Carrigadoon Wind Farm

Non-technical Summary

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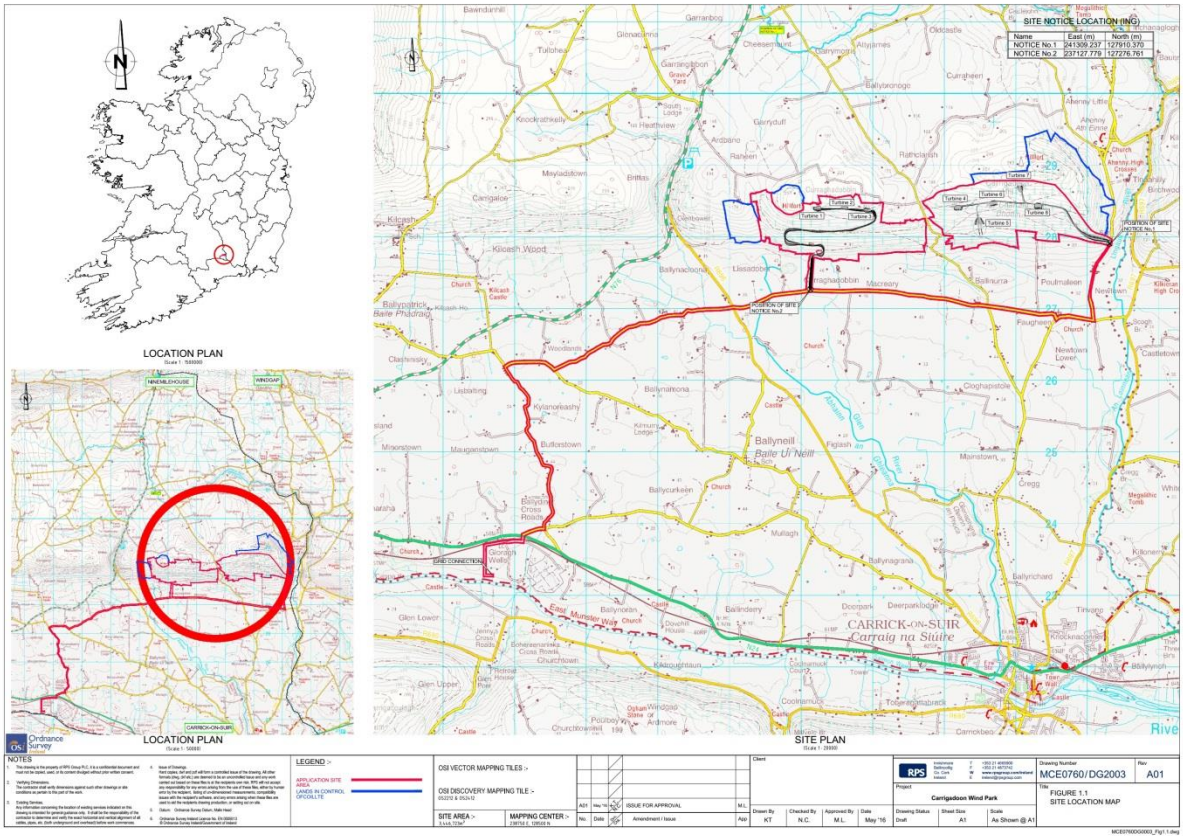
1 INTRODUCTION

DunoAir Curraheen Windpark Ltd (referred to as 'DunoAir' hereafter) proposes to develop a wind farm within the townlands of Curraghadobbin, Macreary, Ballinurra, Poulmaleen, and Newtown Upper, County Tipperary. The location of the proposed wind farm is on two hills, Curraghadobbin Hill and Carrigadoon Hill approximately 7km to the north of Carrick On Suir. The windfarm proposal comprises mainly of 8 No. turbines (24MW), 6km of access tracks, a meteorological mast, sub-station and ancillary drainage and site development works.

The application also incorporates an approx. 13.9km 38kV underground grid connection which runs through the townlands of Ballinurra, Macreary, Curraghadobbin, Lissadober, Ballynacloona, Mayladstown, Kylanoreashy, Butlerstown, and Ballydine connecting to the existing ESB 110kV substation at Ballydine, all in Co. Tipperary.

Figure 1.1 below, and in Appendix A, presents a Site Location Map of the windfarm and grid connection proposal.

Figure 1.1 Site Location



The EIS examines the likely and significant impacts of the proposed development both positive and negative. The Environmental aspects considered include:-

Chapter 4	Human Environment,
Chapter 5	Ecology,
Chapter 6	Soils, Geology & Hydrogeology,
Chapter 7	Hydrology and Flood Risk Assessment,
Chapter 8	Air Quality
Chapter 9	Noise,
Chapter 10	Landscape & Visual Impact Assessment,
Chapter 11	Shadow Flicker
Chapter 12	Archaeology, Architectural & Cultural Heritage
Chapter 13	Traffic and Access
Chapter 14	Electromagnetic and Aviation Impacts

An Appropriate Assessment Screening Report was also undertaken and is included in **Appendix 1.1** of the EIS.

2 PROJECT DESCRIPTION AND CONSTRUCTION

2.1 SITE DESCRIPTION

The wind farm site lies to the west of the R697 and to the east of the R696, and comprises of the two hills of Carrigadoon Hill and Curraghadobbin Hill. There is a county road running between the two hills. Carrigadoon Hill will be accessed from a county road to the immediate east of Carrigadoon Hill and which links the village of Faugheen to the south to the settlement of Ahenny to the north. A relocated and upgraded entrance will be provided at that location adjacent to the existing Coillte forestry entrance. Curraghadobbin Hill will be accessed from a new access point proposed from the county road to the south of the hill.

The grid connection link runs in an underground trench on county roads to the existing ESB substation at Ballydine. The new bus-bar connection point at the ESB sub-station must be subject of a future application by ESB Networks. This will affect the final section of the approach route into the sub-station. The statutory application drawings show the route of the connection as far as the N24. From here it will cross under the railway line and N24 (visa directional drilling) and run through green field area to the substation. While the final connecting point and route is dependent on the bus-bar location to be chosen within the substation by ESB Networks, for the purposes of this application and environmental assessments an indicative route to the sub-station is indicated and considered in the assessments.

The main wind farm site is planted as commercial forestry and has undergone a number of phases of afforestation and felling. There are a number of tracks running through the forestry on each of the hills. There are archaeological hillfort remains at the top of each hill which are designated National Monuments. The locations of the hillforts are currently under cover of commercial forestry and are excluded from the application site area. There are three additional redundant national monument records located at Curraghadobbin Hill. These are also located in areas of forestry.

There are no open watercourses on the wind farm site.

There is an existing telecommunications mast on Carrigadoon Hill. The turbines have been positioned to avoid interference with telecommunications signals.

There are one-off houses located in all directions around the site. None are located within 500m of a proposed turbine however. There is a national school located on the public road to the east of Carrigadoon Hill at Newtown Upper. It lies just over 1km from the closest proposed turbine (T8). The proposed revised and upgraded entrance will be located slightly closer to the school than the existing entry point.

The areas surrounding the hills are low lying agricultural lands. There are a number of equestrian activities also in the areas surrounding the hills in particular to the south of Curraghadobbin Hill and to the north of Carrigadoon Hill. The mountain of Slievenamon is located approximately 7 – 8 km to the northwest of the wind farm site.

The lands are predominantly in the ownership of Coillte with an area to the south of Curraghadobbin in the ownership of a local landowner.

2.2 DEVELOPMENT DESCRIPTION

The development comprises 8 No. turbines, each with an energy output rating of 3MW, giving a total production capacity of 24MW. The wind farm will have a 30 year lifespan and will be decommissioned and the site remediated thereafter. The hub height of the turbines will be a maximum of 85m and the blade diameter a maximum of 82m. This gives a maximum blade tip height of approximately 126.5m.

There is approx. 6km of new access roads proposed across both Carrigadoon and Curraghadobbin Hills. These access tracks will be 5.5m in width. It will be necessary to fell trees in the corridor around the roads to provide a working area. Part of the access road to both hills will be paved due to steep gradients and turbine delivery access requirements. Due to the gradients of the site and the final proposed position of the turbines it is not possible to reuse existing forestry tracks on site for the purposes of the wind farm.

The turbines and roads have been laid out on site to avoid known archaeological remains and to also provide for a buffer zone around same.

A 38kV sub-station is proposed on Curraghadobbin Hill. Electrical cables linking the turbines to the proposed sub-station will be laid alongside the proposed access tracks.

A permanent 80m meteorological mast is also proposed on the western side of Carrigadoon Hill.

The applicant proposes to introduce a community benefit scheme which will contain two initiatives; a community fund and a community turbine co-ownership investment opportunity.

2.3 CONSTRUCTION PROPOSALS

It is estimated that the construction phase will take approximately 18 - 24 months. This may vary due to detailed site investigations prior to detailed design and also due to seasonal restrictions on tree felling activities required for road construction.

No peaty materials have been identified within the area of proposed construction. Working on non-peat sites generally allows for standard construction techniques to be applied. Turbine foundations will be excavated down to a suitable bearing stratum. Road construction will consist of crushed rock or gravel surfacing on suitable reinforced road foundations.

