17. INTERACTION OF EFFECTS

17.1 Introduction

The preceding Chapters 5 to 15 of this Environmental Impact Assessment Report (EIAR) identify the potential significant environmental effects that may occur in terms of Population and Human Health, Biodiversity (Flora and Fauna) Ornithology (Birds), Land, Soils and Geology, Hydrology and Hydrogeology, Air, Climate, Noise and Vibration, Landscape and Visual, Cultural Heritage (Archaeological, Architectural and Cultural Heritage) and Material Assets (Roads and Traffic, Telecommunications and Aviation), as a result of the Proposed Development as described in Chapter 4 of this EIAR. However, for any development with the potential for significant environmental effects there is also the potential for interaction between these potential significant effects. The result of interactive effects may exacerbate the magnitude of the effects or improve them, or have a neutral effect.

A matrix is presented in Table 17-1 below to identify potential interactions of impacts between the various aspects of the environment already assessed in this EIAR. The matrix highlights the potential for the occurrence of positive, neutral or negative effects during both the construction (C) and operational (O) phases. It is considered that the potential effects during the decommissioning phase will be similar to the construction phase effects but of a lesser magnitude. The matrix is symmetric, with each environmental component addressed in the chapters of this EIAR being placed on both axes of a matrix, and therefore, each potential interaction is identified twice. In Section 17.2 below, the potential interactions between each environmental component have been discussed in order of the relevant chapters of the EIAR. Once a potential interaction between two environmental components has been discussed, i.e. Population & Human Health and Hydrology and Hydrogeology, the interaction will not be discussed again in the following relevant section, i.e. Hydrology and Hydrogeology and Population & Human Health in the Hydrology and Hydrogeology section.

Table 17-1 Interaction Matrix: Potential for Interacting Impacts

	Phase:	Population and Human Health	Biodiversity, Flora and Fauna	Ornithology	Land, Soils and Geology	Water	Air and Climate	Noise and Vibration	Landscape and Visual	Cultural Heritage	Material Assets
Population and Human Health	C										
	O										
Biodiversity, Flora and Fauna	C										
	O										
Ornithology, Birds	C										
	O										
Land, Soils and Geology	C										
	O										
Water	C										
	O										
Air and Climate	C										
	O										
Noise and Vibration	C										
	O										
Landscape and Visual	C										
	O										
Cultural Heritage	C										
	O										
Material Assets	C										
	O										

Legend: No Interacting Effect: Positive Effect:
Neutral Effect: Negative Effect:
'C'= Construction Phase 'O'= Operational Phase

The potential for interaction of effects has been assessed, throughout this EIAR, as part of the Impact Assessment process. While the work on all parts of the EIAR was not carried out by MKO, the entire project and all the work of all sub-consultants was managed and coordinated by the company. This EIAR was edited and collated by MKO as an integrated report of findings from the impact assessment process, by all relevant experts, and impacts that potentially interact have been assessed in detail in the individual chapters of the EIAR above and summarised in Section 17.2 below.

Where any potential negative effects have been identified during the assessment process, these effects have been avoided or reduced by design and the proposed mitigation measures, as presented throughout the EIAR and highlighted in Section 17.2 below.

17.1.1 Statement of Authority

This section of the EIAR has been prepared by Eoin O'Sullivan and reviewed by Michael Watson, both of MKO. Eoin O'Sullivan is employed as a Project Director Environmental with MKO. Eoin has over fifteen years' experience in the assessment of a wide range of energy and infrastructure related projects and working in the fields of environmental and human health risk assessment, waste management, waste policy and permitting. Eoin has wide experience in the project management of large scale infrastructural projects and brownfield developments. Eoin holds an MSc in Environmental Engineering and is a Chartered Member of the Chartered Institute of Water and Environmental Management (CWEM) and Chartered Environmentalist (CEnv) with the Society of Environment. Michael has over 20 years' experience in the environmental sector and had worked for the Geological Survey of Ireland and then a prominent private environmental & hydrogeological consultancy prior to joining MKO in 2014. Michael completed an MA in Environmental Management at NUI, Maynooth in 1999. Michael is a professional geologist (PGeo) and full member of IEMA (MIEMA) as well as a Chartered Environmentalist (CEnv).

17.2 Impact Interactions

17.2.1 Population and Human Health

Population and Human Health, Air and Climate, Noise

As identified in Chapter 5 of this EIAR, the construction phase has the potential to create a short-term, negative effect on human health due to the nuisance caused by construction plant and vehicle noise emissions, should the mitigation measures outlined in Chapter 12 not be implemented.

