TOBIN
CONSULTING ENGINEERS
BUILT ON KNOWLEDGE

SPRINGFIELD RENEWABLES LTD.

CASTLEBANNY WIND FARM

VOLUME I - NON-TECHNICAL SUMMARY

CASTLEBANNY WIND FARM

EIAR – NON-TECHNICAL SUMMARY

Document Control Sheet	
Document Reference	10730-NTS-001
Report Status	Final
Report Date	January 2021
Current Revision	A
Client:	Springfield Renewables Limited
Client Address:	Dublin Road, Newtownmountkennedy, Co. Wicklow.
Project Number	10730

Galway Office	Dublin Office	Castlebar Office
Fairgreen House, Fairgreen Road, Galway, H91 AXK8, Ireland. Tel: +353 (0)91 565 211	Block 10-4, Blanchardstown Corporate Park, Dublin 15, D15 X98N, Ireland. Tel: +353 (0)1 803 0406	Market Square, Castlebar, Mayo, F23 Y427, Ireland. Tel: +353 (0)94 902 1401

Revision	Description	Author:	Date	Reviewed By:	Date	Authorised by:	Date
D01	Draft Issue	NOC	10/01/21	JS	10/01/21	JS	10/01/21
A	Final	NOC	27/01/21	RH	27/01/21	JS	27/01/21
TOBIN Consulting Engineers							

ENVIRONMENT I.S. EN ISO 14001:2015 NSAI Certified
HEALTH & SAFETY I.S. ISO 45001:2018 NSAI Certified
QUALITY I.S. EN ISO 9001:2015 NSAI Certified

ACEI ASSOCIATION OF CONSULTING ENGINEERS OF IRELAND

ENGINEERS IRELAND cpd ACCREDITED COMPANY

TABLE OF CONTENTS

1.0 INTRODUCTION 1
1.1 BACKGROUND TO ENVIRONMENTAL IMPACT ASSESSMENT (EIA) 1
1.2 THE APPLICANT 2
1.3 THE NEED FOR THE PROPOSED DEVELOPMENT 2
1.4 SCOPING AND CONSULTATION 3
2.0 DESCRIPTION OF THE PROPOSED DEVELOPMENT 4
2.1 INTRODUCTION 4
2.1.1 The Proposed Site 4
2.1.2 The Proposed Development 5
2.2 PROJECT CONSTRUCTION 6
2.2.1 Construction Schedule 6
2.2.2 Construction Methodologies 7
2.2.3 Environmental Management 7
2.2.4 Surface Water Monitoring during Construction 7
2.2.5 Concrete Deliveries and Pouring 7
2.2.6 Refuelling 8
2.2.7 Dust Suppression 8
2.2.8 Waste Management 8
2.2.9 Vehicle Washing 9
2.2.10 Major Accidents and Natural Disasters 9
2.3 OPERATION AND MAINTENANCE 9
2.4 COMMUNITY BENEFIT PROPOSAL 10
2.5 DECOMMISSIONING 10
2.6 HEALTH AND SAFETY 10
3.0 REASONABLE ALTERNATIVES 11
3.1 INTRODUCTION 11
3.2 DO NOTHING ALTERANTIVE 11
3.3 ALTERNATIVE SITE SELECTION 11
3.4 ALTERNATIVE LAYOUTS/DESIGNS 12
3.5 TURBINE DELIVERY ROUTES 13
3.6 SITE ACCESS 13
3.7 GRID CONNECTION AND SUBSTATION LOCATION 13
3.8 ALTERNATIVE PROCESS 14

3.9 ALTERNATIVE MITIGATIONS 14
4.0 POLICY, PLANNING AND DEVELOPMENT CONTEXT 15
5.0 POPULATION AND HUMAN HEALTH 17
5.1 INTRODUCTION 17
5.2 POPULATION 17
5.2.1 Existing Environment 17
5.2.2 Potential Impacts (Population) 18
5.3 HUMAN HEALTH 20
5.3.1 Existing Environment 20
5.3.2 Potential Impacts 21
5.4 MITIGATION MEASURES (POPULATION AND HUMAN HEALTH) 21
5.5 RESIDUAL IMPACTS (POPULATION AND HUMAN HEALTH) 22
6.0 BIODIVERSITY 23
7.0 ORNITHOLOGY 24
8.0 LAND, SOILS AND GEOLOGY 26
8.1 INTRODUCTION 26
8.2 POTENTIAL EFFECTS 26
8.3 MITIGATION MEASURES 26
8.4 RESIDUAL EFFECTS 27
9.0 HYDROLOGY AND HYDROGEOLOGY 28
9.1 POTENTIAL IMPACTS 28
9.2 MITIGATION MEASURES 29
9.3 RESIDUAL IMPACTS 29
10.0 SHADOW FLICKER 31
11.0 MATERIAL ASSETS – TELECOMMUNICATIONS AND AVIATION 34
11.1 MITIGATION MEASURES 35
11.2 RESIDUAL IMPACTS 35
12.0 NOISE AND VIBRATION 36
13.0 LANDSCAPE AND VISUAL IMPACT 37
13.1 METHODOLOGY 37
13.2 RECEIVING ENVIRONMENT 38
13.3 LANDSCAPE POLICY CONTEXT AND DESIGNATIONS 39
13.4 MITIGATION MEASURES 39
13.5 LANDSCAPE IMPACT ASSESSMENT 40
13.6 VISUAL IMPACT ASSESSMENT 41

13.7 CUMULATIVE IMPACT ASSESSMENT 42
13.8 CONCLUSION 42
14.0 AIR QUALITY AND CLIMATE 43
14.1 POTENTIAL IMPACT 44
14.2 MITIGATION MEASURES 45
14.3 RESIDUAL IMPACTS 45
15.0 CULTURAL HERITAGE 47
16.0 TRAFFIC AND TRANSPORT 49
17.0 INTERACTIONS OF THE FOREGOING 52

1.0 INTRODUCTION

Springfield Renewables Ltd. (Springfield), a co-development company supported by Coillte and ART Generation intends to apply to An Bord Pleanála for planning permission to develop a 21 no. turbine wind farm and all associated infrastructure in the vicinity of Castlebanny in County Kilkenny. For the purposes of this EIAR and planning application, the proposed development is referred to as the Castlebanny Wind Farm.

The main wind farm site which extends to approximately 1434 hectares (ha), of which approximately 1200 ha are currently commercial forest owned by Coillte, is in the southern portion of County Kilkenny between the villages of Ballyhale to the northwest, Inistioge to the northeast and Mullinavat to the southwest. The planning application site area extends to 271.2ha.

The site is bounded by the R704 to the south and local roads to the east, north and west while the South Leinster Way traverses the southern part of the site. The Arrigle River (which form part of the River Barrow and River Nore Special Area of Conservation) runs south-north near the eastern boundary of the site. Three tributaries of the Arrigle and the Derrylacky River encroach on the periphery of the site.

1.1 BACKGROUND TO ENVIRONMENTAL IMPACT ASSESSMENT (EIA)

An Environmental Impact Assessment (EIA) is required to ensure that projects that are likely to have significant effects on the surrounding area and the environment are properly assessed. Any significant impacts discovered in the assessment must be avoided or minimized where possible. The findings and outcome of the EIA are presented as a report, known as an Environmental Impact Assessment Report (EIAR).

TOBIN Consulting Engineers has prepared the EIAR in accordance with relevant and specific environmental legislation, guidance and advice notes. The report has been compiled in consultation with statutory bodies, interested parties and the local community. Further details on the consultation process are provided in Section 1.5 below.

This document is Volume 1 of the EIAR. It is a Non-Technical Summary (NTS), which gives a brief description of the project and the assessment of the relevant environmental matters in non-technical language. The additional Volumes contain information as described below:

Volume 2: The Main EIAR – Contains detailed information relating to the proposed Castlebanny Wind Farm and the findings of the Environmental Impact Assessment Report on the surrounding area. Volume 2 also contains drawings, figures and maps.

Volume 3: Appendices: This Volume contains information and data that has been used in the Environmental Impact Assessment Report and is referred to in Volume 2.

Volume 4: Photomontages: This Volume contains imagery that has been used as part of the Landscape and Visual Impact Assessment contained in Volume 2: The Main EIAR.

The purpose of this NTS is to provide a concise overview, in non-technical terms, of the issues, impacts and mitigation measures highlighted by the environmental impact assessment report and presented in the main EIAR, Volume 2.

1.2 THE APPLICANT

The applicant for permission is Springfield, a co-development company supported by Coillte and ART Generation.

Coillte manages approximately 7% of Ireland's land and operates three businesses with the core business being commercial forestry. Coillte is responsible for harnessing the wind energy in the vicinity of Coillte forests and aims to build responsible projects that are good for the environment, for Irish society and positively benefit the neighbouring community. Coillte has now been involved in the development of 4 operational wind farms on their lands with a capacity of 240 megawatts in conjunction with 3 joint venture partners and has an aspiration to develop a further 1 gigawatt (GW) over the next ten years.

ART Generation is a wholly Irish owned renewable energy company based in Co. Kilkenny It is a well-established energy development company with responsibility for managing the development, construction and operation of projects throughout Ireland including Foyle Windfarm in Co. Kilkenny. ART Generation most recently developed three wind farms in the counties of Kilkenny and Tipperary.

1.3 THE NEED FOR THE PROPOSED DEVELOPMENT

In terms of setting out the need for the proposed Castlebanny Wind Farm, and renewable wind energy in general, it is important to place this proposed development in an international, national, and local policy context from the perspectives of environment, energy and planning. The overarching European and National Policy in terms of decarbonising our economy and reducing our reliance on fossil fuels to generate electricity is set out comprehensively in Chapter 4 (Policy, Planning and Development Context).

From a National perspective, the Government's *Climate Action Plan* published in 2019 is the key document which provides a roadmap for Ireland to meet its European Union (EU) target to reduce carbon emissions by 30% between 2021 and 2030. The Plan sets out a target of 70% of electricity to be produced by renewable energy sources by 2030 with an indicative contribution of up to 8.2 Gigawatts (GW) (i.e. 8,200 MW) to be provided from increased onshore wind capacity. At present in Ireland, there is an installed wind capacity of 4,235 MW[1] which leaves a gap of up to 3,965 MW of wind energy capacity to be installed in order to meet the 2030 targets.

Energy security comprises many diverse factors, including import dependency, fuel diversity, the capacity and integrity of the supply and distribution infrastructure, energy prices, physical risks, supply disruptions and emergencies. It is estimated that in 2015 the cost of all energy imports to Ireland was approximately €3.14b in 2016 due mainly to reduced gas imports. It has since increased, to €5 billion in 2018. This trend reflects the fact that Ireland is not endowed with significant indigenous fossil fuel resources (as well as natural gas from the Corrib gas field) and has only in recent years begun to harness significant quantities of renewable resources. For example, in 2017 approximately €439 million in fossil fuel imports were avoided, of which €226 million was avoided by wind generation.

This dependence on fuel imports makes Ireland highly susceptible to price fluctuations in the international supply market and vulnerable to volatile international trade wars and political decisions. The Government White Paper entitled *Ireland's Transition to a Low Carbon Energy Future 2015-2030* sets out a framework to guide Ireland's energy policy development. The

[1] https://www.iwea.com/about-wind/facts-stats (Accessed 9th Dec 2020)

White Paper states "*Renewable energy will also play a central role in the transition to low carbon energy. No single renewable energy technology – existing or emerging – will alone enable Ireland to overcome the low carbon challenge. Rather, a diverse range of technologies will be required along the supply chains for electricity, heat and transport*". In this context, the addition of up to 126 MW of installed wind energy capacity from the proposed Castlebanny Wind Farm will improve our security of supply and reduce our reliance on energy imports.

The development of renewable energy is a natural step in the evolution of locally generated electricity. Electricity generation has brought significant economic gain to many areas in Ireland over the years. Ireland is now on a path of decarbonisation and the energy that we are using is changing from fossil fuels to renewables, such as wind. The potential to extract local, economic and societal gains is a major benefit associated with the development of renewable energy projects. All renewable projects that are developed over the coming years will attract a significant community benefit fund for the local area which will bring significant opportunities for local communities.

It should be noted that An Bord Pleanála has confirmed, in closing the pre-application consultation process under Section 37 of the Planning and Development Act, 2000, as amended, that the project: "*would be strategic infrastructure within the meaning of section 37A of the Planning and development Act, 2000, as amended"* and as such a direct application is being made to the Board for permission for the proposed development under section 37E of the Planning and Development Act 2000 as amended.

1.4 SCOPING AND CONSULTATION

As part of the EIA process, Springfield and TOBIN Consulting Engineers met with the following planning authorities - An Bord Pleanála and Kilkenny County Council, to discuss the scope of the application for planning permission. In addition, the project team issued written consultation to a number of statutory bodies in 2020. A "Scoping Report" accompanied the consultation cover letter that issued in February 2020 and that correspondence introduced the project and the project team. All comments from each of the Planning Authorities have been taken into consideration in the design and assessment of this project.

The Assessment also consisted of communicating with both statutory, non-statutory organisations and other competent parties at an early stage of the design and assessment of the project. This commenced in February 2020 and has been maintained throughout the EIA process. The purpose of consulting with these bodies was to aid in the assessment and project design.

All comments, observations or concerns raised by consultees on the project design and impact assessment are addressed in the EIAR, with specific responses directed onto the relevant specialist for consideration.

2.0 DESCRIPTION OF THE PROPOSED DEVELOPMENT

2.1 INTRODUCTION

2.1.1 The Proposed Site

The proposed development, known as Castlebanny Wind Farm (See Figures 1-1 and 1-2 of the main EIAR) is located within part of the Coillte commercial forestry landbank in Co. Kilkenny. All elements of the proposed development, including the elements which form part of the overall project but are not part of the current planning application such as forestry replanting and all works required on public roads (with the exception of the two locations on the R704 in the townland of Ballynoony West) to accommodate turbine delivery, have been considered and are addressed as part of this EIAR.

The site of the proposed wind farm is located within the townlands of Castlecosker, Derrynahinch, Kiltorcan, Coolroe Beg, Baunskeha, Castlebanny, Kilvinoge, Cappagh, Coolnahau, Ballytarsna, Mullennakill, Glenpipe, Ballymartin, Ballyvatheen, Ballynoony West and Derrylacky, Co. Kilkenny. The proposed grid connection is located within the townlands of Castlebanny (proposed substation also located here), Cappagh, Coolnahau, Garrandarragh, Ballygegan and Ballyvool (proposed connection with existing 110kV overhead line here), Co. Kilkenny.

The land use/activities on the site of the proposed wind farm are primarily commercial forestry, with some areas of pastoral agriculture. The surrounding landscape is a mixture of agricultural land and forestry, with some existing wind farms, Ballymartin Wind Farm and Rahora Wind Farm, located approximately 1.1 and 4.2 kilometres respectively to the south and southeast of the proposed wind farm site. The landscape is predominately undulating in the wider area, with the proposed wind farm site being located on an elevated area with a topography of between 145m and 265m OD. A number of other areas to the east and south of the site are also elevated. The most significant features in the surrounding landscape are the River Arrigle valley, the upland areas on which the proposed wind farm is proposed and the upland areas to the east of the proposed wind farm, towards Inistioge.

