18 INTERACTIONS OF THE FOREGOING

18.1 INTRODUCTION

The likely significant effects of the proposed project, together with the mitigation measures proposed to address these effects, are described within this EIAR. Notwithstanding this, any development with the potential to give rise to environmental effects has the potential for interactions between the various environmental factors. Such interactions may result in a change in the significance of effects, either by increasing (in-combination) or reducing their magnitude. In accordance with EIAR requirements, the potential for interaction between effects on the receiving environment has been assessed.

Table 18-1 identifies those environmental factors with the potential to interact as a result of the proposed project during the construction (C), operational (O), and decommissioning (D) phases. Potential interactions were identified at an early stage during the design process. Where a potential for interaction between environmental factors was identified, this has been taken into account within the relevant EIAR chapters as part of the assessment process. Both positive and negative interactions have been considered across all project phases and the respective environmental factors. The identified interactions are described further in Section 18-2.

The assessment of potential interactions presented in this chapter is based on the full range of turbines dimensions, the Turbine Delivery Route (TDR) and the proposed Grid Connection Route (GCR) (refer to Chapter 2, Description of the Proposed Development).

18.1.1 Statement of Authority

This chapter has been prepared by Bertha Kasonde of TOBIN. Bertha is a Project Manager with over 8 years of multidisciplinary experience in environmental consulting both in the Public and Private Sectors. She holds a Bachelor of Engineering in Environmental Engineering and M.Sc. in Climate Change, Agriculture and Food Security from University of Galway. She has contributed to EIAR chapters and conducted feasibility studies for various projects including Wind, Solar and BESS.

This chapter has been reviewed by Sinéad Ryan, Associate Director and Environmental Engineer with TOBIN. Sinéad Ryan (BSc, MSc, PIEMA) has over 20 years' professional experience working in the environmental sector in Ireland, with over 10 years in the planning and EIA aspects of onshore renewable energy projects. She has specific experience in constraints-led wind farm design and EIA chapter authoring.

Table 18-1: Interaction between Environmental Factors

Interaction Matrix (√ = Interaction)	Phase	Population and Human Health	Biodiversity	Ornithology	Land, Soils & Geology	Hydrology & Hydro-Geology	Air Quality & Climate	Noise & Vibration	Landscape & Visual	Archaeology & Cultural Heritage	Traffic & Transportation	Material Assets	Shadow Flicker
Population and Human Health	C				√	√	√	√	√		√		
	O				√	√	√	√	√		√	√	√
	D				√	√	√	√	√		√		
Biodiversity	C			√	√	√	√	√			√		
	O			√		√		√			√		
	D			√	√	√	√	√			√		
Ornithology	C				√	√	√	√			√		
	O					√							
	D						√	√			√		
Land, Soils & Geology	C					√	√		√	√			
	O												
	D						√						
Hydrology & Hydrogeology	C						√						
	O												
	D												
Air Quality & Climate	C										√	√	
	O										√		
	D												
	C										√		

Interaction Matrix (√ = Interaction)	Phase	Population and Human Health	Biodiversity	Ornithology	Land, Soils & Geology	Hydrology & Hydro-Geology	Air Quality & Climate	Noise & Vibration	Landscape & Visual	Archaeology & Cultural Heritage	Traffic & Transportation	Material Assets	Shadow Flicker
Noise & Vibration	O										√		
	D										√		
Landscape & Visual	C									√			
	O									√			
	D									√			
Archaeology, Architectural & Cultural Heritage	C												
	O												
	D												
Traffic & Transportation	C												
	O												
	D												
Material Assets	C												
	O												
	D												
Shadow Flicker	C												
	O												
	D												

Table 18-1: Interaction between Environmental Aspects (positive and negative).

Phases include construction (C), operational (O) and decommissioning (D).

Blue denotes identified interactions (which are described in Section 18.2), while grey is used for blocking out part of the table to avoid duplication.

18.2 Potential Interactions

This section summarises key interactions between environmental aspects with the potential for likely significant residual effects from the proposed project, as identified in Table 18-1. Only potential interactions listed in Table 18-1 for each project stage are discussed and each environmental interaction relating to any two-chapter topics is addressed only once. Therefore, not all interactions for each chapter are listed under that chapter heading and follows the same principle as outlined in Table 18-1 to avoid repetition.

