in the construction.

The borrow pit shall be typically constructed as follows:

1. The rock within the proposed borrow pit footprint will be removed by excavation and ripping methods.
2. It is proposed to construct the borrow pit so that the base of the borrow pit is below the level of the adjacent section of access road. This may vary and as excavation progresses into the back edge of the borrow pit, the base of the borrow pit may be raised to suit local conditions. Localised deepening of the borrow pit floor may be required depending on extraction operations.
3. Depending on the depth and type of rock present in the borrow pit it may be possible to excavate the rock from the borrow pit whilst leaving in place upstands/segments of intact rock which will help to retain the placed peat and spoil. The upstands/segments of intact rock will essentially act as engineered rock buttresses.
4. Slopes within the excavated rock formed around the perimeter of the borrow pit will be formed at stable inclinations to suit local in-situ rock conditions. Exposed sections of the rock slopes will be left with irregular faces and declivities to promote re-vegetation and provide a naturalistic appearance.
5. The stability of the rock faces within the borrow pit will be inspected by competent personnel upon excavation to ensure stability during construction works and in the long term. This inspection will allow unfavourable rock conditions to be identified and suitable mitigation measures to be applied such as removal of loose rock.
6. Where it is not possible to leave upstands/segments of intact rock in place it may be necessary to construct rock buttresses founded on in-situ rock within the borrow pits. The rock buttresses will be constructed of rock fill from the borrow pit excavation. The founding stratum for each rock buttress will be inspected and approved by a competent person.
7. It may be necessary to construct the rock buttress within the borrow pit in stages as infilling of spoil behind the buttresses progresses. The buttress will be constructed of selected rock fill and placed and compacted in suitable layers to form a buttress of sufficient stability to retain the placed spoil, as necessary.
8. Infilling of the peat and spoil will commence at the back edge of the borrow pit and progress towards the borrow pit entrance. The contractor excavating the rock will be required to develop the borrow pits in a way which will allow the excavated peat and spoil to be placed safely.
9. The height of the rock buttresses constructed will be greater than the height of the placed peat and spoil to prevent any surface spoil run-off.
10. The use of temporary access ramps and long reach excavators during the placement of the excavated peat and spoil is likely to be required.
11. Where possible, the surface of the placed peat and spoil will be shaped to allow efficient run-off of surface water from borrow pit area.
12. An interceptor drain will also be installed upslope of the borrow pit. This drain will divert any surface water away from the borrow pit and hence prevent water from ponding and lodging on the re-instated borrow pit area.
13. Control of groundwater within the borrow pit may be required. A temporary pump and suitable outfall locations are likely to be required during construction.
14. A silting pond will be required at the lower side/outfall location of the borrow pit.
15. Supervision by a geotechnical engineer or appropriately competent person will be carried out for the works.
16. All of the above commitments will be implemented in full and may be added to by the designer prior to construction.

The borrow pit is shown on planning drawing P2360-0300-0001.

Spoil and Overburden Management

The predicted overburden volumes generated during construction have been calculated and are outlined in Table 2-6. Spoil and overburden will be stored within the Site, at the borrow pit location as shown on Figure 2.2, Volume IV, the dimensions of which and details on rock volume are show in Table 2-5. Further details are provided in the Peat and Spoil Management Plan within the CEMP in Appendix 2.1, Volume III.

Table 2-5: Borrow Pit Dimensions

Element	Typical Dimensions	Rock Volume (m^3)	Comment
Borrow Pit	150m (L) x 100m (W) x 14m (D).	239,580	Rock depth at approximately 1.9m bgl (taken from BH-03)

Prior to the use of the borrow pit/storage area an interceptor drain will be excavated upslope in order to intercept existing overland flow and divert it around the storage area prior to discharge via an overland diffuser on the downslope side. A dirty water cut-off drain will be provided on the downhill side of the storage area to catch potential sediment-laden run-off and transfer it to a settlement pond.

Table 2-6: Summary of Estimated Excavation Quantities on Site

Infrastructure Element (1)	Typical Dimensions	Peat Volume (m^3) (2)	Spoil (non-peat) Volume (m^3) (2)	Comment
10 no. Turbines and Hardstands	25m diameter excavation footprint for turbine foundation with 7,600m^2 hardstand area.	14,364	101,772	Hardstanding area and foundation footprint.
Access Roads (to include Colligan River Crossing Earthworks)	Assumed 5m running surface with 6m wide development footprint.	10,368	16,530	Upgrade of New and Construction of existing roads required.
Temporary Construction Compound	18,000m^2 footprint	3,240	3,240	2 no. TCC areas proposed
Substation	9,288m^2 footprint	2,325	18,329	
Met Mast and Hardstand	Foundation area of 100m^2 with an excavation depth of 1.5m. Hardstand area of 900m^2 with an excavation depth of 0.30m.	0	180	Foundation and Hardstanding area.

Infrastructure Element [1]	Typical Dimensions	Peat Volume (m^3) [2]	Spoil (non-peat) Volume (m^3) [2]	Comment
Borrow Pit (surface material)	150m (L) x 100m (W) x 14m (D).	2,970	34,650	Peat and Soil volumes only. Excludes rock volumes which will be used on site as fill.
	Total =	**36,831**	**174,701**	**Total = 211,532m^3 (peat and spoil volume)**

Note (1) The location of the infrastructure elements on site are shown on drawing no. P2360-0100-0001.

Note (2) A factor of 20% (bulking factor of 15% and contingency factor of 5%) has been applied to the excavated peat and spoil volumes to allow for expected increase in volume upon excavation and to allow for a variation in ground conditions across the site.

2.4.1.7 Biodiversity Management / Enhancement

A Biodiversity Enhancement and Management Plan (BEMP) has been prepared which prescribes land management practices to be employed as part of the proposed Coumnagappul Wind Farm Development (see Appendix 9.1, Volume III).

The measures set out in the BEMP include those designed to protect and enhance existing habitats. Higher value habitats will be actively managed to maintain and improve their value and lower value habitats will see specific interventions designed to improve their attractiveness for a range of species.

The BEMP measures will be employed for the lifetime of the windfarm.

2.4.1.8 Felled Forestry

Permanent felling of approximately 5.4 ha of coniferous forestry is required near the main entrance to the wind farm. It should be noted that the clear-felling of trees in the State requires a felling licence. The Forest Service of the Department of Agriculture, Food & the Marine is Ireland's national forest authority and is responsible for all forest licensing which is governed by the Forestry Act 2014 as amended and the Forestry Regulations 2017 (S.I. No. 191 of 2017). A felling licence will include the provision of relevant replant lands (afforestation area) to be planted in lieu of the proposed tree felling on the Site. The associated afforestation of alternative lands equivalent in area to those lands being permanently clear-felled is also subject to licensing ('afforestation licensing').

It should be noted that the forestry within the Site was originally planted as a commercial crop and will be felled and replanted in the coming years should the Proposed Development not proceed.

The area of trees to be felled will be the minimum required to accommodate the Proposed Development. However, for the purpose of the EIAR the area for felling has been identified as the maximum area that could conceivably be required to construct the Proposed Development.

The felling will be the subject of a Felling Licence Application to the Forest Service prior to construction as per the Forest Service's policy on granting felling licenses for wind farm developments. The Forest Service Policy requires that a copy of the planning permission for the wind farm be submitted with a felling license application therefore the felling license cannot be applied for until planning permission is received for the Proposed Development.

