

## 17 INTERACTIONS OF THE FOREGOING AND A SUMMARY OF MITIGATION MEASURES

### 17.1 INTERACTIONS OF THE FOREGOING

#### 17.1.1 Introduction

The foregoing topics in earlier chapters do not exist in isolation from each other and consequently, any impact on one element of the environment may also impact on another. The Irish Environmental Protection Agency have developed a simple matrix to show the key interactions and interrelationships between the environmental aspects of a Development (**Table 17.1**). The interactions between impacts on different factors have been addressed as relevant throughout the EIAR (**Table 17.2**). The cumulative slight impact on a number of topics may result in a significant impact on another topic.

#### 17.1.2 Impact Interactions

Where any potential negative impacts have been identified during the assessment process, these impacts have been avoided by embedded design mitigation or at a minimum, reduced by the proposed mitigation measures.

### 17.2 SUMMARY OF MITIGATION MEASURES

This Chapter summarises mitigation measures proposed elsewhere in the EIAR. Chapters 4 to 16 of the EIAR outline the findings of the assessment of the predicted effects of the Project on a topic by topic basis. The significance of these effects have been assessed using criteria defined in the topic chapters. In the context of The EPA Guidelines (2022), the significance of effects is categorised from imperceptible through to not significant, significant and profound with varying sub-categories.

#### 17.2.1 Embedded Mitigation

Embedded mitigation includes design changes that were made to reduce or eliminate adverse effects, as well as normal good practice measures; these have avoided the majority of potentially significant effects. **Appendix 17.1** summarises mitigation measures for all technical assessment chapters.

The process of applying the embedded mitigation is set out in **Chapter 2: Project Description**. The key design aspects comprising embedded mitigation include:

- Avoiding inconsistent turbine spacing, outliers and excessive turbine overlapping to minimise visual confusion and ensure a balanced/compact array of key views;
- Achieving an appropriate scale of turbine, taking account of the landscape context;

- Upgrading existing forestry tracks to be used as site access roads;
- Respecting and understanding the ground conditions and topography of the Sites; including avoiding effects on active peat where possible;
- Maximising the separation from residential dwellings, and
- Respecting other environmental constraints and associated buffer separations.

### 17.2.2 Specific Mitigation Measures


In addition to mitigation proposed to address significant adverse effects (**Appendix 17.1**), certain chapters have also proposed further measures to reduce effects that were assessed as 'Not Significant' before mitigation.


**Table 17.2** outlines interactions between environmental aspects. Technical assessments have assessed pathways, both direct and indirect that can magnify effects through the interaction or accumulation of effects. Effects have been cross-referenced between chapter topics. An outline of potential interactions between chapters/topics is presented in **Table 17.1**.

**Table 17.1: Summary matrix of Interactions of Impacts during Construction, Operational and Decommissioning Phases (Source: Adapted from EIAR Guidelines, 2022)**

	Population & Human Health		Biodiversity		Ornithology		Soils & Geology		Hydrology and Hydrogeology		Noise		Landscape & Visual		Material Assets		Cultural Heritage		Traffic & Transportation		Major Accidents and Natural Disasters		
	Const & Decom	Oper	Const & Decom	Oper	Const & Decom	Oper	Const & Decom	Oper	Const & Decom	Oper	Const & Decom	Oper	Const & Decom	Oper	Const & Decom	Oper	Const & Decom	Oper	Const & Decom	Oper	Const & Decom	Oper	
Population & Human Health	Black	Black							Light Blue	Light Blue	Light Blue	Light Blue	Light Blue	Light Blue	Light Blue	Light Blue	Light Blue	Light Blue	Light Blue	Light Blue	Light Blue	Light Blue	Light Blue
Biodiversity			Black	Black	Light Blue	Light Blue	Light Blue	Light Blue	Light Blue	Light Blue	Light Blue	Light Blue	Light Blue	Light Blue	Light Blue	Light Blue	Light Blue	Light Blue	Light Blue	Light Blue	Light Blue	Light Blue	Light Blue
Ornithology					Black	Black	Black	Black	Light Blue	Light Blue	Light Blue	Light Blue	Light Blue	Light Blue	Light Blue	Light Blue	Light Blue	Light Blue	Light Blue	Light Blue	Light Blue	Light Blue	Light Blue
Soils & Geology							Black	Black	Light Blue	Light Blue	Light Blue	Light Blue	Light Blue	Light Blue	Light Blue	Light Blue	Light Blue	Light Blue	Light Blue	Light Blue	Light Blue	Light Blue	Light Blue
Hydrology and Hydrogeology									Black	Black	Black	Black	Light Blue	Light Blue	Light Blue	Light Blue	Light Blue	Light Blue	Light Blue	Light Blue	Light Blue	Light Blue	Light Blue
Noise											Black	Black	Black	Black	Light Blue	Light Blue	Light Blue	Light Blue	Light Blue	Light Blue	Light Blue	Light Blue	Light Blue
Landscape & Visual													Black	Black	Black	Black	Light Blue	Light Blue	Light Blue	Light Blue	Light Blue	Light Blue	Light Blue
Material Assets															Black	Black	Black	Black	Light Blue	Light Blue	Light Blue	Light Blue	Light Blue
Archaeology and Cultural Heritage																		Black	Black	Black	Black	Light Blue	Light Blue
Traffic & Transportation																				Black	Black	Black	Black
Major Accidents & Natural Disasters																						Black	Black