The proposed development site is approximately 7.3km long in the north/south direction and is approximately 2.7km wide in an east/west direction at the widest point. The site lies between the settlements of Mullinavat, Inistiogue and Ballyhale, which are located approximately 4.1km southwest, 5.7km northeast and 1.9km northwest of the site of the proposed wind farm respectively.

The main urban centres in the region are Waterford City, located approximately 15.5km to the south of the proposed wind farm site and Kilkenny City, located approximately 20 km to the north of the proposed wind farm site. The site of the proposed wind farm has an area of approximately 1434 hectares and comprises a single elongated land parcel. These lands lie between the M9 and the River Nore, and just north of the R704 Regional Road which runs from Mullinavat in the west to New Ross in the east. The site runs in a north-south direction. The River Arrigle is located approximately 1.1km to the east of the proposed wind farm site at its nearest point, while the proposed grid connection route crosses this river at one location. The River Nore is located approximately 5.5km east of the site of the proposed development at the nearest point, and approximately 3.9km east of the proposed grid connection at its nearest point.

2.1.2 The Proposed Development

The proposed development will comprise the construction of 21 no. wind turbines and all associated ancillary works. The turbines will have a maximum blade tip height of up to 185m above the top of the foundation level and will be accessible from internal access routes within the site.

Springfield intend to apply for a ten-year planning permission for the following:

- Erection of 21 no. wind turbines with an overall blade tip height of up to 185m and all associated foundations and hard-standing areas in respect of each turbine;
- Improvement of existing site entrance with access onto the R704 regional road, vertical realignment of the R704 in proximity to this entrance, and creation of two new site entrances on the L7451 to form a new crossing point;
- Improvements and temporary modifications to existing public road infrastructure to facilitate delivery of abnormal loads and turbine delivery and construction access at two locations on the R704 in the townland of Ballynoony West;
- Construction of 2 no. temporary construction compounds with associated temporary site offices, parking areas and security fencing;
- Installation of 1 no. permanent meteorological mast up to a height of 100m;
- 3 no. borrow pits;
- Construction of new internal site access roads and upgrade of existing site roads, to include passing bays and all associated drainage;
- Construction of drainage and sediment control systems;
- Construction of 1 no. permanent 110kV electrical substation including:
  - 2 no. control buildings containing worker welfare facilities and equipment store;
  - All electrical plant and infrastructure and grid ancillary services equipment;
  - Parking;
  - Security Fencing;
  - Wastewater holding tank;
  - Rainwater harvesting equipment;
  - All associated infrastructure and services including site works and signage;
- All associated underground electrical and communications cabling connecting the wind turbines to the proposed wind farm substation;
- All works associated with the connection of the proposed wind farm to the national electricity grid, which will be via a loop-in 110 kV underground cable connection approximately 4km in length to the existing overhead 110 kV line in the townland of Ballyvool, Co. Kilkenny, with two new 16m high steel lattice loop-in/out masts at the connection point;
- All related site works and ancillary development including berms, landscaping, and soil excavation;
- Ancillary forestry felling to facilitate construction and operation of the proposed development and any onsite forestry replanting;
- Development of a permanent public car park with seating/picnic tables at the end of the construction phase of the development on the footprint of the southern temporary construction compound; and
- Permanent recreational facilities including marked walking and cycling trails along the site access roads, and associated recreation and amenity signage and outdoor fitness equipment.

A 10-year planning permission and 35-year operational life from the date of commissioning of the entire wind farm is being sought. Given the recent advances in turbine technology, and the

anticipated lifespan of wind turbines, this is considered to be the optimal operational life for the proposed development. The duration of this operational life allows the proposed turbines to be used to generate clean renewable energy until they have reached the end of their life, rather than being removed prematurely.

The application includes an onsite 110kV substation with a loop-in underground grid connection to the existing 110kV overhead line in Ballyvool. Two new masts will be required in Ballyvool to allow for the connection, drawings of which can be seen in Appendix 2-1 of this EIAR. The overall length of the grid connection between the proposed substation and the existing overhead line is approximately 4km, of which, approximately 1km is within the site of the proposed wind farm, and approximately 0.3km is located along the public road corridor. The remaining approximately 2.7km is located off road.

The proposed underground grid connection will run from the proposed onsite substation in an easterly direction towards the boundary of the proposed wind farm site. The first 370m will be located within a proposed new site access road, after this it will move off road across a field and forestry until it crosses the L-7451 local road in the townland of Cappagh. It continues eastwards across fields and forestry, crossing a small stream, the L-8273 local road and then crossing the River Arrigle and along a field until it reaches the L-3418 local road in the townland of Garrandarragh. The route runs in the field alongside this road northwards for approximately 200m, then enters the road corridor to continue northwards for approximately 300m until it turns eastwards, off road again in the townland of Ballyvool across pasture fields. From here it sweeps in an arc to the east where it crosses the L-8276 local road and reaches the existing overhead 110kV line in Ballyvool.

2.2 PROJECT CONSTRUCTION

2.2.1 Construction Schedule

It is anticipated[2] that up to 100 persons will be employed during the peak construction period and it is estimated that the construction phase will take approximately 24 months from starting onsite to completion of commissioning of the turbines.

The hours of construction activity will be limited to avoid unsociable hours where possible. Construction operations shall generally be restricted to between 7:00hrs and 19:00hrs weekdays and between 7:00hrs and 14:00hrs on Saturdays. However, to ensure that optimal use is made of good weather periods or at critical periods within the programme (i.e. concrete pours) or to accommodate delivery of large turbine components along public routes it could be necessary on occasion to work outside of these hours. Any such out of hours working will be agreed in advance with the Local Authority.

The construction phase can be broken down into 5 no. main phases as follows:

- 14 months – Civils
- 12 months – Electrical
- 4 months – Turbine deliveries
- 4 months – Installation
- 2 months – Commissioning

[2] http://www.ewea.org/fileadmin/files/library/publications/reports/Wind_at_work.pdf

The phasing and scheduling of the main construction task items are outlined in Figure 2-6 in Chapter 2 Description of the Proposed Development (included in Volume 2), where January 2024 has been selected as an arbitrary start date for construction activities. Where there is overlap between phases, this reflects the anticipated progression of work through the site, with different areas within the site at different stages of completeness.

2.2.2 Construction Methodologies

Chapter 2 of the EIAR details construction methodologies for the following elements of the proposed development:

- Site Access Tracks and Drainage;
- Temporary Compound, Material Storage Areas and Site Offices;
- Turbine Hardstand, Foundations and Erection; and
- Grid Connection.

The construction methodology associated with the grid connection for the proposed development also considers the methods proposed for bridge crossing including Flatbed formation over culvert/bridge and Horizontal Directional Drilling.

2.2.3 Environmental Management

A CEMP has been prepared for the proposed development. The CEMP will be updated prior to commencement of development to address the requirements of any relevant planning conditions, including any additional mitigation measures which are conditioned and will be submitted to the planning authority for written approval. The construction contractor will be responsible for implementing the mitigation measures specified in the EIAR and CEMP and for communicating the requirements with all staff on-site. Their implementation of the mitigation measures will be overseen by the supervising Ecological Clerk of Works (ECoW), ecologists, archaeologists and/or geotechnical engineers, as appropriate.

2.2.4 Surface Water Monitoring during Construction

The surface water drainage system will be inspected regularly during construction works and during operations to ensure that it is working optimally. Where issues arise, the works will be stopped immediately and the source of potential impacts on the surface water quality investigated.

2.2.5 Concrete Deliveries and Pouring

Only ready-mixed concrete will be used during the construction phase, with all concrete being delivered from local batching plants in sealed concrete delivery trucks. The use of ready-mixed concrete deliveries will eliminate any potential environmental risks of on-site batching. When concrete is delivered to site, only the chute of the delivery truck will be cleaned, using the smallest volume of water necessary, before leaving the site. The small volume of water that will be generated from washing of the concrete lorry's chute will be directed into a temporary lined impermeable containment area. These residual liquids and solids will be disposed of off-site at an appropriate waste facility near Kilkenny City. This washout will be located near the site entrance so that it is easily accessed when departing the site.

Due to the volume of concrete required for each turbine foundation (assumed approximately 650m^3 as a worst case per turbine, but the exact figure will vary according turbine

manufacturers requirements and will be less than this), and the requirement for the concrete pours to be continuous, deliveries are often carried out outside normal working hours. Such activities are limited to the day of turbine foundation concrete pours, which are completed in a single day per turbine.

Because of the scale of the main concrete pours that will be required to construct the proposed wind farm, the main pours will be planned weeks in advance, and refined in the days leading up to the pour. Disposing of any surplus concrete after completion of a pour will be off-site at the concrete production facility.

2.2.6 Refuelling

Any easily manoeuvrable road-going vehicles will be refuelled off-site. For any vehicles which are slow moving or tracked or those for whom regular trips off-site to refuel will not be practical, on-site fuelling will be required.

A limited amount of fuel will need to be stored on the site within the construction compounds for this purpose, and this will be within a double skinned and bunded mobile tank which can be moved around the site using a 4x4 vehicle to refuel but will be stored in the construction compound when not in use.

A spill kit in the form of a supply of fuel absorbent material and mats and a drip tray will be kept with the tank at all times. The drip tray and fuel absorbent mats will be used at all times during refuelling. Similar spill kits will be stored in each construction compound, and at the on-site substation in case of emergency. No refuelling will be carried out within 50m of a watercourse. Only designated trained and competent operatives will be authorised to refuel plant on site.

In the event of an accidental fuel spill, the source of the spill will be fixed, fuel will be contained and cleaned as quickly as possible using the fuel absorbent material in the spill kits. The incident will be reported to the site manager and Environmental Clerk of Works, and appropriate remediation will be carried out (i.e. soil removal for safe disposal at a licensed waste facility near Kilkenny City, etc.).

2.2.7 Dust Suppression

In periods of extended dry weather, dust suppression may be necessary along haul roads and along the site roads to ensure dust does not cause a nuisance. If necessary, water will be taken from stilling ponds in the site's drainage system and will be pumped into a bowser or water spreader to dampen down haul roads and site compounds to prevent the generation of dust. Silty or oily water will not be used for dust suppression, because this will transfer the pollutants to the haul roads and generate polluted runoff or more dust. Water bowser movements will be carefully monitored, as the application of too much water may lead to increased runoff.

2.2.8 Waste Management

A Waste Management Plan (WMP) is provided as part of the CEMP and details the best practice in waste management during all phases of the proposed development, with a view to reducing, reusing, recycling and recovering waste produced, in that order of preference. Waste disposal will be avoided where possible. The WMP and waste management practices associated with the proposed development will be in accordance with relevant provisions of the Waste Framework Directive (Directive 2008/98/EC on waste), the Waste Management Act 1996 as well as all other Irish and EU legislation.

The main site contractor will appoint a Waste Manager who will ensure that all waste contractors have the correct permits for any waste streams they are removing from site, and that they are taking it to the appropriately licensed/permitted waste facilities. They will also ensure that all parts of the WMP will be implemented onsite.

2.2.9 Vehicle Washing

Wheels or vehicle underbodies are often washed before leaving sites to prevent the build-up of mud on public roads and site access tracks. Site access tracks will be already formed using on-site materials before other road-going trucks begin to make regular or frequent deliveries to the site (e.g. with steel or concrete). The site access tracks will be well finished with compacted hardcore, and so the public road-going vehicles will not be travelling over soft or muddy ground where they might pick up mud or dirt.

However, in the interest of best practice and to avoid the potential for the transfer of alien invasive plant species into the site, it is proposed to install a self-contained wheel wash system at the project site near the site entrance. A road sweeper will be available if any section of the surrounding public roads becomes soiled by vehicles associated with the proposed development.

2.2.10 Major Accidents and Natural Disasters

The EIAR considers the potential impacts of major accidents caused by the proposed development (or associated works), as well as the potential vulnerability of the proposed development (and associated works) to natural disasters. In this regard, the most likely major accidents that could occur as a result of the proposed development (and its associated works) include:

- Significant hydrocarbon spillage;
- Turbine collapse; and
- Turbine or substation fire.

The most likely natural disasters that might occur and potentially impact the proposed development (and its associated works) include:

- Fire; and
- Landslide.

Given the topography of the wind farm site, and the nature of the proposed infrastructure/works, it is not anticipated that flooding would cause a significant threat to the proposed project.

2.3 OPERATION AND MAINTENANCE

The proposed wind farm development is expected to have a lifespan of 35 years. During this period, on a day-to-day basis, the wind turbines will operate automatically, responding by means of anemometry equipment and control systems to changes in wind speed and direction.

The wind turbines will be connected together, and data relayed from the wind turbines to a control centre. Each turbine will also be monitored off-site by the wind turbine supplier or Operations and Maintenance (O&M) service provider. The monitoring of turbine output, performance, wind speeds, and responses to any key alarms will be monitored at a control centre 24-hours per day.

Each turbine will be subject to a routine maintenance programme involving a number of checks and changing of consumables, including oil changes. In addition, there will be a requirement for unscheduled maintenance, which could vary between resetting alarms to major component changes requiring a crane. Typically, maintenance traffic will consist of four-wheel drive vehicles or vans. The electricity substations components and site access tracks will also require periodic maintenance in accordance with appropriate operation maintenance plans, procedures and health and safety plans.

Once operational, the wind farm will support 2-3 long term, high quality technical jobs in operation and maintenance as well as a number of jobs in ancillary functions.

2.4 COMMUNITY BENEFIT PROPOSAL

Castlebanny Wind Farm has the potential to bring significant positive benefit to the local community. The project will contribute annual rates to the local authority and it will provide opportunity for local community investment in the project in line with the new Renewable Energy Support Scheme. A community benefit fund will be put in place for the lifetime of the project to provide direct funding to those areas surrounding the project.

The community benefit fund will be established in line with Government policy which will include funding for both wider community initiatives and a Near Neighbour scheme focused on houses in close proximity to the project.

The Community Benefit Fund belongs to the local community. The premise of the fund is that it should be used to bring about significant, positive change in the local area. To make this happen, the first task will be to form a benefit fund development working group that clearly represents both the closest neighbours to the project as well as nearby communities. This group will then work on designing the governance and structure of a community entity that will administer the Community Benefit Fund.

2.5 DECOMMISSIONING

The wind turbines proposed as part of the proposed development are expected to have a lifespan of 35 years. Following the end of their useful life, the wind turbines may be replaced with a new set of machines, subject to planning permission being obtained, or the site will be decommissioned fully, with the exception of the electricity substation.

Upon decommissioning of the proposed wind farm, the wind turbines will be disassembled in reverse order to how they were erected. All above ground turbine components will be separated and removed off-site for recycling.

