32. INTERACTIONS

32.1 Introduction

The preceding Chapters 6 to 31 of this EIAR identify the potential significant environmental effects that may occur in terms of Population and Human Health, Marine Physical Processes, Water and Sediment Quality, Benthic Ecology, Fish and Shellfish Ecology, Marine Ornithology, Marine Mammals and Other Megafauna, Commercial Fisheries, Shipping and Navigation, Civil and Military Aviation, Seascape, Landscape and Visual, Marine Archaeology, Other Sea Users, Offshore Air Quality and Airborne Noise, Biodiversity (Flora and Fauna), Terrestrial Ornithology (Birds), Land, Soils and Geology, Water (Hydrology and Hydrogeology), Air Quality, Climate, Onshore Noise and Vibration, Landscape and Visual, Cultural Heritage (Archaeological, Architectural and Cultural Heritage), Material Assets (Telecommunications, Utilities and Waste Management), Traffic and Transportation, and Vulnerability to/from Major Accidents and Natural Disasters as a result of the Project, as described in Chapter 5 of this EIAR.

All of the potential significant effects of the 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 maintenance and decommissioning of the Project are detailed in the accompanying Chapters 20: Schedule of Mitigation (Offshore) and Chapter 33: Schedule of Mitigation (Onshore),the Construction and Environmental Management Plan (CEMP) and the Operational Environmental Management Plan (OEMP). 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 32-1 and 32-2 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 operation and maintenance (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 33.2 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.

The potential for interaction of effects has been assessed, throughout this EIAR, as part of the Impact Assessment process. While the work on all parts of the Environmental Impact Assessment Report (EIAR) were not carried out by MKO, the entire project and all the work of the sub-consultants was managed and coordinated by the company. The EIAR was edited and collated by MKO as an integrated report of findings from the impact assessment process, by all relevant experts, and effects that potentially interact have been assessed in detail in the individual chapters of the EIAR and summarised in Section 32.2, 32.3 and 32.4 below.

Where any potential negative effects have been identified during the assessment process, these impacts have been avoided or reduced by design and by the proposed mitigations measures, as presented throughout the EIAR.

32.1.1 Statement of Authority

This section of the EIAR has been prepared by Ciarán Fitzgerald and reviewed by Órla Murphy and Sean Creedon, all of MKO. Ciarán Fitzgerald is a Graduate Environmental Scientist who has been working with MKO since June 2024. Ciarán holds a B.Sc. (Honours) in Marine Science from the National University of Ireland Galway and a First-Class Honours PG. Dip in Geographic Information Systems from University College Cork. Ciarán works as part of the Environmental Renewables team as well as a larger multidisciplinary team. Ciarán's role involves undertaking tasks such as report writing, EIAR chapter writing, and QGIS mapping. Prior to joining MKO Ciarán spent time aboard the Research Vessel "Celtic Explorer" working as part of a team undertaking chemical water data, Pelagic species abundance and sorting, bathymetric GIS mapping, data collection and report writing. Ciarán's key strengths lie in GIS mapping and communication. Since joining the company Ciarán has been involved in in a range of Wind Farm Projects, reviewing and completing EIAR chapters such as the Interactions Chapter and assisting with project development. Ciarán holds a Graduate membership of the Chartered Institute of Ecology and Environmental Management.

Órla Murphy is a Senior Environmental Scientist with MKO with over 8 years of experience in private consultancy. Órla holds BSc (Hons) in Geography from Queens University Belfast & a MSc in Environmental Protection and Management from the University of Edinburgh. Prior to taking up her position with MKO in January 2018, Órla worked as an Environmental Project Assistant with ITPEnergised in Scotland. Órla's key strengths and areas of expertise are in Environmental Protection and Management, EIA, Project Management, Renewable Energy and Peatland Management, where she has carried out research projects and site work relating to restoration and management of peatland sites in both Scotland and Northern Ireland. On joining MKO Órla has been involved on a range of renewable energy infrastructure projects. In her role as a project manager, Órla 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. Within MKO, Órla plays a 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.

Sean is an Associate Director in the Environment Team at MKO. He oversees a team of highly skilled environmental professionals working on EIAR for large-and medium scale Renewable Energy infrastructure. Sean has directed and overseen multiple renewable energy projects across wind, solar, battery and hydrogen as well as a range of thermal and other energy related developments. He has worked on the planning and environmental impact elements within all stages of wind farm project delivery. He is a member of the MKO senior management team responsible for developing the business, mentoring team members, fostering a positive culture and promoting continuous employee professional development. Sean has over 22 years' experience in program and project development, holds an MSc from NUI Galway and a Diploma in Project Management from Institute of Project Management Ireland.

Table 32-1 Offshore Site Interactions

	Phase	Population and Human Health	Marine Physical and Coastal Processes	Water and Sediment Quality	Benthic Ecology	Fish and Shellfish Ecology	Marine Ornithology	Marine Mammals and Other Megafauna	Commercial Fisheries	Shipping and Navigation	Civil and Military Aviation	SLVIA	Marine Archaeology	Other Sea Users	Offshore Air Quality and Airborne Noise	Climate	Traffic and Transportation	Vulnerability to Major Accidnets and Natural Disasters
Population and Human Health	C																	
	O																	
Marine Physical and Coastal Processes	C																	
	O																	
Water and Sediment Quality	C																	
	O																	
Benthic Ecology	C																	
	O																	
Fish and Shellfish Ecology	C																	
	O																	
Marine Ornithology	C																	
	O																	
Marine Mammals and Other Megafauna	C																	
	O																	
Commercial Fisheries	C																	
	O																	
Shipping and Navigation	C																	
	O																	
Civil and Military Aviation	C																	
	O																	
SLVIA	C																	
	O																	
Marine Archaeology	C																	
	O																	
Other Sea Users	C																	
	O																	
Offshore Air Quality and Airborne Noise	C																	
	O																	
Climate	C																	
	O																	
Traffic and Transportation	C																	
	O																	
Vulnerability to Major Accidnets and Natural Disasters	C																	
	O																	

