

5 POPULATION AND HUMAN HEALTH

5.1 INTRODUCTION

This chapter of the Environmental Impact Assessment Report (EIAR) describes the potential effects on population and human health arising from the proposed Carrownagowan Wind Farm Project. Please refer to section 2.3 of chapter 2 for a full description of the overall Project and the proposed development.

The assessment comprises:

- a review of the existing receiving environment;
- prediction and characterisation of likely effects;
- evaluation of effects significance; and
- consideration of mitigation measures, where appropriate.

5.1.1 Scope of assessment

5.1.1.1 Topic Areas included for Assessment

The following publications were consulted as part of the scoping of topics for this assessment.

- *Guidelines on Information to be contained in environmental impact statements (2002)*,
- *Draft Guidelines on Information to be contained in environmental impact assessment reports (2017)*,
- *Advice Notes on Current Practice (in the preparation of Environmental Impact Statement) (2003)*,
- *Draft Advice Notes for the Preparation Environmental Impact Statements (2015)*, and
- European Commission's Guidance on the preparation of the EIA Report (Directive 2011/92/EU as amended by 2014/52/EU) (2017), were also consulted.

The previous EPA advice notes of 2003 and the amended draft guidance of 2015 advise that, '*The Environmental Impact Statement concentrate on those topics which are manifested in the environment. Issues such as commercial competition, zoning, property prices, agri-business and other social and economic issues are dealt with by more specific instruments (such as the Planning Acts)*'¹. Table 5.1 outlines the issues which the EPA guidance documents suggest may be examined as part of the human environment study.

¹ Section 2, Environmental Topics – Human Beings - Environment Protection Agency (EPA) '*Advice Notes on Current Practice (in the preparation of Environmental Impact Statement), 2003*'.

Section 4.2.1. Population and Human Health in the receiving environment - Environment Protection Agency (EPA) '*Advice Notes for preparing Environmental Impact Statements*' Draft September 2015'.

Table 5.1 Issues relevant to the Human Environment

Topic Area	Potential Issues
Economic Activity	- <i>will the development stimulate additional development and/or reduce economic activity, and if either, what type, how much and where?</i>
Social Consideration	- <i>will the development change patterns and types of activity and land use?</i>
Land-use	- <i>will there be severance, loss of rights of way or amenities, conflicts, or other changes likely to ultimately alter the character and use of the surroundings?</i>
Tourism	- <i>will the development affect the tourism profile of the area?</i>
Health and Safety	- <i>vectors through which human health impacts could be caused eg will there be risks of death, disease, discomfort or nuisance?</i>

Accordingly, the scope of this assessment is made with respect to these topic areas and considers the effects of the construction, operation and decommissioning of the wind farm development in terms of how the proposal could affect population and settlement, economic activity, employment, land use, amenities and tourism, and health and safety.

5.1.1.2 Tourism and Amenities

Tourism and amenity impacts are interrelated with effects on landscape and visual amenity, archaeology and heritage interests, and transport. Each of these effects are addressed in other chapters of this EIAR and reference should therefore be made to Chapter 12 Landscape and Visual, Chapter 13 Cultural Heritage and Chapter 15 Material Assets.

While reference is made to these effects where relevant, this chapter does not re-evaluate these assessments. The focus of this assessment is primarily on physical disruption, severance or exclusion of users' ability to continue existing activities or deter additional further development of amenities and tourism potential.

5.1.1.3 Human Health

The European Commission document 'Guidance on the preparation of the Environmental Impact Assessment Report, 2017; provides that: *"Human health is a very broad factor that would be highly Project dependent. The notion of human health should be considered in the context of the other factors in Article 3(1) of the EIA Directive and thus environmentally related health issues (such as health effects caused by the release of toxic substances to the environment, health risks arising from major hazards associated with the Project, effects caused by changes in disease vectors caused by the Project, changes in living conditions, effects on vulnerable groups, exposure to traffic noise or air pollutants) are obvious aspects to study. In addition, these would concern the commissioning, operation, and decommissioning of a Project in relation to workers on the Project and surrounding population"*.

Similarly, the 2017 Draft Guidelines on the information to be contained in environmental impact assessment reports, published by the EPA, states that *'in an EIAR, the assessment of impacts on population & human health should refer to the assessments of those factors under which human health effects might occur, as addressed elsewhere in the EIAR e.g. under the environmental factors of air, water, soil etc'*.

The EPA guidance also advises that *'The evaluation of effects on these pathways is carried out by reference to accepted standards of safety in dose, exposure and risk. These standards are in turn based upon medical and scientific investigation of direct effects on health of the individual substances, effect or risk. This practice of reliance upon limits doses and thresholds for environmental pathways such as air water or soil provides a robust and reliable health protection criteria for analysis relating to the environment'*.

Human health, in this chapter of the EIAR, is therefore considered in relation to health effects/issues and environmental hazards arising from the other environmental factors and the assessment is made with regard to the established international health-based guidelines limit value necessary to protect the public.

5.1.2 Study Area

The Study Area for the purpose of this assessment on Population and Human Health primarily focuses on the local receiving human environment in the vicinity of the wind farm development, including the nearby access route. These include those who reside, work, visit, or use the local road networks in the general area. Electoral Divisions (EDs) are the smallest legally defined administrative areas in the State for which Small Area Population Statistics (SAPS) are published from the Census. Therefore in order to discuss the receiving human environment and other statistics in the vicinity of the proposed development site, the Study Area for this assessment has regard to Electoral Divisions (EDs) within or located close to the proposed wind farm development site. The extent of the EDs considered for the purposes of this assessment are shown in Figure 5.1 and set out in Table 5.2.

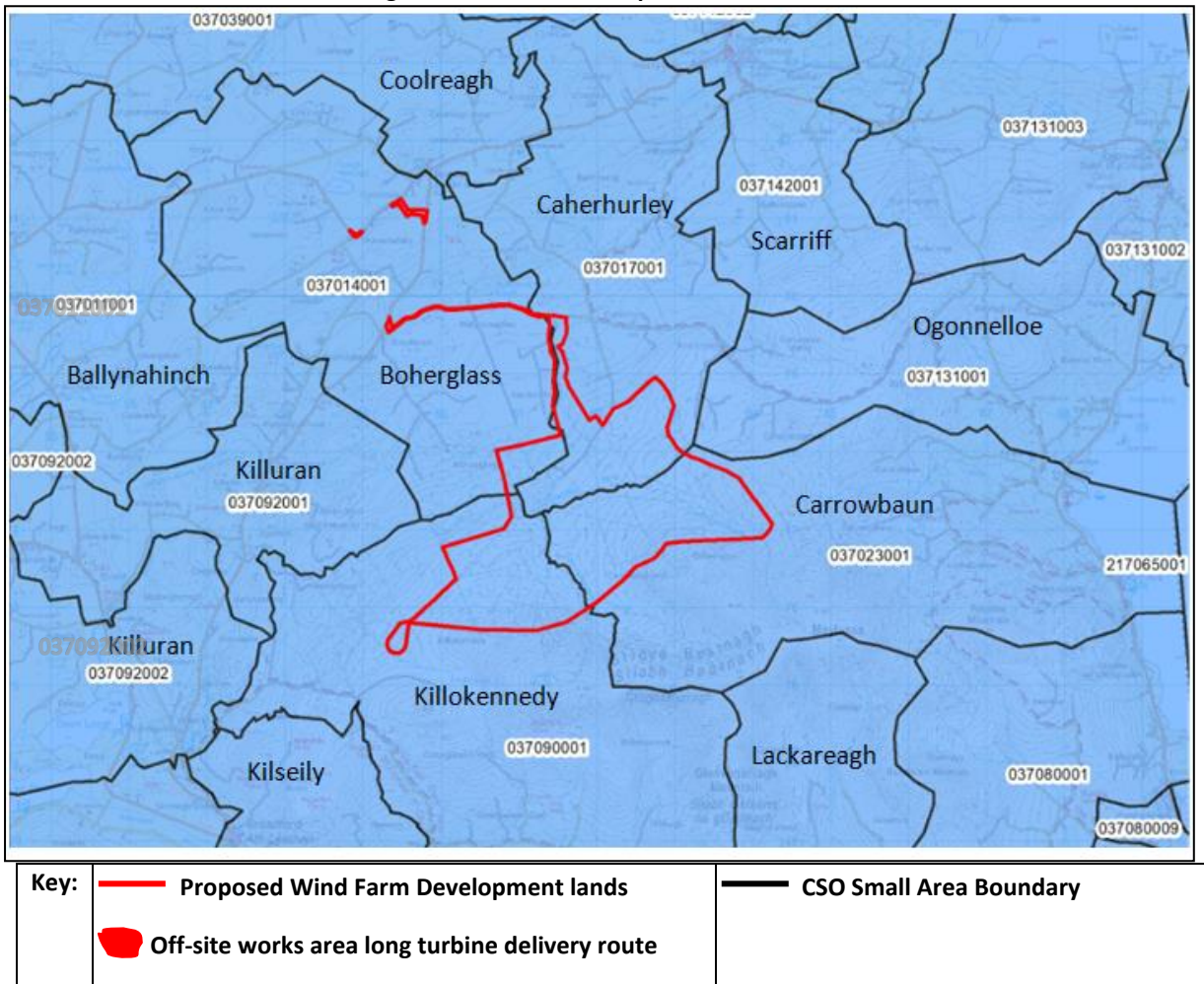
Although, this chapter predominately describes the human environment in the vicinity of the proposed wind farm development, sensitive human receptors in the broader human environment are considered in the other specialised environmental topics including the following;