During the construction stage it will be necessary to provide contractor welfare facilities for the workers. An indicative location for a construction compound is identified on each of the hills. The final siting of the compound will be determined by the contractor on site.

Materials delivery to site are estimated to require approximately 1,575 deliveries. Limited spoil removal off site will be required. This is estimated at approx. 1,200 loads.

A route survey was undertaken to determine the optimal turbine delivery route on the basis of two initial access point options. Based on the study undertaken, the preferred port of entry for the

turbines will be Belview Port, Waterford, based on distance and costs. This will therefore be the most likely port of entry for the turbines. Due to physical restriction on the local county roads to the north and northwest, the turbines will approach the site from the south at Carrick on Suir through Faugheen. Access to Carrigadoon Hill will be at Newtown Upper and access to Curraghadobbin Hill will be from a proposed new entrance at the public road to the south. Some local works are required within the public road along this route to accommodate the turbine delivery. All other traffic accessing the sites will use these entrances also.

A preliminary Construction Environmental Management Plan (CEMP) has been developed for the proposed development and is provided at Appendix 2.2 of this EIS. This outline CEMP forms the basis for a comprehensive plan for the management of various environmental aspects of the site and the proposal during the construction phase of the development. This is an outline format only and shall be required to be updated following receipt of planning permission and prior to the commencement of development on site, and will incorporate any requirements of the planning permission.

2.4 ALTERNATIVES CONSIDERED

A potential wind farm project was previously the subject of investigation and consideration on lands to the north of the subject site by an alternative developer. The site incorporated lands on the northern side of Carrigadoon and Curraghadobbin Hills. No application was lodged at that time as South Tipperary County Council prepared a Wind Energy Strategy and the lands on which the wind farm had been proposed were designated as not being suitable for wind energy developments.

When the current Applicant DunoAir commenced assessments of the subject site two high level options were considered for how a 24MW wind energy development could be achieved. These were by means of:

- 11 No. 2.3 MW turbines, or
- 8 No. 3MW turbines

A high level assessment of the potential visual, noise and ecological implications of these two options was undertaken, and it was determined that the 8 No. 3MW turbine option would result in an overall lesser impact.

Following the decision to proceed on the basis of 8 No. 3MW turbines various iterations of turbine and access route options were considered. These were revised a number of times in response to the findings of environmental assessments and to allow a final proposal to be brought forward which would have least impact. Critical issues to the physical siting of the turbines and road included the presence of archaeological remains on the hills, visual impacts, the topography of the site itself and also a telecommunications mast on Carrigadoon Hill.

2.5 POTENTIAL FOR CUMULATIVE IMPACTS

It is necessary that the EIS consider potential cumulative impacts due to this proposal in combination with any other relevant development. In the case of this instant application there are no other windfarms within the vicinity of the proposed development. A review of the South Tipperary County Council planning register and County Development Plan was also undertaken to identify any

plans or projects which in combination with the proposed wind farm may have potential for cumulative impact. No such developments were identified.

3 PLANNING AND POLICY CONTEXT

3.1 STRATEGIC POLICY

As part of the preparation of this planning application, RPS has completed a planning assessment of the relevant strategic policy and statutory planning policy context for the proposed development at Carrigadoon Wind Farm located in South Tipperary. The strategic policy section sets the context for the development of the renewable energy resource, including its role in combating climate change, its contribution to security of energy supply and its contribution to economic competitiveness. The chapter makes particular reference to electricity generation and associated infrastructure and examines specific policy in relation to this where available.

A number of international and European agreements and policy documents establish support for the development of renewable energy. These include:

- 1992 United Nations Framework Convention on Climate Change;
- The European Sustainable Development Strategy 2006; and
- EU Directives on Renewables (2001/77/EC), Single Electricity Market (2003/54/EC) and National Renewable Energy Plan (2009/28/EC).

Support for the principle of renewable energy development is also provided for in a national context through the following:

- The National Spatial Strategy for Ireland 2002-2020 (NSS);
- Road Map for the delivery of the National Planning Framework 2016;
- The Bioenergy Action Plan for Ireland 2007;
- The National Climate Change Strategy 2007;
- The National Development Plan 2007 – 2013 (NDP);
- Building on Recovery: Infrastructure and Capital Investment 2016-2021;
- Building Ireland's Smart Economy - A Framework for Sustainable Economic Renewal 2008;
- Grid 25;
- The National Renewable Energy Action Plan 2010 (NREAP);
- The DCENRs Strategy for Renewable Energy 2012-2020;
- The National Energy Efficiency Action Plan: Maximising Ireland's Energy Efficiency, 2013-2020 (NEEAP);
- The Sustainable Energy Authority of Ireland (SEAI) Strategic Plan 2010-2015;
- The Framework for Climate Change Bill 2010; and
- The Government White Paper - Ireland's Transition to a Low Carbon Energy Future 2015-2030.

Notably, under EC Directive and as provided for in national plans listed above, in the electricity sector, Ireland's target for renewable energy share is 40% by 2020.

3.2 STATUTORY AND LOCAL PLANNING CONTEXT

3.2.1 Legislative Framework

Under the provisions of the Planning and Development Acts and Regulations an application for a wind farm proposal of more than 5 turbines or exceeding an output of 5MW must be accompanied by an EIS.

3.2.2 DoEHLG Wind Energy Guidelines 2006

The key planning policy document for guidance on wind energy planning applications in Ireland is The Wind Energy Guidelines 2006. The guidelines are intended to ensure a consistent approach throughout the country in the identification of suitable locations for wind energy development and the treatment of planning applications for wind energy developments. The Guidelines state that while the development of renewable energy sources, together with measures aimed at a reduction and more efficient use of energy are priorities, nationally and at European level, the implementation of renewable energy policies must also have regard for the environment.

According to the Guidelines:-

> *'The development plan must achieve a reasonable balance between responding to overall Government Policy on renewable energy and enabling the wind energy resources of the planning authority's area to be harnessed in a manner that is consistent with proper planning and sustainable development.'*

In addition to general national policy the Guidelines acknowledge that in order to fully assess the impact of a wind energy development, a planning authority may need information on some if not all of the following matters:-

- Ground conditions, including peat stability;
- Site drainage and hydrological effects, such as water supply and quality and watercourse crossings;
- Size, scale and layout and the degree to which the wind energy project is visible over certain areas;
- Potential impact of the project on natural heritage, to include direct and indirect effects on protected sites, on habitats of ecological sensitivity and biodiversity value and, where necessary, management plans to deal with the satisfactory co-existence of the wind energy development and the particular species / habitat identified;
- Potential impact of the project on the built heritage including archaeological heritage;
- Landscape issues;
- Visual impact of ancillary development, such as access roads;
- Local environmental impacts including noise, shadow flicker, electromagnetic interference, etc.
- Adequacy of local access road network to facilitate construction of the project and transportation of large machinery and turbine parts to site;
- Information on any cumulative effects due to other projects, including effects on natural heritage and visual effects;

- Information on the location of quarries to be used or borrow pits proposed during the construction phase and associated remedial works thereafter;
- Disposal or elimination of waste / surplus material from construction / site clearance, particularly significant for peatland sites; and
- Decommissioning considerations.

The Department of the Environment, Community and Local Government (DoEHLG) is currently conducting a review of the Wind Energy Development Guidelines specifically in relation to noise, proximity and shadow flicker and this revision document was published in December 2013. No date for the publishing of the revised guidelines has been set.

3.2.3 IWEA Best Practice Guidelines for the Irish Wind Energy Industry 2012

The IWEA published Best Practice Guidelines for the Irish Wind Energy Industry in 2012 which provides best practice practical guidance and recommendations for developing onshore wind project in Ireland. The IWEA's Guidelines are aimed at being complementary to DoEHLG's guidance rather than re-stating its subject matter.

3.2.4 South Tipperary County Council Climate Change Strategy and South Tipperary Renewable Energy Strategy (RES) 2014

The principle of renewable wind energy generation is supported by the South Tipperary Climate Change Strategy and the Renewable Energy Strategy. Community involvement in the development of such projects is recommended by these documents.

3.2.5 South Tipperary County Development Plan 2009 - 2016

The statutory Development Plan for the application site is the South Tipperary County Development Plan 2009 – 2016. There are a number of policy provisions within the Plan which have relevance for the siting of wind energy developments. These relate to landscape characterisation and to the wind energy policy of the Plan. The Plan also contains development management specifications which should be considered for any planning application for wind energy development.

The County Wind Energy Policy was adopted by South Tipperary County Council in December 2006 and is incorporated in Appendix 3 of the South Tipperary County Development Plan 2009 – 2015.

Policy INF 10 of the development plan supports Wind Energy type development as long as it accords with its wind energy policies. Policy INF 10 is set out as follows;

'The Council will facilitate the exploitation of the natural wind energy resource available, provided that it can be demonstrated that such development, and associated infrastructure, is in accordance with Appendix 3: Policy on Wind Energy Development, and the other policies contained in this County Development Plan.'