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

Table 32-2 Onshore Site Interactions

	Phase	Population and Human Health	Terrestrial Biodiversity	Terrestrial Ornithology	Land, Soils and Geology	Hydrology & Hydrogeology	Archaeology and Cultural Heritage	Air Quality	Climate	Noise and Vibration	Landscape and Visual	Material Assets	Traffic and Transportation	Vulnerability to Major Accidnets and Natural Disasters
Population and Human Health	C													
	O													
Terrestrial Biodiversity	C													
	O													
Terrestrial Ornithology	C													
	O													
Land, Soils and Geology	C													
	O													
Hydrology & Hydrogeology	C													
	O													
Archaeology and Cultural Heritage	C													
	O													
Air Quality	C													
	O													
Climate	C													
	O													
Noise and Vibration	C													
	O													
Landscape and Visual	C													
	O													
Material Assets	C													
	O													
Traffic and Transportation	C													
	O													
Vulnerability to Major Accidnets and Natural Disasters	C													
	O													

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

32.2 Impact Interactions - Offshore

32.2.1 Population and Human Health

32.2.1.1.1 *Offshore*

Population and Human Health and SLVIA

The erection of the turbines, in particular, will change the existing seascape in nearby areas. Whether the long-term change in seascape 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 and is often related to the benefits arising from a project. Chapter 16 details the sensitivity of both seascape / landscape receptors and visual receptors the from the Connemara, Aran Islands and North Clare coastal areas due to the diverse and dramatic scenery layered with heritage, tourism and recreational value. Many of the roads and amenity areas are designated as scenic routes and scenic views in the Galway and Clare County Development. In terms of the magnitude of impacts, the Offshore Array Area (OAA) will be a prominent feature of coastal views and the seascape setting, reducing with distance,

Population and Human Health and Offshore Air Quality and Airborne Noise

During construction, there will be an increase in vessel movements and the presence of Project-specific machinery which has the potential to generate noise and vibration. The increase in airborne noise could affect human receptors, both onshore and other sea users. Installation of the (Offshore Electrical Substation) OSS and (Wind Turbine Generator) WTGs may also generate airborne noise through the presence of vessels and Project specific machinery on the vessels.

The vessel emissions during the offshore construction period will have the potential to increase local concentrations of SO_2, NO_x, PM10 and PM2.5. During the construction phase, there will be a small and temporary increase in localised vessel traffic associated with the Project. There are potential impacts which may occur to human health as a result of a decrease in air quality associated with the Offshore Site construction activities.

32.2.1.1.2 *Onshore*

Population and Human Health and Air Quality

Dust and exhaust emissions associated with vehicles and plant will arise as a result of the construction, operation and maintenance and decommissioning activities associated with the Onshore Grid Connection (OGC) and associated infrastructure. The construction and operational and maintenance phase of the Onshore Site will generate additional traffic and negligible additional traffic to the to the area in the form of light goods vehicles (LGVs) and occasionally Heavy Goods Vehicles (HGV's). Although a negative effect on air quality is expected during the operation and maintenance phase due to exhaust and dust emissions from maintenance vehicles, there will be no net carbon dioxide (CO_2) emissions from operation of the Onshore Site.

Population and Human Health and Climate

The construction of the Project will have an effect on climate and will be restricted to the duration of the construction phase. The construction of the Project will allow for increased vessel movements and is likely to generate exhaust emissions. When in operation, the Project will reduce the input of carbon intensive energy into the national grid and reduce the amount of greenhouse gas (GHG) emissions

being released to the atmosphere that are associated with electricity generation and use. Harnessing more energy by means of renewable sources will reduce dependency on fossil fuels, thereby resulting in a reduction in harmful emissions that can be damaging to human health and the environment. The Project will displace carbon dioxide from fossil fuel-based electricity generation, over the proposed 38-year operational life, displacing approximately 17.56 million tonnes of CO_2e emissions per annum from traditional carbon-based electricity generation.

Population and Human Health and Land Soils and Geology

The use of plant machinery on site during excavation works and the movement of spoil may result in the potential for soil and ground contamination. Infrastructure associated with the Onshore Site such as the OGC is not a recognised source of pollution and so the potential for effects during the operation and maintenance phase are imperceptible. With the implementation of mitigation and monitoring measures detailed in Chapter 8 and the CEMP (Appendix 5-16), the potential for residual effects associated with soil or ground contamination during the construction and operation and maintenance phases and subsequent health effects are imperceptible.

Accidental spillage during refuelling of construction plant with petroleum hydrocarbons is a potentially significant pollution risk to land, soils and associated ecosystems. The accumulation of small spills of fuels and lubricants during routine plant use can also be a pollution risk. Hydrocarbon has a high toxicity to humans, and all flora and fauna, and is persistent in the environment. Proven and effective measures to mitigate the risk of spills and leaks have been proposed in Chapter 23 - Land Soils and Geology and will break the pathway between the potential source and the receptor.