- Landscape and Visual Assessment;
- Cultural Heritage Assessment; and
- Material Assets (including traffic and transportation; telecommunications and aviation).

The grid route is also considered where relevant in the chapter.

There is a requirement to replant land taken out of forestry to facilitate the wind farm infrastructure. Three replanting areas have been identified and have obtained Technical Approval for Afforestation from the Forest Service. Consideration of the replacement forestry lands in this chapter is made in the context of land-use only.

Figure 5.1 Small Area Population Districts



Source: Adapted from CSO SATMAPS

Table 5.2 Study Area Small Areas and Electoral Divisions

CSO SMALL AREA	Electoral Division
Area Code SA 037039001	Coolreagh
Area Code SA 037014001	Boherglass
Area Code SA 037017001	Caherhurley
Area Code SA 037142001	Scarriff
Area Code SA 037131001	Ogonnelloe
Area Code SA 037023001	Carrowbaun
Area Code SA 037110001	Lackareagh
Area Code SA 037090001	Killokennedy
Area Code SA 037100002	Kilseily
Area Code SA 037092001	Killuran
Area Code SA 037092002	Killuran
Area Code SA 037011001	Ballynahinch

5.1.3 Methodology

The methodology used for this study included desk based research of published information and site visit to assemble information on the local receiving environment. The desk study included the following activities:

- Review of the most recent Census of Ireland data to establish settlement demographics and economic context of the study area.
- Review of Ordnance Survey Mapping and aerial photography to establish existing land use and settlement patterns within the study area.
- Review of local and regional development plans and planning policy in order to identify future development and identify any planning allocations within the study area.
- Review of Clare Council's Planning Register to identify relevant development proposals currently under consideration by the Council.
- Review of planning policy and strategies to identify Core Paths, walking and cycling routes and other Rights of Ways within the study area.
- Review of tourism data including, Tourism Ireland, Failte Ireland, Visit Clare and local websites to identify tourism data and visitor attractions within the study area.

The desk based research also had regard to published information on public health and wind turbines including:

- Irish Health Service Executive (HSE) Position paper on wind turbines and public health, 2017
- WHO Regional Office for Europe, Night noise guidelines for Europe,
- Health Impacts of Wind Turbine Noise. The Public Health Wales Position Statement (2013)
- Australian Government National Health and Medical Research Council (NHMRC) Statement: Evidence on Wind farms and Human Health (2015)
- The Potential Health Impact of Wind Turbines. Chief Medical Officer of Health (CMOH) Report (Ontario).2010
- Wind Turbine Health Impact Study: Report of Independent Expert Panel. January 2012. Prepared for: Massachusetts Department of Environmental Protection, Massachusetts Department of Public Health

Site visits were undertaken in order to supplement the desk studies and establish an understanding of land use patterns, tourism and recreational resources within the vicinity of the Development. The site visit considered the Development application boundary and the surrounding area. The field survey was used to verify and refine the findings of the desk study including highlighting more sensitive land uses in the area

5.1.3.1 Public Consultation

As the planned open evening in Scarriff was unable to happen due to COVID-19 public health restrictions, a virtual open event was organised. This event enabled the public to examine many aspects of the project in detail and then revert to the project team with any questions, comments or suggestions they had. Refer to the Community Report in **Volume III, Appendix 5-1**.

5.1.4 Assessment Criteria

Determination of the significance of an effect will be made in accordance with the terminology outlined in EPA *Draft Guidelines on Information to be contained in environmental impact assessment reports (2017)* as set out in **Table 5-3** below.

Table 5-3 Impact Assessment Criteria

Quality of Effects	Positive	A change which improves the quality of the environment
	Neutral	No effects or effects that are imperceptible, within normal bounds of variation or within the margin of forecasting error
	Negative /adverse	A change which reduces the quality of the environment
Significance of Effects	Imperceptible	An effect capable of measurement but without significant consequence
	Not significant	An effect which causes noticeable changes in the character of the environment but without significant consequences
	Slight	An effect which causes noticeable changes in the character of the environment without affecting its sensitivities
	Moderate	An effect that alters the character of the environment in a manner that is consistent with existing and emerging baseline trends
	Significant	An effect which, by its character, magnitude duration or intensity alters a sensitive aspect of the environment
	Very Significant	An effect which, by its character, magnitude duration or intensity alters most of a sensitive aspect of the environment
	Profound	An impact which obliterates sensitive characteristics
Duration of Effect	Momentary	Effects lasting from seconds to minutes
	Brief	Effects lasting less than a day
	Temporary	Effects lasting less than a year
	Short-term	Effects lasting one to seven years
	Medium-term	Effects lasting seven to fifteen years
	Long-term	Effects lasting fifteen to sixty years
	Permanent	Effects lasting over sixty years
	Reversible	Effects than can be undone e.g. through remediation or restoration
	Frequency	How often the effect will occur. (once, rarely, occasionally, frequently, constantly – or hourly, daily, weekly, monthly, annually)
Types of Effects	Indirect	Impacts on the environment, which are not a direct result of the project, often produced away from the project site or because of a complex pathway
	Cumulative	The addition of many minor or significant effects, including effects of other projects, to create larger, more significant effect
	‘Do Nothing’	The environment as it would be in the future should the subject project not be carried out.
	‘Worst case’	The effects arising from a project in the case where mitigation measures substantially fail.
	Indeterminable	When the full consequences of a change in the environment cannot be described
	Irreversible	When the character, distinctiveness, diversity or reproductive capacity of an environment is permanently lost.
	Residual	The degree of environmental change that will occur after the proposed mitigation measures have taken effect.
	Synergistic	Where the resultant effect is of greater significance than the sum of its constituents, (e.g. combination of SOx and NOx to produce smog).

Source: EPA *Draft Guidelines on Information to be contained in environmental impact assessment reports (2017)*

5.2 EXISTING RECEIVING ENVIRONMENT

5.2.1 Project Location

Situated in East Clare close to the Clare–Tipperary border, the site of the proposed wind farm development is located on the north western slopes of Slieve Bernagh Mountain. Lands in the portion of the Project Area proposed for wind turbine development occupy parts of the townlands of Ballydonaghan, Caherhurly, Coumnagun, Carrownagowan, Kilbane, Killokennedy, and Inchlughoge, in County Clare. Lands where works are required for the turbine delivery include Ballydonaghan, Drummod and Coolready.