As described in Chapter 17 (Major Accidents and Natural Disasters), the proposed project may itself present a hazard or interact with other hazards, potentially resulting in a major accident or natural disaster during the construction, operational, or decommissioning phases. All identified hazards and sources of hazard have been considered in the technical assessments presented in Chapters 5 to 17. As a result, any interactions relating to hazards are addressed in Chapter 17 and not repeated in this chapter.

18.2.1 Population and Human Health

The following interactions with Population and Human Health have been identified as having the potential to occur during the construction, operational and /or decommissioning phases of the proposed project.

Interactions of Population and Human Health, Land, Soils and Geology, Hydrology and Hydrogeology, Air Quality and Climate

There is potential for short-term interaction between the environmental factors of Population and Human Health, Land Use, Soils and Geology, Hydrology and Hydrogeology, Air Quality and Climate during the construction phase.

These interactions will primarily arise from earthworks and excavation activities e.g. proposed borrow pits, access tracks, hardstands, proposed grid connection route (GCR) and Turbine Delivery Route (TDR) accommodation areas.

Potential human health effects associated with soil disturbance relate primarily to dust generation during material extraction and the handling and movement of soils and excavated rock, as outlined in Chapters 11 - Air Quality and 12 - Climate. There is also a potential risk of accidental spills or leaks from construction plant and machinery, which could result in localised soil contamination.

Potential effects on human health arising from soil disturbance are assessed as localised, negative, imperceptible to slight in magnitude, and temporary to short-term in duration, and are not significant.

Given the baseline environmental conditions and the implementation of proposed mitigation measures, no significant adverse effects on Population and Human Health, Air Quality, or Climate are anticipated.

These potential effects, together with the relevant mitigation measures, are described in Chapters 7 (Land, Soils and Geology), 8 (Hydrology and Hydrogeology), 11 (Air Quality), and 12 (Climate) of this EIAR.

During the decommissioning phase, effects will be similar to those identified during construction, but of a lesser magnitude due to reduced ground disturbance. In addition, a substantial proportion of infrastructure will remain in situ, further limiting potential effects.

Interactions of Population and Human Health and Shadow Flicker

Chapter 10 (Shadow Flicker) provides the assessment of shadow flicker on the population within a specified area of the proposed turbine locations during the Operational Phase. No further interaction will take place.

Interactions of Population and Human Health and Material Assets

The telecommunications impact assessment identified a potential effect on a radio link during the Operational Phase. The three-dimensional analysis indicated that turbines T5 and T6 may obstruct the Fresnel Zone of the radio link, with the potential to affect the operation of the 2RN VHF off-air radio link between Truskmore and Monaghan. Mitigation measure options have been agreed between the applicant and the operator of the 2RN link potentially affected, as outlined in Section 15.5 of this EIAR.

Prior to mitigation, the potential impact is characterised as moderate and negative.

The assessment concludes that, with the implementation of the mitigation measures proposed in Section 15.5.2 of Chapter 15 (Material Assets), no significant effects on material assets are anticipated at any stage of the proposed development.

The proposed GCR works and TDR accommodation areas do not have likely significant effects on telecommunications links, due to the temporary nature and limited scale of the works.

Therefore, no likely significant effects are anticipated in relation to this interaction.

Interactions of Population and Human Health and Noise and Vibration

Noise and vibration effects have been assessed on population receptors in Chapter 9 (Noise and Vibration) of this EIAR. There is no further interaction anticipated beyond that already assessed in Chapter 9.

Interactions of Population and Human Health and Landscape and Visual Effects

Landscape and visual effects associated with the proposed wind farm have the potential to interact with Population and Human Health, primarily in relation to residential amenity. This has been assessed in Chapter 13 (Landscape and Visual).

