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CONSULTANTS IN ENGINEERING, ENVIRONMENTAL SCIENCE & PLANNING

ENVIRONMENTAL IMPACT ASSESSMENT REPORT (EIAR) FOR THE PROPOSED BALLINAGREE WIND FARM

VOLUME 2 - MAIN EIAR

CHAPTER 3 – DESCRIPTION OF THE PROPOSED DEVELOPMENT

Prepared for: Ballinagree Wind DAC

Ballinagree Wind farm

Date: January 2022

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3. Description of the Proposed Development

3.1 Introduction

This chapter of the EIAR describes the existing site and the main components of the proposed project and provides details on the construction, operation and decommissioning of the wind farm, in compliance with the EIA Directive.

A detailed summary of the proposed project assessed in the EIAR and a description of the development for which consent is sought is contained in Section 3.3.1.

The proposed project assessed in this EIAR is comprised of the following key elements:

- The wind farm site (also referred to in this EIAR as 'the Site');
- The grid connection;
- The turbine delivery route (also referred to in this EIAR as 'the TDR');
- Biodiversity enhancement and management plan lands (also referred to in this EIAR as 'the BEMP lands').

An overview of the proposed project is presented in Figure 3-1.

The wind farm site includes the wind turbines, internal access tracks, hard standings, meteorological masts, recreational amenity infrastructure and associated signage, onsite substation, internal electrical and communications cabling, temporary construction compounds, drainage infrastructure, borrow pits and all associated works related to the construction of the wind farm. Refer to Figure 3-2 for the general arrangement of the Site. The Site includes lands in the townlands of Knocknagappul, Ballynagree East, Finnanfield, Ballynagree West, Carrigduff, Carrigagulla, Inchamay South and Annagannihy.

The grid connection which comprises a 110kV underground cable passes through the townlands of Clonavrick, Knocknagappul, Ballynagree East, Bawnmore, Ballynagree West, Derryroe, Rahalisk, Kilberrihert, Caherbaroul, Aughinida and is primarily located within the public road corridor. The grid connection is shown in Figure 3-4 and described in detail in Section 3.3.4. A Grid Connection Constructability Report with provides a detailed description of the proposed grid connection infrastructure and construction methodologies associated with same is located in Appendix 3.3.

Large components associated with the wind farm construction will be transported to the Site via the identified turbine delivery route (TDR). The TDR commences at the Port of Foynes and finishes at the wind farm site and includes the N69 towards Limerick, the M7, the N21, south along the N20 through the towns of Charleville and Buttevant before turning West onto the N72 at Mallow, the R583 towards Millstreet before turning onto the L2758 to the proposed wind farm site. The TDR and location of temporary accommodation works are shown in Figure 3-3 and described in detail in Section 3.3.5.

A Biodiversity Enhancement and Management Plan is included in Appendix 3.4 and comprises land management commitments and monitoring for approx. 304 hectares of lands in the vicinity of the proposed Ballinagree Wind Farm. In addition, the developer has undertaken to create wildlife corridors through strategic tree-felling between areas of upland habitat in the vicinity of the proposed wind farm area. The land management measures are designed to maintain and enhance local biodiversity. The BEMP lands are identified in Figure 3-5 and further detailed in Section 3.3.8.

A glossary of acronyms used throughout this EIAR is included at the beginning of Volume 2 of this EIAR.

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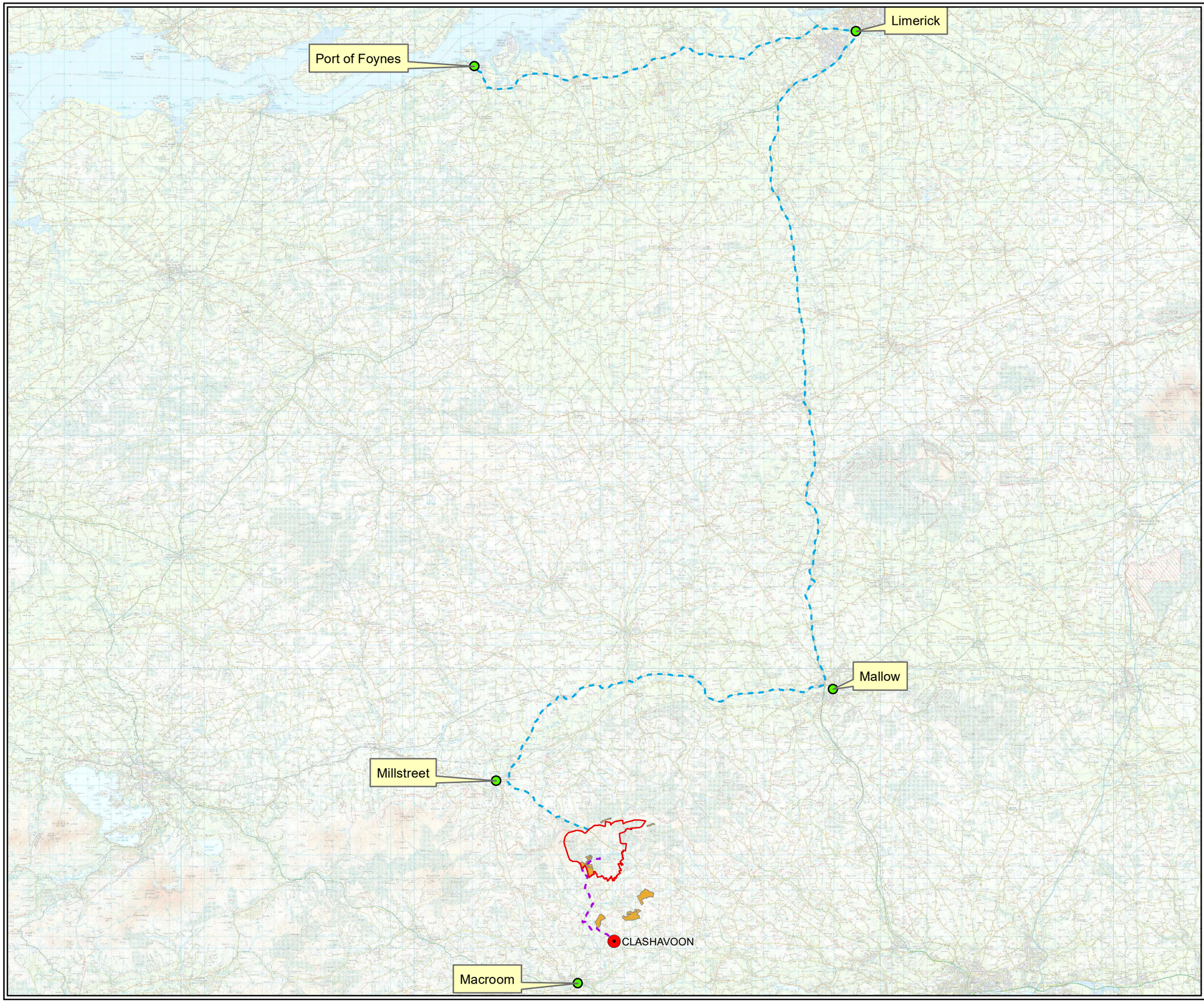

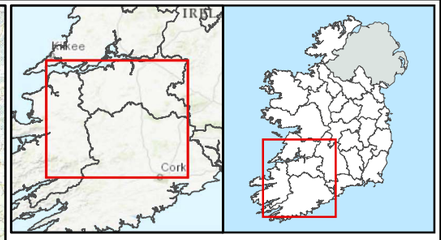

Legend

- Wind Farm Site
- Clashavoon Substation (110-220kV)
- Grid Connection
- Turbine Delivery Route
- BEMP Lands

N W E S

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TITLE:	Project Overview		
PROJECT:	Ballinagree Wind Farm		
FIGURE NO:	3.1		
CLIENT:	Coillte and Ørsted		
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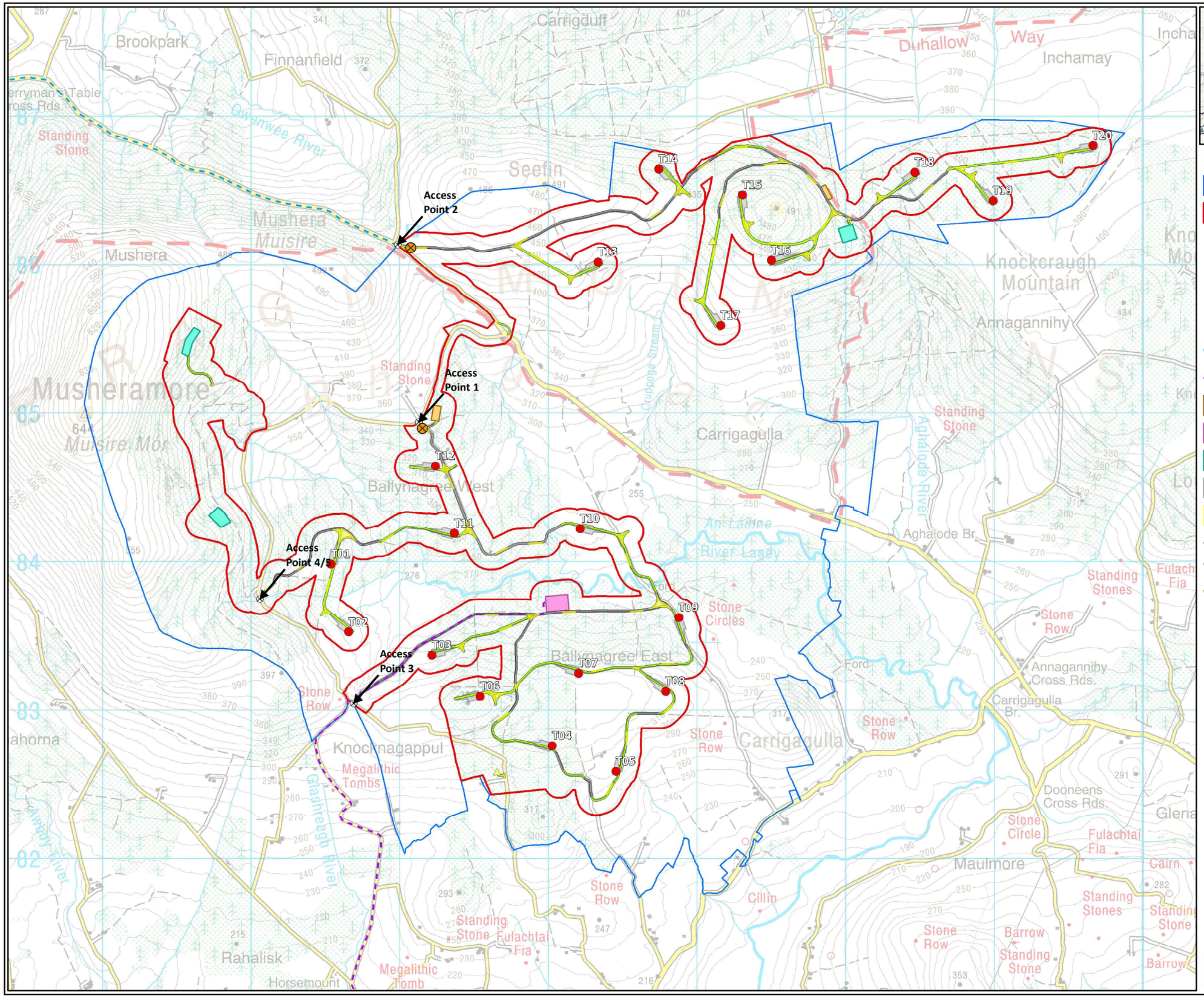

Legend

- Wind Farm Site
- Development Boundary
- Proposed Turbine Layout
- Met Mast
- Wheel Wash
- Access Points
- Turbine Delivery Route
- Grid Connection
- Construction Compound
- Substation Compound
- Proposed Borrow Pits
- Turbine Hardstanding Area
- Turning Heads and Passing Bays