The grid connection will be installed along a series of public road networks between the wind farm site and the existing substation in Ardnacrushna, passing through the townlands of Cloongaheen West, Cloongaheen East, Killeagy, Ballymoloney, Ballyquin Beg, Ballyquin More, Springmount, Leitrim, Fahy More South, Aharinaghmore, Tooreen, Cloghera, Trough, Knockdonagh, Roo West, and Lakyle.

As outlined in Chapter 2, the three sites for replacement forestry are located in Ballard, Co. Wicklow, Trillackacurry, Co. Longford and in Cooraclare, Co. Clare, and these have received approval from the Forest Service. The lands at Ballard are situated c. 1.3km west of Ballinaclash and approximately 4.4km southwest of Rathdrum. The Ballard site is an old Christmas tree farm that has been fully harvested and never replanted. The Trillackacurry site is situated c. 3.6km to the south of Longford town and is planted. The replacement lands in Co. Clare are located approximately 2km west of Cooraclare town, are considered modified and dominated by grassland.

5.2.2 Settlement Patterns

Settlement patterns in the greater region range from very large urban centres, to small community settlements, to relatively isolated farmsteads

The city of Limerick (population 94,192, CSO 2016) approximately 20km to the south, and the towns of Ennis (population 25,276, CSO 2016) approximately 27km to the west and Nenagh (population 8,968, CSO 2016) approximately 25km to the east are the largest urban centres relative to the site of the proposed wind farm and are the major service and employment centres in the region.

Smaller population centres in the the general locality are the towns of Scarriff, Killaloe/Ballina, and Tulla, and the villages of Bodyke, Broadford, O'Callaghan Mills, Tuamgraney and Kilkishen. These towns and small villages provide a range of local community facilities, including primary schools, sporting clubs, churches, general shops and post offices.

The nearest urban settlements to the site of the proposed wind farm is the town of Killaloe/Ballina approximately 7km to the south east, and the villages of Bodyke approximately 2.5 km to the north and Broadford approximately 4 km to the southwest.

Figure 5.2 Principal Towns/villages in the Area

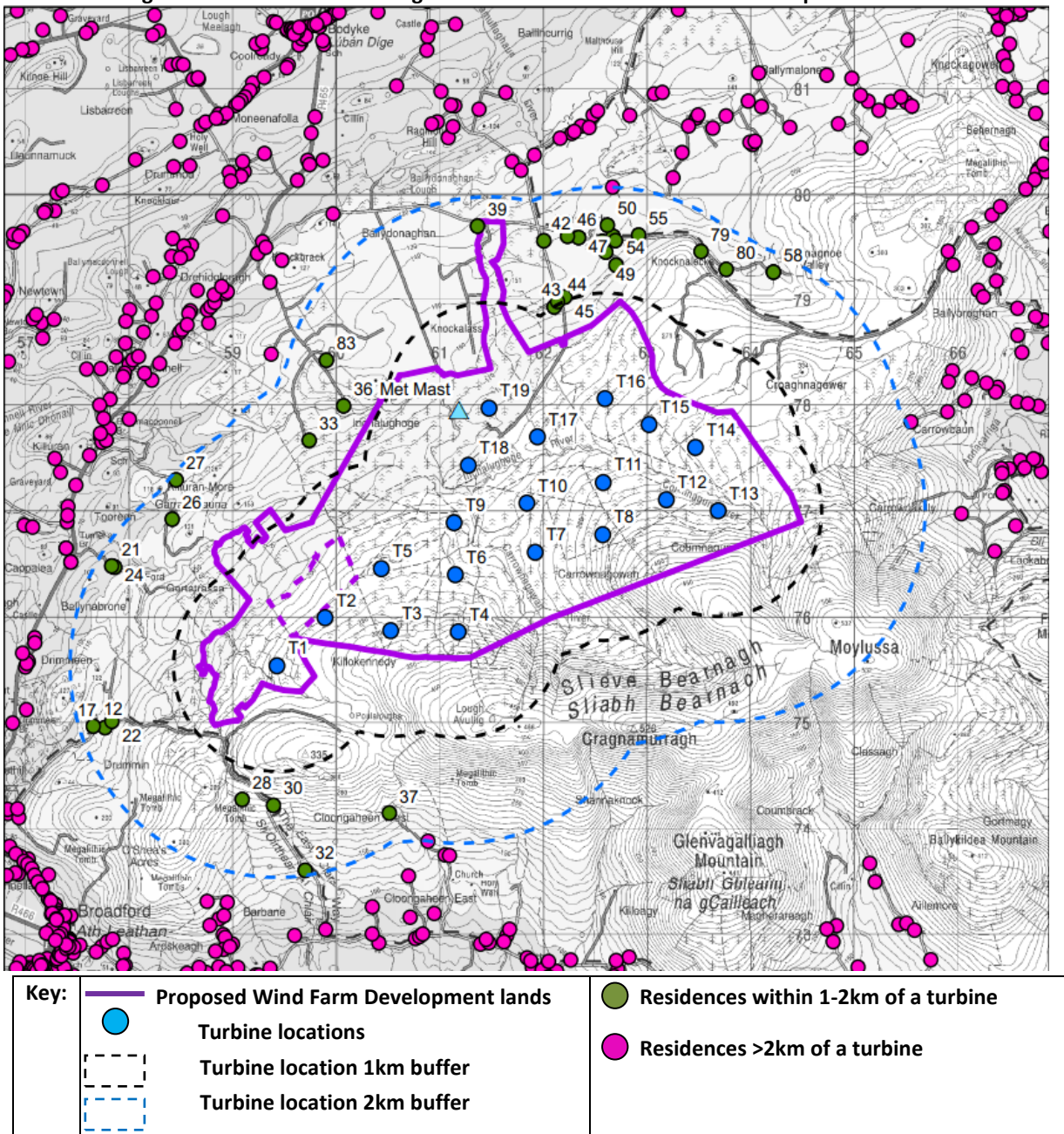


Source: Adapted from CSO SATMAPS

The Project Area for the wind turbine development is located in a rural, lightly populated area. Settlement patterns typically comprise farmsteads and one-off residential dwellings distributed along the local and regional road networks that encompass the site and serve the area. Housing and settlement located in the vicinity of the proposed wind farm development lands is highlighted in Figure 5.3.

There are no occupied residential dwellings within the development site boundary. There are 3 residences (only one of which is occupied) approximately 1km of the nearest proximal wind turbine and approximately 30 residential dwellings within approximately 1-2km of the site.