During the operational phase the Proposed Development has the potential to generate noise but as identified in Chapter 12, the potential effects on population and human health are not significant.

During the operational phase, the energy generated by the Proposed Development will offset energy and the associated emission of greenhouse gases from electricity-generating stations dependent on fossil fuels, thereby having a positive effect on climate (i.e. slowing the rate of global warming). In doing so, there will be reduced effects from climate change on human health over the 'do-nothing' scenario and continuing reliance on generating energy using fossil fuels.

Population and Human Health, Land, Soils and Geology, Air and Climate

The excavation and movement of soils and spoil during the construction phase of the Proposed Development has the potential to create dust emissions which, consequently, have the potential to have a short-term, slight, negative effect on local air quality and human health. Mitigation measures to reduce dust emissions generated during the construction phase of the Proposed Development are presented in Chapter 10.

Population and Human Health and Hydrology & Hydrogeology

As described in Chapter 9 of this EIAR, the construction phase of the Proposed Development has the potential to give rise to some water pollution as a result of site activities, and any water pollution could have a potential significant negative effect on the health of other users of that water within the same catchment. Mitigation measures are presented in Chapter 9 to minimise the potential of any such issues occurring.

Population and Human Health, and Material Assets

Chapter 15 of this EIAR discusses how the construction phase of the Proposed Development will give rise to traffic movements of abnormal loads and increased traffic volumes on the local road network and, therefore, is likely to create some temporary inconvenience for other road users. A Traffic Management Plan will be in place to minimise all disruption insofar as possible, as outlined in the Section 15.1 of this EIAR.

Population and Human Health, and Landscape and Visual

The construction phase of the Proposed Development will see the temporary introduction of construction machinery and the erection of wind turbines into a natural, but already modified landscape. The erection of the turbines in particular will change the existing landscape. The landscape and visual impact assessment of the Proposed Development, included as Chapter 14 of this EIAR, concludes that, from 16 viewpoints, 14 No. had residual effects rating either 'Not Significant', 'Slight' or 'Moderate', and 2 No. viewpoints had residual effects rating as 'Significant'. The impact assessment in Chapter 14 have determined that the Proposed Development is an appropriately designed wind farm although some significant visual impacts occur from a small number of local residential receptors, these effects have been mitigated where possible through use of appropriate set back distances (e.g. 750m set back from residential dwellings – greater than 4x tip height) and therefore it is considered the impact is neutral.

17.2.2 Biodiversity

Biodiversity and Land, Soils and Geology

The removal of forestry, soil and spoil, during construction of the Proposed Development, is likely to result in some disturbance of flora and fauna in the areas surrounding the Proposed Development works areas thereby, potentially causing a short term, slight, negative effect on flora and fauna. Excavated spoil will be stored on site in the spoil management areas or used for landscaping. These potential impacts have been assessed in Chapter 6 and Chapter 8 of this EIAR, and the relevant mitigation measures outlined in these chapters will be in place to avoid any subsequent effect on flora and fauna.

Biodiversity and Water

Site activities during the construction phase have the potential to give rise to some localised water pollution, and consequential indirect effects (such as disturbance and deterioration of habitat quality) on flora and fauna that use that water within the same catchment. The site activities during the construction phase, and continuing on for the operational phase, will give rise to additional localised drainage, which has the potential to have a significant, long term, negative effect on flora and their associated habitats should the appropriate mitigation measures not be implemented. These potential impacts have been assessed in Chapter 6 and Chapter 9 of this EIAR, and the relevant mitigation measures outlined in these chapters will be in place to avoid any water pollution and subsequent effect on flora and fauna.

Biodiversity and Air and Climate

During the construction phase of the Proposed Development, increased vehicular and dust emissions within and around the Proposed Development site have the potential to be a nuisance to flora and fauna. The mitigation measures outlined in Chapter 10 of the EIAR will ensure that the potential for negative effects is reduced or eliminated.

During the operational phase, the Proposed Development will help offset carbon emissions from fossil fuel based electricity generation plants, which will help contribute to a slower increase in the rate of global warming and a reduction in air pollution, consequently, could in combination with other renewable energy projects, have a long term, significant positive effect on flora and fauna.

Biodiversity and Noise and Vibration

Site activity during the construction phase could give rise to noise that could be a nuisance for fauna. Best practice mitigation measures are included in Chapter 6 and Chapter 12 to minimise the potential negative effect of noise generated during the construction phase on biodiversity.