Population and Human Health and Water

Potential health effects arise mainly through the potential for surface and groundwater contamination which may have negative effects on public and private water supplies. The Onshore Site is drained by several 1st and 2nd order streams and lies within 2 no. surface water catchments. However, as outlined in Chapter 23, no negative effects on this watercourse are anticipated following mitigation measures suggested. The OGC is predominantly located in the Mal Bay surface catchment and the Shannon Estuary North surface water catchment. Within these catchment areas there are a total of 11EPA mapped watercourses . There are no public water schemes or group water schemes mapped within the Onshore Site. Mitigation measures will ensure that surface runoff from the developed areas of the Onshore Site will be of a high quality and will therefore not impact on the quality of downstream surface water bodies, no impact on group water schemes, wells and therefore, no subsequent health effects.

Population and Human Health and Onshore Noise and Vibration

As identified in Chapter 26 of this EIAR, the construction phase will generate an increase in noise levels, caused by construction plant and vehicle noise emissions, in the vicinity of the Onshore Site which has the potential to cause an impact to sensitive receptors in the area.

Population and Human Health and Landscape and Visual

The construction and operation and maintenance phases of the Onshore Site will see the modification to road corridors. Road corridors are not considered to be a sensitive landscape receptor as they are a highly modified transport routes that can be readily reinstated. As visual receptors, road users are susceptible to the changes in the landscape they pass through and views from the road, particularly in scenic areas. However, they are not as susceptible to temporary visual change within the road corridor itself. Local residents who view the road corridor from their dwellings are also susceptible to visual change, but generally beyond or away from the road corridor and not when the visual change relates to brief periods of road works. For these reasons, for the vast majority of the OGC route being laid under

existing road surfaces the sensitivity of the receiving landscape as well as visual receptors is deemed to be Low during the construction phase. For those infrequent sections of the cable route through open countryside, the rural landscape and those that enjoy views across it are more susceptible to construction stage impacts. Locations such as the Onshore Grid Connection Route, the Kilrush Golf course, the Onshore Compensation Compound (OCC) are assessed within Chapter 27 Landscape and Visual Impact Assessed

Population and Human Health and Traffic

The Onshore Site 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 as well as dust and exhaust emissions. A Traffic Management Plan (Appendix 29-2) will be in place to minimise all disruption, as described in Chapter 29 Traffic and Transport and the CEMP (see Appendix 5-16).

Population and Human Health and Major Accidents and Natural Disasters

A risk register has been developed which contains all potentially relevant risks identified during the construction phase of the Onshore Site. Seven risks (Critical Infrastructure Emergencies, Severe Weather, Flooding, Utility Emergencies, Traffic Incident, Contamination, and Fire/Gas Explosion) specific to the construction phase have been identified and are presented in Chapter 31: Major Accidents and Natural Disasters. As outlined in 31.4.1 of this EIAR, the scenario with the highest risk score in terms of the occurrence of major accident and/or disaster during the construction is identified as Severe Weather, and Fire/Gas Explosion. The risk register concludes that there is low potential for natural disaster and/or major accident to occur at the Project site.

32.2.2 Marine Physical and Coastal Processes

Marine Physical and Coastal Processes, and Water and Sediment Quality

Changes to seabed levels, sediment properties and suspended sediment concentrations (SSC) have the potential to arise as a result of disturbance to seabed sediments during construction and decommissioning activities. Seabed preparatory works may involve clearance which inherently change the seabed. In addition, while this constitutes direct change to seabed levels, disturbance during construction also causes suspension of sediment in the water column, dispersion over a wider area and subsequently deposition. The resettlement and deposition of disturbed sediment also changes seabed levels.

Marine Physical and Coastal Processes and Benthic Ecology

Seabed preparation activities have the potential to result in deposits of sediment on the seabed. As described in Chapter 7 Marine Physical and Coastal Processes, the OAA is comprised largely of coarse sediments and therefore the majority of disturbed material will not enter suspension but will be deposited directly onto the seabed. Selected modelled scenarios have been taken forward with regard to impacts on benthic habitats, which are further detailed in Chapter 9 Benthic Ecology. Within the Offshore Site, habitats resembling Annex I stony and bedrock reef is present. Habitat loss / disturbance will be temporary to short-term in nature, as seabed preparation and foundation installation will coincide over four months and cable installation will occur for up to 13 months. The effect will cease following the completion of seabed preparation and installation activities, with an expected high recoverability following disturbance.

Sediment disturbance during seabed preparation and installation activities will result in increased SSC. Benthic ecology receptors may be directly or indirectly effected by the increased SSCs and the associated deposition, such as indirect temporary disturbance or as a result of smothering.

Marine Physical and Coastal Processes, and Fish and Shellfish Ecology, Marine Ornithology and Marine Mammals and Other Megafauna

Temporary habitat loss / disturbance will have a likely, temporary adverse effect on stony and bedrock reef. Temporary habitat loss / disturbance will result from seabed preparation activities (e.g. boulder clearance and PLGR) and deployment of jack up spud cans. It is anticipated that the temporary disturbance may result in some direct losses to epifaunal reef communities. Such losses could temporarily affect higher trophic levels including those assessed in Fish and Shellfish Ecology, Marine Ornithology and Marine Mammals and Other Megafauna, at a local level by reducing the availability of prey species in these areas until recovery and recolonisation occurs. There will be further temporary disturbance to these habitats during cable installation; however, this habitat is considered to have a high recoverability and re-colonisation of these epifaunal communities on rocky substrata can be expected following temporary disturbance.

Marine Physical and Coastal Processes and Marine Archaeology

Removal of sediment during seabed preparations (including sand wave clearance) can lead to direct or indirect impact on marine archaeology receptors by impacting and exposing such material to natural, chemical, or biological processes. Seabed disturbance during construction has the potential to cause suspension of sediment in the water column, dispersion over a wider area and subsequent deposition If any marine archaeology receptors are subject to increased sedimentation covering and protecting the receptor as a result of the construction phase, the marine heritage receptor might benefit from the conditions which could provide a higher level of preservation *in situ*.