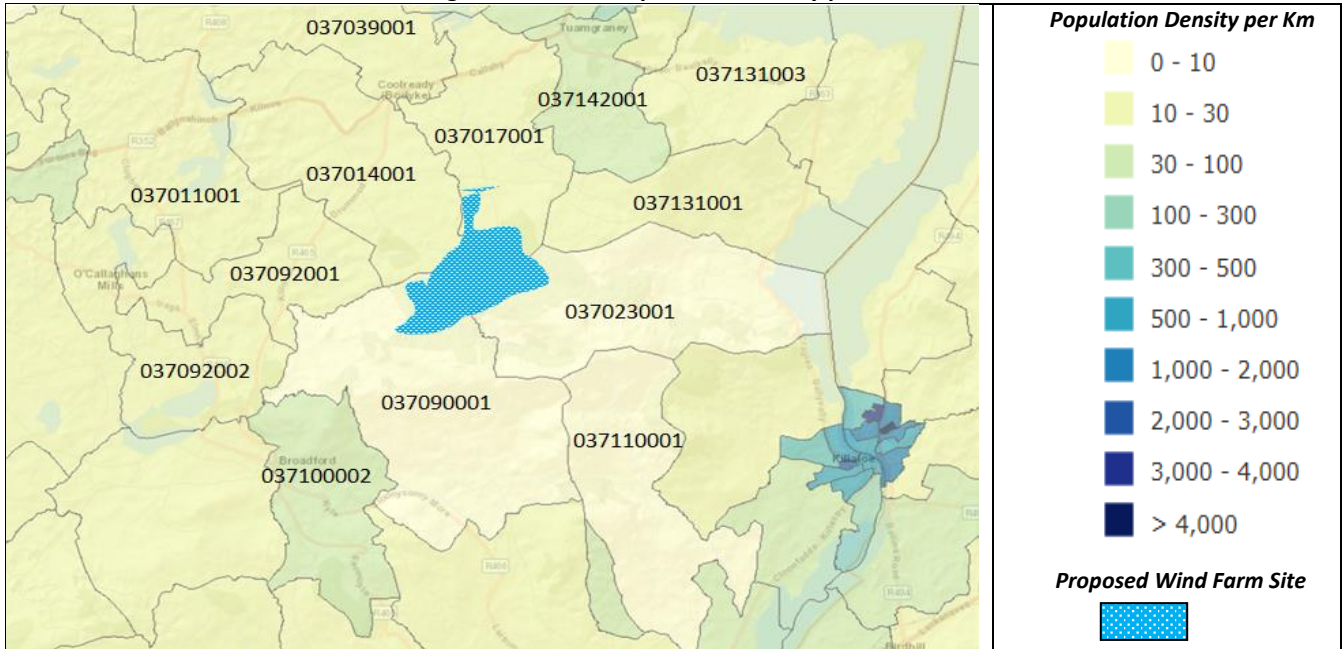
Figure 5.3 Residential Dwellings within 1-2km of the wind farm development lands



5.2.3 Population Density

The 2016 census of population provides population statistic for small geographical areas and electoral divisions. A review of this data shows that while the recorded population density across the Study Area varies between the electoral divisions, the overall region is moderately populated. Population densities outside of the main urban centres and larger towns in the area range from approximately 6 persons per km² to 34 persons per km².

Figure 5.4 Local Population Density per Km



Source: Adapted from CSO SATMAPS

Table 5.4 Small Area Population Statistics

CSO SMALL AREA	Electoral Division	Total number of houses	Total population	Population Density per km2
Area Code SA 037039001	Coolreagh	128	188	12.9
Area Code SA 037014001	Boherglass	123	282	16.6
Area Code SA 037017001	Caherhurley	77	199	14.6
Area Code SA 037142001	Scarriff	119	257	34.6
Area Code SA 037131001	Ogonnelloe	106	226	17.7
Area Code SA 037023001	Carrowbaun	87	116	5.9
Area Code SA 037110001	Lackareagh	52	134	8.7
Area Code SA 037090001	Killokennedy	58	143	5.9
Area Code SA 037100002	Kilseily	137	369	33
Area Code SA 037092001	Killuran	98	188	20
Area Code SA 037092002	Killuran	92	225	16.7
Area Code SA 037011001	Ballynahinch	120	261	13.2

Source: Census of Population 2016 - Small Area Population Statistics (SAPS)

5.2.4 Population Trends

The available data on population trends indicates that while some Electoral Divisions had minor increases in population numbers between 2011 and 2016, other areas are experiencing a population decline. Table 5.6 below shows that almost all areas experienced a rise in population in the period 2006-2011 with the exception of Scarriff ED, Carrowbaun ED and Ballynahinch ED which had population declines of -1.4%, -23.7% and -1.5% respectively. For the period 2011-2016 the data shows

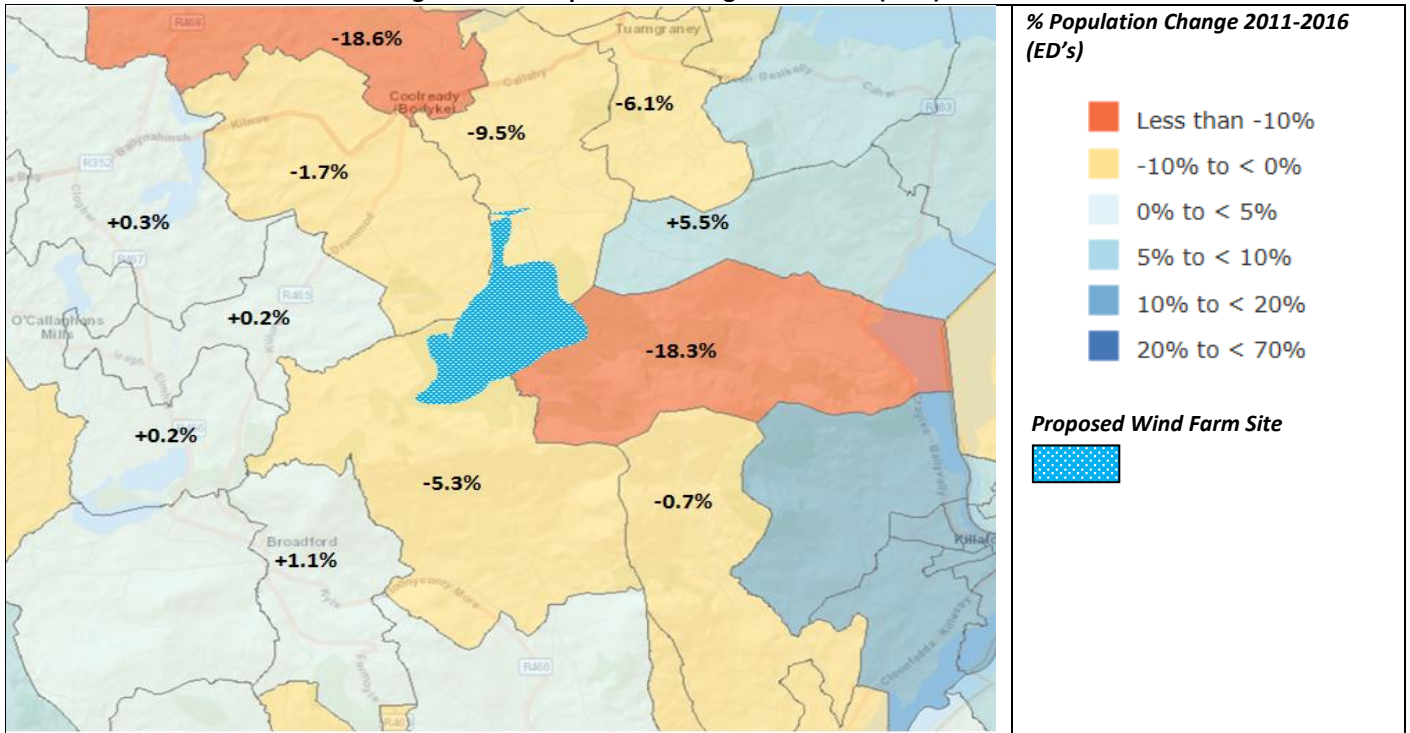
that Scarriff ED and Carrowbaun ED continue to have population decreases while population numbers in Ogonnelloe ED continue to increase.

