MWP

BALLYCAR WIND FARM

Environmental Impact Assessment Report (EIAR)

Volume I: Non-Technical Summary

Ballycar Green Energy Ltd.

Project No. 22156 | January 2024

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1. Introduction

Ballycar Green Energy Ltd. (the 'Applicant') is seeking 10-year planning consent from An Bord Pleanála (the competent Planning Authority) under Section 37E of the Planning and Development Act (as amended) for a proposed wind energy project in Co. Clare, named Ballycar Wind Farm (Proposed Development). The location of the Proposed Development site is shown in **Figure 1-1**. Malachy Walsh and Partners (MWP) have been engaged by the Applicant to prepare an **Environmental Impact Assessment Report (EIAR)** to accompany the planning application. A full description of the proposed development and development lands of the project is provided in **Chapters 2** and **3** of **Volume II** of the **EIAR**.

This **Non-Technical Summary (NTS)** is the first volume of the **EIAR** for the proposed development. The other volumes which comprise the Environmental Impact Assessment Report are:

- Volume II: Main Environmental Impact Assessment Report; and
- Volume II: Appendices.

The purpose of this **NTS** is to provide a concise overview in non-technical terms of the project, environmental effects and mitigation measures highlighted by the Environmental Impact Assessment (EIA) which are presented in detail in the main **EIAR**, **Volume II**.

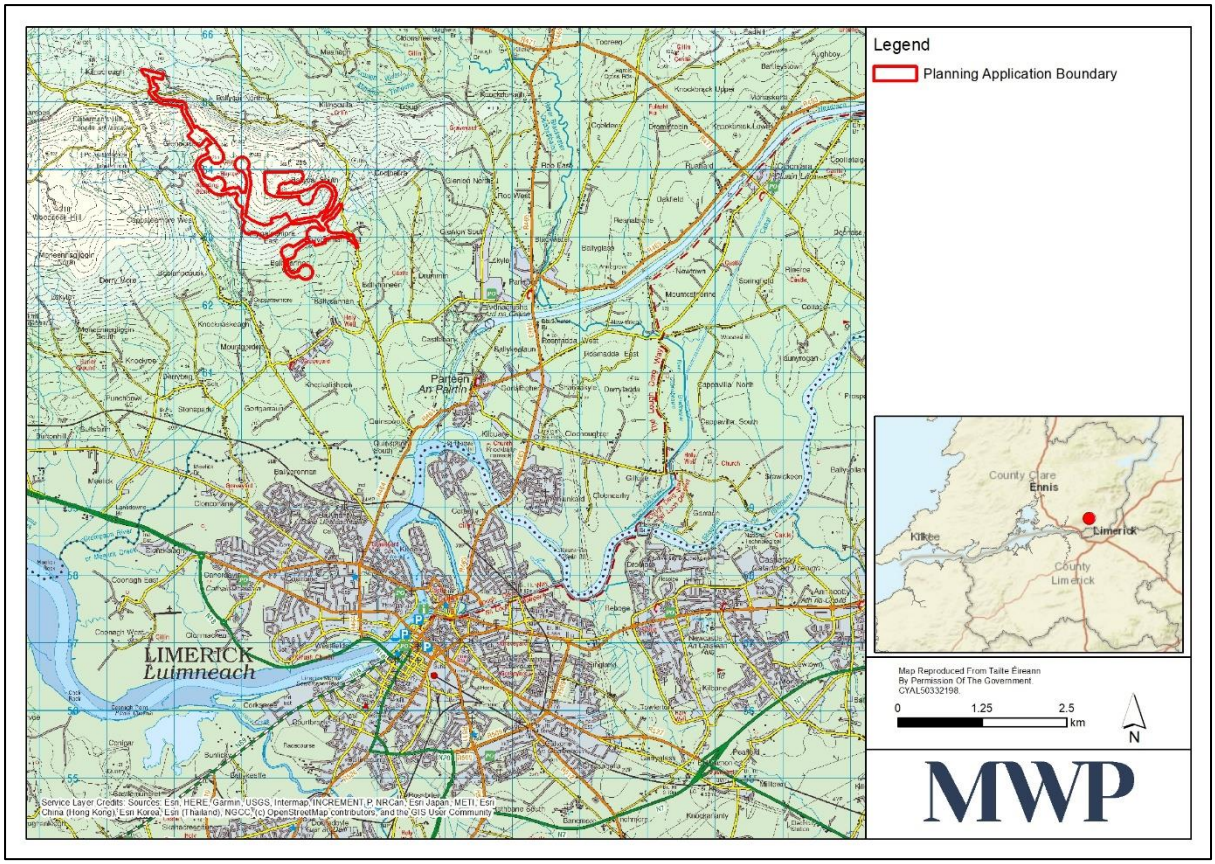

Figure 1-1: Ballycar Wind Farm Location

1.1 The Applicant

The Applicant is Ballycar Green Energy Limited, a subsidiary of Greensource Sustainable Developments Limited (Greensource Ltd.). Greensource is an innovative Irish renewable energy company based in Adare, Co. Limerick that specialises in the development of renewable energy projects, working with communities from pre-planning to operation, and creating long-lasting local partnerships. Greensource has over ten years development and operational experience. The company has a highly skilled and experienced team who are committed to developing projects with successful outcomes for all stakeholders. Working with integrity and care for the local environment, the team has a strong track record, having successfully completed wind energy and other renewable projects in the west of Ireland. Since inception, the company has played a key role in the development of over 150 MW of renewable energy projects, playing a significant role in further decarbonising the electricity system in Ireland.

1.2 Overview of Proposed Development

The components of the proposed development are summarised in Table 1-1 and the layout is illustrated in Figure 1-2.

Table 1-1: Summary of the Proposed Development

Core Wind Farm Elements:	• 12 No. Wind Turbines (blade tip height up to 158m). • 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 lines. • 2 No. Developed Site Entrances, **one temporary entrance to facilitate construction traffic and one permanent entrance.** • New and upgraded internal site service 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 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 northwest of the wind farm site and connects to the proposed 110kV substation. From the proposed 110kV substation, an underground cable is routed in a northwest direction where it connects to the existing 110kV overhead line. The proposed 110kV grid 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 public road. A new

unbound stone access track will be constructed over the 110kV grid route on private land to allow access for future maintenance.

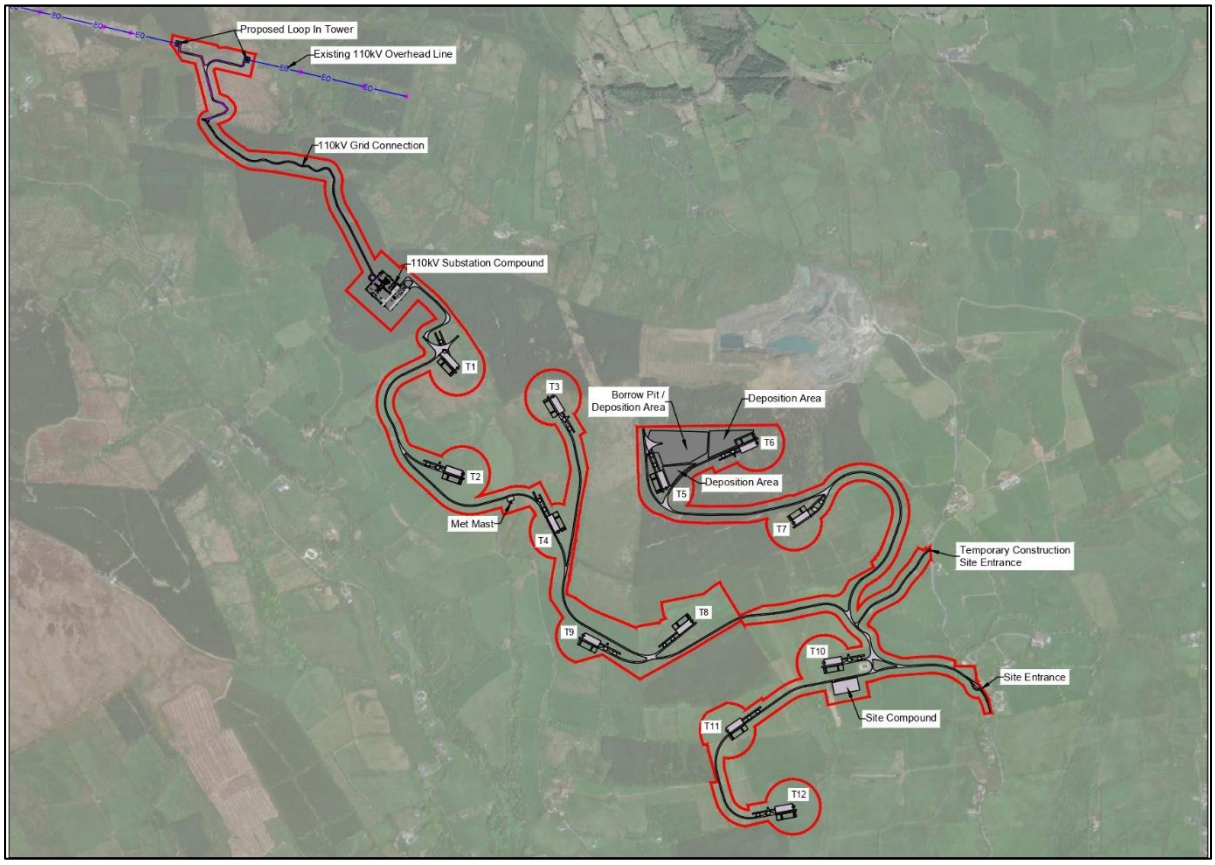

Figure 1-2: Ballycar Wind Farm Layout

1.3 Site 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 1-3** illustrates the proposed wind farm development site boundary included in the planning application. The area within this boundary is 104.7 ha. The grid route, which is also included within the planning application boundary as shown, can be seen in **Figure 1-4**.

The proposed wind farm and associated infrastructure lie within the townlands of Glennagross (orse Glennacross or Glenagross), Cappateemore East, Ballycannan West, Ballycannan East, Ballycar South and Ballycar North. The proposed underground connection between T1 and the proposed 110kV substation 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.

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 is owned and managed commercially. The surrounding land includes some pastures and lands principally occupied by agriculture.