The on-site substation will not be removed at the end of the useful life of the wind farm project as it will form part of the national electricity network. Therefore, the substation will be retained as a permanent structure and will not be decommissioned. Similarly, all access tracks will be retained to maintain recreation and forestry access.

2.6 HEALTH AND SAFETY

The proposed Castlebanny Wind Farm will be constructed, operated and decommissioned in accordance with all relevant Health and Safety Legislation as described in the CEMP.

A Health and Safety Plan covering all aspects of the construction process will address the Health and Safety requirements in detail. This will be prepared prior to the construction stage. Further details are provided in the CEMP.

An operational phase Health and Safety Plan will be developed to fully address identified Health and Safety issues associated with the operation of the site and providing access for emergency services at all times.

The components of a wind turbine are anticipated to have a useful lifespan up to 35 years or more and are equipped with a number of safety devices to ensure safe operation during their lifetime. During the operation of the wind farm regular maintenance of the turbines will be carried out by the turbine manufacturer or appointed service company. A project or task specific Health and Safety Plan will be developed for these works in accordance with the site's health and safety requirements.

3.0 REASONABLE ALTERNATIVES

3.1 INTRODUCTION

To find the most suitable site for the proposed development, Springfield considered a number of factors, as recommended in the Draft EPA Guidelines (EPA, 2017).

Alternatives to the proposed development, in terms of layout and design, were considered under the following headings:

- Do Nothing' Alternative;
- Site Selection;
- Alternative Layouts/Design;
- Alternative Processes
- Alternative Mitigation Measures;

3.2 DO NOTHING ALTERANTIVE

An alternative to developing a wind farm at the proposed development site would be to leave the site as it is, with commercial forestry as the predominant use. Trees would continue to be felled and replanted in line with sustainable forestry practices.

In implementing the 'Do-Nothing' alternative, however, the opportunity to capture a significant part of County Kilkenny's renewable energy resource would be lost. In addition, the opportunity to contribute to meeting Government and EU targets for the production and consumption of electricity from renewable resources and the reduction of greenhouse gas emissions would be missed. The opportunity to generate local employment, a development contribution, rates and investment would also be lost. Also, the proposed amenity access points and associated carparks would not be constructed as part of the rehabilitation and, therefore, this recreational opportunity would be lost. On the basis of the positive environmental effects arising from the project, the do–nothing scenario was not the chosen option.

3.3 ALTERNATIVE SITE SELECTION

The site selection process for the proposed development initially began in 2014, Coillte's Renewable Energy Development Team undertook a detailed screening process, through Geographical Information Spatial software (GIS), using a number of criteria and stages to assess

the potential of a large number of possible sites, on lands within its stewardship (c. 441,000 hectares), suitable to accommodate a wind energy development. The GIS database drew upon a wide array of key spatial datasets such as forestry data, ordnance survey land data, house location data, transport, existing wind energy and grid infrastructure data and environmental data such as ecological designations, landscape designations and wind energy strategy designations available at the time. During the initial screening stage, the site selection process discounted lands that were not available for development under a number of criteria. During a further sieving of the available sites, a number of sites, including the site at Castlebanny, were selected to take forward for further consideration.

The proposed site in Castlebanny, Kilkenny was further examined as a candidate site, to confirm its suitability for a wind energy development. The proposed site was examined under the following headings:

- Wind resource / speed in the area;
- Proximity to the National Grid;
- Planning policy, designations, zoning;
- Environmental designations (such as Natura 2000 sites and other nationally designated sites);
- Accessibility, and road network;
- Distance from settlements and residential properties;
- Visual and Landscape Impact and
- Telecommunication, Archaeological, Geotechnical and Hydrological constraints.

The site proposed for the Castlebanny Wind Farm development emerged as an optimal location for a wind energy development.

3.4 ALTERNATIVE LAYOUTS/DESIGNS

The initial draft layout consisted of 33 no. turbines with initial distances to houses of 750m. This layout was based on turbine tip heights of 170m and rotor diameters of approximately 140m. This layout maximised the available area within the site whilst staying out of areas constrained for various reasons (telecommunications links, sensitive biodiversity areas, etc.).

An alternative layout informed by the same parameters but with turbine tip heights of 185m and rotor diameters of approximately 155m was also prepared. This layout had 25 turbines; the lesser number required for greater separation between the turbines to minimise wind wake effects.

The two layouts were the subject of a design review. This review was focussed on landscape and visual impacts. The review considered draft photomontages from a number of sensitive locations, population centres and fullest views of the project. The review concluded that the 25 turbines with greater tip heights was better from a landscape and visual impact perspective as it appeared less cluttered from the viewpoints with clear views of the turbines. It was also noted that even from closer views, there was little obvious difference between the scale of the different turbine models. It was further noted that the 25 turbine layout was still somewhat cluttered and that a lesser number of turbines in two staggered lines would be optimal.

The next iteration of the layout design took the recommendations from the layout review and developed two staggered lines of turbines of 185m tip height with a total of 21 turbines. This layout is very close to the final layout with some small adjustments.

3.5 TURBINE DELIVERY ROUTES

The port of entry chosen for turbine delivery to this site is Belview Port (Port of Waterford), which minimises the distance and therefore the associated traffic and air quality impacts arising from the delivery. However, given the central location of the site, a number of reasonable alternatives were considered, including Dublin, Cork and Foynes. The selection of any of these ports is less favourable due to some challenging pinch points on each (e.g. from Cork/Foynes, no easy connection from M8/M7 to M9 and from Dublin, no easy transition from M50 to M7), and the associated climatic effects of a longer delivery route to site.

Given the proximity to the proposed development, and the relatively straight-forward access between the site and the M9 Motorway, it was determined that any delivery route for oversize loads would need to use the M9 to minimise the potential for impacts on smaller roads.

3.6 SITE ACCESS

The initial option looked to utilise the Glenville Road (L7451) to provide access to the site. During initial consultation with the local community, the increased traffic on the L7451 was viewed as a point of concern for residents. The use of an existing forestry access road to bypass the L7451 (only requiring a single crossing point) was then investigated and was viewed as the preferred option to minimise traffic impacts on the local road. During further consultation, concerns about the proposed crossing point of the L7451 were raised by local residents for the nearby residential property, and so an amendment was made to move the L7451 crossing point further northward away from the nearest properties.

3.7 GRID CONNECTION AND SUBSTATION LOCATION

Based on the scale of the proposed project, it was known that a 110 kV connection would be required to accommodate the likely output from the project. An assessment of the nearest 110 kV infrastructure identified two potential connection points, a 110 kV substation at Waterford City or a connection onto an existing 110 kV line which passes approximately 3.5 km to the east of the centre of the site. An environmental and economic assessment clearly indicated that a connection to the existing 110 kV line running to the east of the site would have a lot less environmental impacts and would be more economically advantageous.

It was found that construction of a substation on the slopes of the hills to the east of the site (under the existing 110kV overhead line) would pose a greater potential for negative visual impact, particularly due to its location removed from the proposed wind farm development, and due to the more exposed views of the areas. Consideration was also given to potential substation locations within the wind farm site. There were two locations identified within the central area of the wind farm, west of the ridge, that would be screened from views from the eastern hills and, as well as being screened by forestry to the west. There are no elevated roads to the west that would accentuate such a structure. It was also assessed that a substation located within the forestry would have a low impact on biodiversity and would fit more naturally with the wind farm development rather than creating a separate structure separate from the wind farm. Based on all of the above, it was therefore decided that a loop-in connection with a 110kV onsite substation was the preferred approach. The deciding factors for the location of the onsite substation within the site related to visibility and the EirGrid requirement to have a certain setback (2 times tip height) from proposed turbine locations.

There were 6 grid connection routes considered – 5 underground cables and 1 overhead line. The overhead line was discounted due to visibility effects. The chosen grid route connection involved the use of Horizontal Directional Drilling to avoid the SAC, which was deemed to have the least environmental impacts.

3.8 ALTERNATIVE PROCESS

The process selection for alternative renewable energies, was largely carried out after Castlebanny was chosen as a suitable site for wind energy development. As described previously this site selection process was driven by the suitability of areas within the Coillte landbank for wind energy. Only when this site was identified, were the full suite of potential technologies for the production and supply of renewable energy to the Irish national electricity grid considered. The main alternative considered was solar energy, however a significantly larger area would be required to produce the same quantity of energy relative to wind. This would give rise to larger potential for environmental effects.

3.9 ALTERNATIVE MITIGATIONS

The mitigation measures proposed in relation to the various aspects of the project are detailed in the relevant chapters in the main EIAR and are also summarised in Chapter 18 - Schedule of Mitigation Measures. The mitigation measures proposed are considered to be proven and best practice. The level of mitigation proposed is determined to be proportionate to the potential impact. On this basis, the chosen mitigation measures are those that are considered to have the least environmental effects.

4.0 POLICY, PLANNING AND DEVELOPMENT CONTEXT

The planning history, the planning and development context and the planning need of the proposed Castlebanny Wind Farm development has been investigated.

Relevant policy has been reviewed at an international (UN and EU), national, regional and local level. The proposed wind farm development is consistent with the current energy and planning policy context, which seeks to increase the share of electricity generation from renewable sources and locate wind energy developments in suitable locations, thereby minimising any environmental impacts. There is a specific recognition of the importance of on-shore wind farms in achieving these objectives. The proposal will contribute to national and international efforts to reduce carbon emissions to the atmosphere and thereby help to address concerns regarding climate change.

The Kilkenny County Development Plan 2014-2020 identifies areas for wind farm development. The site is located within an area that is "Open for Consideration". This designation indicates that the area is suitable for small scale wind energy developments (5 or less turbines and output less than 5MW). Further to detailed assessment of the proposed project in accordance with the criteria set out in the wind energy strategy, it is considered that a 'Preferred' designation (suitable for large scale wind developments) would have resulted had the project details and associated impacts been available at the time the wind energy strategy was being developed. The draft Kilkenny City and County Development Plan 2021 was published for public consultation on 22nd December 2020. The proposed wind farm is located in an area designated as 'Acceptable in Principle' for wind energy development, suitable for large scale wind developments.

The proposed wind farm will add to Ireland's overall renewable energy generating capacity. Due to the scale of the proposal, the project is of strategic economic and social importance to the Region and the State. The capital investment will represent a significant economic contribution to the Region and the State as a whole. The project will assist in meeting national renewable energy targets and will also result in significant reductions in carbon emissions from electricity generation and reduce the reliance on imported fossil fuels and will assist in the transition from the dependency on fossil fuels to energy generation from renewable sources.

Some types of development are referred to as Strategic Infrastructure Development (SID) under the planning legislation. Depending on some other factors, these include:

An installation for the harnessing of wind power for energy production (a wind farm) with more than 25 turbines or having a total output greater than 50 megawatts.

An Bord Pleanála has determined that this project fits into such a category. Therefore, this planning application will be made to An Bord Pleanála, rather than to the local authority.

A review has taken place of adjoining wind farm developments as well as of other developments in the immediate vicinity of the site. This allows an assessment of cumulative impacts arising from this and other proposals.

The surrounding local area predominantly consists of one-off housing and agricultural buildings. Energy Infrastructure does exist in the local area e.g. there is Ballymartin Wind Farm to the south and Rahora Wind Farm to the south east of the proposed site. The Great Island to Kilkenny 110kV line is located a short distance from the site. In addition, there are 3 no. approved Solar Farm developments located north west of the site. These include:

- Ballyhale Solar Farm located 2km from the site, granted 2016;
- Kilkenny West Solar Farm located 2km from the site granted 2018; and
- Derrynahinch West Solar Farm located 3km from the site and granted in 2019.

There is a considerable economic benefit to the development of wind farms in job creation, investment and energy production. In this particular case, approximately 100-120 jobs will be supported during the construction phase and between 2-3 jobs during the operational phase.

The proposal is considered to be in compliance with land use and energy policies and objectives at international, national, regional and local level.

5.0 POPULATION AND HUMAN HEALTH

5.1 INTRODUCTION

The two environmental factors of population and human health are addressed under separate headings throughout this chapter. The assessment on population considers the current land use of the proposed site, the current activities occurring there, local population information, employment profiles, tourism, visitor attractions and community gain opportunities.

The assessment on human health includes a detailed literature review of studies and research carried out on the potential effects of wind farm developments on human health.

5.2 POPULATION

5.2.1 Existing Environment

The site of the proposed wind farm infrastructure has an area of approximately 1434 hectares and comprises a single elongated land parcel. These lands lie between the M9 and the River Nore, and just north of the R704 Regional Road. which runs from Mullinavat in the west to New Ross in the east. The site runs in a north-south direction.

The South Leinster Way walking/hiking trail, running from Kildavin in County Carlow to Carrick-on-Suir in County Tipperary, which is almost 105km in length, crosses the southern portion of the site. This is designated as a National Waymarked Trail by the National Trails Office of the Irish Sports Council and is jointly managed by Carlow County Council, Kilkenny County Council, Tipperary County Council, Carlow Local Sports Partnership, Kilkenny Trails and Coillte.

The current land use for the grid connection route is predominantly pastoral agriculture with some areas of forestry cover. A short section of the grid connection route (c. 0.3km) will be installed in the public road network. Temporary works on lands required to facilitate turbine component deliveries currently comprise boundary walls and pastoral agriculture, as well as transport (road corridors).

Population Trends

An examination of the existing population in the local area has been carried out to identify population trends and density and to define the properties/receptors surrounding the proposed wind farm site. The proposed development works are located in the local authority area of Kilkenny County Council and within the ED's of Castlebanny (07066), Kiltorcan (07079), Ballyvool (07063), Pleberstown (07081), Castlegannon (07067), Jerpoint West (07035) and Kilbeacon (07103). The ED of Ballyhale (07062) extends close to the north-west perimeter of the wind farm site boundary and is included in defining the existing population study area.

During the period of 2006 to 2016, the population nationally increased by approximately 12% and the population of County Kilkenny increased by approximately 13% while the population of the ED's within which the proposed development is located increased by approximately 19%. This illustrates that the population of the local area is increasing at a rate that is slightly greater than the County or National rates.

Property/Receptors

All receptors within 1km of the site boundary have been identified and verified by means of the above desktop reviews and site surveys. This information is used to inform assessments within this EIAR, in particular for shadow flicker analysis and noise modelling. A 1km buffer from the wind farm site boundary was used to ensure that those properties within reasonable proximity of the main wind farm infrastructure are defined.

In addition, a search of planning applications within 1km of the wind farm site boundary was carried out (most recently in November 2020) to identify proposed developments and consented, but as yet not built, developments. A total of 128 no. receptors were identified.

During the verification process, any properties/buildings identified that would not be considered sensitive receptors (i.e. farm sheds, garages, commercial buildings etc.) or that were deemed uninhabitable without requiring planning permission to renovate to be deemed habitable (a standard approach of eliminating properties with clearly failing or failed roofs was applied) were identified.

5.2.2 Potential Impacts (Population)

5.2.2.1 Potential Effects - Construction

Land Use

The construction of the proposed development will result in a short-term, negative effect but the area will be returned to beneficial commercial forestry use on completion of the construction works which is anticipated to last for 24 months.

