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Holistic Network Design – Implementation Plan

Strategic Environmental Assessment

Environmental Report



NESO
National Energy System Operator

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Non-Technical Summary

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Introduction

The Holistic Network Design (HND) Implementation Plan is being developed by the National Energy System Operator (NESO) on behalf of Department of Energy, Security and Net Zero to deliver the combined offshore network design recommendations, and approved variations, of the initial Holistic Network Designs (HND), Holistic Network Design Follow Up Exercise (HNDFUE) Scotwind, HNDFUE Celtic Sea and HNDFUE INTOG offshore designs.

Offshore wind is currently the fastest-growing sector of renewable energy and the HND Implementation Plan is being prepared in response to the requirement for a future coordinated offshore and onshore network to enable this growth. The HND Implementation Plan provides offshore network design recommendations and sets the framework for the development of developer offshore and onshore cabling, converter stations and substations.

The purpose of this Strategic Environmental Assessment (SEA) Environmental Report is to provide a formal and transparent assessment of the likely significant effects on the environment that could arise from implementation of the HND Implementation Plan, including the consideration of reasonable alternatives. It has been prepared in line with the SEA Directive, and the SEA Regulations that apply in England, Wales and Scotland.

Description of the Plan

Background and Development of the Plan

A series of offshore network design exercises were carried out to support a coordinated offshore and onshore network that could support the growth of offshore wind in Great Britain (GB) and its connection to the electricity network.

There were four work strands developed as part of this design process, known as HND, HNDFUE Scotwind, HNDFUE Celtic Sea, and HNDFUE INTOG. The network design recommendations for these were considered and published in succession between 2022 and 2024.

The HND and HNDFUE design exercises considered certain design objectives equally when comparing potential designs. These are:

- **Economic and efficient** – Delivered in an economic and efficient way, ensuring the best value for bill payers.
- **Deliverability and operability** – Can be operated in a practical and economic way.
- **Environmental impact** – Minimise the impact, where possible, on the natural environment

- **Local community impact** – Minimise the impact, where possible, on the communities that host this infrastructure.

Together the four work strands of the network design process aimed to provide a set of holistic network recommendations to support the connection of offshore wind in GB waters. The HND Implementation Plan considers the implementation of the recommended designs within each of these four work strands combined and also considers several variations to designs that were accepted by NESO prior to August 2024.

Geographic Scope

The geographic area for the HND Implementation Plan initially included all GB waters and onshore areas within England, Scotland and Wales. This area was reduced to focus on the areas proposed for development of offshore wind, known as Project Development Areas (PDAs) and potential study corridors connecting these areas to shore.

An SEA Study Area was developed which included onshore GB and the coastal / offshore waters out to a 15km buffer around the PDAs and cable study corridors, which extends beyond GB waters in some cases. Within this area, potential route corridors and Recommended Designs for the four HND / HNDFUE work strands have been considered, taking into account environmental, community and technical constraints and sensitivities. The potential for positive or negative effects on the environmental topics considered in SEA have been determined. For mobile species this considered the potential for impacts at a distance greater than the SEA Study Area, where needed.

Habitats Regulations Assessment (HRA) and Marine Conservation Zone (MCZ) assessment for the draft HND Implementation Plan have been prepared separately. The HRA investigated the potential for impacts on European sites (Special Areas of Conservation and Special Protection Areas), while the MCZ assessment investigated the potential for impacts on Marine Conservation Zones. These covered a wider study area to consider the potential for impacts on mobile species where required.

Temporal Scope

The draft HND Implementation Plan considers the four HND and HNDFUE work strand network designs, as published (HND, HNDFUE Scotwind, HNDFUE Celtic Sea and HNDFUE INTOG), each of which have set out timelines.

The network recommendations included in these reports are designed to be built upon one another, meaning that the baseline for later work strands will be changed based on the designs included in earlier work strands.

The temporal scope of the SEA considers the potential for short-term (construction phase), medium-term (re-establishment and initial operational phase, considered as 0-5 years post-construction), and long-term (operational phase, 5 years post-construction onwards), as well as decommissioning impacts from implementing the potential offshore and onshore projects that could arise from the draft HND Implementation Plan (including reference to secondary, cumulative, synergistic, permanent and temporary, positive and negative effects). This is in line with the requirements of the SEA Directive.

Scope of the Plan

The draft HND Implementation Plan covers all of the latest GB network designs captured within HND and HNDFUE (as of August 2024). The SEA covers the marine works to the onshore interface point associated with the HND and HNDFUE offshore designs. This scope is illustrated as points 4 and 5 in Figure 1.

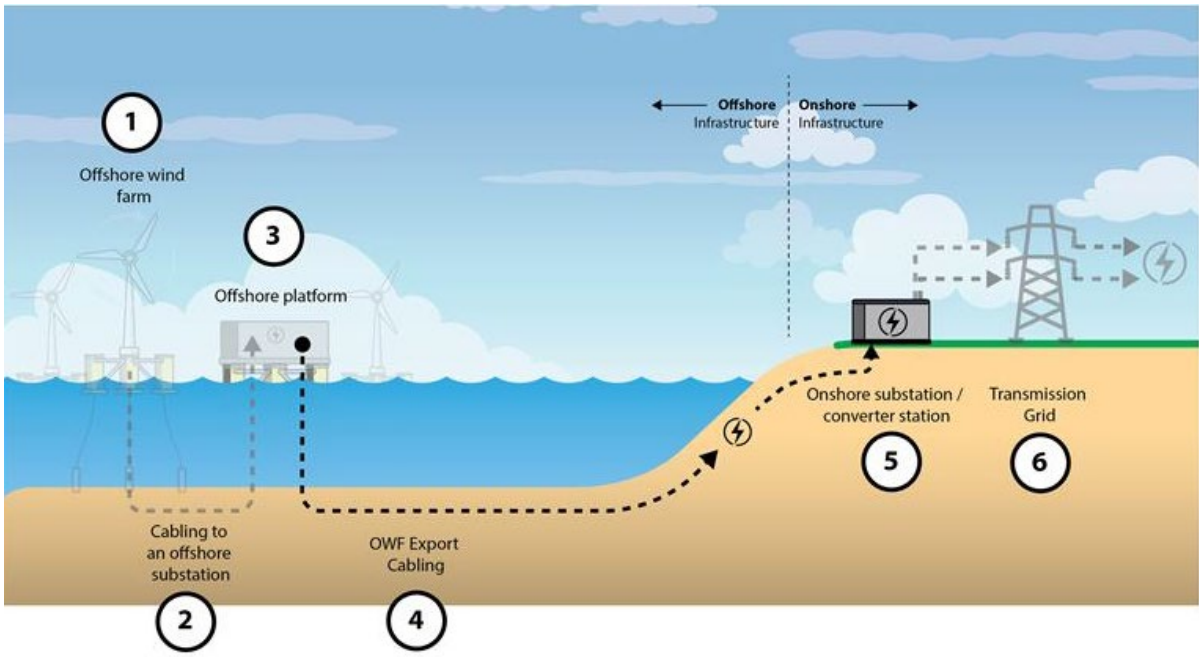


Figure 1: Offshore and onshore elements within the scope and outside the scope of the HND Implementation Plan

As part of the draft Plan development, the four network design objectives were considered on an equal footing for each of the four work strands. As part of this methodology, RPS assessed environmental and social constraints and sensitivities to offshore / onshore cabling and onshore interface infrastructure to indicate the likely risks of impacting various environmental, community and technical constraints / sensitivities, and to inform whether an area could accommodate a proposed interface point and identify possible route corridors / design options. This assessment used BRAG (BLACK, RED, AMBER, GREEN) criteria, which rated the constraints and sensitivities from the most to least likely to constrain whether that option could be delivered, i.e. its level of risk to consenting. The overall aim was to implement the established mitigation strategy of Avoid, Reduce, Mitigate; with a strong focus on Avoid and Reduce applied during the early stages of the overall methodology, with mitigation only considered at a strategic level, where required, in the final options appraisal. The HND appraisal process is summarised by Figure 2 and is detailed in Section 2.4.3.

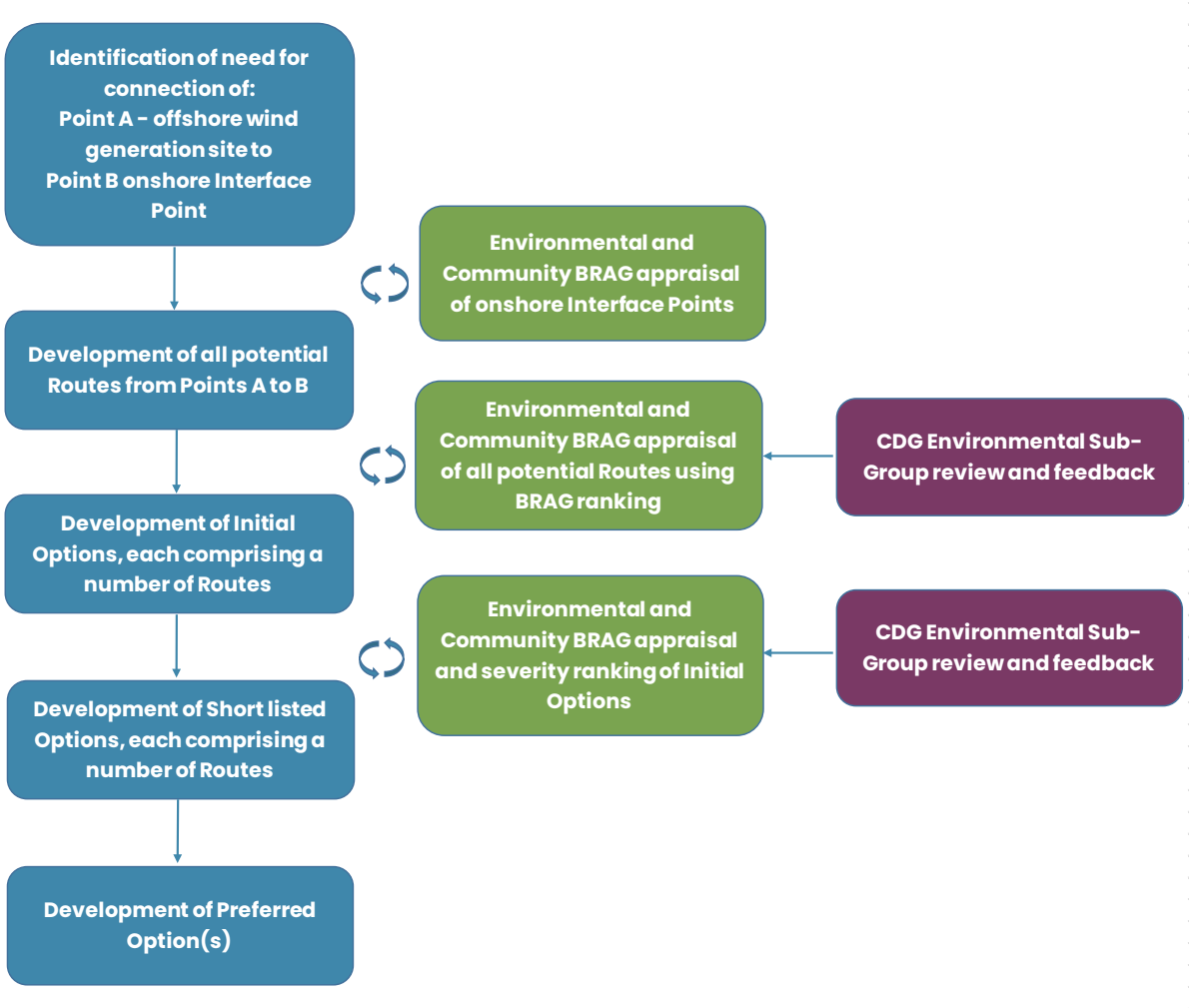


Figure 2: Summary of the appraisal process

Datasets that represented real-world constraints and sensitivities were gathered and allocated a BRAG rating that was based on risk and on specific feature sensitivities, where this was identified by stakeholders. For the initial routing exercise, an analysis using Geographic Information Systems (GIS) was used to identify possible route corridors and their lengths, based on the constraints data and rankings, that could be considered by NG ESO / NESO. This appraisal used BRAG rankings across all environmental, community and technical issues.

Following this first step, NG ESO / NESO short-listed route corridors to be further assessed. GIS techniques were then used to map the risks across the study area, based on a "heat map" or "cost surface" assessing the cost of routing across many constraints considered together. These were done individually across the broad headings of environmental, community and technical constraints, and also as overall combined constraints. Areas of environmental constraints arose due to there being environmentally sensitive habitats or species present and/or the areas being designated through international, European, national, or local planning legislation. Areas of community constraint were where there was likely to be disturbance to, or risk to, human activity or impacts on heritage features. Technical constraints were areas where it would be technically difficult, or not technically

feasible, to construct and operate the elements required to form the HND / HNDFUE network and included issues such as topography, ground conditions and the availability of space at landfalls. Constraints were also scored from 1-10, allowing a cumulative quantitative assessment.

This network design methodology appraised a significant number of potential route corridors and grouped them into design Options for the four HND / HNDFUE work strands. Consideration of technical, environmental, and community constraints and sensitivities was included at all key points in this decision process. The outcome of each work strand was the identification of one or more Recommended Designs for each work strand.

The environmental and community constraints indicators that were used also represented the topics that are considered in SEA (Biodiversity, Flora and Fauna; Population and Human Health; Geology, Soils and Land use; Water; Air; Climatic Factors; Material Assets; Cultural Heritage; and Landscape and Visual Amenity), recognising the potential impacts of cabling and interface operations and the key areas and/or features that should be avoided. The appraisal process considered hundreds of potential routes and options throughout GB. Owing to the considerable scale and the significance of time and resources that would be required to undertake a full impact assessment at each stage of this process, instead, the key criteria of SEA were followed, where environmental and community constraints and sensitivities are considered and avoided. In this manner the appraisal process has acted as a form of 'SEA light' for hundreds of iterations of potential routes and design options, with the key environmental and community indicators influencing the design development.

Environmental Baseline

An environmental baseline was produced by SEA environmental topic as presented in Section 3 of this report. The purpose of Section 3 is to demonstrate the level of baseline environmental information used in the assessment of potential effects of developments arising from the HND Implementation Plan. This is summarised below.

Biodiversity, Flora and Fauna

There are a wide variety of natural habitats and species found within the overall SEA Study Area, protected by a range of designations. Sites have been designated to provide protection to those habitats and species considered to be of particular conservation value. The key sensitivities in the study area are the numerous Special Areas of Conservation (SACs), Special Protection Areas (SPAs), Ramsar Sites, Highly Protected Marine Areas (HPMAs), Sites of Special Scientific Interest (SSSIs), Marine Conservation Zones (MCZs), Nature Conservation Marine Protected Areas (NC MPAs), National Nature Reserves (NNRs), and Local Nature Reserves (LNRs), as well as important and priority habitats and species. A summary of all these key indicators for Biodiversity, Flora and Fauna is provided in Section 3.2.1.

Population and Human Health

In 2021, there were approximately 56.489 million people living in England and approximately 3.107 million people living in Wales, while in 2022 there were approximately 5.436 million people living in Scotland. The total UK population in 2021 was approximately 68.265 million and predicted to increase to approximately 72.4 million individuals by 2043. Many major population centres in GB are situated along, or in proximity to, the coastline. In mid-2022 the population density for the UK was 279 people / km2. There are areas of higher deprivation across GB, which may be measured by income, employment, education, health, crime, barriers to housing and services, and the living environment.

In both England (81.7%) and Wales (79.1%) approximately four-fifths of the population reported themselves to be in good or very good general health in the 2021 census, which was similar to the proportion in Scotland (79.2%) in the 2022 census. Reported long-term health problems that limited day-to-day activities were slightly higher in Scotland (21.4%) and Wales (21.1%) than in England (17.7%). Just under three quarters of all residents in the UK aged 16 years and over were in employment in 2024. The renewables sector generated around £54.4 billion in turnover and provided 247,400 full-time equivalent jobs in 2021 in the UK.

The GB marine area is used for a variety of recreational and leisure activities. Recreational sailing is popular, with 635 marinas and 115 areas used for sailing and racing within the SEA Study Area. Other activities include diving (including to historic wreck sites), water sports such as outdoor swimming, windsurfing, sea kayaking, surfing, paddleboarding and boating, beach use (with over 600 areas designated as bathing waters, 91 Blue Flag beaches and 53 Scotland Beach Award winners), and sea angling. Many of these activities also represent tourist attractions for the region.

Geology, Soils and Land use

GB is situated in a dynamic ocean location with the interactions between the Atlantic Ocean to the west of the British Isles, the North Sea beyond Scotland and the eastern side of England, the English Channel to the south between England and France, the Celtic Sea located between the south-west edge of England, Wales, and Ireland and the Irish Sea between the island of Ireland, the Isle of Man and England. The seabed depth is very variable, influenced by offshore geological and seabed features and structures, including subtidal sediment banks, shelf mounds and pinnacles, shelf troughs, submarine canyons, deep water and carbonate mounds and features such as continental slope, deep ocean rise, pockmark fields, and iceberg ploughmark zones. Faulting is present around GB.

The offshore geology of GB is varied, with the oldest rocks present in Scotland. The offshore geology of Scotland includes areas of mudstone and siltstone to the north; sandstone, mudstone, limestone, chalk and lignite to the east, and sandstone, limestone and mudstone to the west. Offshore of the north-east of England are areas of mudstone, sandstone, limestone and gypsum, with areas of clay and chalk to the south and slate and sandstone to the south-west of England. The geology offshore of Wales is variable, including areas of mudstone and limestone, while off the north-west of England there are areas of mudstone, sandstone and limestone.

The coastal and marine environments in GB are very dynamic, with erosion and deposition processes occurring from the interactions with wind, waves, currents, tides, and coastal features; up to 28% of the English and Welsh coastlines and 19% of Scottish coastlines are reported as being vulnerable to erosion. Wider sediment transport mechanisms across GB seas are controlled by tidal influences. Hard substrates of the GB seabed include unconsolidated gravel spreads and hard cohesive sediments and areas of rock outcrop; these stable substrates are of operational interest for offshore projects. Areas of rock and hard substrate are concentrated around areas of the Scottish Islands, the north-east, south-west and south of England. Other areas of seabed substrates present in GB waters include boulders and cobble fields and areas of sandbanks. Seabed sediments are variable around GB, and include areas of sands, gravels, and mud.

Onshore geology in GB is diverse, including rocks from almost all geological ages. The oldest surface rocks are found in the north-west of Scotland. The bedrock geology is complex and includes older metamorphic rocks that have been covered by different sequences of sedimentary rocks with igneous intrusions. Extensive superficial deposits (younger geological layers of sediments such as sand, silt and clay that may have been deposited by glaciers or other fluvial processes) are present on the bedrock surface, and these can play an important role in the consideration of construction works such as onshore cabling due to their influence on installation methods, likelihood to release contaminants or influence drainage or soil fertility. There are unique geological features present across GB, including the Jurassic Coast, faults, chalk plateaus and granite intrusions and features such as the valleys of the Lake District and the fjords of the west of Scotland formed from glaciation events. The GB coastline is dynamic and varied, representing its diverse geological history with a variety of landforms and features present such as islands, bays, headlands, peninsulas, caves, estuaries, and dune systems.

Soil type can influence the movement of contaminants that may be introduced during construction. The soil types of the UK can be described by 13 reference soil groups determined and recognised by The World Reference Base map: arensols; cambisol; fluviosol; gleysol; histosol; leptosol; luvisol; phaeozem; planosol; podzol; regosol; stagnosols; and umbrisol. The distribution of onshore soil types has been mapped for England, Wales and Scotland.

The UK's total land area covers approximately 60 million acres. There are a wide variety of land uses, including a variety of natural habitats such as peatlands and waterbodies, as well as forestry, urban and industrial areas, and agricultural areas. Land types and land uses that may be constraints to the installation of onshore cabling include quarries, mines, landslide areas, unstable grounds, and potentially contaminated sites.

There are 35 World Heritage Sites (WHS) listed within the UK and nine UNESCO Geoparks. There are 91 MCZs within English Waters, one MCZ in Welsh waters, and 36 NC MPAs in Scotland. There are also over 6,200 SSSIs within GB. Some of these sites are designated, at least partly, for their earth science features. There are also local areas of important geological or geomorphological sites known as Regionally Important Geological and Geomorphological Sites (RIGS); there are currently 51 RIGS throughout England, Scotland, and Wales.

Water

The UK Marine Strategy requires action to be undertaken to achieve a Good Environmental Status of marine waters, taking an ecosystem–based approach to the management of human activities in the marine environment. It considers 11 quality Descriptors. The most recent status assessment of these Descriptors for the UK indicates that Good Environmental Status has not yet been achieved for birds, fish, benthic habitats, non-indigenous species, commercial fish or marine litter, and has only partly been achieved for cetaceans, seals, pelagic habitats, food webs and underwater noise.

The Water Framework Directive (WFD) requires good status to be achieved for rivers, lakes, transitional waters, coastal waters, and groundwaters. In England, 4,655 Water Framework Directive surface waterbodies are assessed each year, in Wales 895, and in Scotland 3,249. This includes rivers, canals, lakes, estuaries and coastal waters. The latest reporting for England indicated that the majority of waterbodies were of moderate status (63.9%), with 16% at high or good ecological status (29% of estuaries and coastal waters). In Wales, the latest reporting indicated that 40% were at high or good ecological status (72.8% of estuaries and coastal waters), and almost half were of moderate status (49.5%). In Scotland, 64% of surface waterbodies were at high or good ecological status (98% of estuaries and coastal waters). Generally, estuaries and coastal waterbodies for England, Wales and Scotland are in better ecological condition than rivers, with a greater percentage of these classified as good or high overall status. When chemical status is considered, no waterbodies achieved good or high status in England, mostly due to the presence of priority substances (ubiquitous, persistent, bioaccumulative, toxic substances). In Scotland, the majority of waterbodies achieved good chemical status, while in Wales a high proportion of rivers and lakes achieved good chemical status, and a lower proportion of estuaries and coastal waters (68.8% and 60.9%, respectively).

WFD protected areas that are within the SEA Study Area include Shellfish Waters, Salmonid waters, Bathing Water sites, areas designated for the protection of habitats and species (water-dependent SACs, SPAs and Ramsar sites), as well as nutrient sensitive areas and drinking water protected areas.

Air

Air quality in GB has generally improved significantly over the last few decades. The UK is obliged to meet limit values for air pollutants, and target values for some pollutants under Air Quality Standards Regulations. During 2023 there were 630 national air quality monitoring sites across the UK, each with different objectives, scope and coverage. For nitrogen dioxide, 34 of 43 zones met the annual limit; for oxides of nitrogen (NOx) all zones met the critical level set. For particulate matter (PM) the limit values were met; the 2020 exposure targets for PM2.5 were met, as well as tighter interim targets set by legislation, including for annual mean concentrations and population exposure. All zones met target values for ozone, set for the protection of human health and for protection of vegetation. However, only one zone met the more stringent ozone objectives for protection of human health, and 13 with objectives for vegetation protection. For other measured air pollutants, all zones met limits set for sulphur dioxide, carbon monoxide, benzene and lead, while

three zones of 43 exceeded the target value for nickel, and two zones exceeded the target value for benzo[a]pyrene. For locations where objectives are not expected to be met by the relevant target date, local authorities declare an Air Quality Management Area; there are currently 440 in England, 29 in Scotland and 44 in Wales; these are set for one or more of the pollutants PM10, nitrogen dioxide, or sulphur dioxide.

The UK National Atmospheric Emission Inventory reports yearly on emissions of important pollutants for England, Wales, Scotland, and Northern Ireland, including greenhouse gases (GHG), regional pollutants leading to acid deposition and photochemical pollution, persistent organic pollutants, and other toxic pollutants such as heavy metals. In England and Scotland, all emissions reported were lower in 2020 than 2005, with the greatest reduction in sulphur dioxide; most levels were also lower in Wales.

The combustion of fossils fuels (e.g., for power generation) emits air pollutants such as sulphur and nitrogen oxides, and this can lead to acids being deposited that can acidify soils and freshwaters. This can negatively affect the properties and function of soils, and in freshwaters can affect what plants and algae can grow, a loss of species that are sensitive to acid from plants to fish and waterbirds.

Climatic Factors

The UK's GHG emissions have reduced by approximately 50% from 1990 to 2022. In 2022, carbon dioxide was the most common emitted GHG across all sectors except agriculture and waste management, and accounted for 80% of GHG emissions, with the largest sources being power generation and road transport. Energy was the sector responsible for the greatest amount of GHG emissions in 2022 (78%).

Human activities have caused warming of the atmosphere, ocean and land. On average this has caused temperatures to rise 1.1oC above preindustrial temperatures. The UK Climate Change Projections anticipate a greater chance of hotter, drier summers and warmer, wetter winters with more extreme weather and rising sea levels. The emphasis for marine projections is on changes in coastal sea levels, including extreme water levels that arise from storm surges and surface waves. These effects of climate change are likely to increase coastal flooding and will require future development to be adaptable or resilient to future climatic changes and its associated impacts.

Carbon sequestration (or Blue Carbon) is the carbon that is captured by ocean and coastal ecosystems and is typically stored in ocean plants and sediments. Blue carbon habitats include mangroves, coastal wetlands, seagrass, and saltmarsh areas. It has been estimated that 244Mt of organic carbon is located in long-term stores across UK seas, only a small portion (around 1.7%) of which is found in coastal vegetated clue carbon habitats, and with these habitats representing only around 1% of the total area of UK seas.