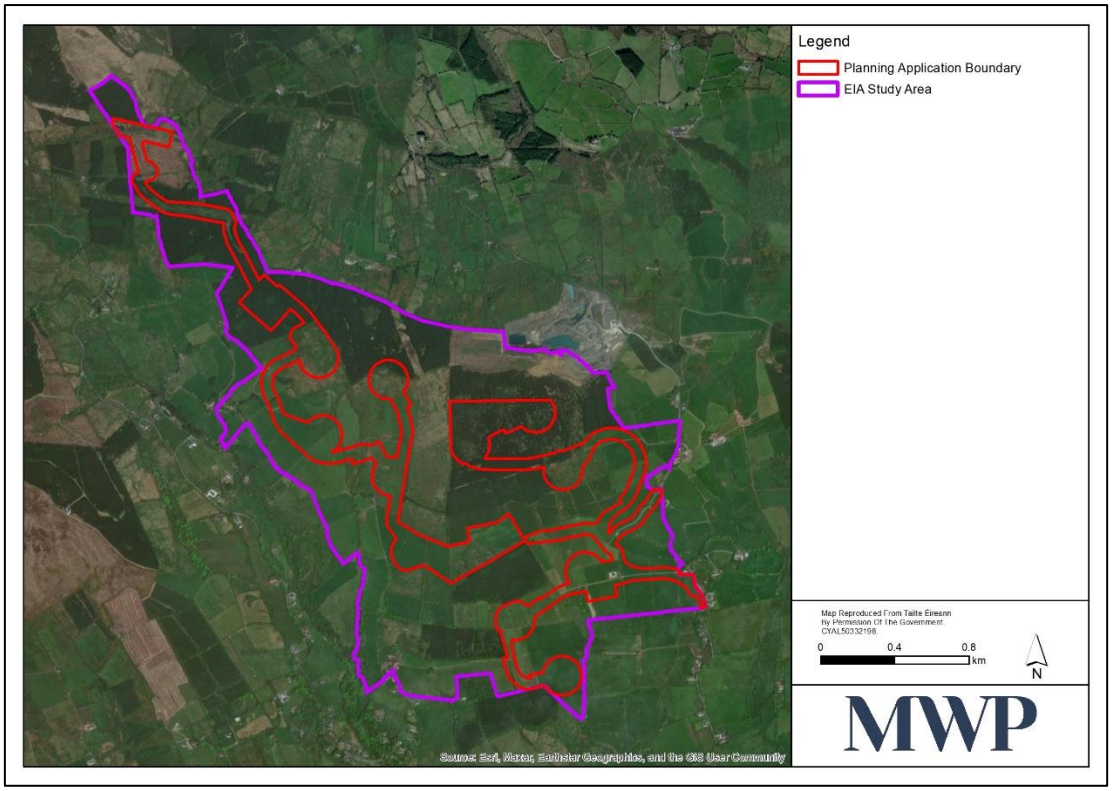

Figure 1-3: EIA Project Area and Planning Application Boundary

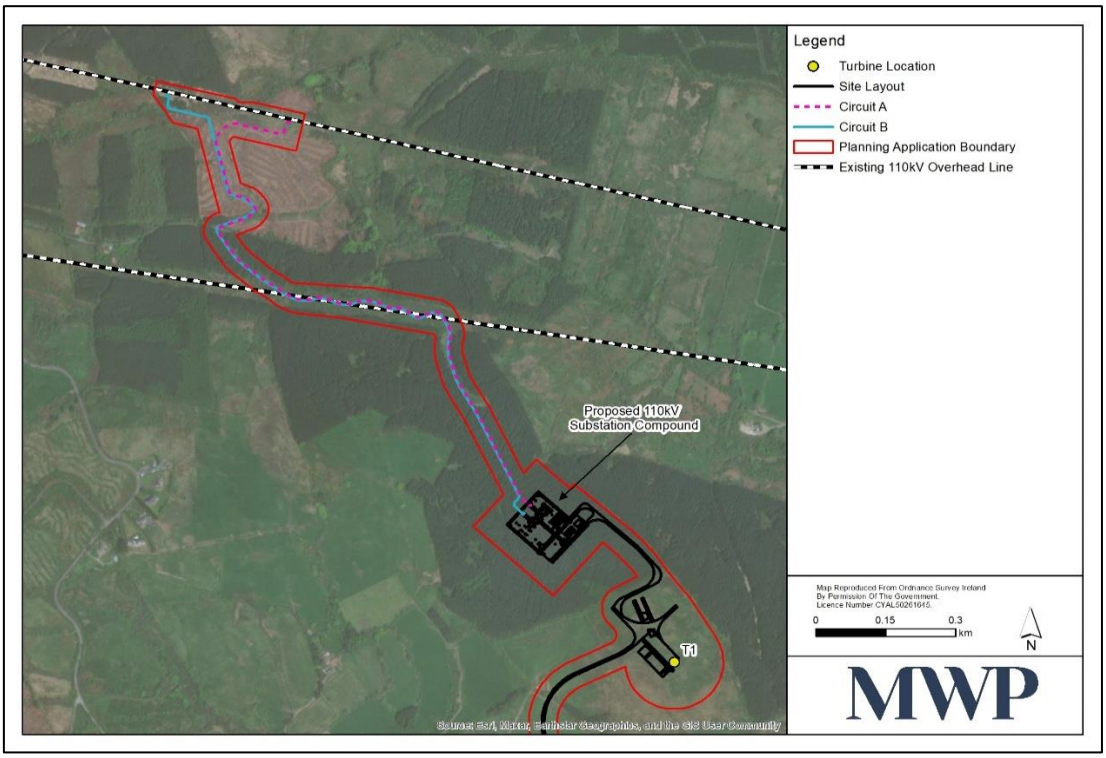

Figure 1-4: Grid Connection Route

1.4 EIA Study Area

The planning application development site boundary includes a total land area of approximately 104.7 ha (see Figure 1-3). 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 1-3) 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.

2. Description of the Proposed Development

2.1 Overview

It is being proposed by the Applicant to develop a wind farm (named Ballycar Wind Farm) comprising twelve (12) No. wind turbines in south County Clare with a maximum tip height of up to 158 metres. 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. Each wind turbine will have a reinforced concrete base pad foundation with a central plinth above the base, which will support the tower.

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 is to be located between T2 and T4. The meteorological mast will be 90m in height.

The proposed development includes a 110kV substation within the wind farm lands described above for exporting power from the wind farm to the national electricity grid. The proposed 110kV substation will comprise an outdoor electrical yard and two single storey buildings (one for the system operator and one for the wind farm operator).

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

2.2 Construction Phase

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.

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.

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.

Primary access to the proposed development site will be provided from the local public road the L-7062 (refer to Figure 2-1). 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.

The proposed route to deliver wind turbine components is from the port at Foynes, County Limerick to the proposed Ballycar wind farm site entrance in County Clare.

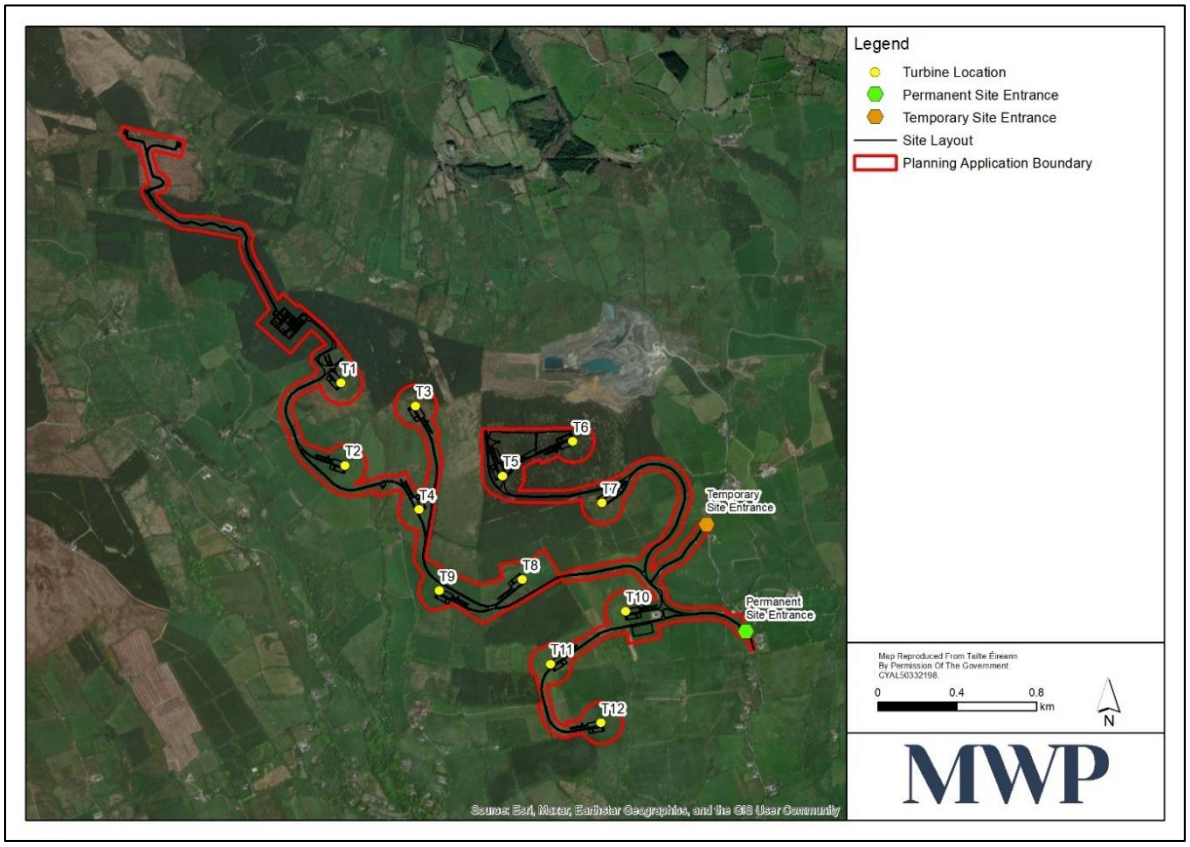

Figure 2-1: Site Access Points

One (1) No. temporary construction compound will be set up upon commencement of the construction phase. The construction compound will be located on the eastern section of the wind farm site near T10 and will have a footprint of approximately 5,000m².

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.

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.

Felling of commercial conifer forestry is required within and around wind farm infrastructure to accommodate the construction of the turbine foundations, hardstands, access tracks, turbine assembly and the proposed 110kV substation. Overall, felling of approximately 15.97ha of forestry will be required.

There will be a requirement for replacement forestry lands, however these will be at a significant remove from the development site so there will be no cumulative impact. These lands will be subject to a separate independent technical and environmental approvals process.

2.2.1 Production of Waste

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 designated deposition areas.

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.

2.2.2 Emissions and Nuisances

The anticipated residues and emissions likely to be generated during the project lifetime are summarised in Table 2-1. 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 2-1 Emissions and Disturbance

	Aspect	Potential Emission/Disturbance	Assessment Provided
Construction /Decommissioning	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; • 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}).	**EIAR Volume 2 Chapter 14** Air and Climate
	Noise	Traffic flows, excavation/blasting mechanical machinery and electrical equipment typically used for construction projects would generate noise emissions.	**EIAR Volume 2 Chapter 10** Noise
	Water	Surface water runoff and discharges from construction working areas are likely during construction, although overall 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 3: Appendix 2A: CEMP.	**EIAR Volume 2 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 Volume 2 Chapter 15 Material Assets** and **EIAR Vol 3 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 Volume 2 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 Volume 2 Chapter 10 Noise**
	Water	No water emissions or pollution sources have been identified for the operational phase.	**EIAR Volume 2 Chapter 8 Water**
	Shadow Flicker	In certain conditions, the movement of wind turbine blades could give rise to shadow flicker at nearby residential receptors. Any perceived shadow flicker at receptors will be eliminated through the installation of control modules.	**EIAR Volume 2 Chapter 11 Shadow Flicker**

2.3 Operational Phase

The proposed development is expected to have a lifespan of no less than 35 years. Each wind turbine will be computerised to control critical functions, monitor wind conditions and report data back to a Supervisory Control and Data Acquisition (SCADA) system.

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 operator or maintenance personnel. In addition, operation and monitoring activities may be carried out remotely with the aid of computers connected via a telephone 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.

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

2.4 Decommissioning

At the end of the estimated 35 year lifespan of the proposed development, the Developer will make the decision 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 grid 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.

2.5 Cumulative Assessment

The proposed development was considered in combination with other relevant plans and projects that could result in cumulative effects.

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. 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 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 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 sites and forestry operations due to geographical separation. The developer commits that the location of any

replanting (alternative afforestation) associated with the project will be greater than 10km from the wind farm site and also outside any potential pathways of connectivity with the proposed project.

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 2-2.

- 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.