Population Trends/ Employment and Economy

There may be a short-term increase in construction workers staying in local accommodation in the area which will add value to the local economy. It is estimated that up to 100 persons will be directly employed during the peak construction period. Indirect employment opportunities will be created in the region through the supply of services and materials to the proposed development. The construction of Castlebanny Wind Farm will have an estimated capital cost in the region of €140 million and an estimated 15-20% of the total construction cost will relate to site works which has the potential to support local contractors and suppliers. As a result, the construction phase of the proposed development will have a short-term, slight and positive effect on population, employment and the economy in the local area and the South-East Region.

Property/Receptors

Access to the proposed wind farm site will be via a new site entrance from the R704 regional road. Negative effects on residential properties and the local population as a result of the construction works, including traffic movements, could include noise and air quality as well as potential for the works to impact on local residents enjoyment of their homes (i.e. residential amenity) . The haul roads proposed are existing public roads which are already used by heavy goods vehicles (HGVs), however there will be a short-term increase in effects during the construction phase. The construction phase will likely have a slight, negative effect on the local population and will be short-term in nature.

Property Value

It is not anticipated that the construction works for the proposed development will have any significant impact on the local property values.

Tourism

It is considered that the construction works will only have a direct impact on the South Leinster Way where access to a short section of the walking trail (c. 3.9km) during the construction phase of development will not be permitted. However, this will be a short-term impact for the duration of construction and a temporary alternative marked route through the forest will be available for users. A notice and accompanying map to this effect will be provided at either end of the walking trail where it crosses the construction site. It is also considered that the effect will be more significant for local recreational users than tourists as the extent of the potential effects is only for a short section (c. 3.9km) of the total length of the walking trail which is 105km in overall length (i.e. <4% of the trail length). It should be noted that other walking/hiking trails in the wider area (some of which link up with the South Leinster Way) would be expected to be available to the public during the construction works and could be used as short-term alternatives. No other direct or indirect impacts on tourist or recreational attractions are predicted.

5.2.2.2 Potential Effects – Operation

Land use

The proposed infrastructure will cover an area of 36.3 ha within the proposed wind farm site area of 1434 ha, which represents only 2.5% of the total. The agricultural and forestry land use within the infrastructure area will be lost, however replacement forestry lands will be planted The proposed development will have a slight to moderate, long-term and negative effect on the existing land use at the site.

Population Trends/ Employment and Economy

It is not anticipated that the proposed development will have any significant impact on the current population trend in County Kilkenny or locally. The improved facilities within the wind farm site and surrounding the proposed development which will be supported by the significant community benefit fund could make the local area attractive for people to move to. Economic benefits from operational activities will include ongoing purchases of local materials, services and equipment required for the operational phase of the wind farm as well as local spend generated from technical operational staff. The wind farm is expected to support 2-3 high quality technical jobs in operation and maintenance as well as a number of jobs in ancillary functions. Some local employment or contract opportunities may develop over the lifetime of the wind farm from occasional less specialised activities.

Property/Receptors

The turbine layout at the proposed development has been designed with cognisance of the local population and receptor locations. In accordance with the 2006 WEDGs, there are no turbines located within 500m of a residential property. The draft 2019 WEDGs recommend a minimum setback distance of four times the tip height (185m x 4 = 740m) from a proposed turbine to the curtilage of any residential property and the proposed development is consistent with this recommendation.

Property Value

Based on similar studies carried out in Scotland, the UK and the United States regarding the effects of wind farms on property prices, it is a reasonable assumption, based on the available published studies, that the operation of a wind farm at the proposed location would not significantly impact on property values in the area.

Tourism

Considering studies from Fáilte Ireland, Biggar Economics and The University of St. Andrews, Fife and The Macaulay Institute, Aberdeen, and the potential for the proposed wind farm to support and fund local community and amenity initiatives, it is considered that the proposed development will have a long-term, imperceptible, neutral impact on tourism numbers in the vicinity of the site.

The reopening of the South Leinster Way, development of a public car park and enhancement of access to walking routes within the site will encourage more use of the public open spaces and provide information to the general public on wind energy. A *Recreation Development Plan* has been prepared for the forestry lands owned by Coillte. Local community consultation has taken place to inform the Plan and will continue to help guide the provision of amenities and services in the local area.

In this regard, it is considered that the proposed development will have a long-term, slight, positive impact on the tourism experience and numbers in the vicinity of the site given that the current South Leinster Way amenity will be enhanced by the project and additional waymarked trails will be available to the public.

5.3 HUMAN HEALTH

5.3.1 Existing Environment

A community profile has been identified to establish the baseline health profile of the area and compare this profile to the rest of the country. The most recent County Health Profiles published are from 2015 (Lenus, 2015) and have been used to establish a community health profile for the County Kilkenny area in which the proposed wind farm development is situated.

The key facts in the 2015 Health Profile relating to County Kilkenny are:

- Kilkenny has a low level of diversity in the population with 89% of the population being white Irish (National 84.5%);
- Breast feeding rates are above average at 51.9% (National 46.6%);
- Female cancer rates were below the national average except for colorectal cancer. Male prostate cancer rate was higher than the national average; and
- Rates of mortality for all causes and for the main causes of death are average or below average.

The map of deprivation included in the County Health Profile shows the electoral areas in which the proposed development is situated to be neither particularly affluent nor particularly deprived and is distinctly average in comparison with the county overall. While we can take this published data as being correct, it may not necessarily accurately reflect the health profile of smaller areas which are close to the proposed development. Within this community, it is not possible to identify every vulnerable individual. However, every human community contains

vulnerable individuals; be those the old, the very young or because they have conditions which may make them more susceptible. Examples are as diverse as humans themselves but can include asthma, autism, and those with psychological illness. It is important to note that Health Standards are set for the vulnerable and not for the robust.

5.3.2 Potential Impacts

The effects of noise, shadow flicker, air quality and EMF are discussed in their respective chapters within the EIAR.

In terms of research on the health effects of wind turbines generally, a number of peer reviewed studies were consulted. From this consultation, there appears to be little scientific evidence of effects of *Wind Turbine Syndrome* and so significant health effects in this regard are not anticipated.

The potential for adverse effects on psychological health, such as anxiety and stress, caused by concern in relation to visual appearance, noise emissions, shadow flicker and other issues, is often highlighted in relation to wind farms. The community may also experience annoyance arising from increased traffic or noise from the construction works. As the correlation on psychological health is difficult to measure, it is useful to look at experience from other operational windfarms to determine if significant psychological effects are reported and published. If this was the case, it would be expected to find recorded evidence of increased levels of depression or anxiety in the vicinity of other windfarms, however there is no such findings in the peer-reviewed literature. On that basis, it is considered that no significant adverse effects on psychological health will occur as a result of the proposed development.

The emergence of Covid-19 requires cognisance to be taken of potential restrictions and their impact on the proposed development as well as measures amongst the population to prevent the spread of the disease. Public health guidance, such as sanitising, social distancing and assessment of workers health as well as any future measures advised by the authorities, will be implemented during construction and operational phases, as required. Health Benefits

Aside from the potential socio-economic benefits previously discussed, there are significant environmental benefits to the proposed development. The current and historical practice of fossil fuel combustion with the associated release of a range of pollutants including particulate matter, oxides of nitrogen, sulphur dioxide, carbon dioxide and many others is well documented. The release of these pollutants from the power generation sector is also a major contributor to global warming and the resulting changing effects on our climate.

5.4 MITIGATION MEASURES (POPULATION AND HUMAN HEALTH)

The proposed development is not anticipated to have a significant effect on the local or regional population, therefore no mitigation measures in respect of population trend impacts are required.

Where required, specific mitigation measures for other environmental factors discussed previously which may interact with human health, such as landscape and visual effects, shadow flicker, air quality, water quality, noise & vibration and transport, are discussed in the relevant chapters of this EIAR. A cross reference of environmental factors is also presented in Chapter 17 (Interactions of the Foregoing).

5.5 RESIDUAL IMPACTS (POPULATION AND HUMAN HEALTH)

The Castlebanny Wind Farm will have a slight positive residual impact on the local population through an influx of construction workers in the short-term. This influx is likely to cause a slight increase in local population over a short period of time resulting in a boost to the local economy through accommodation and spend in local shops and restaurants.

It is considered likely that there will be a short-term, not significant, negative impact on tourism and recreation amenity associated with the use of the South Leinster Way during the construction phase following the installation of guidance and information to the public on alternative available routes.

The establishment of a Community Benefit Fund is considered to be a positive effect for the local community in general. The intention of these schemes is to deliver direct benefit to the local area and to maximise community involvement in the decision making. Through maximising this community involvement, the community benefit funds can facilitate the delivery of desired community initiatives which originate from within the local area.

6.0 BIODIVERSITY

Extensive field and desk surveys were carried out to evaluate the biodiversity value of habitats, flora, fauna, including bats, and aquatic ecology in and downstream of the wind farm site, along the grid connection route, and along the turbine delivery route. The site is dominated by conifer plantations and improved grassland and is mainly of little conservation value. The most valuable area of habitat is the Arrigle River and adjacent wet pasture and hazel woodland, which are within the River Barrow and River Nore Special Area of Conservation (SAC). Other valuable habitats include remnant areas of blanket bog and wet heath, species-rich wet grassland and reedswamp. The wind farm site and surrounding areas also support a valuable bat population, comprising eight species, and including 10 roosts in buildings. A large breeding badger sett is also present. Several of the watercourses downstream of the wind farm were ecologically important, with good water quality and populations of salmon, brown trout, eel and otter.

No Natural Heritage Areas (NHAs) or proposed NHAs will be affected by the wind farm project due to lack of connectivity. A Natura Impact Statement was prepared to consider the impacts of the proposed project on designated areas - SACs and Special Protection AreasThe wind farm was designed to avoid the habitats with the highest biodiversity value, and so effects on them will be minimal when water quality protection measures are put in place. One area of groundwater fed grassland will be temporarily affected by drawing down the water table during construction of a nearby turbine foundation. A locally significant amount of hedgerow and other field boundary habitat will be lost, however, as a result of tree and shrub clearance to reduce the risk of bats colliding with the wind turbine blades. A group of mature trees and some (non-native) broadleaf and mixed woodland will also be felled for bat protection. A plan for managing the bat buffer zones to increase biodiversity has been prepared. The plan also includes habitat creation and enhancement at four other sites in and outside the wind farm. These habitat management measures will counter to some extent the effects of habitat loss and alteration by increasing the amounts and improving the condition of other habitats.

In addition to buffer zones around the turbines, bats will also be safeguarded by turning off six turbines where particular bat activity was highest when wind speeds are low. To protect the badger sett, the position of one of the turbines was moved, and restrictions on the timing and proximity of work in the area will be put in place to protect them from disturbance. There will be no significant effects on aquatic ecosystems, fisheries and other aquatic flora and fauna as a result of water quality mitigation that will be put in place. This will include no in-stream works; as part of this, two watercourses, including the Arrigle River, along the grid connection route will be crossed underneath by directional drilling.

7.0 ORNITHOLOGY

The ornithological assessment was based on bird surveys carried out by two independent survey teams. The bird surveys included vantage point surveys to monitor flight activity over the study area and transect and point count surveys to record the general bird population in the study area. In addition, targeted surveys were carried out, focussing on particular species based on the results of the desktop survey. These included Hen Harrier breeding and roost surveys, breeding wader surveys, breeding Woodcock surveys, and breeding Peregrine surveys. The combined survey effort across the two survey teams included six seasons of vantage point surveys (including three these seasons that were surveyed independently by both teams), as well as comprehensive surveys covering all the potential breeding and wintering species of conservation significance. The surveys provided a robust dataset that was more than adequate for the purposes of assessing the occurrence of populations of conservation importance in the EIAR study area and carrying out collision risk modelling.

A total of 15 waterbird species, seven raptor species, and another two notable species, were recorded during the bird surveys. The only regularly occurring raptor species were Sparrowhawk, Buzzard and Kestrel. Hen Harrier and Peregrine were recorded infrequently and there were a few records of Goshawk, Red Kite and Merlin. Breeding Woodcock were widespread across the wind farm site, and there were scattered records of breeding Snipe, while breeding Water Rail occurred in a small swamp at the edge of the site. Lesser Black-backed Gull regularly occurred in summer feeding in fields around the edge of the site, and commuting across the interior of the site. The only other regularly occurring waterbirds were Mallard, Moorhen and Grey Heron. There were occasional records of Whooper Swan, Greylag Goose, Teal, Golden Plover, Lapwing, Whimbrel, Black-headed Gull, Common Gull, Herring Gull and Great Black-backed Gull. The other notable species recorded were Nightjar and Great Spotted Woodpecker. The Barn Owl survey did not find any evidence of Barn Owls.

The evaluation of the bird survey results and additional information from desk reviews identified 12 Key Avian Receptors. These comprised: visiting Lesser Black-backed Gulls from the breeding population in the Saltee Islands SPA (international importance); Greylag Geese migrating across the site (national importance); a breeding Water Rail population (national importance); a wintering Hen Harrier population (county importance); breeding Snipe and Woodcock populations (county importance); a non-breeding Great Spotted Woodpecker population (county importance); and resident Sparrowhawk, Buzzard and Kestrel populations (local importance (higher value)). The other species recorded were not identified as Key Avian Receptors because either the wind farm site did not form part of the core range of a resident or regularly occurring population, the wind farm site was not on a migration or commuting route used by the species, or they were widespread and common species for which the wind farm site was not considered to be of conservation importance.

The wind farm will not have any impacts that are significant at the international or national scale and will not have any significant impacts on the Lesser Black-backed Gull, Greylag Goose, Water Rail, Hen Harrier and Great Spotted Woodpecker Key Avian Receptors.

The wind farm is likely to have significant displacement impacts to breeding Woodcock and Snipe populations of county importance. Three Biodiversity Management Areas have been identified to compensate for the impact on the breeding Snipe population. Under a best case scenario, the implementation of appropriate habitat creation / management measures at these sites would result in a net positive impact on the breeding Snipe population. However, as with

most habitat compensation measures, there is a considerable degree of uncertainty about the likelihood of success of these measures.

There is also potential for significant impacts on the Kilkenny populations of Buzzard and Kestrel from collision mortality, although there is some uncertainty about the potential significance of these impacts because of the limited data available on Buzzard and Kestrel populations at the county scale, the inherent margin of error in collision risk predictions, and the inherent uncertainty in translating collision risk predictions into impacts at the population scale. The Irish Buzzard population is rapidly increasing so any impact from collision mortality is unlikely to cause an overall decline in the Kilkenny population. However, the Kilkenny Kestrel population is likely to be in an unfavourable conservation state and may be sensitive to impacts from collision mortality.

The wind farm may also have displacement impacts to Sparrowhawk and Buzzard, which are significant at the local scale. However, this is simply a function of the relative size of the wind farm compared to the local scale, and any wind farm project of similar size would be likely to have similar potential displacement impacts on these widespread species.