Interactions of Population and Human Health and Traffic and Transportation

Potential effects on the surrounding road network are addressed in Chapter 16 (Traffic and Transportation). Traffic and transportation activities may interact with Population and Human Health primarily through the generation of noise (assessed in Chapter 9), dust emissions which may influence local residential amenity (assessed in Chapter 11), and temporary traffic disruption (assessed in Chapter 16).

18.2.1.1 Biodiversity

The following interactions with Biodiversity have been identified as having the potential to occur during the Construction, Operation and Decommissioning Phases of the proposed project.

Interactions of Biodiversity and Land Use, Soils and Geology

Biodiversity and Land Use, Soils and Geology interact as a direct result of change of landuse, loss of habitat and disturbance due to movement of soils during the construction and

decommissioning phases of the proposed project. All interactions have been assessed in Chapter 5 (Biodiversity) and Chapter 7 (Land Use, Soils and Geology).

Interactions of Biodiversity and Hydrology and Hydrogeology

Biodiversity and Hydrology and Hydrogeology interact in relation to mitigation measures aimed at protecting water quality. Both topics share a combined potential effect relating to water quality impacts during the construction and operational phases of the proposed project.

Construction phase activities including excavation, ground works, movement and storage of spoil, site drainage, and the use and storage of potential contaminants have the potential, if not appropriately managed or mitigated, to impact nearby habitats and aquatic environments. This gives rise to a potential interaction between Biodiversity and Hydrology and Hydrogeology.

These potential effects, together with the proposed mitigation measures, are addressed in detail in Chapter 8 (Hydrology and Hydrogeology), as well as in the Construction Environmental Management Plan (CEMP) (see Appendix 2-4) of the EIAR. Implementation of these measures will reduce the potential for direct and indirect effects on Biodiversity from project-related activities.

The embedded mitigation SuDS measures will control the movement of run-off from project infrastructure across the entirety of the proposed wind farm site during the operational phase.

Likely significant effects are not anticipated considering the embedded mitigation measures for the protection of water quality.

Interactions of Biodiversity and Air Quality and Climate

There is an interaction between biodiversity and air quality in terms of mitigation of potential dust effects. The two topics share a combined potential effect due to potential dust impacts during construction and decommissioning phases of the proposed project.

Activity during the construction phase, primarily relating to excavation, ground works, movement and storage of spoil, has the potential, if not properly managed or mitigated for, to impact on nearby habitats and aquatic environments, resulting in a potential interaction between Biodiversity and Air Quality.

These potential effects, along with proposed mitigation measures, are discussed in detail within Chapter 5 (Biodiversity), Chapter 7 (Land, Soils and Geology), Chapter 11 (Air Quality) and Chapter 12 (Climate) and the CEMP (see Appendix 2-4) of the EIAR. The proposed mitigation measures will reduce the potential direct and indirect effect from dust on Biodiversity from activity associated with the proposed project.

Section 11.7 of Chapter 11 (Air Quality) further outlines mitigation measures including the use of solid screens or barriers to be erected around any identified breeding populations of marsh fritillary within 50m of the proposed wind farm site infrastructure to mitigate dust impacts.

Therefore, with proposed mitigation measures, the potential effects from the interactions between Biodiversity and Air Quality are considered not significant.

Interactions of Biodiversity and Ornithology

Ornithology is a specialist subsection of Biodiversity and as such there are interactions across all phases of the proposed project, which are assessed and mitigated for in Chapter 5 (Biodiversity) and Chapter 6 (Ornithology). No further interactions are identified.

Interactions of Biodiversity, Noise and Vibration, and Traffic and Transportation

There is potential for interaction between Biodiversity, Noise and Vibration, and Traffic and Transportation during the construction, operational, and decommissioning phases of the proposed development. Traffic movements and site activities during the construction and decommissioning phases have the potential to generate noise, which may give rise to disturbance effects for fauna.

Increased human presence and/or noise and vibration associated with construction works has the potential to displace European otter, during the construction phase of the proposed project primarily along the GCR particularly at Aquatic Sites. Section 5.6.2.1.3.2 of Chapter 5 (Biodiversity) outlines these likely significance effects while mitigation measures are outlined in section 5.6.2.1.5 of the same chapter.