Access Tracks

- Existing Track Upgrade
- New Access Track

TITLE:	Wind Farm Site Layout		
PROJECT:	Ballinagree Wind Farm		
FIGURE NO:	3.2		
CLIENT:	Coillte and Ørsted		
SCALE:	1:25000	**REVISION:**	0
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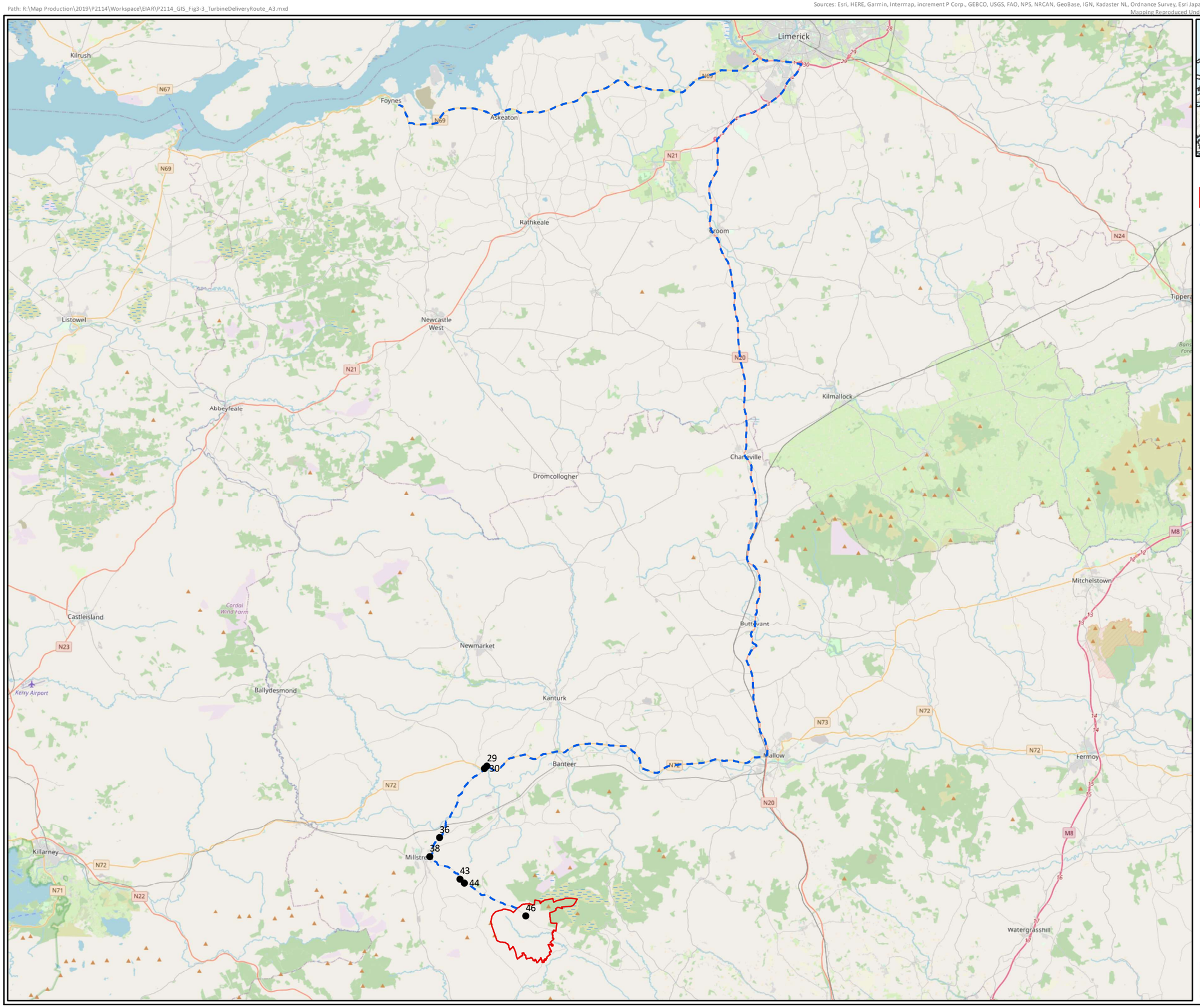

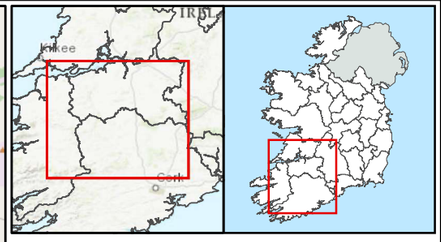

Legend

- Wind Farm Site
- Turbine Delivery Route
- TDR Nodes

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TITLE:	Turbine Delivery Route		
PROJECT:	Ballinagree Wind Farm		
FIGURE NO:	3.3		
CLIENT:	Coillte and Ørsted		
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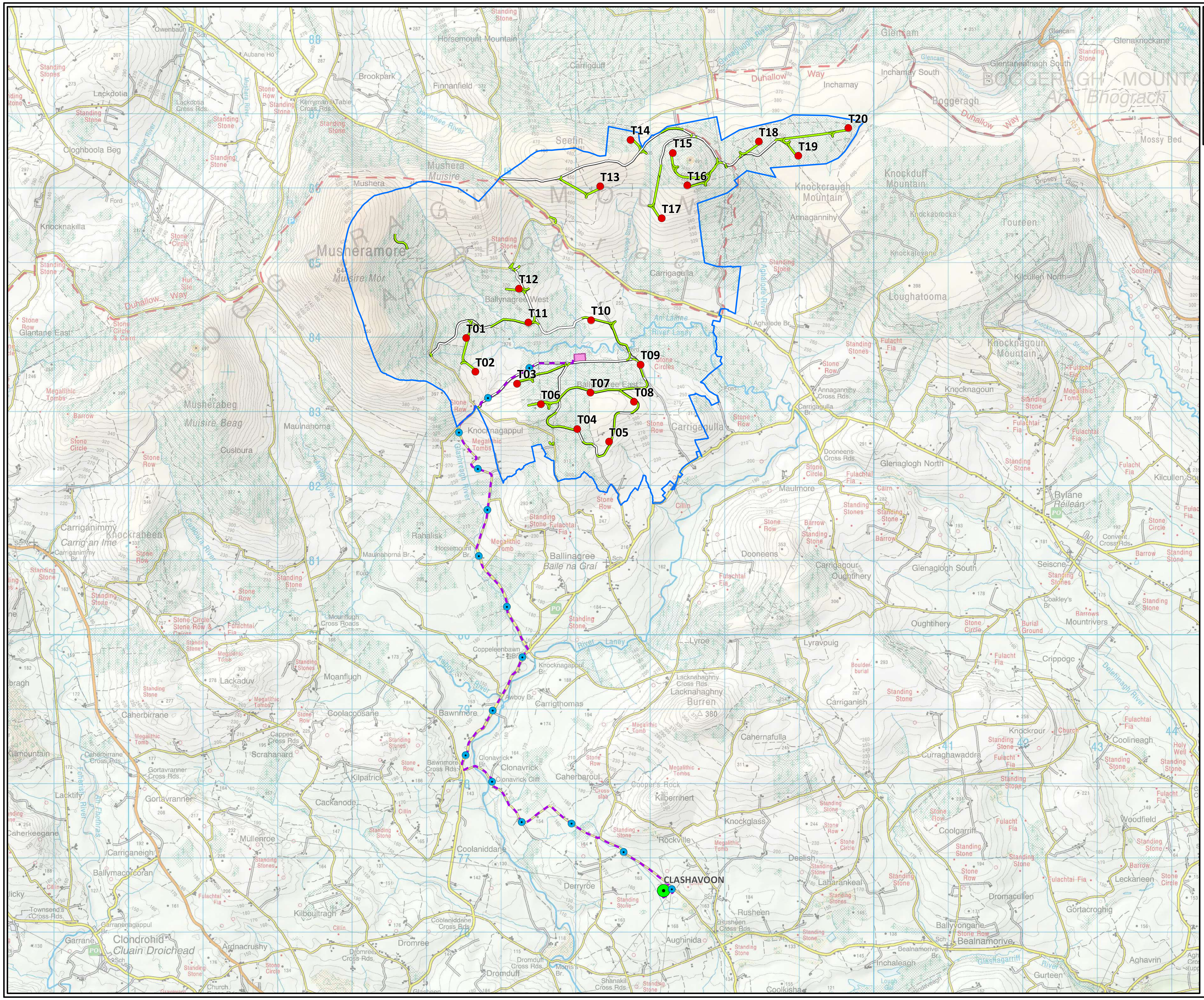

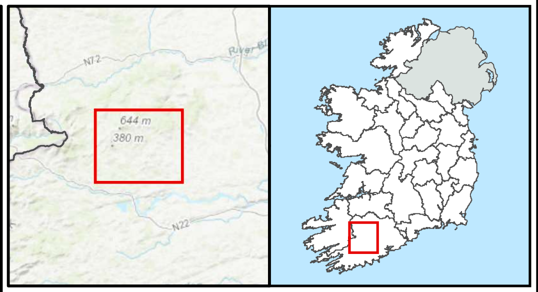

Legend

- Wind Farm Site
- Proposed Turbine Layout
- Joint Bays
- 220kV Substation
- Grid Connection
- Substation Compound

Access Tracks:

- Existing Track Upgrade
- New Access Track

TITLE:	Grid Connection
PROJECT:	Ballinagree Wind Farm
FIGURE NO:	3.4
CLIENT:	Coillte and Ørsted
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Legend

- Wind Farm Site
- BEMP Lands

TITLE:	BEMP Lands		
PROJECT:	Ballinagree Wind Farm		
FIGURE NO:	3.5		
CLIENT:	Coillte and Ørsted		
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3.2 Existing Environment

3.2.1 Wind Farm Site

The proposed wind farm site is located in County Cork, approximately 35km north west of Cork City. The project is located approximately 8km south east of Millstreet and approximately 10km north of Macroom. The total study area of the proposed wind farm site assessed is 1,932.5 hectares.

The wind farm site is located in a rural area. Settlement in the area is made up of one-off rural housing and farmyards generally located along the road network of the area (Linear settlement pattern). The nearest settlement is the village of Ballinagree which is located approximately 1.5km to the south of the wind farm site.

A house survey was carried out in June 2020 which recorded 136 no. houses located within 2 km of the wind farm site. This survey noted that houses are primarily placed in clusters and linear settlement patterns. There are 60 no. residential receptors located within 10 no. rotor diameters (1.55 km) of the proposed wind turbines and 10 no. residential receptors located within 1km of the proposed turbines[1]. The closest receptor to a proposed wind turbine is located at a distance of 809m.

Access to the existing wind farm site is primarily via the existing local road L2578 'Butter Road' from the direction of Millstreet to the North West. All HGV's shall approach the site via this road. A detailed description of access to the site is contained within Section 3.5.3.

An existing 80m meteorological mast is currently located on site with permission recently granted to maintain the mast on site for an additional 5 years (Planning Ref. 21/4476). An additional existing 100m lattice type meteorological mast has been permitted for a period of 5 years by Cork County Council in January 2021 (Planning Ref. 20/5342). It is intended to remove both existing masts prior to construction of the proposed development.

Key features of the existing environment are highlighted below for the wind farm site (and in the following sections for other elements of the project). These and others are described in each chapter of this EIAR.

Existing Hydrological Environment

The wind farm site is situated within three sub-catchments as defined by the WFD and shown on Figure 10.2, Chapter 10 – Hydrology and Water Quality. These sub-catchments are as follows:

- Sullane_SC_020;
- Blackwater [Munster]_SC_050
- Blackwater [Munster]_SC_070

[1] When referencing distance to wind turbines, the measurement is taken from centre point of wind turbine tower to the object in question. Receptors listed include both residential and mixed residential and commercial buildings.

The wind farm site is situated within eight sub-basins as defined by the WFD. These waterbodies are known as:

- Awboy_010 – IE_SW_19A030200
- Laney_030 – IE_SW_19L010400
- Laney_020 – IE_SW_19L010200
- Owenbaun (Rathcool)_010 – IE_SW_18O050500
- Laney_010 – IE_SW_19L010100
- Rathcool_010 – IE_SW_18R010400
- Nad_010 – IE_SW_18N010400
- Glen (Banteer)_010 – IE_SW_18G040600

The main hydrology feature within the wind farm site is the Laney River and Nadanuller Beg Stream. All surface runoff within the Laney_010 sub-basin drains to the River Laney or its tributaries. The River Laney runs in northwest-southeast direction.

The average annual rainfall in period 1981-2010 in the area of the wind farm site is 1,720 mm.

Existing Habitats

The wind farm site encompasses a mixture of habitat types, with conifer plantation and pastures the main types of land cover present. Pockets of recently felled conifer woodland, heath, scrub and improved agricultural grassland are also present across the site. Pockets of upland peat bog are present in the northern part of the site.

The Mullaghanish to Musheramore Mountains SPA is located to the south and west of the site at a distance of 350m from the proposed development planning boundary at its closest point. The Boggeragh Mountains NHA is directly located to the north of the site. 16.3Ha of this NHA extends into the proposed development planning boundary in the north-west part of the site. 760m of existing access track, which is proposed to be used as part of the construction and operation of Ballinagree wind farm, passes through the NHA. This track has previously been used for the construction of the existing Boggeragh wind farm project (Planning Ref: 011248, 085944, 108067) and is currently used for forestry and agricultural activities. No new works are proposed within the NHA as part of this development with the exception of proposed electrical and communications cabling which will follow the wind farm access tracks and shall be buried within this section of road. The road surface shall also be improved in the form of the placement of compacted granular aggregate on the surface following cable trench reinstatement. The alignment of the above section of cable is shown on accompanying planning application drawings. Further details on cable trenching and wind farm access track construction/upgrades are described in Section 3.3.3. There are no European sites located within or within close proximity of the proposed wind farm site boundary.

Land cover classification for the wind farm site is presented in Figure 11.37. European sites within 15km of the wind farm site are shown on Figure 3-6.

Elevations within the wind farm site range from 200m to 490m approximately above ordinance datum. Slopes within the site range from 0% to approximately 20% grade.