Onshore the natural environment can store a significant amount of carbon in soils, sediment and vegetation. Onshore carbon stores include woodland, trees and shrub, which have the largest carbon sequestration rates within semi-natural habitats, while blanket bogs, raised bogs and fens are the largest carbon stores of all habitats.

Material Assets

Given the geographic scope of the HND Implementation Plan, there is the potential for interaction (e.g., damage, disruption or access restrictions) between the offshore infrastructure proposed in the draft plan and areas containing marine infrastructure throughout GB waters and potential for interaction with other users of the marine area.

There are numerous submarine power and telecommunications cables located within GB waters. This includes 19 operational sub-sea power cables, of which 11 are domestic links or interconnectors and eight are international interconnectors, and 20 that are currently proposed or under construction. There are a significant number of telecommunications cables, including 56 major systems connecting GB to other areas; these cables carry a substantial portion of the global internet traffic.

Offshore oil and gas have contributed significantly to the UK's energy sector for decades. This industry is mainly located around the North Sea, west of the Shetland Isles and the East Irish Sea and there are currently 381 petroleum licenses and 272 hydrocarbon fields in GB waters. There is a range of infrastructure associated with this industry, including offshore platforms and a significant number of major pipelines to coastal landfalls, with over 2,000 in GB waters. Carbon dioxide storage is currently at an early stage of development, with 28 appraisal and storage licences. There is one operational offshore gas storage facility located off East Yorkshire, and another planned in the East Irish Sea.

Offshore wind is advanced in GB waters, with over 80 wind farms operational or in planning/development. The majority of the 43 fully commissioned wind farms are located off the east coast of GB. The Crown Estate have agreements for eight tidal energy sites in GB waters, seven of which are off the coast of Wales, and for two wave energy sites. Crown Estate Scotland has ten agreements for tidal energy and three for wave energy in Scottish waters. Offshore meteorological equipment includes those in permanent locations such as eleven moored buoys and seven systems on lightships and islands, and there are also 33 Met Office observation sites around the GB coastline.

There is a significant quantity of existing onshore infrastructure that could interact with the onshore elements of the HND Implementation Plan. The road network, consisting of major roads (motorways and A roads) and minor roads (B roads, C roads and U roads) altogether includes approximately 395,416km of public road. The mainline railway covers a distance of 15,846km, of which 39% is electrified, and includes 2,585 stations.

Electricity generation in the UK is sourced from various fuels including fossil fuels, nuclear power, renewables and other fuels. There are 63 fossil fuel power stations in GB, with an installed capacity of 32,996MW. There are six nuclear power stations in GB with an installed capacity of 6848MW. The UK's National Electricity Transmission System is formed mainly of three separately owned but connected transmission systems and a number of offshore transmission lines, with a common system operator, the National Energy System Operator. The transmission system is managed by three companies: the National Grid Electricity Transmission (NGET), which manages the network in England and Wales; Scottish Power (SP) Transmission, which manages the network across central and

southern Scotland; and Scottish and Southern Electricity Networks (SSEN), which manages transmission across northern Scotland.

The gas National Transmission System in Britain is owned, operated and managed by National Gas Transmission plc (National Gas), with over 8,000km of pipeline and 500 above-ground installations across GB. The onshore oil pipeline consists of several key pipeline systems operated by various companies which transport crude oil, refined products and natural gas liquids across different regions. In total, there are over 3,000km of oil pipelines. Oil is fed into the oil pipeline system via the seven oil terminals on GB. The oil network connects the six major oil refineries and around 60 terminals.

There is significant onshore wind infrastructure throughout GB, including 2,654 operational onshore wind farms that have an onshore capacity of 15,714MW. These are primarily located in Scotland. There are currently approximately 1,334 operational solar farms in GB with an installed capacity of around 9,185MW, primarily concentrated in England. There are currently 95 operational Hydropower facilities in GB with an installed capacity of 620MW, mainly located in Scotland. There are 81 biomass sites across the UK with an installed capacity of 4,143MW, the majority of which are in England. There are renewable energy technology types which may also fall under the umbrella of waste management infrastructure, these include anaerobic digestion, Energy from Waste and Advanced Conversion Technologies (e.g. gasification). There are 143 anaerobic digestion sites throughout GB with an installed capacity of 322MW, 60 operational EfW plants in GB which have an installed energy capacity of 1,480MW, and 19 Advanced Conversion Technology plants across GB with an installed capacity of 227MW.

The waste management infrastructure in GB includes local and national systems designed to handle household, commercial and industrial waste. There are approximately 540 active landfill sites throughout GB. Facilities such as incinerators, Energy from Waste, anaerobic digestion plants and advanced technology conversion facilities are distributed throughout GB in both inland and coastal locations, however, these are mainly located near major urban centres or industrial areas.

The water treatment infrastructure in GB is extensive, and includes Water Treatment Works (WTWs), Wastewater Treatment Works (WwTWs), desalination plants, sewerage systems and stormwater management systems. WTWs and WwTWs are located close to population centres; with WTWs mostly inland, however many WwTWs are at coastal locations. Desalination plants are also located close to the coast as they use seawater, and there are currently 96 in the UK.

Commercial ports are important for UK trade, and there are 51 ports considered as major ports, including 28 located in England, 11 in Scotland and seven in Wales. Major ports accounted for the majority of all UK traffic in 2023, handling 425.9 million tonnes (98%). In terms of shipping, the highest vessel densities are located in the English Channel, which is one of the world's busiest shipping routes, linking the North-West Atlantic to the North and Baltic Seas, with high densities also found on the east coast off England, particularly on approach and within the Thames Estuary, and within routes to the River Humber. Some of the world's busiest shipping routes are contained within the North Sea. There are 18 Traffic Separation Schemes surrounding GB, two deep water shipping routes, and one two-way

route located in the English Channel. There are also seven areas to be avoided, nine precautionary areas, three recommended tracks and four inshore traffic zones, as well as 32 Marine Environmental High-Risk Areas.

Commercial fishing is a significant industry in GB and is based largely around major commercial fishing ports in Scotland (Lerwick, Peterhead) and England (Newlyn and Brixham). In 2023, there were 5,418 registered fishing vessels in the UK, of which 48% were English vessels, 37% were Scottish, and 7% were Welsh. Together the UK fleet landed a total of 719 tonnes of fish worth approximately £1.10 billion into UK ports and abroad in 2023. Aquaculture is a growing industry in GB, worth £1 billion, with 217,000 tonnes of fish and shellfish farmed, in 2021. In Scotland this is mainly salmonid production and dominated by a few large companies, while in England and Wales this is largely shellfish and carried out by smaller enterprises.

Military activity occurs throughout the UK, and much of the coastline is used by the Ministry of Defence (MoD). Much activity occurs offshore, mostly by the navy through the use of practice and exercise areas (PEXAs) for submarine, general surface, fleet and aircraft exercises; there are currently 98 PEXAs. There are also 99 Danger Areas within which live firing may take place and where airspace restrictions may apply. Military radar systems are critical to the UK's air defence capabilities, and there are nine Remote Radar Head sites located in GB. Onshore, there are 6 regional training areas covering the whole of the UK, within which there are 49 live MoD Military Areas located in GB, including training areas, firing ranges or air weapons ranges.

There are over 60 passenger airports which the UK Civil Aviation Authority obtains data on. The majority of the busiest airports in the UK in 2023 were located in England, particularly Heathrow and Gatwick. The busiest airport in Scotland was Edinburgh and in Wales was Cardiff. Airports have safeguards against developments that could be a hazard to aircraft, including the use of Obstacle Limitation Surfaces, which are typically 15km from an airport.

Licenced sites for waste disposal at sea are generally in inshore waters, with approximately 110 open sites off the coast of England, 63 off the coast of Scotland and 13 off the coast of Wales. Most sites receive chemically unchanged geological material that has been taken from the nearby coastline. Marine aggregates (sands and gravels used for development) are extracted under licence from The Crown Estate and Crown Estate Scotland. There are currently seven regions in England and Wales from which marine aggregates are sourced. These include The Humber; The East Coast; The Thames Estuary; The East English Channel; the South Coast; The South West and The North West.

GB is an important producer of a range of minerals that are consumed in many sectors of the economy. In 2022, around 185.9 million tonnes of minerals were extracted from the UK landmass for sale of which 68% was crushed rock (for both construction and industrial use), 21.7% was sand and gravel, 3.5% was other construction materials, 0.4% was coal, and 0.8% was oil and gas (oil equivalent). There are over 2000 active mines and quarries in the UK.

The agriculture industry in the UK covered 70% of the UK land total in 2023 (equal to 17 million hectares of land), employing 462,000 people and contributing 0.56% (equal to £13.7 billion) to the UK economy. The area of woodland in GB is estimated to be 3.16 million

hectares, of which 48% is in Scotland, 42% is in England, and 10% is in Wales. Around 25% of woodland in GB is owned or managed by Forestry England, Forestry and Land Scotland, Natural Resources, whilst the remaining 75% is privately owned.

Tourism represents an important source of income for the GB economy, with the quality of the environment, heritage and culture throughout Scotland, England and Wales having strong national and international appeal. The coastlines of England, Scotland and Wales have a developed tourist infrastructure and a number of coastal attractions.

Cultural, Architectural and Archaeological Heritage

WHS are areas designated by UNESCO as they are considered to have globally important cultural or natural interest; there are currently 35 WHS in the UK, of which there are 18 in England, four in Wales and seven in Scotland.

In England, there are currently 379,545 entries for listed buildings recorded on the National Heritage List for England (NHLE), while in Wales there are 30,118 records for listed buildings recorded by Cadw, and in Scotland there are currently 47,632 listed buildings. In England, there are currently 19,990 entries for Scheduled Monuments on the NHLE, in Wales, there are currently 4,232 recorded by Cadw, and in Scotland, there are currently 8,348 listed by Historic Environment Scotland (HES). There are five areas currently designated as an Area of Archaeological Importance, the historic centres of Canterbury, Chester, Exeter, Hereford, and York. There are currently 1,716 designed landscapes on the NHLE in England, 385 Registered Parks and Gardens recorded by Cadw in Wales, and 390 Gardens and Designed Landscapes in the Inventory of Gardens and Designed Landscapes in Scotland. There are 47 sites on the Register of Historic Battlefields in England and 40 sites on the Inventory of Historic Battlefields in Scotland. Conservation Areas are areas recognised as being of special architectural or historical interest. There are almost 10,000 Conservation Areas in England, 529 in Wales, and over 600 in Scotland. There are 58 Registered Historic Landscapes recorded in Wales.

In GB waters, all crashed military aircraft (known as Military Maritime Graves) as well as certain vessels are designated. Wreck sites are generally defined as sunken ships and aircraft, and any material associated with such vessels. There are many thousands of shipwrecks that lie off the GB coastline, and likely to be undiscovered wrecks in offshore waters. Some of these wreck sites have legal protection; this includes 57 protected wreck sites listed on the NHLE in English waters, six protected wrecks in Welsh waters, and eight Historic Marine Protected Areas (HMPAs) in Scottish waters. Important wreck sites can also be designated as Scheduled Monuments.

As sea levels have changed through GB history, there are areas currently submerged that would have been settled in the past by early humans, and areas that would have formed migration routes in the past. There are submerged palaeo-landscapes and archaeological artefacts that can inform human prehistory of the area.

Landscape, Seascape and Visual Amenity

The value of the GB landscape is recognised through statutory designations and non-statutory classifications. There are 34 National Landscapes in England (formerly known as

Areas of Outstanding Natural Beauty or AONBs) and five in Wales, while there are currently 40 National Scenic Areas (NSAs) in Scotland. There are three UNESCO WHS within GB designated fully, or in part, for their natural interest features: Dorset and East Devon Coast in England, and The Flow Country and St. Kilda in Scotland. National Parks have been established as statutory designations in England, Wales, and Scotland. There are 32 Heritage Coasts in England and 14 in Wales, which are defined and managed by local authorities to protect coastlines from insensitive developments. Local Landscape designations are also defined by local authorities in England, Wales and Scotland as locally important landscapes, provided protection through the planning system. Country Parks are also primarily established and managed by local authorities, with 415 in England, 37 in Wales and 40 in Scotland. There are 42 Wild Land areas in Scotland, representing extensive areas of high wildness with national importance in Scottish Planning Policy. In England and Wales, long distance walks through high-quality landscapes are known as National Trails; there are 20 managed by Natural England and Natural Resources Wales (NRW). In Scotland, similar long-distance walking routes are called Scotland's Great Trails; there are 29 managed by NatureScot. Lands owned and managed by the National Trust are also present across GB.

Landscape Character Areas have been defined in each GB jurisdiction, recognising areas of distinct and recognisable character. In England, there are 159 National Character Areas that have been defined by Natural England; in Wales, there are 48 National Landscape Character Areas defined by NRW and Special Landscape Character Areas identified by local authorities; in Scotland, there are 30 Regional Landscape Character Area studies commissioned by NatureScot, with updates through the 2019 Landscape Character Area map and associated Landscape Character Type Descriptions. Seascape Character Areas have also been described: in England, National Marine Character Area mapping has been produced, divided into 63 Marine Character Areas; in Wales, NRW identified the broad-scale character of the seascapes of Wales and divided these seascapes into 29 Marine Character Areas; similarly in Scotland, 13 National Coastal Character Types have been identified at a broad scale.

Review of Relevant Plans, Programmes and Policies

A review of the Plans, Policies and Programmes relevant to the draft HND Implementation Plan at International, European, National, Regional and Sub-Regional scales is reported in Section 4. This exercise was carried out to establish the context of the HND Implementation Plan, with regard to other Plans and Programmes. In particular, the environmental protection objectives and standards included within these Plans and Programmes that will directly influence, or be influenced by, the HND Implementation Plan need to be considered.

Review of HND Infrastructure Works

Offshore Corridor

Cables that export renewable energy from offshore wind farms require connections from the offshore wind farm array to the shore. This usually requires many cables (typically up to 12) for a development. These export cables can be of two types, high voltage alternating current (HVAC) or high voltage direct current (HVDC). Cables that are part of the same development need to have space between them (typically around 50-100m) to reduce the risk of damage during installation and maintenance. This means that the application areas for cable licences tend to be wide (around 1km) to provide for this spacing as well as any micro routing that is needed.

For the purposes of strategic assessment in the draft HND Implementation Plan, some assumptions have been made about the offshore study corridor e.g., the power that AC and DC cables can take, cable separation distances, numbers of cables in each trench. The offshore study corridors considered in the draft HND Implementation Plan are 5km across.

Installation of the export cables involves several activities, including laying, burial and protection of cables and associated vessel movements and anchoring, use of horizontal directional drilling (HDD), and the operation, maintenance and decommissioning of cables. Preparation of the seabed may be needed before cables are laid, which may include pre-sweeping, the use of grapnels, clearance of boulders and removal of unexploded ordnance. Laying of cables in trenches at approximately 1-3m depth provides for their protection from the environment and from other marine activities. Trenches can be made before or during cable laying through cutting, ploughing or jetting and are usually filled after cables are laid. In some cases, there may be a need for external protection of cables e.g., rock or mattress protection, for instance where the cables cannot be buried to a sufficient depth, or where they need to cross other cables or pipelines.

These activities associated with cabling laying at sea can have environmental pressures, including removal or abrasion of the seabed, physical changes in the type of seabed, changes in suspended solids, changes in water flow including sediment transport and smothering of the seabed due to siltation.

Landfall

Where an export cable makes landfall, this may involve trenching or the use of trenchless installation techniques. For trenching, the trench is first excavated through the beach, then the cable is floated ashore and laid in the trench and the trench is then refilled with the excavated material. HDD involves drilling underground and installing ducts that the cables can then be pulled through. This method can be used where the land type makes trenching difficult, or where there are sensitive habitats or infrastructure present that should be avoided. At sea, HDD involves the digging of exit pits and can reduce the need

for cable protection. HDD typically needs cables to be separated by around 30m and the maximum length over which HDD can be used is around 1.5km.

Onshore Corridor

For laying cables onshore, a corridor of around 40-60m width running from the landfall location to the onshore substation is considered, to account for the cable route itself and the wider construction needs. Typically, this involves the digging of trenches, temporary storage of the excavated material, laying of cables, backfilling of the trench and then reinstatement of the site. HDD may be used to lay cables beneath roads and rivers.

Onshore Terminus

Platforms or other marine structures that are needed to house the offshore substation (where the cable type is AC) or converter station (where the cable type is DC) will be located within the lease areas for offshore wind farms, and the potential for environmental effects associated with these is not within the scope of this plan.

Assessment Methodology

Assessment Approach and Strategic Environmental Objectives (SEOs)

Assessment of the draft HND Implementation Plan comprised an assessment of the baseline environmental information available against the high-level objectives and potential issues. This method involved an assessment against the following SEA topics:

- Biodiversity, Flora and Fauna (BFF)
- Population and Human Health (PHH)
- Geology, Soils and Land Use (GSL)
- Water (W)
- Air (A)
- Climatic Factors (CF)
- Material Assets and Infrastructure (MA)
- Cultural, Architectural and Archaeological Heritage (CH)
- Landscape, Seascape and Visual Amenity (L)

The purpose of this was to predict and evaluate, as far as possible, the environmental effects of the draft HND Implementation Plan, highlighting any significant environmental problems and/or benefits that are likely to arise from its enactment.

Non-Spatial Assessment of Cabling and Onshore Infrastructure

To simplify the assessment process and avoid repetition during the assessment of each proposal, the types and severity of high-level impacts that cabling (i.e., offshore cabling and onshore underground cabling) and onshore infrastructure (substations and converter stations) can have on sensitive features within each SEA topic was considered.

Assessment of Recommended Designs

There were a significant number of potential route corridors, and combinations of these route corridors that were grouped into Options, that were initially considered in the process of network design. This included consideration of environmental and community constraints and sensitivities within these areas. The outcome of this process was the identification of a Recommended Design for each of the four HND / HNDFUE work strands.

The SEA considered these work strands in the order in which they were developed, which allowed for the consideration of projects that may progress from the earlier work strands in the assessment of later work strands, where they could have environmental impacts in combination with each other within the same geographic area. Alternative route corridors that were considered through the HRA and MCZ processes were also considered within the SEA appraisals. A summary assessment also considered the full Recommended Design of the draft HND Implementation Plan, including the identification of the potential for cumulative effects across SEA topics.

The Recommended Designs of the draft HND Implementation Plan were assessed in terms of their potential effects, and the significance of these effects, on the environment against a set of Strategic Environmental Objectives (SEOs). These SEOs were developed in the context of broader environmental protection objectives set at both international and national levels. The SEOs, Indicators and Targets used are given in Table 1. The assessment examined the likely significant effects of the Recommended Designs set out by the draft HND Implementation Plan, and how their realisation can help to achieve these SEOs.

Strategic Environmental Objectives

SEA Topic	Objective	Objective Description	Indicators	Targets
Biodiversity, Flora and Fauna	Avoid damage to, and where possible enhance, biodiversity, flora and fauna.	Preserve, protect, maintain and, where possible, enhance biodiversity and ecosystems	Conservation status of designated habitats and species within international and national designated sites (e.g., SACs, SPAs,	No negative change, or a positive change, in the conservation status of designated habitats and species within

SEA Topic	Objective	Objective Description	Indicators	Targets
		within UK marine and coastal areas, including internationally, nationally, and locally protected sites, habitats and species, and other known species of conservation concern. Preserve, protect, maintain and enhance the connectivity between sites and ecosystems.	Ramsar sites, MCZs, NCMPAs, SSSIs). Status of protected and priority habitats and species (e.g., Annex habitats and species, priority habitats and species). Areas of known importance for flora and fauna (e.g., fish spawning and nursery grounds, RSPB Reserves, NRW habitats sensitive to cabling).	international, and national designated sites. No negative change, or a positive change, in the status of protected or priority species and habitats outside designated sites. Avoid areas of known importance for flora and fauna.
Population and Human Health	Minimise disruption to the local population, and adverse effects on human health and wellbeing, while maximizing potential benefit to the population.	Avoid adverse effects on human health and safety and minimise disruption to the local population, and displacement of recreational and leisure use of the area, while supporting transition from fossil fuel use through delivery of a new secure	Population centres in proximity to onshore routes. Areas of higher deprivation in proximity to onshore routes. Use of the area by recreational and leisure users (e.g., RYA areas, Bathing waters) and status of these areas, where applicable.	Delivery of cables and associated infrastructure with minimal adverse nuisance to communities, including in areas of higher deprivation. Minimise the risk to, or displacement of, recreational and leisure users of the area. No negative change, or a

SEA Topic	Objective	Objective Description	Indicators	Targets
		renewable energy supply for the GB population, with potential employment and other benefit opportunities.	Potential to support new renewable energy supply for the GB population, with potential employment and other benefit opportunities.	positive change, in the status of Bathing Waters. Facilitation of renewable energy infrastructure that supports a transition away from fossil fuel use and maximises the potential benefits to the population.
Geology, Soils and Land use	Minimise damage to the function and quality of the seabed, and avoid significant damage to, or loss of, sensitive onshore land and soils.	Preserve, protect, maintain and, where possible, enhance, sites designated for geological or geomorpholo gical features, and minimize direct and indirect damage to the function and quality of the seabed and sensitive onshore land and soils.	Site condition/status of protected geological/geo morphological features within designated sites (WHSs, MCZs/Historic MPAs, SSSIs, UNESCO Geoparks). Interaction with known areas of potential contamination (e.g., MoD live firing areas, munition disposal areas, unexploded ordnance (UXO), dumping grounds offshore).	No negative change, or a positive change, in the condition of protected geological/geo morphological features within designated sites. Minimise potential interaction with areas of potentially contaminated sediments. Minimise potential loss or alteration to seabed geology and sediments. Minimise potential loss of sensitive land and soils

SEA Topic	Objective	Objective Description	Indicators	Targets
			Potential scale of loss or alteration to seabed geology and sediments. Potential scale of loss of soil resource including high-quality agricultural lands and peatlands or other carbon-rich soils.	including high-quality agricultural lands, peatlands and other carbon-rich soils and where possible enhance these areas.
Water	Avoid impacts on the status or quality of water bodies and avoid interaction with areas of flood risk.	Support the objectives of the WFD and MS (Marine Strategy) by avoiding damage to or deterioration of water status, quality and resource and support the objectives of the Floods Directive by avoiding interactions with national flood zones.	Status of WFD water bodies and protected areas (Bathing Waters, Shellfish Waters) interacting with offshore and onshore routes. MS Environmental status of marine area (e.g., Descriptor 5, 8, 9, 10, 11). Interaction with known areas of potential contamination offshore (e.g., MoD live firing areas, munition disposal areas, UXO, dumping grounds).	No negative change in the status of WFD water bodies, and protected areas. No negative change in the Environmental status of MS Descriptors. Minimise potential interaction with areas of potentially contaminated sediments. Minimise the potential for impacts on water quality during construction.

SEA Topic	Objective	Objective Description	Indicators	Targets
			Potential for impacts on water quality during construction. Interaction with areas of known flood risk (national flood zones).	Minimise potential interaction with areas of known flood risk.
Air	Minimise risk to local air quality and contribute to improving national emissions.	Minimise risk to local air quality and contribute to improving national pollutant emissions.	Sensitive receptors in proximity to routes (e.g., population centres onshore, areas of high recreational/leisure use offshore). Interaction with areas of known air quality issues onshore (e.g., Air Quality Management Areas) Capacity to support new renewable energy connection, with potential effects on pollutant reduction.	Minimise the potential for negative effects on air quality from vessel emissions and onshore emissions. Avoid interaction with areas of known air quality issues onshore. Facilitation of renewable energy infrastructure that supports a transition away from fossil fuel use and maximises the potential for a reduction in air pollutant emissions.
Climatic Factors	Avoid impacts on carbon stocks and potential while contributing to	Minimise loss of carbon sequestering seabed and terrestrial	Interaction with areas of known or potential blue carbon habitats.	Minimise the potential for loss of known blue carbon habitat.