The Applicant commits to not commencing tree removal on site to accommodate the Proposed Development until both felling and afforestation licences are in place and this ensures the afforested lands are identified, assessed and licensed appropriately by the relevant consenting authority.

2.4.2 Grid Connection

It is proposed to connect the development via underground cable to the existing Dungarvan 110kV substation. The proposed grid connection for the Coumnagappul Wind Farm is approximately 22.47 km in length and runs in a northerly direction from the existing Dungarvan 110kV Substation. The proposed connection route utilizes approximately 17,339 m of public road, and approximately 5,031m of wind farm access tracks and sections of private land. The proposed grid connection arrangement is illustrated in Figure 2.4, Volume IV. A detailed description of the proposed grid connection and associated construction methodologies can be found in the CEMP in Volume III, Appendix 2.1. Details of proposed grid connection infrastructure are provided in planning application drawings.

Connection works from the onsite substation to Dungarvan substation will involve the installation of ducting, joint bays and ancillary infrastructure and the subsequent running of cables along the existing road network. This will require delivery of plant and construction materials, followed by excavation, laying of cables and subsequent reinstatement of trenches and road surfaces.

The GCR will consist of 3 No. 125mm diameter HDPE power cable ducts, 2 No. 125mm diameter HDPE communications ducts and 1 No. earth continuity conductor duct to be installed in an excavated trench. The trench will be typically 825mm wide by 1,315mm deep with variations on this design to adapt to bridge crossings, service crossings and watercourse crossings.

The ducts will be installed, and the trench reinstated in accordance with landowner, EirGrid and Waterford City and County Council specifications. The electrical cabling/fibre cable will be pulled through the installed ducts in approximately 730 to 770m section lengths. Construction methodologies implemented and materials used will ensure that the GCR is installed in accordance with the requirements and specifications of EirGrid.

Dungarvan 110kV substation has a number of existing GCR routes exiting the substation within this section. The exact location, depth, and arrangement of the existing GCRs will need to be confirmed by detailed survey and site investigation works. A minimum separation distance between the cables will need to be adhered to in order to comply with EirGrid/ESB requirements.

It is expected that full road closures will be put in place to facilitate cabling works in combination with lane closures, partial road closures and stop/go systems. This will enable the works to be completed as quickly and as safely as possible, with minimal disruption time for residents of the area. These works will be undertaken on a rolling basis with short sections closed for short periods before moving onto the next section. This is described in more detail in Chapter 14 - Traffic and Transportation.

As part of the scoping and consultation process for the Proposed Development, searches of existing utility services were carried out to identify areas where major assets exist such as high voltage electricity cables or gas mains. Private utility and telecommunications companies were also consulted during this period.

In advance of the construction phase cable detection tools, a ground penetrating radar and slit trenches will be used, as appropriate, to verify the exact locations of existing services. The final locations of the proposed cable routes in the public roads and in the verge along the public road will be within the area indicated and assessed in this EIAR and will minimise conflicts with other services.

2.4.2.1 Trenching Methodology

The following section outlines the methodology to be followed during trenching works, with further details in in the Grid Connection Construction Methodology in the CEMP in Volume III, Appendix 2.1.

- All existing underground services along the GCR route will be confirmed prior to the commencement of construction works;
- At watercourse crossings, the contractor will be required to adhere to environmental control measures as described in the Construction Environmental Management Plan (CEMP);
- Where the cable route intersects with culverts, the culvert will remain in place (where possible) and the ducting will be installed either above or below the culvert to provide minimum separation distances in accordance with EirGrid and Irish Water specifications;
- In the event that culverts require removal for ducting installation, a suitable method of damming the water source and pumping the water around the work area will be set out in a method statement and agreed with the relevant stakeholders. Once the ducts are installed the culvert will be reinstated to match existing levels and dimensions. If works of this nature are required, the contractor will liaise with Inland Fisheries Ireland in advance of works;
- A detailed Traffic Management Plan will be prepared and agreed with Waterford City and County Council;
- Excavated material will be temporarily stockpiled onsite for re-use during reinstatement. Stockpiles will be restricted to less than 2m in height. Stockpiles will be located a minimum of 50m from surface water features and all stockpiling locations will be subject to approval by the Site Manager and Project Ecological Clerk of Works (ECoW);
- Excavated material will be employed to backfill the trench where appropriate and any surplus material will be transported off site and disposed of at a fully authorised soil recovery site;
- Any earthen (sod) banks to be excavated will be carefully opened with the surface sods being stored separately and maintained for use during reinstatement;
- The excavated trench will be dewatered if required, from a sump installed within the low section of the opened trench. Where dewatering is required, dirty water will be fully and appropriately attenuated, through silt bags, before being appropriately discharged to vegetation or surface water drainage feature;
- Where required, grass will be reinstated by either seeding or by replacing with grass turves;
- No more than a 50m section of trench will be opened at any one time. The second 50m will only be excavated once the majority of reinstatement has been completed on the first;
- The excavation, installation and reinstatement process will take approximately one day to complete a 100m section;
- Where the cable is being installed in a roadway, temporary reinstatement may be provided to allow larger sections of road to be permanently reinstated together;
- Following the installation of ducting, pulling the cable will take approximately one day between each joint bay, with the jointing of cables taking approximately 1 week per joint bay location.

Image 2-1: Example of 110kV Underground Duct Installation

2.4.2.2 Ducting Installation Methodology

The trenching and ducting works will follow the step-by-step methodology below.

- Grade, smooth and trim trench floor when the required 1,265mm depth and 825mm width have been obtained.
- Place bedding layer of Cement Bound Granular Mixture B (CBGM B) material in accordance with its specification and compact it so that the compacted thickness is as per drawings.
- Lay the bottom row of ducts in trefoil formation as detailed on design drawings. Use spacers as appropriate to establish horizontal duct spacing. Fit a secure cap / bung to the end of each duct run to prevent the ingress of dirt or water.
- Carefully surround and cover ducts with CBGM B in accordance with the design drawings and specifications and thoroughly compact without damaging ducts.
- Place cable protection strips on compacted CBGM B directly over the ducts.
- Lay the top row of ducts onto the freshly compacted CBGM B including the cable protection strips above the bottom row of ducts. Place a secure cap at the end of each duct to prevent the ingress of dirt or water.
- Carefully surround and cover ducts with CBGM B material in accordance with drawings and thoroughly compact without damaging ducts.
- Place red cable protection strip on top of compacted CBGM B over each set of ducts as shown on the drawings.

- Place and thoroughly compact CBGM B material or Clause 804 backfill, or soil backfill as specified and place warning tape at the depth shown on the drawings.
- For concrete and asphalt/bitmac road sections, carry out immediate temporary/permanent reinstatement in accordance with the specification and to the approval of the local authority or landowner, unless otherwise agreed with local authorities.
- For unsurfaced/grass sections, backfill with suitable excavated material to ground level leaving at least 100mm 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.
- Clean and test the ducts in accordance with the specification by pulling through a brush and mandrel. Install 12mm polypropylene draw rope in each duct and seal all ducts using robust duct end seals fitted with rope attachment eyes in preparation for cable installation at a later date. All the works should be witnessed by an EirGrid Clerk of Works (CoW) as required.

2.4.2.2.1 GCR Installation within the public road

The majority of the 110kV route is located within public road and where applicable the trench will be installed in the non-trafficked strip between the typical vehicular wheel locations on the road. The cable will be micro-sited based on the presence of existing utilities and the nature of the road and the adjoining terrain.