Table 5.5 Population Trends

CSO SMALL AREA	Electoral Division	% Change in Population 2006 - 2011	% Change in Population 2011-2016
Area Code SA 037039001	Coolreagh	+ 23.6%	- 18%
Area Code SA 037014001	Boherglass	+ 29.4%	- 1.7%
Area Code SA 037017001	Caherhurley	+ 5.8 %	- 9.5%
Area Code SA 037142001	Scarriff	- 1.4%	- 6.1%
Area Code SA 037131001	Ogonnelloe	+ 21.3%	+ 5.5%
Area Code SA 037023001	Carrowbaun	- 23.7%	- 18.3%
Area Code SA 037110001	Lackareagh	+ 17.5%	- 0.74%
Area Code SA 037090001	Killokennedy	+ 5.9%	- 5.3%
Area Code SA 037100002	Kilseily	+12.1%	+ 1.1%
Area Code SA 037092001	Killuran	+ 4.5%	+ 0.2%
Area Code SA 037092002	Killuran	+ 4.5%	+ 0.24 %
Area Code SA 037011001	Ballynahinch	- 1.5%	+ 0.38%

Source: Census of Population 2016 - Small Area Population Statistics (SAPS)

Figure 5.5 % Population Change 2011-2016 (ED's)



Source: Adapted from CSO SATMAPS

5.2.5 Economic Activity

According to the 2016 census of population employment statistics for the region, the work force is employed in a diverse range of industries. The statistics show that the highest level of employment is within the Public admin/Professional services category with approximately 45% of the workforce within the Study Area employed in this category. Other key employment sectors include Commerce and Trade (16%), Agricultural (15%) and Manufacturing Industries (10%).

A review of the 2016 commuter flow data suggests that while the majority of the workforce work outside of the area in which they live, there is a level of local employment in the locality with approximately 35% of commuters travelling into the area to work.

The larger urban centres are the principal employment centres for the area. These towns provide employment in the retail, services and professional sectors.

Table 5.6 Small Area Population Employment Statistics - % Persons at Work by Industry 2016

CSO SMALL AREA CODE	Electoral Division	% of Workers					
		Agriculture, forestry, fishing	Building and construction	Manufacturing industries	Commerce and trade	Transport / Communication	Public admin/ Professional Services
SA 037039001	Coolreagh	18.1 %	13.3%	8.4%	15.7%	7.2%	37.3%
SA 037014001	Boherglass	12%	10.4%	12.8%	10.4%	12.8%	41.6%
SA 037017001	Caherhurley	20.5%	2.7%	8.2%	15.1%	1.4%	52.1%
SA 037142001	Scarriff	6.7%	8.7%	15.4%	10.6%	2.9%	55.7%
SA 037131001	Ogonnelloe	11.9%	3.6%	9.5%	20.2%	4.8%	50%
SA 037023001	Carrowbaun	10.3%	5.2%	5.2%	25.9%	1.7%	51.7%
SA 037110001	Lackareagh	16.4%	8.2%	1.6%	24.6%	1.6%	47.6%
SA 037090001	Killokennedy	19.4%	9.7%	12.9%	14.5%	8.1%	35.4%
SA 037100002	Kilseily	8.8%	7.4%	16.2%	15.3%	4.7%	47.6%
SA 037092001	Killuran	18.7%	7.7%	14.3%	12.1%	3.3%	43.9%
SA 037092002	Killuran	14.8%	10.2%	10.2%	21.3%	6.5%	37%
SA 037011001	Ballynahinch	21.4%	4.5%	9.8%	11.6%	5.4%	47.3%

Source: Census of Population 2016 - Small Area Population Statistics (SAPS)

Table 5.7 Commuter flows by Electoral Division (ED), 2016

CSO SMALL AREA CODE	Electoral Division (ED)	COMMUTER FLOWS (No's of Persons)		
		Inward Commuters	Outward Commuters	Net Flow
SA 037039001	Coolreagh	17	35	-18
SA 037014001	Boherglass	16	77	-61
SA 037017001	Caherhurley	5	43	-38
SA 037142001	Scarriff	336	213	123
SA 037131001	Ogonnelloe	27	187	-155
SA 037023001	Carrowbaun	17	34	-17
SA 037110001	Lackareagh	0	36	-36
SA 037090001	Killokennedy	4	36	-32
SA 037100002	Kilseily	33	195	-162
SA 037092001/2002	Killuran	10	131	-121
SA 037011001	Ballynahinch	52	65	-13

5.2.6 Land Uses

The proposed wind farm development lands are located predominately within existing commercial conifer forestry that is owned and managed by Coillte, the Irish State Forestry Board, for timber production. The surrounding land use is a mixture of rural farm land and low density residential settlement. The area is well served by a network of local roads and there is already a substantial network of existing forestry roads providing access in and around the Coillte site. A section of public road, the L-8218 Local road, also passes through the forestry site.

There are currently no defined recreational land-uses within or associated with the plantation. Coillte do however grant limited recreational permits/licences for seasonal hunting activities within the plantation.

The nearest forestry lands offering general public recreational amenities are situated on Crag Hill on the lower slopes of the Slieve Bernagh Mountains overlooking Lough Derg. There are 3 way marked trails in this forest – one is a moderate looped walk called the Crag Wood Walk and this trailhead also gives access onto the East Clare Way. A new trail was constructed in 2016 which allows visitors to access Moylussa, the highest point in county Clare.

The land-use along the grid connection comprises mainly transport, and surrounding land use is mainly agriculture and residential.

The lands at Ballard are situated c. 1.3km west of Ballinaclash and approximately 4.4km southwest of Rathdrum. The Ballard site is an old Christmas tree farm that has been fully harvested and never replanted. The Trillackacurry site is situated c. 3.6km to the south of Longford town and is now planted. The replacement lands in Co. Clare are located approximately 2km west of Cooraclare town, are considered modified and dominated by grassland.

5.2.7 Tourism and Amenities

The tourism and hospitality industry in Ireland is one of the major contributors to the national economy and makes a significant contribution to the vitality and sustainability of a wide variety of local enterprises, particularly in rural areas. In 2018, the most current available data from Tourism Ireland, shows that this industry generated approximately €5.2 billion in revenue and supported over 300,000 jobs. (<https://www.tourismireland.com/Research/Visitor-Facts-Figures>)

County Clare is one of the leading tourist counties in Ireland and has an abundance of tourism resources, including natural and cultural attractions. It is evident from a review of various tourism websites that the East Clare area has a substantial tourism offering including activity tourism, specialised tourism, traditional music and cultural heritage.

While there are no tourist attractions pertaining specifically to the site of the proposed wind farm development, there are a number of recreational and cultural amenities in the wider area.

The East Clare Golf Club is located in close proximity to Bodyke village and is a significant recreation and tourism amenity in the area.

The Scarriff Harbour Festival, which takes place annually during the August Bank Holiday weekend attracts a significant number of visitors to the area each year.

Lough Derg, a significant waterbody on the River Shannon, lies approximately 4.2km to the east of the site and provides all kinds of water sport facilities, including cruising, windsurfing, sail boarding, canoeing and game and coarse angling.

Holy Island (Inis Cealtra), on Lough Derg is one of the most famous monastic sites in Ireland and a significant cultural tourism asset.

There are also numerous walks, cycle trails and pony trekking trails in the area. The Ballycuggaran - Crag Wood Walk is located approximately 2.7 kilometres, to the east of the wind farm site and includes a trail to Moylussa.

The **East Clare Way** is a long-distance trail and is designated as a National Waymarked Trail by the National Trails Office of the Irish Sports Council. It is a 180-kilometre (112-mile) long circular route that begins and ends in Killaloe. The circular route explores the hills and lakes to the west of Lough Derg and takes in the towns and villages of Kilbane, Broadford, O'Callaghans Mills, Tulla, Feakle, Flagmount, Mountshannon and Scarriff.¹ The northern sections of the trail cross the Slieve Aughty Mountains. The East Clare Way passes in close proximity to the north, east and south of the site and runs along local roads. The trail runs immediately north of the site along the local road at Caherhurly, some 1.5m kilometres north of the nearest turbine at its closest point. To the southwest, the trail runs approximately 0.8 kilometres from the nearest turbine.

To the southeast of the site, approximately 8.6 kilometres at its closest point, there are several trails known as the 12 o' clock hills looped walks which provide access to the hills of Knockanuarha. These are mainly trails in coniferous woodland. To the Southwest, the Silvermines and Keeper's hill are popular recreation areas, as is the Lough Graney area to the northwest.