SEA Topic	Objective	Objective Description	Indicators	Targets
	a reduction in GHG emissions.	carbon sinks while contributing to a reduction in GHG emissions from the energy supply sector in line with national commitments.	Interaction with onshore habitats that are carbon sinks (peatlands, forests). Capacity to support new renewable energy connection, with potential effects on GHG reduction.	Minimise the potential for loss of onshore habitats that function as carbon sinks. Facilitation of new renewable energy infrastructure that maximises the potential for a reduction of GHG emissions in line with emission reduction targets.
Material Assets and Infrastructure	Minimise disruption to other assets and infrastructure while providing robust new renewable energy infrastructure.	Provide robust new renewable energy infrastructure while minimising disruption to other assets and infrastructure.	Presence of offshore and onshore coastal infrastructure (e.g., cables, pipelines, roads, WWTWs). Interaction with other users of the marine area (shipping, fisheries and Shellfish Waters, military, aviation, dredging sites). Potential capacity of new renewable energy infrastructure facilitated.	Minimise the potential for loss or damage to other marine, coastal, and onshore infrastructure. Minimise the risk to, or displacement of, other users of the area (fisheries and aquaculture, shipping, military activities, aviation, dredging sites). Facilitation of new renewable energy infrastructure

SEA Topic	Objective	Objective Description	Indicators	Targets
				that maximises the potential energy output in line with government targets to decarbonise the power system by 2030.
Cultural, Architectural and Archaeological Heritage	Protect, conserve, and where possible enhance designated and non-designated heritage assets and their settings.	Protect international, national and local heritage designations, and non-designated heritage assets, and their settings.	Interaction with known designated / non-designated marine heritage features/sites (e.g., protected wrecks, Historic MPAs). Interaction with known designated / non-designated coastal archaeological or architectural heritage features (e.g., listed buildings, scheduled monuments). Potential to contribute to archaeological knowledge through surveys and actions.	Avoid or minimise the potential for effects on known designated marine heritage features/sites. Minimise the potential for effects on known heritage features and their setting in development and operation of onshore infrastructure. Potential for gaining new knowledge to inform subsequent decision-making.
Landscape, Seascape and Visual Amenity	Protect, and where possible enhance, the landscape and seascape	Protect and where possible enhance the landscape	Potential for effects on visually sensitive designated areas (e.g.,	No long-term negative change, or a positive change, to areas

SEA Topic	Objective	Objective Description	Indicators	Targets
	character and visual amenity of the GB shoreline.	and seascape character and visual amenity of the GB shoreline.	National Landscapes, WHSs). Population centres in proximity to onshore routes.	designated for landscape. Delivery of cabling and associated onshore infrastructure with minimal adverse visual effects to communities.

Table 1: Strategic Environmental Objectives

Consideration of Alternatives

Alternatives Considered during the Development of HND

As described previously, a significant number of potential route corridors, and combinations of these route corridors that were grouped into Options, were initially considered in the process of network design for the four HND/HNDFUE work strands, that informed the choice of Recommended Designs for each. This process considered environmental, community and technical constraints and sensitivities - these represent the environmental topics that are considered in SEA and how cabling activities may impact key areas or features that should be avoided. All of the alternative route corridors and Options that were technically possible were considered and environmental and community factors influenced which ones were short-listed.

There was a total of 112 route corridors, 31 Options, and 39 interface areas short-listed, and an SEA light assessment was undertaken for each of these. This assessment was based on the key indicators for each SEA topic (areas or features of importance) and identified the potential for effects on these as well as the types of effects (e.g., when there are likely to happen and how significant they are likely to be). The SEA light assessment of all short-listed route corridors, options and interface areas is provided in Appendix F.

Strategic Alternatives

Two strategic-level alternatives were considered and assessed in Section 7. These are summarised below:

Alternative 1 - *Do Nothing approach – considers the existing approach to connection of offshore wind generation sites, whereby those awarded leasing rights for offshore wind*

apply for connection to the onshore electricity network independently and on a first come, first served, basis.

Without the draft HND Implementation Plan, the development of offshore wind and its connection to the onshore electricity network would continue to contribute to the future needs of increased energy and Government targets to reach net zero emissions. Without the draft plan, the development of offshore transmission assets that are needed to bring the energy generated onshore would continue to be controlled by individual developers, with individual connections from each offshore project to the onshore network, known as radial connections.

There is the potential for short to medium-term, negative effects on the SEOs for Biodiversity, Flora and Fauna; Geology, Soils and Land Use; Population and Human Health; Water; Cultural Heritage; and Material Assets, and potential for long-term negative effects on the SEOs for Material Assets; Air; Climatic Factors; Cultural Heritage; and Landscape and Visual Amenity, where radial connections continue and there is no strategic level consideration of sensitive areas and features. There is potential for long-term positive effects on the SEOs for Material Assets, Air, Climatic Factors and Population and Human Health, owing to the development of new renewable energy infrastructure, increased connection of offshore wind to the electricity network to meet population demand and offer alternative to fossil fuel electricity generation with indirect positive effects on air and climatic emissions. There is also the potential for short-term negative effects on the SEOs for Material Assets, as continued radial connection may lead to an increased interaction with existing and planned infrastructure both offshore and onshore, such as cables, pipelines and roads. There is also potential for long-term negative effects on the SEOs for Material Assets and Population and Human Health, as continued radial connection may lead to saturation of some areas for connection to the onshore grid so that new connections cannot be made, and potential for long-term negative effects on the SEOs for Air and Climatic Factors, as less connection of renewable energy sources would contribute to the continued reliance on fossil fuels and their associated air emissions.

Alternative 2 - *HND/HNDFUE network design approach – considers all Recommended Designs established by the four HND/HNDFUE work strands, representing a more coordinated approach to the connection of offshore wind sites to the onshore electricity network.*

The assessment of implementing the Recommended Designs of the HND Implementation Plan has been undertaken in Section 9.

In this case, there is still the potential for short to medium-term negative effects across the SEOs for all SEA topics. However, as environmental sensitivities are considered throughout the development of the draft Plan and selection of Recommended Designs, these potential effects should be minimised. This includes avoidance of designated sites, and areas protected for heritage and landscape importance. With greater coordination in the connection of offshore wind to the onshore electricity network, there is a greater possibility of maximising the potential for positive long-term effects. In comparison to Strategic Alternative 1, there is a reduced likelihood that routes to shore will become

saturated for development and greater potential for direct long-term positive effects on the SEOs for Material Assets, and indirect long-term positive effects on the SEOs for Air, Climatic Factors and Population and Human Health.

Non-Spatial Environmental Assessment

Section 8 provides a description of the potential high-level effects that cabling (i.e., offshore cabling and onshore underground cabling) and onshore converter stations and substations can have on sensitive features within each SEA topic, including during installation, operation and decommissioning.

For Biodiversity, Flora and Fauna, the main effects identified at a strategic level for offshore and onshore cabling are described under the following sub-topics: designated sites; benthic habitats and species; fish and shellfish; marine mammals and reptiles; and birds and bats.

For Population and Human Health, the main effects identified at a strategic level for offshore and onshore cabling are described under the following sub-topics: human health; energy supply; and population, property and community spaces. The main effects identified at a strategic level for onshore substations and converter stations are described under the following sub-topics: human health; economic; social; energy supply; and population, property and community spaces.

For Geology, Soils and Land use, the main effects identified at a strategic level for offshore and onshore cabling are described under the following sub-topics: geology, geomorphology, soil and sediment processes; land use; and contaminated land. The main effects identified at a strategic level for onshore substations and converter stations are described under the following sub-topics: geology and geomorphology; land use; soils; and contaminated land.

For Water, the main effects identified at a strategic level for offshore and onshore cabling are described under the following sub-topics: water quality; and flood risk. The main effects identified at a strategic level for onshore substations and converter stations are described under the following sub-topics: water quality; water quantity; flood risk; abstraction; and private water supplies.

For Air, the main effects identified at a strategic level for offshore and onshore cabling and for onshore substations and converter stations are described under the sub-topic of air quality.

For Climatic Factors, the main effects identified at a strategic level for offshore and onshore cabling and for onshore substations and converter stations are described under the following sub-topics: GHG emissions and carbon storage; and climate change effects.

For Material Assets, the main effects identified at a strategic level for offshore and onshore cabling are described under the following sub-topics: existing infrastructure: cables and pipelines; other users: commercial fisheries and aquaculture; other users: shipping and navigation; other users: commercial forestry; other users: military activities; other users: disposal areas; other users: ports and harbours; other users: mineral resources and aggregate extraction; other users: tourism; other users: aviation; other users: road network users; and other users: agriculture. The main effects identified at a strategic level for onshore substations and converter stations are described under the following sub-topics: existing Infrastructure: cables, overhead lines and pipelines; other users: agriculture; other users: commercial forestry; other users: mineral extraction; other users: aviation; other users: road network users; other users: military activities; and other users: tourism.

For Cultural Heritage, the main effects identified at a strategic level for offshore and onshore cabling are described under the following sub-topics: archaeology and wrecks (offshore cabling) / terrestrial archaeology and heritage (onshore cabling). The main effects identified at a strategic level for onshore substations and converter stations are described under the following sub-topics: archaeology; and heritage.

For Landscape, Seascape and Visual Amenity, the main effects identified at a strategic level for offshore and onshore cabling and for onshore substations and converter stations are described under overall topic area of landscape, seascape and visual amenity.

Environmental Assessment of Recommended Designs

The Recommended Design for the draft HND Implementation Plan includes the following elements:

- The Recommended Design for HND
- The Recommended Design for HNDFUE Scotwind
- The Recommended Design for HNDFUE Celtic Sea
- The Recommended Design for HNDFUE INTOG

The potential environmental effects from implementing each of these Recommended Designs, as well as all Recommended Designs combined, is considered and assessed in Section 9.1.

HND Recommended Design

The Recommended Design for HND includes the proposed connections detailed in Table 2 and shown in Figure 3.

Start Point	End Point	Interface Requirements	Capacity
R4_4 (Mona)	Bodelwyddan	1 AC Substation	1500MW HVAC
R4_5 (Morecambe)	Penwortham	1 AC Substation	480MW HVAC
R4_6 (Morgan)	Penwortham	1 AC Substation	1500MW HVAC
SW_W1 (Machair)	Ballantrae Tee	Busbar Station	2000MW HVDC
Ballantrae Tee	Kilmarnock South	1 DC Converter Station	2000MW HVDC
Ballantrae Tee	Pentir	1 DC Converter Station	2000MW HVDC
R4_1 (Dogger Bank South West)	Birkhill Wood	1 DC Converter Station	1440MW HVDC
R4_2 (Dogger Bank South East)	Birkhill Wood	1 DC Converter Station	1440MW HVDC
R4_3 (Outer Dowsing)	Weston Marsh	1 AC Substation	1500MW HVAC
PA_1 (Dogger Bank D)	Birkhill Wood Alternative	1 DC Converter Station	1440MW HVDC
PA_2 (Berwick Bank)	Near Blyth	1 DC Converter Station	1800MW HVDC
SW_NE4 (Caledonia)	New Deer	1 AC Substation	1500MW HVAC
SW_NE7 (Marram)	Peterhead 2 / DCSS	1 DC Converter Station	1500MW HVDC
SW_E1a (Morven)	Hurlie	1 DC Converter Station	2000MW HVAC
SW_E1a (Morven)	Hawthorn Pit	1 DC Converter Station	1800MW HVDC
SW_E1a (Morven)	Lincolnshire Connection Node	1 DC Converter Station	1800MW HVDC
SW_E1b (Bell Rock)	Morven	N/A	1200MW HVAC
SW_N1 (West of Orkney)	Banniskirk/Spittal	1 AC Substation	2250MW HVAC
SW_N4 (Spiorad na Mara)	Arnish	1 AC Substation	740MW HVAC

Table 2: HND Recommended Design proposed connections

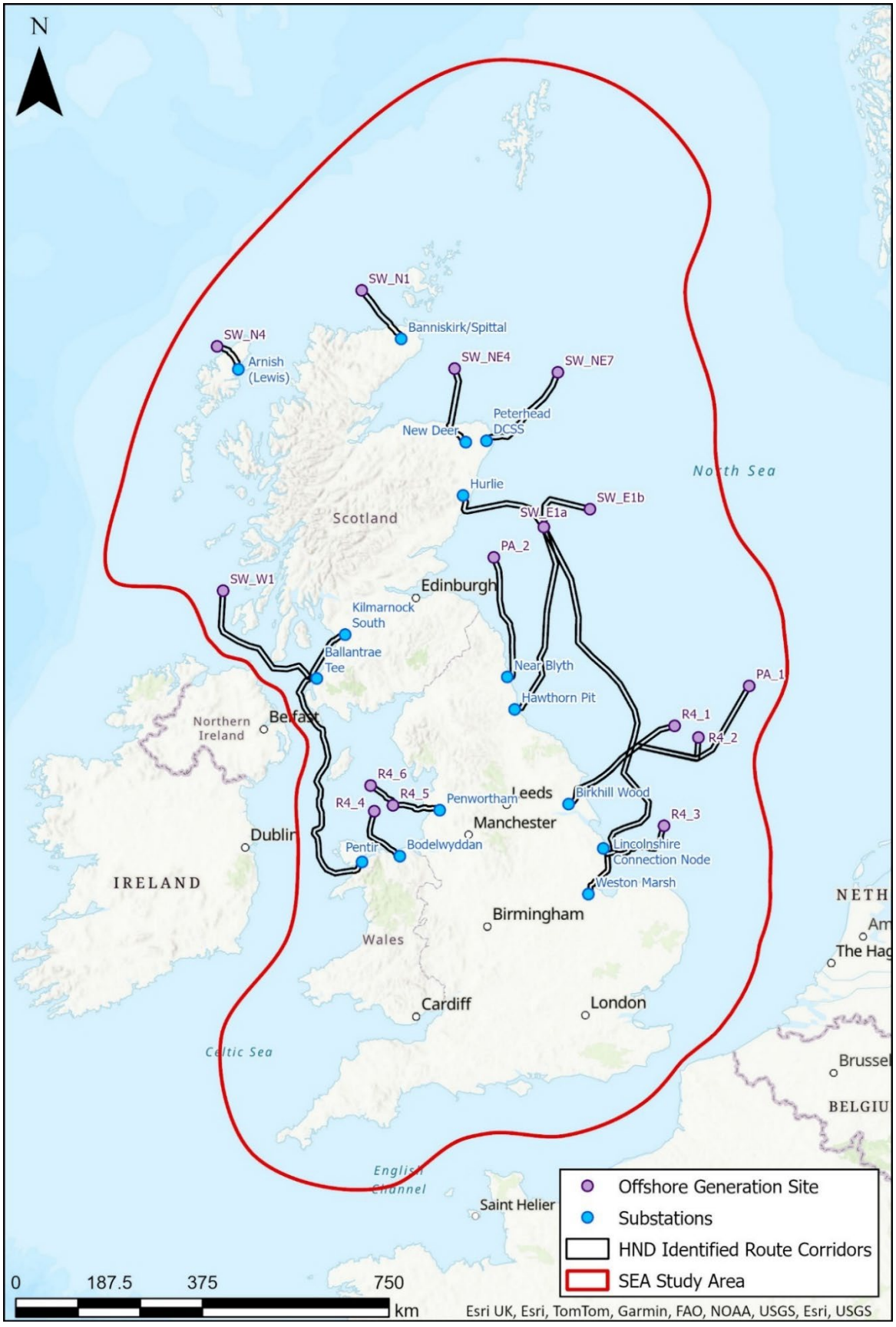


Figure 3: HND Recommended Design Study Area

Assessment of the HND Recommended Design against SEOs is summarised in Figure 4.

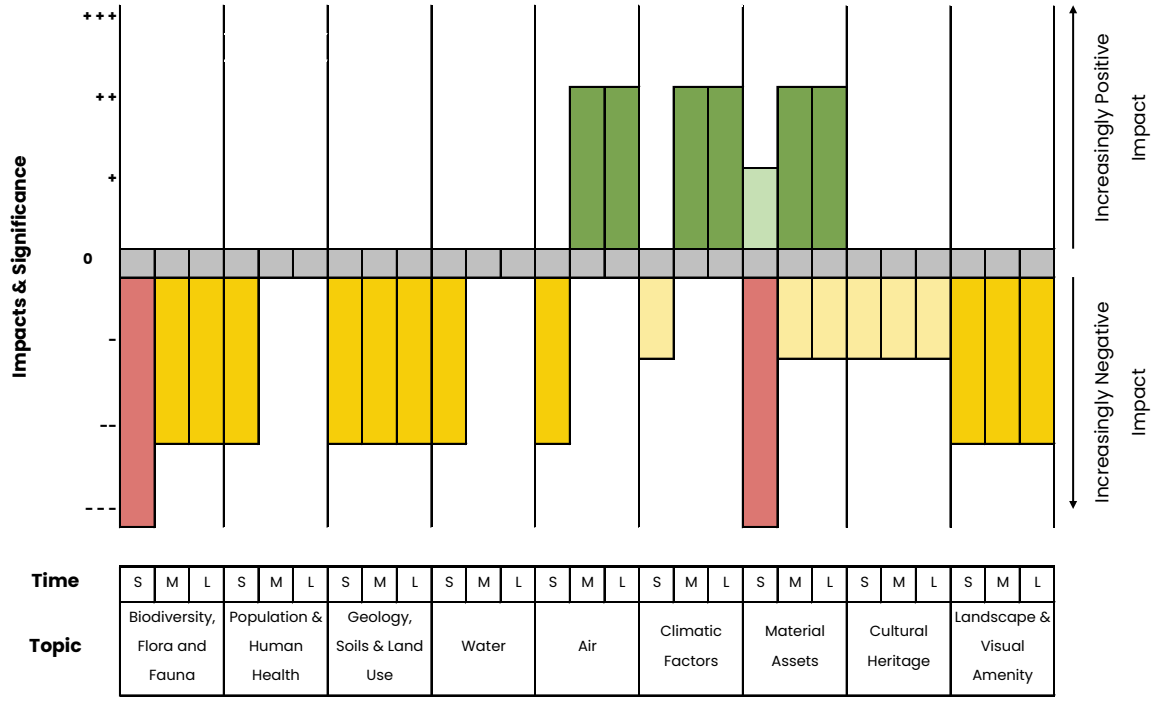
The assessment identified the potential for significant short-term negative effects on Biodiversity, Flora, and Fauna, owing to the potential for direct effects on designated European sites that are not possible to avoid within the identified route corridors, as well as potential direct and indirect effects on other sensitive areas. The unavoidable designated sites include the SACs of North Anglesey Marine, Afon Gwyrfai a Llyn Cwellyn, Dogger Bank, Southern North Sea, Inner Dowsing, Race Bank and North Ridge, Berwickshire and North Northumberland Coast, and River Thurso; the SPAs of Liverpool Bay, Greater Wash, Northumberland Marine and Lewis Peatlands; the Ramsar site of Lewis Peatlands; the nature conservation MPAs of Clyde Sea Sill and Southern Trench; the MCZs of Fylde and Berwick to St Mary's; and the SSSIs of Afon Gwyrfai a Llyn Cwellyn and Northumberland Shore.

The potential for moderate short-term negative effects on Geology, Soils and Land use, was also identified as there are designated sites for geology/geomorphology that cannot be avoided. The potential for moderate negative effects on Biodiversity, Flora and Fauna and Geology, Soils and Land use in the medium and long-term was also identified as there are sensitive habitats and geomorphological features that are not avoidable at this strategic stage, where impacts form cabling may be long-term to permanent e.g., Annex I reefs.

The potential for significant short-term negative effects on Material Assets was identified due to the large quantity of unavoidable infrastructure encountered by the route corridors, including cable and pipeline crossings, particularly within the offshore part of routes, and potential for effects on shipping and navigation, in addition to effects on fishing activity, military areas, and onshore land use. Negative effects on Material Assets are expected to be slight in the medium to long-term. The potential for short to long-term moderate negative effects on Landscape and Visual Amenity was identified, owing to unavoidable interaction with areas of landscape importance and sensitive landscape character. The potential for slight to moderate short-term negative effects was also identified for Water, Air, Climatic Factors and Cultural Heritage during the construction phase.

The potential for slight positive effects in the short-term and moderate positive effects in the medium to long-term during operation was identified for Material Assets owing to the potential to connect 29.9GW of renewable energy generation to the GB grid. Moderate positive medium to long-term effects on Air and Climatic Factors are also identified due to the associated reduction in reliance on fossil fuel generation and resulting emissions with the increased availability of renewable energy.

The potential for cumulative effects was also identified for all SEA topics. An assessment was also made for the alternative routes that were considered as part of the HRA derogation Report.



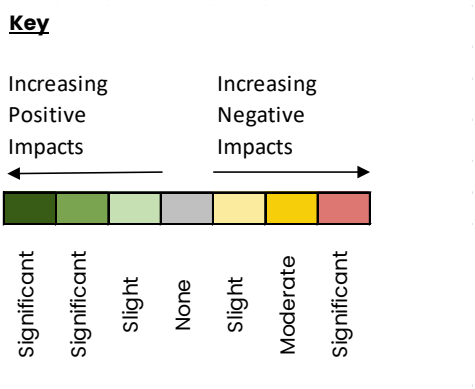


Figure 4: HND Recommended Design summary scoring chart

HNDFUE Scotwind Recommended Design

The Recommended Design for HNDFUE Scotwind includes the proposed connections detailed in Table 3 and shown in Figure 5.

Start Point	End Point	Interface Requirements	Capacity
SW_N3 (Talisk)	Arnish	1 Developer AC Substation	500 HVAC
SW_N2 (Havbredey)	Dounreay	1 AC Developer Substation	1,500 HVAC
SW_NE2 (Ayre)	Banniskirk	1 AC Developer Substation	1,050 HVAC
SW_NE3 (Stromar)	New Deer 2/Greens	1 AC Developer substation, 1 AC Transmission Owner (TO) Substation	1,000 HVAC
SW_NE4 (Caledonia)	New Deer	1 AC Developer Substation	550 HVAC
SW_NE6 (Broadshore)	Peterhead 2 / DCSS	1 AC Developer Substation	1,000 HVAC
SW_NE7 (Marram)	Peterhead 2 / DCSS	1 DC Developer Connection	1,500 HVAC
SW_NE8 (Buchan)	Peterhead 1	1 AC Developer Substation	1,000 HVAC
SW_E2b (Muir Mhor)	Peterhead 2 / DCSS	1 AC Developer Substation	2,000 HVAC
SW_E2b (Muir Mhor)	SW_E2a_1 (Campion)	N/A	2,000 HVAC
SW_E3 (Bowdun)	Fiddes	1 AC Developer Substation	1,050 HVAC
SW_E2a_1 (Campion)	SW_E2a_2	N/A	2,500 HVAC
SW_E2a_2 (Campion)	SW_E1c_1 (Ossian)	N/A	2,000 HVAC
SW_E2a_2 (Campion)	Richborough	1 Developer DC Converter Station	2,000 HVDC
SW_E1a (Morven)	Branxton	1 DC Developer Converter Station	1,500 HVDC
SW_E1a (Morven)	SW_E1c_2	N/A	2,000 HVAC
SW_E1c_1 (Ossian)	SW_E1c_2	N/A	1,000 HVAC

Start Point	End Point	Interface Requirements	Capacity
SW_E1c_1 (Ossian)	Lincolnshire Connection Node	1 Developer DC Converter Stations	2,000 HVDC
SW_E1c_2 (Ossian)	Weston Marsh	1 Developer DC Converter Station	2,000 HVDC
SW_NE1a (Stoura)	Shetland Hub	1 AC Developer Substation	500 HVAC
SW_NE1b (Arven)	Shetland Hub	1 AC Developer Substation	1,800 HVAC
SW_NE1c (Arven)	Shetland Hub	1 AC Developer Substation	500 HVAC
Shetland Hub	Blackhillock	1 DC Transmission Owner (TO) Converter Station	1,800 HVDC

Table 3: HNDFUE Scotwind Recommended Design proposed connections

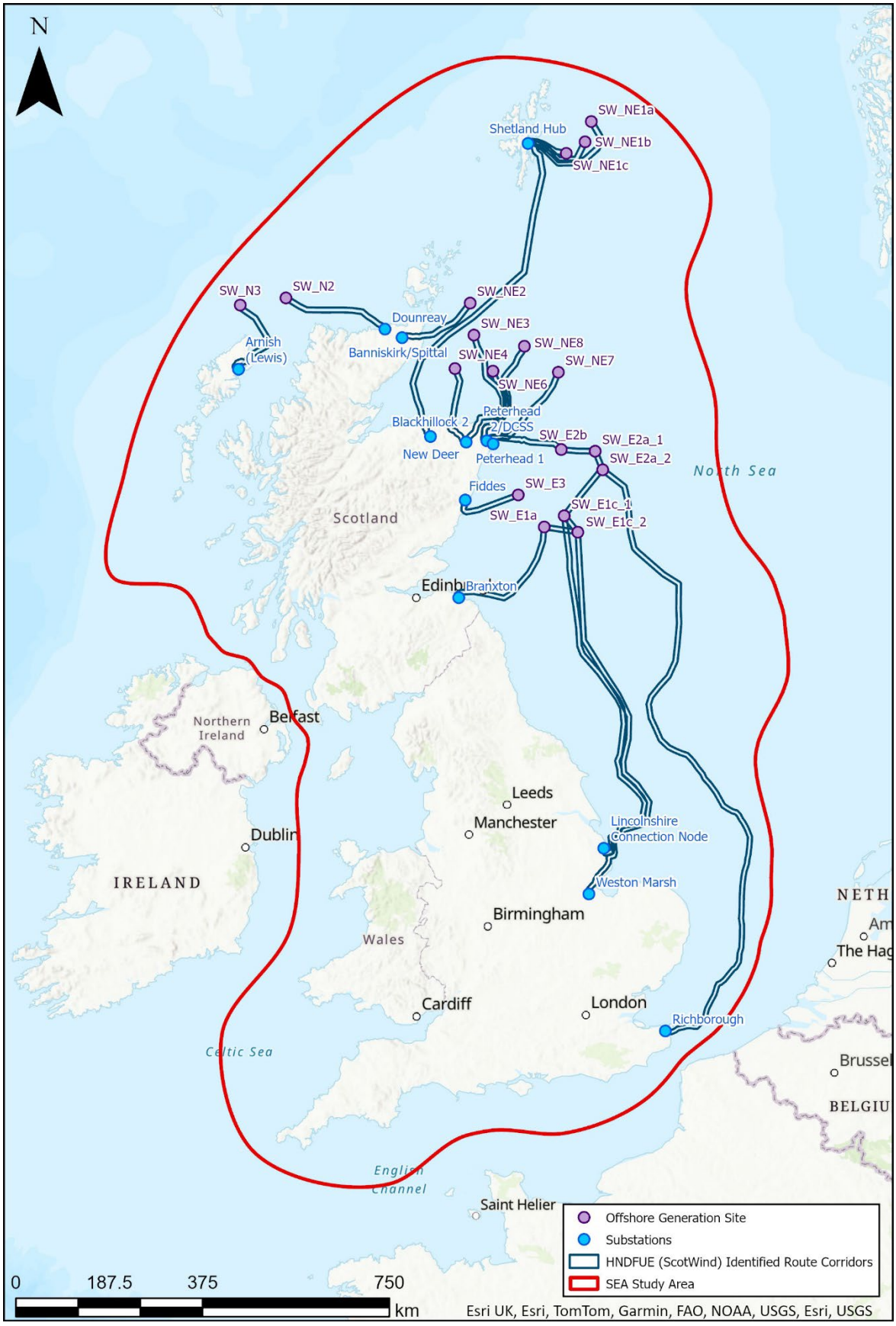


Figure 5: HNDFUE Scotwind Recommended Design Study Area

Assessment of the HNDFUE Scotwind Recommended Design against SEOs is summarised in Figure 6.