8.0 LAND, SOILS AND GEOLOGY

8.1 INTRODUCTION

This chapter provides a summary of the existing soil and geological environment (i.e. baseline for the site) and potential effects of the proposed development. An outline of recommended mitigation measures and any residual effects are also presented.

The topography of the site can be described as gently sloping, rising from the lower lands in the east and in the west to a higher undulation in the north and south of the site. The site consists largely of resistant Devonian sandstone forming the higher ground with the eastern boundary tapering to lower elevations. There are no Irish Geological Heritage sites inside the site boundary. The proposed infrastructure footprint avoids any pockets of peat deposits on the site. The Kiltorcan New Quarry, located around 1 km to the north west of the site, is the closest active shallow quarry excavation identified as a geological heritage site. The development will not affect this geological heritage site.

8.2 POTENTIAL EFFECTS

Three locations within the site will be used as borrow pits for extracting rock. . Based on the area of the three borrow pits (c. 51,000m^2) and a maximum depth of 10m, the volume available in the borrow pits is approximately 510,000m^3. Based on the calculated volumes, the proposed borrow pits exceed the volume required for access tracks and hardstand and therefore the full depth of the borrow pits will not be required. Potential instability can arise from excavation works. No significant stability risk was identified based on the stability analyses carried out.

Construction phase activities of the proposed development will require earthworks resulting in the removal of vegetation cover and excavation of mineral subsoil. Incorrect site management of earthworks and excavations could, therefore, lead to loss of suspended solids to surface waters as a consequence of soil stripping, if necessary, Run-off and erosion from soil stockpiles or dewatering of excavations. The result of increased sediment loading to watercourses is to degrade water quality of the receiving waters and change the substrate character.

The construction of the development has the potential (with no mitigation) to negatively affect the soil and geology mainly due to the management and movements of soils and stone materials.

8.3 MITIGATION MEASURES

Many of the mitigation measures detailed in Volume II Environmental Impact Assessment Report (EIAR) come from CIRIA (Construction Industry Research and Information Association, UK) technical guidance on water pollution control and on current accepted best practice, (CIRIA, 2001). All works will be managed and carried out in accordance with the Construction and Environmental Management Plan and a Soil Management Plan. Together, these will include for measures such as correct handling, storage and re-use of all excavated materials and dust control. Good site practice during project construction, operation and decommissioning will be applied to ensure no fuels, oils, wastes or any other substances are stored or handled in a manner on site in which they may spill and enter the ground.

All temporary excavations on site will be assessed by a competent designer. Mitigation measures will be put in place to ensure these excavations remain stable during construction. Excavation works will be monitored by a suitably qualified and experienced geotechnical

engineer or engineering geologist. The earthworks will not be scheduled to be carried out during severe weather conditions. The long-term stability of the area around the wind turbine foundations will be achieved by filling the area back up to existing ground level.

The effect on natural geological resources will be mitigated by management and reuse of geological materials onsite and efficient design of any borrow pits within the site boundaries.

8.4 RESIDUAL EFFECTS

The proposed development site is not a sensitive site in terms of the soils and geological environment. Peat and Soil Stability Assessments have been carried out when assessing the impact on Land, Soils and Geology, with the findings suggesting negligible peat instability risk and no significant soil stability risk at the site.

Overall, the development of the project will have a not significant, negative and, long-term effect on soil and geology through the application of identified mitigation measures and appropriate management throughout the life cycle of the wind farm.

9.0 HYDROLOGY AND HYDROGEOLOGY

There are two sets of main tributaries that form from the site. Mullenhakill tributary, which is located to the east of the site, flows in a northeasterly direction feeding into Arrigle River. The Arrigle River is located within the Nore catchment. The western portion of the site is drained by three small tributaries to the Derrylacky River. The Derrylacky River is located within the Suir catchment.

As part of the baseline assessment, a comprehensive hydrological monitoring programme has been undertaken at the site. This involved the monitoring of water quality and field chemistry of river and stream flows.

Within the site, there are numerous man-made drains that are in place to drain the existing forestry. The merging of the proposed wind farm infrastructure with the existing forestry drainage, and natural drainage of the site, in a manner that avoids water quality and flooding impacts to downstream rivers and streams is a key component of the wind farm design. The water quality of the local rivers is typically very good.

The proposed wind farm is not located in an area that is susceptible to flooding from rivers or surface water ponding. Drainage attenuation will be applied across the site to ensure no impacts on downstream flooding will occur as a result of the proposed wind farm development.

Due to the nature of wind farm developments, being near surface construction activities, impacts on groundwater are generally negligible and surface water is the main sensitive receptor assessed during impact assessments. Although the site is showing some sensitivity to groundwater vulnerability, particularly where the bedrock is near the surface, the bedrock consist of locally important but mostly poor aquifers. Additional protection is afforded by the presence of clays.

A Group Water Scheme was identified near to the site. The Listerlin GWS is situated 3 km east of the site. Thomastown Public Water Supply (PWS) is located approximately 5 km north of the site. The mapped zone of contribution to these existing sources are relatively remote from the proposed wind farm site and given separation distances from the development site, the aquifer type, the changes in topography and also the surface water drainage regime (GWS is upstream of the site and the PWS is situated further upstream of where Arrigle River joins the Nore River), there are no potential impacts at these abstraction schemes as a result of the proposed wind farm development. There is no potential for impact at nearby private wells, with the maximum groundwater drawdown calculated to be 100mm at 30m from excavations.

Additionally, St Molin's well has also been looked at and the local ground contours and flow direction indicate no potential impacts to the spring source from the wind farm development.

The proposed development site is located within the River Barrow catchment and upstream of the River Barrow and River Nore Special Area of Conservation. The designated site can be considered very sensitive in terms of potential hydrological impacts.

9.1 POTENTIAL IMPACTS

During construction, there will be a risk of pollution from site traffic through the accidental release of oils, fuels and other contaminants from vehicles. Concrete (specifically, the cement component) is highly alkaline and any spillage to a local watercourse would be detrimental to water quality and fauna and flora. The presence of workers at the proposed development will

lead to the generation of foul sewage from toilets and washing facilities. This foul sewage will be collected and tankered off-site for disposal at a licensed waste-water treatment facility.

With regard to water quality impacts, there will be no direct discharges to the surface water environment during the operational phase. Due to the nature of the development there will be vehicles periodically on the site at any given time. The potential impacts are limited by the size of the fuel tank of the vehicles using on the site. As a result, occasional/accidental emissions, in the form of oil, petrol or diesel leaks, could cause slight/negligible temporary and localised contamination of site drainage channels.

As the site is currently a forestry site, the installation of gravel trackways and permanent hardstanding for infrastructure could potentially increase the runoff during the operational phase of the wind farm. The design of the trackways will include for permanent drainage therefore runoff is likely reduced and the risk of surface water pollution during operation is considered to be low.

9.2 MITIGATION MEASURES

In identifying and avoiding sensitive surface waters the proposed development has implemented 'avoidance of impact' measures.

In order to mitigate potential impacts during the construction phase, best practice construction methods will be implemented in order to prevent water (surface and groundwater) pollution. A drainage system has been designed for the site including a number of features such as check dams and settlement ponds. These are designed to maintain discharge rates at existing levels and remove any sedimentation arising from excavation works. A Construction and Environmental Management Plan (CEMP) was developed for the project to ensure adequate protection of the water environment. All personnel working on the project will be responsible for the environmental control of their work and will perform their duties in accordance with the requirements and procedures of the CEMP.

During the ground clearance of the proposed development, water control measures will be implemented by the contractor to limit the volume of water that requires treatment.

Any vehicles utilised during the operational phase will be maintained on a weekly basis and checked daily to ensure any damage or leakages are corrected. The potential impacts are limited by the size of the fuel tank of vehicles used on the site.

Within the selected substation, all fuel will be stored in bunded areas. The exception to this being double walled tanks equipped with leak detection, which do not require additional retention. A hydrocarbon interceptor will be installed at the proposed substation site with regular inspection and maintenance, to ensure optimal performance.

9.3 RESIDUAL IMPACTS

The following conclusions can be drawn in relation to surface water and groundwater:

- The site drains to a number of tributaries surrounding the site boundary, primarily to tributaries of the River Nore and River Blackwater;
- The site is underlain predominantly by low permeability sandstone tills and exposed sandstone bedrock;

- Man-made drains are located throughout the site and will continue to operate as part of the existing water management system on site. The proposed drainage plan will further enhance the water management at this location;
- Based on the results of the Flood Risk Assessment, it is estimated that the risk of flooding to the proposed wind farm development will be minimal and that the development will not increase the risk of flooding elsewhere;
- The implementation of appropriate mitigation measures during the construction and operational phases lead to a low risk due to changes caused by the development on the hydrological regime;
- Water quality in the immediate area of the site is good and is consistent with the expected natural water quality for such an environment. The water quality reported by the EPA downstream of the site is of very good status; and
- The site overlies both locally important and generally unproductive aquifers of medium to extreme Vulnerability.

The residual impacts on the surrounding water quality, hydrology and existing drainage regime at the site are considered to be negligible and short term in nature. The existing on-site drainage system will remain active during construction and operation of the proposed wind farm and will be enhanced by a proposed drainage plan that has been designed for this development.

The construction timescale of activities within the site will be phased and short-term in duration and, thereafter, the only activities within the site will be associated with maintaining existing drains, ongoing maintenance and monitoring during the operational phase. There are no significant long-term impacts.

10.0 SHADOW FLICKER

Wind turbines can cast long shadows when the sun is low in the sky. 'Shadow flicker' is an effect that occurs when the rotating blades of a wind turbine cast a moving shadow over a building. The effect is experienced indoors where a moving shadow passes over a window in a nearby property and results in a rapid change or flicker in the incoming sunlight.

The occurrence of shadow flicker impacts are determined by a number of criteria as follows:

- The presence of screening: Screening can occur from a variety of sources including vegetation, terrain, and buildings. If screening is present between the property and the wind turbine/sun, then shadow flicker would not occur at that property.
- The orientation of the property: The windows of the sensitive property must have windows that face the proposed turbines in order to be able to receive shadow flicker.
- The distance of the property from turbines: The potential effect of shadow flicker diminishes as distance from the turbine increases. An industry standard approach is to use a distance of ten rotor diameters as a maximum limit within which significant shadow flicker effects can occur.
- The presence of direct sunlight: Cloud cover can remove the presence of direct sunlight so that it is diffused and does not cast a shadow. If direct sunlight is present, the turbine blades must be located in the direct path between the sun and the property.
- The time of year and day: The path of the sun varies over the seasons resulting in a changing potential for a shadow to be cast throughout the year. Similarly, the sun's position in the sky over the course of a day is changing such that the shadow cast by a turbine is constantly changing.
- Wind speed: In order for shadow flicker to occur, the turbine must be rotating. This requires a wind speed high enough to cause the turbine to turn on.
- Direction of Wind: The width of a shadow at any given property is dependent on the direction of the wind. This will be different on any given day at every property. The worst-case shadow occurs when the turbine faces directly towards or away from a property, while minimum flicker occurs when it faces perpendicular to the property.
- The presence of people: If the property is empty at the time of a shadow flicker event, then it would not cause a nuisance.

Given the above requirements for the presence of a shadow flicker impact, it could be said that for the vast majority of the time at any given property, shadow flicker should not cause any issues from any given turbine.

The current 2006 Wind Energy Development Guidelines state that, *"Careful site selection, design and planning, and good use of relevant software, can help avoid the possibility of shadow flicker in the first instance. It is recommended that shadow flicker at neighbouring offices and dwellings within 500m should not exceed 30 hours per year or 30 minutes per day".*

The Guidelines also state that, *"At distances greater than 10 rotor diameters from a turbine, the potential for shadow flicker is very low. Where shadow flicker could be a problem, developers should provide calculations to quantify the effect and where appropriate take measures to prevent or ameliorate the potential effect, such as by turning off a particular turbine at certain times".*

The shadow flicker modelling approach presented in the assessment in Chapter 10 is consistent with these guidelines.

The maximum rotor diameter of the turbines in this proposed development will be 155m, therefore all sensitive receptors within 1.55km of the proposed turbine locations (i.e. 10x rotor diameters) have been included in the shadow flicker model. A total of 89 no. shadow flicker receptors were identified and the property locations added to the model.

The default model settings make a number of assumptions which represent a worst-case scenario, namely:

- 'Greenhouse Mode' – assumes that shadows can be seen from 360 degrees at a property/receptor as opposed to only through windows facing the wind turbines;
- That the turbine blade are always turning – in practice, calm conditions, low wind speeds and maintenance shut-down will reduce the duration of operation of the turbines;
- That the wind direction is such that the turbine rotor is always perpendicular to the direction to the property so that it casts the maximum shadow possible for each wind turbine – in practice, the wind direction will change periodically over the course of the year and turbines are programmed to rotate around to face the wind direction;
- That there is 100% sunshine during daytime hours – Met Éireann long term data for the region shows that the sun shines on average for 30% of the daylight hours per year [3]; and
- A 'bare earth' condition without vegetation (including forestry), buildings or other obstacles – existing screening and local topographical variations can reduce the potential for shadow flicker to occur.

Based on these worst-case conditions and including the potential cumulative shadow flicker effect from the existing neighbouring wind farms at Ballymartin/Smithstown and Rahora, it is predicted that 56 no. shadow flicker receptors will experience daily shadow flicker in excess of the 2006 WEDGs threshold of 30 minutes per day. It is predicted that 70 no. receptors will experience shadow flicker in excess of 30 hrs per year in the worst-case scenario. The actual occurrence and incidence of shadow flicker over the course of a day and the year, when the above realistic conditions are taken into account, is likely to be significantly less than the predicted worst-case effects. When reduction factors for sunshine probability and wind direction are taken into account in the model, there are no exceedances of the current guideline threshold limit of 30 hrs per year.

There are no potential impacts relating to shadow flicker during the construction or decommissioning phase of the proposed development as shadow flicker can only occur when the turbine blades are installed and rotating. During commissioning, some shadow flicker may be experienced while the software is being refined but there will be no exceedance of a maximum daily limit of 30 minutes per day during this period.

In accordance with developing best practice, the Developer is committed to minimising any adverse effects from the proposed development on the local community and is committing to ensuring zero shadow flicker at the shadow flicker receptors identified within 1.55km (ten rotor diameters) of the proposed wind turbine locations. This is subject to the technical capabilities of turbine technology where a controlled and safe slow-down of blade rotation is required in the event that shadow flicker on a receptor is predicted to occur.

Mitigation measures in the form of a Turbine Shutdown Scheme will be implemented to ensure that shadow flicker does not occur at the affected properties. A process will be established by the wind farm operator whereby local residents can highlight any concerns or complaints about

[3] 30 Year Average Data (1978-2007) – Kilkenny Weather Station

the operation of the scheme. All concerns raised will be investigated by the wind farm operator and the turbine shutdown software adjusted accordingly, as required.