Existing Archaeological Features

There are 14 known archaeological sites located within the wind farm site and these range in date from prehistoric to post-medieval periods with a notable concentration of ritual and settlement monument types typically associated with the Bronze Age (c. 2400-500 BC). Most prominent of these include two stone circles, one containing five stones and the other fifteen stones, stone rows and standing stones. Further details on the existing environment in relation to archaeology and cultural heritage can be found in Chapter 14.

Existing Soils and Geology

The subsoils present within the development site and wider study area comprise:

- Till derived from Devonian sandstones (TDSs);
- Bedrock outcrop or sub-crop (Rck);
- Blanket peat (BktPt);
- Alluvium (A).

The majority of turbine locations and associated infrastructure in the southern portion of the wind farm site are located within areas classified as Till derived from Devonian Sandstones and areas of bedrock outcrop or subcrop. Areas of blanket peat are concentrated in the northern part of the wind farm site. During site walkovers it was found that peat deposits range from 0.2 to 3m across the site, but predominantly in the northern part of the site. There are areas of peaty topsoil in the southern area that reach maximum depths of 0.3m.

Existing Wind Farm Developments

Figure 3-7 illustrates existing wind farms within 20km of the site. The nearest operational wind farm to the site is the neighbouring Boggeragh Wind Farm directly to the north of the site. Boggeragh Wind Farm consists of 39 wind turbines with rotor diameters of 90m. The nearest neighbouring wind turbine is 861m from T20.

Other nearby wind farms in the vicinity include Bawnmore and Carrigcannon wind farms as shown in Figure 3-7.

On-Site Wind Resource

The layout of the proposed wind farm has been designed to minimise the potential environmental impacts of the wind farm, 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 farm locations. The 2013 Sustainable Energy Authority of Ireland (SEAI) Wind Speed Atlas identifies the site as having an average wind speed of between 5 and 8 m/s at 100 m above ground level.

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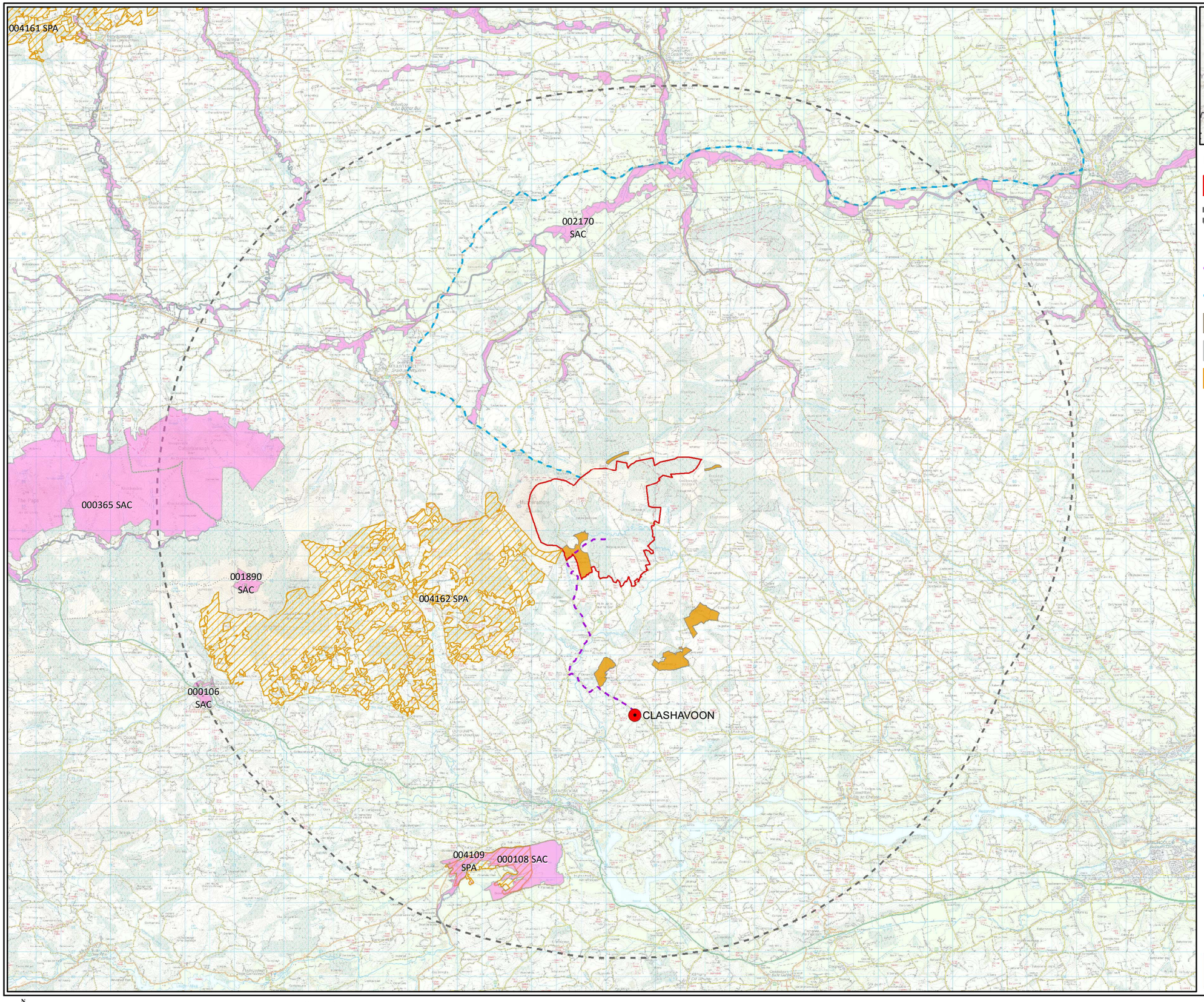

Legend

- Wind Farm Site
- 15km Buffer of Wind Farm Site
- Clashavoon Substation (110-220kV)
- Grid Connection
- Turbine Delivery Route
- BEMP Lands
- Special Area of Conservation (SAC)
- Special Protection Area (SPA)

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TITLE: European Sites Within 15km of Wind Farm Site			
PROJECT: Ballinagree Wind Farm			
FIGURE NO:	3.6		
CLIENT:	Coillte and Ørsted		
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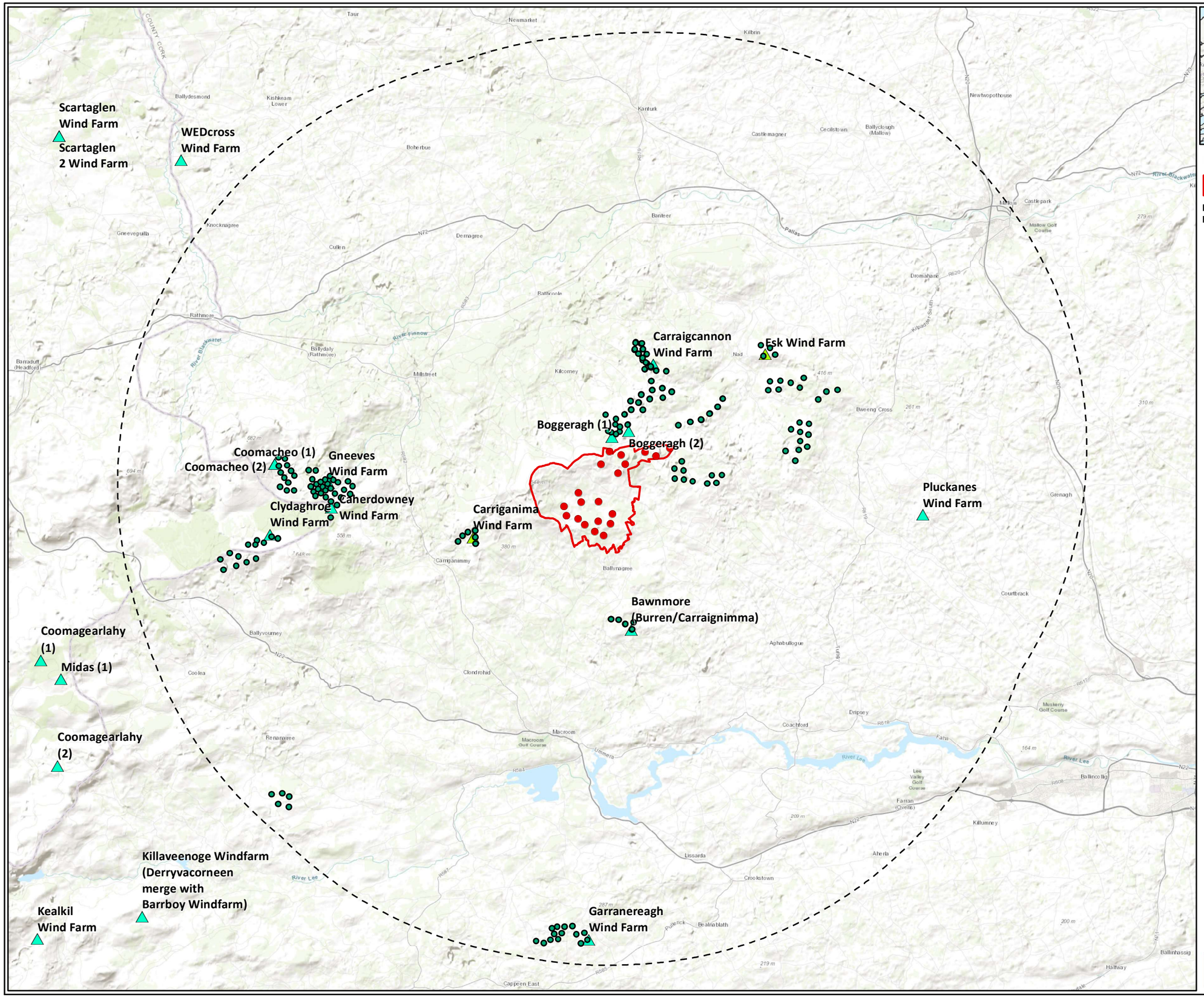

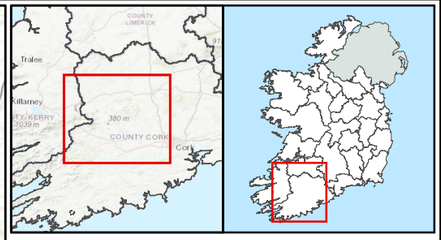

Legend

- Wind Farm Site
- 20km Buffer of Wind Farm Site
- Wind Turbine
- Existing Turbine
- SEAI Wind Farms (2018)
- Other Wind Farms

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TITLE: Existing Wind Farms in the Vicinity			
PROJECT: Ballinagree Wind Farm			
FIGURE NO:	3.7		
CLIENT:	Coillte & Brookfield		
SCALE:	1:180000	**REVISION:**	0
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3.2.2 Grid Connection Cable Route

The proposed grid connection route will be 110kV underground cable ca. 11.4 km in length, with 9.4 km to be constructed within the existing road corridor. The proposed grid connection arrangement is illustrated in Figure 3-4. The grid connection will be contained within the public road corridor throughout its length with the exception of start and finish points where the cables shall be terminated in the existing network substation and proposed onsite substation which is located within the wind farm site.

The grid connection does not pass through any villages or towns. There are a number of recorded archaeological site located along the grid connection route which will be avoided. There is a 19th century masonry bridge over a section of the River Laney in Bawnmore townland, which is known locally as Awboy Bridge (COO60-002). This bridge is being avoided through directional drilling which will require no works to the bridge or channel.. Further details on the grid route are contained in Section 3.5.

The grid connection is located within the Sullane_SC_020 sub-catchment in its entirety.

The majority of the proposed grid connection route is underlain by Till derived from Devonian Sandstones with limited areas of bedrock sub-crop or outcrop and alluvium indicated along the proposed route.

3.2.3 Turbine Delivery Route

Large components associated with the wind farm construction will be transported to the Site via the identified turbine delivery route (TDR). The TDR includes the following roads:

- Port of Foynes;
- N69 towards Limerick;
- M7;
- N21;
- N20 through the towns of Charleville and Buttevant;
- N72 at Mallow and travel west;
- R583 towards Millstreet;
- L2758 to the proposed wind farm site.

The study area and associated existing environment associated with the TDR shall be confined to the public road corridor associated with the above roads with the exception of locations where temporary accommodation works will be required to facilitate the delivery of oversized loads. For these locations, private lands have been identified and assessed in the EIAR. The TDR and location of temporary accommodation works are described in detail in Section 3.5 and presented in Figure 3-3.

3.2.4 Biodiversity Enhancement and Management Plan (BEMP) Lands

A detailed description of the existing environment at each of the proposed BEMP land sites is provided in Appendix 3-4.

3.2.5 Land Ownership

The lands associated with the proposed development are owned by a combination of Coillte and private landowners. Sections of the proposed development are also within the public road. Planning consent is sought for the proposed development as described in Section 3.3.1.

3.3 Proposed Project

As described in Section 3.1, The proposed project assessed in this EIAR is comprised of the following key elements:

- The wind farm site (also referred to in this EIAR as 'the Site');
- The grid connection;
- The turbine delivery route (also referred to in this EIAR as 'the TDR');
- Biodiversity enhancement and management plan lands (also referred to in this EIAR as 'the BEMP lands').