The assessment identified the potential for significant short-term negative effects on Biodiversity, Flora and Fauna, owing to the potential for direct effects on designated European sites that are not possible to avoid within the identified route corridors, as well as potential direct and indirect effects on other sensitive areas. The unavoidable designated sites include the SACs of the Southern North Sea, Inner Hebrides and the Minches, and Sandwich Bay; the SPAs of Thanet Coast and Sandwich Bay, Outer Firth of Forth and St Andrews Bay Complex, Greater Wash, East Mainland Coast, Shetland, and Moray Firth; the Ramsar site of Thanet Coast and Sandwich Bay; the nature conservation MPAs of North East Lewis and Southern Trench; and the SSSIs of Sandside Bay, Rosehearty to Fraserburgh Coast, Loch of Strathbeg, Sandwich Bay to Hacklinge Marshes, Barns Ness Coast, and Spey Bay.

The potential for moderate short-term negative effects on Geology, Soils and Land use, was also identified as there are designated sites for geology/geomorphology that cannot be avoided. The potential for moderate to slight negative effects on Biodiversity, Flora, and Fauna and Geology, Soils and Land use in the medium to long-term was also identified as there are sensitive habitats and geomorphological features that are not avoidable at this strategic stage.

The potential for significant short-term negative effects on Material Assets was identified due to the large quantity of unavoidable infrastructure encountered by the route corridors, including cable and pipeline crossings, particularly within the offshore part of routes, and potential for effects on shipping and navigation, in addition to effects on fishing activity, military areas, and onshore land use. Negative effects on Material Assets are expected to be slight in the medium to long-term. The potential for moderate short to medium-term negative effects on Water was identified, owing to unavoidable sensitive areas including military areas, national flood zones and onshore waterbodies, and for short to long-term moderate negative effects on Landscape and Visual Amenity, owing to unavoidable interaction with areas of landscape importance and sensitive landscape character. The potential for slight negative effects was also identified for Population and Human Health, Air, Climatic Factors, and Cultural Heritage.

The potential for slight positive effects in the short-term and moderate positive effects in the medium to long-term during operation was identified for Material Assets owing to the potential to connect 32.8GW of renewable energy generation to the GB grid. Moderate positive medium to long-term effects on Air and Climatic Factors are also identified due to the associated reduction in reliance on fossil fuel generation and resulting emissions with the increased availability of renewable energy.

The potential for cumulative effects was also identified for all SEA topics.

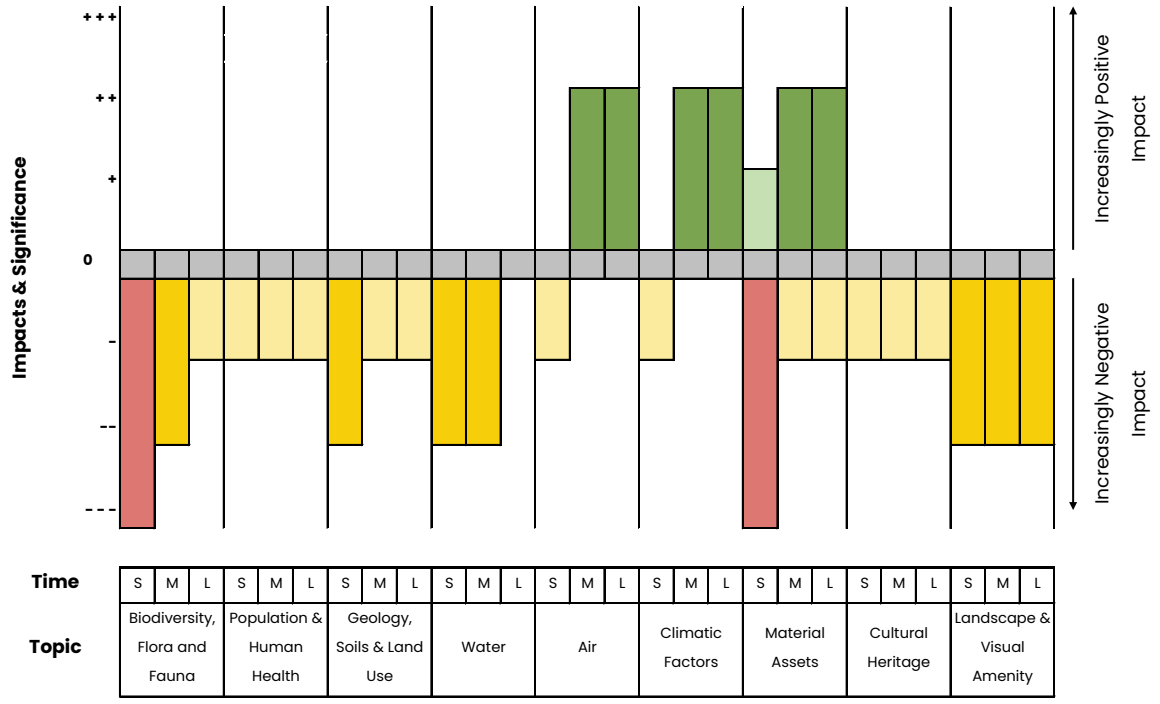


Figure 6: HNDFUE Scotwind Recommended Design summary scoring chart

HNDFUE Celtic Sea Recommended Design

The Recommended Design for HNDFUE Celtic Sea includes the proposed connections detailed in Table 4 and shown in Figure 7.

Start Point	End Point	Interface Requirements	Capacity
PDA1	Carmarthen	1 Developer AC Substation and 1 Transmission Owner (TO) Substation	1500MW HVAC
PDA2	South Wales Connection Node	1 Developer DC Converter station and 1 Transmission Owner (TO) Substation	1500MW HVDC
PDA3	North Devon	1 Developer AC Substation and 1 Transmission Owner (TO) Substation	1500MW HVAC

Table 4: HNDFUE Celtic Sea Recommended Design proposed connections

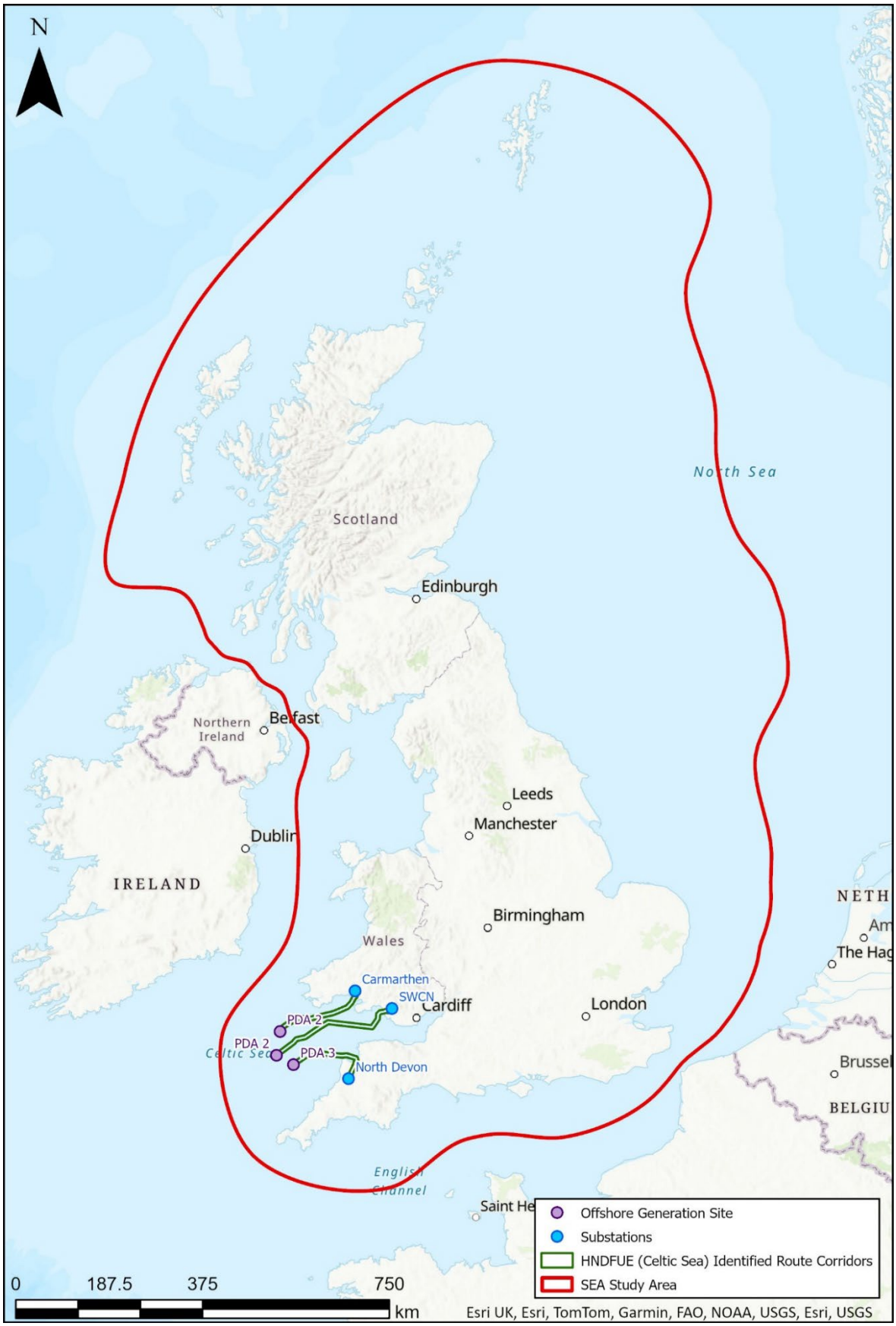


Figure 7: HNDFUE Celtic Sea Recommended Design Study Area

Assessment of the HNDFUE Celtic Sea Recommended Design against SEOs is summarised in Figure 8.

The assessment identified the potential for significant short-term negative effects on Biodiversity, Flora, and Fauna, owing to the potential for direct effects on designated European sites that are not possible to avoid within the identified route corridors, as well as potential direct and indirect effects on other sensitive areas such as Annex I habitats and NRW habitats known to be sensitive to cabling. The unavoidable designated sites include the SACs of the Bristol Channel Approaches, Carmarthen Bay and Estuaries; the SPA of Carmarthen Bay; and the SSSIs of Pembrey Coast and Mermaid's Pool to Rowden Gut.

The potential for moderate short-term negative effects on Geology, Soils and Land use, was also identified as there are designated sites and features for geology/geomorphology that cannot be avoided. The potential for moderate to slight negative effects on Biodiversity, Flora, and Fauna and Geology, Soils and Land use in the medium to long-term was also identified as there are sensitive habitats and geomorphological features that are not avoidable at this strategic stage.

The potential for moderate short-term negative effects on Water was identified, owing to unavoidable sensitive areas including military areas and national flood zones, and for short to long-term moderate negative effects on Landscape and Visual Amenity, owing to unavoidable interaction with areas of landscape importance. The potential for slight negative effects was also identified for Population and Human Health, Air, Climatic Factors, Material Assets, and Cultural Heritage.

The potential for slight positive effects in the short to long-term during operation was identified for Material Assets owing to the potential to connect 4.5GW of renewable energy generation to the GB grid. Slight positive medium to long-term effects on Air and Climatic Factors are also identified due to the associated reduction in reliance on fossil fuel generation and resulting emissions with the increased availability of renewable energy.

The potential for cumulative effects was also identified for the SEA topic of Biodiversity, Flora and Fauna.

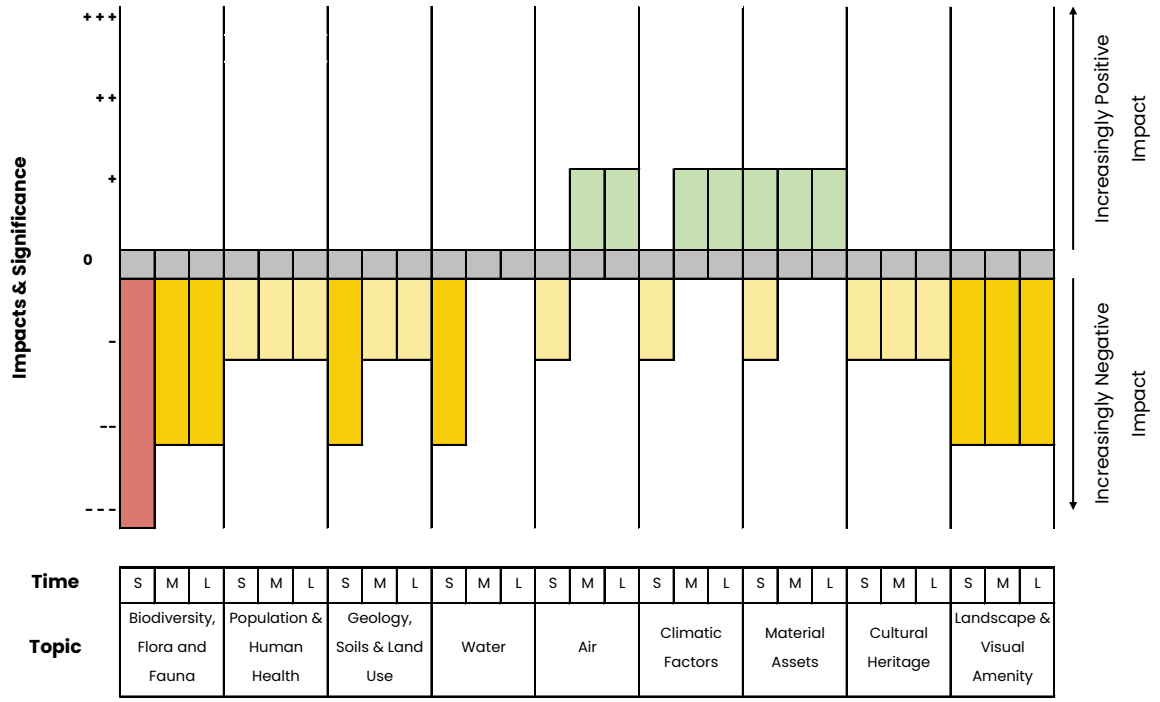


Figure 8: HNDFUE Celtic Sea Recommended Design summary scoring chart

HNDFUE INTOG Recommended Design

The Recommended Design for HNDFUE INTOG includes the proposed connections detailed in Table 5 and shown in Figure 9.

Start Point	End Point	Interface Requirements	Capacity
Aspen	Fetteresso	1 Developer DC Converter Station	1,500 HVDC
Aspen	Cedar	N/A	1,000 HVAC
Beech	Aspen	N/A	500 HVAC
Beech	Cedar	N/A	500 HVAC
Cedar	Branxton	1 Developer DC Converter Station	2000 HVDC
Cenos	Peterhead 1	1 Developer DC Converter Station	1,400 HVDC
Sinclair	Scaraben	N/A	100 HVAC
Scaraben	Peterhead 2 / DCSS	1 Developer AC Substation	200 HVAC
North Connect	Cenos	N/A	1,400 HVDC

Start Point	End Point	Interface Requirements	Capacity
Beech	Beech MPI	N/A	2,000 HVAC

Table 5: HNDFUE INTOG Recommended Design proposed connections

Assessment of the HNDFUE INTOG Recommended Design against SEOs is summarised in Figure 10.

The assessment identified the potential for significant short-term negative effects on Biodiversity, Flora, and Fauna, owing to the potential for direct effects on designated European sites that are not possible to avoid within the identified route corridors, as well as potential direct and indirect effects on other sensitive areas such as Annex I habitats. The unavoidable designated sites include the SPAs of Outer Firth of Forth and St Andrews Bay Complex, and Buchan Ness to Collieston; the MPAs of East of Gannet and Montrose Fields, Southern Trench; and the SSSIs of Loch of Strathbeg, St Cyrus and Kinnaber Links, and Bullers of Buchan Coast.

The potential for moderate short-term negative effects on Geology, Soils and Land use, was also identified as there are designated sites for geology/geomorphology that cannot be avoided. The potential for moderate to slight negative effects on Biodiversity, Flora, and Fauna and Geology, Soils and Land use in the medium to long-term was also identified as there are sensitive habitats and land uses that are not avoidable at this strategic stage.

The potential for moderate short-term negative effects on Material Assets was identified due to the large quantity of unavoidable infrastructure encountered by the route corridors, including cable and pipeline crossings, particularly within the offshore part of routes, and potential for effects on shipping and navigation, in addition to effects on fishing activity. Negative effects on Material Assets are expected to be slight in the medium to long-term. The potential for moderate short-term negative effects on Water was identified, owing to unavoidable sensitive areas including national flood zones, and for short to long-term moderate negative effects on Landscape and Visual Amenity, owing to unavoidable interaction with areas of landscape sensitivity. The potential for slight negative effects was also identified for Population and Human Health, Air, Climatic Factors, and Cultural Heritage.

The potential for slight positive effects in the short to long-term during operation was identified for Material Assets owing to the potential to connect 4.5GW of renewable energy generation to the GB grid. Slight positive medium to long-term effects on Air and Climatic Factors are also identified due to the associated reduction in reliance on fossil fuel generation and resulting emissions with the increased availability of renewable energy.

The potential for cumulative effects was also identified for all SEA topics.

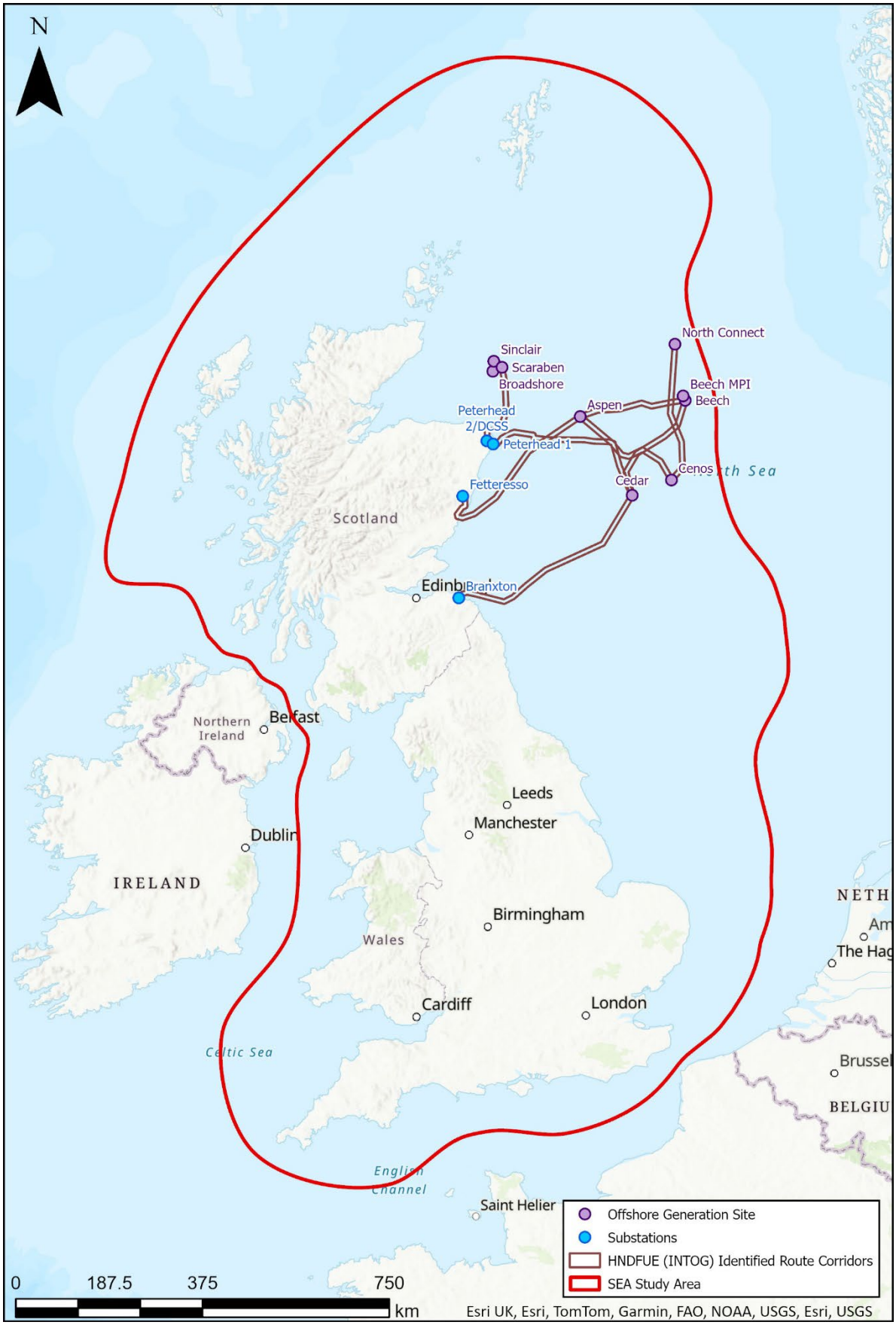


Figure 9: HNDFUE INTOG Recommended Design Study Area

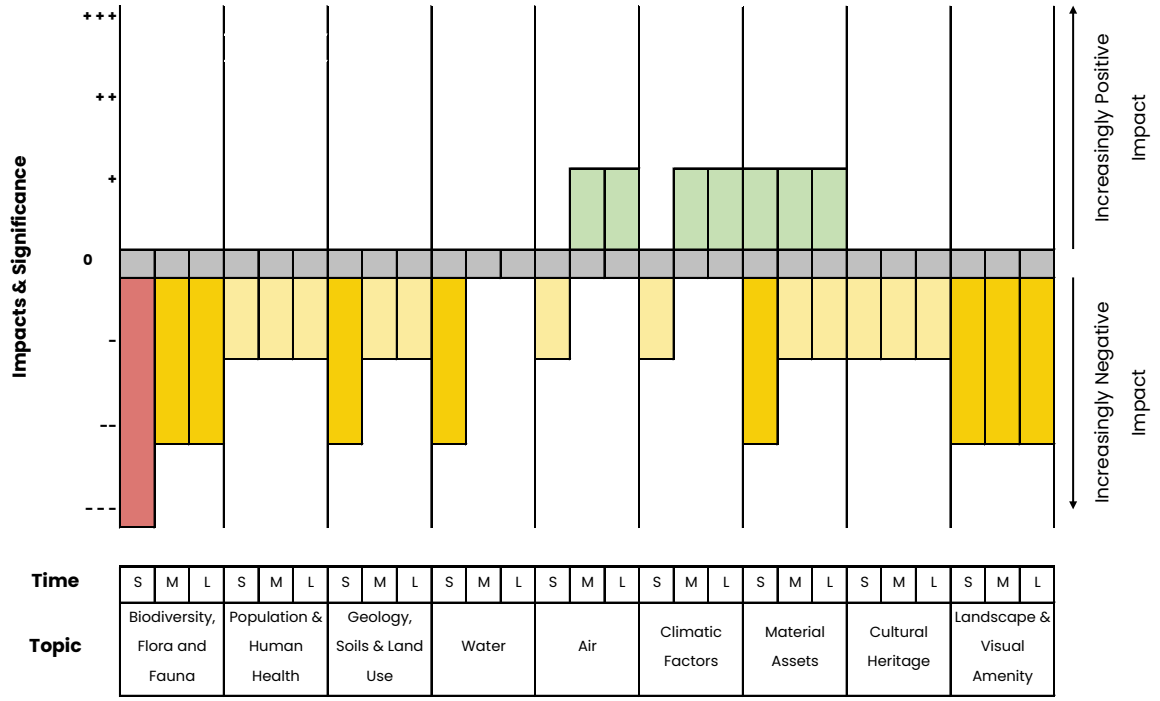


Figure 10: HNDFUE INTOG Recommended Design summary scoring chart

HNDFUE Implementation Plan Recommended Design

The Recommended Design for the HND Implementation Plan is shown in Figure 11.