Note: Const. = Construction phase; Oper = Operational phase Decom. = Decommissioning

 Interaction or inter-relationship

 No interaction or inter-relationship

**Table 17.2: Interactions & Inter-relationships between Environmental Aspects of the Development**

Interaction	Description
Population and Human Health & Hydrology and Hydrogeology	Impacts could be observed through flood risk polluting waters supply and also recreational fisheries; <b>Chapter 9: Hydrology and Hydrogeology</b> considers these aspects and concludes that there are no impacts.
Population and Human Health & Noise	The noise assessment inherently covers any interaction as the methodology used and limits applied are designed to protect health and amenity.
Population and Human Health & Landscape and Visual	<p>The construction phase of the Project will see a temporary introduction of machinery and the erection of 13 No. turbines, Hydrogen plant and all associated buildings and infrastructure into a natural but already modified landscape. <b>Chapter 12: Landscape and Visual Amenity</b> assessed the landscape effects, the visual effects and the cumulative effects of the Project, including assessment from recreational scenic viewpoints, and was also informed by the findings of the Assessment. The interactions between the environmental aspects were carefully considered in the EIAR, particularly in the design of the turbine layout. Detailed zone of theoretical visibility maps (ZTVs), route screening analysis and photomontages were prepared to assess the level of impact.</p> <p>Based on the findings of the collective assessments it is considered that the Project will not give rise to any significant effects, either singly or in combination. Tourists to Ireland have become accustomed to the vision of turbines on the landscape and given the scenario where more windfarms will be built in Ireland in the future, the most widely held view is that this will not impact their likelihood to visit the area again.</p>
Population and Human Health & Material Assets: 1. Shadow Flicker 2. Air Navigation 3. Telecommunications 4. Socio-economic	<ol style="list-style-type: none"> <li>The shadow flicker assessment identified the potential for shadow flicker to affect between 29 and 32 No. out of 46 No. receptors within the shadow flicker study area.  The assessment identified no significant effects, given that shadow flicker is unlikely to cause a nuisance to nearby inhabited dwellings. It also notes that the function to stop the turbine if required to do so, is available.  The potential effects of the Project from shadow flicker are considered to be <b>Not Significant</b>.</li> <li>Operating windfarms have the potential to cause a variety of adverse effects on aviation. Rotating wind turbine blades may have an impact on certain aviation operations, particularly those involving radar. The physical height of turbines can cause obstruction to aviation and the overall performance of communications, navigation and surveillance equipment. All structures over 150 m in height are required to have lighting to warn aviation traffic.  No significant impacts are predicted in terms of human beings and air navigation. In adherence to IAA Safety Regulations and ICAO Annex 15, aeronautical obstacle warning light schemes will be installed as requested by IAA, co-ordinates of ground and tip height elevations at each wind turbine location.</li> <li>During operation, wind turbines have the potential to interfere with electromagnetic signals passing above the ground due to the nature and size of the windfarm. During the construction and decommissioning phase activity, signals may be passed below ground via existing infrastructure. Impacts may include overground or underground communication cables, microwave links, telecommunication links, business radio and television reception.  Mitigation measures were implemented in the design phase through mitigation by avoidance i.e., the known routes of the telecommunication links were plotted and a buffer was applied to them, outside of which the proposed turbines were located.</li> </ol>

