MWP

Chapter 02 Description of the Proposed Development

Ballycar Wind Farm

2. Description of the Proposed Development

2.1 Introduction

This chapter of the Environmental Impact Assessment Report (**EIAR**) presents information on the elements that constitute the entire project, which includes the proposed development, as set out in **Chapter 1** of this **EIAR**. The Project Description details the characteristics and operations involved in the project. The purpose is to provide an appropriate level of detail to provide the basis for Environmental Impact Assessment (EIA). The chapter describes the site location, all characteristics and components of the project and details the activities and operations required to construct, commission, and operate the wind farm development and connect it to the National Grid. Decommissioning of the project is also discussed.

Details of the project are further supported by the following documents:

- **EIAR Chapter 3 Civil Engineering**;
- Construction Environmental Management Plan (**EIAR Volume III**, **Appendix 2A**);
- Surface Water Management Plan (**EIAR Volume III, Appendix 2B**);
- Turbine Delivery Route Assessment (**EIAR Volume III, Appendix 2C**);
- Planning Application Drawings.

For the purpose of the planning application and the analysis conducted in this **EIAR**, the Applicant has considered a wind turbine composed of a tower with a maximum height of 90 meters and a maximum rotor diameter of 136 meters, resulting in an overall maximum tip height (blade in the vertical position) of 158 meters (refer to **Table 2-1** for dimension details of all turbines). Refer to **Planning Drawing No. 22156-MWP-00-00-DR-C-5401** for turbine elevation details.

2.2 Characteristics of the Proposed Development

It is being proposed by *Ballycar Green Energy* (the Applicant) to develop a wind farm (named Ballycar Wind Farm) comprising twelve (12) No. wind turbines in south County Clare. The proposed development includes the following components, infrastructure and ancillary facilities and elements for construction and consideration as described below. The **EIAR** considers the proposed development and all additional components of the project. The following two lists include both the core wind farm elements of the project and the associated development components of the project.

2.2.1 Proposed Development

The development for which planning permission is sought in the planning application (the proposed development) includes the following:

Core Wind Farm Elements:

- 12 No. Wind Turbines (blade tip height up to 158m, refer to Table 2-1 for dimensions of each turbine).
- 12 No. Wind Turbine foundations and hardstand areas.
- 1 No. permanent Meteorological Mast (90m height) and foundation and associated hardstand areas.
- 1 No. Electrical Substation (110kV) including associated ancillary buildings, security fencing and all associated works.
- Grid connection to existing 110kV overhead line.
- 2 No. Developed Site Entrances, one temporary entrance to facilitate construction traffic and one permanent entrance.
- New and upgraded internal site access tracks.
- Provision of an on-site visitor cabin and parking.

Associated Development Components:

- All associated underground electrical and communications cabling connecting the proposed turbines to the proposed onsite substation.
- Turbine Delivery.
- Laying of approximately 1.5km of underground electricity cabling to facilitate the connection to the national grid from the proposed onsite substation to connect to an existing 110kV overhead line.
- Temporary works on sections of the public road network along the turbine delivery route (including hedge or tree cutting, relocation of powerlines/poles, lampposts, signage, and local road widening).
- 1 No. Temporary construction site compound and additional mobile welfare unit.
- 1 No. Borrow pit to be used as a source of stone material during construction.
- 3 No. spoil deposition areas (one at borrow pit location).
- Associated surface water management systems.
- Tree felling required for wind farm infrastructure.

In addition to the proposed development as described, there is a proposed underground connection between T1 and the proposed 110kV substation which will be located northwest of T1. The underground connection from T1 is routed along existing forestry tracks and through conifer forestry to the north west of the wind farm site and connects to the proposed 110kV substation. From the proposed 110kV substation, an underground cable is routed in a north west direction where it connects to the existing 110kV overhead line. The proposed 110kV grid connection route is approximately 1.5km in length. 1.0km of the 110kV grid route is proposed within existing forestry tracks. The remaining 0.5km is routed through conifer forestry. It also crosses a 3m wide local road. A new unbound stone access track will be constructed over the 110kV grid route to allow access for future maintenance.

2.2.1.1 Duration of Permission

A ten-year planning consent is being requested for this development whereby, planning consent for the construction of the development would remain valid for ten years following the grant of permission. It is noted that the Wind Energy Development Guidelines (2006) state that "Planning Authorities may grant permission for a duration longer than 5 years if it is considered appropriate, for example, to ensure that the permission does not expire before a grid connection is granted. It is, however, the responsibility of the applicants in the first instance

to request such longer durations in appropriate circumstances". This text also appears in section 7.22 of the Draft Revised Wind Energy Development Guidelines (2019).

A 10-year planning permission is considered appropriate for a development of this size to ensure all consents required are secured to enable the construction and operation of the development.

The applicant requests the grant of permission is on the basis of an operational period of no less than 35 years from the date of full operational commissioning of the wind farm, with permission for the onsite substation sought in perpetuity given that the substation will form part of the national electricity network. Therefore, it is envisaged that the substation will be retained as a permanent structure and will not be removed.

2.2.1.2 Key Project Design Approach and Considerations

There are multiple elements which must be considered in the design of an appropriate wind farm development. Some of the key elements of the project design approach for the proposed Ballycar Wind Farm included:

- Wind Farm Constructability;
- Environmental Constraints and Iterative Design;
- Wind Resource Zoning and Designations.

2.2.1.3 Constructability

Site conditions such as topography, hydrology, geology, and access, can affect the 'build-ability' of the project. A constructability constraint approach was used integrating the most significant construction related constraints including ground slope, peat depth and hydrology, providing a constructability ranking based on a qualitative assessment. This has been developed by Malachy Walsh and Partners, Wind Farm Engineering Team and it reflects actual site experience and an understanding of the constraints involved in constructing and delivering wind turbine components and infrastructure. Further detail is provided in Chapter 3 Civil Engineering.

2.2.1.4 Environmental Constraints and Iterative Design

An iterative analysis approach was adopted during the wind farm design process based on the detailed baseline studies, which included detailed constraint mapping and iterative modelling, as required, for environmental aspects. 'Mitigation by avoidance' and iterative design was a critical component of the proposed wind farm design process. The objective of the iterative design process was to achieve the optimum, or the most suitable and environmentally sensitive wind farm infrastructure layout, that most complemented the particular environmental and physical characteristics of the project site.

2.2.1.5 Wind Resource Zoning and Designations

The Clare County Development Plan 2023-2029 and associated Renewable Energy Strategy identifies areas of strategic regional and national importance that have the potential to accommodate wind energy development. It designates areas as being either *a) strategic, b) acceptable in principle c) open for consideration or d) not normally permissible,* for wind energy development. As outlined below in Figure 2-1, the development lands principally lie within wind energy areas outlined in the Renewable Energy Strategy for County Clare as follows:

- Strategic for wind energy development (All turbines); and
- Acceptable in Principle.

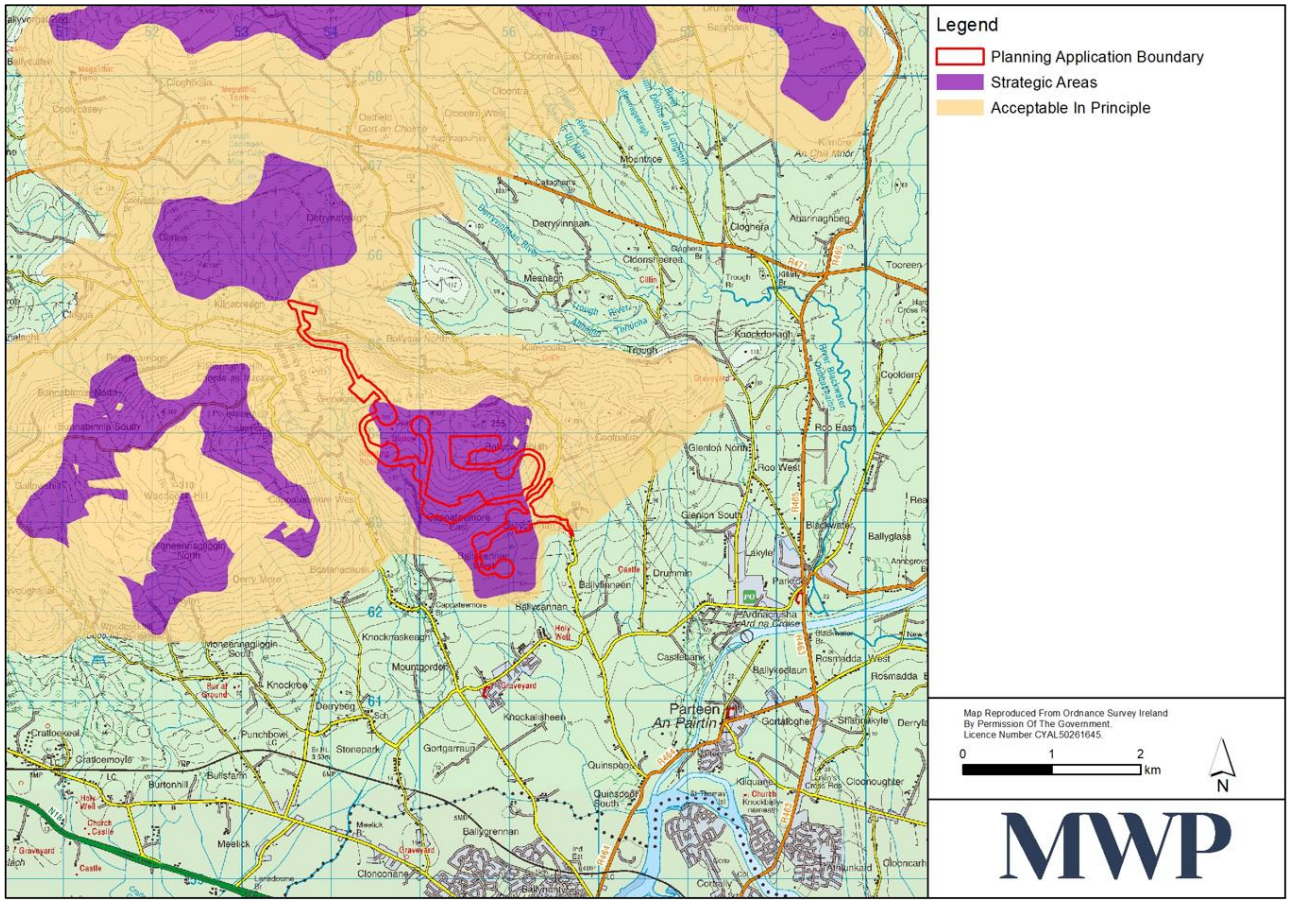

Figure 2-1: Wind Energy Zoning within the main site boundary

2.2.2 Development Location

The proposed development is located in a rural area of southeast Clare to the east of Woodcock Hill and approximately 3km northwest of Ardnacrusha, 3km northwest of Limerick City and Suburbs and 6.7km east of Sixmilebridge. **Figure 2-2** outlines the location of the proposed development while **Figure 2-3** outlines the proposed main wind farm development site boundary included in the planning application. The area within this boundary is 104.7 ha. The grid route is also contained in the planning application and within the planning application boundary as shown in **Planning Drawing 22156-MWP-00-00-DR-C-5005** (outlined in **Figure 2-16**).

The proposed wind farm and associated infrastructure lie within the townlands of Glennagross (orse Glennacross or Glenagross), Cappateemore East, Ballycannan West, Ballycannan East, Ballycar North and Ballycar South. All references to Glennagross within this **EIAR** correspond with Glennacross/Glenagross.

Existing land cover at the site is a mix of pastures and coniferous forests. The majority of the site consists of pastures while the more elevated areas of the site are composed of coniferous forest, which are owned and managed by forestry companies. The surrounding land includes some pastures and lands principally occupied by agriculture.

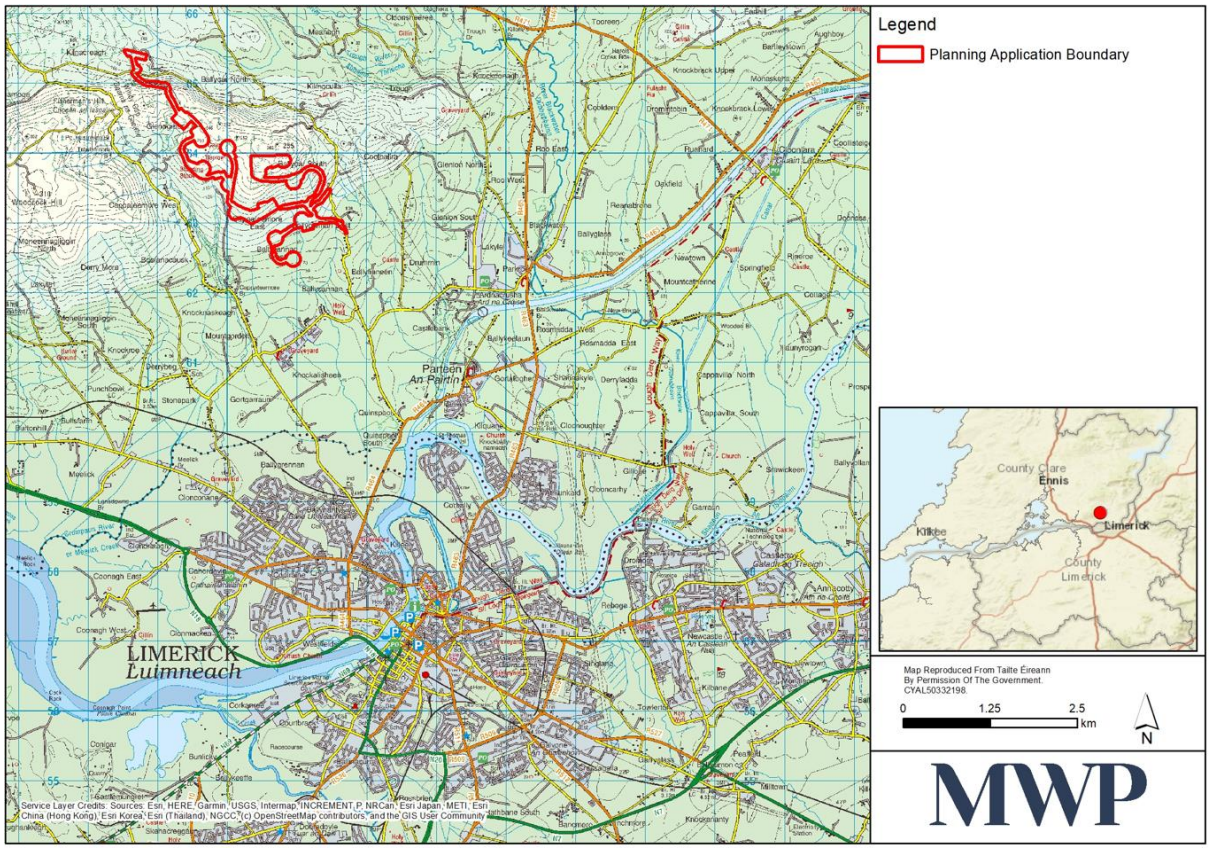

Figure 2-2: Site location of the proposed Ballycar Wind Farm Development

2.2.2.1 Project/ Study Area and Planning Application Area

The planning application development site boundary includes a total land area of approximately 104.7 ha (see **Figure 2-3**). During the project EIA and design process, the wider study area was examined and substantially reduced in size eliminating areas that were considered unsuitable, thereby concentrating on areas that were deemed appropriate for locating wind turbines and associated infrastructure. Therefore, the **EIAR** study area (see also **Figure 2-3**) which is referred to in the figures throughout this **EIAR**, incorporates a larger assessment area than presented in the planning application drawings. The EIA Study Area is based on the planning boundary and adjacent lands. It will also vary from topic to topic depending on the zone of influence and sensitive receptors being assessed. This is reflected accordingly in each chapter. **Figure 2-4** illustrates the site boundary and relevant townlands.