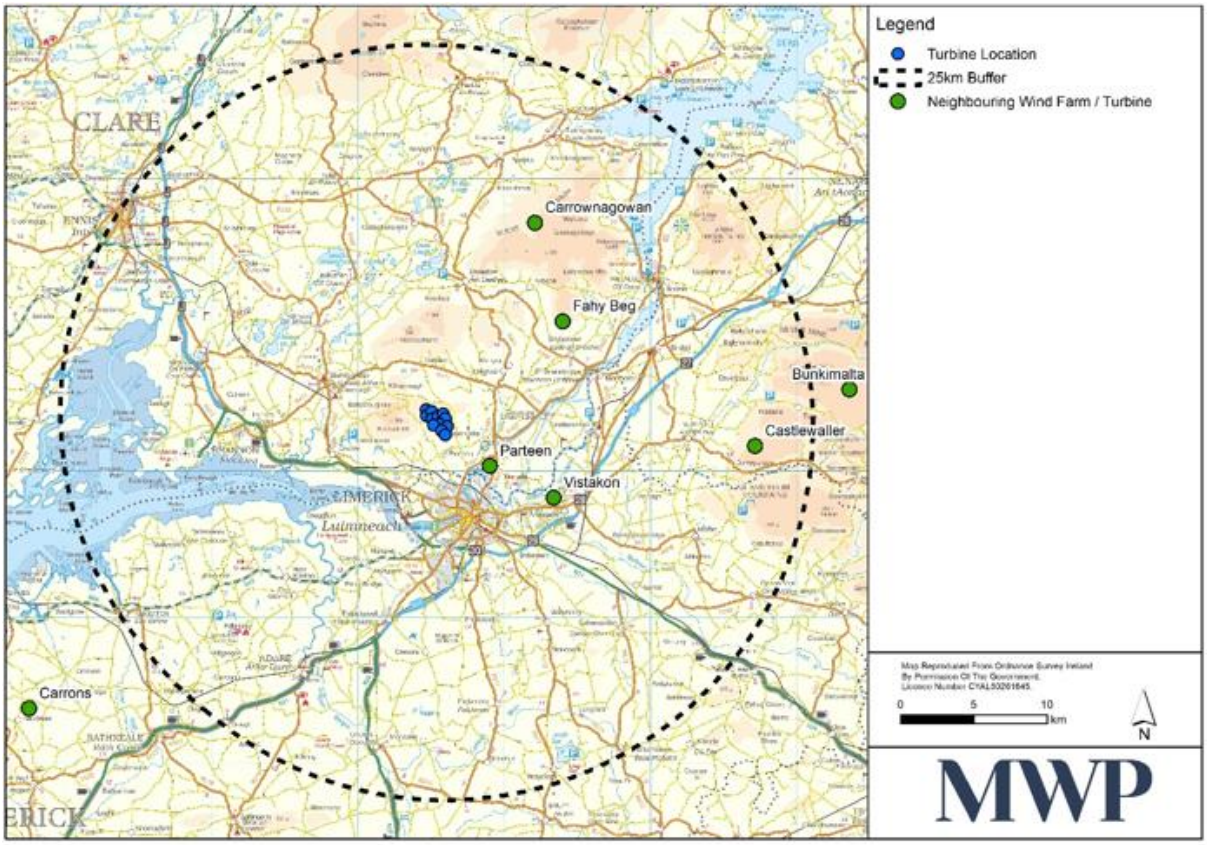

Figure 2-2: Wind Farm developments within 25km of proposed development

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.

2.6 Risk of Major Accidents and Disasters

It is considered that there is no risk for the proposed development 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.

Given the temporary nature of the construction stage and the scale of the proposed project, as well as the environmental protection measures that will be implemented from the outset, the risk of disasters (typically considered to be natural catastrophes e.g., very severe weather event) or accidents (e.g., fuel spill, traffic accident or landslide) is considered low.

In the case of the occurrence of a severe weather event such as flooding during construction, construction work will cease. A scoping exercise was carried out to determine whether a detailed Peat Landslide Hazard and Risk Assessment is 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 peat was noted in the north-western

corner of the site. As no infrastructure is proposed within the peat 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.

2.7 Impact of Climate Change

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.

Flood risk is considered in Chapter 8 of the EIAR 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 increase risk of downstream flooding as a result of the proposed development.

2.8 Alternatives Considered

The consideration of Alternatives is a mandatory part of the EIA process. The legal requirements of the 2014 EIA Directive, relating to the assessment of Alternatives, are set out in Article 5(1)(d) and Annex IV point 2 of the Directive.

During the project design process, alternative wind farm layouts and scales were fully considered in order to find the optimum design solution for the site with the least level of environmental impact. The Alternatives chapter therefore outlines the site selection process, the process of design evolution for the proposed development, the reasonable alternatives considered during the project inception and design process including a comparison of the environmental effects and the principal reasons for proceeding with the current planning application. The following elements are considered further in this chapter:

- Site Selection;
- Project Design Process; and
- Alternatives Considered.

The proposed development has been designed to minimise potential environmental impacts and to maximise wind potential on site. The wind farm has been designed following a step by step EIA process which informed and identified the buildable areas suited to turbines, tracks and infrastructure based on avoidance of unsuitable areas and following the good practice of mitigation by design. More details on the project design and evolution can be read in Chapter 4 of Volume II of the EIAR.

The final site layout or final alternative (12 turbine layout) was determined based on multi-discipline inputs and consideration of topography, biodiversity, land and soils, hydrology, landscape, and engineering constraints and assessments. The development as proposed is the preferred option as it results in the least effects on resources and receptors while meeting the project objectives of a large scale renewable wind energy development.

3. Environmental Assessment

The EIAR has been carried out in accordance with the relevant legislative requirements and guidelines, including the Environmental Protection Agency (EPA) – 'Guidelines on Information to be Contained in an Environmental Impact Assessment Reports, 2022'. Specialist guidance as required for each of the environmental topics has also been used where appropriate.

A summary of each prescribed environmental factor considered in this EIAR is outlined in the following sections.

3.1 Population and Human Health

The scope of the Population and Human Health assessment considers the effects of the construction and operation of the Proposed Development in terms of how the proposal could affect, economic activity, employment, land use, amenities and tourism, and health.

Limerick City and Suburbs (population 102,287, CSO 2022) which is approximately 3km to the southeast, is the largest urban centre relative to the site of the proposed development and is a major service and employment centre in the region. Smaller population centres in the general locality are the towns and villages of Ardnacrusha, Meelick, Cratloe and Sixmilebridge. These towns and small villages provide a range of local community facilities, including primary schools, sporting clubs, churches, general shops, and post offices.

The proposed development lands extend across part of the rural townlands of Glennagross, Cappateemore East, Ballycannan West, Ballycannan East, Ballycar South and Ballycar North

The greatest density of settlement occurs along local road networks surrounding the proposed development area and appears in clustered and ribbon development. There are no residential dwellings within the proposed development site boundary.

The land on which the proposed development is located consists predominantly of Coniferous Forest within the northern section, a section of pastures on the central and southern sections of the site and Broad-leaved Forests within the western section of the site. The surrounding landscape is mostly made up of agricultural land and pastures with some areas of forestry, with ribbon development along the local county roads.

While there are no tourist attractions pertaining specifically to the site of the proposed wind farm development, there are a number of cultural amenities in the wider area including, Limerick City Museum (c. 6.5km to the south), King John's Castle (c. 6km south) and St Mary's Cathedral (c. 6km to the south). However, given that there are currently no tourist attractions specifically pertaining to the proposed development site there are no direct impacts associated with the construction phase of the proposed development.

During the construction phase of the Proposed Development, approximately 60 people will be employed over an 18-month construction phase which will have a direct, positive, short-term to temporary and moderate impact on employment in the local area.

Construction activities can cause a disturbance to the local community and are likely to pose temporary minor disturbances locally. The most notable of these disturbances relates to the generation of additional traffic on the local networks. Here noise and safety implications are also a consideration. However, disturbances associated with the additional volumes of traffic will principally be confined to the construction phase and will cease on completion of works. The construction phase will be managed to minimise the impact on the human environment and the local residents. Dust and noise impacts from construction works are not expected to cause a significant impact, with the implementation of mitigation measures. No significant negative effects on the local human environment are expected.

The operational phase of the proposed development is not expected to present any adverse impacts on the human environment. With the implementation of mitigation measures, noise and shadow flicker effects associated with the operational phase will not be significant at receptors.

The production of electricity by wind energy is environmentally-friendly and thus prevents risk of air pollution and risk to human health.

The visual factor of the development is perhaps the most intrusive aspect. Given the size of the turbine structures and their proposed position along an open upland area, a visual consequence is unavoidable. The extent of intrusion will vary in degree and significance according to viewing distance, the numbers and parts of turbines visible, the number of viewers and of course public perception.

In relation to the local community, with Community Benefit Fund Guidelines, governed by the Sustainable Energy Authority of Ireland (SEAI), and based on the current project scope, Ballycar Green Energy will generate a Community Benefit Fund estimated at €3.75 million over the first 15 years of operation. This amounts to approximately €250,000 per annum, which will result in a positive impact on the local community economy.

3.2 Biodiversity

The biodiversity of the proposed development site and environs is described in terms of designated sites, habitats, flora, fauna and biological water quality. Mitigation measures are specified to ensure that significant effects on these features do not occur. Studies and reporting were in line with best practice and recently produced guidance. The information on the existing environment was obtained using publicly available information sources and by field surveys.

A Natura Impact Statement (NIS) report which considers the potential impacts on the integrity of the relevant Natura 2000 sites of the proposed project, either alone or in combination with other plans or projects, with respect to the Conservation Objectives of Natura 2000 sites in question, has been prepared as a standalone document in the planning application.

The proposed wind farm site is located within the Shannon River Basin District and is encompassed within two catchment areas, Shannon Estuary North catchment (Owenogarney_SC_020 sub-catchment) to the west and Lower Shannon catchment (Shannon [Lower]_SC_100 sub-catchment) to the east.

The western component of the proposed development is within the Crompaun (East)_010 subbasin and is drained by two watercourses, including an unnamed minor watercourse that drains the western extent of the proposed development (stream segment code 27_430). The main mapped watercourse is the 1st order Cappateemore East Stream which rises within the study area and flows south into the 3rd order Crompaun [East] Stream. It is noted that the Cappateemore East Stream, as mapped by the EPA is actually much smaller in size than an adjacent stream that appears to have its source near the source of the Cappateemore East Stream. This stream that is not mapped by the EPA is classified as an 'eroding/upland river' using Fossitt (2000) criteria and is of far greater ecological importance than the EPA mapped channel.

The lower 5km reach of the Crompaun Stream has a low gradient and has been highly modified by drainage. Embankments have been constructed along the lower reaches of the watercourse to prevent backflow during high tides. This watercourse discharges to the Shannon Esturay approximately 3km west of Limerick City.

The eastern component of the proposed development is within the North Ballycannan_010 subbasin. The main watercourses in this area are, from east to west, the 3rd order South Ballycar Stream and the North Ballycannan Stream, a 1st order watercourse that rises within the study area boundary flowing south and discharging to the River Shannon c. 3.8km south of the study area. The southern reach of the North Ballycannan Stream forms part of the Lower River Shannon SAC, c.1km south of the study area. This watercourse is fed by two other watercourses

located within the study area; the East Ballycannan Stream and the West Ballycannan Stream. Both of these streams are 1st order watercourses that rise within the study area boundary.

The proposed grid connection route and substation location to the north of the proposed wind farm site occur within the Blackwater (Clare) River catchment. The nearest watercourse to the proposed substation is a 1st order unnamed tributary (EPA segment code 27_430) of the Glennagross Stream in the Crompaun River catchment. The grid connection route crosses the 1st order Kilnacreagh Stream (EPA segment code 25_3206) which flows from west to east approximately 50m to the south of the nearest proposed tower to be erected to connect to the existing overhead line. The Kilnacreagh Stream joins the 1st order Trough River (EPA code 25B06, also known as the Blackwater River) which flows in a westerly direction for ca. 5.2 km until it is fed by the 3rd order Derryvinnann River. The crossing is within a conifer forestry area.

The proposed development site does not lie within the boundary of any designated Natura 2000 site. Hence, the site of the proposed development does not form part of any Special Protection Area (SPA), Special Area of Conservation (SAC) or candidate Special Area of Conservation (cSAC).