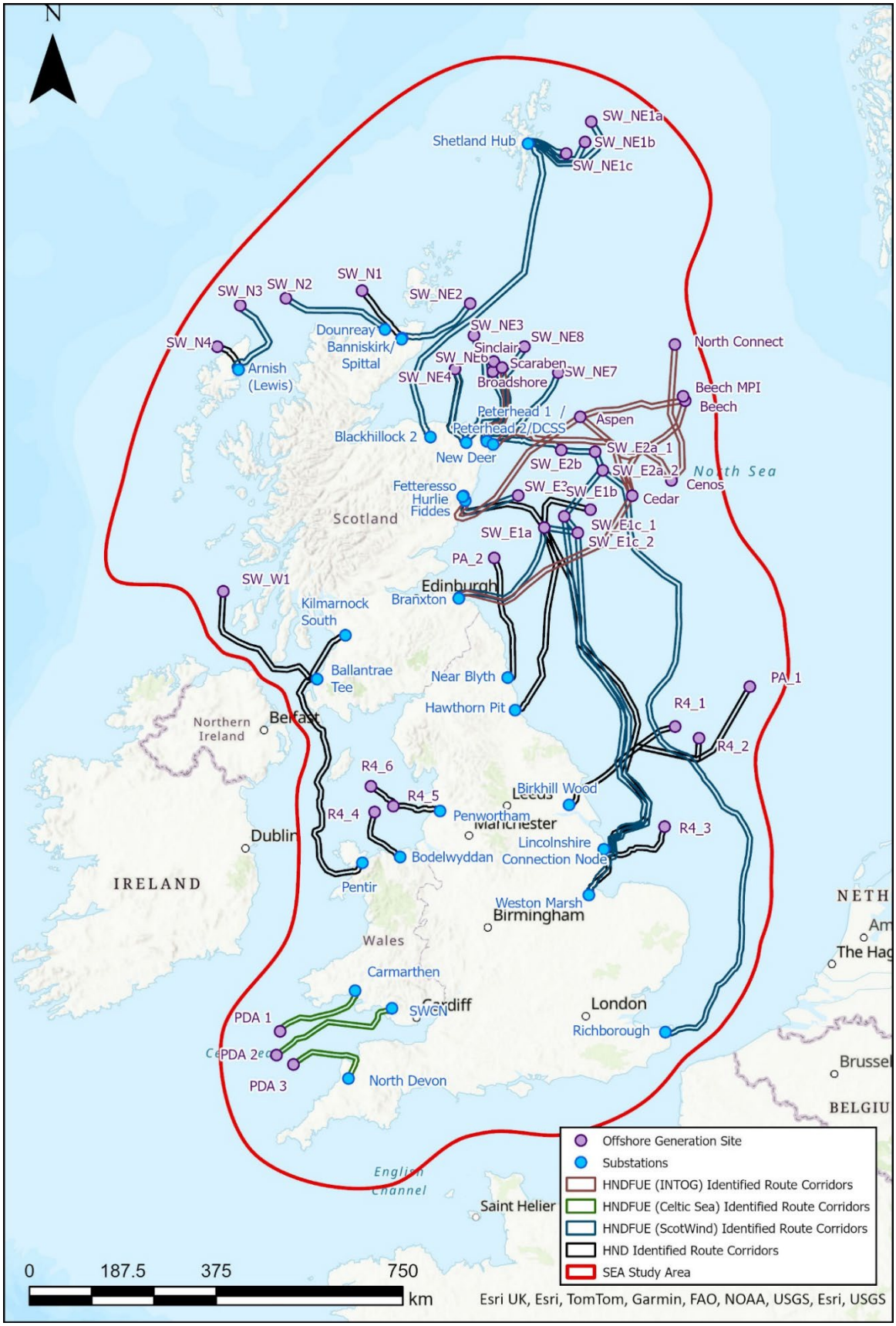


Figure 11: HND Implementation Plan Recommended Design Study Area

Assessment of the HND Implementation Plan Recommended Design against SEOs is summarised in Figure 12.

The assessment identified the potential for significant short-term negative effects on Biodiversity, Flora, and Fauna, owing to the potential for direct effects on designated European sites that are not possible to avoid within the identified route corridors, as well as potential direct and indirect effects on other sensitive areas such as Annex I habitats and NRW habitats sensitive to cabling. The unavoidable designated sites include the SACs of North Anglesey Marine, Afon Gwyrfai a Llyn Cwellyn, Dogger Bank, Southern North Sea, Inner Dowsing, Race Bank and North Ridge, Berwickshire and North Northumberland Coast, River Thurso, Garron Point, Durham Coast, Inner Hebrides and the Minches, Sandwich Bay, Bristol Channel Approaches, and Carmarthen Bay and Estuaries; the SPAs of Liverpool Bay, Greater Wash, Northumberland Marine, Lewis Peatlands (and Ramsar site), Thanet Coast and Sandwich Bay (and Ramsar site), Outer Firth of Forth and St Andrews Bay Complex, Greater Wash, East Mainland Coast, Shetland, Moray Firth, North Caithness Cliffs, Carmarthen Bay, and Buchan Ness to Collieston; the nature conservation MPAs of Clyde Sea Sill, Southern Trench, North-East Lewis, and East of Gannet and Montrose Fields; the MCZs of Fylde, Berwick to St Mary's, Coquet to St Marys, and Holderness Inshore; and the SSSIs of Afon Gwyrfai a Llyn Cwellyn, Garron Point, Durham Coast, Sandside Bay, Rosehearty to Fraserburgh Coast, Loch of Strathbeg, Sandwich Bay to Hacklinge Marshes, Barns Ness Coast, Spey Bay, Pembrey Coast, Mermaid's Pool to Rowden Gut, St Cyrus and Kinnaber Links, and Bullers of Buchan Coast.

The potential for moderate short-term negative effects on Geology, Soils and Land use, was also identified as there are designated sites for geology/geomorphology that cannot be avoided. The potential for moderate negative effects on Biodiversity, Flora, and Fauna in the medium to long-term was identified as there are sensitive habitats and areas and land uses that are not avoidable at this strategic stage. The potential for slight negative effects on Geology, Soils and Land use in the medium to long-term was also identified as there are geomorphological features, and sensitive land uses that are not possible to avoid at the plan level.

The potential for significant short-term negative effects on Material Assets was identified due to the large quantity of unavoidable infrastructure encountered by the route corridors, including cable and pipeline crossings, particularly within the offshore part of routes, and potential for effects on shipping and navigation, in addition to effects on fishing activity, military areas, and onshore land use. Negative effects on Material Assets are expected to be slight in the medium to long-term. The potential for moderate short-term negative effects on Water was identified, owing to unavoidable sensitive areas including national flood zones, military areas and waterbodies, for short-term moderate negative effects on Population and Human Health and Air due to interaction with higher populated areas, and for short to long-term moderate negative effects on Landscape and Visual Amenity, owing to unavoidable interaction with areas of landscape importance and sensitivity. The potential for slight short-term negative effects was also identified for Climatic Factors and Cultural Heritage, and slight medium to long-term negative effects for Population and Human Health, Geology, Soils and Land Use, and Cultural Heritage.

The potential for slight positive effects in the short-term and significant positive effects in the medium to long-term during operation was identified for Material Assets owing to the potential to connect 77.8GW of renewable energy generation to the GB grid. Significant positive medium to long-term effects on Air and Climatic Factors are also identified due to the associated reduction in reliance on fossil fuel generation and resulting emissions with the increased availability of renewable energy.

The potential for cumulative effects was also identified for all SEA topics.

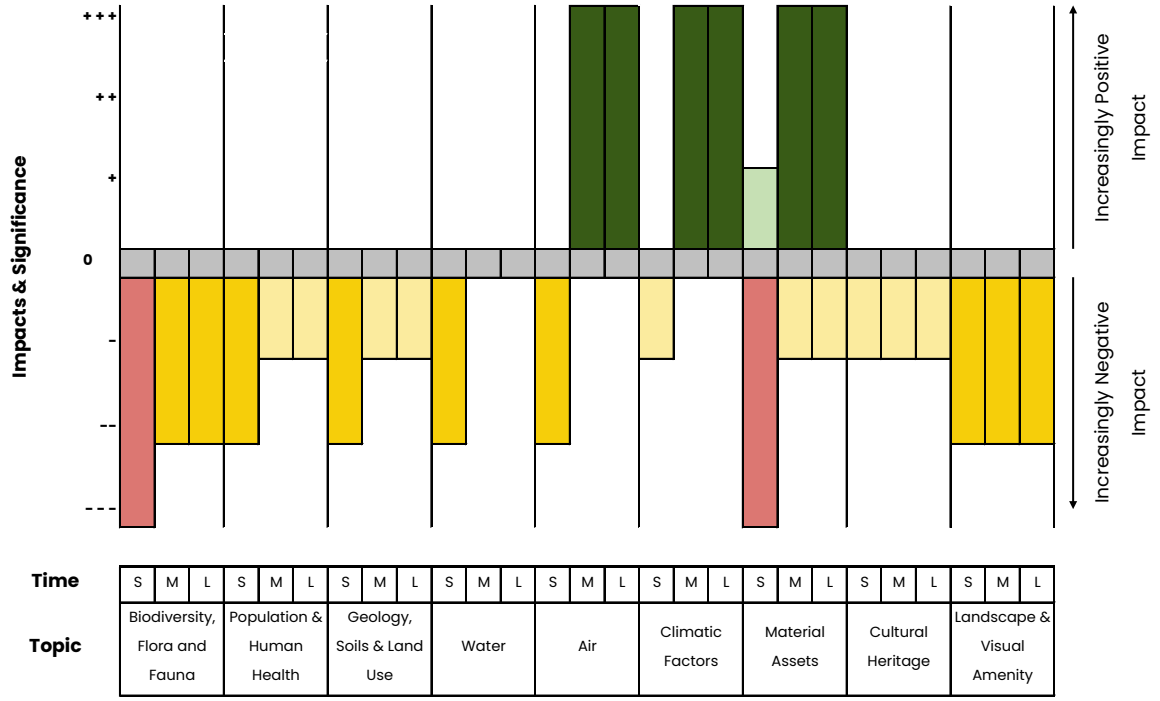


Figure 12: HND Implementation Plan Recommended Design summary scoring chart

Cumulative / In-Combination Development Effects

Existing and planned infrastructure

Assessment of the Recommended Designs of the HND Implementation Plan has considered the potential for these designs to have cumulative or in-combination effects on the SEA topics, detailed in Section 9.2. This included the possibility of effects of the plan elements considered together on environmental sensitivities such as designated sites and existing infrastructure, as well as how the elements of the plan are likely to interact with each other. The potential for cumulative and in-combination effects was identified for Biodiversity, Flora and Fauna; Geology, Soils and Land Use, due to sensitive areas that cannot be avoided at the plan level by multiple routes within the Recommended Design. The potential for cumulative negative effects on Material Assets was identified owing to

the existing infrastructure assets that are unavoidable and interaction with cables that are part of the overall Recommended Design. There is also potential for cumulative negative effects on other users, including shipping and navigation, fisheries, military activities, and agriculture. Cumulative short-term negative effects are possible for Water, Air and Climatic Factors during construction. Cumulatively, the Recommended Design has the potential for significant, long-term positive effects on Air and Climatic Factors by leading decarbonisation of the energy sector.

The potential for cumulative or in-combination effects of development associated with the draft Plan and offshore renewable energy developments was identified, including the development of offshore wind projects that are directly facilitated by the Recommended Design of the draft Plan, which will be located at the starting point of identified route corridors. All existing and planned substantial projects were considered as part of the HND appraisal process and avoided as far as possible and, when unavoidable, these were considered in the SEA appraisal for Material Assets. For offshore wind farms that will be facilitated by the draft Plan, the planning process will consider the project in its entirety i.e., the infrastructure of the wind farm array as well as associated cabling to connect this to the grid onshore.

As well as identifying the general potential for cumulative and in-combination effects, areas were identified where there is greater potential for in-combination or cumulative negative effects to be considered at this strategic stage owing to consideration of concentration of existing and planned cables, and which would need to be taken into consideration at the detailed project planning and design stage. These areas are described as East of Shetland, Offshore and landfall at Peterhead / Fraserburgh, East of Scotland to East of England, Offshore and landfall at Lincolnshire Connection Node / Weston Marsh, Celtic Sea, and offshore and landfall at Kent. Onshore areas were also identified as having greater potential for cumulative negative environmental effects. To minimise the potential environmental and navigational adverse effects, it is recommended that cable routing and protection strategies should be coordinated between developers, transmission owners/operators and other seabed users, including active consideration of shared cable protection and joint corridor-management arrangements.

Other Plans and Programmes

The potential for cumulative and in-combination effects between the Recommended Design and other plans or programmes was also considered.

At this strategic plan level there is not enough detail to fully assess the cumulative and in-combination effects with other strategic-level plans as, although route corridors have been identified, there are no confirmed designs or methodologies for each of the cable routes. Plans and projects should be considered and assessed further for the potential for cumulative and in-combination effects at the project level, as relevant.

Mitigation and Monitoring

Mitigation

Mitigation measures have been recommended where potential adverse effects on environmental topic areas have been identified from implementation of the draft HND Implementation Plan. At a Plan level, the main degree of mitigation has been to avoid sensitive features as far as possible to minimise impacts. At the project level, the further actions of reduce and mitigate must be used, with these recommended mitigation measures aiming to prevent, reduce and, as fully as possible, offset any significant adverse effects on the environment due to implementation of the draft HND Implementation Plan.

Section 10.1 demonstrates environmental impact-specific mitigation measures that should be considered at the project stage development of the Recommended Designs from the HND Implementation Plan to minimise the potential for any negative effects on the wider environment. These mitigation measures should be considered and adopted, where relevant, through the next stages of more detailed design/feasibility and project level study.

In addition to the proposed SEA mitigation, Section 10 details the mitigation measures detailed in the HRA Report that should be adopted within the HND Implementation Plan to minimise the potential for any negative effects on European sites arising from implementation of the potential projects. These mitigation measures are also relevant to MCZs, where potential impact pathways were identified in the MCZ Report. These mitigation measures will be included in the HND Implementation Plan and will be undertaken in the course of its adoption, pending the outcome of a 12-week public consultation period.

Monitoring

The SEA Directive requires that the significant environmental effects of the implementation of the HND Implementation Plan are monitored in order to identify, at an early stage, unforeseen adverse effects and in order to undertake appropriate remedial action. The proposed monitoring programme in Section 10.2 is based on the Targets and Indicators established in the SEOs. SEA monitoring should be undertaken in conjunction with proposed reviews of the HND Implementation Plan, in advance of updates, to enable monitoring outcomes to influence the HND Implementation Plan development

Monitoring is also likely to be required as part of consenting conditions at the project level for cabling and associated infrastructure developments. Project level monitoring outcomes may influence future understanding of environmental interactions that can be taken into account during subsequent HND Implementation Plan updates.

Summary and Conclusions

The Recommended Designs for HND, HNDFUE ScotWind, HNDFUE Celtic Sea and HNDFUE INTOG were determined by NESO on the basis of four Network design objectives 'Economic and efficient', 'Deliverability and operability', 'Environmental impact', and 'Local community impact'. As part of this early work, RPS undertook assessment of environmental and social constraints to offshore cabling (cabling from the proposed offshore wind farm site to the proposed interface point on the onshore grid) to inform the development of recommended network design options. At this stage, all technically feasible route corridors and grouped Options available to the draft Plan were appraised. This considered technical, environmental, and community constraints and sensitivities, and the short-listing of potential route corridors and options was influenced by environmental and social factors.

For a total of 112 short-listed route corridors, 31 short-listed options, and 39 interface areas (which considered the wider area around the endpoint of route corridors where onshore infrastructure, including substations and/or converter stations would need to be developed), an SEA light assessment was then carried out. This was based on key indicators across the SEA topics of Biodiversity, Flora and Fauna; Population and Human Health; Geology, Soils and Land Use; Water; Air; Climatic Factors; Material Assets; Cultural, Architectural, and Archaeological Heritage; and Landscape, Seascape, and Visual Amenity. The assessment included the identification of the potential for effects on these indicators for these topics and the nature of these effects (e.g., how significance they are, and whether they would occur during construction or operation).

The Recommended Designs for the four HND / HNDFUE work strands were assessed in the order in which they were developed, i.e., HND, HNDFUE ScotWind, HNDFUE Celtic Sea, HNDFUE INTOG, as the earlier work strands could have in-combination or cumulative effects with later Recommended Designs in a similar geographic area, and a summary assessment of all elements of the draft Plan was also undertaken. This SEA assessment used a wide range of available data and was informed by a high-level assessment of the ways in which cabling and development of infrastructure could affect SEA topics. These potential effects were established from a thorough review of literature.

The potential for significant negative effects on Biodiversity, Flora and Fauna from development of cabling within identified route corridors and onshore infrastructure within interface areas was identified. This was due to the potential for direct effects on features of designated sites that are unavoidable by cable routes, and indirect effects on designated sites within proximity to developments, noting that that identified route corridors aimed to avoid all designated sites, where this was possible. The potential for moderate negative effects on Biodiversity, Flora and Fauna was also identified, owing to the significant amount of offshore and onshore cabling required, as well as the significant amount of onshore interface infrastructure required, albeit with potential avoidance of sensitive areas.

The potential for significant, short-term temporary, negative effects was identified for Material Assets, mainly due to the significant amount of unavoidable infrastructure, including cables and pipelines, that would need to be crossed by cables within the Recommended Designs, as well as infrastructure that is unavoidable within interface areas, and the potential for damage and/or disruption to services, as well as interaction with busy shipping and fishing areas during construction and decommissioning.

For the SEA topics of Population and Human Health; Geology, Soils and Land Use; Water; Air; and Landscape, Seascape and Visual Amenity, the potential for moderate short-term negative effects was identified, owing to the significant quantity of cabling and onshore infrastructure associated with the draft Plan and the potential effects on sensitive areas or receptors. The potential for longer-term moderate negative effects on Landscape, Seascape and Visual Amenity was also identified, due to possible landscape and visual impacts from development of a significant amount of onshore infrastructure, particularly in areas of higher sensitivity. Best practice mitigation was outlined in the assessments for the avoidance or minimisation of identified negative effects.

The potential for positive effects was also identified. This included significant long-term positive effects on Material Assets from the potential to connect approximately 77.8GW of renewable energy generation to the GB grid, significantly reducing the associated reliance on fossil fuel generation. The potential for significant long-term positive effects for Air and Climatic Factors was also recognised, as this new renewable energy infrastructure will support the less reliance on fossil fuels into the future, resulting in better air quality and less GHG emissions.

Areas were identified where there is greater potential for in-combination or cumulative negative effects to be considered at this strategic stage owing to a concentration of existing and planned cables, and which would need to be taken into consideration at the detailed project planning and design stage. To minimise the potential environmental and navigational adverse effects, it is recommended that cable routing and protection strategies should be coordinated between developers, transmission owners/operators and other seabed users, including active consideration of shared cable protection and joint corridor-management arrangements.

Further environmental studies based on the more detailed designs and construction methods should be undertaken as appropriate and may include ecological surveys, Landscape, Seascape, and Visual Impact Assessments, or heritage assessments. Avoidance or mitigation measures should be applied to ensure that there are no significant negative environmental effects during construction, operation, and decommissioning of the developments associated with the draft Plan.

The HRA Report for the draft Plan considered the potential for Likely Significant Effects, and subsequently Adverse Effects on Site Integrity of identified European sites. In most cases this concluded that the plan will not have an adverse effect on the integrity of any European sites, however this was not the case for several routes, which were considered further in a HRA Derogation Report. The Stage 1 MCZ assessment for the draft Plan identified eight study corridors as having the potential to hinder conservation objectives,

and these were further considered by a Stage 2 Assessment. This stage identified 'other means of proceeding' for all eight identified route corridors.

Next Steps

Consultations on the draft HND Implementation Plan, SEA Environmental Report, HRA Report and MCZ Report are anticipated to commence in November 2025 and run until January 2026. These documents will be made available for viewing digitally via the NESO website.

Following completion of the consultation period, all comments will be collated and the draft HND Implementation Plan, SEA Environmental Report, HRA Report and MCZ Report will be reviewed and revised as necessary. Provided there are no objections or comments that will significantly alter the draft HND Implementation Plan, the final version of the HND Implementation Plan can be drafted and adopted. This is anticipated to be in Q3 2026. Following release of the adopted HND Implementation Plan, an SEA Statement will be drafted to summarise the process undertaken and identify the manner by which environmental considerations and consultations were integrated into the final HND Implementation Plan.

The contact details for any information regarding the draft HND Implementation Plan or its environmental assessments are as follows:

By Email	box.enexternal@neso.energy
By Post	Faraday House, Warwick Technology Park, Gallows Hill, Warwick, CV34 6DA

1. Introduction

1.1 Background

1.2 Strategic Environmental Assessment and Purpose of this Environmental Report

1.3 Screening for SEA

1.4 Scoping for SEA

1.5 SEA Guidance

1.6 Statutory Consultees for SEA

1.7 Appropriate Assessment

1.8 Marine Conservation Zone Assessment



1.1 Background

This Strategic Environmental Assessment (SEA) Environmental Report has been prepared in accordance with the European Communities Directive 2001/42/EC on the assessment of the effects of certain plans and programmes on the environment (SEA Directive), and in accordance with The Environmental Assessment of Plans and Programmes Regulations 2004 (S.I. 2004 No. 1633), The Environmental Assessment of Plans and Programmes (Wales) Regulations 2004 (Welsh Statutory Instrument 2004 No. 1656), and the Environmental Assessment (Scotland) Act 2005 (2005 asp 15).

The purpose of this Environmental Report is to provide a formal and transparent assessment of the likely significant effects on the environment arising from implementation of draft Holistic Network Design (HND) Implementation Plan, including consideration of reasonable alternatives.

The draft HND Implementation Plan is being developed by the National Energy System Operator (NESO) on behalf of Department of Energy, Security and Net Zero (DESNZ). The SEA of the draft HND Implementation Plan is being completed on behalf of NESO.

1.2 Strategic Environmental Assessment and purpose of this Environmental Report

The SEA Directive requires that certain Plans and Programmes, prepared by statutory bodies, which are likely to have a significant impact on the environment, be subject to the SEA process. The SEA process is broadly comprised of the steps shown in Figure 1. These are given a summary description in Table 1. NESO has commissioned RPS to undertake the SEA of the draft HND Implementation Plan, to provide further information to NESO on the potential positive and negative implications of implementing the draft HND Implementation Plan, which will feed into the development process.

SEA Stages

Stage	Description	Status
Screening	Determines whether SEA is required for a Plan / Programme in consultation with the designated statutory consultees.	Completed
Scoping	Determines the scope and level of assessment detail for the SEA, in consultation with the designated statutory consultees.	Completed April – June 2025
Environmental Assessment	Formal and transparent assessment of the likely significant impacts on the environment arising from the implementation of the Plan / Programme, including all reasonable alternatives. The output from this is an Environmental Report, which must go on public display along with the draft Plan / Programme.	April 2025 - September 2025
SEA Statement	Summarises the process undertaken and identifies the manner in which environmental considerations and consultations have been integrated into the final Plan / Programme.	Q1 2026

Table 1: Summary descriptions of the main stages in the SEA process

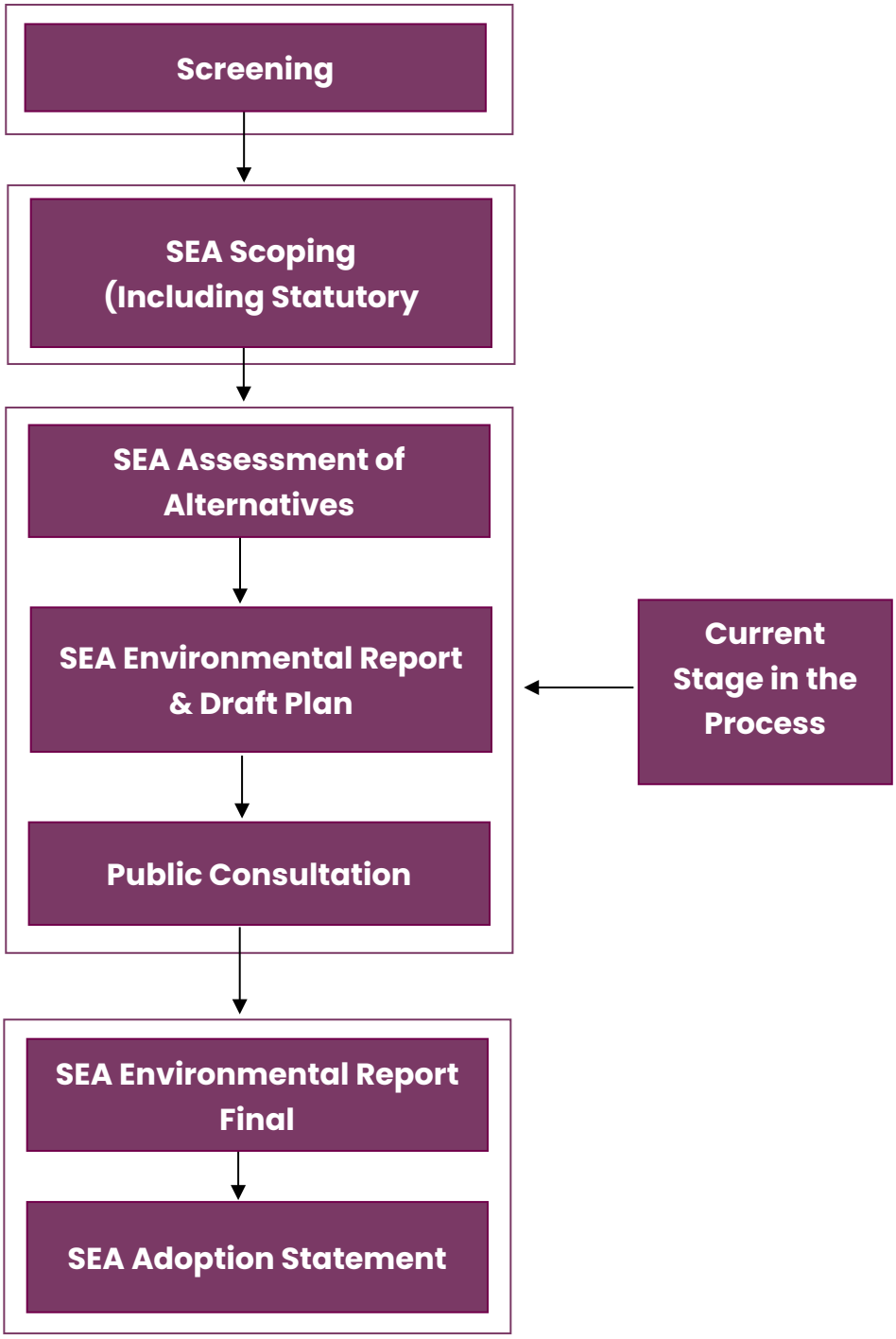


Figure 1: Overview of the SEA process

1.3 Screening for SEA

RPS, on behalf of NESO, conducted SEA screening in accordance with the Office of the Deputy Prime Minister (ODPM) "Practical Guide to the Strategic Environmental Assessment Directive" (2005), which sets out the application of the SEA Directive to plans and programmes and which establishes whether the draft Plan should be subject to SEA, using a series of procedural tasks.