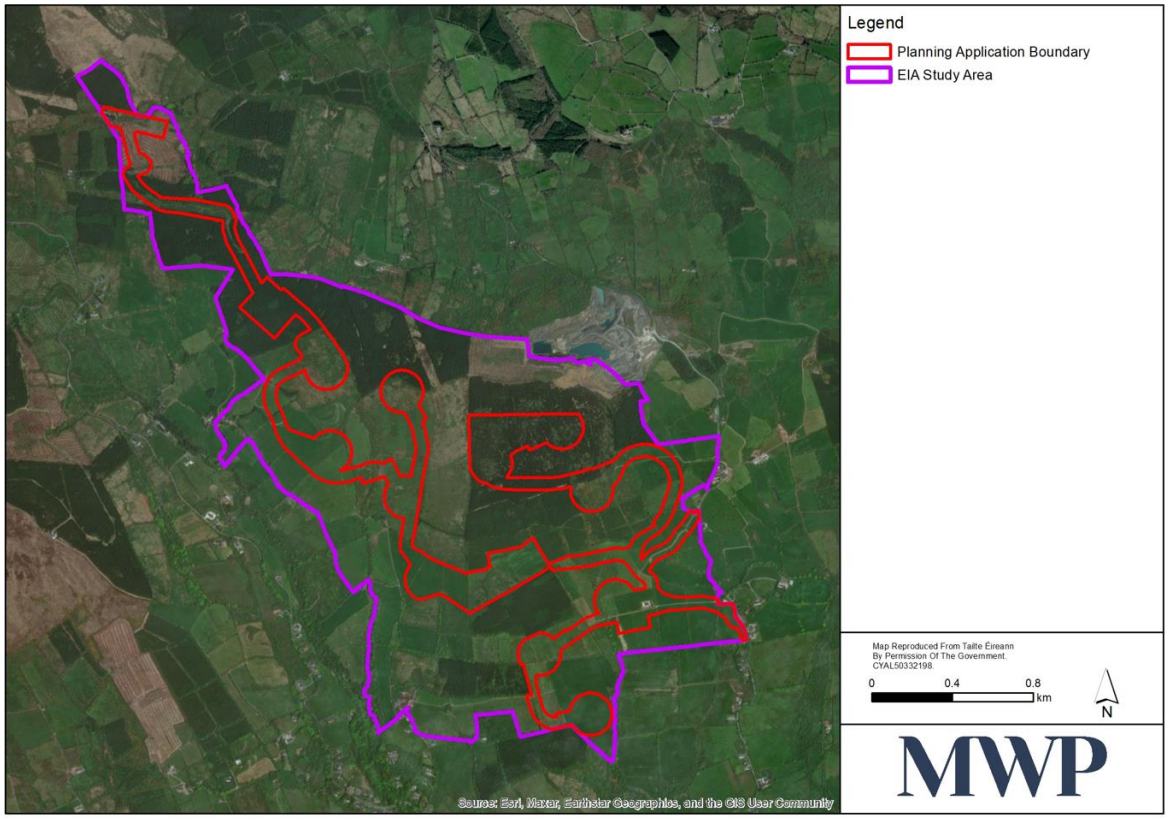

Figure 2-3: EIA Project Area and Site Boundary

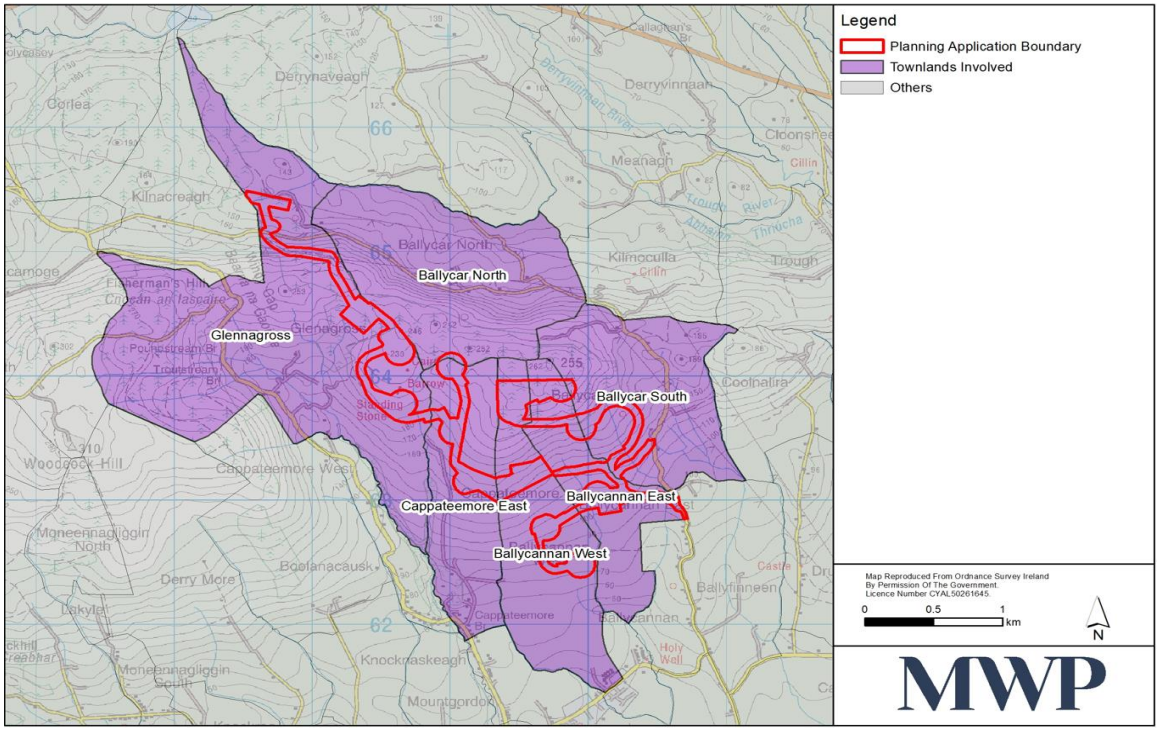

Figure 2-4: Site Boundary and Townlands

2.2.3 Development Lands Ownership

The proposed development lands described in the previous sections include lands under the ownership of forestry companies and private lands. Consent letters from all the landowners are included with the planning application.

Road opening licences will also be sought from Clare County Council for development works within and along the public road network.

2.3 Size, Design and Appearance of the Proposed Project

The figures presented in the following sections are for illustrative purposes only.

Figure 2-5 outlines the proposed development site boundary included in the planning application. The area within this boundary is 104.7 ha.

Figure 2-6 shows the proposed development site layout for which planning permission is being sought and illustrates the positions of the turbines, access tracks, crane hardstand areas, route of the grid connection, substation, permanent met mast, borrow pit, material deposition areas and temporary construction compound. The development footprint within the application area is approximately 104.7 ha.

Figure 2-7 demonstrates the minimum extent of the study area considered for environmental assessment in the EIAR. It will also vary from topic to topic depending on the zone of influence and sensitive receptors being assessed. This is reflected accordingly in each chapter.

The layout reflects the outcome of the iterative engineering and environmental analysis design approach adopted during the wind farm design process which included minimising key risks in terms of ground conditions, potential negative influences on the existing drainage, avoidance of sensitive ecological habitats, and any known archaeological features. This design process, rationale and evolution is described in EIAR Volume II Chapter 4 Alternatives.

The project also includes additional components outside the boundaries of the Development Application Area, including temporary works along the turbine delivery route. There will be a requirement for tree felling and consequently replacement forestry land. However, these will be at a significant remove from the development site, therefore there will be no cumulative impact in conjunction with the proposed development. These lands will be subject to a separate independent technical and environmental assessment, and related consenting process.