A detailed description of each element of the project is contained hereunder. Sections 3.3.1 and 3.3.2 below outline the elements of the project for which planning consent is being sought.

3.3.1 Summary of the Statutory Development Description for Consent

The development description as per the statutory newspaper notice and the application form for which consent from An Bórd Pleanála (ABP) is being sought is as follows:

- Construction of 20 no. wind turbines with a blade tip height range from 179m to 185m, a hub height range from 102.5 to 110.5m and a rotor diameter range from 149m to 155m;
- Construction of turbine foundations and crane pad hardstanding areas including associated drainage infrastructure;
- Construction of new permanent site tracks and associated drainage infrastructure;
- Upgrading of existing tracks and associated drainage infrastructure;
- Upgrade of 2 no. existing forestry and agricultural access junctions for construction and operational access from 1) the Local Roads L2750-0/L1123-62 in the townlands of Finnanfield and Ballynagree East and 2) from the Local Road L7461-0 in the townland of Ballynagree West, Co. Cork;
- Upgrade of 2no. existing forestry access junctions for temporary construction access from the Local Road L7461-17 in the townland of Knocknagappul, Co. Cork;
- Use of 1 no. existing forestry and agricultural access junction for operational access only from the Local Road L-7461-44 in the townland of Knocknagappul, Co. Cork;

- Installation of new permanent watercourse and drain crossings and the reuse and upgrade of existing internal watercourse and drain crossings to include 1) the replacement of an existing stone bridge structure with a new clear span concrete bridge structure along the Local Road L-7461-0 in the townland of Ballynagree West and 2) a new clear span concrete bridge structure along a proposed new track in the townland of Carrigagulla, Co. Cork;
- 3 no. on site borrow pits and associated ancillary drainage within the townlands of Carrigagulla and Knocknagappul, Co. Cork;
- 2 no. Temporary construction site compounds and associated ancillary infrastructure including parking within the townlands of Ballynagree West and Carrigagulla, Co. Cork;
- Use of proposed wind farm access tracks and existing forestry and agricultural tracks as permanent recreational amenity trails for community use including the installation of associated signage and information boards and; the partial reinstatement and re-purposing of the proposed temporary construction compound as a permanent trail head car park and picnic area including associated landscaping within the townland of Ballynagree West;
- Construction of 1 no. permanent on-site 110kV electrical substation including control buildings, electrical plant and equipment, welfare facilities, carparking, water and wastewater holding tanks, security fencing, lightening protection and telecommunications masts, security cameras, external lighting and, all associated infrastructure within the townland of Ballynagree East, Co. Cork;
- Installation of medium voltage underground electrical and communication cabling connecting the wind turbines to the proposed on-site substation and associated ancillary works;
- Installation of permanent high voltage 110kV underground electrical and communication cabling between the proposed on-site substation within the townland of Ballynagree East to the boundary of the existing Clashavoon substation within the townland of Aughinida, Co. Cork. The cabling will be laid primarily within the public road in the townlands of Knocknagappul, Ballynagree East, Ballynagree West, Bawnmore, Clonavrick, Derryroe, Rahalisk, Kilberrihert, Caherbaroul and Aughinida, Co. Cork. Associated works including the installation of 15 no. pre-cast joint bays and communication chambers; and horizontal directional drilling under 4 no. watercourse crossings in the townlands of 1) Knocknagappul, 2) Knocknagappul and Rahalisk, 3) Rahalisk and Bawnmore and 4) Bawnmore and Clonavrick;
- Tree felling to accommodate the construction and operation of the proposed development;
- Erection of 2no. meteorological masts with a height of 100m above existing ground levels for the measuring of metrological conditions within the townlands of Ballynagree East and Carrigagulla, Co. Cork. A lightning rod will extend above the masts by 4 meters;
- Temporary accommodation works at 6 no. locations adjacent to the public roads to facilitate delivery of turbine components to site within the townlands of Dromagh, Dromskehy, Liscahane, Tullig, Drominahilla, Finnanfield and Ballynagree East, Co. Cork. These works will primarily relate to trimming of trees and hedgerows, temporary lowering of boundary walls, temporary removal of boundary walls, temporary ground reprofiling and installation of temporary stone hard standing;
- Installation of a temporary off-site staging area for turbine components within the curtilage of Drishane Castle which is a Recorded Protected Structure (00319) and National Monument (296), within the townland of Drishane More. The works will include removal of a masonry wall and installation of temporary stone hard standing area and associated access track and entrances to and from the public road R583;
- All related site works and ancillary development including landscaping and drainage;
- A 35 year operational life from the date of commissioning of the entire wind farm is being sought.

3.3.2 Additional Project Elements Assessed in the EIAR

In addition to the above infrastructure for which consent from An Bórd Pleanála (ABP) is being sought, the following elements have also been fully assessed in this EIAR; Biodiversity Enhancement of lands shown in Figure 3-5 and described in Appendix 3.4 and; additional Turbine Delivery nodes described in Section 3.5.5.

While it is proposed to apply for the above-mentioned limited range of turbine dimensions, if the Board is of a mind to permit the development based on fixed dimensions only for the turbines, we request that the following three fixed dimensions for turbines are consented:

- Tip height of 185m, hub height of 107.5m, rotor diameter of 155m
- Tip height of 185m, hub height of 110.5m, rotor diameter of 149m
- Tip height of 180m, hub height of 102.5m, rotor diameter of 155m

Each of 3 no. fixed dimensions within the proposed range have been fully assessed as part of the EIA and AA process.

3.3.3 Wind Farm Site

The proposed wind farm will consist of a wind farm of 20 no. wind turbine generators (WTG's), 2no. meteorological masts (PMM's), and 1 no. substation compound along with ancillary civil and electrical infrastructure. The project shall also include infrastructure for community use in the form of walking trails.

3.3.3.1 Turbine Layout

The layout of the proposed wind farm 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. Figure 3-2 shows the proposed wind farm site layout. The layout reflects the outcome of an iterative design process. Further detail on the design philosophy, constraints and alternative layouts is provided in Chapter 2 of the EIAR: Need for the Development and Alternatives Considered.

Turbine location co-ordinates in Irish Transverse Mercator (ITM) are detailed in Table 3-1:

Table 3-1: Proposed Turbine Coordinates

Turbine ID	ITM Coordinates	
	X	Y
1	534501	584042
2	534621	583586
3	535181	583428
4	535989	582819
5	536420	582647

Turbine ID	ITM Coordinates	
	X	Y
6	535505	583151
7	536168	583308
8	536754	583185
9	536843	583683
10	536178	584279
11	535332	584249
12	535205	584703
13	536298	586077
14	536707	586702
15	537272	586528
16	537466	586089
17	537125	585649
18	538431	586680
19	538959	586490
20	539629	586861

Ballinagree 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. We are aware that these guidelines are subject to targeted review. The layout and design of the wind farm has the ability to comply with the "Draft Revised Wind Energy Development Guidelines", published by the Department of Housing, Planning and Local Government (December 2019). If new Guidelines are adopted prior to a decision of permission by the authority, the applicant is happy to demonstrate compliance with same as appropriate.

Further to this the proposed layout sought to achieve an optimum separation distance between dwellings and the proposed turbines by providing a minimum separation distance of 750m between turbines and the closest dwellings. The Draft Revised Guidelines outlines a minimum 500m or 4 times tip height set back. Following completion of layout optimisation, a separation distance of 809m was achieved from the closest dwelling to a turbine tower. There are 18 no. dwellings located within 1km of the wind turbines.

3.3.3.2 Wind Farm Power Output

The proposed wind farm will have an estimated Export Capacity (MEC) ranging from 118 to 132MW depending on final turbine technology installed. Turbines of the exact same make, model and dimensions can have different power outputs depending on the capacity of the electrical generator installed in the turbine nacelle. The exact rating and design of the proposed turbine will be subject to a competitive procurement process that will only commence if the project receives consent. The above range has been fully assessed in the Air and Climate chapter with respect to emissions calculations.

A rated capacity of 118 MW used below (represents the worst case in terms of generation capacity) to calculate the power output of the proposed wind farm.

Assuming an installed capacity of 118 MW, the proposed wind farm has the potential to produce approximately 361,788 MWh (megawatt hours) of electricity per year, based on the following calculation:

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

where:

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

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

C = Rated capacity of the wind farm: 118 MW

The electricity produced by the proposed wind farm would be sufficient to supply approximately 86,140 Irish households with electricity per year, based on the average Irish household using 4.2 MWh of electricity (this latest figure is available from the March 2017 Commission for Energy Regulation (CER) Review of Typical Consumption Figures Decision Paper[2]).

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.

3.3.3.3 Wind Turbines

Turbine General Description

Modern wind turbines from the main turbine manufacturers have evolved to share a common appearance and other major characteristics with only minor cosmetic differences differentiating one from another.

The wind turbines that will be installed on site will be conventional three-blade horizontal axis turbines, that will be designed to ensure the rotors of all turbines rotate in the same direction at all times.

The rotor blades are bolted to the central hub, which is connected to a generator located in the nacelle. The nacelle holds the following turbine components:

- Generator
- Electrical components
- Control unit

A glass fibre reinforced polyester hood covers the nacelle. Earthing and isolation protect all components from lightning strikes.

[2] https://www.cru.ie/wp-content/uploads/2017/07/CER17042-Review-of-Typical-Consumption-Figures-Decision-Paper-1.pdf

The plans and particulars submitted with this application for consent are precise and provide specific dimensions for the turbine structures which incorporates a small range in dimensions. The turbine specifications will have a hub height ranging from 102.5 to 110.5m and a rotor diameter ranging from 149m to 155m with a tip height ranging from 179m to 185m. Each chapter of this EIAR has fully assessed all combinations within this range in turbine specification and the ultimate final turbine selection will fall within the parameters of this range.

The exact make and model of the turbine will be dictated by a competitive tender process, but it will not exceed the maximum or minimum size envelope set out above.

Detailed drawings, which accompany the planning application, show a turbine that may be used for the proposed project.

Turbine Blades

The blades of a modern turbine are made up of glass fibre reinforced polyester. They turn at between 5 and 15 revolutions per minute depending on wind speed and make of turbine.

A turbine begins generating electricity at a wind speed of 3 to 4m/s depending on turbine type, with rated power generation at wind speeds of approximately 12 to 14m/s.

The turbines usually shut down at wind speeds greater than 25m/s, although some machines are designed to operate at up to 30m/s. The yaw mechanism turns the nacelle and blades into and out of the wind. A wind vane on the nacelle controls the yaw mechanism. Blades are pitched to match the wind conditions.

Turbine Tower and Foundation

The tower of the turbine is a conical steel tube, with multiple painted finish. It is generally delivered to site in four or five sections. The first section is bolted to the steel base, which is cast into the concrete foundation.

The upper sections of the tower are bolted to the lower ones in sequence. The base of the tower is approximately 5m in diameter, tapering to approximately 3m, where it is attached to the nacelle. The first floor of the tower is approximately 2-3m above ground level it is accessed by a galvanised steel staircase and a steel hatch door which will be kept locked except during maintenance.

The turbine will be anchored to the foundation as per the turbine manufacturer's guidelines which will be incorporated in the civil foundation design.

Following detailed site investigations, it has been determined that the wind turbine foundations at Ballinagree will be standard shallow reinforced concrete foundations.

For this project the turbine foundations will be circular in shape and will be 25m in diameter and 4m in depth.

The turbine foundations shall be constructed using standard reinforced concrete construction techniques. Detailed construction methodologies for turbine foundations are provided in the CEMP in Appendix 3.1.

In summary the works shall 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.
- The base of the foundations will be excavated to competent bearing strata.
- Excavated soil will be placed in the temporary storage areas adjacent to the turbines in accordance with the soil management plan contained within the CEMP in Appendix 3.1.
- A layer of concrete blinding will be laid approximately 75mm thick directly on top of the newly exposed formation.
- Formwork and reinforcement will be fixed in accordance with the designer's drawings & schedules.
- 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 to the levels and profile indicated on the construction drawings.
- Upon completion of the concreting works the foundation base will be covered from the elements.
- 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 and landscaped using the top-soil set-aside during the excavation.

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 regulations.

Turbine Transformer

The turbine will have a transformer located within the tower. The turbine will generate electricity at approximately 660 volts, depending on the machine chosen. The turbine transformer will step up the voltage to up to 33kV to reduce the electrical loss on the cabling connector circuits that connect to the site substation.

Turbine Colour

The turbines have a multiple painted coating to protect against corrosion. They are coloured off-white or light grey to blend into the sky background. 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

Turbine 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.

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.

It is expected that the entire construction phase, including civil, electrical and grid works, and turbine assembly will take between approximately 18-24 months.

3.3.3.4 Wind Farm Site Access

Ballinagree Wind Farm shall involve the use of 5 no. existing forestry and agricultural field entrances as access points from the public road. The locations of these access points are shown on Figure 3-2.

The access points are numbered 1-5 and are described below in terms of their location and proposed use for the project. Wind turbine component deliveries shall make use of Access Points 1 and 2 only. Access to the proposed main temporary construction compound shall be via Access Point 1. This shall also act as the main access to the recreational amenity trail head during the operational phase.