Disturbance of sediment containing potential marine archaeology receptors (material and contexts) during the laying of inter-array cables (IAC) and export cable laying operations can lead to direct or indirect impact on marine archaeology receptors by impacting and exposing such material to natural, chemical, or biological processes. As above, seabed disturbance during construction has the potential to cause suspension of sediment in the water column, dispersion over a wider area and subsequently deposition Where avoidance is not possible or in case of not yet located Historic Environment further mitigation and archaeological works are detailed in Appendix 5-11 - Archaeological Management Plan.

During the operation and maintenance phase, scour effects, the removal of sediment around a foundation due to tidal movement, caused by the presence of WTG and substation foundations, can lead to direct or indirect impact on marine archaeology receptors by impacting and exposing such material to natural, chemical, or biological processes. Where avoidance is not possible or in case of not yet located Historic Environment, further mitigation and archaeological works are detailed in Appendix 5-11 - Archaeological Management Plan and in Appendix 17-1 -Sceirde Rocks Offshore Wind Farm Marine Geophysical Survey Archaeological Interpretation 2022 (ADCO, 2023).

32.2.3 Water and Sediment Quality

Water and Sediment Quality, and Benthic Ecology, Fish and Shellfish Ecology Marine Mammals and Other Megafauna

Should Suspended Sediment Concentrations (SSC) occur at high intensities and occur frequently or be persistent for extended periods throughout construction and decommissioning, the increase in SSC may under certain conditions have adverse effects on water quality and dissolved oxygen (DO) properties by reducing light penetration into the water column and by physical disturbance to the water column properties, which can then in-directly affect marine ecological species and habitats which are sensitive to changes in water quality. During the Construction phase impacts relating to short-term and localised increases in SSC associated with seabed disturbance have the potential to directly affect marine ecological species and habitats. The construction activities likely to result in seabed disturbance leading to increases in SSC, include site preparation activities, cable installation through trenching, and Offshore Export Cable (OEC) landfall activities.

During the operation and maintenance phase minor maintenance or repairs may be required if unplanned events occur. Additionally, large scale maintenance and repairs are not planned but are likely, over the lifetime of the project. The potential aspects from these activities which may have an effect on SSCs include works on the seabed such as planned/unplanned cable and GBS maintenance. Nonetheless, it is anticipated that the scale of impacts would be reduced as it is likely maintenance will be targeted to specific locations of the cable unless major repairs or maintenance works are required. Should SSC occur at high intensities and occur frequently or be persistent for extended periods throughout operation and maintenance phase e.g., during major repairs, the increase in SSC may under certain conditions have adverse effects on water quality and DO properties by reducing light penetration into the water column and by physical disturbance to the water column properties. This may in-directly impact marine ecological species and habitats which are sensitive to changes in water quality. The accidental release of pollutants within the operational period is limited to routine and accidental release of pollutants from operation and maintenance vessels. In addition to vessel impacts there is also potential for the accidental release of pollutants which are contained within the WTGs and OSS. These contaminants are oils and greases, unmitigated effects from these contaminants could result in direct adverse, non-reversable and long-lasting effects to the water column and/or seabed sediments. Further in-direct effect could arise impacting marine habitats and species which are sensitive to pollution effects.

During the Decommissioning phase, the approach taken will be to preserve the exiting environment through reducing direct impacts to the receiving environment. For example, by leaving seabed preparation and cable protection in situ, any marine habitats and associated species which have colonised these structures throughout the operational life of the Project will remain in place. Accidental releases of pollutants may occur as a result of an accidental spill (i.e. such as during a vessel collision), where spillage of fuel (i.e. diesel), chemicals or other contaminants may occur which could have a detrimental effect on marine life. This includes avoidance of affected areas, and the potential for sub-lethal or lethal effects depending on the length of exposure and the concentration of the pollutants.

Water and Sediment Quality, and Marine Ornithology

Disturbance or displacement to prey species may lead to indirect effects on foraging seabirds during the construction and decommissioning phases. Such indirect effects may be caused by the generation of suspended sediments (e.g. during cable-laying) or underwater noise associated with certain construction activities. An increase in suspended sediment concentration (SSC) may cause fish and mobile invertebrates to temporarily leave the construction area or may smother and hide immobile benthic prey. Suspended sediments also reduce visibility, making it harder for foraging seabirds to see their prey. These activities may lead to a reduction in prey being available within the construction area for foraging seabirds. The Benthic Ecology and the Fish and Shellfish Ecology chapters concluded no significant effects on potential prey species (benthic organisms, fish or shellfish) or on the habitats that support them from construction activities.

Water and Sediment Quality, and Other Sea Users

A number of different aspects of the Offshore Site have the potential to have an effect on suspended sediment concentration (SSC). This effect relates to short-term and localised increases in SSC associated with seabed disturbance during the construction and decommissioning activities. The use of dredging, controlled flow excavation (CFE) or jet trenching during seabed preparation (OAA only) and cable trench installation will generate some of the greatest disturbance to the seabed.

The potential for vessels to accidentally pollute the marine environment with discharge of fuel or wastewater, is extremely unlikely due to strict regulations. . Nonetheless, the impact of an unmitigated effect could directly impact the Water and Sediment Quality. This effect could also result in in-direct effects between Water and Sediment Quality and Other Sea Users, as a result of marine habitats and species within aquaculture/Finfish farms who are sensitive to pollution effects. Aquaculture/finfish farms are deemed to be of low vulnerability, high recoverability and of a high value.With regards to shellfish

in freshwater aquaculture sites, burrowing species will be able to excavate any sediment re-deposited as a result of Offshore Site activities while most crab and lobster species and some mobile shellfish are able to escape from under silt and migrate away from an area. Changes to Water and Sediment Quality such as increased SSC may also adversely impair the feeding capabilities of scallops, although individuals are capable of moving away from areas with higher sediment loads. Shellfish are deemed to be of medium vulnerability, high recoverability and of high value and as there are Other Sea Users such as aquaculture farms within 15 km.