Interaction	Description
	<p>In the operational phase, all electrical components, equipment, apparatus and systems will be required by Irish and European law to comply with the EMC Directive 2014/30/EU. Compliance with this Directive will mean that the electromagnetic emissions from these devices will not cause interference to other equipment. Turbine and substation control electronics will be typical of any circuits used by industry or a conventional generating station.</p> <p>There is no potential for interference with the links from other windfarms in combination with the Project. Based on the remote location of the Project and a distance of 740 metres (4 times the rotor diameter) to the nearest residential dwelling, no significant impacts are predicted on telecommunications or radio reception as a result of the Project.</p> <p>4. The Project will provide opportunities for local suppliers to be engaged in the construction phase. This will be a minor beneficial impact. The developer will seek to secure positive benefits for the local/regional economy by encouraging the use of local labour, manufacture and suppliers where possible. They will hold 'Meet the Developer' days prior to construction to allow local contractors to engage with the process and maximise opportunities.</p>
Population and Human Health & Air and Climate	<p>Impacts on air quality during the construction and decommissioning phase may occur due to dust emissions from construction activities onsite and through increased traffic and associated exhaust emissions from construction traffic. These interactions have been considered as part of the EIAR, without significant effects being predicted and suitable mitigation measures provided to further reduce potential impacts.</p> <p>During the operational phase, the energy and fuel generated by the Project will offset energy and the associated emission of greenhouse gases from electricity-generating stations and fuels dependent on fossil fuels, thereby having a net positive effect on climate. In doing so, there will likely be reduced effects from climate change on human beings. The cumulative effect of the Project with other Irish renewable generation is considered to be a fundamental change in the climate effects of Ireland's energy supply, which is a <b>major, positive effect</b>, that is <b>Significant</b> (beneficial) under the EIA Regulations and will contribute to Ireland's binding emission reduction targets.</p>
Population and Human Health & Cultural Heritage	<p>Damaging a cultural asset could affect tourism; this has been considered in <b>Chapter 14: Cultural Heritage</b> and will not to be an issue.</p>
Population and Human Health & Traffic and Transport	<p>The construction and decommissioning phase will give rise to traffic movements of abnormal loads and is likely to create some short-term inconvenience for road users. A <b>Traffic Management Plan (TMP)</b> will be in place and minimise disruption insofar as possible. Suitable mitigation measures to reduce dust emissions have been outlined in <b>Chapter 15: Traffic and Transportation</b>.</p>
Population and Human Health & Major Accidents and Natural Disasters	<p>The Proposed Development has been assessed as having the potential to result in effects of a slight but not significant, long-term impact overall, in terms of Major Accidents and Natural Disasters. Through the implementation of mitigation measures, the cumulative effects associated with the Proposed Development are predicted to be not significant.</p>
Biodiversity & Ornithology	<p>All interactions for any habitat or species including those associated with Special Protection Areas (SPA) or Special Areas of Conservation (SAC) are considered in the Natura Impact Statement and not considered further here.</p>
Biodiversity & Hydrology and Hydrogeology	<p>Contamination of surface water and groundwater could occur from many elements including discharge, wastewater contamination, hydrocarbon contamination, watercourse crossings construction, entrainment of suspended solids during earth works, increased entrainment of contaminants, and other impacts arising due to localised stability issues, amongst other potential sources. Contamination of water quality could impact both flora and fauna including fisheries, otter, lizards and</p>