If there is sufficient existing screening at a shadow flicker receptor, the Turbine Shutdown Scheme may not be necessary for that receptor. The Developer will engage with any affected residents to investigate options for new or additional screening measures (such as planting), where appropriate and agreeable to the affected residents.

The implementation of mitigation measures to screen shadow flicker effects from sensitive receptors and/or implement wind turbine control measures in accordance with a defined Turbine Shutdown Scheme will ensure that any residual shadow flicker impacts from the proposed development will be eliminated at any shadow flicker receptors. There will be no cumulative effect with the implementation of the above mitigation measures.

11.0 MATERIAL ASSETS – TELECOMMUNICATIONS AND AVIATION

This Chapter assesses the effect on Telecommunication signals, broadcast signals, and aviation arising from the proposed Castlebanny Wind Farm

The nearest significant airport to the proposed development is Waterford Airport, located approximately 23 kilometres south of the proposed wind farm site. Kilkenny Airport, which is an airfield with a grass runway is located approximately 22 kilometres to the northwest of the proposed development.

Waterford Airport responded to the consultation to request an aeronautical assessment of the safety impact on the airport instrument approach flight procedures, the mandatory aerodrome safety surfaces, and any effects on the safety calibration flights' ability to conduct the required flight checking programme for the navigational aids and instrument landing systems at Waterford Airport. Following consultation with the Waterford Airport management which included a virtual meeting, an Aviation Impact Assessment and an ILS Calibration Flight Impact Assessment were commissioned by independent specialist consultants Pager Power to assess the potential impacts that the proposed project might have on operations associated with both the existing Waterford Airport, and the proposed extended runway there. The Aviation Impact Assessment Report and ILS Calibration Flight Impact Assessment Report found that the proposed wind farm is unlikely to have a significant impact upon the existing aviation activity associated with Waterford Airport.

The Irish Aviation Authority responded to the consultation advising that the Department of Defence should be consulted and requested that in the event of permission being granted, they be notified of the aeronautical warning light scheme and position of the constructed turbines.

The Irish Defence Forces provided a combined response with the Air Corps to the consultation to express their concern at the location of the proposed development in relation to the M9 motorway, and the associated potential for impacts on their flight paths. The Aeronautical Technical Briefing Notes found that no measurable impact is anticipated as a result of the Castlebanny Wind Farm. The report also states that the proposed turbines might provide a visual landmark for aircraft, thereby providing a beneficial effect.

Similarly, a number of telecommunications operators were contacted in relation to communication links in the area. Following receipt of their scoping responses, the design of the proposed development was reviewed and revised, as necessary, to minimise any potential for impacting on telecommunications networks. This was carried out by inputting all the constraint data that was received into GIS mapping software and ensuring that the proposed turbine locations would not be located within the appropriate setback distances from the telecommunications signals.

Based on this consultation exercise, and the fact that the proposed layout has been designed to avoid any impacts to the links which were determined to be in the area, it is therefore not anticipated that the proposed development will have any impact on telecommunication links in the area.

In addition to major telecommunication links, wind turbines have the potential to impact on delivery of telecommunication signals to the end users, for example by preventing the radio or television signal going to a house from a transmitter through electro-magnetic interference or physically blocking the signal. This would be an unlikely slight long-term negative impact in the absence of any mitigation.

11.1 MITIGATION MEASURES

Aviation

The proposed development will require certain lighting requirements for tall structures. This will increase the visibility of the proposed development to any local aircraft. The final locations and dimensions of each turbine will be mapped and provided to the local authority and stakeholders (such as the Irish Aviation Authority) prior to erection to ensure that maps and databases are up-to-date for flight navigation.

In order to avoid any impacts on the Instrument Flight Procedures: The assessments show that the clearance distances between the assessed procedures and the proposed turbines exceed all relevant clearance minima. With respect to potential new IFPs as a result of the runway extension, a worst-case 2,000ft DME 12nm arc has been assessed. Considering an existing wind farm (Ballymartin/Rahora), a 1,000ft clearance would not be possible. Therefore, the minimum altitude would need to be increased and taken into account in the design of new IFP's for the extended runway. In doing so, steps could be taken to accommodate the proposed wind farm to ensure minimum clearance distances.

Telecommunications

The proposed development is not anticipated to have any impact on any telecommunication links in the region due to the distance between the existing links and the proposed turbine locations. The developer has signed an agreement with 2RN to commit to restoring service to any end users that may have their television and/or radio service disrupted as a result of the proposed development. This is standard industry practice and will eliminate any potential impacts in this regard.

11.2 RESIDUAL IMPACTS

The implementation of the outlined mitigation measures mean that the proposed development will have no residual impact with respect to aviation.

There will be no impact to telecommunications during the operational phase due to the distance between the proposed turbine locations and the existing links in the area, and the requirement to not cause any impact to end users of telecommunication services by way of restoring the service.

12.0 NOISE AND VIBRATION

AWN Consulting Limited was engaged to conduct an assessment into the likely environmental noise and vibration impacts of the proposed Castlebanny wind farm development (the 'Proposed Development').

The background noise environment has been established through noise monitoring surveys undertaken at several noise sensitive locations (NSL's) surrounding the Proposed Development. Typical background noise levels for day and night periods at various wind speeds have been measured in accordance with best practice guidance contained in the Institute of Acoustics document '*A Good Practice Guide to the Application of ETSU-R-97 for the Assessment and Rating of Wind Turbine Noise*' (IoA GPG). Prevailing noise levels are primarily attributable to local road traffic noise and other agricultural and anthropogenic sources in the area. The results of the background noise survey have been used to derived appropriate noise criteria for the development in line with the guidance contained in *'Wind Energy Development Guidelines for Planning Authorities 2006'.*

When considering a development of this nature, the potential noise and vibration effects on the surroundings must be considered for two stages: the short-term construction phase and the long-term operational phase.

The assessment of construction noise and vibration and has been conducted in accordance with best practice guidance contained in *BS 5228-1:2009+A1:2014 Code of practice for noise and vibration control on construction and open sites – Noise* and *BS 5228-2:2009+A1:2014 Code of practice for noise and vibration control on construction and open sites – Vibration.* Subject to good working practice as recommended in the EIAR Chapter, it is not expected that there will be any significant noise and vibration impacts associated with the construction phase and the likely noise from construction activity at the nearest Noise Sensitive Locations (NSLs) is expected to be well below recommended significance threshold values. The associated construction noise and vibration impacts are not expected to cause any significant effects.

Based on detailed information on the site layout, the likely turbine noise emissions and turbine hub height for the proposed development, a series of 'worst-case' turbine noise prediction models have been prepared for review. The predicted turbine noise levels have been calculated at all NSLs in accordance with the IOA GPG recommendations. The predicted turbine noise levels associated with the Proposed Development in isolation are predicted to be well within the best practice noise criteria curves recommended in Irish guidance document *'Wind Energy Development Guidelines for Planning Authorities 2006.* However, the omni-directional noise modelling calculations identified 7 no. NSLs where the contribution of the Castlebanny turbines could potentially result in a cumulative turbine noise level that exceed the noise criteria curves (i.e. the total turbine noise levels from all permitted and proposed wind farm developments in the area). A directional cumulative assessment of turbine noise levels identified that there will be no exceedances of the noise criteria curves at the 7 no. properties as a direct result of the Proposed Development. Therefore, it is not considered that a significant effect is associated with the Proposed Development.

No significant vibration effects are associated with the operation of the site.

In summary, the noise and vibration impact of the proposed development is not significant considering national guidance for wind farm developments.

13.0 LANDSCAPE AND VISUAL IMPACT

The Landscape & Visual Impact Assessment (LVIA) chapter describes the landscape context of the proposed Castlebanny Wind Farm in Co. Kilkenny and assesses the likely landscape and visual impacts of the scheme on the receiving environment. Although closely linked, landscape and visual impacts are assessed separately.

Landscape Impact Assessment relates to assessing effects of a development on the landscape as a resource in its own right and is concerned with how the proposal will affect the elements that make up the landscape, the aesthetic and perceptual aspects of the landscape and its distinctive character. Visual Impact Assessment relates to assessing effects of a development on specific views and on the general visual amenity experienced by people. Cumulative landscape and visual impact assessment is concerned with additional changes to the landscape or visual amenity caused by the proposed development in conjunction with other developments (associated or separate to it), or actions that occurred in the past, present or are likely to occur in the foreseeable future.

Study Area

As the proposed turbines are greater than 100m tip height, the minimum ZTV radius recommended is 20km from the outermost turbines of the scheme, which is the study area in this instance. Please note, the central study area relates to an approx. 5km radius from the site.

13.1 METHODOLOGY

Production of the Landscape & Visual Impact Assessment involved baseline work in the form of desktop studies and fieldwork, over multiple site visits, comprising professional evaluation by qualified and experienced Landscape Architects. This entailed the following:

Desktop Study

- Establishing an appropriate Study Area from which to study the landscape and visual impacts of the proposed wind farm;
- Review of a Zone of Theoretical Visibility (ZTV) map, which indicates areas from which the development is potentially visible in relation to terrain within the Study Area;
- Review of relevant County Development Plans, particularly with regard to sensitive landscape and scenic view/route designations;
- Selection of potential Viewshed Reference Points (VRPs) from key visual receptors to be investigated during fieldwork for actual visibility and sensitivity.

Fieldwork

- Recording of a description of the landscape elements and characteristics within the Study Area;
- Selection of a refined set of VRP's for assessment. This includes the capture of reference images and grid reference coordinates for each VRP location for the visualisation specialist to prepare photomontages.

Appraisal

- Consideration of the receiving landscape with regard to overall landscape character as well as the salient features of the study area including landform, drainage, vegetation, land use and landscape designations;
- Consideration of the visual environment including receptor locations such as centres of population and houses; transport routes; public amenities, facilities and heritage features and designated and recognised views of scenic value;
- Consideration of design guidance and planning policies;
- Consideration of potentially significant effects and the mitigation measures that could be employed to reduce such effects;
- Estimation of the significance of residual landscape impacts;
- Estimation of the significance of residual visual impacts aided by photomontages prepared at all of the selected VRP locations;
- Estimation of cumulative landscape and visual effects in combination with other surrounding developments that are either existing or permitted.

13.2 RECEIVING ENVIRONMENT

In a broad context, landform is richly diverse across the study area, being neither extreme nor monotonous, comprising of undulating, lowland terrain with multiple hills and valleys that breach five different counties. For the most part, higher topography within the study area is mostly found more than 10km from the site, which includes Brandon Hill, the lower foothills of the Blackstairs Mountains, and Slieve Coiltia in Co. Wexford. Closer to the site, landform tends to be less extreme and more gently undulating. The Castlebanny Hill range has a low, elongated, plateau-like profile, and runs north-south over the course of 8-9km in length, and 2-3km east-west in width. In terms of drainage features, watercourses more commonly take the form of streams or small rivers in the central study area. However, within the wider study area some major, nationally renowned watercourses are found, such as the Rivers Suir, Nore and Barrow.

In terms of land use in the central study area, agriculture, followed by commercial conifer plantations, is predominant. Pasture occupies most of the agricultural land, although there are notable stretches of tillage as well, while less apparent land uses are golf courses, urban settlements and recreational woodlands. The site of the proposed development measures approx. 1434 ha and is mostly covered in coniferous forestry plantations. There is an extensive network of existing access roads across the site, and the South Leinster Way walking/hiking trail crosses its southern portion.

In terms of centres of population, although the study area is strongly rural in character, there are several villages and towns spread throughout. The density of housing and quantity of settlements within the study area are also mildly influenced by it's proximity to Kilkenny and Waterford City. Within the central study area, the most sizeable settlement is the town of Mullinavat, approx. 4.8km from the nearest proposed turbine, although the village of Ballyhale is the closest settlement to the site, approx. 2.7km from the nearest proposed turbine.

The major transport route in the area is the M9 Dublin-Waterford motorway, which enters the central study area to within approx. 2.7km of the nearest proposed turbine, while the Dublin-Waterford InterCity rail line enters the central study area to within approx. 2km of the nearest proposed turbine. There are numerous National roads in the study area, although all are more than 9km from the nearest proposed turbine. However, there are three regional roads, and a relatively regular network of third class roads, within the central study area.

With regards to amenity and heritage features in the central study area, the most immediate and apparent of these is the South Leinster Way; where this waymarked trail passes through the site it is largely enclosed by mature or semi-mature conifer forestry. Mountain View Golf Course is located within 1.3km west of the nearest proposed turbine, with Knocktopher Abbey located approx. 4.5km northwest. Within 5-7km north of the site, the renowned Mount Juliet Estate and Jerpoint Abbey are located. However, for the vast majority of the latter, including the abbey itself, there is no potential for views of the proposed development, owing to intervening landform. Most other well-known amenity and heritage features are located more than 14km from the site.

13.3 LANDSCAPE POLICY CONTEXT AND DESIGNATIONS

Department of Environment, Heritage and Local Government Wind Energy Development Guidelines (2006)

The Wind Energy Development Guidelines (2006) and Draft Revised Wind Energy Guidelines (2019) both provide guidance on wind farm siting and design criteria for a number of different landscape types. The proposed turbines are situated in the 'the '*Hilly and Flat Farmland* landscape type. Such landscape types derive from a matrix of factors (e.g. landform/terrain) other than current land use alone, and even though the majority of the site of the proposed development is not under farmland, this landscape type shares the most landscape characteristics that are consistent within the immediate landscape. The Guidelines recommend consideration of the advice for each relevant landscape type, and it is considered that the proposed development design is in general accordance with the guidance for the relevant landscape type and does not conflict with it.

Kilkenny County Development Plan 2014-2020

In terms of the Kilkenny County Landscape Character Assessment, the site is located within the 'Upland' Landscape character Type, with the nearest designated 'Highly scenic / Visually pleasing' area being more than 4.5km from the site, and the nearest designated 'protected view' being more than 4km away. The Landscape Character Assessment also identifies fourteen Landscape Character Areas (LCAs) within the county. The Castlebanny ridge divides 'Upland Area C South-Western Hills,' from 'Upland Area E – South Eastern Hills.' Of the 32 designated protected views within the county, only three are of potential relevance to the proposed development, all of which are located more than 7km from the nearest proposed turbine. With regards to Wind Energy, according to the County Development Plan, the site of the proposed development is deemed to be "Open to Consideration." However, the County's recently published Draft Wind Energy Development Strategy places the site within an area deemed to be 'Acceptable in Principle' for wind energy development. The County Development Plans of the other four counties within the study area were also addressed. However, all are more than 13k from the site of the proposed development.

13.4 MITIGATION MEASURES

Given the highly visible nature of commercial wind energy developments, it is not generally feasible to screen them from view using on-site measures, as would be the primary form of mitigation for many other types of development. Instead, landscape and visual mitigation for wind farms must be incorporated into the early stage site selection and design phases. In this instance, the three main forms of landscape and visual mitigation employed were: consolidation

of the turbine layout; staggered linear layout to complement its elongated ridgeline setting; and the buffering of residential receptors.

