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17.0 INTERACTION OF THE FOREGOING

17.1 INTRODUCTION

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

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

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

Table 17-1: Interaction between Environmental Aspects (positive and negative)

Interaction Matrix	Biodiversity	Ornithology	Land, Soils & Geology	Hydrology & Hydrogeology	Landscape & Visual	Shadow Flicker	Material Assets	Air Quality & Climate	Noise & Vibration	Traffic & Transport	Cultural Heritage	Population & Human Health
Biodiversity	■		✓	✓				✓	✓	✓		
Ornithology		■	✓	✓				✓	✓	✓		
Land, Soils and Geology			■	✓				✓			✓	✓
Hydrology & Hydrogeology				■								✓
Landscape & Visual					■						✓	✓
Shadow Flicker						■						✓
Material Assets							■	✓				✓
Air Quality & Climate								■		✓		✓
Noise & Vibration									■	✓		✓
Traffic & Transport										■		✓
Cultural Heritage											■	
Population & Human Health												■

17.2 DISCUSSION OF INTERACTIONS

In addition to Table 17-1, the following section summarises the primary interrelationships of aspects of the environment with the potential for significant effects as a result of the proposed project. As described in Section 2.10.7 of Chapter 2 (Description of the Proposed Project), there is potential for the proposed project to be a source of hazard or interact with other sources of hazard that could result in a major accident and/or disaster during its construction and operation. All identified potential hazards and source of hazards associated with the proposed project have been considered through the technical assessments of this EIAR (Chapter 5 to 16), and therefore any interactions are covered by the below summary.

17.2.1 Population and Human Health

Population and Human Health will interact with other environmental aspects including landscape and visual impacts, shadow flicker impacts, telecommunications impacts, air quality and climate, noise impacts and traffic impacts, associated with the proposed project.

Interactions of Population and Human Health and Landscape and Visual Impacts

There will be no significant interaction between Population and Human Health and landscape and visual impacts during the construction phase of the development.

The landscape and visual impact of the development during the operational phase may be considered to be one of the potentially significant environmental impacts for this type of development. Based on the visual effect assessment undertaken for this development, it is concluded that the proposed project will result in long term, but not permanent, visual effects that are readily reversible upon decommissioning. Such effects are not considered to be significant. Overall, it is considered that the proposed project is of a notable scale but appropriately sited in a broad-scale landscape context and will not give rise to any significant residual landscape impacts, visual impacts or cumulative impacts. There is a potential for interactions between these landscape and visual impacts and the residential amenity of those living, working or travelling in the area as well as tourism. This is a subjective interaction which may vary from positive to negative depending on each persons' viewpoint.

Decommissioning stage landscape and visual effects will be similar in nature to construction stage effects, albeit in reverse. Such effects will be temporary in duration. As such, there will be no significant interaction between Population and Human Health and landscape and visual impacts during the decommissioning phase of the development.

Interactions of Population and Human Health and Shadow Flicker

There will be no significant interaction between Population and Human Health and shadow flicker during the construction phase of the development.

As described in Chapter 10, the shadow flicker assessment concluded that the >800m design setback from sensitive receptors measure, along with the implementation of screening and turbine shutdown mitigation measures, will ensure that there are no post-mitigation impacts of shadow flicker on the local community during the operational phase of the proposed project. There is potential for interactions between shadow flicker and Population and Human Health (the residential amenity of those living in the area) where it could cause a nuisance in nearby properties. It should be noted however that the applicant has committed to eliminating shadow flicker as described in Chapter 10 of this EIAR (Shadow Flicker).

There will be no significant interaction between Population and Human Health and shadow flicker during the decommissioning phase of the development.

Interactions of Population and Human Health and Material Assets

There will be no significant interaction between Population and Human Health and Material Assets during the construction phase of the development.

During the operational phase, generating electricity from wind energy has the potential to interfere with the quality of radio waves and microwaves used for communication purposes; including TV signals, radio signals, aircraft landing, navigation systems and microwave links. As outlined in Chapter 11, a comprehensive list of operators were contacted in relation to potential electromagnetic interference. Following consultation with the telecommunication service providers, some potential impacts were highlighted. These potential issues were incorporated into the project design, and it was found that the proposed project will not have any impact on the existing communication links in the area. Any interference that might occur with local communications and radio/tv signals would have potential interactions with residential amenity for those affected, in the event that they could not use their phone/radio/tv. The project design has accounted for these potential interferences and the applicant has committed to addressing any issues in the unlikely event that they arise.