Considering the embedded mitigation measures, no likely significant effects at any geographic scale are anticipated on European otter arising from disturbance/displacement as a result of the proposed project.

Overall, with the implementation of mitigation measures, potential effects arising from the interaction between Biodiversity, Noise and Vibration, and Traffic and Transportation are considered not significant.

18.2.1.2 Ornithology

No significant interactions with other environmental factors were identified in the Ornithology assessment.

The following interactions with Ornithology have been identified as having the potential to occur during the construction, operation and decommissioning phases of the proposed project.

Interactions of Ornithology, Lands, Soils and Geology, and Hydrology and Hydrogeology

Exposing soils during the construction and decommissioning phase has the potential, if not properly managed, to cause the sedimentation of nearby watercourses, which could lead to indirect effects on birds and their prey species through disturbance and deterioration of aquatic habitat quality.

There is potential for some disturbance to foraging birds during construction and decommissioning; however, this is unlikely to be significant due to the temporary and localised nature of any disturbance and availability of extensive alternative foraging habitat in the wider area.

The embedded mitigation SuDS measures will control the movement of run-off from project infrastructure across the entirety of the proposed wind farm site during the operational phase.

Interactions are assessed in Chapter 6 (Ornithology), Chapter 8 (Hydrology and Hydrogeology) and Chapter 7 (Land Use, Soils and Geology). No further interactions have been identified.

Interactions of Ornithology, Noise and Vibration, and Traffic and Transportation

There is potential for interaction between Ornithology, Noise and Vibration, and Traffic and Transportation during the construction and decommissioning phases of the proposed project. However, as noted above, noise and vibration levels during both the construction and decommissioning phases have been assessed in relation to the potential to disturb birds.

Interactions are assessed in Chapter 6 (Ornithology), Chapter 9 (Noise and Vibration) and Chapter 16 (Traffic and Transportation).

Interactions of Ornithology and Air Quality and Climate

There is potential for interaction between Ornithology, and Air Quality during the construction and decommissioning phases of the proposed project. There is a potential for localised dust to be a nuisance for birds in any given area, as assessed in Chapter 11 (Air Quality) and Chapter 6 (Ornithology).

18.2.1.3 Land, Soils and Geology

The following interactions with Land, Soils and Geology have been identified as having the potential to occur during the construction and decommissioning phases of the proposed project.

Interactions of Land, Soils and Geology, Hydrology and Hydrogeology and Air Quality and Climate

During the construction phase, excavations associated with the installation of infrastructure and the construction of internal access tracks have the potential to increase suspended solids in surface water run-off.

Given embedded mitigations for the proposed project, no significant effects are anticipated.

The management of peat stability will be ongoing throughout the construction and operational stages of the project and will be managed through the use of a geotechnical risk register.

Interactions have been assessed and presented in Chapter 7 (Land use, Soils and Geology), Chapter 8 (Hydrology and Hydrogeology) and (Chapter 11 and 12 (Air Quality and Climate respectively).

Interactions of Land, Soils and Geology and Landscape and Visual

Interactions such as the physical impact on the landscape from land disturbance and vegetation clearance, and stockpiling of topsoil have been assessed in Chapter 7 (Land use, Soils and Geology) and Chapter 13 (Landscape and Visual). No further interactions have been identified.

Interactions of Lands, Soils and Geology and Archaeology and Cultural Heritage

There is potential for interaction between Land, Soils and Geology and Archaeology and Cultural Heritage where excavations or material removal occurs, particularly if previously unrecorded subsurface archaeological artefacts or features are present.

Prior to the commencement of construction, a programme of archaeological test trenching will be carried out at the greenfield locations across the proposed wind farm site. Areas of the proposed wind farm site suitable for test trenching are limited to infrastructure associated with T7, T9 and the greenfield section of the TDR in Cherrybrook/Cashelaveela, with the remainder of the site dominated by forestry or bogland.

Chapter 14 (Archaeology and Cultural Heritage) states that, following the implementation of mitigation measures, no significant residual effects are expected on previously unrecorded archaeological, architectural, or cultural heritage resources as a result of the construction of the proposed project. This is because any remains encountered during archaeological monitoring or test trenching will be subject to preservation by record or preservation in situ.