Interaction	Description
	amphibians (loss of breeding ponds) amongst others. Lagoon-type sediment traps and plant filtration beds will be installed in watercourses to maintain water quality and prevent potential impacts on protected species located downstream. These interactions have been considered as part of the EIAR, with suitable mitigation measures provided to minimise potential impacts.
Biodiversity & Soils and Geology	Potential impacts on biodiversity during the construction and decommissioning phase could include disturbance to birds and mammals from loss / changes in habitat. The Project has been designed to avoid impacts on Annex I peatland, wet heath, dry heath, and siliceous rock habitat as much as practicably possible. Restoration will be undertaken in line with the Biodiversity Enhancement and Management <b>Plan (Appendix 5.4)</b> .
Biodiversity & Major Accidents & Natural Disasters	Potential impacts on biodiversity during the construction and decommissioning phase could include disturbance to birds and mammals from loss / changes in habitat.  The Project has been designed in accordance with the best practice measures described in detail in this EIAR and, as such, mitigation against the risk of major accidents and/or disasters is embedded through the design.
Ornithology & Noise	The ornithology assessment considers general disturbance to sensitive bird species, including that caused by the sources likely to occur during the construction and decommissioning of the Project. The potential effects on birds from noise will temporary in nature and will not be significant.
Ornithology & Major Accidents and Natural Disasters	Potential impacts on biodiversity during the construction and decommissioning phase could include disturbance to birds from loss/changes in habitat.  The Project has been designed in accordance with the best practice measures described in detail in this EIAR and, as such, mitigation against the risk of major accidents and/or disasters is embedded through the design to ensure no such impacts will occur.
Soils and Geology & Hydrology and Hydrogeology and Landscape and Visual	The hydrogeological balance of the Sites could be impacted by the amount of earth materials excavated. Adopting good practices, planning ahead and real time monitoring in more sensitive (>1 m peat depth) areas will ensure that any excavations associated with the Project will have minimal impact.  These interactions have been considered as part of the EIAR, with suitable mitigation measures provided to minimise potential impacts. Application of the mitigation measures will reduce the risk of stability issues and impacts on hydrology and hydrogeology arising at a localised scale.
Soils and Geology & Landscape and Visual & Major Accidents and Natural Disasters	The unavoidable residual impacts on the soils and geology environment as a function of the Project is that there will be a change in ground conditions at the Site with the replacement of natural materials such as peat, subsoil and bedrock by concrete, subgrade and surfacing materials.  Stability issues and slope failure arising from vehicular movement could cause significant local or at worst-case scenario landslide issues. Where suitable mitigation measures are applied and proper precautions and planning are executed effectively, the risk of such potential impacts will be significantly reduced and considered avoidable.
Soils and Geology, Landscape and Visual & Archaeology and Cultural Heritage	An assessment has been made of the potential for significant effects of the Proposed Development on the cultural heritage resource. Following the application of effective mitigation measures based on best practice guidelines, including archaeological inputs during the Project design process combined with onsite archaeological testing investigations and monitoring of the construction phase, and built heritage recording of the undesignated vernacular heritage resource, the Proposed Development is not predicted to result in any likely direct significant effects on the cultural heritage resource.

Interaction	Description
	There is a likely negative long-term operational indirect significant impact on the monument setting of one recorded archaeological site located within the Wind Farm Site, and overall moderate indirect cumulative effect on its setting. Although there are no mitigation measures to ameliorate same, it is noted that the indirect impact on setting shall be reversed during decommissioning stage.
Soil and Geology & Major Accidents and Natural Disasters	Major accident could result in soil contamination. The Project has been designed in accordance with the best practice measures described in detail in this EIAR and, as such, mitigation against the risk of major accidents and/or disasters is embedded through the design.
Hydrology & Biodiversity	There is a potential for Fisheries to be impacted by a disturbance or contamination of watercourses during the construction period if the stated mitigation measures are not adhered to. However, the mitigation measures to protect watercourses outlined in Aquatic Ecology, Soils and Geology and Hydrology and Hydrogeology chapters will be strictly adhered to which includes monitoring of Site water run-off during all phases of the Project.
Hydrology & Hydrogeology and Major Accidents & Natural Disasters	<p>Water contamination due to explosion/fire water run off has been identified as a potential effect on hydrology and hydrogeology as a result of a major accident/natural disaster on the Proposed Development. The implementation of measures mentioned in this EIAR will mitigate the identified potential effects.</p> <p>The Project will use the latest best practice guidance to ensure that flood risk within or downstream of the Site is not increased as a function of the Project, i.e., a neutral impact at a minimum.</p> <p>The risk of the Project contributing to downstream flooding is very low, as the long-term plan for the site is to retain and slow down drainage water prior to release. Robust drainage measures on the site will include swales, silt traps, check dams, settlement ponds and buffered outfalls. This has been addressed in <b>Chapter 9: Hydrology and Hydrogeology</b>.</p>
Noise & Traffic and Transportation	Traffic and Transportation will create noise onsite and along the site access roads. Site contractors will be required to employ the best practicable means of reducing noise emissions from plant, machinery and activities, as advocated in BS 5228. Such potential effects are considered to be not significant.
Noise & Major Accidents and Natural Disasters	<p>Alarms (e.g., for security, fire) will be sounded in cases of emergency. The maintenance of these alarms is essential and any faulty alarm causing nuisance alerts will be replaced accordingly.</p> <p>Incidents such as explosions in the substation buildings will have a noise impact. However, proper maintenance and operation will make this risk unlikely.</p>
Landscape and Visual & Material Assets	The Irish Aviation Authority (IAA) has outlined criteria regarding tall structures and the installation of an aeronautical obstacle warning light scheme for the Project. This has been addressed in <b>Chapter 13: Material Assets and Other Issues</b> .
Material Assets & Major Accidents and Natural Disasters	<p>The Seveso III Directive, the main EU legislation dealing specifically with the control of onshore major accident hazards, along with the Chemical Act (Control of Major Accident Hazards involving Dangerous Substances) Regulations 2015 which implements the SEVESO directive, governs the inventory of substances stored at the Hydrogen Plant Site. The facility will be designed, constructed and operated in line with the requirements set out by COMAH Regulations, including 24/7 monitoring. The maximum onsite storage of hydrogen (approximately 26 tonnes) classifies the facility as a 'Lower-tier' COMAH site.</p> <p>During both the construction and operational phases of the Proposed Development, activities will take place at the Wind Farm Site, Hydrogen Plant Site, along the Grid Connection Route, Interconnector Route, Killybegs Turbine Delivery Route and Galway</p>