2.4.2.3 Surface Cable Markers & Marker Posts

Surface cable markers will be placed along the route where the cable depth is unavoidably shallow due to constraints such as existing services. These cable markers will indicate the precise location of the GCR and will be metallic plates in accordance with ESBN and EirGrid standards.

Marker posts will be used on non-roadway routes to delineate the cable route and joint bay positions. Corrosion proof aluminium triangular danger sign, with a 700mm base, and with centred lightning symbol, on engineering grade fluorescent yellow background will be installed in adequately sized concrete foundations. Marker post will also be placed in the event that the cable burial depth is not standard. Siting of any marker posts will be agreed with EirGrid as part of the detailed design process.

2.4.2.4 Joint Bays and Associated Chambers

Joints bays are to be installed approximately every 700m - 850m along the GCR to facilitate the jointing of 3 No. lengths of GCR. Joint bays are approximately 2.5m x 6m x 1.75m pre-cast concrete structures installed below finished ground level. 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.

In association with joint bays, communication chambers are required at every joint bay location to facilitate communication links between Coumnagappul Wind Farm and the existing 110kV substation at Dungarvan. Earth sheath link chambers are only required at single point bonded sections along the cable route. Earth Sheath Links are used for earthing and bonding cable sheaths of underground power cables, 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 precise siting of all joint bays, earth sheath link chambers and communication chambers is subject to approval by EirGrid. Marker posts will be used on non-roadway routes to delineate the duct route and joint bay positions.

2.4.2.5 Joint Bay Construction and Cable Installation

Before starting construction, the area around the edge of the joint bay which will be used by heavy vehicles will be surfaced with a terram cover (if required) and stone aggregate to minimise ground damage. Any roadside drains within the temporary works area will be culverted and check dams made from stone or sandbags covered with terram will be inserted upstream and downstream of these culverts to intercept any solids generated during the insertion or which wash out during the works. Silt fencing with straw bales will be interposed between the works area and any watercourses.

All excavated material will be stored near the excavations and reused for reinstatement works. Any soil required for reinstatement that will be temporarily stockpiled on site will be placed at least 15m back from the nearest watercourse on level ground and will be ringed at the base by silt fencing and be regularly monitored by a designated competent person for signs of solids escape. If necessary, an additional line of silt fencing with straw bales will be added in line with the relevant environmental control measures.

If the joint bay needs to be dewatered, this will be pumped to a percolation area if the soil is not saturated, otherwise a settlement tank will be used to remove any solids from the dewatering process to comply with the environmental control measures.

The following steps outline the methodology for joint bay construction and reinstatement:

- The contractor will excavate a pit for joint bay construction, including for a sump in one corner.
- Grade and smooth floor; then lay a 50mm depth of thick sand for pre-cast concrete construction on 200mm thick Clause 804 granular material.
- Place pre-cast concrete sections on sand bedding.
- Where joint bays are located under the road surface the joint bay will be backfilled with compacted layers of Clause 804 and the road surface temporarily reinstated as specified by the local authority.
- For cable installation and jointing, the cable is supplied in pre-ordered lengths on large cable drums. Installing “one section” of cable 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 & swivel and a pulling head, fitted by the cable manufacturer. A sponge may also be secured to the winch rope to disperse lubricant through the duct. Lubrication is also applied to the cable in the joint bay before it enters the duct.
- Once the “two sections” of cable (total of 6 conductors) are pulled into the joint bay, a jointing container is positioned over the joint bay and the cable jointing procedure is carried out in this controlled environment.
- Following the completion of jointing and duct sealing works, place, and thoroughly compact cement-bound sand in the joint bay, in approximately 200mm layers to the level of the cable joint base to provide vertical support. Install additional layers of cement-bound sand and compact each layer until the cement-bound sand is level with the top of the joint. Install an additional 100mm cement-bound sand layer. Install cable protection strip. Backfill with cement-bound sand to a depth of 250mm below surface and carry out permanent reinstatement including placement of warning tape at 400mm depth below finished surface.

2.4.2.6 Watercourse Crossings Along the Grid Connection

The grid connection cable route includes 1 No. bridge crossing (TII bridge: WD-N72-007.00) which will be completed using horizontal directional drilling (HDD). Where the cable route intersects with existing watercourses, a detailed construction method statement will need to be prepared by the Contractor prior to the commencement of construction and is to be approved by the Local Authority and relevant environmental agencies. Minor watercourse crossing locations have been noted along the cable route in the form of culverts, pipe drains and minor field drains. Crossing of these existing culverts will be as per undercrossing or overcrossing methods, depending on the depth of the culvert or using open trenching.

Inland Fisheries Ireland have published guidelines relating to construction works along water bodies entitled 'Requirements for the Protection of Fisheries Habitats during Construction and Development Works at River Sites", and these guidelines will be adhered to during the construction of the development.

The river crossings associated with the cable route are presented in Table 2-7:

Table 2-7: River Crossings on the GCR

Watercourse Name	Coordinates: ITM	Road Name	Crossing Type
Watercourse 1 - Coligan River (COLLIGAN_040)	623170.967, 595184.165 [Cable route Chainage 550m]	N72 - Bridge Crossing (TII bridge: WD-N72-007.00)	There is insufficient cover available to allow the ducts to be installed in the bridge deck. Therefore, the watercourse will be crossed by Horizontal Directional Drilling (HDD) to pass under the bridge and riverbed. Entry and exit pits will be within the N72 road corridor.
Watercourse 2 - Ballynaguilkee Lower stream (FINISK_020)	620455.928, 603348.975 [Chainage 10,550m].	L1041	Existing culverted stream. The preferred crossing method is using a culvert undercrossing or overcrossing method which will be selected based on the cover available above the culvert. Culvert crossings have been designed in line with ESB specifications. Where it is not possible to cross under an existing culvert while maintaining the culvert in place, the culvert may be replaced. All reinstatement works will be carried out to the required Waterford City & County Councils specification and in line with the 'Guidelines for Managing Openings in Public Roads – 2017'.
Watercourse 3 - Unnamed tributary of the Skeheens Stream (COLLIGAN_010)	621231.261, 608261.270 [Cable route Chainage 15,500m]	Unnamed road at a staggered crossroads (Bryan's Crossroads)	GCR: The cable will exit the public road and enter privately owned lands which are in agricultural use. Here the cable will cross the stream utilising a Horizontal Directional Drilling (HDD stream undercrossing). Entry and exit pits will be within the adjacent agricultural lands. TDR: the route will exit the public road and enter privately owned lands.

Watercourse Name	Coordinates: ITM	Road Name	Crossing Type
			The stream will be crossed using a temporary piped culvert crossing.
Watercourse 4 - Skeheens Stream (COLLIGAN_010))	622466.431, 609322.014 [Cable route Chainage 17,950m]	On the access road within the Wind Farm Site.	The crossing is an existing river ford (shallow point where a river or stream may be crossed by wading, or inside a vehicle getting its wheels wet) on the existing forestry track. The riverbed has been modified and raised to allow this crossing. This crossing will be upgraded as part of the Proposed Development by replacement with an open-bottomed culvert. The cable ducting will be installed above the culvert.

2.4.2.6.1 Horizontal Directional Drilling (HDD) Operations

Horizontal Direction Drilling (HDD) will be employed at 3 no. locations along the GCR:

- HDD of the N72 - Bridge Crossing (TII bridge: WD-N72-007.00) at Watercourse 1 - Coligan River (ITM 623170.9678, 595184.1652)
- HDD of cattle undercrossing on the L5068 (ITM 620475.1496, 599734.4383)
- HDD in private lands of Watercourse 3 - Unnamed tributary of the Skeheens Stream (ITM 621231.2615, 608261.2700)

HDD is a method of drilling under obstacles such as bridges, railways, water courses, etc. in order to install cable ducts under the obstacle. This method is employed where installing the ducts using standard installation methods is not possible. There are two bridges on this GCR route which will require HDD due to insufficient cover and depth in the bridge to cross within the bridge deck.