Policy Wind 1 provides a 'General Policy Statement on Wind Energy Development', which supports wind energy developments in principle at appropriate locations. *'The Council recognises that there is a need to promote the development of 'green electricity' resources and to reduce fossil fuel*

dependency and green house gas emissions in order to address the global issue of climate change, and to comply with European and international policies with regards to renewable and sustainable energy resources. It will be an objective of the Council to ensure the security of energy supply by accommodating the development of wind energy resources in appropriate areas in the county.'

Policy Wind 3 relates to the suitability of different parts of the county for the siting of wind energy developments, including 'preferred areas', 'areas open for consideration' and 'unsuitable areas'.

According to the wind energy policy maps, the proposed wind farm site is located in an area 'open for consideration'. These are defined as follows:

> *Areas Open for Consideration – wind energy development in these areas may or may not be appropriate, depending on the character of the landscape and the potential impact of the proposed development. Any impact on the environment must be low and subject to proper planning and sustainable development, and the guidelines set out in this policy document.*

The development plan contains a list of information which the Planning Authority seeks in respect of wind energy development proposals. It also contains a list of assessment criteria to be considered when determining if a development proposal is appropriate or not.

The plan also contains a number of other general development policies which may have relevance for wind farm applications, in particular landscape related policies and objectives.

3.2.6 Proposed Variation No. 3 of South Tipperary County Development Plan 2009 - 2016

It is noted that Tipperary County Council has published a proposed Variation to the South Tipperary County Development Plan 2009 – 2016 which would comprise a proposed new Renewable Energy Strategy for the County which in turn contains a proposed new Wind Energy Strategy. The proposed new Wind Energy Strategy proposes to amend the current wind energy designation of the subject site. It is noted however these are currently proposed variations only and this current application has been prepared and assessed under the existing statutory development plan provisions outlined above.

3.3 CONSULTATION

3.3.1 Pre-planning Meetings

A pre-planning meeting was held with Tipperary County Council on 18th December 2014.

3.3.2 Public Engagement

Non-statutory public consultation on the project began on the 8th September 2014 and closed on the 18th October 2014 (i.e. a 6 week focused consultation period). Information was delivered to local residents in the form of an introductory letter on 15th July 2014 and a community update brochure delivered on 8thand 9th September 2014.

A project information service was put in place at the outset by the project team which included a dedicated telephone line, project email address and project website. Information was also provided to members of the public through postal and email mailouts; at stakeholder meetings; and at a public information day held locally.

A public information day was held at the Carraig Hotel, Carrick on Suir on Friday 19th September 2014 from 12 noon until 8pm. The information day was promoted in advance through the community update brochure; print media advertisements; press releases; media interviews with the Project Manager in local newspapers and on local radio; and on the project website.

The main categories under which the majority of issues and concerns were raised in relation to the project are as follows:

- Landscape and Visual Impacts
- Planning and Policy Issues
- Project Location
- Archaeology and Cultural Heritage
- Community Benefit Scheme

3.3.3 Prescribed Bodies

RPS undertook written consultation a range of prescribed bodies to advise them of the proposed development of 8 No. 3 MW turbines at the subject site. Few responses were received. A written response was received from An Taisce and a telephone response was received from Fáilte Ireland.

3.4 PROJECT NEED

Ireland has a legally binding target, set by the European Commission, to source 16% of our total energy needs from renewables by 2020. To achieve this, the Irish Government has set a target of providing 40% of our electricity from renewables by that year. Wind generated energy accounted for 15.3% of electricity demand in Ireland in 2012. Most of the renewable energy to be produced will be generated by wind. Up to 2020, 3.5 GW of wind energy capacity will need to be installed in Ireland to meet the Irish renewable energy target.

South Tipperary also has a goal to have 20% of its energy supply produced in the county from renewable energy sources.

4 HUMAN BEINGS

4.1 EXISTING EINVIRONMENT

The nearest town to the proposed wind farm site is Carrick on Suir located approx. 7km to the south of the site and has a population of 5,931 (based on the findings of the 2011 Census of Population). The village of Faugheen lies to the south of the site and the settlement of Ahenny to the northeast. There are no population statistics available for either of these settlements individually. Faugheen is a larger settlement than Ahenny and has some local service provision while Ahenny is a residential settlement only. A national school serving the area is located at Newtown Upper on the eastern side of Carrigadoon Hill close to Ahenny and close to the proposed upgraded entrance to Carrigadoon Hill. Very low rates of population growth are experienced in the immediate area.

One-off rural housing is scattered throughout the area, with some ribbon development located on the public roads near the site. No residential dwellings are located within 500m of a proposed turbine. There is an existing dwelling directly opposite the proposed upgraded entrance on the eastern side of Carrigadoon Hill at Newtown Upper. The closest dwellings to the proposed new entrance to the south of Curraghadobbin are a cottage located on the county road approximately 140m to the west of the proposed access point, a house set back from the public road at the base of Curraghadobbin Hill approximately 350m to the east of the new access track and a farmhouse and buildings a similar distance to the west.

A large proportion of the population are engaged in farming and agricultural work which is to be expected given the location. It is likely that the majority of the remainder of the workforce commute to neighbouring Carrick on Suir and Clonmel for commercial and industrial employment. There are a number of equestrian activities also in the areas surrounding the hills in particular to the south of Curraghadobbin Hill and to the north of Carrigadoon Hill.

Visitor attractions within the area include the Ahenny High Crosses which are located to the south of the settlement of Ahenny to the north east of the site. The Ahenny High Crosses are part of the Ossery Group of High crosses which are believed to be the earliest crosses of their kind and date from the eighth to ninth centuries AD. The Knockroe Neolithic passage tomb at Knockroe (known locally as 'The Caiseal') (RMP No. KK034-019001) in County Kilkenny is located 2 km to the north east of the site. This passage tomb is considered to be of national cultural importance.

There are a number of signposted informal walking and cycling routes traversing the area in the form of trails and along local roads. For example the local road which runs between Curraghadobbin Hill and Carrigadoon Hill is signposted as a cycling trail. Both hills and the Coillte forest tracks are also regularly used for walking recreation purposes, in particular Carrigadoon Hill. The mountain of Slievenamon is located approximately 7 – 8 km to the northwest of the wind farm site and is a popular walking and hiking destination.

The grid connection route runs mainly through agricultural lands, with residential and agricultural buildings along the routes.

Construction activity on site will typically comprise of tree felling, site clearance, excavation work for access roads (in particular from the main entrance into the site), site development work for turbines placement, turbine basements, turbine erection, met mast erection and substation construction.

The contractor retained by the applicant to carry out the works on site will prepare a Health and Safety Plan for the site to cover all aspects of safety at the site. All relevant health and safety standards will be adhered to.

4.2 POTENTIAL IMPACTS

The construction phase of the proposed development has potential to generate noise, dust and construction traffic that can cause inconvenience and obstruction to road users on a temporary basis during the construction period. The nature and extent of these impacts are discussed in separate individual chapters, but they do have potential for knock-on impacts on human beings in the form of inconvenience and disruption, both for residents and visitors / tourists to the area.

The dwelling located opposite the entrance to Carrigadoon Hill is the dwelling with greatest potential for such impact during construction due to proximity, the road construction works and also to movement of construction traffic through the site. The national school at Newtown Upper is also located close to this entrance and could also experience similar impacts.

Construction impacts are likely to be moderate negative in the context of the existing low volumes of traffic on the roads. They will however be temporary in nature.

The construction of the wind farm is expected to generate 15 – 30 jobs on site at different periods and a single direct site management post during operation.

There is potential for impact on nearby equestrian businesses if the proposed turbines and works are located too close to the existing equestrian facilities. Based on guidelines issued the British Horse Society for planners and developers a separation distance of separation distances of 200m or three times blade tip height (378m in this instance) should be provided. The distances to nearby equestrian facilities in this case are well in excess of these recommendations.

The proposed development will require the operation of heavy plant and machinery and involve deliveries to site. There are potential impacts to the Health and Safety of workers on site and road users in the area, during the course of works on the main site and in the public road. These are negligible however as all the relevant health and safety standards will be adhered to and they will be undertaken in accordance with detailed traffic management plans.

Once operational, based on specialist assessments no adverse impacts in respect of dust, noise or shadow flicker are identified. In this regard, due to the separation distances from dwellings no direct potential impacts on human beings are identified. Wind farms by their nature however are experienced differently by different people. It could have potential to impact on tourism and recreation by altering the visual setting of the area for walkers who use Carrigadoon and Curraghadobbin Hills, and thereby altering their experience. There is also potential for impact on tourist related views. The visual impact of the wind farm is considered in detail in Chapter 10. In terms of the use of the hills themselves for recreational walking purposes, it is noted that once operational the new access tracks which will also serve the forestry activities will again be available for public access (subject to the owners Coillte facilitating same as is also the current situation). It is considered that over time locals who use the hills for walking will become used to the altered situation. It is however likely to be perceived negatively by walkers and local residents at least in the initial period of use of the wind farm.

4.2.1 Mitigation

The main potential impacts on the resident, working and visiting communities at construction phase are noise, air and dust, impacts associated with construction traffic and activities. The mitigation measures set out to restrict these physical impacts will in turn mitigate impact on human beings. These are detailed below.