The access points have been selected with consideration for safety of public road users and construction staff and to ensure they can be constructed to comply with the requirements of both Cork County Council and TII design requirements for direct accesses. Each of the access points are described in detail below.

For further details on the design of the above access points refer to Chapter 13. A detailed site layout plan for each of the proposed access points are included in the 0101 Series planning application drawing pack.

Access Point 1: This is the main site entrance for the southern part of the site and shall also act as the main site entrance for the overall wind farm. An existing Coillte forestry access shall be upgraded to facilitate the delivery of turbine components. All turbine components accessing the southern part of the site shall use this entrance for the installation of turbines T1 to T13. This access point shall also be used for all construction and operation vehicles and shall be used by both HGV's and LGV's. This access point shall also act as the main entrance to the recreational amenity trail head at the location of the southern temporary compound during the operational phase of the project. This access is already regularly used by HGV's associated with agricultural and forestry activities and will continue to be used during the construction and operation phases of the project.

Plate 3-1: Access Point 1

Access Point 2: This is the main site entrance for the northern part of the site. An existing agricultural and forestry access shall be upgraded to facilitate the delivery of turbine components. All turbine components accessing the northern part of the site shall use this entrance for the installation of turbines T14 to T20. This access point shall be used for construction and operation by both HGV's and LGV's. This access is already regularly used by HGV's associated with agricultural and forestry activities and will continue to be used for these activities during the construction and operation phases of the proposed project. This access has also been used in the past to facilitate the construction of the existing Boggeragh Wind Farm.

Plate 3-2: Access Point 2

Access Point 3: This is an existing agricultural and forestry access which provides access to the southern part of the site. This access point will be used for operational access by LGV's only. The proposed grid connection export cable shall exit this site through this access point. This access is already regularly used by HGV's associated with agricultural activities.

Plate 3-3: Access Point 3

Access Point 4: This is an existing Coillte forestry access which will be used during the construction phase by LGV's and HGV's. This access point will form part of a public road crossing point with Access Point 5 for construction traffic travelling to and from the proposed borrow pits in the west of the site only. This access is already regularly used by HGV's associated with agricultural and forestry activities.

Plate 3-4: Access Point 4

Access Point 5: This is an existing Coillte forestry access which will be used during the construction phase by both LGV's and HGV's. This access point will form part of a public road crossing point with Access Point 4 for construction traffic travelling to and from the proposed borrow pits in the west of the site only. This access is already regularly used by HGV's associated with agricultural and forestry activities.

Plate 3-5: Access Point 5

3.3.3.5 Wind Farm Internal Access Tracks

11.8km of internal access tracks will be required to be upgraded as part of the project and 13.7km of new internal access tracks will be required. Figure 3-2 illustrates the internal access tracks within the proposed wind farm site. 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 project.

An extensive network of agricultural and forestry access tracks exists within the site. These existing access tracks have been utilised wherever possible for the proposed project.

All access tracks will be 5m wide along straight sections and wider at bends as required as shown on accompanying planning application drawings in accordance with wind turbine manufacturer requirements for the wind turbines of this size. The tracks will be finished with a well graded aggregate. The 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 (Appendix 10.2).

The stone required for the construction of the internal access roads will be sourced from licenced quarries in the vicinity of the project (see Section 3.4.4) and the on-site borrow pits shown in Figure 3-2. The location of licensed quarries, waste facilities (see Section 3.4.7) and haulage routes are identified in Section 3.6.

Existing forest track drainage is extensive throughout the wind farm site and shall be maintained wherever possible and upgraded as required to meet the requirements of the proposed wind farm drainage design. SuDS design approach shall ensure that existing drainage patterns shall be maintained throughout the wind farm site and discussed further below.

The drainage system for the existing tracks and roads will largely be retained. It is proposed to upgrade approximately 11.8km of existing forestry and agricultural tracks which will involve widening by approximately 1m, with some additional widening a bends.

All track widening will be undertaken using clean uncrushable stone with a minimum of fines. This will involve slight relocation of existing roadside ditches to allow widening.

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.
- Stone will be placed and compacted in layers to minimum 500mm depth.
- Drainage ditches will be formed, within the excavated width and along the sides of the track. Drainage infrastructure will be constructed in parallel with the access track construction.
- 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 and where appropriate dressed to blend in with surrounding landscaping and partially obscure visibility of the track during operation.

The majority of the proposed new internal access tracks will be founded on suitable substrate however it has been identified following site investigations that floating road construction will be required in the north-east of the site where peat depths are greatest.

New floating roads within the site will be floated on both mineral soils and on peat soils. Floating roads are constructed without excavating the existing ground. They will consist of a layer of combined geotextile and geogrid laid directly on the existing surface. Layers of stone will then be placed on top with additional geogrid reinforcement as required. A layer of compacted Cl 804 material will be placed on top to provide a suitable running surface. Associated drainage is described in Section 3.5.15.

Further details on access track construction are provided in the CEMP in Appendix 3.1.

3.3.3.5.1 Wind farm Internal Access Track Watercourse Crossings

The proposed wind farm internal access tracks will cross 13 no. watercourses in total. Watercourse crossings associated with wind farm access tracks are shown in Figure 10.5 and described in detail in Chapter 10.

Of the 13no. watercourse crossings identified, 8 no. are existing pipe culverts which shall be either upgraded or replaced or left in-situ. 1no. existing stone bridge shall be replaced with a new clear span concrete bridge. The remaining crossings are proposed new structures in the form of 1no. clear span bridge and 3no. pre-cast box culverts. The proposed crossing designs have been developed in consultation with Inland Fisheries Ireland (IFI). Details of proposed crossing structures are presented in 0500-Series planning application drawings.

Minor watercourse and drain crossings within the site will be crossed using piped culverts. Piped culverts will only be used over very short stretches i.e. at track crossings. Pipe culverts will be sized to take the 1 in 100-year flood flow with a 20% allowance for Climate Change. Concrete or HDPE pipes may be used depending on the size of the watercourse to be crossed. Water being conveyed underneath wind farm access tracks from drains or minor watercourses shall be done using 225mm and 450mm diameter pipes.

For a minor watercourse/drain crossing using a piped culvert, the following shall be employed:

- The access track construction will finish at least 10m from the nearside bank of the minor watercourse/drain.
- All environmental mitigation measures will be implemented locally in advance of the works, in accordance with the measures outlined in the SWMP and CEMP in Appendix 3-1.
- Pipe culvert installation will only take place during dry periods.
- The pipe is laid in one lift or in sections using a crane.
- Suitable bedding material in the form of clean round gravel between 10-100mm diameter, shall be laid in the base of the pipe in accordance with the recommendations set out in *Guidelines on Protection of Fisheries During Construction Works in and Adjacent to Watercourses from* Inland Fisheries Ireland.
- Rock armour headwalls will be constructed where necessary to protect pipe ends and the base of slope embankments on either side of the track.

In some cases where existing internal forest tracks need to be widened, it will be necessary to widen, replace or extend existing pipe drains. In such cases, the above measures shall also be employed.

Further details on hydrology and drainage are contained in Chapter 10 Hydrology and Water Quality, the Surface Water Management Plan (SWMP) which is contained in Appendix 10.2 and on accompanying planning application drawings.

As mentioned above it is proposed to replace 1no. existing bridge structure identified as watercourse crossing no. WF-HF8 with a new concrete clear span bridge. The location of this crossing is shown in Figure 10.5 and in the plate below. Construction methodologies are set out in the CEMP in Appendix 3.1. This feature, while located on the public road is also located within the proposed wind farm planning boundary and therefore listed as an internal crossing. The replacement and design of this structure has been agreed with Inland Fisheries Ireland. This work will also be the subject of a Section 50 consent from the OPW.

Plate 3-6: Existing Bridge Crossing WF-HF8

3.3.3.6 Turbine Hardstandings

A turbine hardstanding area consists of a main crane pad hardstanding of 40m x 75m 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.

The stone required for the construction of the hardstandings will be sourced from licenced quarries (see Section 3.4.4) in the vicinity of the project and the on-site borrow pits shown in Figure 3-2. The location of licensed quarries, waste facilities (see Section 3.4.7) and haulage routes are identified in Section 3.6.

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 will be placed and compacted in layers to minimum 500mm depth.
- A drainage ditch 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 and dressed to blend in with surrounding landscaping.
- Surplus excavated subsoil will be used to reinstate borrow pits.

The majority of the proposed hardstandings will be founded on suitable substrate however it has been identified following site investigations that floating construction will be required in the north-east of the site where peat depths are greatest.

Floated hardstandings will be floated on both mineral soils and on peat soils. Floating hard standings are constructed without excavating the existing ground. They will consist of a layer of combined geotextile and geogrid laid directly on the existing surface. Layers of stone will then be placed on top with additional geogrid reinforcement as required. A layer of compacted Cl 804 material will be placed on top to provide a suitable running surface. Further details on hardstanding construction are provided in the CEMP in Appendix 3.1.

3.3.3.7 On-Site Electricity Substation

An onsite electricity substation will be constructed within the proposed wind farm site as shown in Figure 3-2. This will provide a connection point between the wind farm and the proposed grid connection point at the existing Clashavoon substation.

The dimensions of the substation compound will be 150m x 105m 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 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.

2no. control buildings will be located within the substation compound. The Independent Power Producer (IPP) control building will measure 14.1m by 14.9m and 8m in height. The grid operator control build will measure 25m by 18m and 8m in height. Both control buildings will include control rooms, office space and welfare facilities for staff during the operational phase of the wind farm. Due to the nature of the project there will be a small water requirement for occasional toilet flushing/hand washing with a rainwater harvesting tank adjacent to the 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.

Lightening protection and telecommunications masts will represent the tallest structures in the compound and shall not exceed 18.1m in height.

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 (as amended), 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. The wastewater storage tank alarm will be part of a continuous stream of data from the site's turbines, wind measurement devices and electricity substation that will be monitored remotely 24 hours a day, 7 days per week. This approach for managing wastewater on site has become standard practice on wind farm sites, which are often proposed in areas where finding the necessary percolation requirements for on-site treatment can be challenging and has been accepted by numerous Planning Authorities and An Bord Pleanála as an acceptable proposal (example planning reference: PL19.301619). Existing facilities in the surrounding area have been assessed for the purposes of this planning application. A list of waste facilities in the locality can be found Section 3.4.7. Potable water shall be delivered to site and stored in a holding tank in the substation control building.

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

3.3.3.8 On-Site Electrical Cabling

Electricity generated from wind turbines shall be collected at medium voltage (20/33kV) by an internal circuit of buried cables which will follow on-site access tracks. This circuit shall be terminated at the proposed onsite substation.

Internal collector circuit cable routes are shown on the planning application drawings and will follow the alignment of the internal access tracks. A section of the collector circuit will follow the public road between the two wind farm areas (north and south). The cable shall exit the northern part of the site through Access Point 2 and following local road, entering the southern part of the site via Access Point 1 as shown on accompanying planning application drawings. From here the cable will follow the internal wind farm access track network to the onsite substation where it will be terminated.

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. At several locations the internal wind farm access tracks shall cross watercourses using pre-cast box culverts and clear span bridge (see Section 3.5.3.6). In such cases, cable ducts shall be cast into the structures to allow the power cables to cross the watercourses under the access track.

The design and construction methods associated with the internal wind farm electrical cabling will be similar in nature to that of the 110kV grid connection cable works as described in Section 3.3.4.1.

The width of the internal cable trench with a trefoil formation will be 600mm, a flat formation will require a wider trench width. The depth of cover to the ducts carrying the cables will be 900mm to the top of the upper ducts. The depth of trench for the cables will be 1200mm. 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 100mm and 200mm 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 3.1.

3.3.3.9 Temporary Site Compounds

During the construction phase, it will be necessary to provide temporary facilities for construction personnel. The location of the temporary site compounds are shown on Figure 3-2. Wheel wash facilities will be provided within the site near the site entrance points as shown on Figure 3-2. Ballinagree will have 2no. temporary compounds; one located near the main entrance to the southern part of the site (Access Point 1 described above) which will include welfare facilities and offices and will act as the primary construction site compound, and a second, smaller compound in the northern part of the site as shown in Figure 3-2.

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
- employee parking
- bunded fuel storage
- contractor lock-up facility

- a water tanker to supply water used for other purposes
- canteen facilities
- material/non-fuel storage areas
- diesel generator
- waste management areas

Temporary compounds shall be aggregate hard standings surrounded by security fencing, located as shown on the accompanying drawings. Temporary facilities will be removed and the lands reinstated on completion of the construction phase with the exception of the proposed southern temporary construction compound which will be partially reinstated. The remaining hard standing area shall be used following construction stage as a trail head car park for the proposed recreational amenity trails for use throughout the operational phase of the project. This is described in further detail below.

