

17. INTERACTION OF EFFECTS

17.1 Introduction

The preceding Chapters 5 to 16 of this 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, Water (Hydrology and Hydrogeology), Air Quality, Climate, Noise and Vibration, Landscape and Visual, Cultural Heritage (Archaeological, Architectural and Cultural Heritage), Material Assets (Roads and Traffic, Telecommunications and Aviation), and Major Accidents and Natural Disasters as a result of the Proposed Project as described in Chapter 4 of this EIAR. All of the potential significant effects of the Proposed Project and the measures proposed to mitigate them have been outlined in the preceding chapters of this EIAR. Mitigation measures and best practice measures for the construction, operation and decommissioning of the Proposed Project are detailed in the accompanying Construction and Environmental Management Plan (CEMP) (Appendix 4-5 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 ameliorate them or have a neutral effect.

A matrix is presented in Table 17-1 below to identify potential interactions between the various aspects of the environment already assessed in this EIAR. The matrix highlights the occurrence of potential positive 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 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, for example, Population & Human Health and Water, the interaction will not be discussed again in the following relevant section, therefore there is no Water and Population & Human Health section.

Table 17-1 Interaction Matrix: Potential for Interacting Impacts

	Phase	Population and Human Health	Biodiversity, Flora and Fauna	Birds	Land, Soils and Geology	Water	Air	Climate	Noise and Vibration	Landscape and Visual	Cultural Heritage	Material Assets	Major Accidents & Natural Disasters
Population and Human Health	C												
	O												
Biodiversity, Flora and Fauna	C												
	O												
Birds	C												
	O												
Land, Soils and Geology	C												
	O												
Water	C												
	O												
Air	C												
	O												
Climate	C												
	O												
Noise and Vibration	C												
	O												
Landscape and Visual	C												
	O												
Cultural Heritage	C												

	O												
Material Assets	C												
	O												
Major Accidents & Natural Disasters	C												
	O												

Legend: No Interacting Effect: Neutral Effect: Positive Effect: Negative Effect:

The potential for interaction of impacts has been assessed, throughout this EIAR, as part of the Impact Assessment process. While the work on all parts of the Environmental Impact Assessment Report (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 impacts have been identified during the assessment process, these impacts 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 Evan Connolly and reviewed by Brandon Taylor and Eoin McCarthy, all of MKO.

Evan is an Environmental Scientist with MKO. Evan is an Environmental Scientist with over one year of private consultancy experience. Evan holds a B.Sc. in Earth and Ocean Science from the University of Galway and an interinstitutional M.Sc. in Sustainable Resource Management: Policy & Practice from University of Galway and University of Limerick. Evan’s strengths and areas of expertise are in environmental sustainability, geology, hydrology and oceanography. Since joining MKO Evan has been involved as a Project Planning Consultant on a range of wind energy infrastructure projects. Within these projects Evan has been responsible for the drafting and reviewing of EIAR chapters, geological mapping as well as assisting with proposed project fee proposals and scoping on behalf of clients.

Brandon is an Environmental Scientist with over two years of private consultancy experience. Brandon holds a BSc (Hons) in Geography from McGill University, and a MSc (Hons) in Coastal & Marine Environments from the University of Galway. Brandon’s key skills include scientific research and report writing, particularly in the context of local communities and their interactions with environmental stressors, and geospatial analysis and the application of GIS and remote sensing tools across the fields of renewable energy development, coastal zone management, and education and scientific communication. Since joining MKO, Brandon has been involved in the design and environmental impact assessment (EIA) of multiple large-scale onshore wind energy developments across Ireland, contributing to and managing the production of EIA reports.

Eoin is a Project Director with MKO. with over 14 years of environmental consultancy experience. Eoin holds B.Sc. (Hons) in Environmental Science from NUI, Galway. Eoin’s key strengths and areas of expertise are in project management, environmental impact assessment, wind energy site selection and

feasibility assessment. Since joining MKO in 2011, Eoin has been involved as a Graduate, Assistant and Project Environmental Scientist on a significant range of energy infrastructure, tourism, waste permit, flood relief scheme and quarrying projects. He has overseen some of the largest SID wind energy in Ireland in in that time. In his role as project manager, Eoin works with and co-ordinates large multidisciplinary teams including members from MKO's Environmental, Planning, Ecological and Ornithological departments as well as sub-contractors from various fields in the preparation and production of EIARs. Eoin is also involved in the development of project strategy for the projects that he manages. He has held the role of project manager on over 550MW worth of wind energy projects. Within MKO Eoin plays a large role in the management of and sharing of knowledge with junior members of staff and works as part of a large multi-disciplinary team to produce EIA Reports.