32.2.4 Benthic Ecology

Benthic Ecology, and Fish and Shellfish Ecology

Temporary habitat loss / disturbance will result from seabed preparation activities (e.g. boulder clearance and PLGR) and deployment of jack up spud cans. It is anticipated that the temporary disturbance may result in some direct losses to epifaunal reef communities. Such losses could temporarily affect higher trophic levels at a local level by reducing the availability of prey species in these areas until recovery and recolonisation occurs, which could impact on fish and shellfish. Given the mitigation by design and consideration of the medium sensitivity of the habitats, with consideration of the short-term and intermittent nature of the works limited to discrete areas with good potential for recovery.

Benthic Ecology, Marine Ornithology and Marine Mammals and Other Megafauna

There is the potential for the temporary loss or damage to benthic habitats or species as a result of seabed preparation and construction activities within the Offshore Site. There will be up to 1.03 km^2 of temporary habitat or species loss / disturbance associated with Project activities within the Offshore Site. It is anticipated that the temporary disturbance may result in some direct mortality of any reef epifauna. It has been considered that such losses could potentially temporarily affect higher trophic levels at a local level by reducing the availability of prey species until recovery and recolonisation occurs.

Benthic Ecology and Climate

The key blue carbon ecosystems of Ireland (seagrass beds and saltmarshes) have not been identified to be present within the Offshore Site. Maerl beds were identified within the OAA, which are a potential blue carbon habitat and the sediments across the Offshore Site are considered to have a moderate carbon value. Maerl beds are considered to have a moderate carbon stock and sequestration rate; however it is important to note that much of the OAA was interpreted as rock which will have no carbon storage potential. The activities associated with the construction of the Offshore Site are unlikely to result in significant loss or disturbance or carbon or affect the carbon sequestration potential of the immediate seabed and associated habitats. During the operation & maintenance phase, the Project will displace carbon dioxide from fossil fuel-based electricity generation, over the proposed 38-year operational life. This displacement of carbon will have a positive impact on Climate and as a result, Benthic Ecology.

32.2.5 Fish and Shellfish Ecology

Fish and Shellfish Ecology, and Marine Mammals and Other Megafauna

Underwater sound from survey equipment, site preparation activities, and construction activities can have mortality, physical injury or behavioural effects on fish and shellfish receptors, at an individual or population level. Underwater noise is also anticipated during the operation and maintenance of the 30 WTG and one OSS. Behavioural effects, such as disturbance or displacement, may impact acoustic communication in fish, reproductive success, foraging, predator avoidance and navigation (Hawkins &

Myrberg, 1983; Radford *et al.*, 2014; de Jong *et al.*, 2020). Adverse effects on fish receptors may have indirect effects on marine mammal receptors that rely on this prey.

The foundation structures of WTGs and the OSS, as well as scour protection and cable protection, will cause long-term habitat changes and loss for prey species of marine mammal and megafauna receptors. Long-term habitat change will cause changes in prey abundance and distribution, which can affect foraging success and losses in foraging opportunities for marine mammals and megafauna. The presence of WTGs, the OSS, and scour protection can also generate artificial reef effects, where the presence of infrastructure can function as a fish aggregating device (as explained in Section 12.6.3.3). The infrastructure provides new habitat that can be colonized by biofouling organisms, which in turn attracts higher trophic levels (Degraer *et al.,* 2020). Marine predators, such as marine mammals and basking sharks, then target these areas for foraging and profit from the highly biodiverse community present around the array (Reubens *et al.,* 2014).

Fish and Shellfish and Commercial Fisheries

Ghost fishing may occur if discarded fishing gear becomes entangled with Offshore Site infrastructure and consequently has an adverse effect on fish and shellfish species. Ghost fishing from the discarded fishing gear from commercial fisheries could result in a reduction of Fish and Shellfish abundance. Considering the mobility of each species group and therefore the low likelihood of coming into contact with gear, no species group are considered particularly vulnerable to this impact.

During the operation and maintenance phase of the project the presence of up to 30 WTG, one OSS GBS foundation structures and external cable protection (e.g. rock) may introduce new structures for habitat creation and create artificial reef effects. The introduction of hard infrastructure alters previously soft sediment habitat areas, which can attract new species and increase the habitat complexity and biodiversity of the area (Degraer *et al.,* 2020) and may result in the provision of shelter. This may in turn increase fish abundance in the area which will benefit Commercial Fisheries.

32.2.6 Marine Ornithology

Marine Ornithology, and Shipping and Navigation

Direct temporary disturbance or displacement of birds within the OAA during the construction phase and decommissioning phase will occur as a result of increased vessel activity and other construction activities. Baseline surveys and published evidence (further detailed in Chapter 11 Marine Ornithology) identifies Great northern diver, guillemot and razorbill as species which are sensitive to disturbance from vessels. Direct Temporary disturbance or displacement of birds along the OEC route may also occur during construction and decommissioning as a result of installation of the OEC. Disturbances arising from these activities has the potential to affect sensitive species directly, for example disturbances of individual seabirds by cable laying vessel . The three same species (great northern diver, guillemot and razorbill) were identified as being potentially sensitive to disturbance and displacement from increased vessel activity along the OEC route during the construction phase.