Key habitats identified as Important Ecological Features within the study area have been evaluated as being of 'Local importance (higher value)' for a number of reasons including, their potentially important foraging, commuting, breeding, and resting habitat for fauna and being a species rich area. The habitats include Buildings and Artificial Surfaces (BL3), Spoil and Bare Ground (ED2), Improved Agricultural Grassland (GA1), Stone walls and other stonework (BL1), Grassy Verges (GS2) , Dry-humid acid Grassland (GS3), Wet Grassland (GS4)/Wet Heath (HH3), Scrub (WS1), Hedgerows (WL1)/ Tree lines (WL2), Conifer Plantation (WD4), Mixed broadleaf woodland (WD1), Wet Heath (HH3), Upland Blanket Bog (PB2)/Wet Heath (HH3), Drainage Ditches (FW4) and Eroding/Upland Rivers (FW1).

Key fauna and flora identified as Important Ecological Features within the study area have been evaluated as being of 'Local importance (higher value)' for a number of reasons including their protection under national legislation and occurrence on the wind farm site. Examples of these include badger (*Meles meles*), otter (*Lutra lutra*), Pine marten (*Martes martes*), Irish Hare (*Lepus timidus hibernicus*) and multiple bat species. Additional fauna and flora including Atlantic salmon (*Salmo salar*) and small white orchid (*Pseudorchis albida*) were not recorded during the ecological surveys but were included as Important Ecological Features due to suitable habitats occurring on the site.

The construction phase of the proposed development will require excavation and construction within the site, which will bring about habitat loss. It will have a potential impact on flora and fauna. A Biodiversity Enhancement Management Plan is included in Volume III Appendix 6E outlining proposed enhancement measures for various habitats and species within the study area. A potential impact during construction is disturbance of sheltering or foraging species of fauna by the operation of machinery and other human activity.

The operational phase of the proposed development will not involve any additional removal of habitat nor any point source discharges, and there will be no other material releases that would cause adverse impacts on surface waters. Wind turbines, and their associated equipment, use lubricating and insulating oils in a closed system.

Overall, the impacts of decommissioning a wind farm are potentially similar to construction impacts and will comprise temporary disturbance such as noise associated with decommissioning of turbines and on-site machinery.

General best practice construction mitigation measures will be followed, including working according to a Construction and Environmental Management Plan (CEMP), a draft of which has been prepared. A Surface Water Management System forms an integral part of the project design as do a suite of avoidance measures including buffers and set back distances from watercourses, ecologically valuable habitats and designated sites. The works will be supervised by an Ecological Clerk of Works (EcoW) who will review all method statements and monitor the construction phase to ensure that all environmental controls and mitigation is implemented in full. The project

ecologist will be awarded a level of authority and will be allowed to stop construction activity if there is potential for adverse environmental effects.

It is considered that the effects on important Ecological Features from potential construction, operation and decommissioning impacts will be avoided, reduced and mitigated sufficiently to ensure that no likely significant effects remain, with the full implementation of the ecological mitigation measures.

3.3 Ornithology

Field surveys were undertaken from October 2019 to September 2023. All surveys were undertaken in accordance with Scottish Natural Heritage Guidance (2017) or other relevant guidance. The study area supports species of conservation importance, including breeding kestrel and quarry nesting peregrine (outside of the proposed development footprint). Habitats suitable for foraging by hen harrier are represented within part of the study area, which is within the South Clare non-designated regional zone for hen harrier. Buzzard and sparrowhawk regularly occur within the study area. Overall, the wind farm site is rated as Local Importance (higher value) for birds.

The baseline surveys did not identify any regular migration routes or local movements of waterbird species or birds of prey through the wind farm site; therefore, the proposed development is not expected to have any residual effect on migrating species or local waterbird bird populations.

The proposed development could affect important bird species in a number of ways including the loss of hunting and breeding habitat to accommodate the wind farm infrastructure. For birds, the predicted effects by loss of grassland and woodland habitat to facilitate the Project will be reduced to Not Significant with the implementation of the Biodiversity Enhancement Management Plan.

The presence of the turbines is unlikely to cause a significant displacement effect for most bird species, though hen harrier, buzzard and kestrel are identified as species which may avoid the areas around the turbines. While habituation to the presence of the turbines is likely with time, the residual effect is rated as a Slight Significant short- to medium-term effect.

The Project will include rigorous ornithological monitoring (in line with best practice guidance) at pre-construction, construction, operational and decommissioning phases.

The assessment concluded that the Ballycar Wind Farm will not have a significant residual effect on birds.

3.4 Water

An impact assessment was carried out to determine whether the proposed development is likely to have a significant adverse effect on the hydrology and hydrogeological aspects of the environment and to propose mitigation measures to reduce any potential negative impact of the proposed wind farm.

The proposed development site and grid route is located within the Shannon International River Basin District. The WFD Catchment is the Lower Shannon (ID:25D) and the Shannon Estuary North (ID: 27). The WFD sub-catchment is Shannon [Lower]_SC_100 and Owenogarney_SC_020.

There are five EPA mapped watercourses that flow from north to south within the landownership boundaries of the proposed site, these are:

- Cappateemore East;
- West Ballycannan;
- East Ballycannan;

- North Ballycannan; and
- Unnamed.

One EPA mapped watercourse flows across the proposed grid connection route:

- Kilnacreagh.

The Kilnacreagh stream is located to the north of the substation and flows across the proposed grid connection route. Refer to **Figure 3-1** for the surface water hydrology of the proposed development area.

The Cappateemore East stream and the unnamed stream are tributaries to the Crompaun East stream which flows along the western perimeter of the proposed development site. The West and East Ballycannan streams are tributaries which flow into the North Ballycannan stream, which flows through the eastern section of the proposed site. These watercourses and their network of tributaries extend from the northern extremities of the site and outfall to the River Shannon which is located approximately 3km south of the site. The South Ballycar stream and its tributaries flow south immediately east of the site boundary and outfall into the Shannon south east of the site.

The downstream areas (located outside of the development's site boundary) of the North and West Ballycannan streams are part of the Lower River Shannon Special Area of Conservation (SAC) (Site Code 002165). The downstream areas of the Crompaun East stream (located outside of the development's site boundary) are also within the SAC and the River Shannon and River Fergus Estuaries SPA (Site Code 004077). The Lower River Shannon SAC is located approximately 1km south of T12.

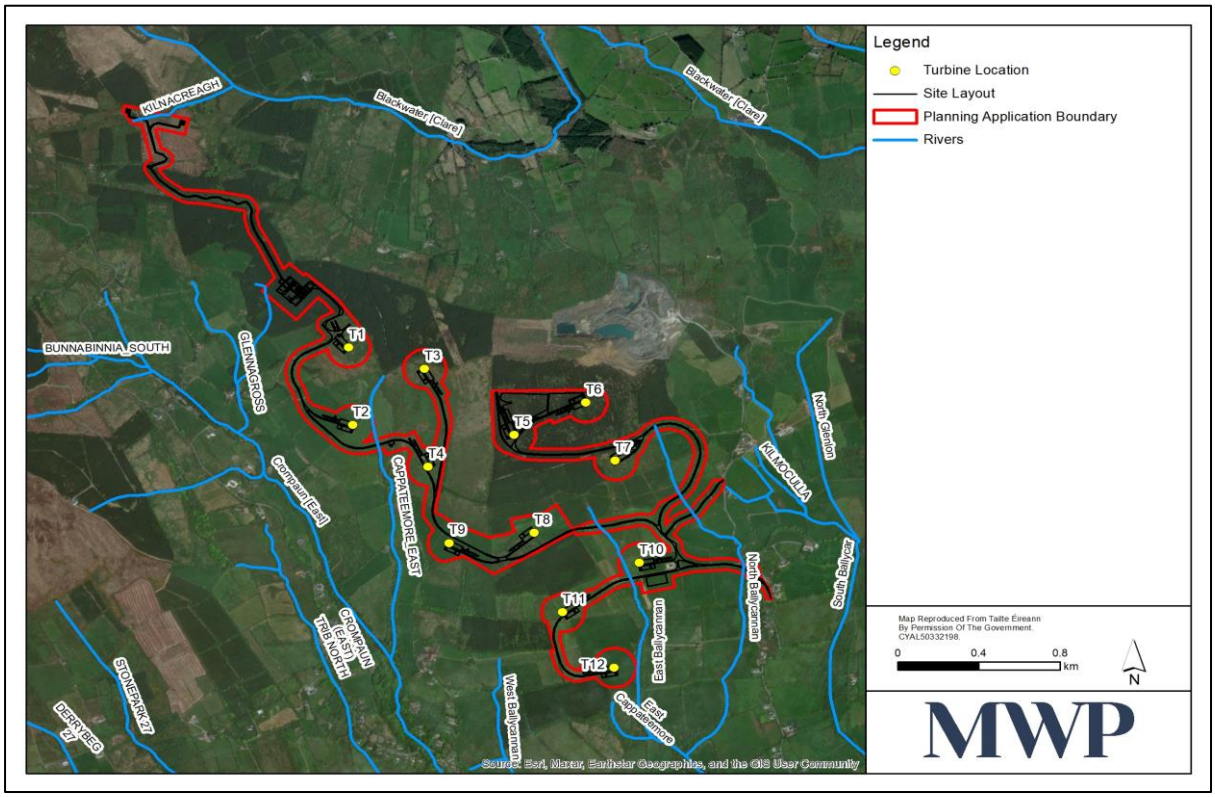

Figure 3-1: Surface Water Hydrology

During the site walkover, an additional stream/brook (unmapped watercourse) which flows through the site was identified. This unmapped watercourse flows from north to south between T2 and T3 and outfalls into the Cappateemore East stream, approximately 220m southwest of T4. This stream is visible on historic 6 inch mapping where it is indicated that this stream is the original course of the Cappateemore East stream.

Based on Biological Monitoring Working Party (BMWP) scores, biological water quality was rated moderate to very good based on the diversity of macroinvertebrate assemblages recorded.

There are two Group Water Schemes located approximately 20km to the north (Bodyke and Raheen Rd). These have 55 and 20 connections respectively and are groundwater sourced schemes. However, there is no hydrological link between these and the proposed development site and therefore, these schemes will be unaffected by any activity associated with the proposed site development.

The majority of the proposed development site is situated within an aquifer that is described by Geological Survey Ireland (GSI) as a Locally Important Aquifer which is Moderately Productive only in Local Zones (Category LI) (Figure 3-2). Parts of the northwest and southern areas of the site are situated within an aquifer which is described as a Poor Aquifer which comprises of bedrock which is generally unproductive except for local zones (Category PI). The grid connection route crosses two aquifers as illustrated in Figure 3-2.