13.5 LANDSCAPE IMPACT ASSESSMENT

The physical landscape, as well as the character of the proposed development and its immediate surrounds, is affected by the proposed turbines, in addition to ancillary development such as access roads, areas of hard standing, grid connection and the proposed substation. By contrast, for the wider landscape of the study area, landscape impacts relate to the influence of the proposed turbines on landscape character.

It is considered that the proposed development will have a proportionately modest physical impact on the landscape within the proposed development site, because none of the proposed features have an extensive physical 'footprint.' This includes approx. 11km of upgraded access tracks and approx. 11km of new access tracks, which have been designed to try and avoid environmental constraints. There will be a requirement to clearfell almost 83 hectares of commercial forestry, out of a total of more than 1300 hectares of commercial forest within the site (i.e. less than 10%). This commercial crop is scheduled to be felled in the future, regardless of the proposed development. Consequently, any potential landscape impacts generated by clearfelling will also be applicable in the do-nothing scenario. The proposed 110kV substation will be located in the centre of a commercial forestry block and at an elevation of approx. 200m, below the ridgeline. In the context of this broad forested site and the proposed wind turbines, the substation and associated infrastructure will be a modest ancillary development that will be well screened by surrounding vegetation. With regards to the proposed grid connection infrastructure, it will have a notably small physical impact on the landscape of the central study area.

The principal landscape impact will be the change in character of the immediate area due to the introduction of large-scale structures with moving components. In this instance, wind turbines are not just a familiar feature of the wider study area, but two such wind farms are located within approx. 6km of the site. In tandem with the aforementioned commercial conifer plantations across the hill range, existing wind turbines contribute in a modest but noticeable way to the prevalent landscape character of this elevated landscape. This is likely to result in an intensification of an established land use in this landscape and for wind energy development to become gradually more of a characteristic feature of this predominantly rural landscape. In terms of scale and function, the proposed development will be well assimilated within the context of the central study area, which consists of a range of productive rural land uses. Although it represents a higher level of built development than currently exists on the site, it will not detract significantly from its productive, utilitarian elevated rural character.

In terms of duration, the lifespan of the project is 35 years, after which time it is likely to be dismantled and the landscape reinstated to prevailing conditions. However, the proposed substation and access tracks will remain in-situ after decommissioning. Within 2-3 years of decommissioning, there would be little evidence that a wind farm ever existed on the site.

Overall, it is not considered that the proposed wind farm will give rise to significant landscape impacts. Instead, for the site itself the significance of landscape impact is deemed to be 'Substantial-moderate,' whilst for the remainder of the central study area the significance of landscape impact is judged to be 'Moderate.' Landscape Impact significance will reduce to 'Slight' and 'Imperceptible' at increasing distances thereafter, as the development becomes a progressively smaller component of the wider landscape fabric.

13.6 VISUAL IMPACT ASSESSMENT

The visual impacts of the proposed development were assessed across 45 viewpoints, covering 38 receptors (i.e. for some receptors, there are two or more viewpoints recorded), which were sourced from a variety of different distances, angles, contexts and receptor types within the study area. Across these viewpoints, the sensitivity of each receptor varied widely, from 'Low' to 'High-medium.'

The higher levels of sensitivity often related to public, elevated views from the uplands, as well as renowned heritage/amenity features and/or scenic villages/towns along the River Barrow or Nore. 'Medium' and 'Medium-low' sensitivity tended to be attributed to more typical rural views that contain a varied mix of anthropogenic land uses, whilst 'Low sensitivity' related to busy motorway corridors, where visual amenity is not a key consideration of receptors. Of the 45 viewpoints that were assessed, over two-thirds experienced a visual impact significance of no higher than 'Slight,' with almost one-third (i.e. 14 out of 45 VPs) experiencing an 'Imperceptible' visual impact significance. Three of the viewpoints experience a 'Moderate-slight' and a further nine experience a 'Moderate' visual impact significance; the highest recorded for the proposed development.

However, it is worth noting that due to the distinctively elongated north-south array of the proposed development, it will appear distinctly different from receptors to the east and west than it will from the north and south. Thus, it is considered more pertinent to understand the range and nature of visual impacts based on geographical locations. These entail: local community views in the central study area (14 receptors); views from the north and south of the wider study area (13 receptors); and, receptors from the east and west of the wider study area (11 receptors).

Of the local community views in the central study area, views of the proposed wind farm from the western side vary considerably in terms of visual exposure, depending on localised topography and screening. As an overview, significance of visual impact ranged between 'Slight' and 'Moderate,' but the closer proximity to the proposed development did not result in clearer views of the proposed wind farm; instead, distance and relative elevation play a bigger part in visual exposure. Views of the proposed wind farm from the eastern side of the site, in the Arrigle Valley, all share a broadly similar viewing context with one another. The proposed turbines tend to have an orderly and legible layout within these views, but increase the scale and intensity of built development within this quiet rural setting, resulting in a consistent significance of impact (i.e. 'Moderate'). Views from the north and south of the central study area are contained on forested/farmed slopes that fall away from the site, affording restricted views of just one end of the array, resulting in a 'Moderate' or 'Moderate-slight' visual impact significance.

In addition, Route Screening Analysis undertaken of the central study area illustrates a moderate to strong degree of wind farm screening from the road network, with 'Screened Views' being more common than 'partial views' or 'open views' from roads. In fact, beyond 1km, intervening vegetation serves to restrict views to an extent that it is more common than the turbines will be fully screened than there will be either 'Open Views' or 'Partial Views' of them.

In terms of views from the north of the wider study area, they tend to be from the lowland farming context of the agricultural plains where localised screening from nearby hedgerows and treelines preclude clear, long-distance views of the proposed wind farm. However, the northern study area also contains several sensitive heritage and amenity receptors, such as Jerpoint Abbey and Mount Juliet Golf Club (where the visual impact significance was considered to be no

greater than 'Slight-imperceptible' at either location), as well as the scenic settlement of Thomastown: receptors that were represented by three viewpoints apiece. Views from the south of the wider study area tend to be from elevated hilltops scattered from the middle distance to the furthest extents of the study area. Consequently, it was the nearest of these elevated southern views that is attributed with the highest significance of impact ('Moderate-slight'), while all other views in this set received impacts judgements in the range of 'Slight' to 'Imperceptible.'

With regards to views from the east and west of the wider study area, there is very limited visibility of the proposed development from the outer western parts of the study area due to intervening terrain screening. However, views from the outer eastern portion of the study area encompass the scenic Nore and Barrow River valleys and the picturesque riverside settlements of Inistioge, Graiguenamanagh and St Mullins. 'Illustrative viewpoints' from each of the settlements were provided, which showed that there is no potential for views of the proposed development from these scenic locations. Other views (i.e. four in total) are from elevated locations on the South Leinster Way and scenic routes within the eastern portions of the study area. However, the range of visual impact significance is between 'Slight' and 'Slight-imperceptible' for this set of viewpoints.

13.7 CUMULATIVE IMPACT ASSESSMENT

In terms of cumulative wind energy developments, there are two other existing wind farms within the 20km radius study area. These are Ballymartin Wind Farm (7 no. turbines, approx. 2.6km southeast of the nearest proposed Castlebanny Wind Farm turbine) and Rahora Wind Farm (5 no. turbines, approx. 5.3km southeast of the nearest proposed Castlebanny Wind Farm turbine).

Half (i.e. 19 of 38) of the receptors will have no other cumulative wind farms visible within the same viewing context as the proposed Castlebanny Wind Farm. Of the 19 viewpoints where there will be other cumulative wind farms visible within the same viewing context, 12 viewpoints are likely to experience visibility of just one of the existing windfarms in the study area, and seven viewpoints are likely to experience visibility of both existing windfarms in the study area. Where such cumulative visibility does exist, in most cases it does so in a 'combined view' (i.e. within a single viewing arc) and rarely in a succession view (i.e. within a series of viewing arcs from the same location). In summary, the magnitude of cumulative effects in respect of other wind farms is deemed to be 'Low.' Thus, significant cumulative impacts are not considered to occur.

13.8 CONCLUSION

Overall, it is considered that the proposed wind farm will not give rise to any significant landscape or visual impacts.

14.0 AIR QUALITY AND CLIMATE

This chapter assesses the effect on air quality and climate for the region surrounding the proposed Castlebanny Wind Farm.

Climate

As atmospheric levels of CO_2 are widely recognised as being one of the primary causes of climate change, the impact assessment below is based on the potential impacts that the proposed project would have in relation to changes in emissions of CO_2.

The carbon emitted or saved as a result of the proposed development is hugely significant in order to assess its impact on climate. The carbon calculation takes into account the carbon released from a number of sources during the construction, operational and decommissioning stages. These include the effects of drainage works, forestry felling, losses associated with harvesting and transport of felled trees, changes in land use and wind turbine manufacture and construction. Also included in the assessment tool is an assessment of carbon losses associated with peat disturbance, but as the proposed development was designed to avoid any such areas of peat, its impact is small relative to the factors mentioned above. Similarly, assessments are carried out to estimate the savings of carbon over the lifetime of the wind farm, compared to the current fossil fuel methods of electricity generation which power the grid. The assessments in the carbon savings category relate to the generating capacity of the wind farm over the number of years for which it is operational, forestry felling, improvement works at the site (i.e. peatland improvement, habitat creation, etc.) and the restoration of the site (i.e. removal of infrastructure and restoration of previous conditions) when the wind farm will be decommissioned. As there is no peat being excavated, there will be no restoration of peat.

Air Quality

The Environmental Protection Agency (EPA) is the competent authority responsible for the implementation of all Irish and EU ambient air quality legislation. The main air pollutants monitored by the EPA are ozone, carbon monoxide, nitrogen dioxide and oxides, sulphur dioxide, particulate matter (PM_{10} and $PM_{2.5}$), benzene, lead, Poly Aromatic Hydrocarbons (PAH), Arsenic, Nickel, Cadmium and Mercury[4]. Apart from ozone, all of these pollutants result from the burning of fossil fuels, either from transport, domestic heating, electricity generating stations or industry. High ozone levels are formed from the reaction of two key pollutants, nitrogen oxides (NO_x) and volatile organic compounds (VOCs), in the presence of sunlight.

The proposed Castlebanny Wind Farm site is situated within the EPA's 'Rural East' Air Quality Index for Health Region. The most recent reporting by the EPA indicates that the current air quality in this region is classified as Good (according to EPA records accessed on 18/11/20).

Although no data is available relating to air quality in the immediate vicinity of the study area, it is expected that the air quality at the proposed Castlebanny Wind Farm site can be represented by sites classed as Zone D (rural environment) as the data presented is the most recent data available and provides a reference of the air quality in a rural setting in relative proximity to the site.

[4] http://www.epa.ie/air/quality/monitor/

14.1 POTENTIAL IMPACT

Climate

During the construction phase of the proposed development, the potential negative effects on climate will include those associated with exhaust emissions from construction traffic. There is a slight short-term negative effect on climate anticipated from this.

The felling of forestry will be required over approximately 83 ha of the site area However, these areas of forestry are a commercial crop that would be felled at some point as part of the ongoing forestry cycle, regardless of the construction of the proposed wind farm. Approximately 75 ha of this area will be replanted off site while the remaining approximately 7.9 ha will be replanted onsite at the end of the construction phase. The result is that there is no net loss of afforested area, and therefore the loss of carbon associated with tree felling is negated. The felling is anticipated to have a short-term imperceptible neutral effect on climate.

While in operation, the wind farm will have indirect, positive effects on the climate. Wind energy is a renewable, clean and a sustainable means of electricity generation. The proposed Castlebanny Wind Farm will have a positive effect on the atmospheric environment and climate by avoiding emissions of pollutants and greenhouse gases that would otherwise be emitted from a conventional, fossil fuel fired generation plant. This will have a long-term moderate positive effect on climate. It will provide a significant contribution to the renewable energy production targets for County Kilkenny and on a national scale for Ireland.

Air Quality

Dust or pollutants generated from the proposed development construction phase will typically arise from:

- Movement of construction vehicles;
- Transportation of turbines and construction materials to and within the site;
- Blasting, breaking and crushing of Rock;
- Movement and placement of stockpiles (excavated soils/fill materials); and
- Wind generated dust from stockpiles, any required excavations and exposed unconsolidated soils.

There will be some exhaust emissions from construction activities onsite during the construction phase giving rise to a localised short-term imperceptible negative effect on air quality on site. There will also be a predicted increase in traffic volumes on nearby roads (R704) resulting from the construction phase, which is anticipated to have a potential short-term imperceptible negative effect on air quality along these routes due to dust and emissions.

The existing environment at the site of the proposed project currently has a high standard in relation to Air Quality. On a national level, the wind farm while in operation will have an indirect, slight positive effect on air quality due to the corresponding reduction in fossil fuel power generation which can produce a number of harmful pollutants.

The proposed amenity facility will also have a presence of vehicles during the operational phase to carry out onsite maintenance works and accessing the proposed public amenity car park. This vehicular activity will have the potential to create nuisance dust and exhaust emissions locally. The effect on the onsite air quality will be a long term negligible negative as a result.

14.2 MITIGATION MEASURES

Climate

During the construction and decommissioning phase of the proposed development, all contractors will ensure that machinery used on site is properly maintained and is switched off when not in use to avoid unnecessary exhaust emissions from construction traffic.

During the operational phase of the proposed development, the works onsite will be limited to maintenance associated with the wind farm components and use of the amenity facilities. Although the intensity of activity will be only a small fraction of the construction phase, all employees and contractors that are on site will ensure that machinery used is properly maintained and is switched off when not in use to avoid unnecessary exhaust emissions from maintenance traffic.

Air Quality

Potential effects arising from dust and exhaust emissions will be minimised through the provision of mitigation measures that are detailed below and also incorporated into the Construction and Environmental Management Plan (CEMP). These are as follows:

- Minimisation of extent of working areas;
- Stockpiling of excavated materials will be limited to the volumes required to practically meet the construction schedule;
- Drop heights of excavated materials into haulage vehicles will be minimised to a practicable level;
- Daily inspections by site personnel to identify potential sources of dust generation along with implementation measures to remove causes where found;
- Provision of dust suppression measures (e.g. sweeps/covers/water bowsers) will be used on stockpiles and the road surface during periods of extended dry weather.
- Traffic coming to site will only use the specified haul routes.;
- Onsite borrow pits will be used to minimise quantities of stone material being brought to site;
- Best practice (including industry recognised dust suppression techniques/equipment) will be used to minimise the potential for dust production during the extraction of rock from the borrow pits and excavations elsewhere;
- Vehicles and plant will be routinely serviced to minimise the exhaust emissions during construction;
- Vehicles will not be left running unnecessarily and low emission fuels will be used where possible; and
- The use of a wheelwash near the site entrance will prevent the transfer of dust from the construction works on to public roads.

14.3 RESIDUAL IMPACTS

Climate:

While the proposed construction works will have a short-term imperceptible negative effect on climate due to greenhouse gas emissions, the avoided emissions, resulting from the operational stage will have a moderate, long-term, positive effect on climate. The estimated power output of between 105-126 MW of Renewable Energy from the proposed wind farm to the electrical grid, is directly compatible with the provisions set out in the Climate Action Plan 2019.