Interaction	Description
	<p>Turbine Delivery Route that will have the potential to cause accidents and/or disasters and that could be vulnerable to potential disaster/accident.</p> <p>The implementation of mitigation through design, avoidance principles, choice of best alternatives for location of works, pollution control measures, surface water drainage measures and other preventative measures incorporated into the project design in order to minimise potential significant adverse effects on major accidents and disasters at the Wind Farm Site, Hydrogen Plant Site and along the Interconnector Route, Grid Connection Route Killybegs Turbine Delivery Route and Galway Turbine Delivery Route.</p> <p>Layout design amendments along with application of the specified mitigation during each phase of the Project have reduced the potential significance to all receptors related to the Development to not significant in terms of risk likelihood and consequence aside from risk 'N; Transport' during the operational phase, specifically in relation to transporting hydrogen on the public road network. Which falls into the amber zone on the risk assessment matrix, this represents 'medium risk scenarios'.</p> <p>The TLUP QRA concluded the Hydrogen Plant location is acceptable. The Preliminary Hazard Analysis reports includes safety requirements as mitigation for each hazard identified. This mitigation, along with implementation of the Major Accident Prevention Policy (MAPP), means that the environmental impacts arising from the vulnerability of the Hydrogen Plant to Major Accidents and Natural Disasters have been assessed as an imperceptible, long-term effect.</p> <p>Any technical fault at the Project would not impact the local or national energy supply.</p> <p>The extremely low frequency (ELF) electric and magnetic fields (EMF) associated with the operation of the proposed cables fully comply with the international guidelines for ELF-EMF set by the International Commission on Non-Ionizing Radiation Protection (ICNIRP), a formal advisory agency to the World Health Organisation, as well as the EU guidelines for human exposure to EMF. Accordingly, there will be no operational impact on properties (residential or other uses), construction staff, operational &amp; maintenance staff or recreational users of the site as the ICNIRP guidelines will not be exceeded at any distances even directly above the cables.</p>
<p>Traffic and Transport &amp; Biodiversity: Fisheries</p>	<p>During the construction phase, increased traffic could lead to increased sedimentation/pollution of watercourses as moving vehicles disrupt soil and emit pollutants. The interactions between these aspects were considered in the EIAR and mitigation has been embedded in the design of the Project. This assessment has identified no potentially significant residual effects on Fisheries from Traffic &amp; Transportation from the Project.</p>
<p>Traffic and Transport &amp; Major Accidents &amp; Natural Disasters</p>	<p>The Project will utilise the existing road network during the construction phase. Construction related traffic will originate from the delivery of materials to site, removal of surplus excavated material from site and transport of employees to, from and throughout the Site. The localised traffic disruptions will be mitigated through the use of industry standard traffic management measures. Please see <b>Chapter 15: Traffic and Transport</b> and <b>Appendix 2.1</b> for details.</p>