Residual effects will persist in relation to the setting of archaeological, architectural, or cultural heritage sites, as effects on setting cannot be fully mitigated. However, these effects will not be significant or permanent and will be removed following the decommissioning of the turbines.

Therefore, with mitigation in place, the potential effects arising from the interaction between Land, Soils and Geology and Archaeology and Cultural Heritage are considered not significant.

18.2.1.4 Hydrology and Hydrogeology

No significant interactions with other environmental factors were identified in Hydrology and Hydrogeology assessment (Chapter 8 (Hydrology and Hydrogeology)).

Interactions with Hydrology and Hydrogeology that have been identified as having the potential to occur during the construction, operation and/or decommissioning phases of the proposed project have been discussed in the following sections of this chapter:

- Section 18.2.1 Interactions of Population and Human Health
- Section 18.2.2 Interactions of Biodiversity
- Section 18.3 Interactions of Ornithology
- Section 18.2.4 Interactions of Land, Soils and Geology

18.2.1.5 Shadow Flicker

No significant interactions with other environmental factors were identified in the Shadow Flicker assessment (Chapter 10 (Shadow Flicker)).

Interaction of Shadow Flicker and Population and Human Health has been discussed under section 18.2.1 in this Chapter.

18.2.1.6 Material Assets

No significant interactions with other environmental factors were identified in the Chapter 15 (Material Assets) assessment.

Interactions between Material Assets and Air Quality and Climate have the potential to occur during construction. Waste management measures will be implemented to minimise the volume of waste sent to landfill, as landfill disposal is associated with higher embodied carbon emissions compared with alternatives such as reuse and recycling. Where feasible, materials will be reused onsite or removed for recycling.

Waste management for the proposed project is described in Chapter 15 (Material Assets) and in the CEMP (Appendix 2-4) of this EIAR. The effects arising from the interaction between waste and climate are considered not significant.

The potential interaction between Material Assets and Human Health has been addressed in Section 18.2.1 above.

18.2.1.7 Noise and Vibration

The potential interaction between Noise and Vibration and other specialist chapters in the EIAR is primarily limited to Chapter 4 (Population and Human Health), Chapter 5 (Biodiversity), Chapter 6 (Ornithology) and Chapter 16 (Traffic and Transportation). The Noise and Vibration assessment (Chapter 9 (Noise and Vibration)) has accounted for interactions with traffic and transportation. No further interactions have been identified.

Interactions with Noise and Vibration that have the potential to occur during the construction, operation, and decommissioning phases of the proposed project are addressed in the following sections of this chapter:

- **Section 18.2.1** – Interactions with Population and Human Health

- **Section 18.2.2** – Interactions with Biodiversity
- **Section 18.2.3** – Interactions with Ornithology

18.2.1.8 Landscape and Visual

No significant interactions with other environmental factors were identified in the landscape and visual assessment.

Interactions between cultural heritage and archaeology with landscape and visual have been identified and assessed during the construction, operation and decommissioning phases of the proposed project (Chapter 14 (Cultural heritage and Archaeology) and Chapter 13 (Landscape and Visual).

Interactions with Landscape and Visual Impact that have been identified as having the potential to occur during the construction, operation and/or decommissioning phases of the proposed project have been discussed in the following sections of this chapter:

- Section 18.2.1 Interactions of Population and Human Health
- Section 18.2.4 Interactions of Land, Soils and Geology

18.2.1.9 Air Quality and Climate

No significant interactions with other environmental factors were identified in Air Quality and Climate assessments (Chapter 11 and 12 (Air Quality and Climate respectively).

Interactions with Air Quality and Climate mainly relate to an increase in emissions, particularly dust emissions through works on site or traffic. The following interactions with Air Quality and Climate have the potential to occur during the construction, operation and decommissioning phases of the proposed project and have been discussed in the following sections of this chapter:

- Section 18.2.1 - Interactions of Population and Human Health
- Section 18.2.2 - Interactions of Biodiversity
- Section 18.2.3 - Interactions of Ornithology
- Section 18.2.4- Interactions of Land, Soils and Geology
- Section 18.2.7 – Material Assets
- Section 18.2.12 - Interactions of Traffic

18.2.1.10 Archaeology and Cultural Heritage

No significant interactions with other environmental factors were identified in Archaeology, and Cultural Heritage assessment.