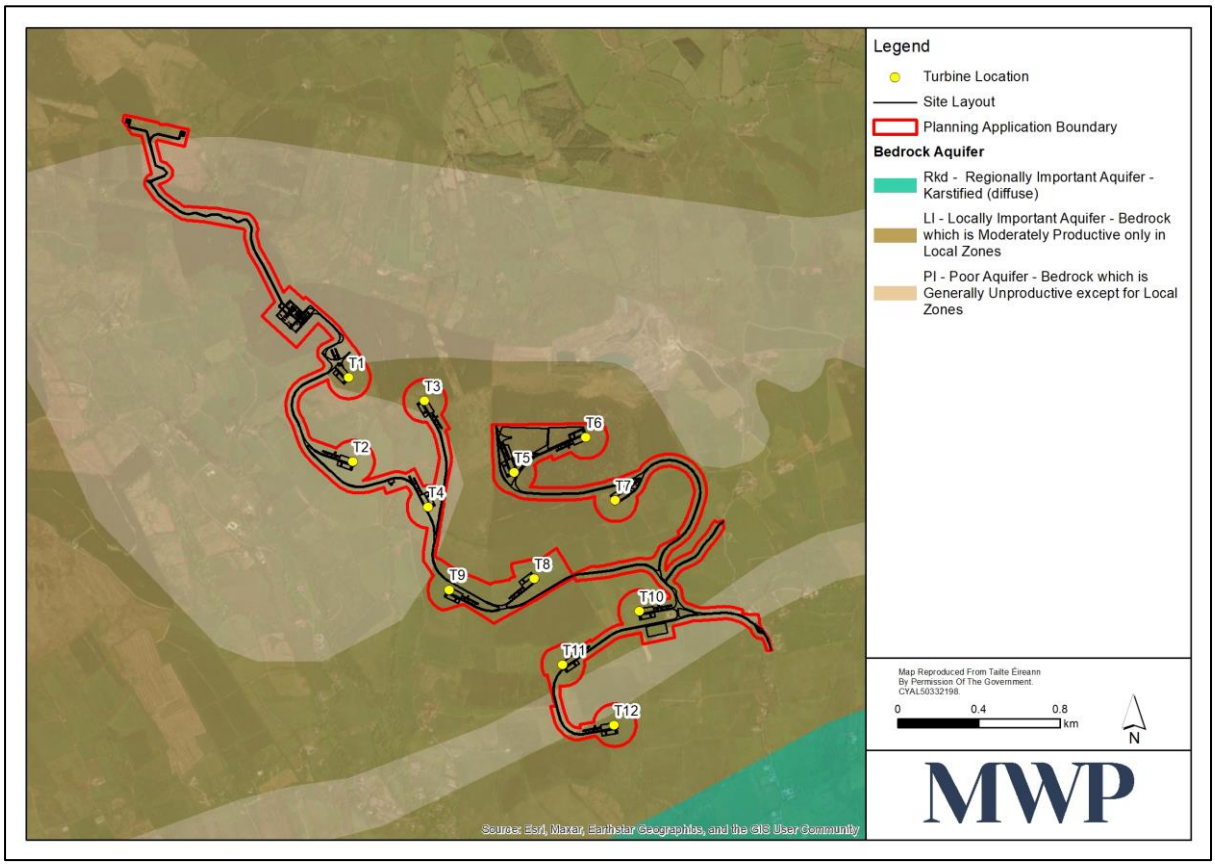

Figure 3-2: Groundwater Aquifer

A review of the available sources of flooding on floodinfo.ie indicates there are no instances of historic flooding on-site or in close proximity of the site or along the grid route.

During the construction period, the proposed development has the potential to lead to impacts on hydrology and water quality unless appropriate mitigation is applied. New internal track construction will be required to provide

access to all 12 turbine locations and the substation location. The construction of new access tracks will require some additional drains and the removal of soil and diverting near-surface groundwater flow into the drains and channels.

During the operational phase, the main potential hydrological impact of the development is a slight increase in run-off from a storm event to the streams within the site due to a minor decrease in ground permeability at the turbine hardstands and substation.

The potential impacts associated with decommissioning of the proposed development will be similar to those associated with construction but of a reduced magnitude, due to the reduced scale of the proposed decommissioning works in comparison to construction phase works.

On implementing identified mitigation measures, the significance of the residual impact on the water environment during the construction and operational phase of the development is assessed as being imperceptible to not significant. Mitigation by design has been implemented in the first to prevent adverse impacts. Other mitigation measures will be implemented and monitored throughout the construction and operation phases as outlined in the CEMP. It is considered that the proposed project design including control measures together with mitigation measures will ensure that there will be no significant negative effect on surface water quality, surface water flows or groundwater resources.

No significant cumulative impacts on any of the regional surface water catchment or groundwater bodies will occur as a result of the construction and operation of the proposed development.

3.5 Land and Soils

The Land and Soils chapter describes any prospective effects on land and soils due to the construction and operation of the proposed development.

The study area for the proposed wind farm is primarily in agricultural use, with areas of conifer forests, transitional woodland scrub throughout. The surrounding CORINE Land Cover is illustrated in Figure 3-3.

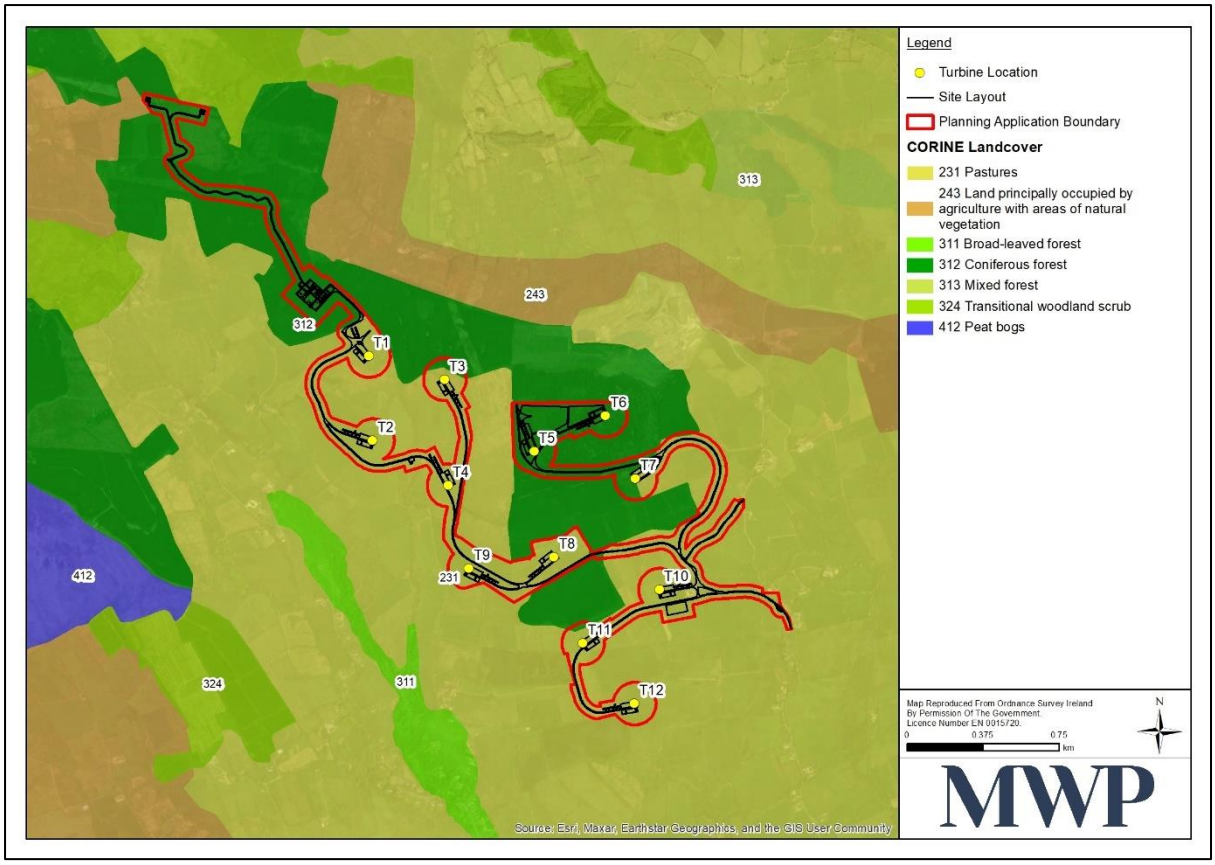

Figure 3-3: Surrounding Land Use

The site is described as being located at the southern slope of a hill within a hill-and-trough landscape. The maximum elevation of the site is approximately 262m AOD. Elevations of the site range between circa 60m AOD in the southwestern portion of the site to 262m AOD in the northern and northeastern portions of the site, and between 80m AOD in the southwestern portion of the site to 245m AOD in the north western portion of the site.

The proposed site is underlain by the Carboniferous rocks, with a dominant presence of *Old Red Sandstone* formation in central parts of the proposed development. The main lithology underlaying the grid route consists of carboniferous rocks, namely the Cratloes Formation. The predominant soil type within the majority of the study areais " *AminSP – Shallow poorly drained mineral (Mainly acidic)"* according to the Teagasc/EPA Soil Maps available on the Geological Survey of Ireland online mapping system.

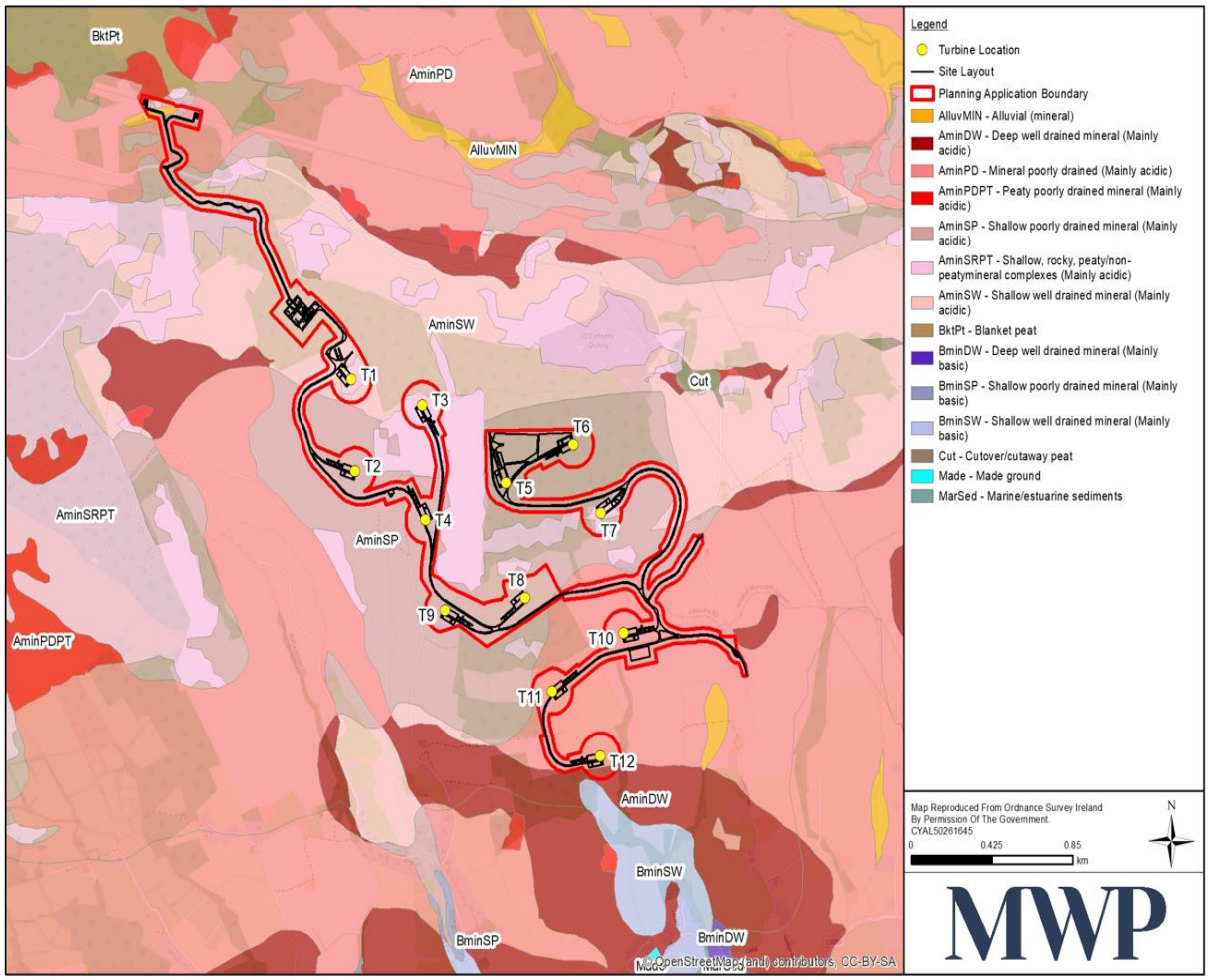

Figure 3-4: Teagasc Soils (Source: GSI)

There is no risk of peat instability at this site, or from felling activities, as the limited area of peat identified on site, is being completely avoided.