17.2

Impact Interactions

17.2.1

Population and Human Health

Population and Human Health, Land, Soils and Geology

The use of plant machinery on site during excavation works and the movement of peat and spoil may result in the potential for soil and ground contamination. A wind farm and associated underground grid connection cabling is not a recognised source of pollution and so the potential for effects during the operational phase are imperceptible. With the implementation of mitigation and monitoring measures detailed in Chapter 8 and the Construction and Environmental Management Plan (CEMP) (Appendix 4-5), the potential for residual effects associated with soil or ground contamination during the construction and operational phases and subsequent health effects are imperceptible.

Population and Human Health and Water

As described in Chapter 9 (Water) of this EIAR, the construction phase of the Proposed Project 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.

The primary potential for cumulative effects will occur during the construction phase of the Proposed Project as this is when earthworks and excavations will be undertaken at the Site. The potential for cumulative effects during the operational phase of the Proposed Project will be significantly reduced as there will be no exposed excavations, there will be no sources of sediment to reach watercourses, there will be no use of cementitious materials and fuels/oil will be kept to a minimum at the site. During the decommissioning phase, the potential cumulative effects are similar to the construction phase, but to a much lesser degree with less ground disturbance

Mitigation measures are presented in Chapter 9 to minimise the potential of any such issues occurring.

Population and Human Health and Air

During the construction phase, the Proposed Project has the potential to create a short term, negative effect on human health via exhaust emissions as a result of the use of construction vehicles/machinery and plant on the site and the transport of workers and materials to/from the site. As outlined in Chapter 10 (Air), the potential effects on human health are short-term, slight, negative impacts.

By providing an alternative to electricity derived from coal, oil or gas-fired power stations, the Proposed Project will result in emission savings of carbon dioxide (CO₂), oxides of nitrogen (NO_x), and sulphur dioxide (SO₂). The production of renewable energy from the Proposed Project will have a long-term, significant, positive impact on air quality.

Population and Human Health and Climate

During the construction phase, the Proposed Project has the potential to create a short term, negative effect on climate via exhaust emissions as a result of the use of construction vehicles/machinery and plant on the site and the transport of workers and materials to/from the site. This potential impact will be short-term and slight and will be restricted to the duration of the construction phase.

During the operational phase, the energy generated by the Proposed Project 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, and Noise

As identified in Chapter 5 (Population and Human Health) 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 (Noise) not be implemented.

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

Population and Human Health, and Landscape and Visual

The construction phase of the Proposed Project will see the temporary introduction of construction machinery and the erection of wind turbines into a natural, but already modified working landscape. The erection of the turbines in particular will change the existing landscape. Whether the long-term change in landscape created by the erection of the turbines is deemed to be positive or negative is a subjective matter. What appears to be a positive visual effect to one viewer could be deemed to be a negative effect by another viewer. The landscape and visual impact assessment of the Proposed Project, included as Chapter 13 of this EIAR. 15 No. photomontage viewpoints were selected to represent a good geographic spread of views from within the 20km LVIA Study Area, focussed in the direction of the proposed turbines. The LVIA determined the potential for “Significant” residual visual effects at one viewpoint, VP14 Tigreenaun. The rating of predicted effects at VP14 is mainly owing to the proximity of residential receptors to the proposed turbines (within 1.3km) and the substantial magnitude of change observed from that vantage point. The number of receptors experiencing these effects is very low as the landscape surrounding the Proposed Wind Farm site has a significantly low population density. The visual effects ratings for the remaining viewpoints range from “Imperceptible” and “Not Significant” at viewpoints greater than 4.5km from the proposed turbines, to “Moderate” at viewpoints as close in as 1km. In terms of visual effects on local (within 3km) residential receptors, the LVIA determined that, in general, when viewing the proposed turbines from the north or south, the narrow field of view causes the perceived scale (height and breadth) of turbines to diminish quickly with distance, thereby mitigating visual impacts. The Proposed Project is therefore considered acceptable in this context and is in alignment with emerging baseline trends.

Population and Human Health, and Material Assets

Chapter 15 (Material Assets) of this EIAR discusses how the construction phase of the Proposed Project 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 short-term 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. A Traffic Management Plan (Appendix 15-2) will be in place to minimise all disruption, as described in Chapter 15 Material Assets and the CEMP (see Appendix 4-5). During the operational phase, impacts on the surrounding local road network will be imperceptible. With the

implementation of measures detailed in Chapter 5 and the CEMP (Appendix 4-5) dust and exhaust emission will be contained and the potential for impact on health will be imperceptible.

As detailed in Chapter 15, the Proposed Wind Farm will have a short-term effect on utilities imperceptible effect during the construction phase. During the operational phase, there will be an imperceptible effect on utilities, Gas Networks Ireland, telecoms, and aviation.