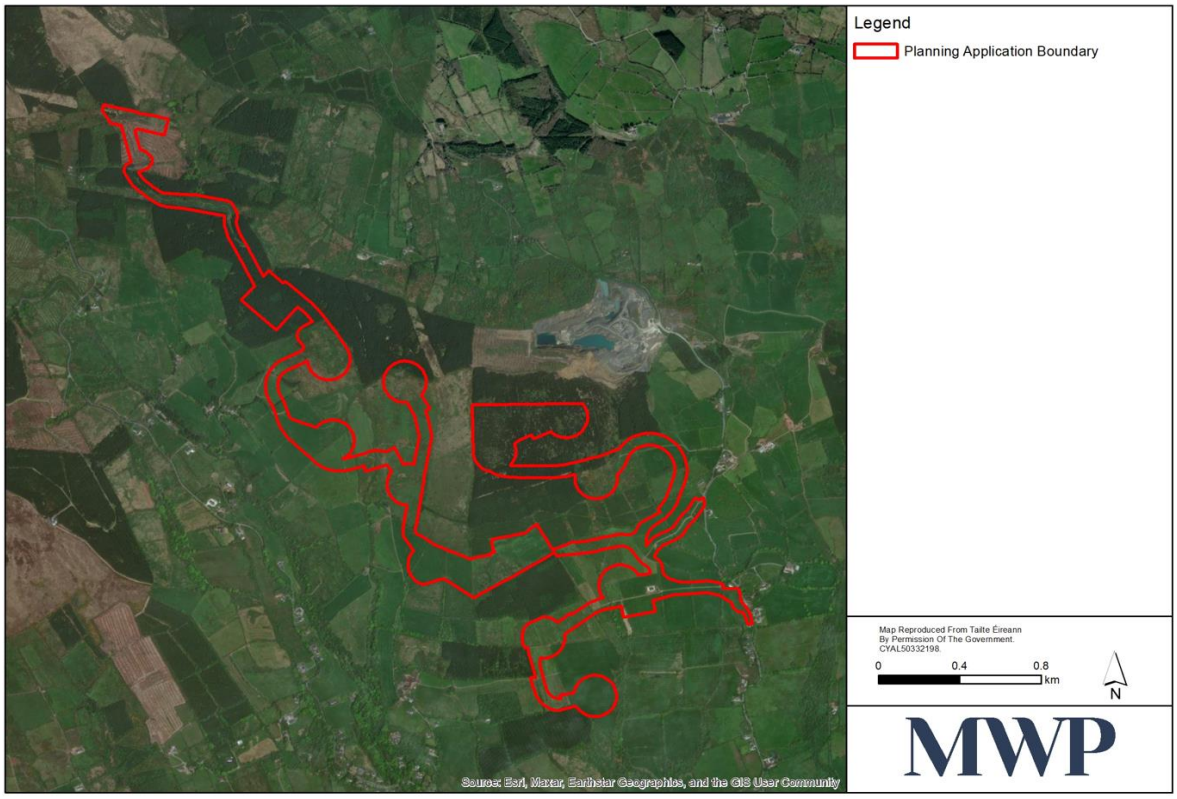

Figure 2-5: Wind Farm Project Development Site Boundary

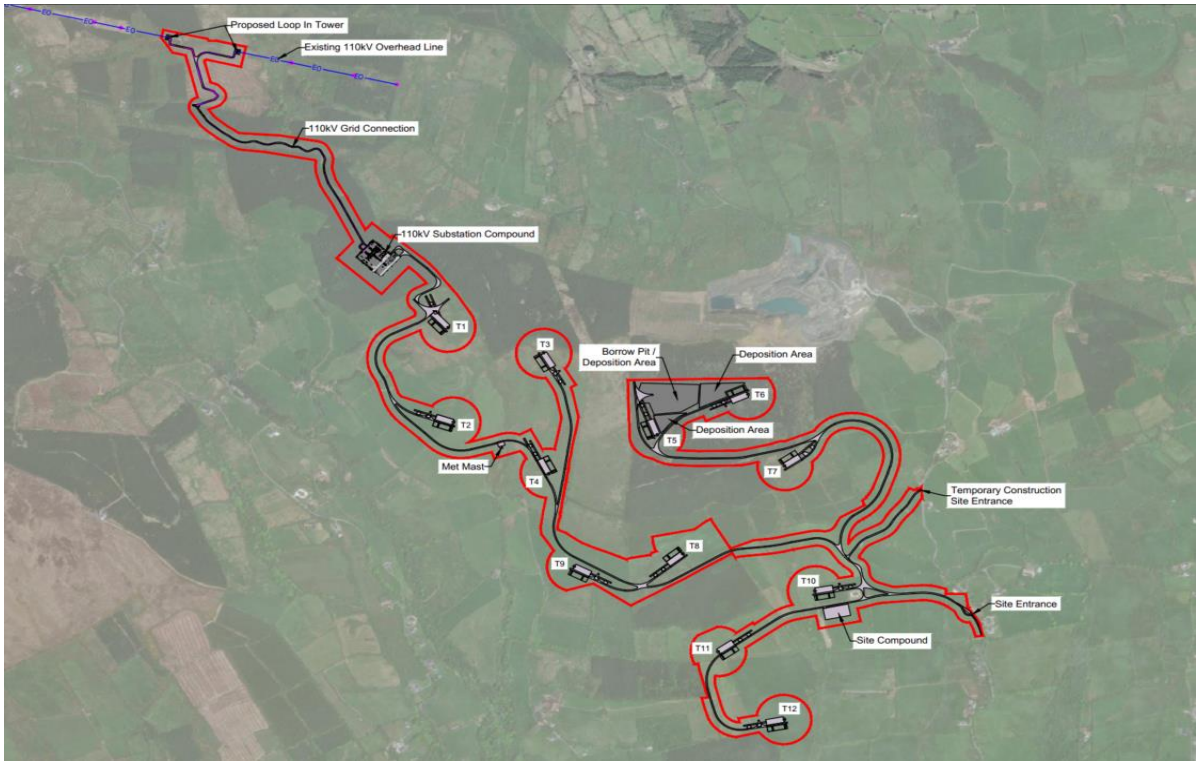

Figure 2-6: Proposed Wind Farm Layout

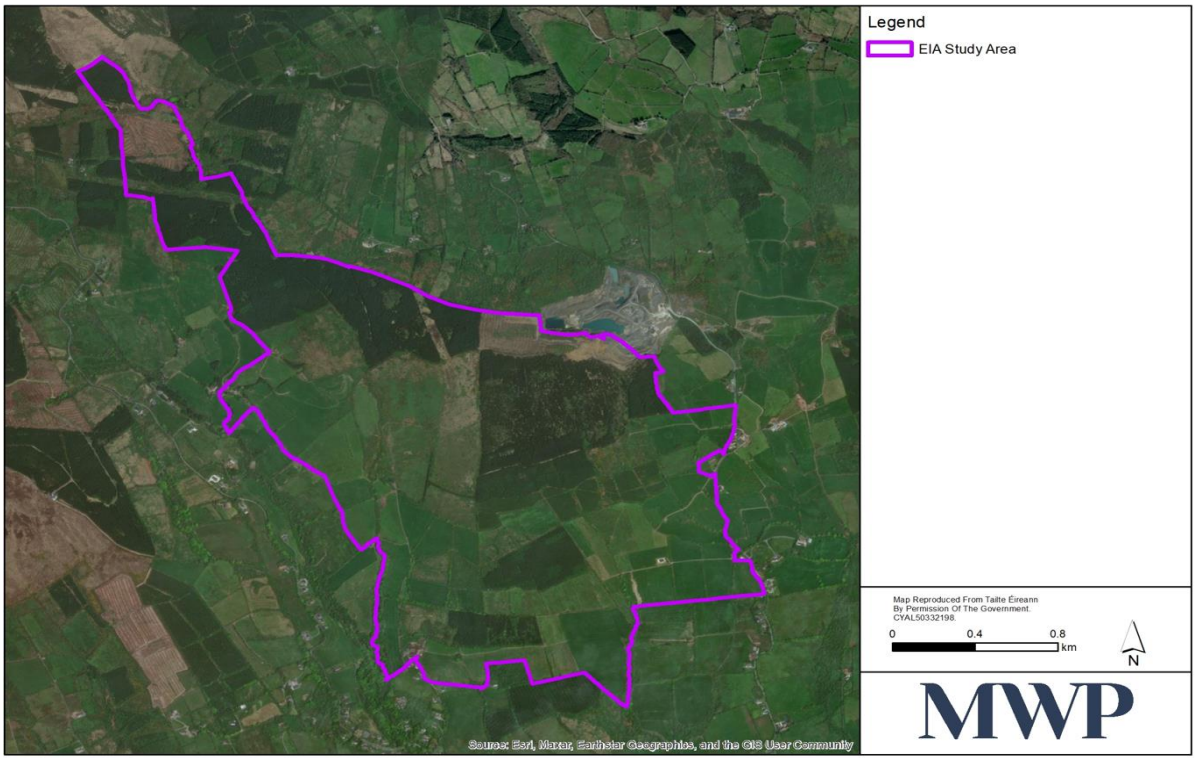

Figure 2-7: Minimum extent of Study Area considered in the EIA for wind farm infrastructure

2.3.1 Wind Turbines

It is proposed to install twelve (12) No. wind turbines each with a maximum tip height of up to 158 metres (refer to Table 2-1 for specific turbine dimension details). Eleven of the turbines will have a hub height of 90m and a blade length of 68m and one turbine (T10) will have a hub height of 82m and a blade length of 68m. Refer to Planning Drawing No. 22156-MWP-00-00-DR-C-5401 for turbine elevation details.

The turbine selected will be certified under the International Electrotechnical Commission IEC 61400-1 safety standards and will be designed to withstand the environmental conditions encountered on site. The proposed turbines will be of a typical modern design, incorporating tubular towers and three blades attached to a nacelle. The tower supports a nacelle and rotor hub. Commercial wind turbine hubs and towers are typically made of steel, while the blades can be made of a matrix of glass-fibre reinforced polyester or wood-epoxy or a similar composite material. Requirements for finish and colour are detailed in the 2006 Department of Environment, Heritage and Local Government Wind Farm Development Guidelines as follows:

- Turbines shall be finished to a white, off-white, or grey colour to correspond with the colour scheme of existing turbines; and
- All surfaces will have a matt non-reflective finish.

It is proposed to install lighting on the turbines in a pattern that is acceptable to the Irish Aviation Authority/AirNav Ireland for aviation visibility purposes. The dimensions and co-ordinates of the proposed turbines are set out in Table 2-1.

Table 2-1: Proposed Turbine Dimensions and Co-ordinates

Turbine Ref. No.	Hub Height	Blade Length	Maximum turbine tip height (m)	Grid Co-ordinates (ITM)	
T1	90	68	158	554589	664237
T2	90	68	158	554609	663823
T3	90	68	158	554964	664122
T4	90	68	158	554981	663600
T5	90	68	158	555405	663769
T6	90	68	158	555757	663943
T7	90	68	158	555904	663633
T8	90	68	158	555503	663247
T9	90	68	158	555084	663192
T10	82	68	150	556023	663087
T11	90	68	158	555645	662822
T12	90	68	158	555899	662525

2.3.2 Wind Turbine Foundations

Each wind turbine will have a reinforced concrete base pad foundation with a central plinth above the base, which will support the tower. See planning application Drawing No. 22156-MWP-00-00-DR-C-5402 for foundation details.

2.3.3 Hardstands and Lay Down Areas

Turbine hardstands are required to accommodate the delivery of the turbine components prior to their erection and to support the cranes during erection. Each wind turbine will have an associated turbine hardstand area adjacent to the foundation. The hardstand areas will be excavated and bear onto rock (or other suitable bearing stratum) with a foundation of 0.5-1.5m depending on the local bedrock profile. Following construction, the foundation pedestals will be covered over and allowed to re-vegetate naturally. Regarding decommissioning, 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 disturbances such as noise and vibration and dust. See planning application Drawing No. 22156-MWP-00-00-DR-C-5403 for hardstand details.

2.3.4 Permanent Meteorological Mast

A permanent meteorological mast will be erected within the wind farm to monitor the local wind regime while the wind farm is in operation. The permanent meteorological mast will be located between T2 and T4. The meteorological mast will be 90m in height. The mast will have a base foundation and hardstanding area. An illustration of a meteorological mast is shown in Figure 2-8. The meteorological mast will have an antenna for internal radio communications for the SCADA (Supervisory Control and Data Acquisition) equipment on site. The meteorological mast will be surrounded by a galvanised steel palisade fence, 2.4m in height. See planning application Drawing No. 22156-MWP-00-00-DR-C-5404 for details.

Figure 2-8: Meteorological mast on a wind farm

2.3.5 Underground cabling within the proposed development site

A network of underground cabling servicing each turbine with electrical power and signal transmission will be installed along internal access tracks within the proposed development site.

2.3.6 Internal Site Access Tracks

Internal site access tracks are required to interconnect elements of the site and allow access to all wind turbines and wind farm infrastructure. Existing tracks will be upgraded, and new tracks will be constructed to access each of the turbines, substation compound and meteorological mast. The routing of internal access tracks is shown in Figure 2-9. These access tracks will be constructed using excavated and floating track techniques depending on the ground conditions. See planning application Drawing No. 22156-MWP-00-00-DR-C-5405 for details. The methods of construction are outlined in EIAR Chapter 3 Civil Engineering.

2.3.7 Site Access

Primary access to the proposed development site will be provided from the local public road the L-7062 (refer to **Figure 2-9).** There will be two site entrances, one to facilitate construction traffic delivering material from the local quarry and one to facilitate turbine deliveries, materials sourced from alternative quarries and operations and maintenance vehicles.

Entrance Point A to the north-east of the site is proposed as a temporary access to be used during the construction phase only. It is intended to source materials from the local quarry approximately 1 km north of this entrance point, thereby minimising the impact of additional construction traffic on the L-7062 and the residents on this road. This entrance will be reinstated to its original condition once the construction phase is completed.

Entrance Point B will be from the south-east of the site and from the L-7062. This site access point will be for turbine deliveries, construction materials, aggregates other than those sourced from the local quarry, and operations and maintenance vehicles. This will be a permanent access point however it will be scaled back, landscaped, fenced and gated as the wind farm enters the operational phase (**Figure 2-10)**.

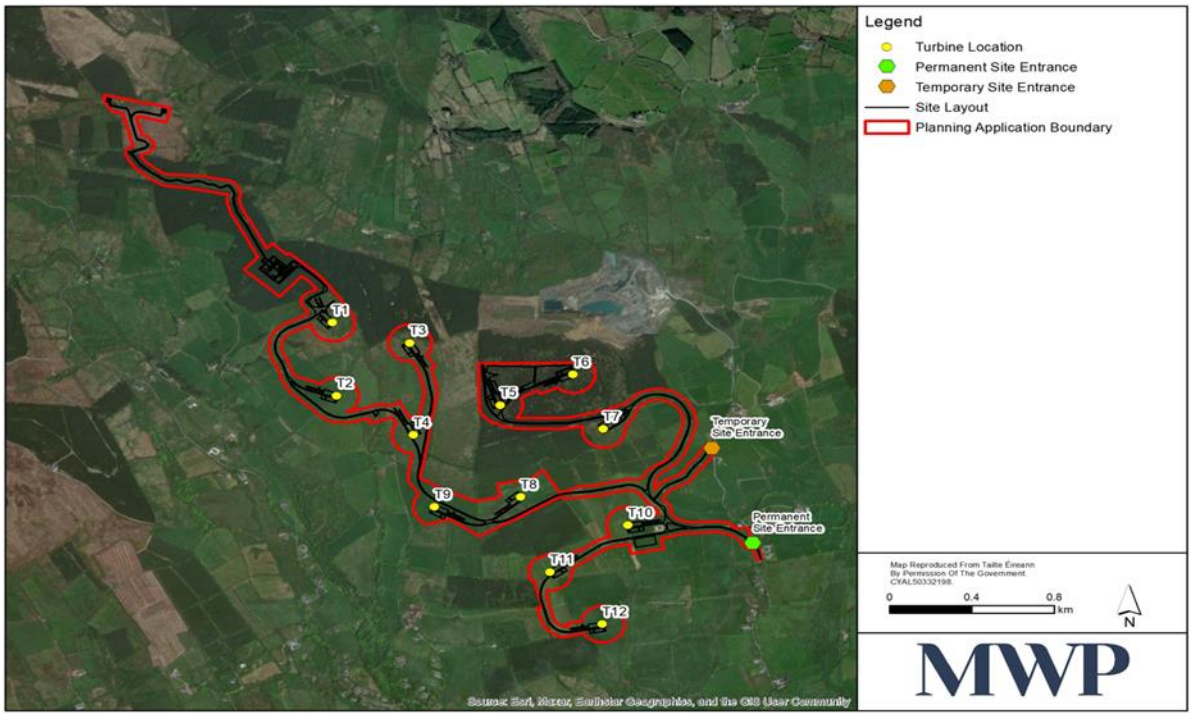

Figure 2-9: Site Access Points and Internal Access Track Layout

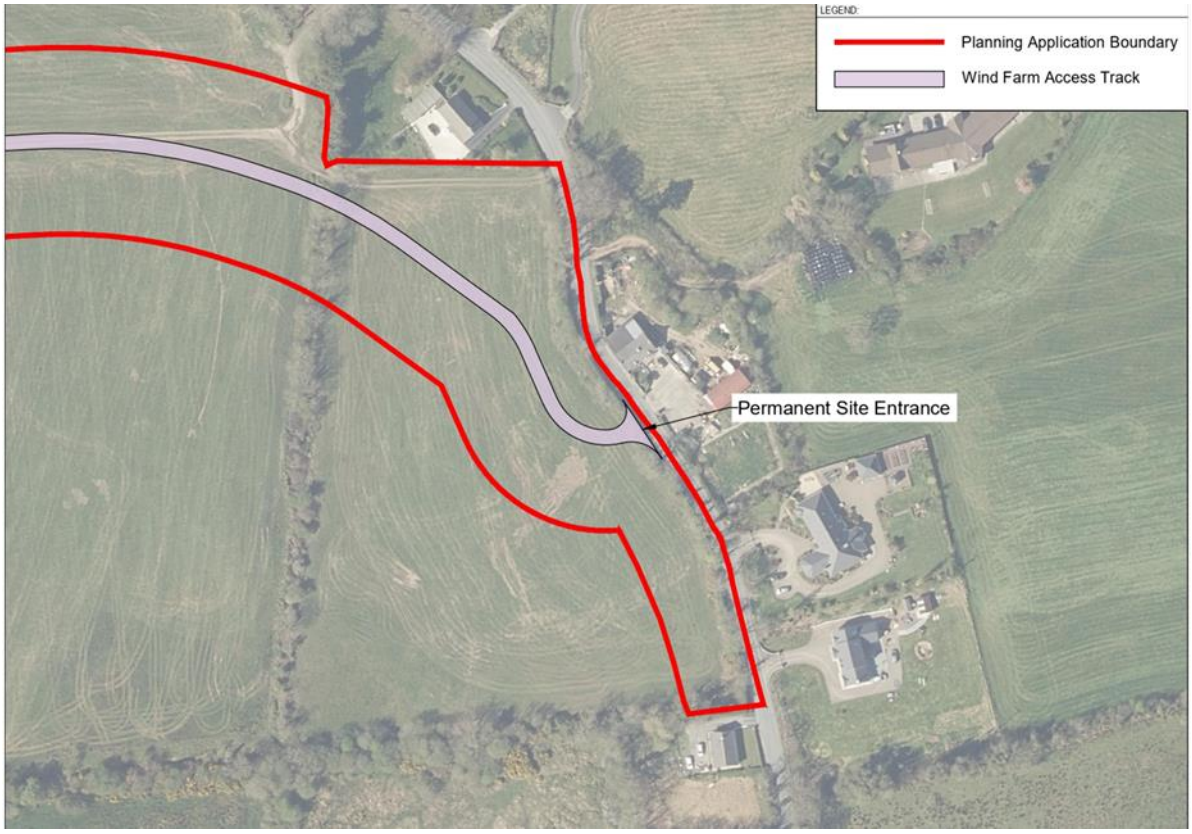

Figure 2-10: Permanent Access Finish

2.3.8 Turbine Delivery

The proposed route to deliver wind turbine components from the port at Foynes County Limerick to the proposed Ballycar wind farm site entrance in County Clare is shown on drawing 22156-MWP-00-00-DR-C-5009 and also in Figure 2-11.

Blade deliveries will use the Limerick tunnel to avoid entering the centre of Limerick city. Oversized loads such as tower components which have a loaded height greater than 4.65m will travel along the Dock Road crossing the River Shannon at Shannon Bridge. These components will then travel along Condell Road to Clonmacken Roundabout where they will rejoin the blade delivery route to the Ballycar site.

The Turbine Delivery Assessment Report is available in Volume III Appendix 2C.

Proposed Wind Turbine Component Delivery Route:

- Depart Foynes Port and travel along the N69 as far as the N18 interchange.
- From here, the WTG blades and components with loaded heights of less than 4.65m will travel North along the N18 via Limerick Tunnel and exit at Junction 3 through the toll arriving at Clonmacken Roundabout from the west.
- Where the component loaded height is greater than 4.65m the components will continue on the N69 through the Dock Road Roundabouts and along the Dock Road R510 to Shannon Bridge Roundabout. Here the components will turn northwards over Shannon Bridge and travel along the R527 Condell road arriving at Clonmacken Roundabout from the south.