Other waymarked trails include the Lough Derg Way and cycle route, and Lough Derg drive in Co. Tipperary and the Arra Mountains Loop. The Lough Derg Way extends 68 kilometres from Limerick City to Dromineer in Co. Tipperary, and passes through Clonlara and O' Briensbridge to the south of the site, and through Killaloe and north through the Arra Mountains to Castletown, and Dromineer, on the eastern shore of Lough Derg. At its closest point the trail is located approximately 7.7 kilometres from the nearest turbine.

As well as visitor attractions and resources which support outdoor recreational activity there are a range of services which cater to tourists and visitors such as hotels, bed & breakfasts and caravan parks. Such facilities are present in many of the settlements in the surrounding area including Scariff, Mountshannon and Killaloe .

5.2.8 Public Health

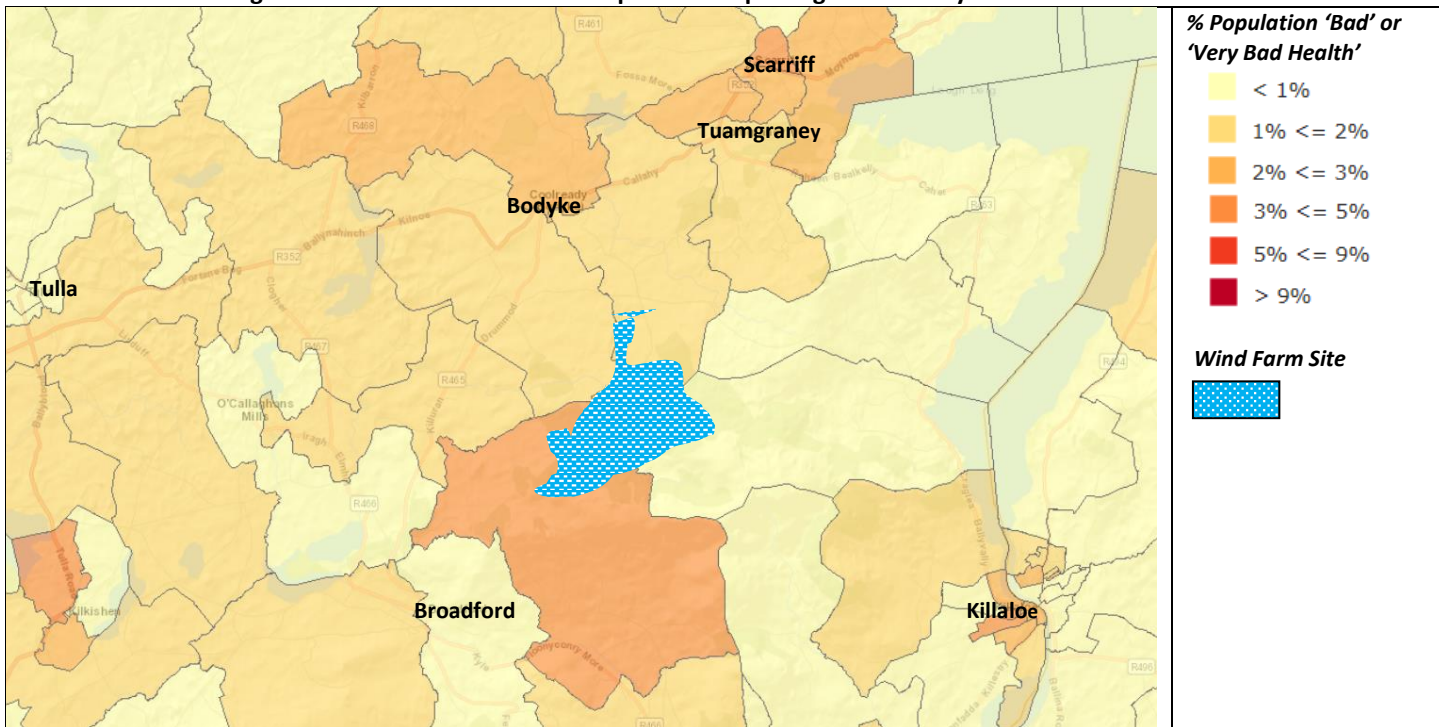
The 2016 Census also provided information on the general health profile of the population for each small area. The statistic show that overall the local population has good health with only between 1-3% of the proportion of the population in the Study Area reporting to have 'bad' or 'very bad' health.

Table 5.8 Health Statistics - %Population Reporting Bad or Very Bad- Health

CSO SMALL AREA	Electoral Division	Total population	% Bad or Very Bad Health
Area Code SA 037039001	Coolreagh	188	2.1%
Area Code SA 037014001	Boherglass	282	2.1%
Area Code SA 037017001	Caherhurley	199	1.5%
Area Code SA 037142001	Scarriff	257	2.6%
Area Code SA 037131001	Ogonnelloe	226	0.8%
Area Code SA 037023001	Carrowbaun	116	0.9%
Area Code SA 037110001	Lackareagh	134	1.5%
Area Code SA 037090001	Killokennedy	143	3.5%
Area Code SA 037100002	Kilseily	369	1.2%
Area Code SA 037092001	Killuran	188	1.0%
Area Code SA 037092002	Killuran	225	0.9%
Area Code SA037011001	Ballynahinch	261	1.1%

Source: Census of Population 2016 - Small Area Population Statistics (SAPS)

Figure 5.6 Health Statistics - %Population Reporting Bad or Very Bad- Health



Source: Adapted from Airo Census 2016 viewer

5.3 LIKELY SIGNIFICANT EFFECTS

5.3.1 Population and Settlement

The project is unlikely to have a significant effect on population numbers of the area. There will be no loss of residential dwellings and therefore there will be no displacement of the existing population. There will be no mass in-migration associated with the development.

It is expected that construction personnel will primarily be local to the region. A minor number of key employees involved in the construction, may decide however to temporarily re-locate to the area in the short-medium term. During the operational phase of the wind farm, it is envisaged that any operators and maintenance personnel will be sourced locally. Overall, throughout construction, operation, and decommissioning, it is expected that the development will have a neutral impact on population numbers.

During operation, the wind farm development would however bring added benefit to the local community through the provision of a community benefit fund. This fund would assist local communities to enhance and/or maintain a range of amenities and services for residents in the local towns, villages and surrounding hinterland, which in turn would help sustain existing population levels in the area. Two important areas of Government policy development are nearing completion which will have a bearing on the establishment of future community benefit funds, the updated Wind Energy Development Guidelines and the Renewable Energy Support Scheme (RESS). Both sets of policy will provide the Government requirements on future community benefit funds for renewable energy projects. Coillte's approach to community benefit is fully outlined in the Community Report included as Appendix 5-1 of Volume III and described in the Mitigation section below.

5.3.2 Economic Activity

It is not likely that the wind farm project would directly or indirectly result in any reduction in existing economic activity of the area during any phase of the development.

During the construction phase aggregates and concrete supply for road construction and foundations will be obtained from local quarries and suppliers, supporting the local economy. There is also potential economic opportunities for local companies and businesses to provide a ranges of services including catering, accommodation and plant hire.

During the operation of the wind farm, there is no known specific direct or indirect economic development likely to result from the proposed project.

Overall, it is considered that the proposal would have a positive temporary impact on economic activity during the construction phase and a neutral effect during operational and decommissioning stages.

5.3.3 Employment

In the construction phase, it is envisioned that resources and labour will be sourced in the region where possible. It is estimated that the construction phase will take approximately 18 months and

may employ approximately up to 100 persons, which will have a positive, if short-term, impact on employment. In the long-term, the development will generate full-time employment for two persons during its operational phase.

5.3.4 Land-use

All new development proposals have the potential to effect the local area character and human environment by introducing a new incompatible land use activity which could result in physical disruption, severance or exclusion of users ability to continue existing activities or the sterilisation of lands thus preventing any additional further land-use potential.