There will be no significant interaction between Population and Human Health and Material Assets during the decommissioning phase of the development.

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

During the construction phase of the development, there is potential for short-term interaction between Population and Human Health, air quality, climate, hydrology/hydrogeology and land, soils and geology.

This interaction is primarily associated with the disturbance of ground within the proposed wind farm site which may result in suspended solids in watercourses and dust emissions. Suspended solids, unmitigated, may enter nearby watercourses and be transported off site by construction vehicles. Dust emissions, unmitigated, may impact on air quality. These potential impacts, along with detailed mitigation measures are discussed in detail within Chapters 8 (Land, Soils and Geology), 9 (Hydrology and Hydrogeology) and 14 (Air Quality and Climate) of the EIAR to reduce the potential direct and indirect impact on Population and Human Health from the proposed construction works. With mitigation, these works will have no significant interactions with Population and Human Health (specifically relating to residential amenity and human health).

As the operation of the proposed project will provide renewable electricity to the grid and reduce the reliance on fossil fuels, the interaction between the proposed project and climate is positive. Furthermore, a reduction in the use of fossil fuels will improve air quality, thereby having a positive interaction with human health.

The decommissioning phase of the development will result in generally similar impacts as the construction phase, albeit to a significantly smaller extent as much of the infrastructure will remain in-situ. There will also be a reduction of the electricity being produced from a renewable energy source nationally i.e. the reverse of the positive impact of the operational phase of the development on climate and air quality. This would be anticipated to have a negative interaction with human health.

Interactions of Population and Human Health and Noise Impacts

Wind farms generate noise in the vicinity of the development during both their construction and operational phases. There is no occupied dwelling located within >800m of the nearest proposed turbine. Noise and vibration impacts have been considered in Chapter 13 of the EIAR and it has been found that during both the construction and operational phases of the proposed project, these impacts are predicted to be within the relevant guidance limits for all properties. Likewise, any works required during the decommissioning of the proposed project will not result in a significant noise impact on nearby sensitive receptors. Any potential noise effects will have the potential to negatively interact with residential amenity and human health.

Interactions of Population and Human Health and Traffic Impacts with Noise and Air Quality

Public perception of the construction phase will likely be influenced primarily from the impact of traffic movement. When taken in context with the existing traffic flows in the area, the construction of the proposed project will result in varying (both temporally and in relation to each road) impacts on the surrounding road network as discussed in detail in Chapter 16 (Traffic & Transportation). Any increase will be short-term in nature (expected duration of construction phase is approximately 24 months) and once the wind farm is operational, traffic movements to and from the site (for maintenance and for the recreational amenity) will be slight. Any increase in traffic volumes has the potential to create noise and dust nuisance, thereby having the potential to interact with residential amenity and human health for those living in the area. When mitigation measures are allowed for, this is not anticipated to be significant.

17.2.2 Landscape and Visual Impact

Interactions of Landscape and Visual and Population and Human Health

There will be no significant interaction between Landscape and Visual Impacts and Population and Human Health during the construction phase of the development.

As noted above, the landscape and visual impact of the operational development may be considered to be one of the typical potentially significant environmental impacts for a wind farm development, which would have interactions with residential amenity and tourism. Effects relating to this however may be subjective and vary from one person to the next depending on their opinion.

Taking into account all of the evidence from the photomontages and the zone of theoretical visibility (ZTV) for the proposed project, the addition of 19 no. wind turbines will have varying levels of visibility locally, but in general will not result in a significant level of landscape and visual impact on the wider region. The proposal for the wind farm to provide an amenity area directly and support amenity projects being undertaken in the area as part of the community benefit scheme will have a positive impact on tourism and health in the area. Potential Impacts on Tourism are discussed in Chapter 5 of the EIAR (Population and Human Health), which finds there will be no significant negative impact on tourism as a result of the proposed project.

Interactions of Landscape and Visual and Cultural Heritage with Tourism

There will be no significant interaction between Landscape and Visual Impacts and Cultural Heritage during the construction phase of the development.