Potential interactions with Archaeology and Cultural Heritage with Land, Soils and Geology mainly relate to the possibility of finding of unrecorded archaeology during the construction phase when disturbing the soils for ground works.

This interaction is discussed above in Section 18.2.4- Interactions of Land, Soils and Geology. Interactions with and Landscape and Visual are discussed in Section 18.2.9.

18.2.1.11 Traffic and Transportation

No significant interactions with other environmental factors were identified in Traffic and Transportation assessment (Chapter 16 (Traffic and Transportation)).

Interactions with Traffic and Transportation mainly relate to an increase in traffic for the proposed project. The following interactions with Traffic and Transportation have the potential

to occur during the construction, operation and decommissioning phases of the proposed project and have been discussed in the following sections of this chapter:

- Section 18.2.1 - Interactions of Population and Human Health (also addressed interactions with noise and dust)
- Section 18.2.2 - Interactions of Biodiversity
- Section 18.2.3 - Interactions of Ornithology
- Section 18.2.10 - Interactions of Climate and Traffic and Transportation

During the construction , operational and decommissioning phases, there is the potential for interactions between climate and traffic. Vehicles accessing the site will result in emissions of CO_2, a greenhouse gas. The effects of the proposed project on climate are assessed by reviewing the change in annual average daily traffic on roads close to the site.

18.3 Positive Interactions of Elements

The proposed project has potential to give rise to positive effects on the receiving environment. In addition to the interactions between environmental factors identified above, the following beneficial interactions are anticipated:

- The introduction of wind energy generation as a land use within the site will facilitate the provision of renewable electricity to the national grid, thereby reducing reliance on fossil fuels and contributing to a reduction in emissions associated with climate change. This represents a positive interaction between Material Assets (i.e. energy infrastructure), Air Quality, Climate, Population and Human Health, and Biodiversity.
- Employment generated by the proposed development, together with the use of local services and facilities by project personnel during all phases, will result in a positive interaction between Material Assets (i.e. electrical infrastructure) and Population and Human Health, particularly in terms of the local economy, employment and socio-economic effects.
- The establishment of a Community Benefit Fund will result in a positive interaction between Material Assets (i.e. energy infrastructure) and Population and Human Health, with regard to socio-economic conditions, residential amenity and tourism. The Fund will be positive for those residing in the local area and enhance the local economy. Further detail is provided in Chapter 5 (Population and Human Health) and
- The development of wind energy infrastructure, in conjunction with associated community benefit initiatives, has the potential to contribute positively to the perception of the area as an environmentally sustainable location. The proposed development will support local projects through the Community Benefit Fund, which may have associated positive effects on the local community and those living in closest proximity. Consideration of public and visitor attitudes, amenity and community benefit is provided in Chapter 4 (Population and Human Health).

18.4 Major Accidents and Natural Disasters

No further interactions have been identified outside of those assessed in Chapter 17 (Major Accidents and Natural Disasters).

18.5 Conclusion

Interactions between environmental factors will occur to a certain extent. The principal interactions are likely to arise between population and human health; land, soils and geology;

hydrology and hydrogeology; landscape and visual; noise; air quality and climate; traffic and transportation; and biodiversity. All of which have been assessed in the relevant chapters of the EIAR.

Assessment of potential interactions during the construction, operational and decommissioning phases indicates that significant cumulative or synergistic effects are not anticipated. No additional interactions, beyond those identified and assessed in this chapter, are predicted to give rise to further effects.

The proposed development is expected to result in positive effects at international, national, regional and local levels, particularly in contributing to the achievement of renewable energy targets and enhancing domestic energy security. Positive effects are also anticipated through the implementation of a Community Benefit Fund to support local initiatives.

Overall, the assessment concludes that interactions between environmental factors are not predicted to result in significant adverse effects.