3.3.3.10 Recreational Amenity Trail

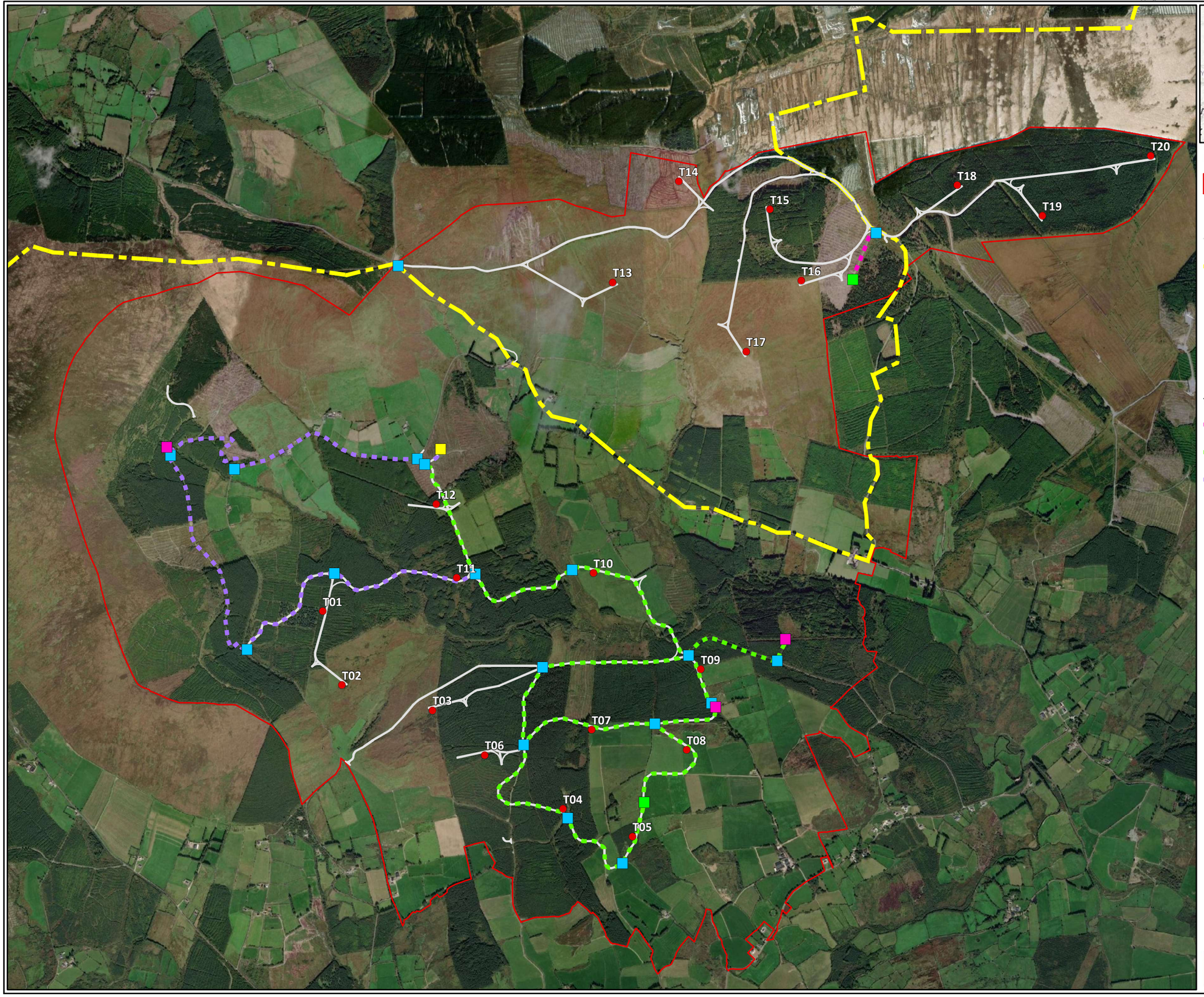
Tracks that will be built and/or upgraded for the construction and operation of the wind farm will be made available as a recreational amenity during the operational phase of the project. In this regard 15.05 km of tracks shall be made available as recreational amenity trails for community use and shall include trail signage and way-markers. The location and alignment of the proposed amenity trail is shown in Figure 3-8. The proposed amenity trails will not require any additional track construction and will make use of existing and proposed wind farm and forestry internal access tracks.

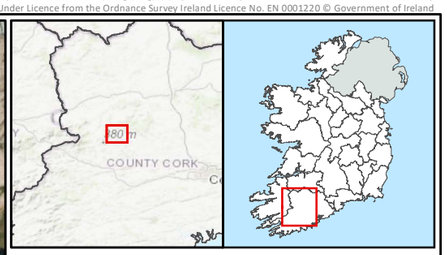
All signage and way-markers shall be positioned within the corridor of the proposed trail upgrades. An example of recreational amenity trail labelled vista photograph at a viewing point is presented in Plate 3-1. Details of signage and information boards are included in accompanying planning application drawings.

As described above, the proposed wind farm temporary construction compound shall be partially reinstated following construction of the wind farm to provide a trail head car park. This shall include the partial reinstatement of the overall hard standing compound, landscaping, tree planting and installation of picnic tables. The general arrangement of the proposed trail head car park and picnic area can be found in planning application drawing P2114-0300-0017. The proposed car park shall facilitate 40no. parking spaces for visitors.

Plate 3-7: Example of Recreational Amenity Labelled Vista Photograph at Sliabh Bawn Wind Farm

Path: R:\Map Production\2019\P2114\Workspace\EIAR\P2114_GIS_Fig3-8_RecreationalAmenityTrails_A3.mxd





Legend

- Proposed Wind Farm Site
- Wind Turbine
- Access Tracks
- Duhallow Way Walking Route
- Heritage Information Board
- Trail Viewing Point
- Trail Waymarker
- Trailhead carpark, picnic area and inforamtion

Trail Routes:

- Northern Trail
- Southern Loop
- Western Loop

N W E S

0 0.5 1 2 Kilometers

TITLE:	Recreational Amenity Trails
PROJECT:	Ballinagree Wind Farm
FIGURE NO:	3.8
CLIENT:	Coillte & Brookfield
SCALE: 1:23000	**REVISION:** 0
DATE: 19/11/2021	**PAGE SIZE:** A3

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3.3.3.11 Borrow Pits

The project shall include the opening of 3 no. borrow pits on site. The locations of the proposed borrow pits are shown in Figure 3-2. Detailed drawings of the proposed borrow pits are included in planning application drawings. Detailed methodologies outlining the excavation and management of the proposed borrow pits are contained in the CEMP in Appendix 3.1.

3 no. proposed borrow pit locations have been identified as a source of site won general fill for construction activities. The locations were selected as potential sources of general fill (Class 1 material) for the proposed project using the criteria of no peat deposits, low landslide susceptibility and proximity to existing access tracks and proposed infrastructure.

The proposed borrow pits shall provide site-won stone that will significantly reduce the amount of construction aggregates that would need to be delivered to site. The proposed borrow pits shall also be reinstated with excavated soil material which will avoid the need to export excess spoil to off-site facilities.

Each borrow pit shall have its own drainage network to manage surface runoff which will be implemented prior to excavation.

The proposed borrow pits will each have a footprint area of approximately 1ha. This will provide a potential volume of approximately 30,000m^3 of site won general fill based on an aggregate resource thickness of 3.0m at each of the borrow pits.

At each borrow pit location approximately 1.0m of overburden material will be required to be stripped to access the underlying deposits. This material will be temporarily stockpiled prior to re-use in the reinstatement of the borrow pits. No permanent stockpiles of material will remain after construction.

All works associated with the opening, excavation and reinstatement of the borrow pits shall be carried out in accordance with the measures set out in the CEMP and associated Soil Management Plan in Appendix 3.1.

It is proposed that all onsite materials excavated shall be retained on site and re-used as part of the construction phase to minimise the import materials requirements.

3.3.3.12 Meteorological Masts

2 no. meteorological (Met) masts (PMM's) shall be erected on site at the locations shown in Figure 3-2.

The permanent met masts shall be of the following general configuration:

- 100m high lattice steel mast with a shallow concrete foundation. A lightning rod will extend above the masts by 4 meters.

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

- In advance of the installation works, felling shall be carried out to facilitate the works. Infrastructure felling associated with the project is described below in Section 3.3.3.13.

- An access track shall be extended towards the mast location from the proposed wind farm access track (in the case of the northern PMM) or existing forest track network (in the case of the southern PMM), as shown on Figure 3-2. The access track shall be 3.5m in width. Temporary and permanent drainage infrastructure shall be extended also.
- A small aggregate crane pad of approximately 10m x 10m in size shall be constructed in front of the proposed mast location.
- General construction methods for the above access track and hard standing shall 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 shall be excavated followed by shuttering, steel fixing and finally concrete pouring by ready mix truck. Excavation and concrete operations shall be carried out in accordance with the CEMP (Appendix 3.1). The foundation shall be 10m x 10m x 1.8m in size.
- Following crane setup, the mast sections shall be delivered and unloaded by truck.
- In accordance with an agreed lifting plan, mast sections shall be lifted by crane into place. Wind speeds shall be monitored at all times during lifting operations by the lead climber and crane operator.
- Mast sections shall be bolted together by climbers.
- Following erection of main mast sections, lightning protection and other ancillary components shall be fixed to the mast.

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

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

3.3.3.13 Tree Felling

Much of the proposed wind farm site comprises commercial coniferous forestry. 10 no. turbines are located within forestry and consequently tree felling will be required as part of the project. Permanent felling of approximately 70 ha of coniferous forestry is required within and around the wind farm infrastructure to accommodate the construction of some turbines, hardstands, crane pads, access tracks and the proposed onsite substation. The felling area proposed is the minimum necessary to construct the proposed project and also to comply with any environmental mitigation (bats in particular). In addition to the wind farm infrastructure felling described above, 18 ha of coniferous forestry is being felled as part of the proposed BEMP measures. The total amount of felling proposed for the project therefore is 88 hectares. In advance of other construction works, clearance felling will commence on site and is expected to take up to 3 months.

The above felling hectarage includes some areas which have recently been felled already for commercial timber extraction. It may be the case that these areas are replanted prior to planning permission being granted or commencement of construction as part of the on-going commercial operation of the forest. Regardless the area will be permanently felled to make way for the wind farm infrastructure and therefore this area is included in the total felling hectarage.

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 project site. The license will include the provision of relevant replant lands to be planted in lieu of the proposed tree felling on the site as discussed in Section 3.6.4 below. It should be noted that the forestry within the proposed wind farm site was originally planted as a commercial crop and will be felled and replanted in the coming years should the project proceed or not.

To ensure a tree clearance method that reduces the potential for sediment and nutrient runoff, the construction methodology will follow the specifications set out in the Forest Service Forestry and Water Quality Guidelines (2000) and Forest Harvesting and Environmental Guidelines (2000).

In this regard, before any felling works commence on site all personnel, particularly machine operators, will be made aware of the following and will have copies of relevant documentation, including:

- The felling plan, surface water management, construction management, emergency plans and any contingency plans;
- Environmental issues relating to the site;
- The outer perimeter of all buffer and exclusion zones;
- All health & safety issues relating to the site.

The proposed tree felling around proposed 'infrastructure' will be limited to:

- 20m wide corridors for new and upgraded access tracks;
- Outer footprint of turbine hardstandings including an additional 10m offset from same;
- Outer footprint of temporary compounds;
- Outer footprint of onsite substation compound;
- 6m corridor for buried cables in private lands;
- 101.3m radius around each turbine tower located in forestry for bat impact mitigation;
- 25m radius around the footprint of on-site meteorological masts.

3.3.4 Grid Connection

The proposed grid connection cable route is indicated in Figure 3-4 and planning application drawings. A detailed description of the proposed grid connection and associated construction methodologies can be found in the Ballinagree Windfarm 110kV Underground Cable Construction Methodology Report contained in Appendix 3.3 and in the CEMP in Appendix 3.1. Details of proposed grid connection infrastructure are provided in planning application drawings.

3.3.4.1 Grid Connection Cabling

The grid connection route (grid connection) will consist entirely of underground 110kV cable and will connect the on-site substation to the existing 110/220kV substation at Clashavoon, within the townland of Aughinida.

The grid connection will be 11.37 km in length, with 9.35 km to be constructed within the existing road corridor. The proposed grid connection arrangement is illustrated in Figure 3-4.

Connection works from the onsite substation to Clashavoon 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.

Connection works within the Clashavoon Substation Site will be carried out by the network operator in accordance with a future grid connection offer. Appendix 3.5 shows an arrangement for these works which has been developed following consultation with EirGrid and assessed in this EIAR. The works shown in Appendix 3.5 do not form part of the statutory development description for planning permission. The works represent an informed view of the proposed future works at this time and may change depending on a future grid connection offer which will consider all the relevant circumstances at that time. Grid connection works included in this application for consent are presented in the accompanying planning application drawings.

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 shall 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 13 - Traffic and Transportation.

As part of the scoping and consultation process for the project, 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.

It is desirable that a minimum separation distance of 300mm will be maintained from existing services. New cable ducts will be laid below existing services wherever possible.