Construction traffic and deliveries shall be timed to reduce impact on local road users including the national school at Newtown Lower. Noise generating equipment will be located as far as possible from local noise sensitive areas. Construction operations will be limited in so far as possible to 08.00-20.00 Mon to Friday, 08.00-18.00 on Saturday with no Sunday works proposed. The site contractor will be required to conform with relevant standards and regulations for Health and Safety on site, which will mitigate against any risks to the temporary working community.

4.2.2 Residual Impact

There will be some unavoidable temporary residual impacts on the community during the construction phase of the proposed project due to increased traffic and increased levels of noise and dust associated with the construction process. Some obstruction to road users may also occur during the construction period, particularly when plant and turbines are being transported to the site and turbines are being delivered. These will be a moderate negative impact on occasion during construction, but will be temporary.

There are no predicted direct adverse impacts to residents and the local community when the development will be operational due to shadow flicker, noise, air emissions or traffic. The individual experiences and reactions of the local population to the development however will vary. This is also likely to be the case for tourists and visitors to the area. For some it will be negative for others positive. In the case of negative initial reaction it is often the case that over time people become used to the development as part of an altered landscape.

5 ECOLOGY

5.1 EXISTING ENVIRONMENT

The wind farm site and grid connection route are located within 15 kilometres of 6 No. sites protected under EU legislation as Natura 200 sites. They are 5 No. Special Areas of Conservation (SACs) and 1 No. Special Protection Area (SPA). Due to this proximity a screening exercise was undertaken to determine if the proposed development had potential to impact on any of these sites. It concluded that it did not have the potential. The wind farm is also located within 15km of 1 No. Natural Heritage Area (NHA) and 16 No. proposed Natural Heritage Areas (pNHAs) which have national protection objectives.

There are no waterbodies that could support populations of waterbirds in the winter. The nearest major waterbody is the River Suir, approximately 7km to the south of the main site and 200m to the south of the grid connection at Ballydine. There are no major waterbodies lying to the north of the site, meaning that there are unlikely to be any regularly used flightlines across the site during the winter period.

The study area of the proposed Carrigadoon Wind farm is a coniferous plantation situated in a predominantly agricultural landscape. The plantation contains coupes of conifer in various stages of rotation. Narrow strips of Beech are frequently planted in strips between coniferous planting areas, and there are occasional Oak and Willow at the edges of the coniferous planted areas. Several areas of plantation also contain scattered broadleaved trees, mainly Beech, within the conifer stands. The ground flora in the areas under conifer plantation is sparse.

Areas of mixed woodland are comprised mainly of Beech, with occasional Horse, Sycamore, Silver Birch and Rowan; and with a shrub layer of Holly, Blackthorn, Hawthorn, Traveller's-joy and Bramble. Species in the ground flora includes Bracken, Rosebay Willowherb, Nettle and Great Wood-rush.

Vegetation along the tracks includes Black Knapweed, Eyebright, Red Bartsia, Common Bird's-foot-trefoill, Marjoram, Wild Carrot, Common Centaury and Fairy Flax. There are also some remnants of heathland flora among the young conifer in some areas that have been felled and recently replanted and on top of some rocky outcrops. Vegetation here includes scattered Gorse, Heather), Bell Heather and Bilberry. The conservation evaluation of the habitats recorded on site is of local importance.

The land immediately adjacent to the study area is predominantly comprised of improved agricultural grassland, bound by hedgerows. A number of coniferous plantations are present in the area, as is some scrub. There are two rivers including the Lingaun and the Glen, and their associated tributaries.

The grid connection route comprises of tarmacadam roadways, bound by hedgerows and residential property boundaries in places. The lands surrounding the grid connection route are predominantly improved agricultural grassland, with some landscaped residential gardens and a small amount of coniferous planting. The proposed route crosses one tributary of the Lingaun River, two tributaries of the Glen River and the Glen River itself; a total of four watercourse crossings. No evidence of rare plant species was observed along the proposed grid connection route during the site survey conducted in 2016.

Japanese Knotweed was observed during the site survey in September 2014, and was located in the south-east of the study area at Carrigadoon Hill. There were also two smaller stands in close proximity to this larger stand.

There are historical records of Common Frog within the general area of the wind farm and also at a location approx. 5km from the grid connection point at Ballydine. There is a record of Smooth Newt, recorded in 2012 at Ballydine Quarry. No amphibians were recorded in the study area.

Winter bird field studies took place over the winter period 2013/2014 with breeding bird surveys carried out in spring/summer 2014.

During the winter bird surveys, a total of 22 species were recorded, with 26 species recorded during the breeding surveys. Overall, 29 species were recorded over the two seasons. None of the species recorded during the field surveys are species that are listed under Annex I of the E.U. Birds Directive. Only one species recorded is designated as a bird of high conservation concern by Birdwatch Ireland; Meadow Pipit. Only five species recorded during the field surveys are designated as medium conservation concern by BirdWatch Ireland: Goldcrest, Linnet, Mistle Thrush, Robin and Sparrowhawk. All other species recorded are of low or no conservation concern.

Hedgehogs have been recorded in 2012 approximately 1km north of the proposed grid connection route at Ballynacloona, and are likely to be present across the study area. There are several records of Otter along the River Suir, including a record from 2011 at Ballydine. Evidence of Otter has also been recorded on the Glen River, south of Lissadober, in 1981. There are no habitats suitable for Otter at the proposed wind farm site. No evidence of Otter was observed during the site survey of the proposed grid connection route conducted in 2016.

There is evidence of badger activity on both hills.

Common and Soprano Pipistrelle bats were the most commonly recorded species onsite and were ubiquitous along hedgerows, treelines, forest edges and tracks throughout the area. Brown Long-eared bat was encountered along woodland tracks in several areas. Leisler's bat, was recorded as commuting across and foraging high above the area. Natterer's bat, a woodland species, was observed hunting along forest tracks and within more open forest areas.

No onsite bat roosts were identified during surveys and the nearest known bat roost to the study area is in Piltown village, approximately 8km to the southeast. No hibernation site is currently known in the local area and none was identified during the assessment.

Deer prints were observed occasionally on both hills.

Red Squirrel has been recorded in 2013 approximately 1.3km south east of the wind farm site in mixed broadleaf habitat. No signs of Red Squirrel were observed during the field survey.

No rare or protected species of butterfly were observed during the site walkover.

Badgers, bats, red squirrel, deer and some birds recorded on and close to the site are consider of national conservation importance.

The study area lies within the Suir River catchment, which supports important salmonid populations. The eastern part of the wind farm site on Carrigadoon hill lies within the Lingaun River Sub Basin. The River Lingaun and River Suir are not designated salmonid waters under the Salmonid Waters Regulations. Inland Fisheries Ireland has indicated that the Lingaun headwater tributaries act primarily as 'contributories' to downstream nursery waters for salmonids and other species. Salmonid fish do not spawn within them, but they provide food downstream by drift of aquatic organisms. However there are no streams or formal drains directly connecting the wind farm site to any major water body. The final part of the grid connection route closest to Ballydine sub-station is within the Suir Sub Basin. The proposed grid connection crosses one tributary of the Lingaun River, the Glen River and two of its tributaries.

5.2 POTENTIAL IMPACTS

No potential significant impacts on Natura 2000 are identified.

The development construction will lead to a loss of broadleaved forestry and mixed broadleaved / coniferous forestry on the site. This has potential for a significant negative local impact.

There is a risk of indirect impacts as a result of run-off and eutrophication and sedimentation during construction decreasing water quality of the Lingaun and Glen River, which are part of the Suir catchment area, which could give rise to impacts on fish and otter populations. However, this risk is very low as there are no streams or rivers located within the study area. Therefore no direct impacts are anticipated. The proposed grid connection crosses one tributary of the Lingaun River, the Glen River and two of its tributaries. There will be no in-stream works and the grid connection will cross all watercourses in the body of the road. There is no direct connectivity from the grid connection route to the Lower River Suir SAC and therefore no impacts are identified.

There is no connectivity (i.e. rivers or streams) between the area of proposed works and the River Nore SPA. Similarly, there are no connecting pathways between the study area and the NHA or any of the pNHAs identified. No potential impact is identified.

The main impact of the wind farm to habitats is habitat loss. Total habitat loss of Mixed Broadleaved Woodland is 3,290 m² and of Mixed Broadleaved/ Conifer Woodland is 39,500m². The impacts on ecological habitats which were not selected as key ecological features are not assessed. The removal of vegetation on site has potential for habitat removal for birds and bats which is a negative impact. While no badger setts were identified on site in the areas of proposed works these will need to be investigated prior to construction and there is potential for interference with setts which is a negative impact. The grid connection route is confined to public roadways for the majority of its length and will not result in any loss of habitats of conservation value.

The main potential impacts to fauna include indirect impacts arising from a reduction in water quality, disturbance to and/or displacement of fauna. The impacts on species which were not selected as key ecological features are not assessed. Following assessment of potential impacts on key ecological features no likely significant negative impacts were identified.