A specialist contractor will be appointed to prepare a Methodology Statements of works, prepared by the and submitted to the local and relevant authorities associated with the Proposed Development.

The drilling methodology is as follows:

- A works area of circa. 150m^2 will be fenced on both sides of the river crossing, all within the road corridor.
- Fuels, lubricants and hydraulic fluids for equipment use on Site will be carefully handled to avoid spillage, properly secured and provided with spill containment kits in case of incident.
- The timing of grid connection cable laying will be carried out during metrologically dry seasons/periods and HDD on the stream crossing will not be carried out during the salmonid spawning season.
- The depth of the bore will be at least 3m below the level of the public road and stream bed so as not to conflict with the road drainage and watercourse;
- Inert, biodegradable drilling fluid will be used;
- There will be no refuelling within 50m of the watercourse.

- The drilling rig and fluid handling units will be located on one side of the bridge and will be stored on double bunded 0.5mm PVC bunds which will contain any fluid spills and storm water run-off.
- Entry and exit pits (1m x 1m x 2m) will be excavated using an excavator. The excavated material will be temporarily stored within the works area and used for reinstatement or disposed of to a licensed facility.
- A 1m x 1m x 2m steel box will be placed in each pit. This box will contain any drilling fluid returns from the borehole.
- The HDD pilot bore will be undertaken using a wireline guidance system. Assembly will be set up by the drilling team and steering engineer.
- A comprehensive monitoring system will be established to closely oversee any procedures involving bentonite, encompassing the careful observation of pumping pressure, the precise formulation of drilling mud (including drilling fluid volume), and the accurate measurement of mud returns.
- Fluid return lines used in HDD process will be tested for leaks prior to use to check their reliability.
- The pilot bore will be drilled to the pre-determined profile and alignment under the watercourse crossings.
- The steering engineer and drill team will monitor the drilling works to ensure that modelled stresses and pressures are not exceeded.
- The drilled cuttings will be flushed back by drilling fluid to the entry and exist pits and re-cycled for re-use.
- Once the first pilot hole has been completed a hole-opener or back reamer will be fitted in the exit side which will then be pulled back to the entry side as part of the pre-reaming/hole opening process to enlarge the hole to the correct size.
- When the pre-reaming/hole opening/hole cleaning has been completed, a reamer of slightly smaller diameter than the final cut will be installed on the drill string to which the ducts will be attached for installation. The steel boxes will be removed, with the drilling fluid disposed of to a licensed facility.
- The ducts will be cleaned and proven, and their installed location surveyed.
- The entry and exit pits will be reinstated to the specification of ESB Networks, EirGrid, Waterford City & County Councils & landowner.
- A joint bay/transition coupler/ transition chamber will be installed at either side of the bridge following the horizontal directional drilling as per EirGrid requirements, this will join the HDD ducts to the standard ducts.

In the case of HDD operations within the public road corridor, the works will be carried out in accordance with measures described in the Traffic Management Plan contained within the CEMP. Appropriate road opening licences will be in place.

See the 110kV Grid Connection Outline Construction Methodology in Appendix 2.1, CEMP for further details on GCR construction.

2.4.3 Turbine Delivery

Large components associated with the wind farm construction e.g. turbine blades and tower sections, will be transported to site via the identified turbine delivery route (TDR). A substation transformer unit will be transported to site which will be categorised as an abnormal load. As a result, an abnormal load permit will be sought for this movement. Multiple transformers have already been delivered to ESBN substations in the area without any impact on the structures along the road network.

The proposed turbine delivery route is presented in Figure 2.3 and is 73.2 km in length. A Delivery Route Selection and Assessment was carried out to identify the optimum delivery route to site and is presented as Appendix 2.2 in Volume III of this EIAR.

The proposed access route to Site is as follows:

- Loads will depart the Port of Waterford (Belview) and travel along the N29, taking the third exit on the Slieverue Roundabout to continue on the N29;
- Loads will proceed to the Luffany Roundabout where they will take the first exit onto the N25;
- Loads will travel west on the N25;
- Loads will continue west onto the N72;
- Loads will depart the N72 and head north on the R672;
- Loads will depart the R672 right near Touraneena onto the L5119;
- Loads will continue north-east on the L5119 to the proposed site entrance.

The objective will be to maintain the strategic capacity and safety of the N29, N25 and N72 carriageways at all times, cognisant of the National Development Plan, 2021 – 2030, with key sectoral priorities for maintaining the N25 and N72 national road network to a robust and safe standard for users.

Temporary accommodation works will be required at selected locations along the TDR to facilitate the delivery of large components to the site. No permanent road widening or junction accommodation works are required along the turbine delivery route. Some temporary hardcore surfacing will be required at roundabouts or areas of oversail. All temporary accommodation works associated with the TDR will be fully reinstated following the construction stage.

Overhead utilities and obstructions will need to be removed at several locations to provide adequate overhead clearance. The removal of overhead utilities will be by either temporary disconnections or permanent re-routing. Such works will be carried out by the utility providers in advance of turbine delivery to site. Further details and assessment of these works are provided in Chapter 14- Traffic and Transportation.

Temporary accommodation works will only be required during the operational phase in the unlikely event of a major turbine component replacement. The temporary accommodation works will not be required for the decommissioning phase as turbine components can be broken up on site and removed using standard HGVs.

Elements of the temporary accommodation works for the delivery of turbines are summarised below. Works within private lands at PoI 17 and PoI 26 are included within the planning application red line boundary. All other works are within the road.

Table 2-8: Accommodation Works on Delivery Route

POI Ref.	Description of Works
POI 02: N29 / R711 Slieverue Roundabout	Load bearing surface through the centre of the roundabout island. Temporary removal of road signage.
POI 03: N29 / N25 Luffany Roundabout	N29 / N25 Luffany Roundabout - Preparation of local load bearing surfaces for vehicle over-run. Temporary removal of all obstruction including road signage and street lighting.
POI 05: N25 / R680 Carrick Road Roundabout:	Load bearing surface through the roundabout and temporary removal of road signage.
POI 06: N25 / N72 Junction	Preparation of local load bearing surface through built out green area. Removal of road signage.
POI 07: R672 / N72 Junction	Preparation of local load bearing surface through cycle lane and ghost island hatched area. Temporary removal of all street furniture along cycle lane to facilitate vehicle overrun and to avoid local monument.
POI 08: N72 / R672 Junction	Preparation of local load bearing surface through cycle lane and pedestrian footway. Temporary removal of all street furniture.
POI 10: R672 Colligan	Load bearing surface to be laid and the road bollard to be temporarily removed.
POI 12: R672 Colligan	Load bearing surface to be laid. Hedge, wall section and fence may need to be removed and reinstated (to be determined at a later date and appropriate consents sought in advance of works).
POI 13: R672 West of Colligan	A load bearing surface should be laid, and one traffic bollard should be removed.
POI 14: R672 North of Garrycline	Load bearing surface to be laid. Trees and vegetation may need to be removed (to be determined at a later date and appropriate consents sought in advance of works). Road signage to be temporarily removed
POI 15: West of Colligan	Load bearing surface to be laid. Temporary removal of all street furniture. Trailer suspension raise to oversail the verge. The fence and vegetation may need to be removed and reinstated (to be determined at a later date and appropriate consents sought in advance of works).
POI 26: R672 Clooncogaile Cross Roads	Loads to **utilise third party land** to the north of the road where a load bearing surface will be laid. Ditches will be temporarily culverted and the verge reprofiled. Fences and road signage will be temporarily removed and reinstated. Included in Proposed Development Red Line Boundary.
POI 27: Unclassified Road east of Clooncogaile Cross Roads	Trees and vegetation may need to be cut (to be determined at a later date and appropriate consents sought in advance of works) and utility pole to be temporarily removed.