- Upon reaching the Clonmacken Roundabout, two route options to reach the R464 Kileely Road are considered.
    - Option 1 – Northwest on Condell Road towards the Coonagh Roundabout and then via the Coonagh to Knockalisheen Distributor Road. Through the Coonagh Cross, Cratloe Road and Moyross Road roundabouts to the Knockalisheen Distributor Road Roundabout. Then turning southeast on Knockalisheen distributor road to the existing junction with the R464 Kileely Road.
    - Option 2 – Northeast on the L8570 Clonmacken Road passing the Jetland Shopping Centre and through the Ennis Road junction and Moylish Roundabout towards Thomond Park. Turning left at the Cratloe Road/R464 Kileely Road junction (Hassett's Cross).
- Taking the R464 Kileely Road to Parteen before turning left onto the L-3056 Local Road to the proposed wind farm site entrance.

The route from Foynes Port to the Limerick Tunnel and through the Dock Road in Limerick to Clonmacken Roundabout is already proven for this type of turbine as it was successfully used to deliver Vestas V136 turbine components and blades to Cloncreen Wind Farm in County Offaly.

The delivery of turbine components to the proposed development will require temporary works on sections of the public road network along the delivery route including hedge or tree cutting, relocation of powerlines/poles, lampposts, signage and temporary local road widening. Such works are temporary for the delivery of turbine components and are not included in the planning application boundary. Hedge/tree cutting and local road widening are assessed where applicable in the relevant chapters of this EIAR.

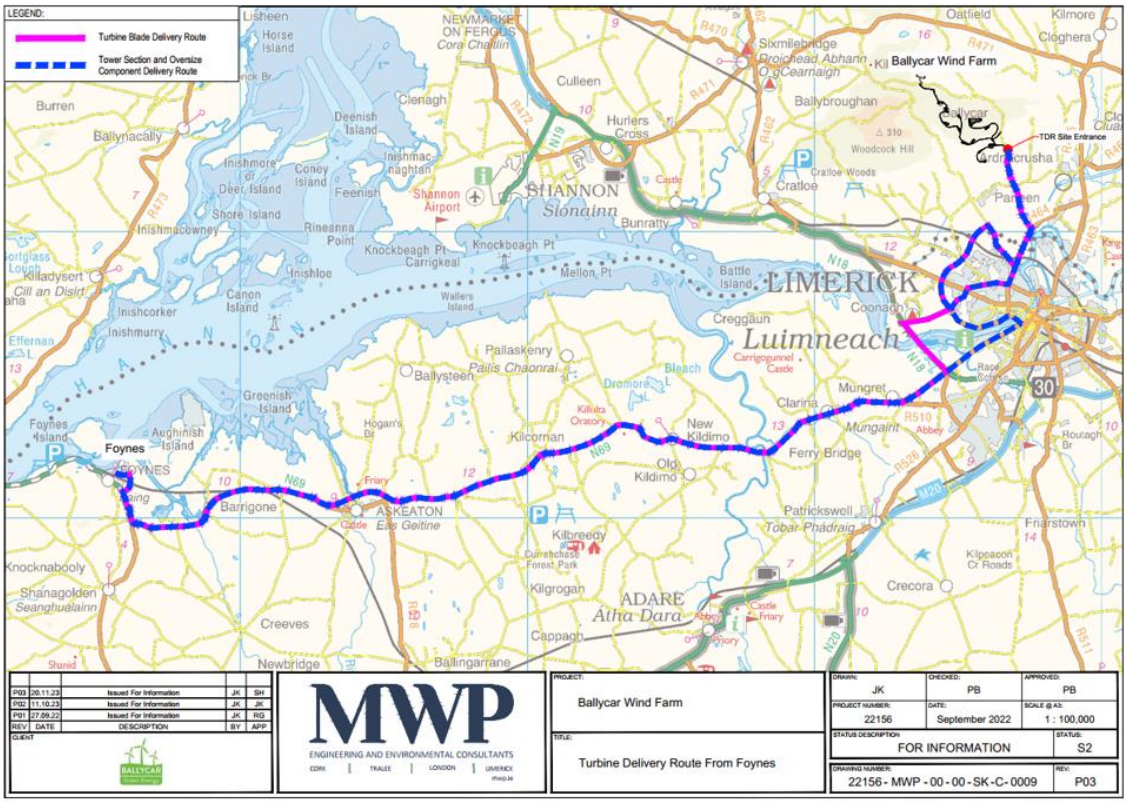

Figure 2-11: Proposed TDR Foynes to Ballycar Wind Farm

2.3.9 Traffic Management

Reasonable efforts will be made to minimise the impact of the works on local residences and users of the public road networks. A Traffic Management Plan (TMP) outlining the required traffic management procedures to be implemented on the public roads during the construction of the proposed development and delivery of the wind turbine components is included as **Appendix 2D.** In the event An Bord Pleanála (the Board) decides to grant approval for the proposed development, the final TMP will address the requirements of any relevant planning conditions, including any additional mitigation measures which are conditioned by the Board. The Traffic Management Plan will be updated at the construction stage (or the update commenced during planning compliance stage) to ensure controls are in place with all suppliers coming to the project site.

2.3.10 Temporary construction compounds and welfare facilities

One (1) No. temporary construction compound will be set up upon commencement of the construction phase. The location of the temporary compound is shown in **Figure 2-12**. See planning application **Drawing No. 22156-MWP-00-00-DR-C-5408** for details.

The compound will be used as a secure storage area for construction materials and will also contain temporary site cabins to provide welfare facilities for site personnel. Facilities will include office space, meeting rooms, canteen area and mobile sanitary facilities. The proposed development will include an enclosed wastewater management system at the temporary compound capable of handling the demand during the construction phase. A holding tank is proposed at the compound for wastewater management. The holding tank will be emptied by a licensed permitted contractor only. Upon completion of the project the compound will be decommissioned by backfilling the area with the material arising during excavation and landscaping with topsoil.

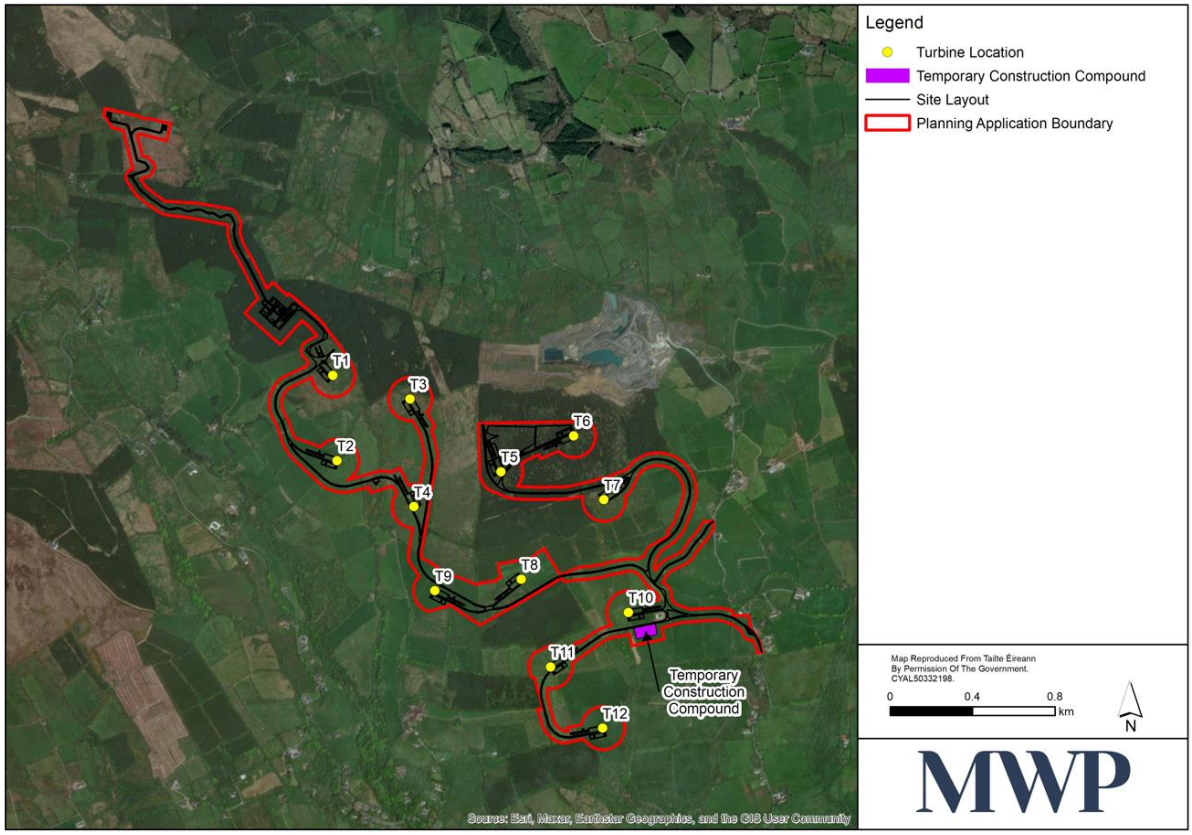

Figure 2-12: Location of Temporary Construction Compound

2.3.11 Borrow Pits and Material Deposition Areas

There is one (1) No. proposed on-site borrow pit location which has been identified to provide the majority of the required fill material for internal tracks, passing bays, hardstands, foundations, and temporary compound. The location of this proposed borrow pit is shown in Figure 2-13.

It is estimated that approximately 165,000m³ of aggregate will be won from this borrow pit. The extraction of rock from the borrow pit may potentially be undertaken by a combination of rock breaking, ripping, and blasting.

Post-construction, the borrow pit area and two other nearby deposition areas will act as material storage areas for the management of excess material generated on the site during construction. See planning application Drawing No. 22156-MWP-00-00-DR-C-5411 for details.

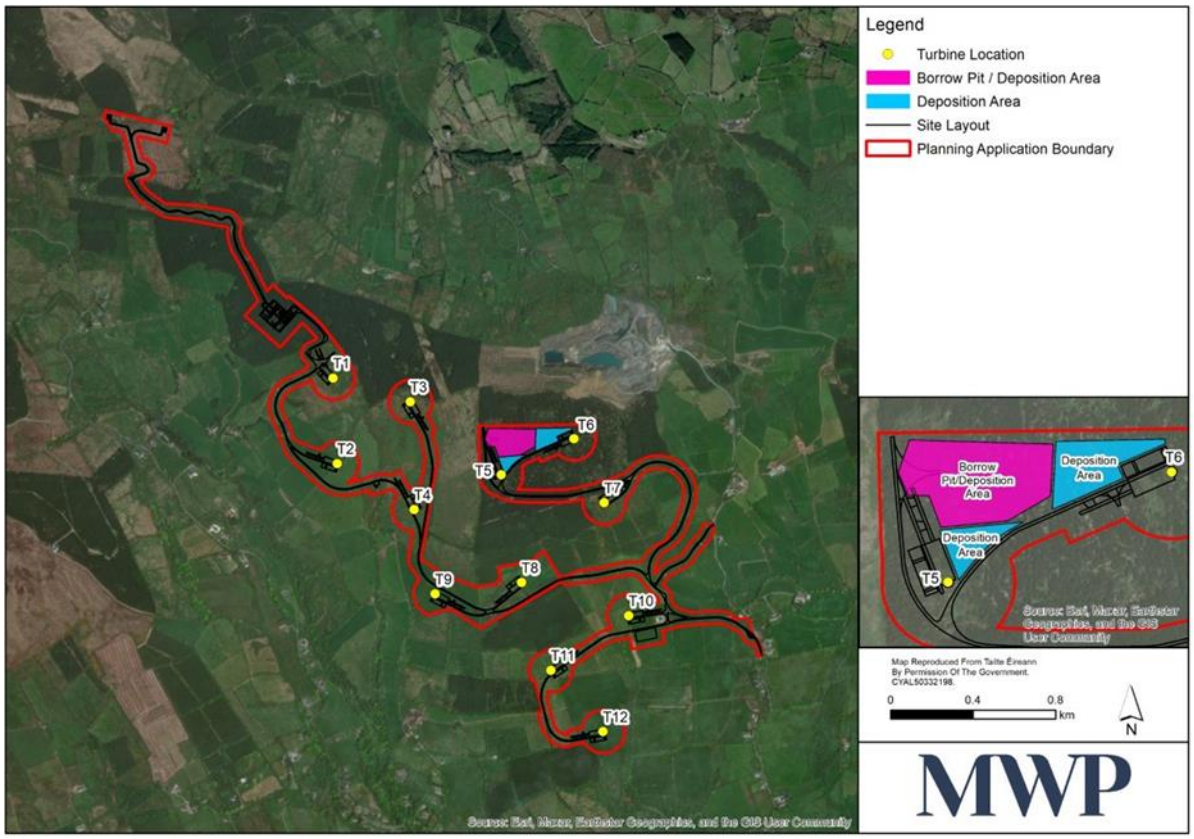

Figure 2-13: Borrow Pit/Material Storage Locations

2.3.12 Surface Water Management

A site surface water management system will be constructed on the site so as to attenuate run-off, guard against soil erosion and safeguard downstream water quality. The drainage system will be implemented along all work areas including all internal site access tracks, storage areas, crane hardstand areas and temporary site construction compound. Details of the proposed site drainage system are described in Chapter 3 Civil Engineering of the EIAR.

The following gives an outline of drainage management arrangements along internal access tracks:

- The surface water run-off drainage system will be implemented along all internal access tracks, to separate and collect 'dirty water' run-off from the track and to intercept clean over land surface water flows from crossing internal tracks.
- To achieve separation, clean water drains will be positioned on the upslope and dirty water drains positioned on the downslope of tracks, with track surfaces sloped towards dirty drains.
- Clean water will be piped under both the access tracks and downslope collection drains to avoid contamination. Piping the clean water under the access track allows the clean water to follow the course it would have taken before construction, thus mimicking the existing surface water over land flow pattern of the site and therefore not altering the natural existing hydrological regime on site.

See planning application Drawing No. 22156-MWP-00-00-DR-C-5006 to 22156-MWP-11-00-DR-C-5006 for drainage details.

2.3.12.1 WaterCourse Crossings

Watercourses Within the Wind Farm Boundary

On the proposed site, 8 no. watercourse crossings will be required.

Land Drains within the Wind Farm Boundary

On the proposed site, 1 no. land drain crossing will be required.

Watercourses Within the Grid Connection Route

1 no. watercourse and 1 no. land drain crossing are required along the proposed grid connection route.

Refer to Chapter 3 Civil Engineering of the EIAR for the details on watercourse crossings. No instream works will be required.

2.3.13 Conifer Tree Felling

Felling of commercial conifer forestry is required within and around wind farm infrastructure to accommodate the construction of two turbine foundations, and associated hardstands, access tracks, turbine assembly, substation, grid connection and borrow pit and deposition areas. It is proposed to fell around turbines as a mitigation for bats and to facilitate construction. A *circa* 5m distance on either side of access tracks will be felled to facilitate construction. Overall felling of approximately 15.97ha of forestry will be required.

All tree felling will be undertaken in accordance with a tree felling licence, using good working practices as outlined by the Department of Agriculture, Food, and the Marine (DAFM) Standards for Felling and Reforestation (2019) and will follow the specifications set out in Forest Service's 'Forestry and Water Quality Guidelines' (2000) and 'Forest Harvesting and Environmental Guidelines' (2000). These standards deal with sensitive areas, buffer zone guidelines for aquatic zones, ground preparation and drainage, chemicals, fuel, and machine oils. All conditions associated with the felling licence will be complied with. A felling licence application will only be submitted once planning permission is received for the proposed development.