Negative landscape and visual impact on Cultural Heritage resources can arise during the operational phase of a wind farm with respect to archaeological features and their setting in the landscape. This would therefore create an interaction between these two topics. There is also a

potential interaction with tourism associated with the setting of archaeological features. There will be no significant negative impacts on any of the main archaeological features and attractions (and tourism) in the region as discussed in Chapter 13 (Landscape and Visual Impacts) and Chapter 15 (Cultural Heritage).

There will be no significant interaction between Landscape and Visual Impacts and Cultural Heritage during the decommissioning phase of the development, as works will be curtailed to the location of the infrastructure proposed for the development which has been designed with consideration for archaeological features in the vicinity of the proposed wind farm site. The removal of the turbines may have an interaction with cultural heritage (and tourism) as the setting of any monuments would be altered.

17.2.3 Biodiversity

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

Exposing soils during the construction phase has the potential, if not properly managed, to cause sedimentation of nearby watercourses. It is envisaged that the excavation of turbine foundations and the construction of internal site access tracks could potentially lead to increased suspended solids in surface water run-off. However, mitigation measures will be put in place to control siltation occurring during the construction phase and ensure protection of the aquatic environment. Excavation and removal of soils for the construction of permanent features such as hardstands and access tracks may potentially lead to habitat loss. However, the total area for the proposed ground works and infrastructure comprises only 2.2% of the wind farm site area and therefore this is not considered to be a significant interaction.

There is also the potential, if not properly managed, for a negative interaction between the site drainage regime and aquatic ecology during the construction phase of the proposed project. Suitable mitigation measures (as discussed in the CEMP and Chapter 18 (Schedule of Mitigation)) will be put in place to control erosion and sedimentation of receiving waters. During the construction and operational phases of the development, the existing on-site drainage scheme and the surface water management plan for the development will ensure that there is no negative interaction between Lands, Soil and Geology, Hydrology and Hydrogeology and Biodiversity by controlling the runoff of water from the site (at greenfield run off rates) and via controlled and carefully designed surface water attenuation ponds.

Mitigation measures will be implemented during the decommissioning phase of the development, similar to the construction and operational phase, to ensure that there is no significant interaction between Lands, Soil and Geology, Hydrology and Hydrogeology and Biodiversity.

Interactions of Biodiversity, Noise and Vibration and Traffic and Transport

There is potential for interaction between biodiversity, noise and vibration and traffic and transport during the construction, operational and decommissioning phases of the development. However, as noted above, noise and vibration impacts during these phases of the proposed project are predicted to be within the relevant guidance limits, and for the construction and decommissioning phases will be short-term in nature.

Detailed baseline surveys of the biodiversity in the area of the proposed project have been undertaken and, as a result of the incorporation of the findings of the surveys into the project design and site layout plan, construction works will be carried out to avoid areas of highest importance for biodiversity on site. Traffic using the site during the construction, operational

and decommissioning phases of the development will be restricted to the use of the designated internal access tracks. Potential direct and indirect effects on Natura 2000 sites have also been considered in the AA Screening Report and NIS that accompany this application and mitigation measures proposed, where appropriate.

Interactions of Biodiversity, Air Quality and Climate

There is potential for interaction between biodiversity, and Air Quality and Climate during the construction and decommissioning phases of the proposed project. There is a potential for localised dust to be a nuisance for biodiversity in any given area. Any such impact would be localised and short-term, with mitigation described in Chapter 14 (Air Quality and Climate) to be used to minimise this. During the operational phase, the proposed wind farm will contribute to reducing greenhouse gas emissions, thereby reducing the potential for climate change. This will have a slight indirect positive impact with respect to biodiversity in this regard.

17.2.4 Ornithology

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

Exposing soils during the construction phase has the potential, if not properly managed, to cause sedimentation of nearby watercourses as described above. This might negatively impact the prey species of birds downstream of the site. However, mitigation measures will be put in place to control siltation occurring during the construction phase and ensure protection of the aquatic environment. Excavation and removal of soils for the construction of permanent features such as hardstands and access tracks may potentially lead to habitat loss and disturbance of birds. However, the total area for the proposed ground works and infrastructure comprises only 2.2% of the wind farm site area, and therefore this is not considered to be a significant interaction.

Mitigation measures will be implemented during the decommissioning phase of the development, similar to the construction and operational phase, to ensure that there is no significant interaction between Lands, Soil and Geology, Hydrology and Hydrogeology and Ornithology.