Biodiversity and Landscape

The removal of some vegetation within the Proposed Development footprint and surrounding areas is likely to result in a change to the visual landscape during the construction phase, which will become part of the normal landscape of the wider area for the duration of the operational phase. The visual effect of this change is considered to be long-term, localised and slight.

17.2.3 Birds

Birds and Land, Soils and Geology

The removal of forestry and spoil, during construction of the Proposed Development, is likely to result in some disturbance of flora and fauna, including birds, in the areas surrounding the Proposed Development works area thereby, potentially causing an indirect long term, slight, negative effect on birds. The relevant mitigation measures outlined in Chapter 7 and Chapter 8 will be in place to avoid any subsequent effect on flora and fauna.

Birds and Water

Site activities during the construction phase have the potential to give rise to some water pollution, and consequential indirect effects on birds and their prey species (such as disturbance and deterioration of habitat quality) that use that water within the same catchment. The site activities during the construction phase, and continuing on for the operational phase, are likely to give rise to additional localised drainage, which has the potential to have a significant, negative effect on the habitats of particular bird species and subsequently a long, term, negative effect on ornithology should the mitigation measures outlined in Chapter 9 of this EIAR not be implemented.

Birds and Air and Climate

During the construction phase of the Proposed Development, increased vehicular and dust emissions within and around the site have the potential to be a nuisance for birds, thereby having a short term, slight, negative effect. The mitigation measures outlined in Chapter 10 of the EIAR will ensure that the potential for negative effects is reduced or eliminated.

During the operational phase, the Proposed Development will help offset carbon emissions from fossil fuel based electricity generation plants, which will help contribute to a slower increase in the rate of global warming and, consequently, could in combination with other renewable energy projects, contribute to preventing the loss of bird species from Ireland as a result of climate change.

Birds and Noise and Vibration

Site activity during the construction phase could give rise to noise that could be a nuisance for birds that use the Proposed Development site, therefore, causing a short term, slight, negative effect on ornithology. Best practice mitigation measures are included in Chapter 7 and Chapter 12 to minimise the potential negative effect of noise generated during the construction phase on ornithology.

17.2.4 Land, Soils and Geology

Land, Soils and Geology and Hydrology & Hydrogeology

As identified in Chapter 9 of this EIAR, the movement and removal of spoil during the construction phase has the potential to have a significant, negative effect on water quality through potentially silt-laden runoff from the Proposed Development works areas. Mitigation measures to ensure there are no significant, negative effects on water quality are presented in Chapter 9.

Land, Soils and Geology and Archaeological, Architectural and Cultural Heritage

The removal of spoil during the construction phase has the potential to have a permanent, significant, negative effect on previously unrecorded sub-surface archaeological site and artefacts. Mitigation measures outlined in Chapter 14 will reduce the potential for negative effects on unrecorded sites and artefacts during excavations.

Land, Soils and Geology and Landscape and Visual

The removal of spoil and the subsequent replacement with crushed stone for the construction of site roads and hardstanding areas within the Proposed Development site has the potential to alter the local landscape. The visual effect of this change is expected to be long term, localised in nature and slight.

17.2.5 Air and Climate

Air and Material Assets

The movement of construction vehicles both within and to and from the Proposed Development site has the potential to give rise to dust nuisance effects during the construction phase. This is assessed further in Chapter 10 of this EIAR, and mitigation measures are presented to minimise any potential effects.

Climate and Material Assets

Following construction of the Proposed Development, there will be a Permanent Imperceptible Negative Effect on Climate as a result of greenhouse gas emissions from construction plant and vehicles, embodied carbon associated with the turbines and construction materials. Operation of the Proposed Development will have a Direct Long-Term Moderate Positive Effect on climate as a result of reduced greenhouse gas emissions. Operation of the Proposed Development will have a Direct Long-Term Moderate Positive Effect on climate as a result of reduced greenhouse gas emissions.

17.2.6 Landscape and Visual

Landscape and Visual and Cultural Heritage

As described in Chapter 13 of this EIAR, the Proposed Development has the potential to change the landscape setting of recorded sites and monuments in the wider area. However, it is concluded in Chapter 13 that any potential, indirect, visual effect of the Proposed Development on national and recorded monuments would not be significant.

17.3 Mitigation and Residual Impacts

Where any potential interactive negative impacts have been identified in the above, a full suite of appropriate mitigation measures has already been included in the relevant sections (Chapters 5-15) of the EIAR. The implementation of these mitigation measures will reduce or remove the potential for these effects. Information on potential residual effects and the significance of effects, is also presented in each relevant chapter.