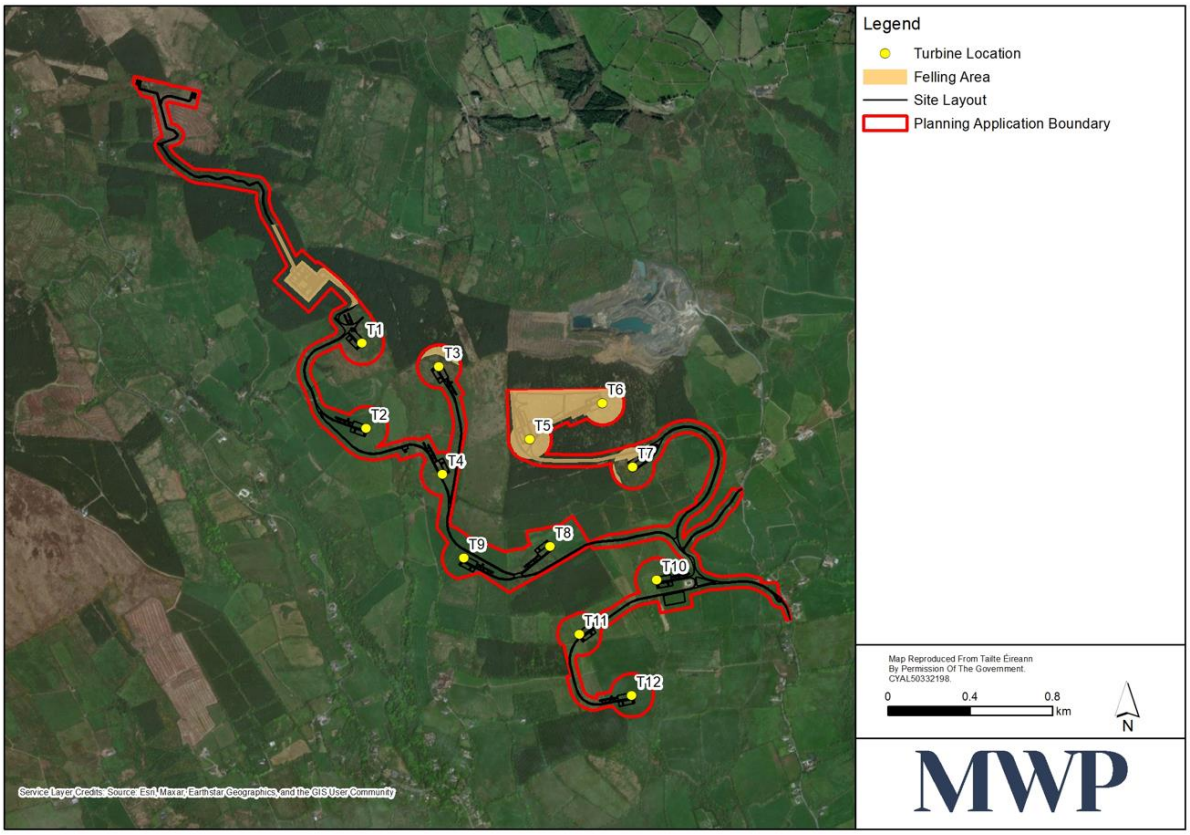

Figure 2-14: Areas to be felled

2.3.14 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 is 15.97 hectares. 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. The Applicant 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.

2.3.15 Grid Connection Options and Infrastructure

The grid connection route and associated connection point for connecting the proposed development to the National Grid has also been assessed in the various EIAR chapters. The grid connection route is outlined in **Figure 2-15** and described in the following subsections. See planning application **Drawing No. 05923-DR-100, Drawing No. 05923-DR-101, Drawing No. 107, Drawing No.110** and **Drawing No. 05923-DR-111 to Drawing No. 05923-DR-121** for details.

2.3.16 Connection Route and Connection Point

The proposed underground connection between T1 and the proposed 110kV substation will be located in the northwest of the site. The underground connection from T1 is routed along existing forestry tracks and through conifer forestry to the north west of the wind farm site and connects to the proposed 110kV substation. From the proposed 110kV substation, an underground cable is routed in a north west direction where it connects to the existing 110 kV overhead line. The proposed design for the 110kV Loop-In from the existing OHL will require two new Interface Mast Structures which will be constructed under the existing Ardnacrusha- Ennis 110kV OHL, on the boundary of the proposed development. The proposed 110kV grid route is approximately 1.5km in length. 1.0km of the 110kV grid route is proposed within existing forestry tracks, with the remaining 0.5km routed through conifer forestry. The route crosses a 3m wide local public road. A new unbound stone access track will be constructed over the 110kV grid route on private lands to allow access for future maintenance. Refer to planning application **Drawing No. 05923-DR-100, Drawing No. 05923-DR-101, Drawing No. 107, Drawing No.110** and **Drawing No. 05923-DR-111 to Drawing No. 05923-DR-121** for details.

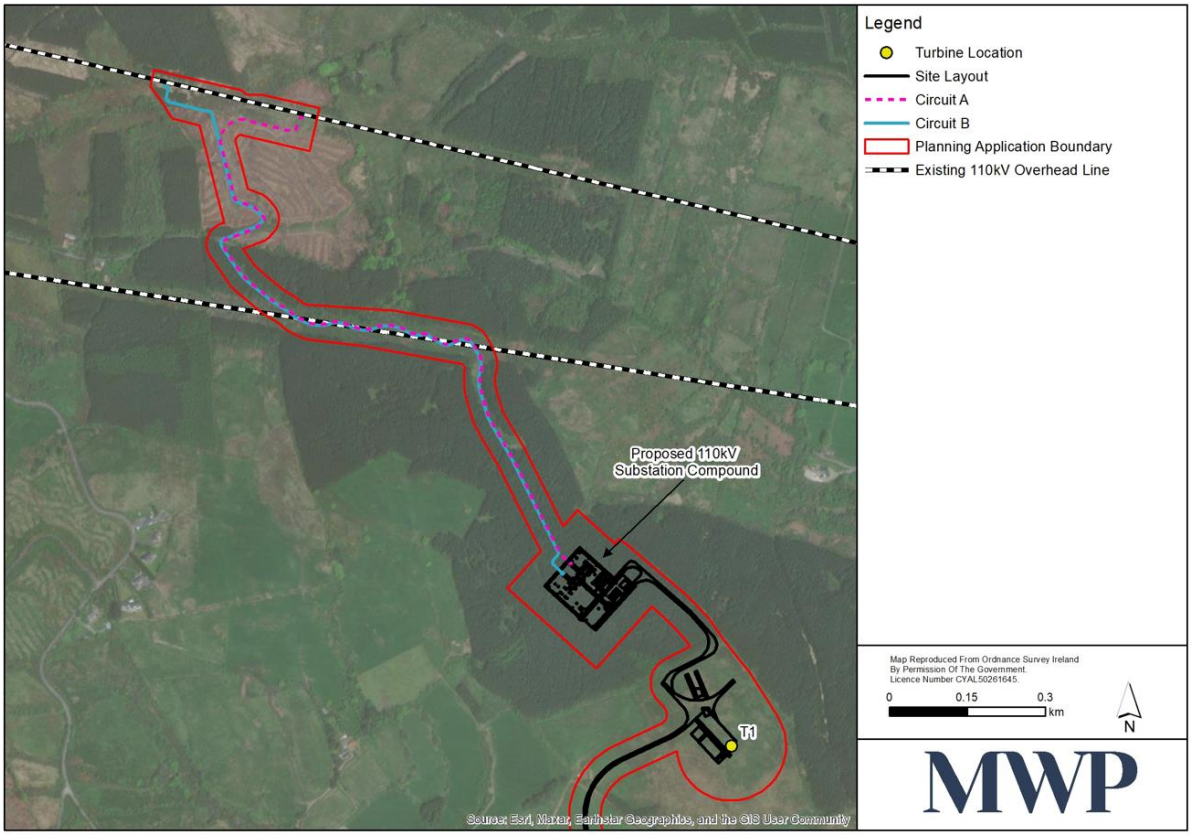

Figure 2-15: Grid Connection Route and Substation

2.3.17 Electrical Substation

The proposed 110kV electrical substation and compound will comprise an outdoor electrical yard and two single storey buildings (one for Eirgrid and one for the wind farm operator). The Eirgrid building will contain a control room, a storeroom, an office / canteen and a toilet. The wind farm operator building (or IPP substation building) will contain a storeroom, a communications room, a control room, a staff room, an office, a switchgear room and a toilet. Both substation buildings will be approximately 8.66m in height, with pitched roofs and an external

blockwork and plastered finish. There will be a very small water requirement for toilet flushing and hand washing and therefore it is proposed to harvest water from the roofs of the buildings. The discharge from the toilet within each building will go to a holding tank located within the substation compound where the effluent will be temporarily stored and removed at regular intervals by an approved contractor. Parking for each building will be located within the compound area. The substation buildings and associated compound will be contained within a 2.6m high galvanised steel palisade fence. It is proposed to topsoil and revegetate the cut and fill slopes required for the substation site.

Layout drawings of the proposed substation compound and buildings are in Drawings No. 05923-DR-130 to 05923-DR-142 for details.

2.3.18 Underground Cabling within the Wind Farm Site

A network of underground cabling serving each turbine with electrical power and signal transmission will be installed along internal access tracks connecting to the sub-station compound. There will be no overhead power lines constructed on the site.

2.3.19 Turbine transformers

Each individual turbine will generate electricity at a nominal voltage. Each turbine will also have its own transformer to step-up to an on-site distribution voltage. The transformer and associated switchgear will be located within the turbine tower. The maximum export capacity of each turbine is approximately 4.5 megawatt (MW)

2.3.20 Communication links

There will be communication links between the wind turbines, meteorological mast, and the substation. The links will use ducted fibre optic cables laid in the same trench as the network of underground electrical cables around the site. Furthermore, an antenna will be positioned on the permanent met mast at 40m height for radio communications for the SCADA equipment. This antenna is for internal site communications for the wind farm. It is not for the provision of public telecommunications services and there is no agreement with any telecommunications service providers.

2.3.21 Cumulation with other existing and/or approved Projects

The grid connection and substation is included in the project, which is assessed throughout the EIAR, and is therefore not considered cumulatively.

The project was considered in combination with other plans and projects that could result in cumulative effects including:

- Clare Wind Energy Strategy (2017); and
- Clare County Development Plan 2023-2029.

Any development under these plans will first have to be consented under planning and development legislation. Significant cumulative impacts are not predicted with the plans listed above, as each plan has a range of environmental and natural heritage policy safeguards in place. Furthermore, this project has been developed in view of achieving the objectives of these plans. Therefore, development of this project in combination with the

scope of works required to achieve the objectives of these plans will not result in cumulative effects. In terms to the proposed development, the zoning in the development plans relates to wind energy development and there is no other contradictory zoning for other project types or infrastructure. In terms of the Shannon Estuary Strategic Development locations outlined in the county development plan, the project is not located in any of these sites.

The material for the cumulative assessment was gathered through a search of relevant County Councils' Online Planning Registers, the An Bord Pleanála website and the EIA Portal. A review of applications for the preceding 5 years was carried out during the EIA process, starting October 2021, with a final search on December 8th 2023. The search focused on the townlands common to the development area. All other wind farm developments were considered within 25km of the site. Finally, recent planning applications that are pending a decision from the planning authority, which were accompanied by an EIAR, were also considered. The projects in the surrounding areas mostly relate to small scale development including agricultural sheds and shed extensions, dwelling houses, and extensions to dwelling houses, attic conversions, domestic wastewater treatment systems, installation of photovoltaic for domestic purposes, garages, demolitions, and retention permission applications etc. A final search in relation to these projects was undertaken on the 8th December 2023.

Such minor domestic and agricultural development will not introduce cumulative effects. These minor projects are either under the threshold for EIA or excluded from the list of projects requiring EIA and due to the nature and scale of these applications would not introduce complex or significant issues. Therefore they are not considered in the cumulative assessment.

Larger scale projects within 25km of the proposed development site are included in Table 2-2. The most relevant applications relate to O'Connell's Quarry in Ballycar South. These include a permitted quarry expansion, an application for a substation which was refused, and a batching plant which was withdrawn.

The quarry extension application, which was granted in May 2019, is for a 10 ha extension to an existing large working quarry. Considering the location of the extension adjacent to the operational quarry and that it is an existing regulated quarry, it is very unlikely to introduce significant cumulative effects. The extension is accessible from the existing quarry and is solely for the provision of additional stone, for the existing facility. These works will take place within the regulated site boundary of the quarry.

The application relates to additional rock extraction, but for processing under existing quarry activities. The construction of the wind farm project will only require relatively localised excavation, installation, and construction works and will not interact with quarry activities. The quarry is considered in the cumulative assessment throughout the EIAR where relevant.

Land management practices in the wider area which are considered in combination with the effects of the project are agriculture and forestry. It is proposed that all agricultural activities within the planning boundary will cease for the duration of the construction and commissioning phase. Agricultural activities within the wider study area will continue and will be separated from construction activities by appropriate stock proof fencing. Forestry operations within the planning boundary (apart from the operations required for the development) will also cease and will resume again post commissioning of the wind farm.

In terms of the replacement forestry lands, there is no potential for significant cumulative effects associated with the site and forestry operations. The developer commits that the location of any replanting (alternative afforestation) associated with the project will be at a distance so as to not create any potential cumulate effects and also outside any potential pathways of connectivity with the proposed project. This will ensure that there is no potential cumulative effect associated with this replanting. In addition, the developer commits to not commencing the project until both felling and afforestation licenses are in place and this ensures the afforested lands are identified, assessed and licensed appropriately by the relevant consenting authority.