The proposed development will involve removal of soil, subsoil, and bedrock for facilitating access tracks and hardstand emplacements. The aggregates (rock, stone, gravel, sand) used during construction of the tracks, hardstands and substation will be extracted from one (1) No. proposed on-site borrow pit. Large amounts of aggregates, concrete, and steel will be used during construction. Concrete and additional aggregate materials will be sourced from authorised facilities.

During the construction phase, sources of contaminants (such as oil based substances or other hazardous chemicals) will not be stored at the site except where this is done within safely bunded areas that safely contain all spillages and prevent the migration of contaminants into soil and bedrock. Refuelling will be completed using a double skinned fuel bowser (twin walled, in case the outer wall (skin) of the bowser was ruptured accidentally) with spill kits on the ready in case of accidental spillages. The risk is considered to be low once mitigation measures are implemented.

With the implementation of specific mitigation measures, no significant effects on the land, soil and geology of the site of the proposed development or along the grid route will occur during construction, operation, or during decommissioning due to correct procedures and outlined mitigations being in place.

The assessment also confirms there will be no cumulative effects on land soil and geology environment as a result of the proposed development.

3.6 Noise and Vibration

Potential noise and vibration effects during construction and operation of the proposed development were assessed. The main sources of noise from a wind turbine include aerodynamic noise (rotating blades in the air) and mechanical noise (gearbox (if not a direct drive system) and generator).

Construction noise will occur during excavation and earth moving, laying of tracks and hard standings, transportation of materials and erection of the wind turbines. The construction phase will be phased and temporary. The decommissioning phase works will be similar in magnitude to the construction phase.

The proposed development is to be developed in a rural area of county Clare, designated for wind farm development. The land use in the immediate area is mainly agricultural and forestry related. This also applies to the turbine delivery route. The main sources of noise in the area include traffic on the local and regional road network, and machinery involved in working agricultural land and forestry. Natural noise sources include wind borne noise in vegetation and water in streams and rivers.

The construction phase entails the building of the wind farm infrastructure including, tracks, hard standings, turbine bases, drainage system, substation, control buildings, and borrow pit, and also any temporary works required along the turbine delivery route. The noise from construction activities has been assessed and is predicted to result in a temporary, negative, moderate to not significant effect. There are also no significant controlled vibration impacts anticipated at sensitive locations during the construction phase.

Once operational, the wind turbines and the substation facility will generate noise which will propagate into the receiving environment. The predicted operational noise assessment demonstrated that predicted noise levels will comply with the noise limits set out in Wind Energy Development Guidelines. The significance of impact is assessed against the noise limits in the 2006 DoEHLG Wind Energy Guidelines. As these thresholds are predicted not to be exceeded then no significant impact is concluded and therefore mitigation measures are not required.

The decommissioning phase works will be similar in magnitude to the construction phase; therefore, the conclusions of the construction phase impacts can be assumed for the decommissioning phase. There will be no significant cumulative effects during the construction phase with other developments. There will be no cumulative operational effects with other development.

Measures to be taken in to minimise noise and vibration during the construction phase are set out in the Construction and Environmental Management Plan (CEMP). The measures will be adopted from best practice described in BS5228-1&2 +A1 2014 Code of Practice for the Control of Noise and Vibration on Construction and Open Sites. It will include a nominated community liaison officer tasked with responding in a prompt manner to any noise and vibration complaints which may arise.

3.7 Cultural Heritage

The assessment was completed using a combination of (1) desk-based assessment of all available archaeological, historical, cultural and cartographic sources; (2) inspection of the limits of the proposed site in May 2021; (3) licenced archaeological testing (licence no. 22E0744) at Glennagross townland in October 2022.

There are six National Monuments located within 10km of the proposed development, 177 Recorded Monuments within a 5km radius of the study area and five Recorded Monuments in close proximity to the proposed development, with one feature within the planning boundary. The recorded monuments within proximity include: (1) ring barrow CL052-064003; (2) standing stone CL052-064002; (3) cairn CL052-064001; (4) enclosure CL053-040 and (5) earthwork CL053-049. Of these, only one recorded monument is within the planning boundary: cairn CL052-064001.

There are no National Monuments in State Care / Guardianship within the boundary of the proposed development. There are however six National Monuments located within 10km of the proposed development.

No direct impact will occur at the construction phase of the proposed development on any known archaeological monuments or sites. Given the scale of the proposed construction works there is a possibility that construction of the proposed development will impact on potential unknown subsurface archaeological features, deposits or artefacts. This impact is assessed as '*moderate'* based on (1) location of the five recorded monuments within proximity, (2) the large number of recorded sites within the wider study area. Archaeological monitoring of all ground works will be undertaken during the construction phase.

During the operational phase, no direct effects will occur. Any likely direct effects will occur at the construction phase of the proposed development. Indirect visual impacts of the proposed turbines on all recorded monuments situated between 3km to 5km distance from proposed turbines is classified from '*not significant'* to '*slight effect'*. The proposed turbines may not be visible from all monuments due to surrounding vegetation/buildings. As for the recorded monuments located in vicinity of the proposed development boundary, the impact is classified from 'slight' to 'significant': 'slight' (earthwork CL053-049), *'moderate'* (enclosure CL053-040), *'significant'* (ring-barrow CL052-064003, standing stone CL052-064002, cairn CL052-064001).

There are no archaeological impacts anticipated in the course of the de-commissioning of the proposed turbines. Potential subsurface archaeological issues will have been adequately resolved by the mitigation measures in advance of construction phase of the project, i.e. pre-development testing and archaeological monitoring of ground works associated with the construction phase of the wind farm development.

An assessment of cumulative impacts taking into consideration projects within 25km of the proposed development including all permitted and existing turbines has been undertaken. When considered cumulatively effects on the wider setting of cultural heritage assets is 'not significant'.

With the proposed mitigation of licensed archaeological monitoring and testing, no cultural heritage residual impacts are anticipated.

3.8 Air and Climate

The potential effects of the Proposed Development on local air quality and climate have been assessed.

Representative Environmental Protection Agency ambient air quality data has been used to characterize the existing air quality in the area. The air quality for the region where the is proposed development is situated (Rural West Air Quality Index for Health Region 6) is currently ranked as '1 - Good'.

During the construction phase there will be emissions from vehicle exhausts. The movement of machinery, construction vehicles and the use of generators during the construction phase will 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}).

Traffic levels for the construction period of the proposed development are below TII criteria which warrant a quantitative assessment of construction traffic and therefore are unlikely to cause an adverse effect on local air quality and will not have a significant effect on local, regional or national Air Quality Standards given the scale of the high levels of dispersion, and the limited duration of works.

In terms of air quality, the greatest likelihood of effects during the construction stage will be from dust emissions associated with the construction works.

Using Institute of Air Quality Management (IAQM) methodology, the dust emission magnitude is considered low risk across all construction and decommissioning activities. There is a minimum separation of 418m between the

nearest dwelling and major construction element (substation), so therefore dust is unlikely to be a significant impact at the nearest dwellings.

Dust and emissions from the construction works will likely result in an adverse, not significant, temporary effect on sensitive receptors for the duration of the construction phase. Standard best practice is adhered to during the construction phase in order to minimise fugitive dust emissions in particular.

It is not expected that any negative impacts to air quality or the climate will occur during the operational phase and therefore no mitigation measures are required.

There will be some carbon dioxide (CO_2) losses associated with the turbine life (manufacture, construction and decommissioning), and the disruption of the natural on-site natural CO_2 sink resources. However, this will be quickly re-paid once the wind farm is operational. The calculated payback CO_2 period is 1 year.

Once operational, there will be no direct emissions to the atmosphere from the proposed development. The electricity generated will displace electricity that would otherwise have been generated by burning fossil fuels.

The proposed wind farm project will assist Irelands CO_2 reduction commitments under the Paris Agreement as well as facilitate decarbonisation objectives, at local and national levels as set out in the National Climate Action Plan 2023 and the 2023 - 2029 Clare County Development Plan. The Clare County Development Plan 2023 -2029 (Renewable Energy Designation) has designated the location of all proposed wind turbines as 'Strategic' for wind energy generation.

Overall, Ballycar Wind Farm is fully aligned with current energy and climate policy, aims and objectives, which primarily seek to increase the production of electricity from renewable sources.

3.9 Material Assets

Based on a review of the proposed development and the suggested topic areas set out in the EPA guidelines (2022), the consideration of the projects impact on Material Assets is discussed in the context of built services. This includes transport infrastructure, electricity supply and infrastructure, telecommunications, aviation, water and wastewater infrastructure and waste management. In addition, having regard to a portion of the projects setting within an active forest plantation, commercial forestry resources have also been considered as a relevant material asset.

3.9.1 Traffic and Transport

The proposed development site is situated off the L7062, the local access road between Parteen/Ballycannan and Ballycar. The entrance to the proposed development will be from a junction off the L7062. The L7062 is a local access road of 80km/h speed limit consisting of a 2-lane carriageway. The road is approximately 6m at the stretch between the proposed entrance and the junction at Parteen, narrowing to 4.5m wide in local areas. There will be two site entrances, one to facilitate construction traffic delivering material from a local quarry and one to facilitate turbine deliveries, materials sourced from alternative quarries and operations and maintenance vehicles (**Figure 3-5**).

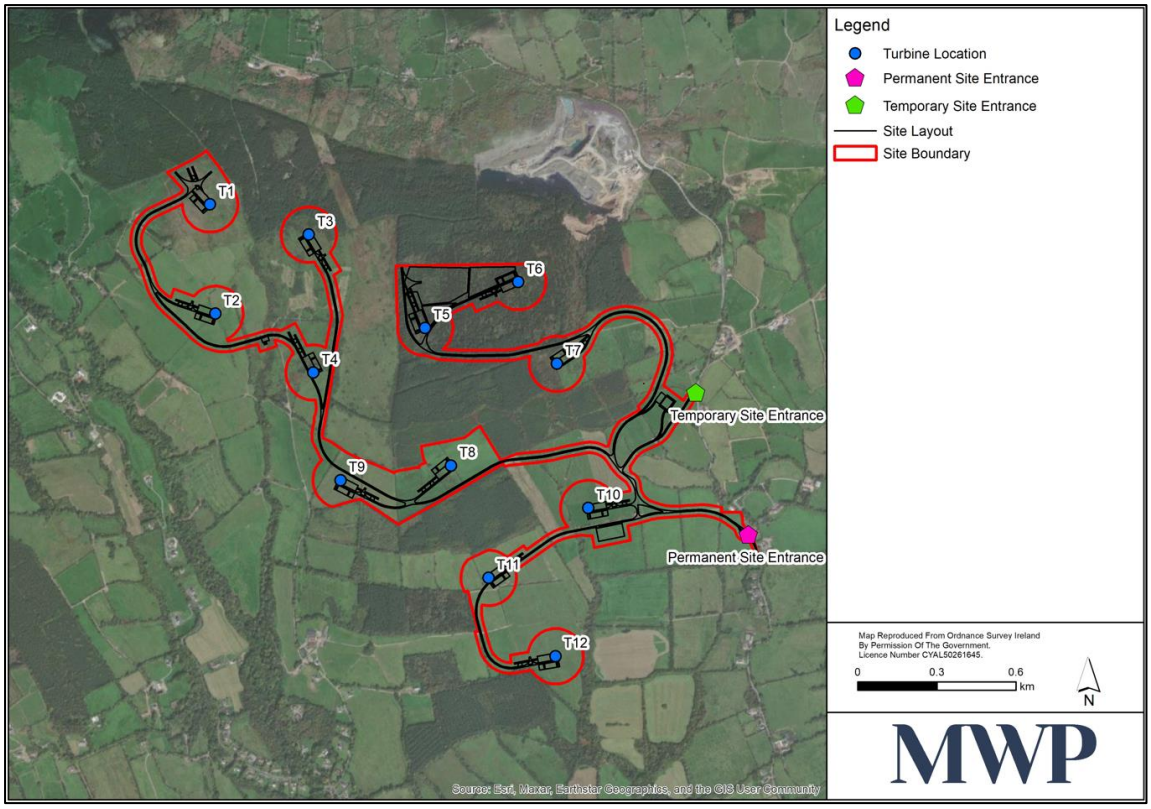

Figure 3-5: Site Access

The construction phase of the project will generate traffic due to site personnel trips and material deliveries. This traffic will be short-term in nature and will travel along regional and local access roads. The operation and maintenance phase of this development will attract negligible traffic.