32.2.7 Marine Mammals

Marine Mammals and Other Megafauna, and Shipping and Navigation

During the construction phase, there will be an increase in vessel traffic associated with the Project, which could result in an increased risk of disturbance from marine sound and barrier effects to marine mammals and other megafauna through avoidance and displacement, as well as potential behavioural changes. During the construction phase, there will be up to 21 vessels associated with the Project, which could result in an increased risk of injury or mortality to marine mammals and other megafauna. Considering the mitigation that will reduce the likelihood and severity of vessel collisions, and the fact

that vessel collisions are not a dominant cause of mortality in marine mammals, the effect is highly unlikely to occur, and this is also in the context of the likelihood of occurrence of less agile species around the Offshore Site (e.g. basking shark and minke whale). During the operation and maintenance phase, there will be periods of increased localised vessel traffic associated with the Project, which could result in an increased risk of disturbance from marine sound and barrier effects to marine mammals and other megafauna through avoidance and displacement, as well as potential behavioural changes.

32.2.8 Commercial Fisheries

Commercial Fisheries and Shipping and Navigation

Increased vessel traffic associated with the construction, operation and maintenance and decommissioning phases may lead to interference with fishing activity (e.g. fouling of static gear markers), or damage and / or loss of gear, which in turn may lead to economic effects on fishers. Increased vessel traffic includes the presence of construction, maintenance or decommissioning vessels on site during works, as well as vessels transiting to and from the Offshore Site. Navigational safety associated with increased vessel traffic is assessed in Chapter 14: Shipping and Navigation.

32.2.9 Shipping and Navigation

Shipping and Navigation, Commercial Fisheries and Other Sea Users

During the construction phase, there will be an increase in localised vessel traffic associated with the Offshore Site. As such there is the potential for obstruction to other commercial fishers and other sea users as a result of the physical presence of Project vessels and associated advisory safe clearance distances. Activities associated with the construction, operation and maintenance, and decommissioning of structures and cables may displace existing routes/activity and increase encounters and collision risk with other third-party vessels. This is addressed within Chapter 14 Shipping and Navigation.

Shipping and Navigation and Climate

The construction of the Offshore Site will require delivery of construction materials (such as foundations and turbines), seabed disturbance (i.e., dredging, boulder clearance, rock placement, etc.), and the operation of marine vessels and plant. Greenhouse gas emissions, e.g., carbon dioxide, carbon monoxide and nitrogen oxides will arise as a result of the production of construction materials, seabed disturbance activities, and the operation of marine vessels and construction machinery as a result of construction activities. These activities will give result in emissions from transportation vessels (marine) and exhaust emissions. Similarly, operation and maintenance phase related activities will result in the emission of greenhouse gas to the atmosphere. Offshore vessel usage is considered a predominant source of emissions during the operation and maintenance phase of the Project

Shipping and Navigation and Marine Archaeology

Penetration and compression effects of jack-up vessels and anchoring of construction, operation and maintenance and decommissioning vessels during WTG, substation, or cable installation can lead to direct impact on marine archaeology receptors. Activities which may result in penetration and compression effects leading to impact on archaeological receptors include anchoring of jack-up and construction vessels. Where avoidance is not possible or in case of not yet located Historic Environment further mitigation and archaeological works are detailed in the Archaeological Management Plan..

Shipping and Navigation and Offshore Air Quality and Airborne Noise

During the construction phase, there will be an increase in localised vessel traffic associated with the Project. As such there is the potential for an increase in noise, vibration, and exhaust emissions from the Project vessels.

During the operation and maintenance phase, there will be a small and long-term increase in localised vessel traffic associated with the Project. As such there is the potential for an increase in noise, vibration, and exhaust emissions from the Project vessels.

32.2.10 SLVIA

SLVIA, and Shipping and Navigation

Construction activities including vessel traffic and incremental installation of the WTGs within the Offshore Site will be noticeable from some areas of coastline and sea area. These views are generally flanked and backed by coastline and the Aran Islands rather than impacting on the open sea horizon to the south and west.

32.2.11 Other Users of the Marine Environment

Other users of the Marine Environment and Offshore Air Quality and Airborne Noise

Other sea users, primarily consist of aquaculture sites directly to the northeast of the Offshore Site and of Mace Head. Coastal vessel traffic around the west of Ireland, including the wider Galway Bay area, is considered to be moderate, and it is unlikely that the addition of Project vessels or use of specific machinery during the construction phase would result in a significant effect from airborne noise and vibration. Other sea users would be present in the vicinity of airborne noise emissions.

32.3 Impact Interactions - Onshore

32.3.1 Terrestrial Biodiversity

Terrestrial Biodiversity and Offshore Air Quality and Airborne Noise

Onshore ecological receptors include birds using the shoreline and otters, and terrestrial mammals. Birds, otters, and terrestrial mammals may be present along the shoreline or within suitable habitat onshore during the construction period, and therefore may be affected, or displaced due to the increase noise associated with the construction period. This is assessed within Chapter 20 Terrestrial Biodiversity.

Terrestrial Biodiversity, and Land, Soils and Geology

To facilitate the construction of the OCC and OGC for the Onshore Site as well as the proposed passing bays, there will be a loss of hedgerow habitats, mature scrub/scrub woodland and mixed broadleaved woodland, which may in turn impact on the land, soils and geology of the area. In total, to facilitate the Onshore Site there will be a total loss of approximately 443m of hedgerow habitat and 0.571ha of mature scrub/scrub woodland and mixed broadleaved woodland. This is assessed in Chapter 20 Terrestrial Biodiversity.