Table 2-2: Planning Applications in the Area

Planning Ref.	Applicant	Description		Planning Authority Decision
16368 ABP- PL.247632 Third party Modified 24/04/2017	Terra Solar limited	for a 10 year permission for the development of a solar PV panel array consisting of up to 29,225.37 sq.m of solar panels on ground mounted steel frames, 1 No. substation, 3 No. inverter cabins, underground cable ducts, a temporary site compound area and ancillary facilities, boundary security fencing, site landscaping, a site entrance and access track, CCTV and all associated site works located in the townland of Ballymorris	Ballymorris, Co. Clare	Granted, Conditional 30/10/2016
17411	Highfield Solar Limited	The development will consist of a 10 year permission for the construction of a Solar PV Energy development within a total site area of up to 9.4 hA, to include one single storey electrical substation building, electrical transformer/inverter station modules, solar PV ground mounted on steel support structures, access roads, fencing, CCTV, and associated electrical cabling, ducting and ancillary infrastructure	Ballymorris and Garryncurra, Cratloe	Granted, Conditional 22/05/2018
18818 ABP-304690-19 Third party Conditional 13/12/2019	Bobby O'Connell and Sons Ltd	for development which will consist of quarrying an area consisting of 10 hectares located adjacent to the existing working quarry including extraction of rock by blasting means down to 150mOD; Extracted rock will be processed at the existing working quarry; Landscaping of the quarry during the operational phase and restoration of the quarry on completion of extraction; All associated ancillary facilities / works; The applicant is seeking a 16 year permission as part of the application	Ballycar, Ardnacrusha	Granted, Conditional 23/05/2019
18995	Jim Bolton	for the restoration of 3.76 hectares of an extant sand and gravel quarry to agricultural grassland. The development is necessary to comply with condition no. 4 of substitute consent 03.SU.0127 and will include importation of inert material and all associated development works	Faheymore North, O'Briensbridge,	Granted, Conditional 07/02/2019
19194	Harmony Solar Knockanoura Limited	for development consisting of a ten year permission for a solar farm on a site of approximately 31.18 hectares consisting of the following; up to 92,550 sq. m of solar photo-voltaic panels on ground mounted steel frames; electrical substation with electrical control building and associated compound with palisade fence; inverter/transformer stations; underground power and communication cables and ducts; boundary security fencing; upgraded internal access tracks; new internal access tracks and associated drainage infrastructure; upgrade and use of the existing access to the local public road between Feenagh and Rathclooney, CCTV cameras and all associated site services and works.	Knockanoura & Cranagher, Spancil Hill,	Granted, Conditional 29/07/2019
19505	Ballynanty Rovers Athletic Football Club	to construct 1) Club House incorporating changing rooms and meeting room with Klargester biodisc sewage treatment plant and Ash Environmental Technologies with Wastewater Drip Distribution System in playing area; 2) Playing pitch with associated drainage works, alterations to the site levels; 3) A 30m x 45m Astroturf training pitch; 4) Car Parking to support playing pitches, site boundary fencing, provision of 2 no. vehicle entrances and all associated site works	Knockalisheen	Granted, Conditional 12/03/2020

Planning Ref.	Applicant	Description		Planning Authority Decision
20740	DTW Construction Ltd-Mr Tom Walsh	for the construction of a total of 70 Dwellinghouses (including 14 no. Detached 4 Bed houses, 4 No. split level 4 Bed houses, 12 No. Semi-Detached 4 Bed houses, 36 No. Semi-Detached 3 Bed houses, 4 No. Semi-Detached 2 Bed houses) and for new connections to public services including water & foul sewerage including pumping station, rising main and associated plant. PERMISSION is also sought for vehicular and pedestrian entrances, access roads, footpaths, landscaping works, parking areas, boundary treatments & all ancillary site works	Clonlara,	Granted, Conditional 19/08/2021
20562	Renewable Energy Systems Ltd (RES)	the development will consist of a planning permission for a period of 5 years to construct and complete a Solar PV Energy development with a total site area of 99.2 hectares, to include a single storey electrical substation building, electrical transformer and invertor station modules, solar PV panels ground mounted on support structures, internal access tracks, security fencing, electrical cabling and ducting, CCTV and other ancillary infrastructure, drainage, additional landscaping and habitat enhancement as required and associated site development works including works relating to the access to the site. The Solar farm will be operational for 35 years. A Natura Impact Statement has been prepared in respect of this planning application.	Manusmore, Clarecastle	Granted, Conditional 12/10/2020
ABP-308799-20	Coillte	Coillte applied for planning permission for the development of 19 wind turbines, one meteorological mast, 110kV substation and all associated site development works	Townlands of Ballydonaghan, Caherhurley, Coumnagun, Carrownagowan, Inchalughoge, Killokennedy, Kilbane, Coolready and Drummod, Co. Clare.	Granted, Conditional 29/09/2022
21915	Renewable Energy Systems Ltd (RES)	the development will consist of planning PERMISSION for a period of five years to construct and complete a Solar PV Energy development with a total site area of 16.08 hectares, to include inverter station modules, solar PV panels ground mounted on support structures, internal access tracks, watercourse crossing, security fencing, electrical cabling and ducting, CCTV and other ancillary infrastructure, drainage, additional landscaping and habitat enhancement as required and associated site development works including works relating to the access to the site. The solar farm would be operational for 35 years. A Natura Impact Statement has been prepared in respect of this planning application	Manusmore and Carrownanelly , Clarecastle, Ennis	Granted, Conditional 21/10/2021
22254	Seamus Madden	or a revised site boundary and revised position of a single 800kW wind turbine, 73 metres to hub height as granted under P10/453 and P15/812	Gortatogher, Parteen, Co Clare	Granted, Conditional 29/09/2022
22459	Ahaclare Development Ltd	for development at this site, Sixmilebridge TD, Sixmilebridge, Co Clare. The development will consist of the construction of a residential development consisting of 60 no. dwelling houses(14 detached, 46 semi-detached), inner relief road including realignment of existing access road to Ashview Drive and new site access on Rossmanagher Road, connection to	Sixmilebridge Td Sixmilebridge Co Clare	Granted, Conditional 17/01/2023

Planning Ref.	Applicant	Description		Planning Authority Decision
		public utilities together with ancillary site development works. A Natura Impact assessment (NIS) has been submitted with this application		
22591	Reeve Wave Ltd	for a 10 year planning permission for a solar array at Ballyglass, Coolderry, Dromintobin North, Reanabrone, and Oakfield (townlands) Ardnacrusha, Co Clare. The development will consist of c265,000 m2 of solar panels on ground mounted frames, 8 no. single storey control cabins with associated electrical transformer units and hardstand areas, 2 no. ring main units, underground cabling within the solar array site and within the L70382 public road to connect solar array field parcels, security fencing, CCTV, access tracks (upgrade of existing and new), upgrades to four existing agricultural field entrances on the R463, l3046 and L70382 and creation of new entrance on L70382, temporary construction compound, landscaping and all associated ancillary apparatus and development works. The solar array will connect to the national grid and will have an operational lifespan of 35 year	Ballyglass, Coolderry, Dromintobin North, Reanabrone, and Oakfield (townlands,), Ardnacrusha	Granted, Conditional 17/02/2023 Currently at Third Party appeal Ref- ABP 316043-23
22586	Renewable Energy Systems Ltd (RES)	for development at this site in the townlands of Ballyvonnavaum TD, Coolshamroge TD, Cloonmore TD, Deerpark TD, and Manusmore TD, Ennis, Co Clare. The development will consist of planning permission for a period of 10 years to construct and complete a Solar PV Energy development with a total site area of 27.34 hectares, to include inverter station modules, solar PV panels ground mounted on support structures, internal access tracks, security fencing, electrical cabling and ducting, CCTV and other ancillary infrastructure, drainage, additional landscaping and habitat enhancement as required and associated site development works including works relating to the access to the site. The solar farm would be operational for 35 years. A Natura Impact Statement has been prepared in respect to the application for planning permission	Ballyvonnavaum TD, Coolshamroge TD, Cloonmore TD, Deerpark TD, , and Manusmore TD, Ennis,	Granted, Conditional 09/03/2023
221095	Irish Water	for development at Newmarket-on-Fergus Wastewater Treatment Plant in the townland of Boheraroan, Newmarket-on-Fergus, Co. Clare and an associated rising main traversing the townlands of Ballyconneely, Ballynacragga, Boheraroan, Dromoland, Latoon North, Latoon South, Manusmore, Newmarket and Rathfolan, County Clare. The development will compromise proposed works within the existing Newmarket-on-Fergus Wastewater Treatment Plant, including: a. 1 No. 7.8m high storm storage tank with minimum storage capacity of 516m3, measuring approximately 11m diameter. All ancillary works site development works including site preparation works, hardstanding, site clearance, ground levelling and site drainage as required to facilitate the development. This application is accompanied by a Natura Impact Statement (NIS).	Boheraroan, Newmarket on Fergus	Granted Conditional, 12/10/2023 Currently at third Party Appeal, Ref ABP- 318408-23
23148	RWE Renewables Ireland Limited	for development of a wind farm in the townlands of Fahy Beg, Fahy More North, Ballymoloney, Ballyknavin (Ed O'Briensbridge), Balllyquin More, Woodpark and Leitrim, Co Clare together with the development of an underground grid connection cable to the national grid. The underground grid connection is located primarily within the public road within the townlands of Leitrim, Fahy More South, Ballybrack, Aharinaghmore, Tooreen (Ed Cloghera) Aharinaghbeg, Knockdonagh, Roo East, Blackwater, Rosmadda West, Parkroe, Lackyle (Ed Ballyglass) and Castlebank, Co Clare. Temporary accommodation works to	Fahy Beg, Fahy More North, Ballymoloney, Ballyknavin, (Ed O'Briensbridge), Ballyquin More, , Woodpark, Leitrim, Fahy More South, Ballybrack, Aharinaghmore, Tooreen , (Ed Cloghera), Aharinaghbeg,	Refused 03/05/2023 Currently at First Party Appeal, Ref ABP- 317227-23

Planning Ref.	Applicant	Description		Planning Authority Decision
		facilitate the delivery of wind turbine components to the site will be required in the townland of Ardataggle, Co Clare. The development will consist of: Construction of 8 no. wind turbines with a blade tip height range from 169m to 176.5m, a hub height range from 102.5m to 110m and a rotor diameter range from 131m to 138m; Erection of 1 no. permanent meteorological mast to a height of 100m above ground level; Construction of 1 no. onsite 38kV electrical substation to ESB Networks (ESBN) specifications and associated compound including Welfare facilities, Electrical infrastructure, Parking, Wastewater holding tank, Rainwater harvesting tank, Security fencing and all associated infrastructure, services and site works including landscaping in the townland of Woodpark; Installation of medium voltage electrical and communication cabling underground between the proposed turbines and the proposed on-site substation and associated ancillary works; All associated drainage and sediment control; Installation of medium voltage (38kV) electrical cabling and communication cabling underground along the public road within the townlands of Leitrim, Fahy More South, Ballybrack, Aharinaghmore, Tooreen (Ed Cloghera), Aharinaghbeg, Knockdonagh, Roo East, Blackwater, Rosmadda West, Parkroe, Lackyle (Ed Ballyglass) and Castlebank between the proposed on-site substation within the townland of Woodpark and the existing Ardnacrusha substation within the townland of Castlebank, and associated ancillary works. the application	Knockdonagh, Roo East, Blackwater, Rosmadda West, Parkroe, Lackyle, (Ed Ballyglass) Castlebank and Ardataggle, Co. Clare	
2360249	Harmony Solar Clare Ltd.	A solar farm on a site of 70 hectares consisting of the following: 309,008 sq. m. of solar photovoltaic panels on ground mounted steel frames; a 38 kV electrical substation with electrical control building and associated compound with palisade fence; the installation of 21 electrical skids within 7 no. electrical compounds (with acoustic barrier fencing); underground power and communication cables and ducts, including underground cabling along the L3056 public road; new and upgraded internal access tracks (including stream crossings as required); 3 no. upgraded site entrances to the public road (one entrance to L-3054 (Lackyle Heights), and 2 no. entrances to L-30541); boundary fencing (including 607m of acoustic barrier fencing on the eastern boundary); landscaping and biodiversity enhancement measures; and all associated ancillary development, site works and services. The solar farm will be operational for 40 years. A Natura Impact Statement (NIS) has been prepared in respect of the proposed development and will be submitted to the planning authority with the application.	Land to the west/north-west of Ardnacrusha within the townlands of Castlebank, Drummin,, Glenlon North, Glenlon South and Ballykeelaun, Co Clare	Granted conditional 06/09/2023
ABP- 318505-23	Futurenergy Carrownagowan DAC	Proposed construction of a 110kV underground grid connection cable connecting the permitted Carrownagowan windfarm to the existing 110kV substation at Ardnacrusha.	Caherhurly, Killokennedy. Cloongaheen West, Leitrim, Castlebank, Ballykeelaun	New application

2.3.21.1 Other Wind Farm Developments

The potential cumulative impact of the proposed development has been assessed in accordance with Annex IV of the EIA Directive as amended which provides that the EIAR must contain a description of the likely significant effects of the project on the environment resulting from the cumulation of effects with other existing and/or approved projects, taking into account any existing environmental problems relating to areas of particular environmental importance likely to be affected or the use of natural resources.

The proposed development would positively cumulate with other wind farm developments in the region to advance in delivering local, regional, and national Green Energy targets. Wind turbines identified within 25km of the proposed Ballycar development are listed below and illustrated in Figure 2-16.

- Limerick Blow Moulding, Parteen (single turbine) (existing) (permission for retention and changing of position granted);
- Vistakon (single turbine) (existing);
- Castlewaller (Permitted but not constructed);
- Carrownagowan Wind Farm (Permitted, under Judicial Review);
- Carrownagowan Wind Farm Grid Connection (Submitted); and
- Fahy Beg (Refused, Appealed to An Bord Pleanála).

The potential for cumulative effects are considered in the relevant chapters of this EIAR.

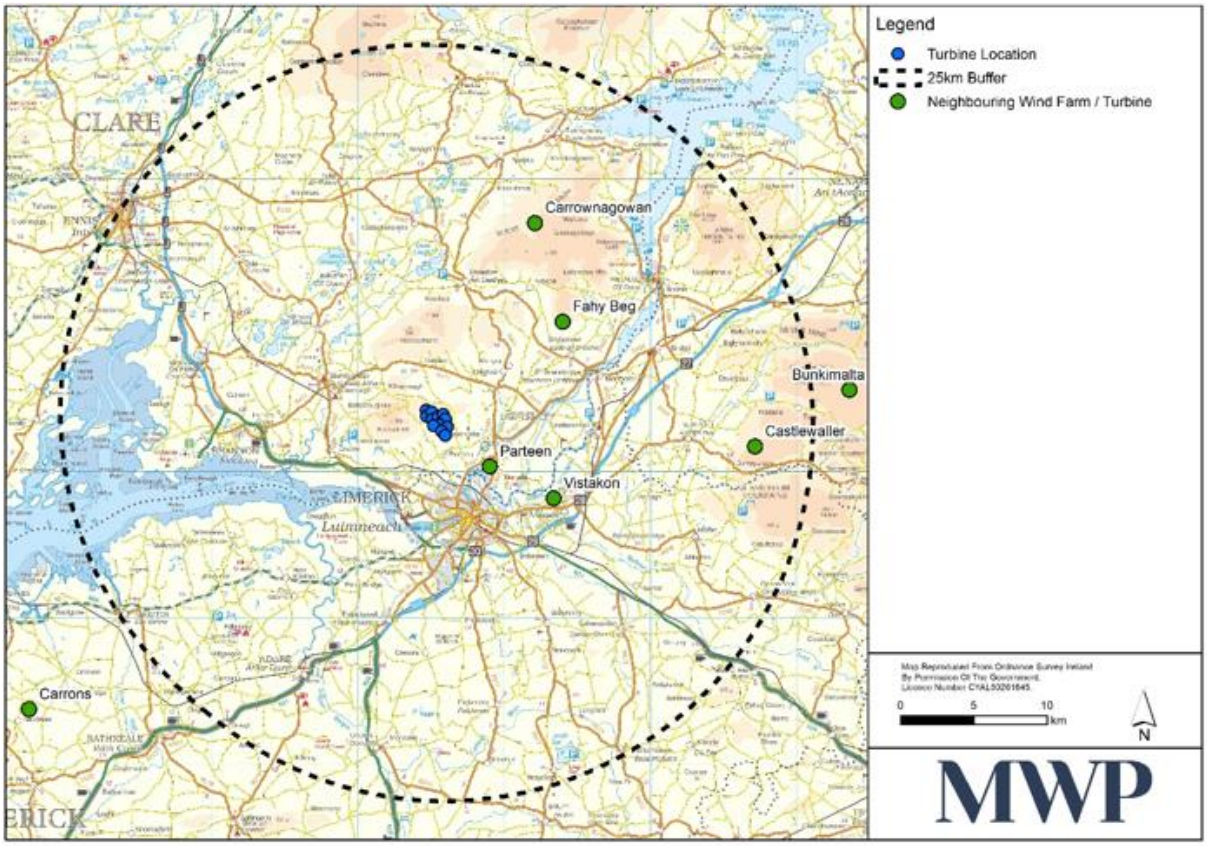

Figure 2-16: Wind Farm developments within 25km of proposed development

2.3.21.2 Solar Farm Developments

The nearest proposed solar farms to the proposed development are listed as follows:

- Drummin Solar Farm – 70 hectares of 309,008 m^2 of solar photovoltaic panels, a 38 kV electrical substation and other ancillary works (Permitted by Clare County Council but not yet constructed); and
- Ballyglass Solar Farm – c. 265,000 m^2 of solar panels on ground mounted frames and other ancillary works (Permitted by Clare County Council, Appealed to An Bord Pleanála).