POI Ref.	Description of Works
POI 28: Ford's Cross Roads	Utility pole to be temporarily removed and road to be widened.
POI 17: Bryan's Cross Roads	Will require **third party land** take. Temporary stream crossing and load bearing surface. Temporary removal of fencing and cutting of hedgerow. Included in Proposed Development Red Line Boundary.
POI 18: Sweep Crossroads	Trailer suspension raise to oversail stone wall. Utility pole and hedge may need to be removed (to be determined at a later date and appropriate consents sought in advance of works).
POI 19: West of Blaentasour	Road widening required to a minimum driveable surface of 4.5m and clearance of 5.5m corridor. Vegetation trimming may be required (to be determined at a later date and appropriate consents sought in advance of works).

All overhead utilities and obstructions will be removed at any locations that the swept path analysis indicated possible conflict and where the lifting trailer is raised, namely at R672 Hickeys Cross road and at the Sweep Crossroads. The removal of overhead utilities will be either temporary disconnections or permanent re-routing. Such works will be carried out by the utility providers in advance of turbine delivery to site.

A traffic management plan will be agreed with Waterford City and County Council in advance of any such works. Any trenching and road reinstatement works associated with utility diversions will be subject to a road opening license and is expected to be carried out in such a way as to ensure one lane of traffic will be open to traffic at all times. Such works will be carried out over a number of days (estimated 1 day per service).

The schedule of turbine component deliveries will be determined by the turbine supplier however it is reasonable and worst case to assume that five convoys will be required to deliver all of the turbine components to site over the course of the turbine installation works which is expected to take place over the course of 5 months. This is based on a total of 7 no. loads per turbine to deliver blades, tower sections and nacelles, with each convoy consisting of components for two turbines at a time. Over the course of the 5 -month installation period, it has been assumed convoys will be scheduled to deliver components to site every 4 weeks. The impact on residents and businesses is assessed in Chapter 6, Population, Human Health and Material Assets.

2.5 Construction

2.5.1 Construction Activities

In the event that the Planning Authority decides to grant planning permission for the Proposed Development, tree felling, upgrading of existing site tracks and the provision of new site tracks will precede all other activities. Drainage infrastructure will be constructed in parallel with the track construction. This will be followed by the construction of the turbine hardstanding areas and foundations.

In parallel with these works the on-site electrical works i.e., the sub-station and internal cable network as well as off-site connection works to the national grid will be completed. Construction techniques are outlined in the CEMP in Appendix 2.1.

The hours of construction activity for the Proposed Development will be limited to avoid unsociable hours as per Section 8.5 (d) of the code of practice for BS 5228: Part 1: 1997. Construction operations will generally be restricted to between 08:00 hours and 19:00 hours Monday to Saturday. It should be noted that it may be necessary to commence turbine base concrete pours earlier due to time constraints incurred by the concrete curing process. Work on Sundays or public holidays will only be conducted in exceptional circumstances or in an emergency. Additional emergency works may also be required outside of normal working hours as quoted above. Further details on working hours and restrictions of same are provided in the CEMP in Appendix 2.1.

2.5.2 Construction Programme

The construction of the Proposed Development in its entirety is expected to take 24 months. The proposed construction programme upon which assessments in the EIAR have been based is presented hereunder.

Activity	Month																							
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24
Mobilisation and site setup																								
Site clearance and felling																								
Internal access tracks																								
Turbine hard standings																								
Turbine foundations																								
TDR accommodation works																								

Activity	Month																							
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24
Turbine Installation																								
Onsite substation																								
Grid connection cable works																								
Private electrical network																								
Landscaping, reinstatement, demobilisation																								

2.5.3 CEMP

A Construction and Environmental Management Plan (CEMP) is contained in Appendix 2.1 of Volume III.

The CEMP sets out the key environmental management measures associated with the construction, operation and decommissioning of the Proposed Development, to ensure that during these phases of the Proposed Development, the environment is protected, and any potential impacts are minimised. The CEMP will be developed further at the construction stage, on the appointment of the main contractor to the Proposed Development to address the requirements of any relevant planning conditions, including any additional mitigation measures that are conditioned.

The CEMP document is divided into six sections:

- Section 1: Introduction provides details on the existing site and the Proposed Development.
- Section 2: Existing Site Environmental Conditions provides details of the main existing geotechnical, hydrological, ecological and archaeological conditions onsite. These conditions will be considered by the Contractor in the construction, operation and decommissioning of this Proposed Development and the prescribed measures complied with.
- Section 3: Overview of Construction Works, this section provides an overview of the construction works proposed and drainage and sediment controls to be installed.
- Section 4: Environmental Management Plan (EMP), this section outlines the main requirements of the EMP and outlines controls for the protection of the environment for example soil management, waste management, traffic management, site drainage management, site reinstatement & decommissioning, habitat and archaeology management etc.
- Section 5: Safety & Health Management Plan, this section defines the work practices, procedures and management responsibilities relating to the management of health and safety during the design, construction and operation of the Proposed Development.
- Section 6: Emergency Response Plan contains predetermined procedures to ensure the safety, health and welfare of everybody involved in the Proposed Development and to protect the environment during the construction phase of the Proposed Development.

2.5.4 Traffic Management

A careful approach will be taken to planning the entirety of the works associated with the Proposed Development to ensure minimal impacts on road users and the public.

A Traffic Management Plan will be adopted, in consultation with Waterford City and County Council, to provide a safe environment for road users and construction workers. A Traffic Management Plan is contained in the CEMP. In the event permission is granted for the Proposed Development the Traffic Management Plan will be finalised following the appointment of the contractor for the main construction works to address the requirements of any relevant planning conditions, including any additional mitigation measures that are conditioned and will be submitted to the planning authority for agreement.

Construction Haul Routes

The stone required for the construction of the internal access roads will be sourced from within the on-site borrow pit and as such will significantly reduce the need for road haulage from local quarries.

The Site is surrounded by a comprehensive road network with routing options available via the main Site entrance to the west of the Site. Access to the proposed substation compound will be facilitated via the main Site entrance along internal access tracks and the location of the met mast will be accessed from the south. The proposed haul routes for the delivery of materials associated with the construction of the Proposed Development are outlined in Figure 14.3, Volume IV.

Construction deliveries from the south will use the L-5119 and the undesignated local road as the designated delivery routes for the Site which will likely be accessed via the N72 and the R672. Deliveries from the north will also use the L-5119 and undesignated local road near the Site entrance as the designated delivery route which will be accessed via the M8, the N24, the L-3214, the R665, and the R671. The haul routes are primarily along national secondary and regional roads, with additional local roads leading to the Site. In order to reduce two-way construction vehicle movements on local roads, it is proposed that all general construction delivery vehicles enter the Site via the L-5119 and the Undesignated Local road and exit the Site via the Undesignated Local Road and continue south at Renadampaun towards Lagg onto the L-1041 and rejoin the R672 at Beary's Cross.