When the forestry replanting (and the associated balance of carbon) is accounted for, over the 35-year life of the wind farm it is anticipated that 3,652,569 tonnes of carbon will be offset in the production of electricity. The project will have a positive long-term impact on climate and air quality, with a reduction in greenhouse gas emissions by utilisation of the least cost renewable energy technology.

The greenhouse gas emissions associated with the expected maintenance vehicles and use of the public amenity car park will have a potential negligible long term negative effect on climate.

Air Quality

There is anticipated to be a very localised potential slight, short-term, negative effect on air quality through dust generation and exhaust emissions during the construction stage, following the application of mitigation measures outlined above and in the CEMP.

In the context of an operational lifetime of 35 years, emissions of a number of pollutants associated with burning fossil fuels including nitrous oxides (NO_x), sulphurous oxides (SO_x), particulate matter (PM) and secondary pollutants, such as ozone, will be avoided at energy production facilities elsewhere in the country through the generation of renewable energy. The avoided emissions, therefore, result in a potential slight long-term, positive effect on air quality at those locations.

15.0 CULTURAL HERITAGE

The archaeological, architectural and cultural heritage assessment of the proposed Castlebanny Wind Farm in County Kilkenny examines the cultural heritage environment of the project area and its surroundings and evaluates the potential effects of the development on that environment. The assessment involves desk-based research comprising a cultural heritage constraints study and mapping analysis and field inspections which entailed ground survey that focused on previously recorded, unrecorded and potential cultural features. Based on the results of the assessment, the potential direct and indirect impacts of the development on the cultural heritage environment are evaluated and measures to minimise these potential impacts are proposed.

The Castlebanny Wind Farm project area is located in the South Eastern Uplands of County Kilkenny, on the north/south aligned ridge of Mullennakill Mountain, bounded to the east by the Arrigle River valley where the grid connection cable runs, with separate sections for the turbine delivery route (TDR) works to the south and southwest. Archaeological sites in the vicinity of the project area include prehistoric settlements and monuments and medieval religious and secular sites. There is a particular concentration of prehistoric features to the south of the project area that include megalithic tombs, standing stones and burnt mounds (fulachtaí fia); several important medieval sites are located to the north of the area, notably the extensive remains of the 12th-century Cistercian foundation, Jerpoint Abbey.

Two archaeological sites on the Record of Monuments and Places (RMP) are located within the boundary of the proposed wind farm: a ringfort-rath (KK032-029) in Cappagh townland in the north of the area and a 'structure' (KK036-040) in the east of the area, in Coolnahau townland. The structure is described as a 'large, overhanging rock with space under walled around to make a rectangular room', and it is traditionally associated with St Moling or St Mulling, a 7th-century monk and bishop who is said to have dwelt here as a hermit. Beside the eastern end of the planned grid connection cable route is another rath, in Ballyvool townland (KK032-033). One of the TDR works areas is next to the site of Ballynoony Castle (KK040-003), which appears as an earthwork on historic maps though there are no upstanding or visible remains.

Numerous archaeological sites and features have been recorded in the surroundings of the proposed wind farm. Within 10km of the area there are nine National Monuments including Ballyboodan Ogham Stone (NM 599), Knocktopher Church (NM 73) and Jerpoint Abbey (NM 80). Two walled towns – Inistioge and Thomastown, both situated along the River Nore – are also within a 10km radius. There are more than 250 archaeological (RMP) monuments recorded within 5km of the proposed wind farm. These include Neolithic stone monuments, Bronze Age fulachtaí fia and ring barrows, medieval enclosures and ringforts, churches, castles and bullaun stones. There are also extensive vernacular heritage remains of stone farmsteads and villages. These places attest to the richness and diversity of the area's prehistoric, medieval and historic heritage.

Sites of architectural significance in the surroundings of the proposed wind farm include those listed on the Kilkenny County Council Record of Protected Structures (RPS). There are no RPS sites within the proposed wind farm area: the nearest are a national school and railway station, located at more than 1km distance. The area does not intersect with the grounds or demesne lands of any historic houses: the nearest named house with associated grounds is Glenpipe House.

The potential direct and indirect effects of the development on the cultural heritage environment are assessed in relation to impacts during the construction phase, operation phase and decommissioning phase. Designs for the proposed wind farm, grid connection cable route and TDR works are mapped in relation to recorded archaeological and architectural sites; ground conditions observed during the field survey are assessed. Land currently or previously used for forestry has undergone significant prior ground disturbance from mechanical planting and harvesting which lowers the potential for archaeological features. Agricultural land, especially pasture, may have undergone less disturbance and has moderate potential for unrecorded archaeological features. Most of the proposed grid connection cable crosses pasture fields with moderate potential for unrecorded archaeological features.

The direct impacts of the works are rated as high for the wind farm construction and grid connection cable installation because these works will involve excavation below the depth where archaeological deposits might be expected and the impacts are permanent. Without implementing mitigation measures, the development would have potential negative direct effects on archaeological heritage.

Mitigation measures to reduce the impact of the development on the cultural heritage environment were developed during the course of the assessment. The main measure is to avoid direct impacts on registered archaeological and architectural sites, as well as vernacular heritage features, through the design of the works. The proposed layout of turbines, hard stands and tracks avoids zones of notification for recorded monuments. There are no planned building works within the zones of notification for three of the RMP sites – the ringfort-rath in Cappagh (KK032-029), the structure in Coolnahau (KK036-040) and the ringfort-rath in Ballyvool (KK032-033); temporary TDR works are proposed within the zone of notification for the castle site at Ballynoony West (KK040-003).

To minimise potential direct impacts on unrecorded archaeological heritage and at the castle site in Ballynoony West, archaeological testing will be carried out in advance of construction in areas of the proposed development where there appears to be minimal ground disturbance, which are rated as having moderate archaeological potential. The testing of areas with moderate potential will be followed by monitoring of ground works (topsoil stripping). Where development is planned in areas with previous or current planted forest, with low potential, inspection of topsoil stripping will take place to determine the level of ground disturbance and archaeological monitoring will be conducted if minimal ground disturbance is identified. Archaeological monitoring of topsoil stripping will take place along the grid connection cable route where this crosses pasture (unforested) land with moderate potential.

Archaeological testing and monitoring is to be carried out under licence from the National Monuments Service. In the event that archaeological features or sites are uncovered during the monitoring phase, further mitigation measures may be needed. Allowance will be made for avoidance (preservation in situ) or full archaeological excavation, in consultation with the National Monuments Service of the Department of Housing Local Government and Heritage. If the proposed mitigation measures are implemented, the impact of the development on the cultural heritage environment will be slight.

16.0 TRAFFIC AND TRANSPORT

This chapter assesses the potential impact of the proposed project on the surrounding road network and its capacity. Regional access to the site area is typically via national roads (e.g., M9) with local access into the proposed site from the R704 and a new crossing point on the L7451 local road.

For the project stages access to the site will be via different routes to reduce the impact on the existing environment. The construction and decommissioning stages will use the same access from the R704, via forestry lands (avoiding the L7451) to a new crossing point on the L7451 to the Wind Farm site. The operational access will be from the R704 via the R704/ L7451 priority junction and along the L7451 to the new crossroad access.

A Road Safety Audit was carried out to assess the new operational site entrance, with the key problem identified in the audit being the inadequate visibility available on the R704 from the site access to the west. In response to this, an upgraded site access is proposed with vertical realignment works on the R704 to the west to remove the hidden dip obscuring the visibility.

For developments of this nature, the construction phase is the critical impact period, with impacts experienced on the surrounding road network. The construction traffic impact assessment for the development was developed based on the site layout, the construction materials required and the construction programme. In addition to this construction traffic is the traffic associated with the works required off site to accommodate a development of this nature, such as advanced Turbine Delivery works and cabling works.

The construction activity with the largest impact on the traffic volumes is the pouring of the turbine foundations and the second largest is the haul of material to the site for the internal access track construction. A number of haul routes were identified based on proximity to site and suitable road infrastructure. Mitigation measures on the haul route include selection of site access points to locate HGVs away from properties, remove HGVs from the less substantial local road network, and improved visibility at the site accesses increasing safety. No preferred construction material haul route has been selected but each has been assessed against available link capacity and change in HGV content.

Mitigation by design has an impact on the potential impacts of the proposed project. The potential traffic generations associated with the internal access track construction has been reduced by the use of the borrow pits identified onsite (i.e. a two-third reduction) and utilisation of the existing forestry access tracks onsite where suitable, resulting in only 11km of new internal access track construction and 11km of upgrade of existing. The impact of the mitigation by design reduces the volume of traffic required at the site. As this mitigation is by design and is incorporated into the potential effects, the residual impact of the construction traffic remains the same. A short-term slight negative effect on the national road network and slight negative short-term effect on the R704 is predicted during average operations at the Wind Farm site. The worst-case scenario residual construction traffic impact will be experienced on the R704 with an expected very significant brief adverse effect, corresponding to the isolated 21 no. days of the 2-year construction programme, associated with the turbine foundation concrete pours.

The Volume II EIAR investigated and assessed the proposed Turbine Delivery Route (TDR). A preliminary report was undertaken using the longest abnormal load (i.e. turbine blade) to identify pinch points. The preliminary assessment was undertaken with a 75m length blade and revised swept paths have been undertake with a blade of up to 77.5m long. 12 pinch points were

identified with two alternative means of leaving the N25 Waterford Bypass and travelling onto the M9 northbound to site. Advanced TDR works will be required at these pinch point locations.

A combined traffic assessment of these advanced works in conjunction with the main Wind Farm site and the cabling works was assessed. The worst impact was identified on the R704, with the link capacity reducing by 2.1% on average and 6.8% at peak (which still leaves a spare link capacity of 63.8% in this case). The average potential traffic impact is likely to be a moderate negative brief effect of temporary duration. The peak effect will be brief occurring on 21 no. isolated days. The impact on the national road network will be slight and brief for peak and not significant and short-term / temporary for the average residual impact.

The cabling construction works will occur at the same time as the main Wind Farm works and have been included in the previous paragraphs traffic impacts. The cabling works will have low traffic volumes when the two trench crossings are constructed, with the largest volume of traffic required at the longitudinal trench over a 5-day period.

To minimise the impact of the proposed development during the construction stage a Traffic Management Plan (TMP) has been prepared and is included in the Construction and Environmental Management Plan (CEMP). The site layout incorporates passing bays, widened approaches to the site accesses, internal access track loops and compounds to assist with the traffic management and delivery on the site by providing adequate locations clear of the public road for vehicles to queue, facilitating larger HGVs onsite to pass each other safely and also allows for reducing the high-risk reversing manoeuvres on site. The overall traffic impact will be on average slight over the 2 year construction programme with isolated peaks of brief but very significant impact (i.e. 21 days over 2 years). The operational stage of the development will result in low traffic volumes for operation and maintenance works at the Wind Farm. Existing traffic operations at the Wind Farm site for forestry and agriculture uses are accounted for in the baseflow traffic and will have a neutral impact as pre-existing. A benefit of the Wind Farm when constructed is its use as a recreational amenity (for walking and cycling). Traffic information from similar sites indicates that the recreation amenity will result in an increase of 11 movements to the development per day. Due to the low volume of traffic, no mitigation measures were applied to the operational stage impacts. Overall the operational stage traffic impact is likely to have a slight negative long-term effect on the road network in the vicinity of the Wind Farm.

As outlined above the decommissioning stage will have a similar but reduced impact in comparison to the construction stage traffic. In the construction stage the largest traffic volume impacts were associated with the haul of the material for the road construction and the turbine foundation pours. As the proposal is to leave these in place, this significantly reduces the decommission stage traffic volumes. Mitigation measures are proposed during the decommissioning works for the public's safety and access to the Wind Farm will be restricted during the decommissioning works. These restrictions will only have a minor reduction in traffic but are in the interest of public safety. During the decommissioning works, the access used for the construction stage will be used again, to remove the impact of HGVs from the local road and the residents on the L7451.

During decommissioning, if the turbines are to be removed off site, the TDR haul route will be reused. The advantage to the use of this route is all the permanent infrastructure works installed for the construction phase will be installed and ready to use in advance of the traffic management. Works will be required for swept paths similar to that in the construction stage at the pinch points. The decommissioning will be over 35 years away and a new TMP will be undertaken specifically for the decommissioning phase to mitigate the impact. Potential future

road infrastructure improvements may also benefit the decommissioning stage. The predicted residual impact for the decommissioning stage is slight and temporary.

17.0 INTERACTIONS OF THE FOREGOING

The potential effects of the proposed development and the measures proposed to mitigate these effects have been outlined in the EIAR. However, in any development with the potential for environmental effect there is also the potential for interaction between effects of the different environmental aspects.

The result of these interactions may either exacerbate the magnitude of the effect or may in fact ameliorate it. As part of the requirements of an EIAR, the interaction of the effects on the surrounding environment needs to be addressed.

Table 17-1 below outlines the different environmental aspects which have potential to interact as a result of the proposed development. Interactions have been clearly identified in the early stages of the project and where the potential exists for interaction between environmental impacts, the EIAR specialists have taken the interactions into account when making their assessment. Potential interactions (both positive and negative) have been considered for the construction, operation and decommissioning phases of each of the different environmental aspects.

All environmental factors are interrelated to some extent. However, the most common interactions are between human beings and visual perception, noise, air quality and ecological resources. Having studied the interaction of potential impacts during the construction, operational and decommissioning phases it has been determined that no amplification effect is anticipated. The proposed development will have some positive impacts on an international, national, regional and local level. It is important to note that the physical, environmental and landscape and visual impacts are almost entirely reversible upon decommissioning of the development.

Interaction Matrix	Biodiversity	Ornithology	Land, Soils & Geology	Hydrology& Hydro-geology	Landscape & Visual	Shadow Flicker	MA - Telecoms & Aviation	Air Quality & Climate	Noise & Vibration	Traffic & Transport	Cultural Heritage	Population & Human Health
Biodiversity			√	√				√	√			
Ornithology			√	√				√	√			
Land, Soils & Geology				√				√			√	√
Hydrology & Hydrogeology												√
Landscape& Visual											√	√
Shadow Flicker												√
MA- Telecoms. & Aviation												√
Air Quality & Climate										√		√
Noise & Vibration										√		√
Traffic &Transport												√
Cultural Heritage												
Population & Human Health												

Table 17-1 Interactions matrix

www.tobin.ie

TOBIN Consulting Engineers

@tobinengineers

Galway
Fairgreen House,
Fairgreen Road,
Galway,
H91 AXK8,
Ireland.
Tel: +353 (0)91 565 211

Dublin
Block 10-4,
Blanchardstown Corporate Park,
Dublin 15,
D15 X98N,
Ireland.
Tel: +353 (0)1 803 0406

Castlebar
Market Square,
Castlebar,
Mayo,
F23 Y427,
Ireland.
Tel: +353 (0)94 902 1401