Interactions of Ornithology, Noise and Vibration and Traffic and Transport

There is potential for interaction between Ornithology, noise and vibration and traffic and transport during the construction phase of the development. However, as noted above, noise and vibration impacts during both the construction and operational phases (and the decommissioning phase) of the proposed project are predicted to be within the relevant guidance limits, and for the construction and decommissioning phases will be short-term in nature. Therefore, the in-combination effects of noise and vibration caused by additional traffic during the construction and decommissioning phases will have a limited effect on ornithology.

Potential direct and indirect effects on Natura 2000 sites have also been considered in the AA Screening Report and NIS that accompany this application and mitigation measures proposed, where appropriate.

Interactions of Ornithology, Air Quality and Climate

There is potential for interaction between Ornithology, and Air Quality and Climate 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. Any such impact would be localised and short-term, with mitigation described in Chapter 14 (Air Quality and Climate) to be used to

minimise this. During the operational phase, the project will contribute to reducing greenhouse gas emissions, thereby reducing the potential for climate change. This will have a slight indirect positive impact with respect to ornithology in this regard.

17.2.5 Traffic and Transport

Interactions of Traffic and Transport and Air Quality and Climate

There will be no significant interaction between Traffic and Transport and Air Quality and Climate during the construction and decommissioning phases of the development, with the exception of exhaust emissions and dust from construction vehicles. This is a short-term, temporary impact and is addressed in the CEMP, Appendix 2-2.

As the potential traffic associated with the operational phase of the proposed project will be very low, there will be no significant interaction between Traffic and Transport and Air Quality and Climate during the operational phase.

Interactions of Traffic and Transport and Noise and Vibration

There will be an interaction between Traffic and Transport and Noise and Vibration during the construction and decommissioning phase of the proposed project, as construction vehicles will result in increased noise and vibration along transport routes as they travel to and from the site. This is addressed in the Chapter 12 (Noise and Vibration).

As the potential traffic associated with the operational phase of the proposed project will be very low, there will be no significant interaction between Traffic and Transport and Noise and Vibration during the operational phase.

17.2.6 Cultural Heritage

Interactions of Cultural Heritage and Lands, Soils and Geology

For the proposed project, the design of the wind farm incorporated the results of historical and project-specific archaeological surveys within the application area. No sites with statutory protection will be directly impacted by the proposed project. The construction works (ground disturbance) associated with the proposed project will be monitored by a suitably qualified archaeologist working under licence. The potential impacts to Cultural Heritage are discussed in detail in Chapter 15 (Cultural Heritage), which finds there will be no significant negative impacts.

17.2.7 Land, Soils and Geology

Interactions of Land, Soils and Geology and Hydrology and Hydrogeology

As spoil and stone are transported and moved around the site during construction, there is a potential for silt runoff to negatively affect water quality. This is discussed in Chapter 9 (Hydrology and Hydrogeology) and mitigation measures are set out therein.

17.2.8 Positive Interaction of Elements

In addition to the interactions noted above, the proposed project has the potential to have positive impacts on the receiving environment and interactions between topics.

The provision of a valuable new land use (consisting of wind energy production which would replace carbon based energy) within the site of the proposed project which currently comprises mostly forestry would result in an interaction between Material Assets, Air and Climate and Human Health. The creation of local jobs during all phases of the proposed project will result in an interaction between Material Assets (i.e. electrical infrastructure) and Population and Human Health (in terms of local socio-economics). The community benefit fund and the amenity facility will have an interaction between Material Assets (i.e. electrical infrastructure) and Population and Human Health (in terms of local socio-economics, residential amenity and tourism).

Furthermore, the development of wind farms is regarded by many to enhance the reputation of a region as an environmentally friendly place to visit (public and tourist attitudes to wind farms are discussed in Chapter 5 (Population and Human Health)). Any possible short-term impact is strongly counterbalanced by the benefits to society of clean, renewable energy.

Where a potential impact as a result of the proposed project has been noted during the environmental impact assessment, relevant and appropriate mitigation measures have been identified and proposed. A detailed chapter highlighting the specific mitigation measures proposed for the wind farm is included in this EIAR (Chapter 18 – Schedule of Mitigation Measures).

17.3 CONCLUSION

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



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