Dust Suppression

In periods of extended dry weather, dust suppression may be necessary along haul roads to ensure dust does not cause a nuisance. If necessary, water will be taken from stilling ponds in the site's drainage system and will be pumped into a bowser or water spreader to dampen down haul roads and the construction compound 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. A site speed limit will also be adhered to which will assist in suppressing dust on the Proposed Development site.

Vehicle Washing

Wheels or vehicle underbodies are often washed before leaving sites to prevent the build-up of mud on public (and site) roads. A vehicle or wheelwash facility will be provided at the Proposed Development and will be used where required. The site roads will be well finished with non-friable, compacted hardcore, and so the public road-going vehicles will not be travelling over soft or muddy ground where they might pick up mud or dirt. A road sweeper will be available if any section of the public roads were to be dirtied by trucks associated with the Proposed Development.

2.5.5 Soil and Peat Management

Management of all excavated soils and peat will be carried out in accordance with the Soils Management Plan contained Volume III.

2.5.6 Surface Water Management and Site Drainage

Site drainage at the Coumnagappul Wind Farm will implement Sustainable Drainage Systems (SuDS). This design approach ensures that existing drainage patterns will be maintained throughout the site.

An appropriate drainage design as proposed for this development is the primary mitigation measure for the protection of waterbodies, incorporating silt protection infrastructure and control measures to reduce the rate of surface water runoff from the wind farm site.

The drainage system will be constructed alongside all turbine hardstands, internal access tracks, substation and the temporary construction compound. The drainage system for the existing tracks and roads will largely be retained. Where the roads require widening, this will involve the re-location of existing roadside swales to allow for widening.

As standard and best practice approach, surface water runoff attenuation and drainage management are key elements in terms of mitigation against impacts on surface water bodies.

Two distinct methods will be employed in the management of construction surface water runoff. The first method involves keeping clean water clean by avoiding disturbance to natural drainage features, minimising any works in or around drainage features, and diverting clean surface water flow around excavations and construction areas. The second method involves collecting any drainage waste from works areas within the site that might carry silt or sediment, and to route them towards settlement ponds prior to controlled diffuse release over vegetated natural surfaces. There will be no direct discharge to surface water.

'Clean' water is separated from 'dirty' water utilizing interceptor drains as illustrated in Image 2-2 below. The interceptor drains will be installed on the upslope side of the construction area. This will reduce the amount of water from the construction area that will need to be treated before it can be safely discharged into the environment. Collected clean water will be carried under wind farm infrastructures by cross drains at regular intervals to ensure the original hillside flow is not impeded. The maximum distance between the cross drains will be 250m. The cross drains will be connected to a diffuse outfall to allow collected water to disperse overland.

The proposed access tracks will be constructed from a permeable aggregate material which allows the runoff to infiltrate underground. The excess water will drain into the swales which will be connected, during the construction stage, to the settlement ponds. The settlement ponds will have a diffuse outfall which will disperse the flow across the site. On completion of the works the settlement ponds will be filled in and the swales will be connected to a diffuse outfall.

The proposed access roads and associated drainage infrastructure will follow contours as much as possible to reduce the gradient of the road and road drains (swales). This will reduce velocities within the swales, and consequently erosion.

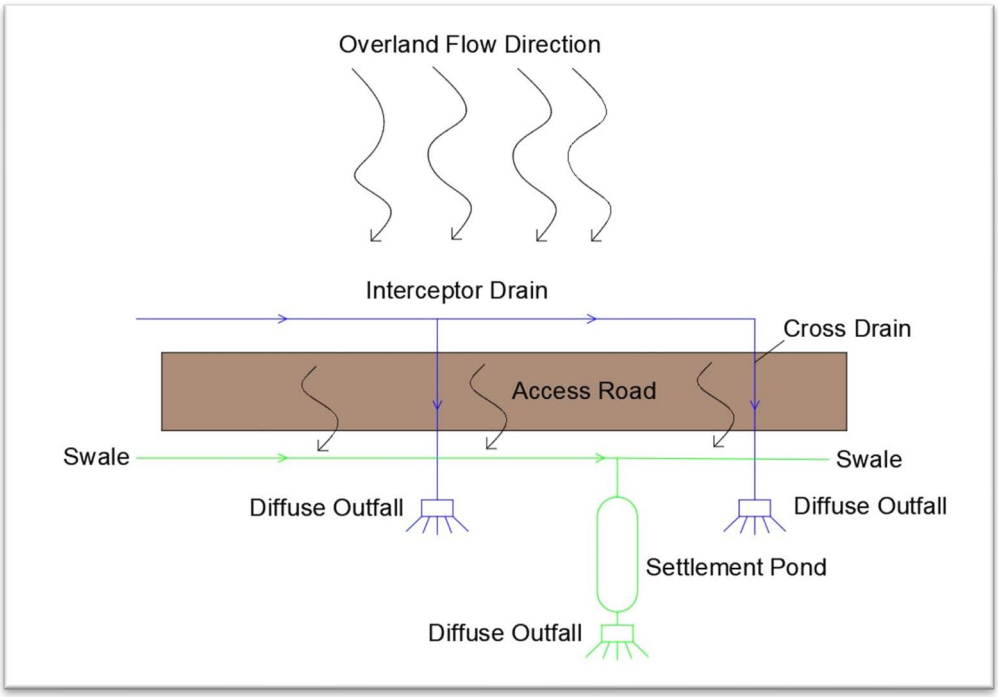

Image 2-2: Drainage Diagram

The settlement ponds will be designed in the accordance with CIRIA C648. The volume of a settlement pond is related to the area draining into it. Any upslope runoff from site will be diverted from ponds. This is achieved by interceptor drains as discussed above.

Suspended solids will settle out only when the water is still. It is necessary to retain the water in the settlement pond for several hours to allow the suspended solids to settle out. Retention time depends on the particle size, disturbance of the water, depth of water, temperature and particle density. Retention time of 2h is applied for designing the ponds as outlined in CIRIA C648. This will allow silts to settle out.

CIRIA C648 recommends designing the outfall from the ponds to accommodate 1 in 10 years storm event, for this Proposed Development the outfalls will be designed to accommodate flows associated with 1 in 100-year event. The settlement ponds will be 1.0m deep. The proposed size of the settlement ponds is provided in the Surface Water Management Plan (SWMP) contained in the CEMP in Appendix 2.1, Volume III.

The existing access roads, where required, will be upgraded. Where the existing drainage infrastructure does not prevent mixing of clean and dirty water, it is proposed to improve drainage at these locations by implementing drainage methodology proposed for new access roads.

Further details on hydrology and drainage are contained in Chapter 12 Hydrology and Water Quality, the Surface Water Management Plan (SWMP) which is contained in the CEMP in Appendix 2.1 and on accompanying planning application drawings. The proposed drainage is shown on Planning Drawings Series- 0100 and 0500.

2.5.7 Waste Management

A Waste Management Plan for the Proposed Development has been included in the CEMP, Volume III.

The Developer, in conjunction with appointed contractor, will prevent, reduce, reuse and recover as much of the waste generated on site as practicable and ensure the appropriate transport and disposal of residual waste to off-site licensed facilities. The location of these facilities are identified in Table 3-3. This is in line with the relevant National Waste Management Guidelines and the European Waste Management Hierarchy, as enshrined in the Waste Management Act 1996, as amended.