Drummin Solar farm is located approximately 2km east of the proposed development while Ballyglass is located approximately 4km east. The potential for cumulative effects are considered in the relevant chapters of this EIAR.

2.4 Description of Construction

2.4.1 The construction phase land use requirement

Land use requirements during the construction phase will be greater than that of the permanent land take area. The temporary land take required during the construction phase is set out below.

Table 2-3: Land Use Requirements

Item	Area
Construction compound	5,000m² Site Compound No. 1 only
Wind Turbine Construction	36,000m² (3,000m² per hardstand) WTG construction requires temporary workspaces during the erection of the different turbine components. These workspaces include storage areas for the turbine blades and temporary areas for the assembly of the auxiliary cranes and parking.

2.4.2 Proposed Works

Construction works will be carried out in a phased manner in order to minimise disruption to the local community, minimise environmental impact and enusre the safest working conditions possible. A comprehensive description of activities is outlined in Chapter 3 Civil Engineering. The construction of the proposed development will principally comprise of the following works:

- Felling of any areas of coniferous forestry plantation necessary to facilitate construction works;
- Construction of site entrances and any sections of internal access tracks necessary to facilitate access to the temporary construction compound and proposed on-site borrow pit location;
- Construction of temporary construction compound including fencing (for security and ecology, water and archaeological exclusion zones), site offices, parking, material laydown and storage areas, etc;
- Establishment of the on-site borrow pit and temporary storage of stockpiled overburden and surplus excavated materials within the material storage areas;
- Earthworks and drainage infrastructure associated with construction of new and upgraded internal access tracks, crane hardstand, turbine foundations and substation compound;
- Construction of upgraded and new watercourse crossings for construction of internal access tracks and underground cables;
- Excavation of turbine bases and permanent met mast foundations, and associated turbine hardstand areas;
- Installation of sections of underground cabling between turbines;
- Installation of sections of underground cabling to selected connection point option;
- Construction of the substation compound;
- Turbine delivery, installation, and commissioning; and
- Meteorological mast delivery, installation, and commissioning.

2.4.3 Construction Methods

Details on the construction methods are fully set out in EIAR Chapter 3 Civil Engineering and in Volume III Appendix 2A CEMP. Table 2-4 provides a summary of the types of proposed construction techniques for the various elements of the project.

Table 2-4: Proposed Construction Techniques

Element	Construction Technique
Wind turbine foundations and hardstands	Wind turbine locations will be cleared, graded, and foundations will be either excavated or piled by rotary core technique. Blasting may be required at wind turbine locations where bedrock is present near the ground surface. An engineered concrete foundation will be installed in the excavated/piled structure location. Backfill will be provided, and grading will be performed in a manner to allow for immediate drainage away from each tower. Construction activities include tree removal, vegetation clearing, topsoil stripping, excavation and or piling, grading, foundation construction, final grading and landscaping of temporary works areas.
Permanent Meteorological Mast	Construction includes tree removal, topsoil stripping, excavation, grading, foundation construction, final grading, and landscaping of temporary works area.
Site Access	Sightline improvements of the existing site access junction will be required. Construction activities include vegetation clearing, topsoil and/subsoil stripping, aggregate placement and grading, and landscaping of temporary works areas.
Internal access tracks	Upgrading, widening and new excavated tracks: Construction activities will include vegetation clearing, topsoil stripping, excavation, placement of geogrid/ geotextile layer and aggregate, compaction, grading, berm placement and landscaping.
	Floating Tracks: Construction activities will include removal of major protrusions, placement of geogrid/ geotextile layer and aggregate, compaction, grading, berm placement and landscaping.
Internal underground site electrical cables	To the extent possible, underground electrical collector cables will be co-located with access tracks in order to minimise the area of construction disturbance. Underground cable installation construction activities include topsoil stripping, trenching, installing electrical cables, and revegetation of disturbed areas unless the cables are under the tracks.
Substation Compound	Construction includes tree removal, topsoil stripping, excavation, grading, foundation construction, building construction.
Temporary Local widening and Construction compound	Construction includes topsoil stripping, excavation, grading, aggregate placement, compaction, and landscaping.
Borrow pit	Construction includes tree removal, topsoil stripping, excavation and/or blasting.
Water crossings	No in-stream works. Existing crossings: widening using pre-cast piping. New crossings: Clear span crossings.
Connection cable to grid connection point (other than at water crossings)	Construction activities include excavation, trenching, backfilling, resurfacing.

2.4.4 Duration and Timing

It is envisaged that construction of the proposed development will commence in 2026 with an 18 month construction period. The start date is dependent on planning being granted, receipt of a grid connection offer from EirGrid, funding and all permits being in place.

A typical programme of work is outlined in Table 2-5 below. A number of these phases will however run concurrently as outlined as follows.

- As the internal site access tracks are constructed up to each turbine, hardstanding areas for the crane, turbine foundations and building foundations will be prepared.
- Once the tracks are completed, the trenching and laying of underground cables will begin.
- Construction of the site sub-station and control houses will commence so that they will be ready to export power as turbines are commissioned.

Table 2-5: Preliminary Construction Programme

Phase	Activity	Duration
Phase 1	Clearfelling (to be complete ahead of construction site mobilisation)	2 months (prior to construction)
Phase 2	Prepare site, pre-construction activities, site entrance, temporary compound	1 month
Phase 3	Access track construction + Drainage plan implementation	3 months
Phase 4	Hard standing construction for turbines	2 months
Phase 5	Turbine Foundation construction	4 months
Phase 6	Trenching and ducting (underground electrical collection system)	2 months
Phase 7	Substation construction	4 months
Phase 8	Permanent meteorological mast erection	1 month
Phase 9	Turbine delivery	3 months
Phase 10	Turbine erection	4 months
Phase 11	Wind Farm Commissioning	4 months (approx.)

2.4.5 Major temporary features

Temporary features on site include the compound facilities, plant, and equipment along with safety fencing and building materials. Large excavators and turbine erection cranes are also a temporary feature on site during the construction phase. There will be some temporary stockpiling of soils on site. Any surplus material will be placed within the material deposition areas.

2.4.6 List of Plant

Mechanical machinery and electrical equipment typically used for construction projects will be required to facilitate the proposed development. The following is a non-exhaustive list of plant that is typically used for wind farm and heavy civil engineering work:

- 30-50T Excavators;
- 15-30T Excavator;
- Rubber Tired 15-20T Excavator;

- 3-10T Mini Diggers;
- Mobile Crane for construction;
- Rebar/shuttering/precast units/conc. pipes/box culverts etc 60t to 120t;
- Cranes (1 main, 1 assist) Erection 120t to 1000t;
- Telescopic Handler;
- Tractors and trailers;
- Road grader;
- Double contained fuel bowsers;
- 12T Rollers;
- Diesel powered generators; and
- Water bowsers.

2.4.7 Construction Working Hours

Typically, construction will occur within the hours 7.00am – 7.00pm, Monday to Friday and 7.00am to 2.00pm on Saturdays, which will be confirmed with the Local Authority. Due to the requirement for the concrete pours to be continuous, the working day may extend outside normal working hours in order to limit the traffic impact on other road users, particularly peak period school and work commuter traffic. Such activities are limited to the day of turbine foundation concrete pours, which are normally complete in a single day per turbine. Turbine and crane erections may also occasionally occur outside of these times in order to take advantage of low wind periods. Working hours will be confirmed at the outset of the project and any changes in hours will be agreed with the Local Authority.

Works along public roads will be from 9.00 a.m. to 5.00 p.m. Monday to Friday and 9.00 a.m. to 2.00 p.m. on Saturdays. A permit for moving abnormal loads will be sought from An Garda Síochána for the delivery of oversized wind turbine components (i.e. blades, nacelles and towers).

No work on Sunday or bank holidays unless preapproved with the Local Authority.

2.4.8 Construction Personnel

During the construction phase, the number of on-site construction personnel will vary for each phase of the development. Overall, it is envisaged that the proposed development would generate employment for up to 60 persons during the construction phase to include site contractors, on-site vehicle and plant operators, engineers, materials delivery personnel, environmental personnel, health and safety personnel.

It is expected that the civil works for the grid connection route will require at least 10 personnel to complete the works. The electrical works will require less heavy machinery but more labour personnel, with typically 25 personnel to complete the works.

2.4.9 Construction Environmental Management Plan (CEMP)

A Construction and Environmental Management Plan (CEMP) has been prepared and will be updated through preconstruction and construction and will be implemented on site. The CEMP will be a key construction contract document, which will ensure that all mitigation measures, which are considered necessary to protect the environment, prior to construction, during construction and during operation of the proposed development, are

implemented. The CEMP will collate and manage the proposed and agreed mitigation measures, monitoring and follow-up arrangements and management of environmental impacts. The environmental commitments of the project will be managed through the CEMP and will be secured in contract documentation and arrangements for construction and later development stages. The CEMP will mainly address the construction phase however, where monitoring is to continue into the operational phase these commitments will be communicated and transcribed into operational process documentation. The CEMP is included in Appendix 2A of Volume III.

2.5 Description of Commissioning

Wind farm commissioning can take approximately two to four months to complete from the erection of the final turbine to exporting of power. It involves commissioning engineers working through an entire schedule of SCADA (Supervisory Control and Data Acquisition) and electrical testing and control measures to ensure the wind farm will perform and export power to the NEG as designed.

2.6 Description of Operation

2.6.1 Land Use Requirement

The permanent land take will be limited to the wind turbine hardstands, access tracks, permanent crane hardstand areas, visitor compound area, control building and substation hardstandings which account collectively for approximately 31% (32.5ha approximately) of the total area within the wind farm planning boundary.

2.6.2 Operating Hours and Operational Conditions

The proposed development is expected to have a lifespan of circa 35 years. The proposed development is designed to operate when wind speeds at the hub height are within the operating range of the wind turbines. Most turbine models have a cut in wind speed of 3m/s with optimum generation at approximately 12.5m/s. The turbines are expected to have a cut out wind speed of 25m/s.

Each wind turbine will be computerised to control critical functions, monitor wind conditions and report data back to a SCADA system. An anemometer mounted on the top of the wind turbine nacelle provides wind speed information used to automatically set blade pitch and control the wind turbine. A wind vane mounted on top of the nacelle provides information needed to yaw the wind turbine into the wind. The SCADA system monitors problems and diagnoses failures. If a problem causes a wind turbine to shut down, the wind turbine will either be restarted by the SCADA system operator, or service personnel will perform the necessary repairs and then manually restart the wind turbines.

In addition, the wind turbine can also be controlled manually at the nacelle, from a panel inside the base of the tower, or from a remote computer via the SCADA system. Using the tower top control panel, the wind turbine can be stopped, started, and turned out of the wind.

Turbines can be programmed to shut down during periods when shadow flicker is predicted to occur. Shadow flicker control modules will be installed on the appropriate turbines which can be programmed to shut down to eliminate the occurrence of shadow flicker at any particular dwelling. Turbines will be fitted with shadow flicker control modules to ensure that the proposed wind farm will comply with existing guideline thresholds and also eliminate flicker at receptors. This is detailed in EIAR Chapter 11, Shadow Flicker.

2.6.2.1 Turbine Maintenance

During the operation of the wind farm, the turbine manufacturer, the Developer or a service company will carry out regular maintenance of the turbines. During the life of the project, it is envisaged that at least two permanent jobs will be created locally in the form of an operator or maintenance personnel. In addition, operation and monitoring activities may be carried out remotely with the aid of computers connected via a broadband link. However, routine inspection and preventive maintenance visits will be necessary to ensure the smooth and efficient running of the wind farm and require a minimal presence.

2.6.2.2 Grid Maintenance

It is unlikely that the underground cable will require much maintenance during its operation, however in the event a fault does occur, inspection of the fault will be carried out to determine what works to the ducting may be required.

2.7 Decommissioning and Restoration Phase of the Proposed Development

2.7.1 Wind Farm

At the end of the estimated 35 year lifespan of the proposed development, a decision will be made whether to repower or decommission the turbines. Any further proposals for development at the site during or after this time will be subject to a new planning permission application. If planning permission is not sought after the end of life of the turbines, the site will be decommissioned and reinstated with all 12 No. wind turbines and towers removed. Removal of infrastructure will be undertaken in line with landowner and regulatory requirements and best practice applicable at the time. The information below outlines the likely decommissioning tasks based on current requirements and best practice.

Prior to the decommissioning work, the following will be provided to Clare County Council for approval:

- A plan outlining measures to ensure the safety of the public workforce and the use of best available techniques at the time;
- A comprehensive reinstatement proposal, including the implementation of a program that details the removal of all structures and landscaping.

If the site is to be decommissioned, cranes of similar size to those used for construction will disassemble each turbine. The towers, blades and all components will then be removed.

Wastes generated during the decommissioning phase will be taken off site, and disposed of at an authorised waste facility. Any materials suitable for recycling will be disposed of in an appropriate manner.

At present it is anticipated that underground cables connecting the turbines to the substation will be cut back and left underground. The cables will not be removed if an environmental assessment of the decommissioning operation demonstrates that this would do more harm than leaving them *in situ*. The assessment will be carried out closer to the time to take into account environmental changes over the project life.

Hardstand and turbine foundation areas will be left in situ and covered with soil to match the existing landscape. Access tracks will be left for use by the landowners.

2.7.2 Grid Connection

The grid connection cable will remain a permanent part of the national grid and therefore decommissioning is not foreseen. In the event of decommissioning, it will involve removing the cable from the ducting but leaving the ducting and associated supporting structure in place. It is also likely the substation will remain in place and will previously have been taken in charge by the system operator, after the wind farm is connected to the national electricity grid.

2.8 The Use of Natural Resources

2.8.1 Aggregate

Large amounts of aggregates, concrete, and steel will be used during construction. The majority of aggregate materials (circa 62%) required for the construction of the tracks, hardstands and the substation compound will come from aggregate (rock, stone, gravel, sand) extracted from the proposed on-site borrow pit. Material to be delivered to site will mainly consist of higher grade materials not available to be won on site, limestone capping material for access tracks and hardstands, and concrete for the construction of the 12 No. turbine bases, permanent met mast foundation and substation infrastructure.