For cable trenches located in public roads, the contractor will excavate cable trenches and then lay high density polyethylene (HDPE) ducting in the trench in a surround of cement bound material (CBM). A rope will be inserted into the ducts to facilitate cable-pulling later. The as-constructed detail of the cable duct locations will be carefully recorded. Cable marker strips will be placed above the ducts and two communication ducts will also be laid. An additional layer of cable marker strips will be laid above the communication ducts and the trench back-filled. Back-filling and reinstatement in public roads will be to a specification to be agreed with the road authority, at a minimum matching the pre-construction surface.

Plate 3-8: Cable Duct Laying in Trefoil Configuration

The following is a synopsis of the key activities for the installation of the grid connection:

- All relevant bodies i.e. ESBN, Gas Networks Ireland, Eir, Cork County Council, Irish Water etc. will be contacted and all drawings for all existing services will be sought to reconfirm the conditions identified in this EIAR.
- Immediately prior to construction taking place the area where excavations are planned will be surveyed and all existing services will be identified, and temporary warning signs erected where necessary.
- For cable works in the public road, the traffic management plan will be implemented.
- An excavator will be used to excavate the trench to the dimensions of approximately 600mm wide by approximately 1.2m deep.
- Once the trench has been excavated, a bedding layer of sand or concrete will be installed and compacted. All concrete will be offloaded directly from the concrete truck into the trench.
- PVC ducts for electrical and communication cables will be installed on top of the compacted base layer material in the trench.
- When ducts have been installed in the correct position on the trench base layer, sand or Lean-mix cement will be carefully installed in the trench around the ducts.
- A red cable protection strip will be installed above duct surround layer of material and for the full length of the cable route.

- Suitable backfill material (lean mix cement) will be installed on top of the ducts surround material to a level 300mm below the finished surface level.
- Yellow marker warning tape will be installed for the full width of the trench, and for the full length of the cable route, 300mm from the finished surface level.
- The finished surface of the road, road verge, or agricultural land will be reinstated as per its original condition or to the requirements of the Cork Area Engineer.

Construction methodologies for the crossing of watercourses by the grid connection cable ducts are described below.

3.3.4.2 Watercourse Crossings Along the Grid Connection

A total of 13no. watercourse crossings have been identified along the proposed grid connection route.

The grid connection cable route contains 3 No. bridge watercourse crossings and one large culvert crossing which will be completed using horizontal directional drilling (HDD). A number of other minor watercourses crossing locations have been noted along the cable route, i.e. 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.

A full list of watercourse crossings along the grid connection route including their locations and crossing methods can be found in Chapter 10. Further details of watercourse crossings along the proposed grid connection cable route and associated construction methodologies, Appendix 3.3 and the CEMP in Appendix 3.1.

3.3.4.2.1 Horizontal Directional Drilling (HDD) Operations

HDD will be employed at 4 no. locations along the proposed grid connection route as part of the project as shown on the site layout plans.

The operation shall take place from one side of the watercourse within the public road corridor and will be carried out by an experienced HDD specialist. Each crossing is expected to take place in a single day under one mobilisation.

The process will involve setting up a small, tracked drilling rig on one side of the watercourse at least 10m back from the stream bank.

A shallow starter pit will be excavated at the point of entry and shall be located at a sufficient distance from the watercourse to achieve a minimum 3m clearance depth below the bed of the watercourse.

A detailed survey of buried services within the public road to confirm the conditions predicted in this EIAR will be carried out by the contractor prior to commencement of the operation. The council will be made aware in advance of the operation and invited to oversee the activity.

A pilot hole will be bored as per the agreed alignment and shall be tracked and controlled using a transmitter in the drill head.
By tracking the depth, position and pitch of the drill head the operator can accurately steer the line of the drilling operation. The drilling operation is lubricated using a fluid. When the pilot hole has been drilled to the correct profile, its diameter is increased if necessary to match the external diameter if the cable duct. The flexible plastic ducting is then pulled through the pre-drilled hole and sealed at each end until required for cable installation.

A detailed method statement with site specific mitigation measures for this activity is included in the CEMP (Appendix 3.1) and Appendix 3.3. In the case of HDD operations within the public road corridor, the works shall be carried out in accordance with measures described in the Traffic Management Plan contained within the CEMP in Appendix 3.1.

3.3.4.2.2 Standard Trench Crossings of Existing Culverts or Services (Ducting Below or Above)

- For the crossing of buried pipe drains, culverts or services, if encountered, ducts shall be installed above or below the existing infrastructure.

When crossing existing culverts or buried services, the following methodology will be employed:

- The general method of trench construction will follow the procedure outlined above for Installation of cable ducting.
- The service infrastructure shall be located and marked by an engineer in accordance with the Code of Practice for Avoiding Underground Services.
- All services will be safeguarded and protected in accordance with the asset owner's specifications.
- Within 500mm of the existing service, hand digging will be employed to expose it.
- Cable ducts shall pass over or under the existing service, depending on the depth of the service and other constraints.
- A minimum separation distance of 300mm shall be maintained between the cable ducts and the existing service.
- Existing services within the trench shall be left in the same condition as they were found. Any issues shall be reported to the asset owner immediately.

Details for crossing existing culverts and services are presented in accompanying planning application drawings. Further detail on construction methods for crossing existing culverts and services can be found in Appendix 3.1 and 3.3.

3.3.4.3 Joint Bays and Communication Chambers

Joint bays are pre-cast concrete chambers where individual lengths of cables are joined to form one continuous cable. A joint bay is constructed in a pit. The bay is 6m x 2.5m x 2.05m deep. A reinforced precast concrete slab is laid in the bay to accommodate the jointing enclosure.

Suitable joint bay locations along the grid connection route have been identified and assessed as part of the EIAR. Figure 3-1 shows a standard Eirgrid 110kV single circuit joint bay.

Eirgrid and Cork County Council shall be consulted as part of the detailed design of joint bays and associated link box and communications chambers which will be within the parameters assessed in this EIAR .

It is expected that 15 no. of joint bays will be required for the grid connection. Of these, 12 no. joint bays shall be located in public roads with 3 no. located on private lands. The location of joint bays are shown on Figure 3-4 and accompanying planning application drawings.

Precast concrete cable joint bays will be installed within excavations in line with the trench. The cable joint bays are backfilled and the finished surface above the joint bay reinstated as per its original condition. The cable joint bays are re-excavated a second time during cable pulling and jointing, after which the finished surface above the joint bays is reinstated again to its original condition.

Construction work areas and traffic management measures will be setup at 2 no. consecutive cable joint bays simultaneously. The underground cable will be pulled through the installed ducts from a cable drum set up at one joint bay and using a winch system which is set up at the next joint bay, the cable is pulled through.

The cables are jointed within the precast concrete cable joint bays. The finished surface above each cable joint bay is reinstated to its original condition, and the construction work area removed.

Further details of joint bay construction can be found in Appendix 3.1 and 3.3.

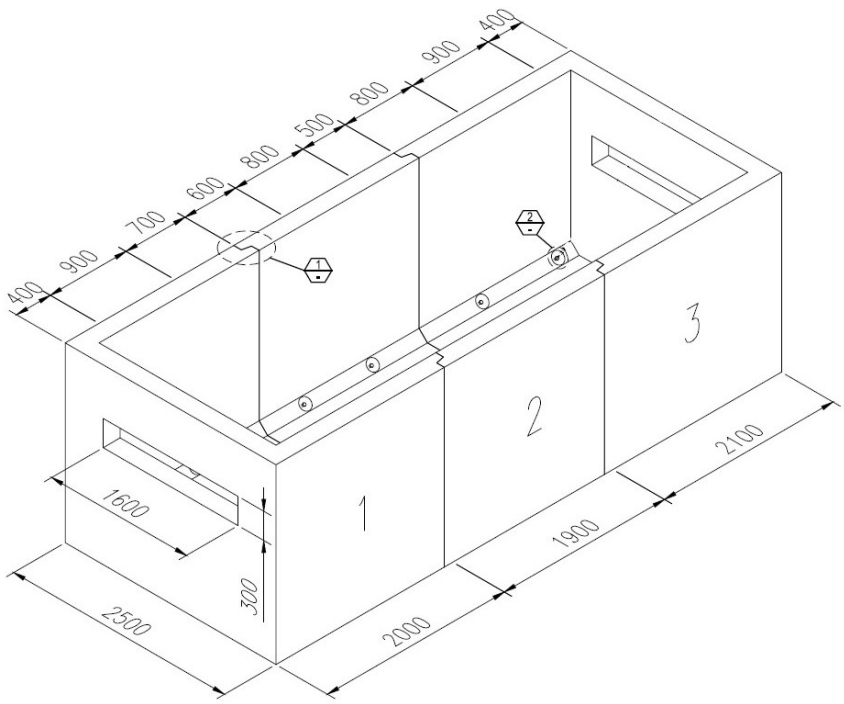

Figure 3-9: Eirgrid 110kV Single Circuit Joint Bay

3.3.5 Turbine Delivery Route

3.3.5.1 Route Description

Large components associated with the wind farm construction will be transported to site via the identified turbine delivery route (TDR). It is proposed that turbine deliveries shall approach the site from the North via Foynes Port, the N69, the M7, the N21, the N20 through Charleville, Buttevant and Mallow, the N72, the R583 and shall turn left onto the L2758 before the town of Millstreet, approaching the site from the North-West.

Temporary accommodation works will be required at selected locations along the TDR to facilitate the delivery of large components to the site. The delivery route is presented in Figure 3-3 . A Delivery Route Selection and Assessment was carried out to identify the optimum delivery route to the Site and is presented in Appendix 13-1 of this EIAR.

Large components associated with the wind farm construction will be transported to the Site via the identified turbine delivery route (TDR). The proposed route to site is as follows:

- Loads will depart the Port of Foynes and turn left onto the N69 towards Limerick;
- Loads will travel onto the M7 and turn onto the N21;
- Loads will turn onto the N20 and travel south through the towns of Charleville and Buttevant;
- Loads will turn west onto the N72 at Mallow and travel west;
- Loads will turn onto the R583 towards Millstreet;
- Loads will turn left onto the L2758 before entering Millstreet;
- Loads will travel South-East along the L2758 to the proposed wind farm site and will access the northern part of the site as Access point 2 and the southern part of the site at Access point 1.

3.3.5.2 Temporary Accommodation Works

All temporary accommodation works associated with the TDR shall 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 13- Traffic and Transportation and Chapter 11 - Population and Human Health & Material Assets.

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.

Key elements of the temporary accommodation works for the delivery of turbines are summarised below in Table 3-2 and full details of all accommodation works area provided in Chapter 13- Traffic and Transportation.

Table 3-2: TDR Temporary Accommodation Works

TDR Node Reference Number (POI__)	Location	Summary Description of Proposed Temporary Accommodation Works
29	N72 Dromtarriff Bends	Trimming of trees and vegetation. Removal of hedgerow. Temporary removal of street furniture. Oversail into third party lands. Placement of temporary load bearing surface.
30	N72/R583 Junction	Removal of trees and vegetation. Temporary removal of street furniture and wall.
36	R583 Drishane Castle	Construction of a temporary staging area comprising aggregate hard standing and associated access track to and from the public road R583 in the grounds of Drishane Castle. Removal of masonry wall to facilitate temporary access from public road R583. Overrun and oversail of public road verge. Placement of temporary load bearing surface. Relocation of telegraph pole. Trimming of trees and vegetation.
38	R583/L1123 Junction	Relocation of utility poles and overhead lines. Removal of walls. Temporary removal of street furniture. Placement of load bearing surface on third party land. Overrun and oversail of public road footpaths. Suspension of parking.
40	L1123 Left bend south of Millstreet	Relocation of utility poles and overhead lines. Overrun and oversail of public road verge. Placement of temporary load bearing surface. Suspension of parking.
43	River Owenbawn Left Bend	Removal of trees and vegetation. Relocation of utility poles and overhead lines. Removal of wall.
44	Auhane West of Tullig	Ground reprofiling and placement of load bearing surface on third party land. Relocation of utility poles and overhead lines. Temporary removal of street furniture. Removal of hedge.
46	Temporary widening of existing junction between Butter Road (L1123/L2758) and unnamed local road on approach to main site entrance.	Ground reprofiling and placement of load bearing surface on third party land. Removal of hedge.

For additional information relating to the TDR, please refer to Chapter 13 Traffic and Transportation.

Drishane Castle Staging Area (POI 36)

As described above, a staging area is required at TDR Node POI 36 in the grounds of Drishane Castle, off the R583 to facilitate the delivery of large turbine components to the site.

The staging area will comprise a 200m x 50m temporary aggregate hard standing with tracks providing access from the R583. At this location, turbine blades travelling from the port of entry shall be transferred using cranes from flat, extendible carrier trailers, onto blade lifting trailers for the remainder of the route. The purpose of this is to minimise the amount of temporary accommodation works required between Millstreet and the site.

The staging area shall be fenced by security construction fencing and gated and shall comprise also of temporary cabins for welfare and security requirements. The staging area shall be in use throughout the duration of the turbine installation works.

The location and general arrangement of the proposed staging area is presented in Figure 3-3 and accompanying planning application drawings.