Any waste generated during the Proposed Development construction phase will be collected, source separated and stored in dedicated receptacles at the temporary compound during construction. It will be the responsibility of the contractor for the main construction works (when appointed) to nominate a suitable site representative such as a Project Manager, Site Manager or Site Engineer as Waste Manager who will have overall responsibility for the management of waste.

Table 2-9: Licensed Waste Facilities in the Vicinity of Coumnagappul Wind Farm

Licensed Waste Facility Location	Type of Waste
Tony Kirwan Civil Engineering Contractors Ltd. Ballycraddock, Kilmeaden, Co. Waterford	Soil and stones
Kilbarry Developments Ltd. Lacken Road, Kilbarry, Co. Waterford	Soil and stone
Kereen Quarries Ltd. Kereen Lower, Cappoquin, Co. Waterford	Iron and steel, concrete, bricks, tiles and ceramics, mixture of concrete, bituminous mixtures, ferrous metal.
BIGbin Waste Tech Ltd. Circle K garage, Kilrush, Dungarvan, Co. Waterford	Bbiodegradable kitchen and canteen waste, mixed municipal waste
Friends of the Earth (Skip & Fuels) Ltd. Carriganard, Six Cross Roads, Co. Waterford	Paper and cardboard packaging, wooden packaging, concrete, bricks, wood, plastic, mixed construction and demolition wastes, plastics, metals, soil and stones, mixed municipal waste, bulky waste.

Typical waste quantities generated during construction of similar-sized developments are included hereunder with typical recovery / reuse that can be achieved.

Table 2-10: Typical Waste Quanties for Wind Farm Development

		Reuse		Recycle/Recovery		Disposal	
Waste Type	Tonnes	%	Tonnes	%	Tonnes	%	Tonnes
Mixed C&D	1200	10	120	80	960	10	120
Timber/Wood	1000	40	400	55	550	5	50
Plasterboard	360	30	108	60	216	10	36
Metals	300	85	255	10	30	5	15
Concrete	200	20	40	65	130	15	30
Other	540	20	108	60	324	20	108
Total	3600		1031		2210		359

2.5.8 Temporary Site Compound

During the construction, it will be necessary to provide temporary facilities for construction personnel. Two temporary site compounds, the locations of which are shown on Figure 2.2, Volume IV will be constructed. Wheel wash facilities will be provided within the site near the site entrance point.

Facilities to be provided in the temporary site compounds will include the following:

- site offices, of Portacabin type construction;
- Portaloos;
- bottled water for potable supply;
- a water tanker to supply water used for other purposes;
- canteen facilities;
- material/non-fuel storage areas;
- employee parking;
- bunded fuel storage
- contractor lock-up facility;
- diesel generator;
- waste management areas.

The construction compounds will be established by removing topsoil down to a firm substrate, laying down geotextile material and then constructing a working surface of stone sourced from within the Site, and surrounded by security fencing. The topsoil will be removed and stored in accordance with the Spoil Management Plan contained within the CEMP in Appendix 2.1.

Temporary facilities will be removed, and the lands reinstated on completion of the construction phase.

2.6 Operation

Wind farm commissioning can take in the region of three months to complete from the erection of the final turbine to the commercial exportation of power to the national grid. It involves electrical and mechanical testing and control measures to check that the wind farm will perform and export power to the national grid, as designed and commissioning engineers working through an entire schedule of SCADA (Supervisory Control and Data Acquisition).

During the operational period, the turbines will operate automatically on a day-to-day basis, responding by means of anemometry equipment and control systems to changes in wind speed and direction. The turbine manufacturer or a service company will carry out regular maintenance of the turbines. Scheduled services will typically occur twice a year.

The operation of the wind turbines will be monitored remotely, and an operative working from a remote headquarters will oversee the day to day running of the proposed wind farm.

The applicant requests the grant of permission is on the basis of a 40-year operational period from the date of full operational commissioning of the wind farm. With permission for the onsite substation and grid connection sought in perpetuity given that the substation will form part of the national electricity network. Therefore, the substation will be retained as a permanent structure and will not be removed.

40 years is the anticipated minimum useful lifespan of wind turbines which are being produced for the market today. The lifespan of wind turbines has been increasing steadily in recent years and allowing this duration will improve the overall carbon balance of the development, therefore maximising the amount of fossil fuel usage that will be offset by the wind farm. Leaving the wind turbines in-situ until the end of their useful lifespan would be optimum from an environmental viewpoint, particularly in relation to carbon savings.

Routine Maintenance

Wind farms are designed to operate largely unattended and during the operational phase the wind farm will normally be unmanned. Each turbine will have its own in-built supervision and control system that will be capable of starting the turbine, monitoring its operation and shutting down the turbine in the case of fault conditions.

Supervisory operational and monitoring activities will be carried out remotely with the aid of computers connected via a telephone modem link.

Visits will be necessary to carry out routine inspection and preventive maintenance. A light vehicle will be required for routine access, occurring about once weekly, and in the event of any unscheduled fault conditions. In the unlikely event of a major component failure, a mobile crane will be required on site.

Routine inspection of the bridge crossings within the Site will be carried out in accordance with EIRSPAN Bridge Management System Routine M45aintenance Manual (Transport Infrastructure Ireland, September 2022)

2.7 Community Gain

The Developer will set up a community benefit fund which will allocate funds from the wind farm to community groups in the area should the wind farm be granted planning permission and be successful under the Government's RESS support programme.

If consented, the proposed Coumnagappul Wind Farm will require an approximate €88 million investment and will provide sustainable, low carbon energy generation infrastructure to meet Ireland's growing demand. The development benefits to the local community would include significant investment in local infrastructure and electrical systems, local job creation, and a contribution of approximately €21 million in Waterford City and County Council rates over the project lifetime of 40 years.

If consented the Proposed Development will also provide a community fund calculated in accordance with the Renewable Electricity Support Scheme (RESS) Terms and Conditions at €2 per MW/h of electricity produced by the project. This is to be made available to the local community for the duration of the RESS (15 years). The average capacity factor of wind energy projects in Ireland is 28.3% (SEAI, 2019). Assuming this efficiency, and a capacity of c.68MW, the community benefit fund would amount to an average of €337,155 per annum. The actual fund will vary around this average from year to year, depending on each year's wind conditions. 40% of the fund will be allocated to not-for-profit community enterprises, with an emphasis on low carbon initiatives. The remainder of the fund will be directed towards local clubs, societies and other initiatives. It is envisaged that the communities nearest the Proposed Development will benefit most from the Community Fund.

It is proposed that an annual payment of €1,000 will be provided to each household within 1km of any proposed turbine. An annual payment of €500 will be provided to each household located between 1km and 2km of a turbine. It is proposed that these payments will be fixed and will not fluctuate.

2.8 Risk of Major Accidents and Disasters

The CEMP includes an Emergency Response Plan (ERP). It provides details of procedures to be adopted in the event of an emergency relating to health & safety or environmental protection.

SEVESO

The Proposed Development is not connected with or in close proximity of any site regulated under the Control of Major Accident Hazards Involving Dangerous Substances Regulations (SEVESO sites), therefore no significant effects associated with major industrial accidents involving dangerous substances are anticipated.

Fire

In accordance with Chapter 19 of the Safety, Health and Welfare at Work Acts 2005 (as amended), the Proposed Development shall be subject to a fire safety risk assessment which will assist in the identification of any major risks of fire on site. Additionally, individual numbers will be painted on to the top of each turbine hub in order to assist any aerial fire service in navigation over the site and surrounding lands.