Table 2-6: Summary of Approximate Aggregate and Steel Quantities

Item	Unit	Quantity
Total Volume of stone required (including site won and imported)	m3	265,150
Volume of stone to be won onsite from borrow pit	m3	165,000
Imported stone for turbine bases and crane hardstands	m3	4,700
Imported stone for tracks	m3	11,000
Imported stone for substation compound	m3	70,000
Imported stone for construction compound	m3	900
Imported stone for met mast	m3	350
Imported stone for temporary works on turbine delivery route	m3	6,500
Imported stone for cable route to OHL	m3	1,200
Imported stone for internal WF cables	m3	5,500
Total volume of imported stone required	**m3**	**100,150**
Imported Concrete and Steel Reinforcement		
Concrete for bases (12 @ 900 m3 each)	m3	10,800
Concrete for substation and met mast foundations	m3	250
Concrete for cable route	m3	6,700
Reinforced steel for turbine bases (12 @ 100 tonnes each)	tonnes	1,200

There are three quarry facilities in the area which are capable of supplying these construction materials, McGraths quarry in Tulla, O'Connell Quarries in Ballycar, Ardnacrusha and Roadstone in Bunratty. The Traffic Management Plan is available in Appendix 2D, Volume III.

2.8.2 Water

Water needs for construction activities will be limited to concrete truck chute washing, wheel wash, dust suppression and sanitary facilities. This water requirement will be sourced from on-site rainwater collection systems and settlement ponds.

It is estimated that up to approximately 3,000 litres per day of potable water will be required during peak construction for employees. It is proposed that this potable water requirement will be imported in bulk water tanks.

Potable water for the operational and maintenance phase is estimated to be approximately 50 litres per day. This water will be supplied as bottled water.

2.9 The Production of Waste

2.9.1 Excavated soils, subsoil, and rock

It has been calculated that there will be approximately 418,300m³ of material excavated during the construction of the proposed development. It is intended that all soils and subsoils generated from excavation works will be retained on site and reused in bunding, landscaping and localised earthworks. Excess spoil material will be stored on site in the designated deposition areas.

2.9.2 Domestic Waste-Water Effluent

Wastewater from welfare facilities on site will drain to integrated wastewater holding tanks associated with the toilet units. The stored effluent will then be collected on a regular basis from site by a permitted waste contractor and removed to a licensed/permitted waste facility for treatment and disposal. Table 2-7 outlines some known waste facilities which are approved to accept this waste stream and may be utilised.

During the construction time period, wastewater production is estimated to be 3,000 litres per day.

Although primarily controlled remotely, during the operational phase, maintenance personnel will visit the substation building on a regular basis. The daily average wastewater production during the operational phase is estimated from the average number of workers on site, which is expected to be 2 workers, resulting in a typical wastewater production rate of 100 litres per day. The wastewater generated during the operational phase will be managed by a holding tank which is of twin-hull design and fitted with an alarm to indicate levels and when it is due for empty. The holding tank will be emptied by a permitted contractor only.

2.9.3 General Wastes

Construction phase waste may consist of hardcore, concrete, spare steel reinforcement, shuttering timber and unused oil, diesel and building materials. This waste will be stored in the construction compound and collected at the end of the construction phase and taken off site to be reused, recycled and disposed of in accordance with best practice procedures at an approved facility. Plastic waste will be taken for recycling by an approved contractor and disposed or recycled at an approved facility. Domestic type waste generated by contractors will be collected on site, stored in an enclosed skip at the construction compound and disposed of at a licensed landfill facility.

The power generation aspect of the proposed development would not produce any waste emissions or pollutants. The general operation and maintenance of the proposed development has the potential to produce a minimal amount of waste. Wastes arising during the operation phase of the project include but are not limited to lubricating oils, cooling oils, and packaging from spare parts.

The containment and disposal of such oils will be carried out by an approved contractor. Such operations will be carried out in accordance with the Waste Management (Hazardous Waste) Regulations, 1998. The remaining wastes will all be removed from site and reused, recycled, or disposed of in an authorised facility in accordance with best practice.

Table 2-7: Sample of Authorised Waste Facilities

	EWC code	Facility	Location
Soils	17 03 02	Clare Waste & Recycling Co. Ltd	Raheen, Tuamgraney, Co. Clare. V94 WY67.
Domestic Wastewater	20 03 04	Clare Drains Environmental Ltd (Destination: Bunlicky WWTP)	Clare Drains Environmental, Unit 10 Abbey Business Park, Quin Road, Ennis, Co. Clare.
C & D Waste	17 01 07	Clare Waste & Recycling Co. Ltd	Raheen, Tuamgraney, Co. Clare. V94 WY67.
Waste Oils	13 02 08	Enva Ireland Ltd	Smithstown Industrial Estate, Shannon Co. Clare, V14 FT53,
Domestic Waste	20 03 01	Clare Waste & Recycling Co. Ltd	Raheen, Tuamgraney, Co. Clare. V94 WY67.
Oil Interceptors	13 05 01 13 05 02 13 05 03 13 05 06 13 05 08	Enva Ireland Ltd	Smithstown Industrial Estate, Shannon, Co. Clare. V14 FT53.

2.10 Emissions and Disturbances

The anticipated residues and emissions likely to be generated during the project lifetime are summarised in **Table 2-8** below. These environmental effects have been identified, assessed and proposals for management of the anticipated disturbances and/or emissions are presented throughout relevant chapters of this **EIAR**.

Table 2-8: Emissions and Nuisances

	Aspect	Potential Emission/Disturbance	Assessment Provided
Construction /Decomissioning	Air	The main emissions to atmosphere during the construction stage of the project is from fugitive dust associated with the following activities: • Groundworks associated with the construction of the project infrastructure; • Transportation and unloading of crushed stone around the site; • Vehicular movement over potentially hard dusty surfaces such as freshly excavated and constructed access tracks and crane hardstanding areas;	**EIAR Vol II Chapter 14 Air and Climate**

	Aspect	Potential Emission/Disturbance	Assessment Provided
		• Vehicular movement over material potentially carried off site and deposited on public roads. The movement of machinery, construction vehicles and the use of generators during the construction phase will also generate exhaust fumes containing predominantly carbon dioxide (CO_2), sulphur dioxide (SO_2), nitrogen oxides (NO_x), carbon monoxide (CO), and particulate matter (PM_{10}).	
	Noise	Traffic flows, excavation/blasting, mechanical machinery and electrical equipment typically used for construction projects would generate noise emissions.	**EIAR Vol II Chapter 10 Noise**
	Water	Surface water runoff and discharges from construction working areas are likely during construction, although the quantity of surface runoff would not change overall as a result of the construction work. Occasional and low quantity discharges could arise from pumping in order to dewater foundation excavations. This would be discharged to the water management drainage system. Pollution sources could arise as a result of soil erosion or from oil/ fuel or chemical storage and use. Proposals for management of water quality and quantity from the proposed development are presented in **EIAR Volume III: Appendix 2A: CEMP.**	**EIAR Vol II Chapter 8 Water**
	Traffic	The additional traffic, especially heavy goods vehicles associated with the construction phase, has the potential to cause disturbance to those using the local road networks.	**EIAR Vol II Chapter 5 Population and Human Health, EIAR Vol III Appendix 15C**
Operational	Air	Due to the nature of the project no significant point source or diffuse air emissions will be produced during its operation.	**EIAR Vol II Chapter 14 Air and Climate**
	Noise	Potential noise disturbance from operational turbines and a proposed new 110kV on-site substation. Any perceived noise disturbance will be in compliance with limits.	**EIAR Vol II Chapter 10 Noise**
	Water	No water emissions or pollution sources have been identified for the operational phase.	**EIAR Vol II Chapter 8 Water**
	Shadow Flicker	In certain conditions, the movement of wind turbine blades could give rise to shadow flicker disturbance at nearby residential receptors. Any perceived shadow flicker disturbance at receptors will be eliminated through the installation of control modules.	**EIAR Vol II Chapter 11 Shadow Flicker**

2.11 Environmental Protection Measures

The design was primarily influenced by *mitigation by avoidance*. Buffers and set back distances are the principal tool used by the Malachy Walsh and Partners designers when incorporating mitigation by design and avoidance. This methodology has been applied successfully nationally and internationally by the design team. This can only be done when all the environmental sensitivities have been established across the project area. Buffers and set back distances have been derived from guidance documents, stakeholder input, studies and project experience. The buffers and set back distances applied in this instance are outlined in **Chapter 4 Alternatives**.

The key to avoiding environmental impacts during the works is down to design mitigation, good site management practices, tight controls, regular inspections and ongoing vigilance with staff and employees on site. The **Construction and Environmental Management Plan (CEMP)**, (refer to **Appendix 2A** of the **EIAR**) details the environmental protection measures that will be implemented during the construction phase, with measures required during the operational phase also incorporated.

2.11.1 Surface Water Management System

A site drainage system will be constructed on the site so as to attenuate run-off, guard against soil erosion and safeguard downstream water quality. The measures are outlined in Chapter 3 Civil Engineering and in the Surface Water Management Plan (Volume III, Appendix 2B).

2.11.2 Site Management Controls

Drainage within the temporary site compound will be directed to an oil interceptor to prevent pollution if any spillages occur. There will be no domestic wastewater discharges to the environment. Temporary toilet facilities will include an integrated wastewater holding tank and will be emptied routinely by a licenced waste contractor. A bunded containment area will be provided within the compound for the storage of fuels, lubricants, oils etc.

The compound will be in place for the duration of the construction phase and will be removed once commissioning is complete.

2.12 Transboundary Effects

The location of the project is entirely in County Clare within the Republic of Ireland. Transboundary impacts relate to potential impacts on other Member States, i.e. outside of the Republic of Ireland.

Considering the nature of the project, the largely localised nature of potential impacts and the distance from neighbouring member states, it is considered that any potential for impacts on transboundary receptors would not arise. Following on from the assessments carried out as part of the EIAR studies, it is concluded that the project is unlikely to result in significant transboundary impacts.

2.13 Risk of Major Accidents and Disasters

It is considered that there is no risk for the project to cause major accidents and/or disasters or vulnerability of the project to potential disasters/accidents, including the risk to the project of both natural disasters and man-made disasters for the following reasons:

2.13.1 Construction Issues

As in all construction activities, there is a wide range of potential risks of accidents and hazards associated with wind farm construction. While many risks are similar in nature to those for other industries, wind farm construction works take place in exposed windy locations and involve transport of heavy equipment, heavy cranage and specialised electrical installation.

2.13.1.1 Health and Safety

All work on site will be carried out in compliance with all relevant Legislation and Work Practices including the below, to ensure that the construction areas, site environs and public roads remain safe for all users. This legislation includes:

- Safety, Health & Welfare at Work (Construction) Regulations 2013;
- Safety, Health & Welfare at Work Act 2005;
- Safety, Health & Welfare at Work (General Applications) Regulations 2007 to 2020; and
- Irish Wind Energy Association Best Practice Guidelines.

The Construction and Environmental Management Plan (CEMP), (refer to Appendix 2A of the EIAR) outlines the safety procedures that will be implemented during the construction phase. The effective implementation of the CEMP will help to reduce the risks associated with the construction phase of the proposed development.

2.13.1.2 Landslide

A scoping exercise was carried out to determine whether a detailed Peat Landslide Hazard and Risk Assessment was required for this site. This scoping exercise reviewed whether peat was present onsite. No peat was mapped on the GSI maps for the site. During a site walkover a small area of peaty type soil was noted in the north-western corner of the site. The extents of the area was mapped and peat probes were carried out. When designing the layout for the wind farm, this area was completely avoided. As no infrastructure is proposed within this area of the site, it was not deemed necessary to carry out a Peat Stability Risk Assessment for this site.

Overall, there is no risk of instability of the site, access tracks, turbine bases, or grid connection from peat.

2.13.2 Operational Issues

2.13.2.1 Fire/ Fuels

The presence of electrical generating equipment and electrical cables along with the storage and use of various oils (diesel fuels, lubricating oils, hydraulic fluids) can create the potential for fire and/or ground contamination. This potential exists within the turbine tower, nacelle, substation, electrical transmission structures and operations maintenance buildings. Modern wind farm design will minimise the use of combustible materials. Lightning and surge protection will cover the nacelle and rotor blades, as well as electrical equipment, including cables. Each element of equipment has strict and exact operational protocols that provide for the elimination of risk. The protocols set out the flammability or chemical properties of each of the oils, lubricants and fuels that may be used within equipment on site. The proposed development will be operated to the specifications of the chosen turbines and in accordance with all electrical standard operating procedures.

2.13.2.2 Lightning Strikes

A lightning strike could cause a fire or could cause severe damage to blades which may lead to blade failure. To protect wind turbines from damage caused by a lightning strike and to provide grounding, each turbine will be equipped with an electrical grounding system.

2.13.2.3 Turbine Structural Failure

Turbine structural failure includes tower collapse, blade failure or separation. Risk may arise due to stress, wear and tear.

Rigorous safety checks are conducted on the turbines during operation to ensure the risks posed to staff, landowners and general public are negligible. These checks are specified particular to the turbine model for the project. The separation distances of turbines from public roads and residences are well beyond fall over distances that would present a risk of significant accidents.

2.14 Impact of Climate Change

2.14.1 Severe Weather

There is potential for the Proposed Development to be impacted by severe weather including increased wind and storms due to climate change. However, wind turbines are designed to withstand extreme weather conditions with brake mechanisms installed within the turbines so that they only operate under specific wind speeds and will shut-down during high wind speed events. Therefore, there is very low risk to the proposed development from high wind speeds.

2.14.2 Flooding

Flood risk is considered in EIAR Chapter 8 Water to determine whether the site is at risk from extreme fluvial flooding events. This assessment concluded that the site is not at risk from extreme flooding. The assessment also considered the increased risk of downstream flooding as a result of the proposed development. The assessment considers that forest felling, new site access tracks, turbine hard-standing areas and other new, hard surfaces have the potential to contribute to a low level of increase in surface water run-off. The assessment however determined that the risk of an increase in downstream flooding is low due to the small percentage increase in run-off contributing to the catchments as a result of the wind farm development.

2.15 References

Clare County Development Plan 2023-2029.

Clare Wind Energy Strategy (2017).

Department of Agriculture, Food and the Marine – Standards for Felling and Reforestation (2019).

Department of the Environment, Heritage, and Local Government (DoEHLG) – Wind Energy Development Guidelines (2006).

Draft Revised Wind Energy Development Guidelines. Department of Housing Planning and Local Government, 2019.

Forest Service, Department of the Marine and Natural Resources – The Forestry and Water Quality Guidelines (2000).

Forest Service, Department of the Marine and Natural Resources – The Forestry Harvesting and the Environmental Guidelines (2000).

Irish Wind Energy Association Best Practice Guidelines (2012).

Safety, Health & Welfare at Work (Construction) Regulations 2013.

Safety, Health & Welfare at Work Act 2005.

Safety, Health & Welfare at Work (General Applications) Regulations 2007 to 2020.