The wind turbine loads will be delivered in consultation with Clare County Council, Limerick City and County Council and An Garda Síochána, during off-peak traffic periods. A total of 120 delivery vehicles will be required for the 12 turbines. This could result in temporary delays for other location traffic during the off peak traffic delivery periods.

From a transportation planning perspective, the proposed development will not be a significant traffic generator and will not adversely impact the future operational capacity of the existing junction which was assessed. The development is aligned with the intention of the council set out in the Clare County Development Plan 2023-2029, which earmarks the Ballycar area as a strategic area of wind energy potential.

A traffic management plan will be implemented to ensure significant effects do not result.

3.9.2 Aviation

Shannon Airport, one of Ireland's main international Airports and an important state economic asset, is located circa 20km south west of the proposed wind farm development site.

The only potential effect on aviation associated with the proposed development during the construction phase is during the erection of wind turbines on site. Ballycar Green Energy will agree an acceptable aviation obstacle warning lighting scheme with the Department of Defence and IAA/AirNav Ireland ahead of turbine construction and will supply the coordinates and elevations for built turbines, as is standard for wind farm developments.

During the operational phase there is potential for surveillance radar impacts on the Woodcock Hill Monopulse Secondary Surveillance Radar (MSSR) and the Shannon Airport (Primary Surveillance Radar) PSR from turbines at the proposed development.

The following have been made to remediate the concerns raised by the Air Navigation Service Provider *(*ANSP) in relation to surveillance radar effects on the Woodcock Hill Monopulse Secondary Surveillance Radar (MSSR) and the Shannon Airport (Primary Surveilance Radar) PSR:

- The technical documentation provided by the manufacturer (Thales) of the two systems provides assurance that mitigation for the Ballycar Windfarm is possible. Cyrrus would recommend that an onsite condition survey is carried out by Thales on both the Shannon Airport and Woodcock Hill systems to confirm their current operational state and ascertain whether updates or upgrades would be required.
- A limited operational flight trial may also be prudent at this stage to provide a baseline of the current systems coverage over the area of the proposed Windfarm.
- Once the windfarm is built, the systems may require minor optimisation by Thales. Once completed, a further Flight Check would be recommended to confirm the systems performance was acceptable over the Windfarm area.

Due to the sub-surface nature of the proposed grid connection infrastructure, there will be no effects on aviation.

Correspondence from AirNav Ireland outlines their support in principle in relation to the proposed development.

3.9.3 Forest Resources

Existing land cover at the site is a mixture 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 is managed commercially.

The main impact on the existing forest resources during the construction phase will be the requirement for permanent tree felling to facilitate the wind turbines and associated infrastructure so that both energy and timber production can occur on the site. 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). Conventional felling has taken place and will continue to take place at the site independent of the wind farm development.

The wind farm operational phase will not impede or deter either existing or future use of the local forest resources for recreational activities.

3.9.4 Television and Telecommunications

The potential for electromagnetic interference from wind turbines occurs only during the operational phase of the development and therefore will not occur during the construction phase.

There are no telecom ducts within the proposed wind farm.

Best practice measures outlined will still be carried out during excavations. In the absence of mitigation, the construction phase will likely have a negative, not significant and short-term effect.

As is standard practice, a signed Protocol between the developer and RTE will be in place, in which the developer will be responsible for resolving any issue of interference with television reception as a result of the proposed development.

In terms of telecommunications, the Ballycar Wind Farm Telecommunications Impact Study, refer to **Appendix 15B**, concluded the following:

- Based on the findings of the consulting process, there were four Telecom Operators with networks in the vicinity of the proposed wind farm that required a detailed technical analysis. A 2D and a 3D network analysis was carried out on each of the Telecom Operator Networks, the results of which found that only three of the Telecom Operator Networks could be impacted by the proposed wind farm development. (i.e Enet, Eir and Three Ireland).
- Extensive field survey and software modelling analysis was carried out to determine viable mitigation measures to offset the impact of the proposed wind turbines. The mitigation measures that were assessed included the provision of a relay mast and the provision of alternative relay links. Consultations with each of the three impacted telecom operators were carried out and mitigation measures were agreed with the effected telecom providers.

In the absence of mitigation, the operational phase of the proposed development could potentially have a negative, slight and long term effect on telecommunications in the local area.

3.9.5 Water and Wastewater Infrastructure

No public water or wastewater utility infrastructure is required at the wind farm site.

Water needs for construction activities will be low and limited to truck washing, wheel wash, dust suppression and sanitary facilities. It is proposed that 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 construction employees. It is proposed that this water requirement will be imported in bulk water tanks.

During the construction time period, sanitary wastewater, estimated to be 3,000 litres per day, will be collected in portable toilets. Disposal of sanitary wastes will be managed through a contract with a licenced waste contractor.

There is no mapped water infrastructure within the proposed development area. Best practice measures in relation to excavations/utilities outlined in the CEMP will however be implemented, and therefore no adverse impacts to existing water infrastructure is likely.

Potable water required during the operational and maintenance phase is estimated to be approximately 60 litres per day. This water will be supplied as bottled water. The volumes of water required are minimal and would have a negligible impact on the water supply utilities.

During the operational phase, wastewater from welfare facilities on site, estimated to be approximately 60 litres per day, 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 licenced waste facility for treatment and disposal. The volumes of wastewater requiring disposal are minimal and would have an imperceptible effect on the capacities of external treatment facilities.

3.9.6 Gas

Based on information from Gas Networks Ireland (GNI), there are no gas transmission lines within the wind farm or grid connection footprint, therefore no effects to gas infrastructure are anticipated during the construction phase.

No effects to existing gas infrastructure are anticipated during the operational phase as the proposed development does not require a connection to gas infrastructure.

3.9.7 Waste Infrastructure

There is currently no waste or construction phase waste infrastructure within the proposed development site.

The use of permitted waste contractors and authorised waste facilities is essential to appropriately manage waste to prevent adverse environmental effects. All waste will be dealt with in accordance with regional and national legislation. Resources and efficient waste management practices will be utilised to prevent adverse effects on the environment.

The principle objective of sustainable resource and waste management is to use material resources more efficiently, to re-use, recycle and recover material and to reduce the amount of waste requiring waste disposal. The value of products, material and resources is maintained in the economy for as long as possible such that the generation of waste is minimised. To achieve resource efficiency there is a need to move from a traditional linear economy to a circular economy. Resource efficiency techniques will include the following:

- Excavated spoil will be resourced efficiently on site and will be reused for the backfilling, landscaping, and restoration around wind farm infrastructure such as turbines and hardstands. Dedicated spoil storage areas and a borrow pit are proposed within the site. These will be used for generating material for the construction of access tracks and hardstands and for spoil storage.
- It is not envisaged that any soil will be removed from the site, however in the event that removal of minimal quantities are required, these will be treated as Article 27 by-product (a non-waste) or treated to comply with Article 28 if practicable, and recycled if possible.
- Spoil will also be stored around the turbines to a maximum height of one metre (1m). The felled areas around the turbines have been identified as a potential additional area that will be used to store material; however, priority will be given to restoration of the borrow pit and the dedicated spoil storage areas.
- Berms will be formed along sections of access tracks and hardstands that will act as a physical edge protection measure to prevent vehicles falling off where a drop off greater than 1m exists from the track / hardstand edge. Spoil generated onsite will be used to create these berms.
- Approximately 165,000m^3 of stone won from the borrow pit will be reused on site.

Construction phase waste may consist of hardcore, concrete, spare steel reinforcement, cable wires, shuttering timber 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.

There is an approved facility located near the development area in Tuamgraney which is operated by Clare Waste and Recycling Ltd., a permitted waste company which provides skips for construction, commercial and domestic waste. Furthermore, Enva are located at Smithstown Industrial Estate in Shannon, Co. Clare and accept hazardous wastes.

During the operational phase, the types of wastes to be generated would be similar to established construction waste streams and would not require unusual or new treatment options. Waste volumes are not likely to be significant as to require new permitted treatment, storage and disposal facilities.

With the implementation of mitigation measures, residual effects will likely be imperceptible during both the construction and operational phase.

3.10 Shadow Flicker

In terms of the overall project, shadow flicker relates solely to the operational wind turbines. Shadow flicker is defined as the alternating light intensity produced by a wind turbine as the rotating blade casts shadows on the ground and stationary objects, such as the window of a residence. Shadow flicker can only occur if there is an unobstructed direct line of sight from within a dwelling to a turbine.

No flicker will occur when the turbine is not rotating or when the sun is obscured by clouds or fog or if blinds or curtains are drawn at the receptor location.

Shadow flicker was calculated for the proposed wind turbines using industry-standard simulation software Wind Farm, a tool which has been successfully applied to a number of similar studies around the world. In general, the shadow flicker assessment methodology involves the identification of houses within a defined study area, which have the potential to be adversely impacted by shadow flicker. In line with best practice guidance, the study area is usually limited to a distance (between a house and wind turbine) equivalent in length to 10 of the proposed wind turbine rotor diameters. In line with best practice, the scope of this assessment extends to a distance of 10 times the maximum rotor diameter (or 1.36 km). There are 271 No. properties within the 10 x rotor diameter study area. Of the 271 properties assessed, 79 houses were found to be potentially effected by shadow flicker, in the absence of mitigation.

The developer for the proposed development is committed to installing mitigation measures that will eliminate shadow flicker at a receptor.

Turbines will be programmed to shut down during periods when shadow flicker is predicted to, and where conditions are present for it to occur. This strategy has been successfully employed at other wind farms.

Therefore, there will be no adverse residual effects on receptors from shadow flicker during the operational phase of the wind farm.

3.11 Landscape and Visual

The proposed wind farm which includes 12 turbines (11 of tip height 158m and one turbines of tip height 150m) and associated infrastructure lie within the townlands of Glennagross, Cappateemore East, Ballycannan West, Ballycannan East, Ballycar South and Ballycar North. The proposed development site is in south County Clare, and close to the border with County Limerick and Limerick city centre lies approximately 4.9 kilometres from the nearest turbines. The northern suburbs of Ballynanty are approximately 3 kilometres south of the nearest turbine.

3.11.1 Methodology

Landscape and Visual Impact Assessment (LVIA) is a tool used to identify and assess the significance of and the effects of change resulting from development on both the landscape as an environmental resource in its own right, and on people's views and visual amenity. The significance of the effect is a judgement based on the sensitivity of the receptor, combined with the magnitude or degree of change, based on the *Guidelines for Landscape and Visual Impact Assessment* (2013). This process is the same for landscape and for visual effects. The assessment of landscape and visual effects included a desktop study, review of the proposed development drawings and visualisations, and a number of site visits.

3.11.2 Receiving Environment

The study area includes the landscape within a 20 kilometres radius of the site. 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 surrounding turbines T5 and T6 and the substation are composed of coniferous forest, which are owned and managed commercially. The surrounding land includes some pastures and lands principally occupied by agriculture, with significant areas of natural vegetation.

The wider study area includes Limerick City and the surrounds, west as far as Shannon, and taking in the Broadford and Slieve Bernagh Hills to the north, including Killaloe to the north-east, and including the rural areas south of Limerick and the towns of Caherconlish and Adare.