Terrestrial Biodiversity and Water

There are 11 no. EPA mapped watercourses located along the OGC, as well as multiple drainage ditches which drain roadsides and field boundaries. These are further detailed in Chapter 24 'Water' of this EIAR and in the CEMP included in Appendix 5-16. There are no instream works proposed to facilitate the OGC route, nor any other component of the Onshore Site. Therefore, there will be no direct impacts on aquatic habitats or species as a result of direct mortality, or any other direct pathway, as a result of the construction of the OGC or OCC. There is also the potential for indirect impacts on watercourses and their aquatic habitats or species. Additionally, the OCC is located in close proximity to an EPA mapped watercourse, the Ballynote East stream. Indirect impacts may arise via the deterioration of water quality arising from the runoff/percolation of pollutants into surface or groundwater systems, as a result of the construction phase of both the OGC and OCC.

Terrestrial Biodiversity and Onshore Air Quality

Increased vehicular and dust emissions during the construction phase of the Onshore Site within and around the Onshore Landfall Location (OLL), OGC and the OCC site have the potential to cause significant effects to biodiversity. This is assessed in Chapter 20 – Terrestrial Biodiversity.

Terrestrial Biodiversity and Climate

The construction of the Onshore Site will result in greenhouse gas emissions associated with excavations, production of construction materials, and operation of vehicles and plant. During the operation and maintenance phase, the Onshore Site 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 positive effect on biodiversity.

Terrestrial Biodiversity and Noise and Vibration

Site activity during the construction phase could give rise to noise that could cause a potential effect on biodiversity which uses the site. This is assessed in Chapter 20 Terrestrial Biodiversity, Chapter 26 Noise and Vibration and the CEMP (Appendix 5-16)

32.3.2 Terrestrial Ornithology

Terrestrial Ornithology and Biodiversity

The removal of hedgerow, mature scrub/scrub woodland and mixed broadleaved woodland during the construction phase of the Project is likely to result in some disturbance of biodiversity, including birds, in the areas surrounding the Onshore Site. Where sections of habitat are removed, these will be replaced with suitable hedge/tree species which are common in the local context.

Terrestrial Ornithology and Hydrology and Hydrogeology

A short section of the OGC, borders the River Shannon and River Fergus Estuaries SPA between the OCC and Moneypoint Powerstation. There is the potential for disturbance impacts associated with construction works adjacent to the estuarine habitat. In particular, this impact is likely for wintering waterbirds, including SCI's from the SPA. Temporal restrictions on construction activity will be employed to avoid impacts. Between October and March, no construction works will be undertaken within 500m of the River Shannon and River Fergus Estuaries SPA adjacent to Moneypoint. This is assessed in Chapter 21 Terrestrial Ornithology.

32.3.3 Land, Soils and Geology

Land, Soils and Geology and Water

There is a possibility that excavations of spoil during construction could have the potential to impact on the water environment. Erosion of soils/subsoils may occur at any works area where excavation is ongoing (i.e., along the proposed OGC). Erosion of soil/subsoil can reduce the overall volume of soil/subsoil at the Onshore Site, with the potential for some eroded subsoils to reach watercourses. In addition, the transformer in the OCC will be oil cooled. There is a potential for spills / leaks of oils from this equipment resulting in contamination of soils and groundwater. This is assessed in Chapter 23 Water. To prevent this, all excavation works will be temporary, stockpiles will be covered, and silt fencing will be used where appropriate near surface watercourses.

Land, Soils and Geology and Archaeology and Cultural Heritage

During construction there's the potential for direct effects such as 'physical impacts' on a monument or site. The construction phase of a development may consist of earthmoving activities such as topsoil removal and excavation works as part of the construction phase. This may have a number of potential negative effects on the known and potential archaeological, architectural and cultural heritage. Any archaeological sites/features, if detected, during archaeological monitoring will be preserved by record (archaeologically excavated) or preserved in-situ (avoidance) and therefore a full record made of same. This is assessed in Chapter 24 Onshore Cultural Heritage.

Land, Soils and Geology and LVIA

The removal of spoil and the subsequent replacement with crushed stone for the construction of the site roads and hardstanding areas particularly at the OCC, has the potential to alter the local landscape. This is assessed in Chapter 27 Landscape and Visual Impact Assessment.

Land, Soils and Geology and Climate

The construction of the Onshore Site will require the removal and reinstatement of a small volume of peat material, use of construction materials (such as cement), and the operation of vehicles and plant. Greenhouse gas emissions, e.g., carbon dioxide (CO_2), carbon monoxide and nitrogen oxides associated with the removal and reinstatement of peat habitat, production of construction materials, and operation of vehicles and plant will arise as a result of the construction activities. This is assessed in Chapter 30 Climate.

32.3.4 Archaeology and Cultural Heritage

Archaeology and Cultural Heritage, and LVIA

Effects on settings of sites may arise when a development is proposed immediately adjacent to a recorded monument or cluster of monuments. While the Onshore Site may not physically impact on a site, it may alter the setting of a monument or group of monuments. A Landscape Management Plan has been developed for the OCC which will provide natural vegetation screening. Furthermore, some monuments may not be readily visible in the landscape which further ameliorates potential effects on setting. Additionally, many of these monuments are located on private land which are not formally accessible to the public. This is assessed within Chapter 24 Cultural Heritage and Chapter 27 Landscape and Visual Impact Assessment.

32.3.5 Onshore Air Quality

Onshore Air Quality, and Traffic and Transport

The construction of the OLL will require the operation of construction vehicles and plant onsite giving rise to exhaust and dust emissions. The construction of the OGC, requires the operation of construction vehicles and plant onsite, therefore giving rise to exhaust and dust emissions. The transport of the OCC infrastructure, construction vehicles, aggregate materials, waste removal vehicles and construction staff to/from the Onshore Site for the construction of the associated Onshore Site infrastructure, will also give rise to exhaust emissions associated with the transport vehicles. This is assessed in Chapter 26 Air Quality and Chapter 29 Traffic and Transport.