During construction there will be a level of effect on existing land-uses within the development site. Existing forestry activities and harvesting within the plantation will cease for the duration of the construction works. Hunting and public access within the plantation will also be prohibited during construction and decommissioning. Usage of the section of public road, the L-8218 Local road, which passes through the site will be restricted during construction. Similarly, during decommissioning there will be restrictions on public access within the site. Outside of the development footprint, it is not envisioned that land use activities would be adversely impacted.

Once operational, conventional felling and forestry activities will resume and continue to take place at the site independent of the wind farm proposal. Only a relatively small area of commercial forestry, approximately 0.3% of the forestry resource in the area locally, will be permanently displaced in the footprint of the wind farm infrastructure. This loss of land use would not be significant.

Also there will be no severance, loss of rights of way or public amenities during the operational phase. It is likely that the improvements to the on-site forestry tracks would provide opportunities for further development and use of some the forest areas for recreation. Therefore no significant negative effects on potential recreational use.

In terms of impacts to neighbouring lands and land-uses it is considered that the wind farm development does not pose a significant risk to either existing or future land-uses. All existing land-use practices can co-exist with the proposed wind farm.

The land-use along the grid connection comprises mainly transport, and surrounding land use is mainly agriculture and residential. The grid connection construction works, estimated to be 10 months, will require a road opening licence and temporary traffic management measures along the grid route, including alternating one-way stop/go traffic and temporary road closures with local diversion routes. This will result in disruption to existing traffic and access for local landowners and property owners/residents in the vicinity of the route.

The active construction area for the grid connection will be small, ranging from 100 to 200 metres in length at any one time, and it will be transient in nature as it moves along the route. The grid connection construction works will therefore have a temporary moderate short-term negative impact for road users and local landowners and property owners/residents in the vicinity of the route. Once in place, the grid connection will not affect existing or further land uses.

Overall, it is considered that during the construction phase there is likely to be a slight to moderate negative impact on land use within the wind farm site and along the grid connection route. Similarly,

during decommissioning there is likely to be temporary disruptions to land-uses and access. Impacts would be temporary and not significant. During operation it is considered that the wind farm development would have a neutral impact on land-uses.

The requirement to replant land taken out of forestry would be an indirect impact of the proposed development. The total replanting requirement for the proposed development is c.72ha. Each of the proposed replanting sites are located within a rural, working landscape in which agriculture and forestry form the primary land-uses. The proposed replanting sites are in private ownership and there will be no severance, loss of rights of way or public amenities due to afforestation of these lands.

5.3.5 Tourism and Amenities

While tourism has become a major economic driver in East Clare, no significant economic benefits of this industry are directly associated with the proposed development lands. The development site is not currently used as a forest park or recreation site. There are no picnic facilities near the site or any direct tourist attractions or services at the site.

Given that there are currently no tourism attractions specifically pertaining to the proposed development site there are no direct impacts associated with the construction phase of the proposed wind farm development.

The construction of the grid connection cable from the wind farm site will travel southwards along the L8218 and then eastwards along the L30302 to the village of Kilbane. This section of the grid route is part of the East Clare way designated walking route. Therefore this section, approximately 4km, of the East Clare walking trail will be effected during the grid construction and access will be temporarily restricted. This will be a slight to moderate adverse temporary impact on this amenity.

The location of the wind farm development away from major tourist attractions will ensure that visitors are not directly impeded from the larger area during the operational phase. However, a range of attractions are present in the wider area from which the development may be visible. This includes sites of historical, cultural or natural interest as well as sites or linear routes which support a diverse range of outdoor recreational activities including walking, cycling and fishing.

Chapter 12 describes the assessment of landscape and visual impacts. Overall this assessment concluded that the wind farm development will have a moderate visual effect. While visual perception is largely subjective, it is considered based on that assessment in terms of both the overall impact on landscape character and the nature and extent of visual effects that the wind farm would be unlikely to have a significant, negative impact on the existing or future tourism potential of the area.

5.3.6 Health and Safety

5.3.6.1 Safety

While there is the potential for construction related hazards, serious risks to human health and safety are not envisioned. During construction and decommissioning the site will be managed in accordance with the following safety and health regulations and guidelines which will ensure a high standard of safety both for workers on site and the general public.

- Safety, Health & Welfare at Work (Construction) Regulations 2013;
- Safety, Health & Welfare at Work Act 2005;
- Safety, Health & Welfare at Work (General Applications) Regulations 2007 to 2016; and
- Irish Wind Energy Association Best Practice Guidelines.

If blasting is required it will be done in accordance with a site specific blasting plan. Pre-notification signs and warnings to any potentially affected landowners will be undertaken.

A Safety and Health Plan covering all aspects of the construction process will be prepared in advance of construction and will comprehensively deal with safety and health related issues.

Under normal conditions, access to the site and turbines is very safe for people and animals. It is not anticipated that the workings of the turbines will present any danger to the public.

The rigorous safety checks imposed on the turbines during design, construction, commissioning and operation ensures the risks to humans are negligible. The safety and health record of the wind energy industry worldwide is exceptionally good.

During the operational phase, potential electrical risks are associated with turbine transformers, switches and cabling. It is not envisioned that these will however pose any significant risk as these will fully meet health and safety regulations relating to high voltages.

Access to the turbines and the substation will be controlled during operation to ensure the public are restricted for their safety. The substation will be surrounded by a 2.5m steel palisade fence.

Blades can potentially fail through damage sustained in severe weather mainly through lightning strike or due to inadequate upkeep and maintenance. This is extremely rare and the developer undertakes to operate and maintain all plant safely and in good working order on the site. Modern wind turbine design incorporates a fail-safe mechanism that comes into play under extreme weather conditions. This mechanism causes the turbines to automatically shut down in periods of excessively high wind-speeds. The separation distances of turbines from public roads and residences are well beyond fall over distances that would present a risk of significant accidents.

Overall, it is not expected that the Project will result in significant effects resulting in the risk of major accidents and disasters, nor is the project considered vulnerable to risks of major accidents and disasters.

Overall, the project will have a net benefit on human health in the long term by contributing to the production of clean renewable energy.

5.3.6.2 *Health and Wellbeing*

Construction works and new development not only can pose safety risks but can also give rise to potential impacts on general amenity affecting health and wellbeing. General amenity is to do with the pleasant, amenable qualities of a place as it is used and perceived by the people who reside, frequent or view it. There are a number of general elements that contribute to, or detract from, the amenity of an area. Nuisances such as noise, dust and traffic are potential factors for the devaluation of amenity.

The potential wellbeing and nuisance effects of the proposed wind farm scheme on the local human environment have been identified as follows:

- Dust emissions from construction and decommissioning activities
- Noise emissions during construction activities and operation
- Visual impacts during operation
- Shadow flicker during operation
- Traffic nuisance during construction

Each of these issues has been fully assessed and is documented in other chapters of the EIAR as set out in Table 5.9. These assessments were reviewed to inform this study and it is concluded having regard to these environmental factors, under which human health effects might occur, there will be no significant effects on human health as a result of the project.

Table 5.9 Nuisances issues and relevant assessment

Development Phase	Potential Nuisance / Health & Safety Issue	Addressed In EIAR Chapter
Construction Phase	Noise emissions and vibration	Chapter 10
	Dust emissions	Chapter 14
	Traffic nuisance	Chapter 15
Operational Phase	Noise emissions and vibration	Chapter 10
	Visual impacts	Chapter 12
	Air quality impacts	Chapter 14
	Shadow Flicker nuisance	Chapter 11
Decommissioning	Traffic nuisance	Chapter 15
	Noise emissions and vibration	Chapter 10

Traffic and road usage

Potential impacts on the surrounding road network will arise principally during the construction phase. Peak daily construction traffic is predicted to be 180 no. 2-way HGV movements (90 each way) with the predicted highest peak hourly HGV traffic volumes to be approximately 24 movements per hour. Peak construction traffic would principally occur during turbine base pours and therefore arise on nineteen occasions.