3.11.3 Landscape Effects

The landscape effects of the proposed development were considered in the context of the site and immediate vicinity, and the effects on the wider landscape. The landscape effects at construction phase (when the turbines are being constructed) are considered to range from Not Significant, during the grid connection works to a Moderate and adverse landscape effect which is temporary in nature, during construction phase of the remainder of on-site elements (turbines, hardstands and tracks, met mast, temporary compound and substation). These effects will largely be perceived in the vicinity of the site (within the south of the Slieve Bernagh LCA) and the northern part of the River Shannon Farmlands LCA, but not in any of the wider LCAs within the study area.

During the operational phase of the proposed development, the significance of the landscape effects is considered to be Moderate in immediate vicinity of the site. The effects range from neutral to adverse. It is noted that though the turbines are considered to result in long term effects they are reversible.

Turbines will become a more pronounced presence in the immediate vicinity of the site and, more locally, the substation, located north-west of the site. The quality of the effect is considered adverse in terms of the changes to the physical fabric of the site which, though limited, include removal of some habitats, treelines and hedgerows.

Effects on the Slieve Bernagh Landscape Character Areas (LCA) will be Moderate in the vicinity of the site. Effects range from Slight in the centre of the LCA, to no effect in the northern part of the LCA which includes the northern and eastern slopes of the Slieve Bernagh hills.

LCA 9 River Shannon Farmland is an extensive LCA, extending from Bunratty to the west, to Lough Derg in the north-east. The southernmost turbine of the proposed development is situated in this LCA. Due to the expansive nature of the LCA, the effects on the landscape character will vary. The proposed development will be clearly visible from this part of the LCA near the site, with more pronounced visual effects in Viewpoints 1,3 and 4. The visual presence of the proposed development will be significantly less in parts of the LCA to the west, at Bunratty and in the vicinity of Cratloe and also to the north-east at Killaloe. In these areas there will be places where viewers will have glimpses, or no views of the proposed development. The LCAs of Limerick City and the Southern Environs are represented, and again the visibility, and the effect on landscape character will vary throughout the LCA.

The proposed cable route will not result in any visual effects at the operational stage as it is below ground.

3.11.4 Visual Effects

Visual effects have been assessed using a combination of tools, including Zone of Theoretical Visibility (ZTV) maps and Photomontages, combined with several site visits. 26 Viewpoints were chosen to represent a range of receptors, which included selection from a wider list of locations, some of which had theoretical visibility but no actual visibility.

As outlined in the SNH (2017) guidance (paragraph 76) on visual representation of windfarms, views at varying elevations, directions and distances and in varying contexts, and representing various types of visual receptor were visited. The viewpoints chosen also reflect the pattern and extent of the theoretical visibility, and the sensitivity of visual receptors. In this case, the settlement pattern influences the viewpoint selection due to the proximity of Limerick City, so the number of viewpoints reflects the wider variety of settled areas which are represented by montages.

As indicated on the ZTV and in the baseline section, viewpoints include local residents in both rural areas and in settlements, and local community views. Viewpoints also include locations at landscape and visual designations (as well as waymarked trails (East Clare Way, 12 O' Clock hills trails, Limerick's Riverside Walk and the Lough Derg Way), viewing points at Woodcock Hill and Knockanaurha/12 O' Clock Hills, and cultural heritage attractions including Bunratty village. A range of views are included, from a variety of elevations, landscape contexts and directions. Viewpoints also represent viewers on scenic routes, where visibility occurs, as well as representing views from the various Landscape Character Areas, both in Co. Limerick and in Co. Clare.

During the construction phase, visual effects are likely to be confined to the immediate vicinity of the site where works such as vegetation clearance, widening of site entrances, and earthworks as well as the construction of the structures are likely to be more evident, from the local roads close to the site.

The construction stage visual effects are considered Moderate, adverse effects in the immediate vicinity of the site and site entrances, as well as the elevated lands to the west near Woodcock Hill, however these are temporary in nature. In the wider landscape, the significance of the visual effect is considered Not Significant, adverse and temporary, during the construction stage.

During the Operational Phase, the visual effects from the 26 viewpoints are summarised as follows;

- Two views (2,4) were judged to be Significant and adverse;
- Three views (1,3,9) were considered Moderate-Significant. Two of these (1,9) were considered neutral and one adverse (3) in quality;
- Visual effects at six views (5,7,10,13,14,25) are categorised as Moderate and neutral;
- Three views (8,11,19) are categorised as Slight-Moderate and neutral;
- Visual effects at six views were considered Slight (Viewpoints 12,18,21,23,24,26) and neutral;
- Four viewpoints showed no visibility (Viewpoints 6,16,17,22).

Local viewpoints – local roads, settlements and residences (site and immediate vicinity within 3km)

A considerable number of viewpoints represent the immediate surrounds of wind farm and are represented by Viewpoints 1,2,3,4,9,10,11, with the closest views representing clusters of houses. These show varying visual effects. The most pronounced visual effects (Significant and adverse) are illustrated in viewpoints 2 and 4 which are viewpoints in very close proximity (less than 1 kilometre) east and west, of the nearest turbines, and which are slightly lower in elevation. Viewpoints 1 and 3 show slightly less pronounced visual effects as the turbines are partly screened by intervening vegetation and are slightly further away (more than 1 kilometre) from the turbines. The other close view is that from Woodcock Hill, a local landmark, which lies west of the proposed turbines. This is just off a scenic route and would have a similar but more open view than the scenic route, and is a location for recreation as well as the location of a mast and radar dome. This viewpoint is considered Moderate-Significant but neutral in quality.

Scenic Routes and Views

Viewpoint 9 is at the Trig point of Woodcock Hill but represents the closest stretch of Scenic Route to the site. It is a location where views would be more open and slightly more elevated than the scenic route and would

therefore represent this location. Other scenic routes/views or otherwise designated views are represented by viewpoints 18 (Scenic Route at Ashroe, Co. Limerick) and 28, the view from Mungret College to the Monastic Complex. These views are considered to be Slight and neutral in terms of visual effect. It is noted that the Limerick Development Plan includes considerable detail on river views, and though not considered as Designated views, they are also represented by Viewpoints 6 and 7 (though Viewpoint 7 looks in the opposite direction to the intended view).

Settlements

The viewpoint selection represents the settled landscape of the wider surrounds. Several viewpoints represent settlements in Co. Clare (within approximately 10km) to the site, which include Viewpoint 15, Parteen (Viewpoint 13), O' Briensbridge (Viewpoint 17), the outskirts of Clonlara (Viewpoint 8) and Castleconnell in Co. Limerick (Viewpoint 22). Visual effects in these locations is not pronounced, with Imperceptible visual effect from Sixmilebridge and no visual effect from the viewpoints at O' Briensbridge and Castleconnell. These are however included to reflect the actual visibility from these settlements. More pronounced visual effects include the view from Parteen which is expected as it is much closer to the site, and at Clonlara, though these are considered Slight-Moderate and Moderate and neutral in quality.

The settlement of Limerick City is well represented in viewpoints due to its proximity to the site, and also to the topography as the turbines are located on elevated and sloping lands. Viewpoints 5,6,7, and 25 represent varying viewers in Limerick City – Viewpoints 6 and 7 are taken from the riverfront representing 'Waterfront Panoramas' in the Development Plan, though no views will be available from View 6. View 7 from Thomond Bridge will have open views (visual effect here is judged as Moderate and neutral) though it is noted the view in the Development Plan is to the south in the opposite direction. A similar view to Viewpoint 7 is View 25 from the parapet on King John's Castle, where there are open views to the site and a 360 degree panorama of the city views.

Cultural Heritage

Viewpoints 20,25,26 represent cultural heritage locations which are also National Monuments, at Bunratty, King John's Castle and the view to Mungret Monastic complex. The visual effects are most pronounced in the view from King John's castle which is expected as it is closest (approximately 5km) from the site and provides expansive and elevated views towards the proposed development. Views are considered Moderate and neutral in quality, with the turbines being set well into the landscape in a tight cluster and a feature of the landscape that does not interfere with the panoramic views from the castle. The castle parapet and access walkway is the only location in the castle where such views exist. Other views from the courtyard are restricted by the walls. The turbines are largely screened from ground level in the vicinity of Bunratty castle.

Recreation and Amenity

The Riverside walkway begins in Limerick City at the Shannon banks and continues to the University of Limerick and beyond, and is known as the Lough Dery Way, a long distance walking trail from Limerick City to Lough Derg. View 6 represents the beginning of this trail and Viewpoint 8 represents the trail viewers at the Cloonlara bridge. As noted above, glimpses of the turbines are likely from the trail between Limerick City riverfront and the University, however more open views such as Viewpoint 6 illustrate that the turbines will appear as a feature of the surrounding landscape and will not change the overall character of the view from the trail. Other nearby trails represented include the popular 12 O' Clock Hills routes, which are accessed near Kilkishen (Snaty) in Co. Clare, and which involve several looped walks which begin in densely wooded areas. The summit of Knockanaurtha is open moorland and extensive views are available in all directions. This viewpoint represents the summit area, with four turbines fully visible and a visual effect considered Slight-Moderate and neutral. However, it is noted that much of the trails will be screened and out of the theoretical visibility. The East Clare way lies to the east of the 12 O' Clock Hills trails and some visibility is likely from here. However, given that this trail it is not as elevated as Viewpoint 19, increased screening is likely in certain sections resulting in similar or lesser visual effects.

Cumulative Landscape Effects

The operational phase landscape cumulative effects range from Slight to Moderate on certain parts of the landscape character of the Slieve Bernagh LCA and parts of the Shannon Estuary Farmland.

Cumulative Visual Effects

Considering other wind farm developments in combination with the proposed development, the montages indicate that in the majority of the views where other turbines are visible (in combination), these appear as distant and distinct wind farms, and do not result in a proliferation of turbines in any one view, or any cases where one wind farm is seen behind the other and in close proximity. Cumulative visibility is considered to vary throughout the study area, ranging from Slight to Moderate.

Other non-wind farm developments include planned solar farms in the area. Two solar farms are permitted in the vicinity of Ardnacrusha, at Drummin, which is within 2km east of the site, and at Coolderry, further east of Ardnacrusha, approximately 4.3 kilometres from the proposed development. The nature of the solar farms is that they are more likely to be visible at close range unless open views from elevated locations are available such as those near Ballycannon. Cumulative visual effects are considered to be Not Significant to Slight in some localised areas.

3.12 Interaction of the Foregoing

There is potential for interactions between one aspect of the environment and another which can result in direct or indirect impacts, and which may be positive or negative.

A matrix has been generated to summarise the relevant interactions and interdependencies between specific environmental aspects (Refer to Table 3-1). It contains each of the environmental topics, which were considered as part of this environmental impact assessment, on both axes.

Table 3-1 Matrix of Interactions

	Population and Human Health	Biodiversity and Ornithology	Water	Land and Soils	Noise and Vibration	Shadow Flicker	Landscape & Visual	Cultural Heritage	Air Quality and Climate	Material Assets	Traffic and Transport
Population and Human Health			C	C	C/O/D	O	C/O/D		C/O	C	C/D
Biodiversity and Ornithology			C	C	C/O/D				C/O		
Water		C		C							
Land and Soils		C	C		C		C	C	C		C
Noise and Vibration	C/O	C/O									C/D
Shadow Flicker	O						0				
Landscape	C/O							C/O			
Cultural Heritage	C			C							
Air Quality and Climate	C/O	C/O		C						C/O	
Material Assets	C/O								C/O		C
Traffic and Transport	C/D	C/D			C/D		C/D		C/D	C/D	

	Interaction Occurs
	No Interaction

C	Construction Phase Effect
O	Operation Phase Effect
D	Decommissioning Phase Effect