The SEA screening determined that SEA is required for the draft Plan. This was determined based on the following rationale:

- Although the draft Plan does not set a framework for development that strictly falls within Annex I or II of the Environmental Impact Assessment (EIA) Directive, given the intent of the Directive and the voluntary undertaking of EIA for recent projects involving significant subsea cabling and associated onshore infrastructure, it is considered that the draft Plan should be subject to SEA.
- Regardless of the strict consideration of EIA works for which the draft Plan may set a framework for future development, it has been determined that the draft Plan requires an assessment pursuant to Article 6 or 7 of the Habitats Directive in view of the likely effect on European sites.

1.4 Scoping for SEA

The SEA Scoping for the draft HND Implementation Plan took place from January to February 2025, followed by statutory consultation. A Scoping Report was prepared to provide sufficient information on the draft HND Implementation Plan to enable the consultees to form an opinion on the appropriateness of the scope, format, level of detail, and methodology for assessment and the consultation period proposed for the Environmental Report.

The provision of a Scoping Report to consultees is recommended as good practice as it can inform stakeholders about the key environmental issues and the key elements of the Plan or Programme. In addition, the Scoping Report can be used as a tool to generate comments from stakeholders on the scope and approach of the SEA. Responses received from consultees to the SEA Scoping consultation were taken into account in the Environmental Report, where possible. All comments and responses are included in Appendix A of this Scoping Report.

Table 2 was created to generate discussion during the scoping process and consultation in relation to the SEA receptors and was subsequently amended as required following receipt of scoping responses.

Scoping of SEA Issues

SEA Topic	Scoped In / Out	Potential Environmental Issues
Biodiversity, Flora and Fauna	In	• Potential for direct permanent loss of habitats and species, including protected or priority habitats and species, in the footprint of new onshore infrastructure and where cable protection materials are required for offshore cable routes in the construction, operation/maintenance and decommissioning phases. • Potential for indirect loss of habitat and species resulting from scouring around protective structures and surface laid elements of cables or from alterations to physical processes within a wider zone of effect due to the placement of submarine structures on the seabed during construction, operation/maintenance and decommissioning phases. • Potential for construction and decommissioning phase damage or disturbance of offshore and onshore habitats and species, or indirect changes in habitat type post-construction during operation/maintenance e.g., through changes in sediment dynamics / smothering effects, effects on water quality / temperature or onshore soil quality through construction pollution, or cable protection materials. • Potential for benthic community alteration where cable protection materials alter the colonising habitat e.g., epifauna colonisation of hard structures at construction, operation/maintenance and decommissioning phases. • Potential disturbance effects from visual presence, underwater sound and vibration on marine mammals, reptiles, fish and seabirds during offshore pre-construction, construction, operation/maintenance and decommissioning phases. Potential disturbance effects from visual presence and noise on terrestrial mammals and birds during onshore construction and maintenance activities. • Potential collision risk for marine mammals, fish, seabirds (above and below the water surface), and other marine fauna with vessels during the construction and decommissioning phases, and during cable maintenance activities. Potential for collision risk for mammals and birds with vehicles during the construction,

SEA Topic	Scoped In / Out	Potential Environmental Issues
		operation/maintenance and decommissioning of onshore infrastructure. • Potential effects of heat from cables on benthic communities and fish during operation. • Potential effects of Electromagnetic Fields (EMF) from transmission cables on fauna such as marine mammals and electrosensitive fish. • Potential effects of noise and vibration from cables on fauna such as marine mammals and fish. • Potential for introduction or spread of non-native species during construction, operation/maintenance and decommissioning.
Population and Human Health	In	• Potential for disturbance of the local population during construction (e.g., dust, noise) and impacts on residential amenity, including in deprived or sensitive areas. • Potential for direct conflict with other users of the coastal and marine environment (e.g., fishing, recreation and leisure). • Potential positive or negative effects on employment and the local economy (e.g., local community employment, fisheries, and skilled technical workers, potential for increased capital investment in the local area). • Potential for long-term indirect health effects on the local population. • Potential for long-term positive effects on air quality (reduced emissions). • Potential / perception of EMF risk from electricity transmission cables. • Potential for interaction between transmission infrastructure and settlement patterns.
Geology, Soils and Land Use	In	• Potential for physical damage to the seabed from offshore cabling. • Potential for indirect physical effects on the seabed or subsurface from offshore cabling or presence of protective materials e.g., through alteration of the

SEA Topic	Scoped In / Out	Potential Environmental Issues
		sediment regime, changes to seabed morphology, depositing of dredged material. • Potential for alteration of hydrodynamics or coastal processes from offshore cabling or presence of protective materials. • Potential for loss or physical damage of sensitive lands or geological features onshore e.g., peatlands and agricultural land during the onshore cable installation process, landfall site or substation / converter station construction. • Potential for release of previously contaminated materials during cable installation process both offshore and onshore. • Potential for indirect physical effects on onshore sediment processes from onshore cabling, landfall site or substation /converter station presence.
Water	In	• Potential for the accidental release of contaminants or disturbance of historic sediment contaminants during construction, or release of contaminants from vessels during construction and operation, with effects on marine water quality (offshore cabling activities) and downstream freshwater quality (onshore cabling and infrastructure construction). • Potential for the disturbance and mobilisation of marine and onshore sediments and effects on turbidity of waterbodies. • Potential for indirect effects on the water column e.g., temperature, turbidity, salinity. • Potential for the introduction of temporary sound sources into the marine environment and onshore waterbodies. • Potential for the introduction of non-natural EMF into the marine environment and onshore waterbodies. • Potential for the introduction of litter and debris into the marine environment and onshore waterbodies. • Potential to adversely affect the status and / or the potential to achieve Good Environmental Status of Marine Strategy Descriptors.

SEA Topic	Scoped In / Out	Potential Environmental Issues
		• Potential to adversely affect the status and / or the potential to achieve Good Status of Water Framework Directive (WFD) river, lake, transitional and coastal waterbodies, and WFD Protected Areas (Bathing and Shellfish Waters).
Air	In	• Potential for localised effects of air pollutants during the construction phase and / or operational support / maintenance (plant emissions), including in air quality sensitive areas. • Potential for indirect positive effects on air quality in the long-term through reduction in emissions from power stations owing to new renewable energy connections.
Climatic Factors	In	• Potential to support new renewable energy connection, with potential effects on Greenhouse Gas (GHG) reduction. • Potential for the short-term generation of GHG emissions from machinery during construction, maintenance and decommissioning activities offshore and onshore. • Potential for a short-term release of CO_2 from sediments offshore and onshore during construction and decommissioning phases. • Potential for damage or loss of habitats that are valuable for carbon storage both offshore (blue carbon resources such as saltmarsh, seagrass and maerl beds) and onshore (e.g., peatlands, woodlands).
Material Assets	In	• Potential for interaction with / disruption effects on ports, shipping and navigation during construction and decommissioning and for risks to anchors from cable protection materials or unburied cables along cable routes during operation. • Potential for interaction (e.g., damage, disruption or access restrictions) with areas of marine infrastructure (e.g. submarine cables, gas and oil infrastructure, existing or planned renewable infrastructure and meteorological infrastructure) and onshore infrastructure (e.g. transport network, non-renewable power stations, oil and gas, renewable infrastructure, waste management

SEA Topic	Scoped In / Out	Potential Environmental Issues
		infrastructure, water treatment infrastructure, met office radar and manufacturing infrastructure). • Potential for temporary disturbance or displacement from areas of importance for commercial fisheries and aquaculture, and for long-term effects on fishing activities along cable routes (e.g., risks to fishing gear from cable protection materials, unburied cables or construction debris). • Potential for interaction with areas used for forestry (temporary damage or access disruption during construction and decommissioning along onshore cable routes to permanent loss in the footprint of onshore infrastructure such as substations / converter stations). • Potential for temporary damage or access restrictions to agricultural lands during onshore cabling activities, and for permanent loss in the footprint of onshore infrastructure such as substations / converter stations. • Potential for temporary disruption effects on areas of known military / defence activity and for the presence of Unexploded Ordnance (UXO) to affect the cable installation process. • Potential for temporary or permanent disruption effects on aviation operations, including navigational radar and telecommunications during construction due to the potential presence of tall equipment (e.g., cranes). • Potential for indirect effects on coastal tourism, including disturbance and access restrictions. • Potential for interaction with / disturbance of areas used for offshore disposal or for aggregate extraction and / or onshore disposal or mineral extraction.
Cultural Heritage	In	• Potential for direct or indirect effects on marine archaeological features (including protected features) such as historic wrecks and submerged landscapes and terrestrial archaeological features including scheduled monuments and registered battlefields during construction. • Potential for direct or indirect effects on marine, coastal and terrestrial designated and non-designated

SEA Topic	Scoped In / Out	Potential Environmental Issues
		archaeological and architectural heritage and settings due to development altering decay or erosion processes. • Potential for direct or indirect effects on coastal designated and non-designated architectural heritage and settings during construction of new onshore infrastructure such as substations / converter stations or offshore infrastructure. • Potential for direct or indirect effects on terrestrial designated and non-designated archaeological heritage during construction of new onshore infrastructure such as substations / converter stations. • Potential for direct or indirect effects on designated and non-designated archaeological and architectural features and their settings from the presence of new onshore or offshore infrastructure. • Potential for long-term effects on the setting of designated landscape from impacts on designated and non-designated archaeological and architectural features from the presence of new onshore infrastructure such as substations / converter stations. • Potential for long-term effects on the setting of archaeological and architectural features from the presence of new onshore infrastructure such as substations /converter stations. • Potential for the discovery of new cultural heritage features during construction, and for recording and sharing learning from these sites/ features. • Potential for positive outcomes for conserving and enhancing the historic environment.
Landscape / Seascape and Visual Amenity	In	• Potential for effects on areas of designated landscape quality and scenic views (e.g., National Landscapes, National Scenic Areas, National Parks). • Potential for effects on the general landscape and seascape and its sensitivity to development (potential compatibility with landscape and seascape character types).

SEA Topic	Scoped In / Out	Potential Environmental Issues
		• Potential visibility of onshore structures by human receptors.

Table 2: Scoping of SEA issues

1.5 SEA Guidance

Key guidance documents that were used in the SEA for the draft HND Implementation Plan are listed in Appendix B of this Environmental Report.

1.6 Statutory Consultees for SEA

Under Article 6 of the SEA Directive, the competent authority (in this case NESO) preparing the Plan or Programme is required to consult with specific "environmental authorities" (statutory consultees) on the scope and level of detail of the information to be included in the Environmental Report.

The statutory consultees for SEA in England are:

- Natural England
- Historic England
- Environment Agency (EA)

The statutory consultees for SEA in Scotland are:

- Scottish Government
- Scottish Environment Protection Agency (SEPA)
- Nature Scot
- Historic Environment Scotland (HES)

The statutory consultees for SEA in Wales are:

- Cadw (Welsh Historic Monuments)
- Natural Resources Wales (NRW)
- Welsh Government

JNCC are also a statutory consultee for SEA in English, Scottish and Welsh offshore waters. The statutory consultees are as listed in the legislation for each jurisdiction. HND Central Design Group (CDG) Environmental sub-group (ESG) members have also been and will be

consulted in all stages of SEA consultation. The ESG includes the DESNZ, Marine Management Organisation (MMO), Transmission Owners/operators (TO's), Office of Gas and Electricity Markets (OFGEM), Scottish Government, Department for Environment, Food and Rural Affairs (DEFRA), JNCC, Natural England, NatureScot, Natural Resources Wales (NRW), Scottish Environmental Protection Agency (SEPA), Historic Environment Scotland (HES), Historic England, Wildlife Trusts (England), Crown Estate (TCE), and Crown Estate Scotland (CES).

1.7 Appropriate Assessment

The Habitats Directive (Council Directive 92/43/EEC) on the conservation of natural habitats and of wild fauna and flora obliges Member States to designate, protect and conserve habitats and species of importance in a European Union context. Article 6(3) of the Habitats Directive requires that "Any plan or project not directly connected with or necessary to the conservation of a site but likely to have a significant effect thereon, either individually or in combination with other plans or projects, shall be subject to appropriate assessment of its implications for the site in view of the site's conservation objectives."

The Habitats Directive is implemented in England and Wales and their inshore waters (within 12 nautical miles of the coast) by the Conservation of Habitats and Species Regulations 2017 as amended, the Conservation (Natural Habitats, &c) Regulations 1994, in Scotland on land and within inshore waters, and in UK offshore waters by The Conservation of Offshore Marine Habitats and Species Regulations 2017.

Any proposed Plan or Project that has potential to result in a likely significant effect on a designated European site, known as a National Site Network site, will require an Appropriate Assessment (AA). Case law has determined that the likelihood need not be great, merely possible, and that the precautionary principle must apply as set out in European Commission Guidance and as required by CJEU case law (i.e., C 127/02 'Waddenzee').

Habitats Regulations Assessment (HRA) for the draft HND Implementation Plan is being carried out in parallel with the SEA process. The HRA process included Stage 1 assessment of potential likely significant effects and Stage 2 AA of the potential for Adverse Effects on Site Integrity (AEoSI) of European sites (including Ramsar sites). A derogation report was also produced, indicating the process and outcomes for the derogation test identified as being necessary as part of the AA for the draft HND Implementation Plan in relation to the potential for AEoSI for four identified route corridors of the Recommended Design.

The outcomes of the HRA Report and Derogation Report have been integrated into the SEA Environmental Report.

1.8 Marine Conservation Zone Assessment

NG ESO (now NESO) commissioned a plan level Marine Conservation Zone (MCZ) assessment to accompany the HRA. Specific consideration of the potential for effects to occur on MCZs in English, Welsh, and Northern Irish waters; and Marine Protected Areas (MPAs) in Scottish waters, is required as part of marine licence applications, as set out in Section 126 of the Marine and Coastal Access Act 2009 (MCAA).

A Stage 1 MCZ Report considered the potential for adverse effects on MCZs, as well as Highly Protected Marine Areas (HPMAs) and Scottish Nature Conservation Marine Protected Areas (MPAs). This determined whether the draft HND Implementation Plan is capable of affecting (other than insignificantly) the protected features of an MCZ and/or any ecological or geomorphological process on which the conservation of any protected features of an MCZ is (wholly or in part) dependent. The Stage 1 assessment identified eight route corridors of the Recommended Design that had potential to hinder the conservation objectives of an MCZ, HPMA or MPA, despite the implementation of best practice mitigation measures. A Stage 2 Assessment was therefore completed for these identified route corridors. The Stage 2 MCZ Report concluded that other means of proceeding (OMP) could be identified for all eight study corridors that are considered reasonably feasible. The outcomes of the MCZ Reports have been integrated into the SEA Environmental Report.

2. Description of the HND Implementation Plan

2.1 Offshore Wind in Great Britain

2.2 Background to Holistic Network Design

2.3 Development of the HND Implementation Plan

2.4 Scope of the HND Implementation Plan



2.1 Offshore Wind in Great Britain

Offshore wind is currently the fastest-growing sector of renewable energy (Sankannawar, 2023); in the UK offshore wind generation overtook that of onshore generation in 2019 and accounted for 55% of all wind generation in 2021 (Waters, 2024). The UK has become one of the world leaders in offshore wind energy deployment, with 13GW of offshore wind capacity and a target set out in the UK Energy Strategy of 50GW by 2030 of which 5GW will be floating wind. The British Energy Security Strategy (BESS), published by the UK Government in April 2022, set out a plan to increase the supply of electricity from zero-carbon British sources, including an ambition 50GW of offshore wind in the UK by 2030 to, with 11GW of that located in Scotland (UK Government, 2022).

Offshore wind has been identified as a critical technology in achieving net zero greenhouse gas emissions by 2050. To help realise this target, a step-change in both the speed and scale of deployment of offshore wind is required. One of the challenges to delivering the ambition for offshore wind deployment in the timescales required will be making sure that the offshore and onshore transmission network enables this growth in a way that is efficient for consumers and takes account of the impacts on communities and the environment.

2.2 Background to Holistic Network Design

In response to the requirement for a future coordinated offshore and onshore network to enable this growth, the Offshore Transmission Network Review (OTNR) was commissioned by the UK Government in 2021 and most recently updated in 2023 (UK, Government, 2023). Through this, the Energy System Operator NG ESO and later NESO[1] carried out a series of offshore network design processes to determine the offshore network required to realise this ambition, which included the Holistic Network Design (HND) and Holistic Network Design Follow Up Exercise (HNDFUE) design exercises.

Network design objectives were established, to be considered on an equal footing when evaluating and comparing designs. These were considered in both the HND and HNDFUE design processes:

- **Economic and efficient** – Delivered in an economic and efficient way, ensuring the best value for bill payers.

[1] NESO was formed as a publicly owned arms-length governmental body on 1 October 2024. Prior to this, this organisation was known as the Electricity System Operator, or ESO, a private company within the National Grid Group.

- **Deliverability and operability** – Can be operated in a practical and economic way.
- **Environmental impact** – Minimise the impact, where possible, on the natural environment
- **Local community impact** – Minimise the impact, where possible, on the communities that host this infrastructure.

The first HND was published in 2022 as the Pathway to 2030 Holistic Network Design report (NG ESO, 2022a) and presented a design recommendation to connect 23GW of offshore wind using a coordinated offshore network. Offshore wind projects at an early stage of development located around Scotland, Wales, the east coast of England north of the Wash, north-west England and south-west England were within the scope of the HND. This was a first of its kind, integrated approach for connecting offshore wind to Great Britain. It recognised that the planned increase in scale of offshore wind deployment would require additional transmission network infrastructure to deliver generated energy to customers, and that a change from the current radial approach to designing, building, and connecting offshore wind farms (OWFs) involving limited coordination to a more centralised and strategic approach to network planning would be needed; it integrated the connections of OWFs to shore with the capability to transport electricity around Great Britain. This process considered and compared a series of onshore and offshore design options including future generation and demand scenarios, the existing transmission network and total capital and operational costs. The onshore network needs were considered in NOA 2021/22 Refresh (NG ESO, 2022b), with further detailed design assessments to be undertaken by the Transmission Owners.

In response to the release of further capacity within existing and new offshore wind leasing rounds by both the Crown Estate and Crown Estate Scotland, NG ESO was then asked to carry out a follow-up exercise to the original HND and set out an additional set of design recommendations to connect a further 21GW of offshore wind. This additional capacity was split across three separate leasing rounds: ScotWind, Celtic Sea (Round 5) and INTOG. Three separate design exercises were then carried out by NG ESO (and later NESO) for the offshore wind farm sites leased in each of these rounds. The design recommendations that resulted from these design exercises were then published as the Beyond 2030 suite of documents. The recommendation to connect the ScotWind sites was published in 2024 in the initial Beyond 2030 document **Beyond 2030 A national blueprint for a decarbonised electricity system in Great Britain** (NG ESO, 2024a). This report recognised that Britain's electricity needs were expected to rise substantially (by up to nearly 65%) by 2035, with the ambition of the UK Government to have a fully decarbonised electricity system by 2035 and to meet the targets of the Sixth Carbon Budget.

The Celtic Sea and INTOG recommendations were published in two additional documents within the Beyond 2030 suite of documents, **Beyond 2030: Celtic Sea** (NG ESO, 2024b), recommending a design for the connection of 4.5GW of floating offshore wind in the Celtic Sea, between south Wales and south-west England, and **Beyond 2030 INTOG** (NESO, 2024), with in-scope INTOG projects located off the north-east coast of Scotland.

2.3 Development of the HND Implementation Plan

The draft HND Implementation Plan has been prepared by NESO on behalf of Department of Energy, Security and Net Zero (DESNZ) to implement the recommendations of the HND work strands described in Section 2.2, and approved variations to the initial HND offshore design as accepted by NESO prior to August 2024. Applications for further variations to the initial HNDFUE designs are anticipated and it is intended that these will be addressed during periodic reviews of the HND Implementation Plan / SEA, with updates produced as required. The HND Implementation Plan is defined as the cumulative offshore network design recommendations from the HND and HNDFUE processes.

Figure 2 illustrates the development of the HND work strands and proposes how these should be incorporated into the SEA, Habitats Regulations Assessment (HRA) and Marine Conservation Zone (MCZ) Framework. It outlines the key tasks that have been undertaken to date, and those that have yet to be undertaken. These can be summarised as follows:

1 Development and publishing of the Holistic Network Design - Pathway to 2030 (NESO, 2022a). Assessment of coordinated and radial approaches to cabling connections from Round 4 OWFs and some ScotWind OWFs. Impact Assessment of proposed amendments to HND preferred routes and options[2].

2 Development and publishing of Holistic Network Design Follow Up Exercise - Beyond 2030 (NESO, 2024a). Assessment of coordinated and radial approaches to cabling connections from remaining ScotWind OWFs.

3 Development and publishing of Beyond 2030: Celtic Sea (NESO, 2024b). Assessment of coordinated and radial approaches to cabling connections from Celtic Sea OWFs.

4 Development and publishing of Beyond 2030: INTOG (NESO, 2024c). Assessment of coordinated and radial approaches to cabling connections from Innovation and Targeted Oil and Gas OWFs.

5 SEA Screening on the need for SEA.

6 Development of the HND Implementation Plan; an umbrella document that brings together HND, HNDFUE Scotwind, Celtic Sea and INTOG designs as defined at the current time[3].

[2] This is an ongoing activity and, as such, may not be completed in time for consideration within the SEA and HRA appraisals. Depending on when this is completed, it could be incorporated into step 7 of the process, after step 8, public consultation, or as part of annual Plan review.
[3] Note that SEA screening and scoping is based on this combined concept.

7 Decision on preferred overall option and compilation of an HND Implementation Plan document, the draft Plan. SEA Environmental Assessment, HRA and MCZ.

8 Public Consultation on the draft Plan, SEA Environmental Report and HRA Report and MCZ Report.

9 Compilation of Final Plan, SEA Statement and Final HRA Report.

10 Annual Review to ascertain progress and consider any amendments to the HND Implementation Plan, to include impact assessments of proposed amendments to HNDFUE, Celtic Sea and INTOG preferred routes and options.