During the operational phase of the Wind farm there will be considerably less site activity compared to the construction phase. Maintenance visits are likely to be regular but infrequent, and will use

established tracks. Therefore it is highly unlikely that vehicular access or turbine maintenance operations will result in habitat damage.

The main operational impacts of the wind farm will arise from the rotation of the blades of the wind turbines and, to a lesser extent, from occasional vehicular movement along access roads. The rotation of the blades is likely to present a potential collision hazard to birds and bats. The rotation of the blades of the turbines will result in increased noise levels which may cause disturbance to local wildlife. This would be a potential negative impact.

5.3 MITIGATION MEASURES

Mitigation measures to reduce impact due to construction are specified. These include and relate to:

- Appointment of an Environmental Manager for the duration of the Construction Stage;
- Demarcate valuable habitats on site to protect them from construction activity;
- Runoff and sediment control measures;
- Measures for storage of fuel and oil;
- Wheelwash dewatering measures;
- Felling Specifications;
- Measures for Badger protection;
- Measures for Bat protection; and
- Measures for eradication of invasive species.

Mitigation measures for the protection of bats are also specified for the operational phase including:

- Vegetation free buffer zones around turbines; and
- Changes to cut-in speeds if turbines located too close to trees. This should not arise in this case however due to the clearance proposals in the application.

5.4 RESIDUAL IMPACTS

The resulting impact of the proposed development on local bat populations, with implemented mitigation measures, is considered to be minor negative with the favourable conservation status (FCS) of bat species being unaffected and all species confirmed or expected on or near the study area are anticipated to persist.

For ground mammals, the impacts will be negligible in the long-term following mitigation. There may be a reduction in some mammal activity (e.g. red squirrel) close to turbines due to noise disruption. Likewise, the impacts on birds will be negligible in the long-term following mitigation.

Habitat loss will be a negative impact but of local importance.

6 SOILS, GEOLOGY AND HYDROGEOLOGY

6.1 EXISTING ENVIRONMENT

Turbines T1 and T2 are mapped as being located in acid deep poorly drained mineral soil (AminPD). While turbine T3 is mapped on acid shallow well drained mineral soil (AminSW). In the eastern portion of the site turbines T6, T7 and T8 are mapped as being within acid deep well drained mineral soil (AminDW). While proposed turbines T4 and T5 are located within Amin(PD) acid deep poorly drained mineral soil.

All of the proposed turbine locations are located within areas mapped as being underlain by sandstone and shale till. There is no site specific site investigation data available on the thickness and type of overburden present. Rock is mapped as being close to the surface at T2 and at the highest elevations within the windfarm site.

Turbines T1, T2, T3, T4, T6, T7 and T8 are located on red brown conglomerate and sandstone of the Carrigmaclea Formation. Turbine T5 is located on the yellow and red sandstone and green mudstone of the Kiltorcan Formation. There is no rock outcrop indicated in the immediate vicinity of the turbine locations. The proposed grid connection cable route is located on areas underlain by limestone bedrock.

There are a number of historic pits and quarries to the north east of turbine T7. The GSI database indicates the presence of mineral localities approximately 2km to the north east of the site.

The majority of the proposed turbine locations (T1, T2, T3, T4, T6, T7 and T8) are mapped as being within the Carrigmaclea Formation which is classed as a Locally Important Aquifer (Ll) i.e. bedrock which is moderately productive only in local zones. The southern portion of the study area is underlain by the Kiltorcan Formation which is classed as a Regionally Important Fissured aquifer (Rf) and contains turbine T5.

There are no private wells within 500m of the proposed turbine locations. The GSI well database records indicate no private wells in the immediate vicinity of the proposed turbine locations. There are no GSI or EPA Source Protection Zones indicated on the GSI website in the vicinity of the proposed development for public water supplies.

The proposed cable route from the wind farm site to the transmission substation at Ballydine is located in areas underlain by limestone bedrock. A number of karst features are indicated on the GSI karst database in the areas which the proposed cable route passes through.

The proposed windfarm development area is located in the Carrick on Suir and Mullinavat groundwater bodies. The proposed cable route to Ballydine is located within the Clonmel Groundwater Body.

The GSI vulnerability map indicates an extreme vulnerability rating at all of the proposed turbine locations (T1 to T8). An intrusive site investigation programme has not been undertaken at the site. There is no data available on the GSI Geotechnical webviewer for the study area. No geological heritage sites have been identified with 1km of the proposed works area.

An assessment of the site soil classification and stability issues was undertaken by RPS in combination with a site walkover in June 2015. No peat deposits were identified on the available mapping within the site boundary.

6.2 POTENTIAL IMPACTS

No significant potential impacts have been identified during the construction or operational stages. All potential impacts have been ranked as slight or imperceptible.

There is potential for sediment release as a result of the generation of sediment and spillage of soil from mobile plant and associated equipment during the construction phase which could lead to contamination of surface water. There is a risk of increased instability risk as a result of incorrectly designed drainage control measures. There is potential for spillage of fuels and lubricants for machinery during the construction stage, for soil compaction and sterilisation of natural resources.

Potential impacts on hydrogeology include increases in vulnerability of groundwater to pollution and localised changes in groundwater levels due to temporary pumping of excavations. There is a requirement for a significant depth of cut (maximum depth 15m) to achieve suitable gradients on the site access road which will impact on groundwater levels in the immediate vicinity of the cut. Potentially polluting activities which may impact on groundwater quality during the construction stage include the discharge of foul effluent from welfare facilities and from fuel and chemical storage areas within the site compound.

During the operational stage there is potential for an increase in instability risk if the drainage control measures are not properly maintained and potential for spillages of fuel and oil from vehicles accessing the site.

6.3 MITIGATION MEASURES

During the construction phase there will be a number of measures put in place to mitigate any potential impacts on the geology and hydrogeology at the site. All works will be carried out under the supervision of suitably experienced and competent personnel. Site preparatory works will be carried out in suitable weather conditions and the drainage control measures will be constructed in accordance with Code of Best Forest Practice and Forestry and Water Quality Guidelines with maintenance being carried out as required. The assessment of the stability of soft soil in all excavations will be carried out by a suitability experienced geotechnical engineer during the construction stage. The Construction and Environmental Management Plan will be updated prior to the construction stage which will provide detailed proposals in relation to the management, storage and disposal of excavated materials.

During the operational phase visual inspection on the drainage system shall be carried out. Maintenance carried out as required on the drainage system and the substation foul water storage tank.

6.4 RESIDUAL IMPACTS

There are no significant residual impacts on the soils, geology and hydrogeology as a result of the construction stage. Provided that appropriate engineering supervision, good site practices and all of the mitigation measures outlined are implemented the residual impacts will be limited to the permanent excavation of materials for roads, turbine bases and substation area and the compaction of ground from construction traffic.

7 HYDROLOGY AND FLOOD RISK ASSESSMENT

7.1 EXISTING ENVIRONMENT

The eastern part of the proposed site on Carrigadoon Hill lies within the Lingaun River catchment. The River Lingaun rises to the north west of the proposed site. It flows in an easterly direction, then changes course to flow south past the site to meet the River Suir east of Carrick-on-Suir. There is a drinking water abstraction point immediately north of Carrick-on-Suir, approximately 5km downstream of the windfarm site.

The Glen River rises to the south west of the site and flows in a south westerly direction to meet the River Suir in Carrick-on-Suir. The western part of the proposed site on Curraghadobbin Hill lies within this river catchment.

There are no streams or formal drains directly connecting the windfarm site to any major water body in either the Lingaun or Glen Catchments. The proposed grid connection route however which runs in the public road to the south of Curraghadobbin Hill crosses the Glen River and 2 tributaries of same in three places along this road. Two of the crossing points are bridges with one draining under the road. The grid connection will be placed within the road build up at each of these locations. No instream works are proposed.

7.2 POTENTIAL IMPACTS

The construction of roads and hardstanding areas can impact on drainage and hydrology increasing runoff from the site and reducing infiltration to groundwater. This in turn could increase the peak flow to streams locally, and consequently increase flood risk. This is considered to be a potential permanent slight negative impact.

During the construction stage, the existing soil regime will be disturbed. There is the potential for sediment laden runoff from the site clearance and construction works. Drainage and silt management measures will be required to be installed in association with the road construction. This is considered to be a temporary slight negative impact.

There is potential for contamination of surface water from spillages including chemicals, solvents, fuel, lubricants, and hydrocarbons from plant or materials stored onsite during the construction of the access roads and the clearfelling and replanting operations. This is considered to be a temporary slight negative impact.

There is a stand of Japanese Knotweed in the south-east of the study area at Carrigadoon Hill this is likely to require both physical and chemical treatment. With the use of chemical treatment, there is potential for contamination of surface water. In the event of herbicide or pesticide application being required and contaminating surface water, it would represent a short term slight to moderate negative impact.

There is potential for leaching of nutrients to the surface water. The maximum leaching of nutrients can tend to occur a few years after cutting. The potential for leaching of nutrients is considered to be a short term slight negative impact. Nutrients may also be added to surface waters from

fertilisers. No fertilisers are proposed to be applied but the Forest Service may require the application of urea to stumps to prevent butt rot.