Ground Conditions

Ground conditions within the Site were assessed against the Scottish Government's 2017 guidance document, '*Peat Landslide Hazard and Risk Assessments: Best Practice Guide for Proposed Electricity Generation Developments'.* Intrusive ground investigation works were carried out as part of the peat stability assessment included peat depth probing, shear strength testing, ground augering/coring and trial pitting. Shallow peat depths were noted on site and the findings of the peat assessment showed that the site has a low risk of peat failure and is suitable for the Proposed Development.

Traffic

The Proposed Development will utilise the existing local road network during the construction phase.

All structural fill for access tracks, turbine hardstands, turbine foundations and on-site substation will be sourced from the on-site borrow pit instead of local quarries and will reduce the impact on the local road network.

Traffic Management Plan (TMP) is provided specifying details relating to traffic management (see CEMP Appendix 2.1, Volume III). Prior to the commencement of the construction phase of the Proposed Development a detailed Traffic Management Plan will be prepared by the Contractor for agreement with the relevant local authorities and An Garda Síochána.

Climate and Flooding

Flood risk assessment for the Proposed Development is included in Chapter 12 – Hydrology and Water Quality. All Proposed Development infrastructure is located outside and above the mapped 1,000-year flood level and, therefore, all infrastructure is located in Flood Zone C (Low Risk). There are no recorded recurring flood events specifically within the Proposed Development site.

The works programme for the construction stage of the development will take account of weather forecasts and work will be suspended in the case of extreme weather events. The following forecasting and weather warning systems are available and will be used on a daily basis at the site to direct proposed construction activities:

General Forecasts: Available on a national, regional and county level from the Met Eireann website (www.met.ie/forecasts). These provide general information on weather patterns including rainfall, wind speed and direction but do not provide any quantitative rainfall estimates;

Weather Warning or Advisories: Met Éireann's main suite of warnings are issued by the duty forecaster between 10am and midday and are updated as necessary as new information becomes available. In general, warnings will not be issued more than 60-hours ahead of the expected adverse weather but advisories on potential hazards are issued up to a week in advance. The three warning categories are:

- Yellow: Not unusual weather. Localised danger.
- Orange: Infrequent. Dangerous/disruptive.
- Red: Rare. Extremely dangerous/destructive.

MeteoAlarm: Alerts to the possible occurrence of severe weather for the next 2 days. Less useful than general forecasts as only available on a provincial scale.

Rainfall Maps: Forecast quantitative rainfall amounts for the next 3 hours but does not account for possible heavy localised events;

Rainfall Radar Images: Images covering the entire country are freely available from the Met Eireann website (www.met.ie/latest/rainfall_radar.asp). The images are a composite of radar data from Shannon and Dublin airports and give a picture of current rainfall extent and intensity. Images show a quantitative measure of recent rainfall. A 3-hour record is given and is updated every 15 minutes. Radar images are not predictive.

Consultancy Service: Met Eireann provide a 24-hour telephone consultancy service. The forecaster will provide interpretation of weather data and give the best available forecast for the area of interest.

2.9 Decommissioning

On decommissioning, cranes will disassemble the above ground turbine components which will be removed off site for recycling. All the major component parts are bolted together, so this is a relatively straightforward process.

The foundation pedestals will be covered over and allowed to re-vegetate naturally. Leaving the turbine foundations in situ is considered a more environmentally sensible option as to remove the reinforced concrete associated with each turbine would result in environmental nuisances such as noise and vibration and dust.

It is proposed that all the internal site access tracks and turbine hard standings will be left in place. These will continue to be used for forestry and agriculture. Turbine foundation pedestals and hardstanding areas will be covered over with topsoil previously stripped and used for landscaping purposes during the construction stage and left to revegetate naturally.

The temporary accommodation works along the TDR will not be required for the decommissioning phase as turbine components can be dismantled on site and removed using standard HGVs.

Grid connection infrastructure including the on-site substation and ancillary electrical equipment will form part of the national grid and will be left in situ.

The mast will be decommissioned using a similar methodology as the construction except in reverse.

It is expected that the decommissioning phase will take no longer than 6 months to complete.

The key site targets are as follows;

- Ensure decommissioning works and activities have minimal impact/disturbance to local landowners and the local community;
- Ensure decommissioning works and activities have minimal impact on the natural environment;
- Adopt a sustainable approach to decommissioning; and,
- Provide adequate environmental training and awareness for all project personnel.

The key site objectives are as follows;

- Using recycled materials if possible, e.g. soil and overburden material for backfilling and reinstatement;
- Ensure sustainable sources for materials supply where possible;
- Avoidance of any pollution incident or near miss as a result of working around or close to existing watercourses and having emergency measures in place;

- Avoidance of vandalism;
- Keeping all watercourses free from obstruction and debris;
- Correct implementation of the sustainable drainage system (SuDS) drainage design principles;
- Keep impact of decommissioning works to a minimum on the local environment, watercourses, and wildlife;
- Correct fuel storage and refuelling procedures to be followed;
- Good waste management and housekeeping to be implemented;
- Air and noise pollution prevention to be implemented;
- Monitoring of the works and any adverse effects that it may have on the environment. Decommissioning methods will be altered where it is found there is the potential to have an adverse effect on the environment;

Wind Turbines

Prior to any works being undertaken on wind turbines, they will be disconnected from the grid by the site operator in conjunction with ESB Networks and EirGrid. The dismantling and removal of wind turbines of this scale is a specialist operation which will be undertaken by the turbine supplier that completed the installation where possible. Turbine dismantling will be undertaken in reverse order to methodology employed during their construction. A number of large-scale cranes will be brought back to site utilising the existing hard stand areas. The dismantling of turbines will be bound by the same safety considerations as was the case during construction in terms of weather conditions where works will not be undertaken during adverse weather conditions and in particular not during high winds.

The turbines will most likely be removed from site in a similar manner to how they were transported to the site originally in extended articulated trucks. The destination of the turbines post decommissioning is unclear at this time and will be subject to an assessment of potential for recovery of parts.

The transport of disassembled turbines from the site will be undertaken in accordance with a Transport Management Plan which will be issued to and agreed with the competent authority at that time as part of a permit application for the delivery of abnormal loads using the local roads under the Road Traffic (Special Permits for Particular Vehicles) Regulations 2007. The Transport Management Plan will provide for all necessary safety measures, including a convoy and Garda escort as required, off-peak turning/reversing movements and any necessary safety controls.

Turbine Foundations

On the dismantling of turbines, it is not intended to remove the concrete foundation from the ground. It is considered that its removal will be the least preferred options in terms of having potential effects on the environment. Therefore, the nine turbine foundations will be backfilled and covered with soil material from areas of earthworks. The soil will be spread and graded over the foundation using a tracked excavator and revegetation allowed to occur naturally.

On-site Underground Cabling (for Turbines)

The electrical and fibre optic cabling that connects each turbine will be removed from the cable ducting. The cabling will be pulled from the cable duct using a mechanical winch which will extract the cable and re-roll it on to a cable drum. This will be undertaken at each of the joint bays/pull pits along the cable. The road will be excavated using a mechanical excavator at each cable pulling pit location 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 for an underground element that is not visible.

The 110 kV cable and substation will remain in situ and will become an ESB networks asset and will be part of the national electricity grid and therefore it is not proposed to remove this cable.

Transport Route Accommodation Works

During the construction of the Proposed Development , a number of road and junction improvements and the provision of a turbine delivery accommodation roadway will have been completed to provide access to the site during turbine delivery. These accommodation areas will likely require reuse during decommissioning and turbine component removal.

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