17.2.2 Biodiversity

Biodiversity and Land, Soils and Geology

The excavation and removal of spoil, during the construction phase of the Proposed Project is likely to result in some disturbance of flora and fauna in and adjacent to the Proposed Project footprint thereby, potentially causing a long term, slight, negative effect on biodiversity. These potential impacts have been assessed in Chapter 6 of this EIAR, and excavated peat and spoil will be contained on site in designated peat and spoil management areas.

It is also proposed to plant and manage approximately 4.7km of hedgerow within the Proposed Wind Farm site. The measures listed above will have a slight long term positive effect on mammals, birds, bats, and invertebrates as these measures will both create and increase suitable habitat for foraging, commuting, and nesting for a wide range of fauna including those listed above. In addition, it is proposed to convert/manage land for enhancement purposes for bog woodland scrub, grassland and marsh fritillary. Please see Chapter 6 Biodiversity and the associated Biodiversity Management and Enhancement Plan (Appendix 6-4), for details.

Biodiversity and Water

Site activities during the construction phase have the potential to give rise to some 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 an indirect, negative, significant, temporary 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. It is also proposed to plant and manage approximately 1,230m of hedgerow and fencing from drains and rivers within the Proposed Wind Farm site. The measures listed above will have a slight long term positive effect.

Biodiversity and Air

During the construction phase of the Proposed Project, increased vehicular and dust emissions within and around the Site have the potential to be a nuisance to flora and fauna, thereby having a temporary, 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 potential for effects on biodiversity from vehicular and dust emissions are imperceptible, however the overall displacement of fossil fuel emissions will have a long-term moderate positive effect on air quality for biodiversity.

Biodiversity and Climate

During the construction phase of the Proposed Project, the use of construction vehicles/machinery and plant, the transport of workers and materials to/from the Site and the enhancement, translocation and

planting of hedgerow habitat will give rise to exhaust emissions. The production of these emissions will result in a short-term, negative impact on biodiversity.

During operational phase, the Proposed Project 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, moderate positive effect on biodiversity.

The construction of the Proposed Project will involve the removal of carbon fixing vegetation and habitat, however, as detailed in Appendix 6-4 Biodiversity Management and Enhancement Plan, it is proposed to plant and manage approximately 4,700m of hedgerow within the Proposed Wind Farm site and afforest 15ha of forestry conifer plantation into native broadleaf as part of the Proposed Project (Chapter 6 of this EIAR). As outlined in Chapter 11, the Proposed Project will displace carbon dioxide from fossil fuel-based electricity generation, over the proposed 35-year lifespan operational phase 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 positive effect on biodiversity.

Biodiversity and Noise and Vibration

Site activity during the construction phase could give rise to noise that could be a nuisance for fauna, thereby having a temporary, slight, negative effect. 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 Project footprint and surrounding areas is likely to result in a change to the visual landscape during the construction phase. However, due to the areas replanted and enhanced in line with Chapter 6 will become part of the normal landscape of the wider area for the duration of the operational phase. The landscape effect of this change is considered to be overall long-term positive effect.

17.2.3 Ornithology

Ornithology and Land, Soils and Geology

The removal of hedgerows and soil, during construction phase of the Proposed Project is likely to result in some disturbance of fauna, including birds, in the areas surrounding the Proposed Project works area. The relevant mitigation measures outlined in Chapter 7, Chapter 8 and the CEMP (Appendix 4-5) will be in place to avoid any subsequent effect on ornithology.

It is also proposed to plant and manage approximately 4,700m of hedgerow within the Proposed Wind Farm site. The measures listed above will have a slight long term positive effect on mammals, birds, bats, and invertebrates as these measures will both create and increase suitable habitat for foraging, commuting, and nesting for a wide range of fauna including those listed above. In addition, it is proposed to convert/manage land for enhancement purposes for bog woodland scrub, grassland and

marsh fritillary. Please see Chapter 6 Biodiversity and the associated Biodiversity Management and Enhancement Plan (Appendix 6-4), for details.

Ornithology 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.

Ornithology and Air

During the construction phase of the Proposed Project, increased vehicular and dust emissions within and around the Site have the potential to be a nuisance for birds, thereby having a temporary, slight, negative effect. The mitigation measures outlined in Chapter 10 and the CEMP (Appendix 4-5) will ensure that the potential for negative effects is reduced or eliminated. During the operational phase, the potential for effects on ornithology from vehicular and dust emissions are imperceptible.

Ornithology and Climate

The construction of the Proposed Project will result in greenhouse gas emissions associated with production of construction materials and operation of vehicles and plant. This impact on ornithology will be negative and slight only, given the quantity of greenhouse gases that will be emitted to the atmosphere, and will be restricted to the duration of the construction phase. As discussed above in Section 17.2.1, once emitted to the atmosphere, the greenhouse gas emissions that will arise from construction phase activities will have a permanent imperceptible negative effect on Climate.

During the operational phase, the Proposed Project 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.

Ornithology 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 Project site, therefore, causing a temporary, 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.