7.3 MITIGATION MEASURES

Site preparation works and road construction works shall be carried out in dry weather where possible to minimise soil erosion and the release of sediments to watercourses.

Where possible the proposed access roads are to be gravel surfaced to allow infiltration. However due to the excessive slopes (>12%) for approximately 1,470m it will be necessary to apply a hard top surface to the proposed roads.

An open drainage channel for access road drainage shall be constructed along the side of the access track. To ensure that the access track remains free from standing water, the track will be constructed with an appropriate crossfall gradient to ensure drainage to the roadside drainage channel. The channel will be used to convey surface water runoff to a series of pipes crossing under the road, at approximately 50m intervals, from where it is dispersed locally to a vegetated area via a series of finger drains.

Where ground conditions allow, the drainage channels will allow runoff to infiltrate into the ground, however the infiltration capacity of the soil in the area is unclear at this stage. It is proposed to provide check dams and silt traps at regular intervals, and these will encourage attenuation of flows in the channel, as well as maximising percolation potential. However, the primary function of the drainage channels will be to convey runoff to a point where it is released to filter across a vegetation buffer zone by way of Finger Drains. All drainage infrastructure will be designed to have adequate capacity for 1 in 100 year rainfall events.

In areas with large cut slopes or embankments silt fences will be required along the toe of the slopes while vegetation is re-established on the soil.

In order to limit the compaction of soil and excessive disturbance of exposed soils at the site, the access road and site compound will be utilised for vehicle movements (other than machinery associated with felling activities that is required to access the clearfell areas). Low ground pressure vehicles or vehicles with wide tyres, tracks and chains will be employed on site.

A range of measures are also detailed to prevent the contamination of the surface water during the construction phase arising from the storage of potentially polluting materials on site.

The long term maintenance of roadside drains and silt traps is required. In order to ensure that drains are operating correctly and are not being clogged, visual inspections of the drainage system will be carried out on a regular basis to ensure they are free from contamination and clogging of sediments. Any materials requiring disposal from cleaning of the drains will be kept outside the aquatic buffer zones or removed off site for disposal at a suitable location.

7.4 RESIDUAL IMPACTS

Provided that appropriate engineering supervision, good site practices and all of the mitigation measures outlined are implemented there should be no significant residual impacts on the hydrology or flood risk of the area as a result of the construction stage.

8 AIR QUALITY

8.1 EXISTING ENVIRONMENT

The lack of industrial activity or large population centre in the immediate area is likely to ensure good air quality. The site is within an area defined by the EPA as Zone D (rural) in terms of air quality and demonstrates low background air emission concentrations.

The closest sensitive receivers in terms of potential impact from air emissions are a dwelling and national school at the eastern access to Carrigadoon Hill at Newtown Upper. At the entrance to Curraghadobbin Hill the closest dwelling is located 140m to the west on the public road.

8.2 POTENTIAL IMPACTS

Due to the proximity of these receivers to the works site (excavation and road construction) there is potential for impact due to dust emissions during periods of construction activity in these areas.

The other potential source of air emissions is due to exhaust emissions. During construction increased vehicle movements will result in locally increased levels of these exhaust emissions and, therefore, local levels of pollution although these are likely to be indiscernible.

The most significant benefit of wind energy and the reason behind it of course is the generation of electricity from the wind with no production of emissions. The energy produced by the proposed Carrigadoon windfarm will equate to significant emissions savings of CO_2, SO_2 and NO_X.

8.3 MITIGATION MEASURES

Mitigation measures to minimise the potential for dust generation and for dust emissions then are necessary. 'Good practice' site procedures will be adopted to limit potential for secondary impacts due to dust and dirt being transported onto the surrounding road network. The degree of active control measures necessary to be adopted at the proposed development will depend on the time of year and the weather conditions prevalent at that time.

8.4 RESIDUAL IMPACTS

There is potential for impact on a number of neighbouring properties due to the proximity of the properties to proposed roads / access works. The periods for greatest potential impact on air quality at these locations however will be for a limited duration when the works are taking place in close proximity to them only. Construction works on most of the site will not impact them. With the mitigation measures proposed the impacts will be minor to moderate for restricted periods.

The proposed development has capacity to generate 24MW of clean energy per annum with no air emissions.

9 NOISE

9.1 EXISTING ENVIRONMENT

A noise monitoring survey was completed at three locations in the vicinity of the proposed turbines between the 3rd March and 26th March 2015 and at two locations between 12th March and 26th March 2105. The data collected from these locations allows representative noise levels to be established for all potential noise sensitive locations (mainly houses and a national school) in the vicinity.

9.2 POTENTIAL IMPACT

There is potential for minor construction noise impacts at the nearest noise sensitive properties. The worst-case potential impacts were considered and are predicted to fall well within the noise threshold limits for construction works. The actual construction phase noise levels however are likely to be less than 'worst-case' consider, and for the majority of the construction phase will be significantly less.

The potential noise levels due to the operation of the wind farm were modelled using a detailed noise modelling software. The model predicted future noise levels based on a worst-case noise output from the proposed turbines. The model considers background noise levels which were gathered from the survey, wind data gathered at the same time and noise output ratings for the turbine models proposed. The model predicts noise levels due to the wind farm at all potential receivers in the vicinity of the site. All predicted noise levels from the proposed wind turbines are within the required threshold limits of the Windfarm planning guidelines.

9.3 MITIGATION MEASURES

During construction works, the contractor undertaking the construction works will be required to utilise various specified noise abatement measures.

On the basis of the predicted modelled noise impacts the threshold noise limits at the nearest noise sensitive receptors set in the planning guidelines will not be exceeded. No mitigation measures are required.

9.4 PREDICTED IMPACT

There is potential for short-term moderate noise level increases at the nearest receptors to the proposed development during the construction and decommissioning phases. On account of the short nature of these impacts and assuming that the mitigation measures suggested in this section are adhered to, this impact will be relatively minor.

During the operational phase, the noise levels from the proposed development will be within the recommended threshold noise limits as outlined in the relevant Irish guidance document (Wind Farm Planning Guidelines, 2006).

10 LANDSCAPE AND VISUAL IMPACT ASSESSMENT

10.1 EXISTING ENVIRONMENT

The proposed wind farm development site can be described as a forested hill landscape, intertwined by local access road and tracks, which lies within a wider setting of a mosaic of marginal pastureland. The site is confined to the south facing slopes of Curraghadobbin and Carrigadoon Hills. The site presents as the outer rim hills of the Slievenamon Mountain range. The hills are aligned on east-west axis, forming the southern edge to the Lingaun River Valley.

Curraghadobbin Hill and Carrigadoon Hill are contained within the outer slopes of the Slievenamon Mountain Mosaic character area. The character area is comprised of 'moorland, forestry and marginal pasture'. This area includes the primary and lesser peaks of Slievenamon at the western extent of the upland, as well as the outer slopes of the hills enclosing the Lingaun River Valley to the east of the peak. To the north of the site, is the Lingaun Valley Marginal and Farmland Mosaic landscape character area. This area is comprised of 'moorland, forestry and varying pasture'. It encompasses the Lingaun River and Valley, which extends eastwards from the peak of Slievenamon.

There are currently no other wind farm developments in the local or wider area. However, the immediate landscape character of both Curraghadobbin Hill and Carrigadoon Hills has been impacted upon by the coniferous tree plantations that dominate the southern and eastern slopes of the hills. The landscape character of both hills is significantly different from adjacent hills particularly to the east in Co. Kilkenny, where a pastoral open landscape of agricultural fields with native mature hedgerows and pockets of native woodland prevails. In addition, a mobile phone mast rises above a clearing of afforestation on the western slope of Carrigadoon Hill altering the landscape character of the site.

The most sensitive receptors (locations from which the development could potentially be viewed) were identified as including:

- The settlement of Ahenny;
- View from Kilmacoliver to Skough Road, on Baunfree Hill to the east of the site;
- The village of Faugheen to the south of the proposed development;
- Carrick on Suir; and
- Various archaeological / cultural features in the area.

10.2 POTENTIAL IMPACT

The landscape and visual impact assessment comprises of two strands; and Landscape Impact Assessment and a Visual Impact Assessment. The former considers the impact of the proposal on the overall character of the wider landscape. The latter looks at the visibility aspect of the development and the extent to which it can be seen.

10.2.1 Landscape Impact Assessment

The introduction of the proposed wind park would impart another level of change to the existing landscape character of these hills in the form of large scaled structures with moving components. The proposed turbines will not immediately be absorbed into the existing landscape, as they will be perceived initially as being out of context in a wider rural agricultural setting. However, they would be introduced into an 'altered' landscape, the alteration being coniferous plantings, which may mitigate to some extent, the installation of the turbines into an established coniferous wooded setting.

The Slievenamon area is identified as being of special sensitivity. However, it is noted that the integrity and unity of the traditional landscape pattern has been compromised by recent land cover change in the form of forestry plantations. This is of particular relevance to Curraghadobbin and Carrigadoon Hills. Initially, the wind farm development could be seen as having a minor adverse effect, particularly by the local community during construction stage. However it is not considered a significant and negative one that would constitute unacceptable detrimental effects on either the local or wider character.