The construction of the access tracks and hard standing associated with the staging area shall be the same as for onsite wind farm access track and hardstanding construction as described in Section 3.5.3 and the CEMP in Appendix 3.1. Further details of access to and from the staging area for construction stage traffic can be found in Chapter 13.

Drawings showing the proposed access points are contained in accompanying planning application drawings.

3.3.6 Replant Lands

Replacement replanting of forestry in Ireland is subject to license in compliance with the Forestry Act 2014 as amended. The consent for such replanting is covered by the Forestry Regulations 2017 (S.I. No. 191 of 2017). The total amount of felling proposed for the project therefore is 88 hectares. Detailed consideration of the approach to afforestation requirements associated with the project is attached in Appendix 1.3. It should be noted that the clearfelling of trees in the State requires a felling licence. The associated afforestation of alternative lands equivalent in area to those lands being permanently clearfelled is also subject to licensing ('afforestation licensing').

The Forest Service of the Department of Agriculture, Food & the Marine is Ireland's national forest authority and is responsible for all forest licensing. In light of the foregoing and for the purposes of this project, the developer commits that the location of any replanting (alternative afforestation) associated with the project will be greater than 10km from the wind farm site and also outside any potential hydrological pathways of connectivity i.e. outside the catchment within which the proposed project is located. On this basis, it is reasonable to conclude that there will be no more than imperceptible indirect or in-combination effects associated with this replanting In addition, the developer commits to not commencing the project 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.

3.3.7 Biodiversity Enhancement and Management Plan (BEMP) Measures

A Biodiversity Enhancement and Management Plan (BEMP) has been prepared to outline a set of land management prescriptions (commitments and monitoring) as part of proposed Ballinagree Wind Farm Development. A combined total of c. 304 ha of lands in the vicinity of the wind farm, but beyond 250m of any proposed turbine, have been identified and landowners have agreed to a long-term commitment to detailed land management measures designed to maintain and enhance local biodiversity. In addition, the developer has undertaken to create wildlife corridors through strategic tree-felling between areas of upland habitat in the vicinity of the proposed wind farm area.

The BEMP lands are spread across 6 no. land parcels in the townlands of Carrigduff, Annagannihy, Knocknagappul, Rahalisk, Oughtihery, Dooneens, Carriganish, Kilberrihert and Caherbaroul, Co. Cork. The BEMP lands are identified in Figure 3-5.

The measures set out in the BEMP include those designed to protect watercourses, prevent overgrazing and to clear invasive and site inappropriate plants. 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 wide range of species. Inputs (e.g. fertiliser, herbicide) will be controlled and appropriate planting will increase the available feeding, roosting and nesting cover for wildlife. Certain measures (e.g. control of stocking density) will be universal across the management lands. Other measures (e.g. planting of wild bird cover and native deciduous woodland) will be entirely site specific. The measures proposed for each land parcel take into account the habitats present and their current condition and importance in the local landscape.

The BEMP programme represents a significant commitment to enhance the biodiversity value and ecological connectivity across a large land bank. The programme will run for the lifetime of the windfarm and many of the proposed features (e.g. tree and hedgerow planting) will have a longer-lasting biodiversity benefit to the lands included in this plan and the wider locality. The BEMP is not designed to mitigate or address particular potential impacts associated with the construction, operation or decommissioning of the proposed wind farm. It is instead a commitment provided to yield a lasting biodiversity benefit to the area around Ballinagree.

The BEMP measures are described in detail in Appendix 3.4. It is expected that measures associated with the implementation of the proposed BEMP will be equivalent to standard agricultural activities and will be carried out and maintained by the involved landowners. Consent letters from the individual landowners are also included in Appendix 3.4.

3.4 Project Construction

3.4.1 Construction Activities

In the event that the Planning Authority decides to grant planning permission for the proposed project, 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 3-1.

The hours of construction activity for the project 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 shall 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 3.1.

3.4.2 Construction Programme

The construction of the project in its entirety is expected to take between 18-24 months. The proposed construction programme upon which assessments in the EIAR have been based is presented in Figure 3-7 below.

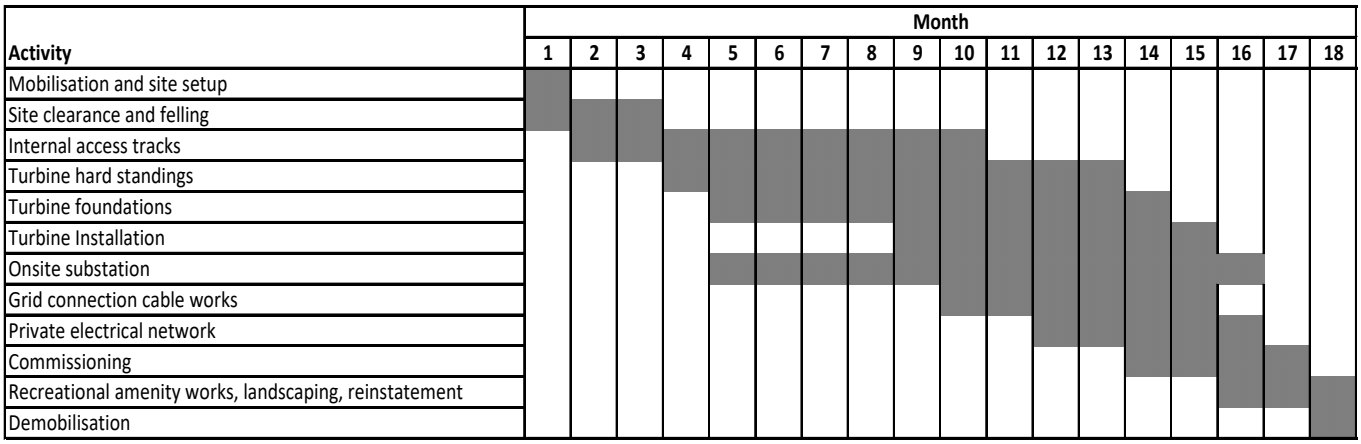

Figure 3-10: Outline Project Construction Programme

The implementation of the BEMP measures shall be carried out in parallel with wind farm landscaping and reinstatement.

3.4.3 Construction and Environmental Management Plan (CEMP)

A Construction and Environmental Management Plan (CEMP) is contained in Appendix 3-1 of Volume 3.

The CEMP sets out the key environmental management measures associated with the construction, operation and decommissioning of the proposed project, to ensure that during these phases of the project, the environment is protected, and any potential impacts are minimised. The final CEMP will be developed further at the construction stage, on the appointment of the main contractor to the project 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 project.

Section 2: *Existing Site Environmental Conditions* provides details of the main existing geotechnical, hydrological, ecological and archaeological conditions onsite. These conditions are to be considered by the Contractor in the construction, operation and decommissioning of this proposed project.

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 project.

Section 6: *Emergency Response Plan* contains predetermined guidelines and procedures to ensure the safety, health and welfare of everybody involved in the project and to protect the environment during the construction phase of the proposed project.

3.4.4 Traffic Management

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

A Traffic Management Plan will be adopted , in consultation with Cork County Council, to provide a safe environment for road users and construction workers. A Traffic Management Plan is contained in the CEMP in Appendix 3-1. In the event permission is granted for the proposed project the Traffic Management Plan shall 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 shall be submitted to the planning authority.

Quarries and Associated Haul Routes

The surrounding licenced quarries currently in operation and the indicative haul routes to the site have been identified. The nearest suppliers of quarry stone (TII Class 6 products] is identified as Bweeng Quarry located in Mallow, Co. Cork. This is a Sand & Gravel quarry located to the north-east of the Ballinagree site. The location of the quarry is shown in Figure 13-5.

All quarry materials required for the construction of the proposed wind farm shall therefore approach the site from the direction of Millstreet along the L2758/L1123 (also known as The Butter Road). This shall act as the main haul route for the construction phase of the project.

3.4.5 Soil and Peat Management

Management of all excavated soils and peat shall be carried out in accordance with the Soils Management Plan contained within the CEMP in Appendix 3-1. There are no peat deposition areas required as part of this project following assessment of the existing environment. Any peat excavated for the construction of access roads within the site will be re-used on site in berms and for landscaping purposes and along the margins of the access roads. Topsoil will be re-used for landscaping and will also be used for reinstatement purposes around turbine bases, hardstanding areas and borrow pits.

Further details on soils management can be found in Chapter 9 of this EIAR and the Soils Management Plan contained within the CEMP in Appendix 3-1.

3.4.6 Surface Water Management and Site Drainage

A key design philosophy employed for Ballinagree wind farm is the use of existing forestry and agricultural tracks and associated drainage alongside the implementation of Sustainable Drainage Systems (SuDS). This design approach ensures that existing drainage patterns will be maintained throughout the site.

An appropriate drainage design 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, borrow pits, 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 wate 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 on diagram below. The interceptor drains will be installed on the upslope side of the construction area. This will reduce the amount of water from 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 material to 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.

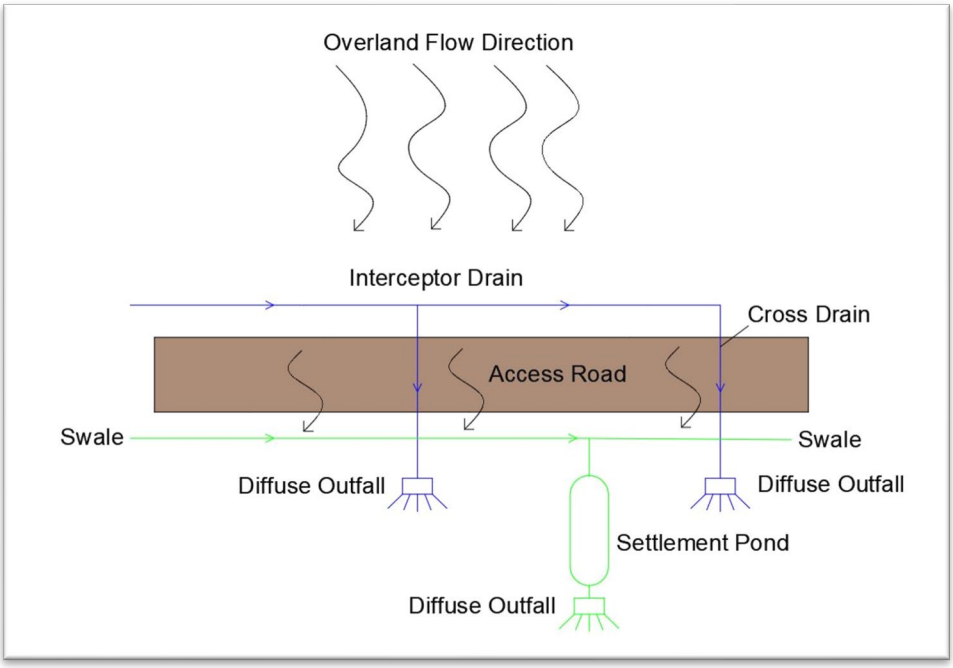

Plate 3-9: Drainage Diagram

The settlement ponds will be designed in the accordance with CIRIA C648. The volume of a settlement pond is in relation with area draining into it. Any upslope runoff from site should 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 suggested 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 project 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 Surface water management plan (SWMP) contained in Appendix 10.2.

The existing access roads, where required, will be upgraded. 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 10 Hydrology and Water Quality, the Surface Water Management Plan (SWMP) which is contained in Appendix 10.2 and on accompanying planning application drawings. The proposed drainage is shown on Planning Drawings Series- 0100.

3.4.7 Waste Management

A Waste Management Plan for the project has been included in the CEMP in Appendix 3.1.

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 to licensed facilities. The location of these facilities area identified in Table 3-6. 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 project 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 3-3: Licensed Waste Facilities in the Vicinity of Ballinagree Wind Farm

Facility	Type of wasted accepted
Kanturk Civic Amenity Site	Plastic, metals, oil, paper, cardboard, glass, electrical goods
Mallow Civic Amenity Centre	Plastic, metals, oil, paper, cardboard, glass, electrical goods, timber, green waste
Munster waste management	Domestic, commercial, industrial, agricultural
Codrum Recycle Centre	Plastic, metal, oil, paper, cardboard, glass, Electrical good

3.5 Project Operation and Lifespan

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 35-year operational period from the date of full operational commissioning of the wind farm. With permission for the onsite substation sought in perpetuity given that the substation could form part of the national electricity network. Therefore the substation will be retained as a permanent structure and will not be removed.

35 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. During this operational period the wind turbines will generally operate automatically, responding by means of anemometry equipment and control systems to changes in wind speed and direction.

It is expected that maintenance activities associated with the implementation of the proposed BEMP will be equivalent in nature to agricultural activities and will be carried out by the involved landowners. The BEMP measures are described in detail in Appendix 3.4.

3.6 Project 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 recreation, forestry and agriculture. Turbine hardstandings shall be covered over with topsoil previously stripped and used for landscaping purposes during the construction stage, and left to revegetate naturally. The recreational trails and associated signage shall be left in situ.

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 shall form part of the national grid and will be left in situ.

No decommissioning activities are envisaged for the Biodiversity Enhancement and Management Plan lands.

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

A detailed decommissioning plan will be agreed in advance of construction with Cork County Council.

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