During the operation and maintenance phase, the Onshore Site will generate additional traffic to the area in the form of light goods vehicles (LGVs) visiting the permanent OCC intermittently for inspections but on occasion, Heavy Goods Vehicle (HGVs) may be required over short periods during maintenance/substation component replacement activities. The OCC will be operated and maintained by Eirgrid and ESB. On occasion, the removal of hydrocarbons (transformer oil) and waste from welfare facilities will be removed from the OCC by a licenced waste disposal company. This is assessed in Chapter 26 Air Quality and Chapter 29 Traffic and Transport.

32.3.6 Traffic and Transport

Traffic and Transport and Climate

The transport of Onshore Site infrastructure and construction materials to the site, will give rise to greenhouse gas emissions associated with the transport vehicles (terrestrial) and exhaust emissions. This impact will be restricted to the duration of the construction phase. This is assessed in Chapter 30 Climate.

32.3.7 Vulnerability to Major Accidents and Natural Disasters

As described in Chapter 33 of the EIAR, major accidents or natural disasters are hazards which have the potential to affect the Project and lead to environmental effects both directly and indirectly. These include accidents during construction, operation and maintenance and decommissioning of the 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, marine physical and coastal processes, water and sediment quality, benthic ecology, fish and shellfish ecology, marine ornithology, commercial fisheries, shipping and navigation, civil and military aviation, SLVIA, marine archaeology, other sea users, offshore air quality and airborne noise, biodiversity, land and soil, hydrology and hydrogeology, cultural heritage, onshore air quality, climate, onshore noise and vibration, landscape, material assets, and the traffic and transport. The risk of a major accident and/or disaster during the construction of the Project is considered 'low' in accordance with the 'Guide to Risk Assessment in Major Emergency Management' (DoEHLG, 2010). This is assessed within Chapter 33 Major Accidents and Natural Diasters

32.4 Project Interactions

When considering interactions, it is also important to consider the interaction between the offshore and onshore potential significant effects. The result of interactive effects may exacerbate the magnitude of the effects or ameliorate them or have a neutral effect. Where there is a possible interaction between the Project, this has been detailed below and shown in Appendix 32-1.

32.4.1 SLVIA and Archaeology and Cultural Heritage

The effects on settings of onshore sites may arise as a result of the introduction of 30 WTGs to the Connemara coast as part of the Offshore Site. Although it will not physically impact on a site, it may alter the setting of a monument or group of monuments. Some monuments may not be readily visible in the landscape which further ameliorates potential effects on setting. Additionally, many of these monuments are located on private land which are not formally accessible to the public. Chapter 17 Marine Archaeology details the most relevant monuments that may be effected by the proposed WTGs, detailing the potential visibility based on the photomontages taken for the Project (Volume 2 of the EIAR).

32.4.2 Benthic Ecology and Terrestrial Biodiversity

Direct temporary disturbance or displacement of species that utilise both the Onshore and Offshore Site (such as otters and bats) may occur during the construction, operation and maintenance and decommissioning phases.

Otters that utilise the Offshore Site may also make use of the Onshore Site, allowing for potential interactions. No information on bat migration along the west coast of Ireland is available in existing literature, and no conclusive evidence currently exists that Irish bats migrate offshore. Surveys undertaken along the coastline (as detailed in Appendix 20-1) provide a thorough baseline understanding of the use of the Onshore Site and surrounding habitats by commuting, foraging and roosting bats. No evidence of seaward commuting was identified,

32.4.3 Marine Ornithology and Terrestrial Ornithology

Direct temporary disturbance or displacement of birds, both within the Onshore and Offshore Site may occur during the construction, operation and maintenance and decommissioning phases. Birds that utilise the Offshore Site may also make use of the Onshore Site, depending on their foraging range allowing for potential interactions.

32.4.4 Water and Water and Sediment Quality

Effects on Water and Sediment quality in the Offshore Site, could be effected by changes to the water quality within watercourses, etc. that travel through the Onshore Site. During construction and decommissioning in particular, dust and exhaust emissions could occur at high intensities and occur frequently or be persistent for extended periods. The increase in these emissions may have a negative effect on water quality within watercourses that travel through the Onshore Site and may subsequently interact with the Offshore Site

32.4.5 Offshore Air Quality and Airborne Noise and Onshore Air Quality

Construction activities in both the Offshore and Onshore Sites will give rise to exhaust emissions, both from vessel and vehicle operations respectively. Although unlikely, there is the potential for interactions

in emissions caused by both the offshore and onshore activities. This is considered a short-term, negative impact on air quality. Mitigation measures are detailed in Chapter 19 Offshore Air Quality and Airborne Noise and Chapter 25 Air Quality.

32.4.6 Offshore Air Quality and Airborne Noise and Onshore Noise

Construction activities in both the Offshore and Onshore Sites will give rise to noise emissions. Although unlikely, there is the potential for interactions in noise caused by both the offshore and onshore activities. This is considered a short-term, negative impact on noise, and based on distance from the main construction works between the Offshore and Onshore Sites, very unlikely. Mitigation measures are detailed in Chapter 19 Offshore Air Quality and Airborne Noise and Chapter 26 Noise and Vibration.

32.5 Mitigation and Residual Impacts

Where any potential interactive negative effects have been identified in the above, a full suite of appropriate mitigation measures has already been included in the relevant sections (Chapters 6 – 31) of the EIAR and are detailed in the CEMP Appendix 5-16. The implementation of these mitigation measures will reduce or remove the potential for their effects. Information on potential residual impacts and the significant of effects, is also presented in each relevant chapter.