11 Full Plan Review on a 5 / 6-year cycle.

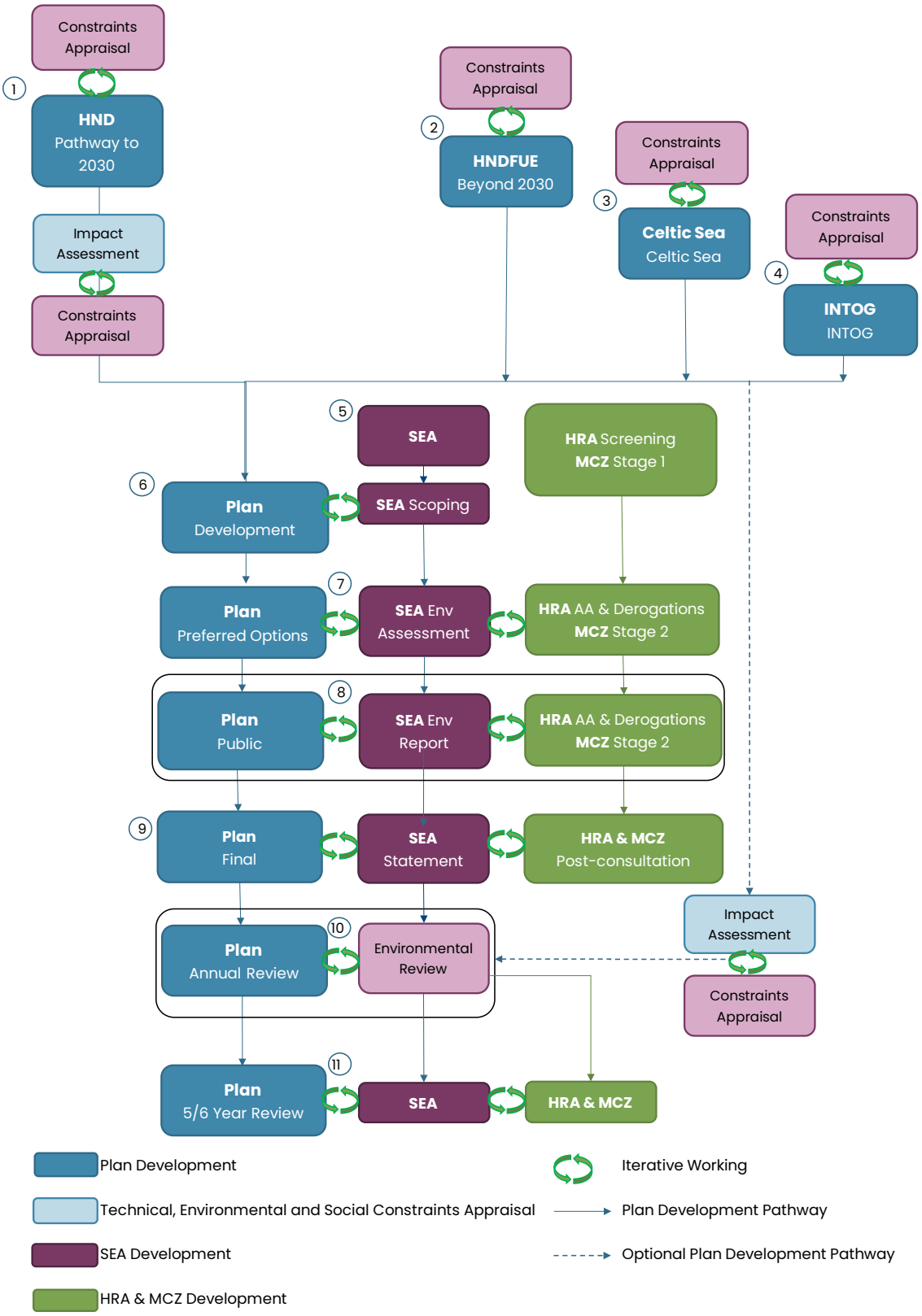


Figure 2: HND/SEA/HRA

2.4 Scope of the HND Implementation Plan

Three facets of strategic energy planning are currently in development by NESO. Each of these plans has distinct aims, objectives and overall timelines. In order to adequately appraise these plans, and abide by relevant environmental regulations, each strategic energy plan will have its own environmental assessments. The scope of each plan is as follows:

The **Strategic Spatial Energy Plan (SSEP)** is a GB-wide plan that will map potential zonal locations, quantities and types of electricity and hydrogen generation and storage over time. The environmental assessments for this plan, comprising SEA, HRA and MCZ, will cover onshore and offshore generation (spatial zones).

The **Centralised Strategic Network Plan (CSNP)** will provide an independent, coordinated and longer-term approach to wider onshore and offshore transmission network planning in GB. The first CSNP will cover gas, electricity and hydrogen, with all three vectors covered by the statutory environmental assessments. To enable an efficient future energy system, the CSNP, guided by the SSEP and Future Energy Scenarios, will strategically plan the electricity, gas, and hydrogen transmission network. The environmental assessment for this plan, comprising SEA, HRA and MCZ, will cover all onshore and offshore transmission reinforcement works.

The **HND Implementation Plan** (this plan) covers all the latest GB network designs captured within HND and HNDFUE (as of August 2024). The environmental assessments for this plan, comprising SEA, HRA and MCZ, will cover marine works to the onshore interface point associated with the HND and HNDFUE offshore designs.

2.4.1 Geographic Extent of the HND Implementation Plan and SEA

The initial geographic area covered by the draft HND Implementation Plan encompassed coastal waters and onshore areas in the jurisdictions of England, Scotland, and Wales, as well as offshore GB waters out to the boundary of the EEZ, as illustrated by the EEZ boundary in Figure 3.

This initial plan area was cropped to a smaller plan area to focus on the proposed Project Development Areas (PDAs) for the Recommended Design illustrated in Figure 4, with the inclusion of a 5km buffer around PDAs and cable corridors to consider the potential for effects of development within these areas. This plan area remains within GB waters, as illustrated by the HND Implementation Plan Area boundary in Figure 3.

The SEA Study Area included a 15km buffer around PDAs and cable corridors due to the need to include areas of seabed and water column within one tidal excursion which may

be impacted by development. This SEA Study Area extends beyond GB waters in some instances, as illustrated by the SEA Study Area boundary in Figure 3 and Figure 4.

Within this SEA Study Area, potential route corridors and Recommended Designs for the four HND / HNDFUE work strands have been considered, taking into account environmental, community and technical constraints and sensitivities. The potential for positive or negative effects on SEA environmental topic areas have been determined, with reference, where relevant, to the potential for effects at a greater distance (e.g., for mobile species). The consideration of a wider geographic area than the plan boundary enables a comprehensive environment assessment across all SEA topics, however the plan is not anticipated to have significant effects beyond GB waters.

The HRA and MCZ assessments for the draft HND Implementation Plan have been prepared separately and investigate the potential for impacts on European sites and MCZs and cover wider study areas and zones of influence to address ex situ impacts to habitats and species.

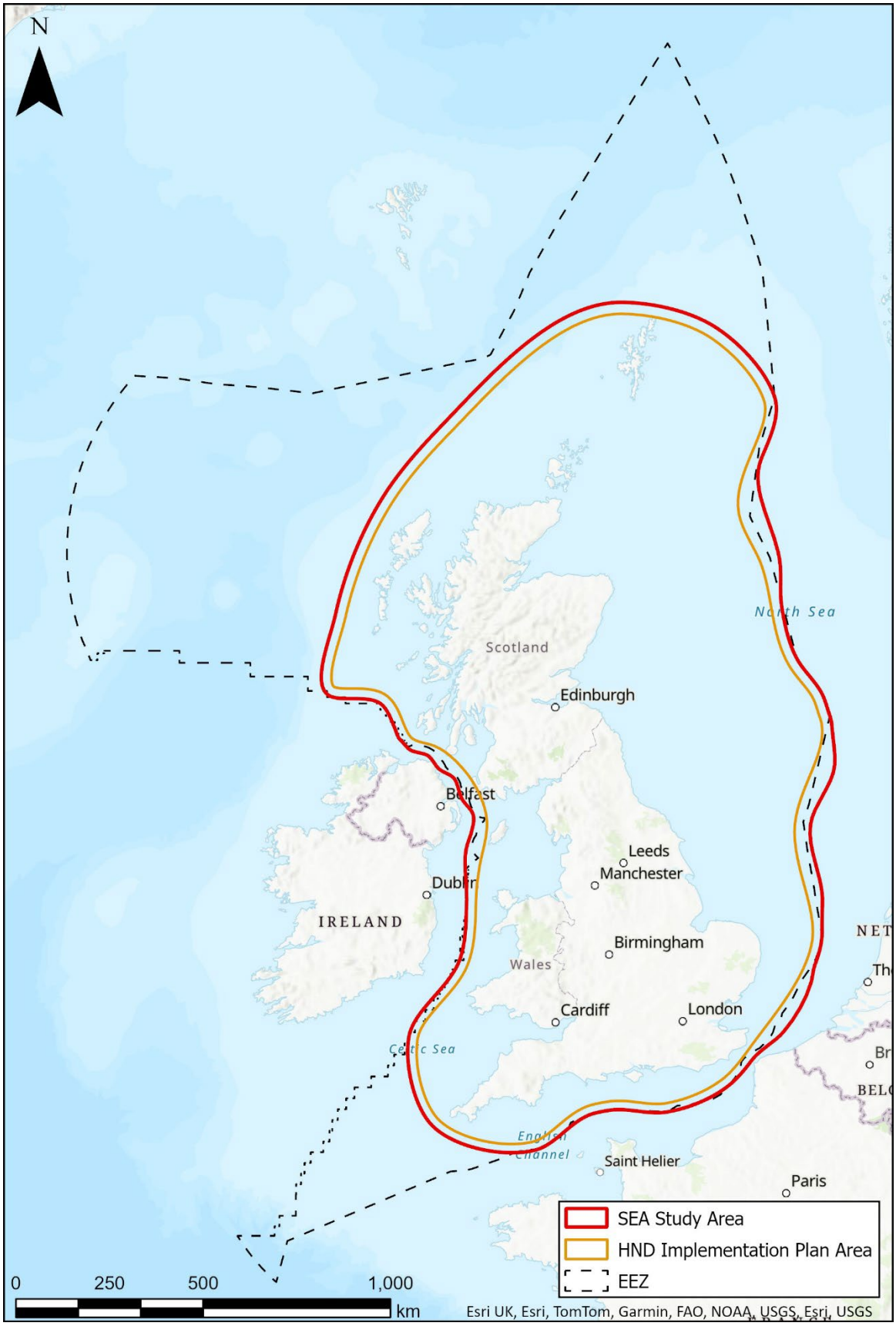


Figure 3: Initial geographic area of the Draft HND Implementation Plan (EEZ), HND Implementation Plan Area and SEA Study Area

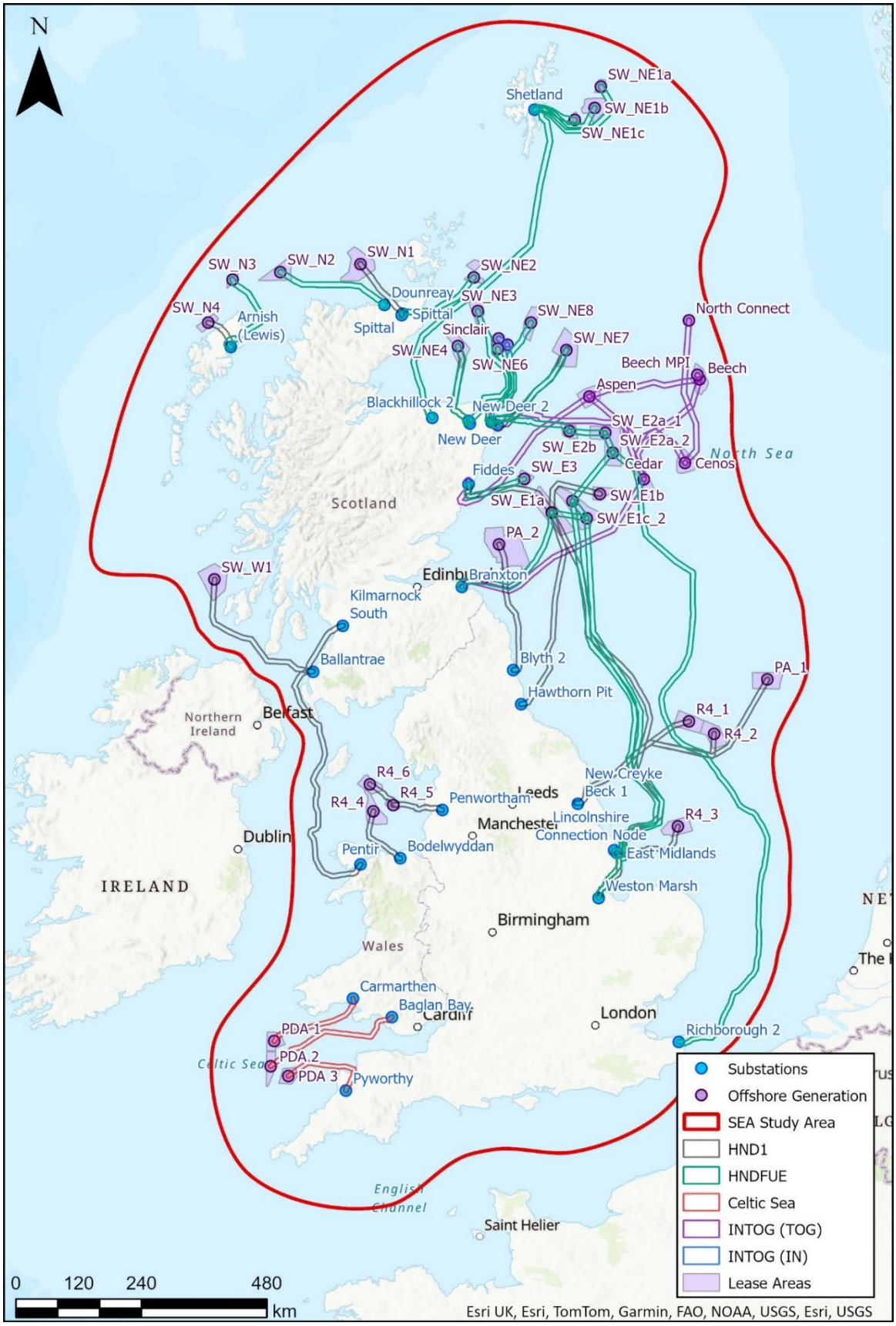


Figure 4: The SEA Study Area for the draft HND Implementation Plan

2.4.2 Temporal Extent of the HND Implementation Plan and SEA

The draft HND Implementation Plan encompasses the four HND / HNDFUE work strand network designs, as published, each of which have set out timelines:

- **HND -** the 'Pathway to 2030 Holistic Network Design', published in 2021, provides recommendations for the connection of 23GW of offshore wind power and helps deliver the UK Government's target of 50GW of offshore wind ***by 2030***.
- **HNDFUE: Scotwind** - the initial Beyond 2030 document 'Beyond 2030 A national blueprint for a decarbonised electricity system in Great Britain', published in March 2024, facilitates the connection of an additional 21GW of offshore wind directly as a result of the ScotWind leasing round ***by the mid 2030s***.
- **HNDFUE: Celtic Sea** – 'Beyond 2030: Celtic Sea', published in August 2024, facilitates the connection of the Crown Estate's (TCE) Floating Offshore Wind Leasing Round 5, connecting 4.5GW of floating offshore wind into South Wales and South West England ***throughout the 2030s***.
- **HNDFUE: INTOG** – 'Beyond 2030: INTOG', published in December 2024, facilitates the connection of Crown Estate Scotland's (CES) Innovation and Targeted Oil and Gas (INTOG) offshore leasing round ***in the 2030s***.

The network recommendations laid out in these reports are designed to be built upon one another, with the Beyond 2030 network designs building on top of the Pathway to 2030 baseline. The baseline for later work strands will be altered based on the designs in earlier work strands.

The temporal scope of the SEA considers the potential for short-term (construction phase), medium-term (re-establishment and initial operational phase, considered as 0-5 years post-construction), and long-term (operational phase, 5 years post-construction onwards), as well as decommissioning impacts from implementing the potential offshore and onshore projects that could arise from the draft HND Implementation Plan (including reference to secondary, cumulative, synergistic, permanent and temporary, positive and negative effects), in line with the requirements of the SEA Directive. It should be noted that due to the strategic level of the SEA for the Plan that the temporal periods do not relate specifically to certain species or habitats, it is assumed that post-5 years the maximum amount of potential recovery will have occurred.

2.4.3 Scope of the HND Implementation Plan

2.4.3.1 HND Development

The draft HND Implementation Plan is being prepared to implement the cumulative offshore network design recommendations, and approved variations to the initial HND and HNDFUE offshore designs, as described in Section 2.3. The objective of the four work strands comprising the network design process, namely HND, HNDFUE: Scotwind, HNDFUE:

Celtic Sea, and HNDFUE: INTOG, was to provide a set of holistic network recommendations to facilitate the connection of offshore wind in GB waters.

The draft HND Implementation Plan provides offshore network design recommendations and sets the framework for the development of offshore cabling, associated onshore cabling, converter stations and developer substations; it is these elements that are within the scope of the draft HND Implementation Plan, as shown in Points 4 and 5 in Figure 5. The offshore wind farm spatial and environmental considerations are not within the remit of the draft HND Implementation Plan but are covered by the Offshore Energy Strategic Environmental Assessments, the Scottish Sectoral Marine Plan for Offshore Wind Energy, and TCE / Crown Estate Scotland leasing, as shown in Points 1, 2 and 3 in Figure 5. Additional onshore requirements, such as new or upgraded grid substations, grid reinforcements etc. will be considered by tCSNP2 Refresh and the Centralised Strategic Network Plan (CSNP) and associated SEA, as shown in Point 6 in Figure 5. These related offshore and onshore elements that are not within the remit of the draft HND Implementation Plan will, however, be considered by the SEA in the assessment of the potential for cumulative or synergistic effects on the environment.

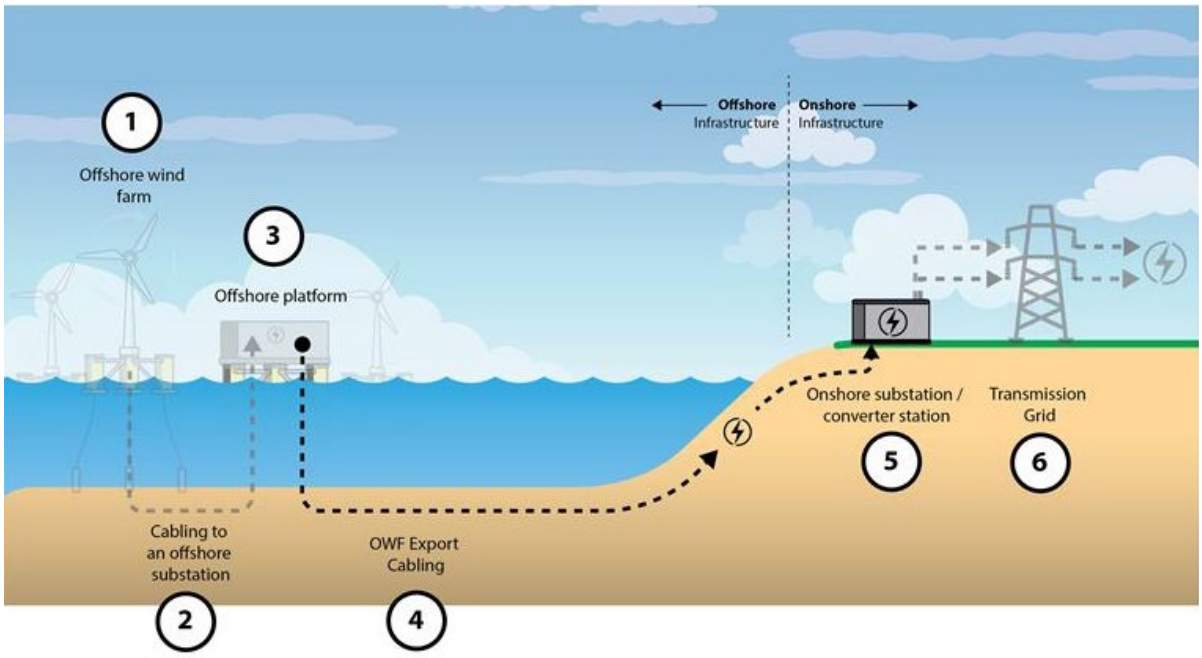


Figure 5: Offshore and onshore elements within the scope and outside the scope of the HND Implementation Plan

2.4.3.2 Assessment Methodology

The four network design objectives outlined in Section 2.2, i.e. 'Economic and efficient', 'Deliverability and operability', 'Environmental impact', and 'Local community impact' were considered on an equal footing in the determination of a Recommended Design(s) for

each work strand. The economic and deliverability appraisals were undertaken by NESO, while the environmental and community appraisals were undertaken by RPS.

As part of the overall HND and HNDFUE work strand design methodology, RPS undertook an assessment of environmental and social constraints to offshore cabling (cabling from the proposed offshore wind farm site to the proposed interface point on the onshore grid) to inform the development of recommended network design options. The RPS assessment methodology was intended to provide a consistent, rapid and robust approach to establishing the likely risks of impacting various environmental, community and technical constraints / sensitivities, and hence determine the potential feasibility of an area to accommodate a proposed interface point and identify potentially feasible route corridors / design options.

This assessment methodology involved three levels of ratings, based on BRAG (BLACK, RED, AMBER, GREEN) criteria, each of which was considered relevant to that assessment stage, as detailed in Appendix C. These were:

1. The rating of individual constraints and sensitivities based on their potential to constrain the deliverability of the option if impacted by that option.
2. The ranking of individual aspects of the proposed HND/HNDFUE work strand e.g., Interface Points, cable Route Corridors, offshore platforms, which took account of the number and level of constraints intersected.
3. A final overall ranking of HND/HNDFUE work strand options, which amalgamated the rankings of the individual aspects of the option i.e., Interface Points, cable route corridors, offshore platforms, to give a single relative ranking for the option, thus enabling options to be compared.

The overall aim of this methodology was to robustly implement the established mitigation strategy of Avoid, Reduce, Mitigate; with a strong focus on Avoid and Reduce applied during the early stages of the overall methodology, with mitigation only considered at a strategic level, where required, in the final options appraisal.

The stages in the network design and assessment process are summarised in Figure 6. The starting point in the network design and assessment process was to consider how to feasibly get from 'Point A', the offshore site where wind energy would be generated, to 'Point B' representing potential interface points and/or substations on shore. Environmental screening of all potential interface points onshore, considering BLACK and RED constraints within a 5km radius, led to the screening out of some sites due to the higher level of constraints. Potential route corridors were then developed between the offshore wind generation sites and the screened in onshore interface points. Environmental screening of all potential route corridors using BRAG ratings, and taking on board feedback from the HND CDG ESG, enabled the identification of initial Options for network design, each of which comprised several route corridors. The ESG included the Marine Management Organisation (MMO), Transmission Owners/operators (TO's), Office of Gas and Electricity Markets (OFGEM), Scottish Government, Department for Environment, Food and Rural Affairs (DEFRA), Joint Nature Conservation Committee (JNCC), Natural England, NatureScot, Natural Resources Wales (NRW), Scottish Environmental Protection Agency (SEPA), Historic Environment Scotland (HES), Historic

England, Wildlife Trusts (England), Crown Estate (TCE), and Crown Estate Scotland (CES). Further appraisal of these initial Options using BRAG rankings, with a severity to differentiate between Options within the same BRAG ranking, along with further input from the ESG, enabled the identification of short list Options. Appraisal of onshore requirements such as consideration of necessary reinforcements to the onshore network, in consultation with TO's led to the identification of one or more Preferred Options for each of the four HND / HNDFUE work strands.

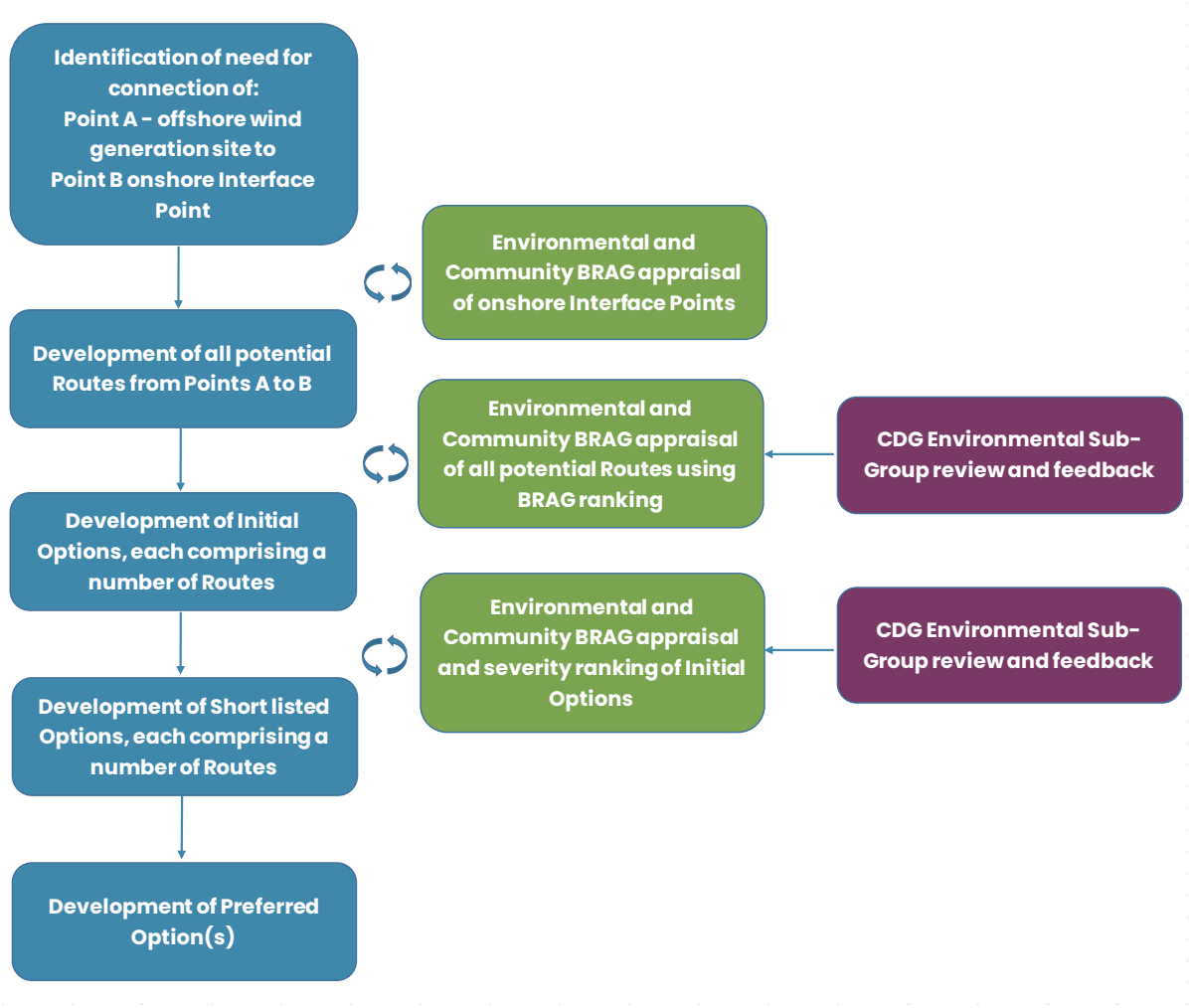
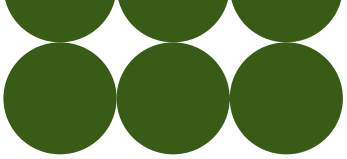


Figure 6: Summary of the appraisal process

2.4.3.3 Constraints Analysis and Assessment

Datasets that represented real-world environmental, community and technical constraints and sensitivities to cabling were gathered and prepared, and were allocated a BRAG rating – Black, Red, Amber, Green, based on the level of risk that impacting on them would pose to the consenting of a cable through an area or across a feature, or the level of risk posed to the establishment of an asset. These ratings were as detailed as possible, based on specific feature sensitivities, where identified by stakeholders. For example, all Special Areas of Conservation (SACs), Special Protection Areas (SPAs) etc. were typically given an Amber rating, except where qualifying features were flagged by Joint Nature Conservation Committee (JNCC) / Natural England (NE) / Natural Resources Wales (NRW),



or otherwise identified as being sensitive to cabling operations, in which case they were elevated to Red. Three documents (Nature conservation considerations and environmental best practice for subsea cables for English Inshore and UK offshore waters by NE and JNCC, Sensitivity of marine ecology receptors to cabling activities in Wales by NRW, and Natural England and JNCC, and advice on key sensitivities of habitats and Marine Protected Areas in English Waters to offshore wind farm cabling within Proposed Round 4 leasing areas by NE and JNCC) fed into this analysis, The constraint analysis was informed by a series of principles covering issues such as allowable proximity, features to avoid, etc., which were used to assign the BRAG ratings to each constraint. The data list used in the assessment methodology within the four work strands of the draft HND Implementation Plan are detailed in Appendix C.