Traffic studies carried out for the proposed development indicate that while the increased traffic volume on the local road network during the construction phase would be substantial, this increase will be well within the carrying capacity of the local road network. However, the existence of additional traffic, especially heavy goods vehicle traffic, associated with the construction phase has the potential for local residents and users of these roadways to experience minor disturbances and/or be inconvenienced on encountering site related traffic.

The grid connection construction works, estimated to be 10 months, will require a road opening licence and temporary traffic management measures along the grid route, including alternating one-way stop/go traffic and temporary road closures with local diversion routes. This will result in disruption to existing traffic and access for local landowners and property owners/residents in the vicinity of the route. The works however will be short term and appropriate traffic control and management systems will be in place to minimise as far as possible traffic disruption to road users.

Once the works are complete, the road will be reinstated. The grid connection construction works will therefore have a temporary moderate short-term negative impact for road users and local landowners and property owners/residents in the vicinity of the route.

Once operational, the wind farm will not generate any negative impacts on traffic in the locality.

Noise:

The HSE position paper 2017 states that “There is no direct evidence that exposure to wind farm noise affects physical or mental health. Similarly, The World Health Organization states that ‘There is no reliable evidence that sounds below the hearing threshold produce physiological or psychological effects’.

While there is no reliable published scientific evidence that demonstrate a direct causal link between people living in proximity to modern wind turbines, the noise they emit and resulting physiological health effects, wind turbine noise can be a source of annoyance for some people.

Chapter 10 of this EIAR considers the effects of noise emitted for the scheme against national guidelines.

The construction phase has the potential to generate noise emissions which could cause disturbance to local noise sensitive areas. The results of the construction noise predictions indicate that noise generated during the construction phase will not exceed the acceptable construction noise limit at any dwelling location, for the duration of the construction phase. The noise assessment proposes recommendations regarding measures of reducing the amount of noise reaching the noise sensitive areas in accordance with *BS528-1:2009, Code of Practice for noise and vibration control on construction*.

During the operational phase, there are two potential sources of noise from wind turbines: mechanical noise from the gearbox or generator and aerodynamic noise from the rotor blades. However, with the advances in the development of commercial wind turbines, mechanical noise has been significantly reduced. In relation to aerodynamic noise, the noise predictions assessment undertaken show that the recommended national guide limits for noise can be achieved at all 3rd party local residential dwellings.

Therefore, considering the separation distance between the wind farm and nearest residential receptors and with adherence to the national guide limits, the local population is unlikely to be experience significant adverse effects from noise.

Shadow Flicker

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.

The HSE position paper 2017 states that, “There is insufficient direct evidence to draw any conclusions on an association between shadow flicker produced by wind farms and health effects. Flashing lights can trigger seizures among people with a rare form of epilepsy called photosensitive epilepsy. The risk of shadow flicker from wind farms triggering a seizure among people with this condition is estimated to be extremely low”.

The development has the potential to give rise to shadow flicker impacts on surrounding dwellings. The modelling undertaken, assumes a worst-case scenario, and has determined that 2 no. properties could theoretically experience potential shadow flicker exceeding threshold values greater than the 30 hours per year or 30 minutes per day guideline limit. Where meteorological conditions and the presence of screening are taken into consideration, the model concludes that the guideline limits will not be exceeded. With the implementation of additional turbine management measures to shut-down operations at critical times the proposed development will not have a significant negative impact on nearby dwellings as a result of shadow flicker. (Refer to Chapter 11 Shadow Flicker for further details.)

Air Quality

It is generally accepted that the proposed development will make a positive contribution to air quality once operational. Notwithstanding this, there is the potential for short-term negative impacts in terms of dust emissions during the construction phase of the development.

Vehicle and fugitive dust emissions would occur primarily during project construction. Dust generated during the construction phase is not likely to significantly affect the local air quality. Given the distances to the nearest sensitive receptors, dust levels will not exceed the recommended TA Luft 350mg/m³/day guide-limit. There is, however, the possibility of nuisance dust occurring in the vicinity of the site entrances and along the local public road which could affect road users. This is considered a temporary minor negative impact and mitigation will be needed.

With the effective implementation of standard dust management measures to control and reduce dust no significant adverse impact, in terms of a community nuisance is likely to occur.

Visual Impacts

A landscape and visual impact assessment was carried out in relation to the proposed development (Refer to Section 12 of this EIAR). A total of 27 viewpoints were used determine the visual presence of the proposed wind farm. From these viewpoints photomontages were prepared and an assessment completed.

Given the size of the turbine structures and their proposed position along an 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 affected and of course public perception.

The proposed Carrownagowan wind turbines will be prominent in some views from very close to the site and will be visible from certain long distance viewpoints. Overall the development will have a moderate visual effect in that the proposed turbines will be immediately apparent and recognisable new elements within the landscape.

5.4 MITIGATION

The potential for significant impacts on the human environment will principally arise during the construction phase from traffic, noise and dust effects and during the operational phase from noise and shadow flicker effect and will need to be addressed. Mitigation in relation to these issues are outlined in their respective Chapters of this EIAR. No additional mitigation is proposed here for those particular aspects.

In relation to the local community, Coillte will fully take into account the updated Wind Energy Development Guidelines and the Renewable Energy Support Scheme (RESS) in terms of a community fund and will build on those in Coillte's approach to community benefit.

Coillte expects that for each megawatt hour (MWh) of electricity produced by the wind farm, the project will contribute €2 into a community fund for the RESS period i.e. first 15 years of operation and €1 per MWh for the remaining lifetime of the wind farm.

If this project is constructed as currently designed, Coillte estimate that a total of approximately 10 million euro will be available in the local area for community funding over the lifetime of the project. The above figure is indicative only and will be dependent on the generation capacity of the wind farm. Refer to section 8.1 in the **Community Report** included as Appendix 5-1 of Volume III and in particular to **Ref 5.35 Community Benefit Fund Framework** as agreed in April 2020.

All Forest Service guidelines and Health and Safety legislation will be adhered to during all forestry-related activities at the proposed replanting lands. The potential for significant negative effects on worker and public health and safety is therefore minimal. No additional mitigation is proposed here.

5.5 RESIDUAL IMPACTS

- With the implementation of mitigation measures, noise nuisances will be kept to a minimum and within acceptable noise limits.
- With the implementation of mitigation measures, shadow flicker effects will be kept to a minimum and within the guide limits on the number of exposure hours per year.
- With the implementation of standard traffic management measures, traffic nuisances will be kept to a minimum.
- With the implementation of mitigation measures, significant health and safety implications are not envisioned.
- With the implementation of standard best management construction activities, dust levels will remain within recommended acceptable guide limits.

5.6 CONCLUSION

As with any development, the construction activities can cause a nuisance 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 concern. 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. With the mitigation measures in place, no significant negative impacts on the local human environment are expected.

There are no predicted major adverse operational impacts associated with the wind farm development as proposed which would significantly negatively impact on local society. The project will produce electricity in an environment-friendly manner thereby avoiding the risk of air pollution and thus risk to human health.

Noise effects are not considered to be significant. The noise assessment shows that the proposed wind farm would be able to operate within the recommended noise limit criteria in the wind energy planning guidelines for all third-party properties not involved in this project and thus will not adversely impact on the quality of life of local residents and the existing relatively tranquil environment in which they live.

Effect of shadow flicker is not considered to be significant. The shadow flicker assessment shows that while there is potential for a number of dwellings within 1.3 km of the turbines to experience shadow flicker effects which exceed the recommended threshold limit of exposure hours per year, the reality of such effect is unlikely.

The operational phase will be managed to minimise the impact on the human environment and the local residents. Should it be required, turbines can be operated in a noise reduced mode at specific wind speeds to ensure that the limit is met at all locations or shut down for periods. Similar in the instances of shadow flicker occurrences, turbines can be programmed to shut down during periods when shadow flicker is predicted to occur. With the mitigation measures in place, no significant negative effects on the human environment are expected.

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 affected and of course public perception.