The turbines will be contained within the coniferous woodland plantations, on an existing altered and compromised landscape, and within the Landscape Policy zoning 'Areas Open for Consideration'

It is considered that the overall Landscape Effects of the proposed development may be considered to be **Minor Adverse**.

10.2.2 Visual Impact Assessment

The first part of this element of the assessment was to undertake an assessment of visibility of the windfarm. This assessment was undertaken for a study area of 20km around the subject site and it looked at visibility of different extents of the turbines. It considered areas from which the nacelle was visible, those from which only half a blade of turbine was visible and finally where only a tip of a blade(s) were visible.

The visibility of all eight turbines will be greatest to the immediate south of the site, to the west to Clonmel, south-west to the foothills of the Comeragh Mountains, on elevated lands to the south of Carrick on Suir and from the south-east into Co. Kilkenny. There is also a concentration of visibility of all eight turbines from the west on the eastern and southern slopes of Slievenamon; and from the north of the site within the Lingaun Valley Marginal and Farmland Mosaic LCA. All eight turbines will theoretically be visible from various locations to the east of the site along the western border of Co. Kilkenny, where there are protected views.

No turbines will be visible from the village centre of Ahenny, where there are two Architectural Conservation Areas, as well as several archaeological monuments, including the Ahenny High Crosses

The turbines will also be visible from the west, north and north-east of the proposed site. This may have an impact on the visual amenity of the Lingaun Valley area.

There is also concentration of theoretical visibility of five of the turbines from low lying lands adjacent to the River Suir to the south east of the site, between Portlaw in South Tipperary and Mooncoin, Co. Kilkenny.

12 No. key viewpoints within the areas from which the turbines will be visible were identified and photomontages prepared. An assessment of the impact of the development on these views was undertaken. The visual impact or level of visibility of the development on these 12 No. views was assessed as follows:

- 3 No. moderate to substantial
- 3 No. moderate
- 5 No. slight to moderate
- 1 No. Negligible to slight

Of the sensitive receptors identified at the outset, there are no views available from Ahenny; there are moderate to significant impacts on the views from Kilmacoliver and some of the archaeological features in the area; slight to moderate from Carrick-on-Suir; moderate to substantial from Faugheen / Poulmaleen.

11 SHADOW FLICKER

11.1 EXISTING ENVIRONMENT

Using the Department of Environment Planning Guidelines for Wind farms we can calculate the areas that need to be tested for shadow flicker for both Wind farms and the cumulative effect where they overlap. This area extends around the site in all directions and there are 11 No. dwellings which fall within the area of potential influence.

11.2 POTENTIAL IMPACT

There is no potential for shadow flicker impact during construction.

The shadow flicker model used for this assessment is based on a worst case assessment as it assumes that there are no potential screens between the turbines and the potential receivers, e.g. no trees, boundary hedgerows etc. It also assumes that the sun will always be shining from sunrise to sunset (no cloud cover) and that the turbines will always be turning.

Six of the eleven houses show no potential for shadow flicker. This is due to the position of the dwellings relative to the turbines and sunpath. Under worst case conditions, there is potential for shadow flicker at 5 No. dwellings. In three of these cases the level of worst case impact is below the planning guideline limit. The limit is exceeded at two properties under worst case conditions. A more detailed assessment of these two properties reveals that the periods of potential shadow flicker would be sunrise and sunset.

11.3 MITIGATION MEASURES

Based on the findings of the worst case assessment, it is unlikely in reality that shadow flicker would exceed guideline limits at any dwellings. It is likely that there would be some cloud cover at some of the sunrise and sunset periods in which the flicker could potentially be received. However, even on the bases of the worst case assumptions, mitigation measures may be implemented in the event that shadow flicker becomes an issue and exceeds guideline limits of 30 hours per year or 30 minutes per day. These include turning off the specific turbine that is creating the shadow flicker effect on a residence during the period in which the shadow flicker is occurring. The developers are prepared to implement this mitigation measure should the need arise. A further mitigation option is the planting of vegetation screening such as a line of shrubs or trees between dwellings and the development. The developer is also prepared to implement this mitigation option for affected dwellings should it be required by the occupiers.

11.4 RESIDUAL IMPACT

Based on the assessment it is unlikely that shadow flicker will exceed guidelines at any properties. There are two dwellings only which could potentially exceed the guidelines under worst case conditions. If necessary the mitigation measures will be employed to further restrict potential. There is no significant residual impact therefore identified.

12 ARCHAEOLOGICAL, ARCHITECTURAL AND CULTURAL HERITAGE

12.1 EXISTING ENVIRONMENT

There is a wealth of sites and monuments of archaeological, architectural a cultural importance within the immediate and wider vicinity of the subject site.

The desktop survey of the published archaeological datasets has identified the presence of a number of recorded monuments in the vicinity of proposed development that are listed in the Record of Monuments and Places and five groups of monuments within the surrounding study area that have been deemed by the State to be of national significance and are, therefore, designated as National Monuments. These include the two collections of high crosses in Ahenny and Kilkieran (to the northeast and southeast), Knockroe passage tomb to the north and the adjacent sites of Kilcash Church and Kilcash Castle to the west.

The Record of Monuments and Places (RMP) lists a total of eleven archaeological monuments that are located in the vicinity of the proposed development area. All of these monuments are protected under the National Monuments Acts and include two large hillforts, which enclose the summits of Carrigadoon and Curraghadobbin Hills. The stated policy of the National Monuments Service is that sites listed in the RMP are to be preserved by avoidance and surrounded by exclusion zones in which no development works may occur. There are no defined criteria for the extent of such buffer zones and their extent is typically decided by the National Monuments Service or the Planning Authority on a case-by-case basis. Three of the sites within the landholding are listed as redundant records in the RMP as there is not enough definitive evidence to conclusively prove that they are archaeological in origin. It is, nonetheless, recommended that sites listed as redundant records should be preserved by avoidance in the absence of definitive proof that they are non-archaeological in origin.

Table 12.1 - Recorded Monuments and Places sites within/adjacent to proposed development area

Site Type	RMP reference	ITM Coordinates
Carrigadoon Hillfort	TS078-036001-	632448, 627396
Curraghadobbin Hillfort	TS079-024001-	636872, 628617
Cairn	TS079-024005-	636872, 628617
Ringfort	TS079-008----	636929, 628823
Enclosure	TS079-025----	637075, 628853
Enclosures	TS079-026---- & TS079-026001-	638703, 628760
Enclosure	TS079-028----	638721, 627796
Redundant Record	TS079-024002-	637384, 628382
Redundant record	TS079-024003-	636804, 628225
Redundant record	TS079-024004-	636985, 628263

A total of 8 RMP sites and the surrounding Zones of Notification are located within c.50m of the edge of the roads along which the proposed underground cable will be laid (**Table 1**). These include a medieval church site, a deserted medieval settlement and a post medieval site; a 17th century house. These all date from the late medieval period. There are no recorded sites from the early medieval period recorded in the vicinity of the grid connection. There are 5 No. protected

structures located within 50m of the grid connection route and 3 No. structures listed on the National Inventory of Architectural Heritage (NIAH).

12.2 POTENTIAL IMPACTS

12.2.1 Construction Stage – Potential for Direct Impact

On the basis of the layout and positioning of roads and turbines proposed it is envisioned that the proposed development will have no direct impacts on any recorded sites or monuments of cultural significance during the construction phase.

There were no potential unrecorded archaeological features noted during the inspection of the site and the footprint of the proposed development. However, it has been noted that any archaeological sites that may have existed beneath or within modern forestry plantations may have been damaged by a combination of site preparation mounding works and root action. Given the presence of hillforts on both hill summits within the vicinity of the proposed development the potential for the presence of associated unrecorded archaeological features, deposits and artefacts cannot be discounted despite the disturbance created by the forestry plantations. Any ground reduction works required for the proposed development, such as the construction of turbine bases and access roads, would have a direct and profound negative impact on any unrecorded sub-surface archaeological deposits that may exist on the footprint of the proposed development.

A proposed 38kv underground link to the Ballydine ESB sub-station will be placed in a trench in the public road. In general, the impacts of the proposed development on the protected archaeological and architectural heritage resource are assessed as being imperceptible in nature. This is in part due to the presence of the public and forestry roads that will carry the cable route combined with the absence of protected monuments or structures on the direct footprint of the proposed scheme. The buried nature of the completed scheme will result in no visual impacts on the cultural heritage resource. It is, therefore, concluded that the proposed cable scheme will not result in a cumulative impact on the cultural heritage resource in combination with the proposed wind farm development.

The ground reduction works required for the proposed underground link would have a direct and profound negative impact on any unrecorded sub-surface archaeological deposits that may exist on its footprint.

12.2.2 Construction Stage – Potential for Indirect Impacts

The eleven RMP sites within/adjacent to the proposed development site include two large hillforts, which enclose the summits of Carrigadoon and Curraghadobbin Hills. The physical remains of both hillforts survive despite the modern forestry plantation works. The stated policy of the National Monuments Service is that RMP sites are to be preserved by avoidance and surrounded by exclusion zones in which no development works may occur. There are no defined criteria for the extent of such buffer zones and their extent is typically decided by the National Monuments Service or the Planning Authority on a case-by-case basis. Three of the sites within the landholding are listed as “redundant records” in the RMP as there is not enough definitive evidence to conclusively prove that they are archaeological in origin.