Site activity during the operational phase could give rise to noise that could be a nuisance for birds, which use the Proposed Project site. Best practice mitigation measures are included in Chapter 7 and Chapter 12 and to minimise the potential negative effect of noise generated during the operational phase. The limited onsite noise activity generated by the Proposed Project during the operational phase will have an imperceptible negative effect on birds

17.2.4 Land, Soils and Geology

Land, Soils and Geology and Water

As identified in Chapter 9 of this EIAR, the movement and removal of peat and 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 Wind Farm works areas. Mitigation measures to ensure there are no significant, negative effects on water quality are presented in Chapter 8, Chapter 9, and the CEMP (Appendix 4-5).

Land, Soils and Geology and Air

The excavation works and transportation of vehicles to/from and around the site will give rise to dust and exhaust emissions which is considered a short-term, slight, negative impact on air quality. Mitigation measures outlined in Chapter 10 will reduce the potential for negative effects on land, soils, and geology, including includes dust suppression measures which is further outlined in the CEMP (please see accompanying CEMP (Appendix 4-5). No ground works are required for the operational phase.

Land, Soils and Geology and Climate

The construction of the Proposed Project will result in greenhouse gas emissions associated with production of construction materials and operation of vehicles and plant. This impact will be negative and slight only, given the quantity of greenhouse gases that will be emitted to the atmosphere, and will be restricted to the duration of the construction phase. As discussed above in Section 17.2.1, once emitted to the atmosphere, the greenhouse gas emissions that will arise from construction phase activities will have a permanent imperceptible negative effect on Climate.

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

The removal of peat and spoil during the construction phase is likely to have a permanent, significant, negative effect on any previously unrecorded sub-surface archaeological site and artefacts. Any archaeological sites/features, if detected, during monitoring will be preserved by record (archaeologically excavated) or preserved in-situ (avoidance) and therefore a full record made of the same. 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 peat and spoil and the subsequent replacement with crushed stone for the construction of the site roads and hardstanding areas within the Proposed Wind Farm 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

Air, and Material Assets

The transportation of vehicles to/from and around the Proposed Project site will give rise to dust and exhaust emissions which is considered a short-term, slight, negative impact on air quality. Following implementation of mitigation measures as outlines in Chapter 10, Chapter 12, and the CEMP

(Appendix 4-5) there will be a short-term imperceptible negative effect on air quality due to transportation movements. Dust and exhaust emissions generated through the transportation of vehicles to/from and around the Proposed Project site during the operational phase (average of 1-2 LGVs per day) are imperceptible.

17.2.6 Climate

Climate and Material Assets

The construction of the Proposed Project will result in greenhouse gas emissions, e.g., carbon dioxide (CO₂), carbon monoxide and nitrogen oxides, associated with tree felling, production of construction materials, and operation of vehicles and plant. This impact will be permanent and slight only, given the quantity of greenhouse gases that will be emitted to the atmosphere, and will be restricted to the duration of the construction phase. This is assessed further in Chapter 11 of this EIAR, and mitigation measures are presented to minimise any potential effects.

The Proposed Project will displace carbon dioxide from fossil fuel-based electricity generation, over the proposed 35-year lifespan of the Proposed Project. Therefore, while there will be greenhouse gas emissions associated with the operation of the Proposed Project, this will be offset by the operation of the Proposed Project which will offset 39,462 tonnes of carbon dioxide per annum or approximately 1,381,170 tonnes over its operational life from traditional carbon-based electricity generation. Subsequently, this will cause a long-term positive effect on Climate as a result of reduced greenhouse gas emissions.

17.2.7 Landscape and Visual

Landscape and Visual and Cultural Heritage

As described in Chapter 13 of this EIAR, the Proposed Project 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 Project on national and recorded monuments would not be significant.

17.2.8 Major Accidents and Natural Disasters

As described in Chapter 16 of the EIAR, major accidents or natural disasters are hazards which have the potential to affect the Proposed Project and lead to environmental effects both directly and indirectly. These include accidents during construction, operation and decommissioning of the Proposed Project caused by operational failure and/or natural hazards. The assessment of the potential for significant accidents or disasters is conducted in connection with the information that must be included in the EIAR. This includes aspects such as population and human health, biodiversity, land and soil, hydrology and hydrogeology, air quality, climate, material assets, cultural heritage, and landscape. The risk of a major accident and/or disaster during the construction of the Proposed Project is considered 'low' in accordance with the 'Guide to Risk Assessment in Major Emergency Management' (DoEHLG, 2010).

When the above mitigation is implemented, and all mitigation detailed in the EIAR is implemented, the residual effect(s) associated with the construction, operation and decommissioning of the Proposed Project are not significant.

17.3 Mitigation and Residual Effects

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 impacts and the significance of effects, is also presented in each relevant chapter.