The proposed turbine locations and access roads have been designed to avoid all recorded archaeological sites, including those designated as 'redundant records' and the proposed development will therefore have no physical impacts on any of these sites. The summits of Carrigadoon and Curraghadobbin Hills both contain hillforts listed in the Record of Monuments and Places. The physical remains of both of these large enclosure sites have been obscured by tree plantations and vegetation overgrowth. The proposed development will have a moderate negative impact on these sites which is defined as a change that, though noticeable, does not compromise the integrity of the site and which is reversible. This arises where an archaeological site can be incorporated into a modern day development without damage and where all procedures used to facilitate this are reversible.

There are no protected sites or monuments of cultural heritage significance within the proposed development. The summit and northern slopes of Carrigadoon Hill do contain the physical remains of historical quarrying activities, which have resulted in profound negative impacts on the site of Carrigadoon Hillfort. The proposed development on the southern slopes of the hill will not impact on the physical remains of this quarrying activity.

12.2.3 Operational Phase – Potential for Direct Impacts

It is envisioned that the proposed development will have no direct impacts on any sites or monuments of cultural significance during the operational phase.

12.2.4 Operational Phase – Potential for Indirect Impacts

The proposed turbines will be visible from a number of National Monuments located to the north, east and west of the proposed development site, and accordingly have the potential to indirectly impact on archaeological features by reason of visual impact.

The proposed turbines will be visible from the Knockroe passage tomb which is situated on a south-facing slope located approx. 2km to the north. A significant attribute of this Neolithic monument is its alignment with the setting sun on the Winter Solstice and this event has attracted large numbers of attendees in recent years. This astronomical alignment is centred towards the area where the sun sinks below the ridge line in the area of the proposed development site. The visual impact of the presence of turbine structures on or near this astronomical event will create a significant negative visual impact on the National Monument.

The second passage tomb within the study area, located 2km to the west on Baunfree Hill, is not a National Monument but it is listed in the Record of Monuments and Places. This Neolithic tomb has a recorded alignment towards a cairn monument on top of Slievenamon to the west and this sight-line also extends across the proposed development site and the proposed development will also have a significant negative visual impact on this visual alignment.

None of the proposed turbines on Carrigadoon Hill will be visible from the Ahenny High Crosses located 760m to the northeast of the proposed development site.

The proposed turbines will also be visible from the Kilkieran high crosses, which are located in a graveyard 1.5km to the east that provides a view towards the southern slopes of both hills. The

visual intrusion on the setting of these monuments is assessed as a moderate to significant negative visual impact.

The southern slopes of both hillsides are also visible from Kilcash Castle and Church located 4km to the west. These are both designated National Monuments and the proposed turbines will also be visible from these monuments. Any visual intrusion on the setting of these monuments will be considered to be a moderate to significant negative visual impact.

While any one of the visual impacts on the setting of any of the individual National Monuments described above could be deemed as moderate in nature, their combined cumulative impact are assessed as being a significant negative visual impact.

12.3 MITIGATION MEASURES

A range of mitigation measures to ensure the protection of known and unknown archaeological features on site are specified for the construction phase.

There are no mitigation measures possible to restrict views of the proposed development from various National Monument Sites in the vicinity.

12.4 RESIDUAL IMPACT

There will be a residual indirect impact on archaeology by reason of visual impact. These are considered significant negative indirect impacts.

13 TRAFFIC AND ACCESS

The proposed wind farm site is served directly by local roads, which mainly serve residential properties, the settlements of Ahenny and Faugheen, the Coillte lands at the subject site and agricultural land. These local roads connect into a number of National and Regional Roads serving the area e.g. R696, R697, N76 and the N24.

The local roads in the vicinity of the development, and along the route of the grid connection, are single carriageway with varying road widths.

13.1 POTENTIAL IMPACT

There will be an increase in vehicle movements per day during the construction phase in the form of material deliveries, workers commuting to/from the site and the disposal of residual spoil.

Two site access points are proposed, one to each hill. The access to Carrigadoon Hill is located to the east of the hill. This is the existing Coillte entrance at Newtown Upper which will be upgraded and slightly repositioned as part of the wind farm proposals. A new site access is proposed to Curraghadobbin Hill from the public road to the south.

Turbine delivery will be via the county road from Carrick on Suir, via Faugheen and to each of the site entrances. Depending on the port of delivery of the turbines this will either be from the N24 or from the N76 via the R696. Some relatively minor works are required in the county road to accommodate the turbine access. These works are all either within the public roadway or are on lands within the control of the applicant. The works within the public roadway would be the subject of a detailed traffic management plan for turbine delivery which would be agreed in advance with Tipperary County Council and An Garda Síochána as required. No adverse impacts are identified.

Based on the total estimate of materials to be delivered to site there is a total number of approx. 5,500 truck movements (in and out) likely to arise from the development. It is estimated that at peak operation this may equate to approx 28 truck movements per day. This will however depend on the final construction programme prepared by the contractor. Workers commuting to and from the site will also add to the traffic flows. It is anticipated that there will be 15 – 30 people employed at the site during construction. This level of increase in traffic levels will have a moderate impact on the immediate local county roads but will be minor on wider regional and national road network. These will be temporary impacts. It is noted also that the entrance to Carrigadoon Hill is located close to an existing national school at Newtown Upper and has potential to conflict with dropping off and collection times.

Turbine delivery traffic also has potential to cause inconvenience to local traffic due to delays and to the local road works required to facilitate the turbine delivery trucks. This is a temporary and short term impact however and is considered a moderate temporary impact.

The construction of the grid connection within the public road network will also result in inconvenience to local road users. No road closures however are anticipated as being required for the works, though local delays may occur around the active construction areas.

No traffic impacts are identified for the operational phase.

13.2 MITIGATION MEASURES

Mitigation measures in the form of various traffic management measures are proposed. The condition of local roads will also be checked prior to construction and any damage caused to the local road network will be made good thereafter.

13.3 PREDICTED RESIDUAL IMPACTS

The residual traffic impacts will relate to relatively low volumes of traffic and will be of a temporary nature. Overall they are not considered significant.

14 ELECTROMAGNETIC AND AVIATION

14.1 RECEIVING ENVIRONMENT

There is an existing telecommunications mast at the summit of Carrigadoon Hill in the ownership of Towercom. A number of signals to and from the telecommunications mast were identified. Three signals run southwestwards across the southern slope of Carrigadoon Hill from the mast. They pass to the south of Curraghadobbin Hill away from the proposed wind farm. A fourth signal runs southeastwards across Carrigadoon Hill from the mast. A fifth signal runs generally westwards from the mast and is to the north of the proposals on both Carrigadoon and Curraghadobbin Hill.

Three further signals run northwestwards, northwards and northeastwards from the mast. These cross the northern slopes of Carrigadoon Hill with no potential for impact.

There is an RTÉ signal running to the south east of Carrigadoon Hill in a northeast / south west direction. This is outside the area of potential impact for the proposed wind turbines.

The nearest airport to the subject site is Waterford Airport which is located 20km to the southeast.

14.2 POTENTIAL IMPACTS

Based on a previous turbine layout proposal potential interference with signals from the telecommunications mast on Carrigadoon Hill was identified.

No potential impacts with aviation traffic or the RTÉ signal were identified.

14.3 MITIGATION MEASURES

To mitigate the potential impacts the previous turbine layout proposal, the turbines on Carrigadoon Hill were repositioned outside the area of influence of the telecommunications signals.

14.4 PREDICTED RESIDUAL IMPACTS

Due to the repositioning of the turbine locations now incorporated in the current proposals no residual impacts are identified.

There is no potential for impact on flights to or from Waterford Airport. The site is located to far distant from any other airport

15 INTERACTIONS

The table below illustrates the interactions and cumulative impacts that could result. It demonstrates that impacts resulting from one aspect of the environment can have a direct effect on other elements of the environment.

Table 15.1 - Interaction of Impacts

Initial Impact Identified in EIS as having an Interaction/ Cumulative Effect on Receptor	Human Beings	Noise	Air Quality	Shadow Flicker	Flora & Fauna	L'scape & Visual	Cultural Heritage	Traffic	Soils, Geology & Hydro-geology	Hydrology
Human Beings		X	X	X		X	X	X		
Noise								X		
Air Quality								X		
Shadow Flicker										
Flora & Fauna										
Landscape & Visual							X			
Cultural Heritage										
Traffic										
Soils, Geology & Hydrogeology										X
Hydrology										

In the case of this development impacts on a range of distinct environmental aspects have potential to impact on human beings in turn. For instance a noise impact or air quality impact would have potential to impact on human beings. In a somewhat less physically direct way, impact on the landscape can impact on human beings as they perceive the landscape in different ways.

Other areas of interaction are traffic and noise, where increased traffic and construction machinery can give rise to increased noise levels.