For the initial routing exercise GIS analysis was used to identify feasible route corridors, based on the constraints data and rankings, enabling indicative route corridors and route corridor lengths to be generated for use in optimiser modelling by NG ESO / NESO. This appraisal also assigned BRAG rankings in terms of environmental, community and technical issues as defined in Appendix C.

Following the initial routing, NG ESO / NESO identified short-listed route corridors for further assessment. GIS techniques were then used to generate a “heat map” or “cost surface”, whereby the study area was mapped based on the “cost” of routing a cable through each cell in a raster of constraints. In this context “cost” does not represent a monetary value, rather it represents the combined influence of multiple criteria that affect the feasibility of laying a cable or establishing an asset, under the broad headings of environmental, community and technical. Areas of environmental constraints arose due to there being environmentally sensitive habitats or species present and/or the areas being designated through international, European, national, or local planning legislation. Areas of community constraint were where there was likely to be disturbance to, or risk to, human activity or impacts on heritage features. Technical constraints were areas where it would be technically difficult, or not technically feasible, to construct and operate the elements required to form the HND / HNDFUE network and included issues such as the availability of space at landfalls.

To apply the GIS modelling each constraint was allocated a rating, usually between 1 and 10, with 10 representing a very onerous (RED) constraint. Higher values were used for features that were crucial to avoid (BLACK). This allowed the GIS to sum-up constraint values over sections of route corridors to produce the cost surface. The BRAG rating of data allowed for easy and quick identification of constraints and their relative sensitivities to cabling, while the heat mapping allowed for easy and quick identification of cumulative constraints and sensitivities. By using heat mapping the BRAG rated data could be mapped and assessed qualitatively, with heat mapping used to generate least cost study corridors, to assist in identification of A to B route corridors and their strategic alternatives.

2.4.3.4 Assessment Outcomes and Identification of Preferred Options

The network design methodology applied for the four HND / HNDFUE work strands appraised a significant number of potential route corridors and grouped Options, including consideration of technical, environmental, and community constraints and

sensitivities at key points in this process. The outcome of each work strand was the identification of one or more Recommended Designs. The number of potential strategic route corridors and options appraised for each work stream and the Recommended Design identified for each is summarised in Table 3. The Recommended Designs are shown in Figure 7.

Development and assessment of HND Work Strands

HND Work Strand	Description	Route Corridors Appraised	Options Appraised	Outcome Recommended Design
HND	Development and assessment of coordinated and radial approaches to cabling connections from Round 4 OWFs and some ScotWind OWFs.	166	79	Coordinated design – 9 of 18 in scope OWFs connected using coordinated connections.
HNDFUE: Scotwind	Development and assessment of coordinated and radial approaches to cabling connections from remaining ScotWind OWFs.	146	140 initial design options and 6 shortlisted design options.	Design S_009s
HNDFUE: Celtic Sea	Development and assessment of coordinated and radial approaches to cabling connections from Celtic Sea OWFs.	19	41 initial design options and 8 shortlisted design options.	Design C_011z
HNDFUE: INTOG	Development and assessment of coordinated and radial approaches to cabling connections from Innovation and Targeted Oil and Gas OWFs.	30	29 designs shortlisted for the TOG designs; 5 designs shortlisted for the IN designs.	Combination of IN_002 and TOG_R012U-NC

Table 3: Steps in the development and assessment of the HND Work Strands

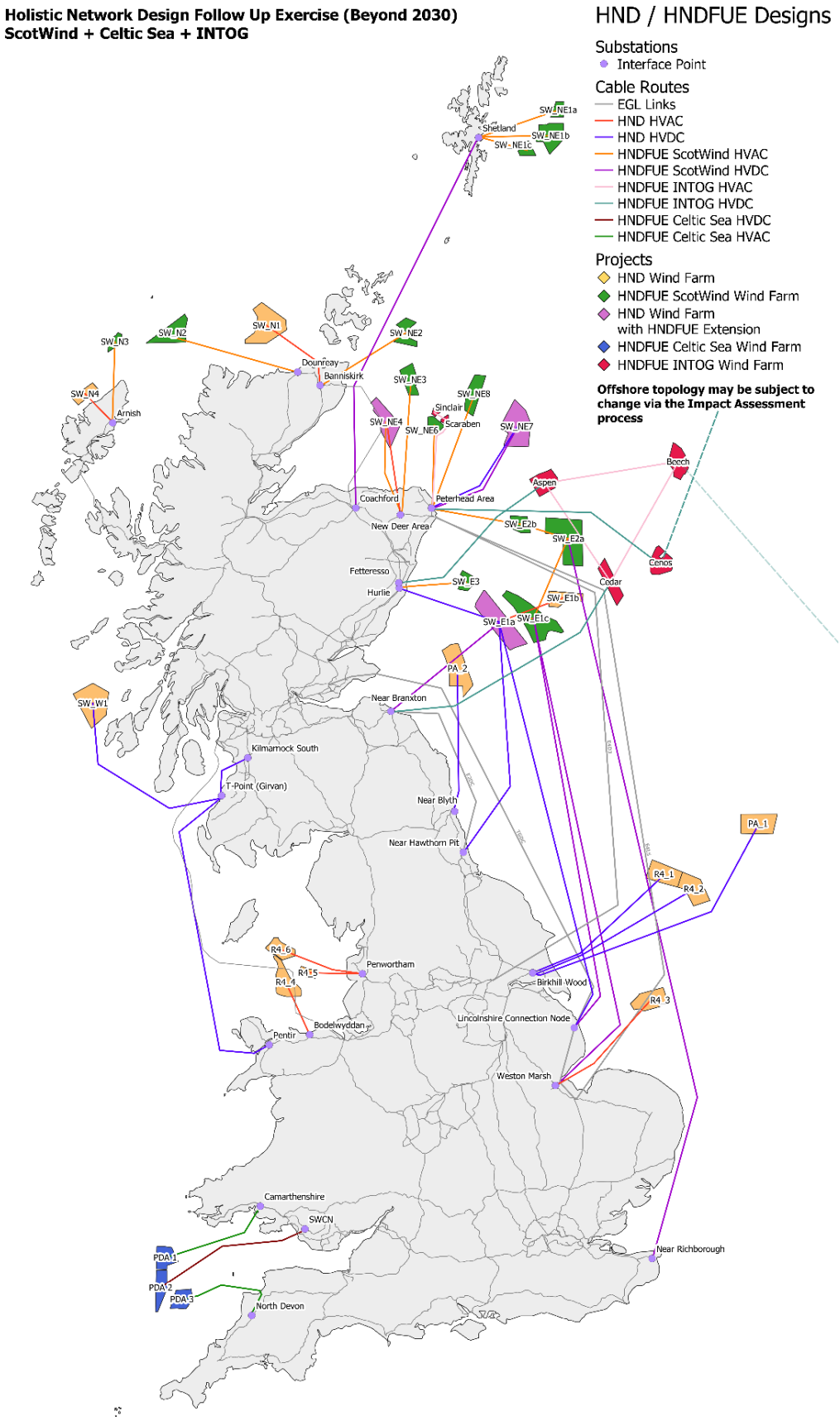


Figure 7: Schematic representation of complete HND and HNDFUE Recommended Designs (the Plan)

The environmental and community constraints datasets reflected and represented the topics considered in SEA, recognising the potential impacts of cabling operations and the key areas and/or features that should be avoided. The appraisal process considered hundreds of potential routes and options throughout GB, as detailed in Table 3. Owing to the considerable scale and the significance of time and resources that would be required to undertake a full impact assessment at each stage of this iterative process, this was not considered feasible within the necessary timeframe. Instead, the key criteria of SEA were followed, whereby environmental and community constraints and sensitivities are considered and avoided. In this manner the appraisal process has functioned as a form of 'SEA light' for hundreds of iterations of potential routes and options, with important environmental and community factors influencing the design development. Furthermore, all short-listed route corridors and options have been appraised using key indicators under each SEA topic, as further detailed in Section 6.

The environmental and community constraints datasets, as introduced earlier and shown in Appendix C, also reflect and represent the SEA topics of Biodiversity, Flora and Fauna; Population and Human Health; Geology, Soils and Land use; Water; Air; Climatic Factors; Material Assets; Cultural Heritage; and Landscape and Visual Amenity, recognising the potential impact of cabling across these topic areas. The BRAG rating definitions used for the constraints data are also shown in Appendix C.

Section 9 of this SEA Environmental Report provides a comprehensive assessment of the Recommended Designs established by the four HND / HNDFUE work strands, under the assessment framework detailed in Section 6.

3. Baseline and Environmental Problems

3.1 State of the Environment Reporting

3.2 Environmental Characteristics



In line with the SEA Directive, this section describes the environmental baseline for the draft HND Implementation Plan SEA Study Area. This includes: a description of the state of the environment at present; a discussion of the key problems/issues currently being faced in the area; and a description of the expected evolution of the environment should the draft HND Implementation Plan not be implemented, i.e., in the absence of the Plan.

3.1 State of the Environment Reporting

State of the Environment Reporting across the GB jurisdictions provides data and information summarising the general state of the environment through time with the aim of highlighting whether environmental management has been effective or where further management may be required. State of the Environment Reporting provides a mechanism to identify early warnings for environmental risks, e.g., to air, land and water etc. It is recognised that reporting requirements for the GB jurisdictions do not follow the same timescale requirements and are undertaken when resources allow. Therefore, the State of the Environment Reporting provides a means to understand key environmental issues and how the environment is changing, rather than the current state of the environment.

3.1.1 State of the Environment Reporting for England

England's state of the environment reporting is split into reports covering coastal and marine (Environment Agency, 2023), the urban environment (Environment Agency, 2021), health people and the environment (Environment Agency, 2020a), soil (Environment Agency, 2019), air quality (Environment Agency, 2018a), water resources (Environment Agency, 2018b) and water quality (Environment Agency, 2018c). Additionally, the 'State of the water environment: long-term trends in river quality in England: 2024' has been used to provide more up to date information on water quality, where applicable (Environment Agency, 2024a).

These states of the environment reports highlight the societal inequalities present with many industrial heritage towns and cities having too little green spaces, poor water and air quality with the COVID-19 pandemic amplifying these issues. There is a need for sustainable development with a focus on the transition to net zero, while air quality issues are one of the biggest environmental threats to human health in the UK.

A summary of the relevant aspects of the state of the environment in England, as presented in the most recent state of the environment reports has been provided in Table 4.

State of the Environment in England

Theme	Key Findings
Air Quality (Environment Agency 2021; 2018a)	There were 31 air quality reporting zones in England in 2020. Emissions and concentrations of most air pollutants have decreased in recent decades. Although annual average urban, roadside and rural background nitrogen dioxide (NO2) levels had decreased between 1990-2017 (linked to reductions in transport emissions), NO2 remained a concern as urban locations exceeded the EU annual mean limit values in 2016. Particulate matter (PM2.5 and PM10) and ozone were within legal limits but remained at levels of concern for human health in many locations. PM2.5 and PM10 concentrations had been declining in recent years, while annual average urban background ozone pollution had increased between 1990 and around 2003, after which levels remained relatively stable. Annual average sulphur dioxide (SO2) levels in the UK had decreased significantly since 1992 at all UK long-term monitoring sites and were below the EU limit value in 2016, reflecting large reductions in the amounts of coal and fuel oil being used for energy generation and other purposes. Annual average levels of lead (Pb) and cadmium (Cm) had both reduced by more than 50% since 2004. Where regulations existed, metallic pollutants were generally below EU target and limit values. Nickel (Ni) levels exceeded EU target values in some industrial areas in 2016, but there was no clear trend between 2004 and 2016. Atmospheric ammonia (NH3) decreased slightly (6%) between 1998 and 2014 in the UK, whilst NH3 emissions had decreased by 16% in this same timeframe. NH3 emissions in the UK have since increased by 10%. Benzo[a]pyrene is one of the more toxic Polycyclic aromatic hydrocarbons (PAHs) and was monitored as a 'marker' for the group. Annual average levels in the UK reduced by more than half between 2008-2016. Ambient concentrations of most other persistent organic pollutants (POPs) had decreased significantly since 1990. Annual mean benzo[a]pyrene levels in all but one monitoring location in England were below EU target values in 2016. Background benzene levels fell sharply between 2004 and 2008 linked to the introduction of catalytic converters in cars in the 1990s, with little change since.

Theme	Key Findings
Climate Change (Environment Agency, 2021)	England's climate was reported as changing and will continue to change as a result of Greenhouse Gas (GHG) emissions. The 21st century has so far been warmer than the previous three centuries. It was estimated that climate change has increased the likelihood of record-breaking warm years in central England by at least 13 times. Over the previous 50 years, more winter rainfall has fallen in heavy events. Hot, dry summers, heatwaves and floods are all expected to become more frequent in future years. Sea levels are rising around the UK, and this is expected to continue into the future. Coastal flood risk and erosion from rising sea levels is expected to increase over the coming decades. Extreme temperatures and flooding could both have environmental and human health effects and could damage buildings and infrastructure.
Water (Environment Agency 2018c; 2024a)	Water quality in rivers had improved markedly in recent decades but these improvements have not continued in recent years, with a 1% decline in the number of rivers that were at 'good or better' ecological status in 2016 compared to 2015. It was noted that the main activities preventing waterbodies reaching good status included agriculture and rural land management, the water industry, and urban and transport. An analysis of trends in water quality at a set of long-term river monitoring sites in England was carried out by the Environment Agency in 2024. Results of this analysis show that there have been substantial reductions in the concentrations of BOD (46%), NH3 (85%) and orthophosphate (83%) from 1990 to 2023, whilst nitrate concentrations have increased by 23% from 1990 to 2023, however, these concentrations have decreased by 19% from 1998 (the year of peak nitrate concentrations). Phosphorous and nitrates were the main nutrients affecting water quality in England according to the 2018 report, originating from sewage effluent and agricultural runoff, and agricultural use of fertilisers and associated run-off, respectively. The 2024 report noted that nitrogen and phosphate load to rivers from agriculture have declined significantly resulting in a reduction in soil nutrient balances, whilst pollution loads to rivers from water company sewage treatment works has decreased for NH3 (by 80%), BOD (by 55%) and phosphate (by 68%). Chemicals often found in rivers at levels exceeding their environmental quality standard in water included metals such as cadmium, lead, nickel and zinc and the organo-metal tributyltin. Concentrations of all dissolved metals have decreased

Theme	Key Findings
	substantially between 1990 and 2023 with mean concentrations reducing by more than 70% for cadmium, chromium and nickel, by more than 50% for lead and zinc, and by 37% for arsenic and 48% for copper. These reductions in concentrations for metals mostly occurred in the period between 1990 and the early 2000s. Since 2010, the annual means suggest concentrations are neither decreasing nor increasing, although there is still inter-year variation. Furthermore, concentrations of bioavailable metals (lead, copper, nickel and zinc) in rivers polluted by abandoned metal mines are reported as stable or slightly increasing, whilst in other rivers, concentrations are reported as decreasing. Recent data suggested the pesticide cypermethrin could exceed more stringent environmental quality standards due to be introduced from 2018. Groundwaters had been deteriorating in quality over the previous 60 years. Only 53% achieved good chemical status in 2016. Nitrates were a major issue and could cause exceedance of drinking water quality standards. Nitrates accounted for 65% of the reasons for failure for those groundwaters that were protected for use for drinking water and classed as poor status. Chemicals from industrial and agricultural sources contaminated many groundwaters, with pesticides one of the more common groups of chemicals found. Bathing water quality had improved over the previous 30 years, with 98% of sites passing minimum standards and 65% at excellent status in 2017. Population growth, climate change, emerging chemicals, plastic pollution, nanoparticles and fracking were reported as presenting potential future threats to water quality.
Marine (Environment Agency, 2023)	Of all assessed coastal waters, 45% were at good ecological status in 2021, indicating no change in coastal water quality overall since 2016. In 2021, only 19% of assessed estuaries were at good ecological status. Nitrogen levels, as well as the effects of physical modification in heavily modified waterbodies, were the primary reasons for estuarine and coastal waterbodies not achieving good ecological status. The main source of nitrogen to the water environment in England is agriculture, comprising 69% of inputs. The second largest source is wastewater, contributing close to 25%. Of monitored estuarine and coastal waterbodies, 93% and 47% respectively exceeded nitrogen standards set for good ecological status in 2019.

Theme	Key Findings
	All assessed waterbodies failed to achieve good chemical status in 2019. The failures mostly related to revised and improved assessment methodologies, which resulted in a more comprehensive assessment of the prevalence of persistent, bioaccumulative and toxic (PBT) chemicals in the environment. Heavy metal inputs from the UK to coastal and estuarine waters have decreased considerably since 1990, although further improvements since 2012 were not evident. Polychlorinated biphenyl (PCB) inputs from UK rivers to coastal and marine waters have reduced from around 2,000kg in 1990 to less than 250kg in 2019, reflecting the ban on PCB production and restrictions on use in the UK. Bathing Waters have improved significantly since 1995 when monitoring began. Just over 97% of Bathing Waters in England passed the minimum standard in 2022, just under 2% lower than in 2021, but the same level as in 2015. Just over 72% achieved an excellent standard, with more than 70% achieving an excellent standard for the previous four years. In 2021, 75% of Shellfish Waters failed to meet aspirational standards set for environmental protection, with this rate of compliance broadly static over recent years. A range of seafloor plastic litter types, including fishing-related plastics and plastic sheeting litter both increased significantly between 1992 and 2017. Plastic bags were the only category to see a significant decrease. In 2021, 56% of estuarine and coastal waterbodies were assessed as 'heavily modified'. Physical modification was the reason for failure to achieve good status in 44% of all assessed estuarine and coastal waterbodies in 2019.
Biodiversity (Environment Agency, 2023; 2021)	Much of England's existing coastal habitat is protected under some form of legislation, requiring avoidance of damage and, in the case of internationally protected sites, the restoration of coastal habitats where damage is unavoidable. Sites designated as part of the National Nature Recovery Network which have been designated under this, complement the existing site network and aid resilience to future change. England has experienced an ongoing loss of habitats such as sand dune habitats, dune wetland habitats, saltmarsh habitats, seagrass, native oyster habitats and kelp during the 20th Century. However, it was noted in 2021 that saltmarsh coverage in England had increased by 7% from 2009, while some species of

Theme	Key Findings
	kelp are predicted to increase in abundance or range with continued environmental change. Some marine species have also experienced a decline. There were 37 mammal species recorded in UK seas. Trends for cetacean species' populations are poorly understood in English waters. For the Greater North Sea, Good Environmental Status was considered consistent for bottlenose dolphin and Minke whale, while some species of whale (fin and humpback) were being recorded more often in UK waters. Seal populations appeared to be increasing in some places. For UK seabirds, although some species have seen population increases, overall, the situation had deteriorated over the previous decades. Of the 25 breeding seabird species in Britain and Ireland, 24 have been listed as red or amber. In 2018, the breeding seabird index in the UK was 28% lower than in 1986. There has been little to no change in percentages meeting abundance targets for all seabirds (breeding and wintering) over the short-term, measured between the late 2000s and the mid-2010s, apart from wintering waterbirds in the Celtic Seas region, which had declined. Terrestrial biodiversity is only considered in terms of urban environments. Biodiversity is lower in urban areas than in natural and semi-natural habitats but could provide opportunities for certain groups such as some mammal and pollinator species.
Soil (Environment Agency, 2019)	UK soil contains about 10 billion tonnes of carbon, roughly equal to 80 years of annual GHG emissions. Intensive agriculture has caused arable soils to lose 40 to 60% of their organic carbon, and the impacts of climate change is considered to pose further risks. Extended periods of wet weather can cause widespread damage to soil structure. Very heavy rainfall and thunderstorms can cause soil erosion which could exacerbate flood risks. An estimated 3.9 million hectares of agricultural lands are at risk of compaction in England and Wales, with risk highest on clay soils during wet periods. Erosion regularly exceeded the rate of formation in many areas. Approximately 17% of arable soils in England and Wales show signs of erosion, although 40% are thought to be at risk. Erosion is mainly confined to lighter arable soils on hillslopes and peats in upland areas. Agricultural intensification has led to an increase in erosion. Land used for industry, such as to store and dispose of waste and chemicals, has caused contamination of soils. Unintentional

Theme	Key Findings
	contamination has also occurred through accidents, spills and the demolition of buildings that contain toxic substances. Microplastics are widespread in soil with unknown consequences. The most recent estimate of the total area of contaminated land in England, from 2005, was 300,000 hectares. Reversing soil degradation and restoring fertility by 2030 is an aim of the Government's 25 Year Environment Plan. The proposed Environmental Land Management scheme will provide an opportunity to reward farmers for protecting and regenerating soils.
Water Resources (Environment Agency, 2018b)	Water is taken from rivers, lakes, reservoirs, estuaries and groundwater for a wide range of uses. Almost 9,500 billion litres of freshwater was abstracted in 2016. Impacts of pressures on water resources are evident and will increase with a growing population, changing climate and changes to how land is used. Abstraction, drainage and altered water levels are major causes of damage to wetlands. In 2017, abstraction from around 28% of groundwater bodies and up to 18% of surface waters was at higher than sustainable levels. In 2016, unsustainable abstraction prevented at least 6%, and possibly up to 15%, of river waterbodies from meeting good ecological status or potential.
Waste (Environment Agency, 2020a)	England generated 187 million tonnes of waste in 2016, an increase of 2.8% from 2014. Most waste generated came from sources other than households. Construction, demolition and excavation generated around 64% of waste, with commercial and industrial sources generating around 17%. Around 92% of non-hazardous construction waste was recycled in 2016: this rate had stayed the same for several years. Households generated around 12% of total waste. Urban areas tended to have lower household recycling rates than rural areas. Around 0.7 million tonnes was exported from the UK in the 12 months up to October 2018. Some of the large importers such as China stopped accepting plastic waste at the beginning of 2018, so that more plastic waste then needs to be managed within the UK or diverted in the interim to countries unlikely to have adequate capacity, resulting in pollution risks. In 2019, just over one third of all serious pollution incidents in England were caused by waste management activities. Of these, just over half were caused by illegal waste activities, and just under half by legal waste management activities such as landfill, biowaste and incineration.

Theme	Key Findings
Environmental Pollution and Health (Environment Agency, 2020a)	Pollutants can affect human health through long-term, low-level, exposure. Air pollution is the main environmental health threat in the UK, with the transport industry contributing to this, and with NH3 emissions from agriculture showing an increasing trend since 2013. The emergence of synthetic chemicals and microplastics is providing serious concern, along with growing antimicrobial resistance with human health implications. Water quality in groundwater bodies has been decreasing with fewer pollution incidences and generally surface waterbodies have been improving; however, issues are present for coastal and inland waterbodies being impacted by sewage and agricultural livestock outputs. Further pollution effects impacting health and wellbeing included noise and light pollution, with road and railway traffic noise found to frequently exceed the World Health Organisation's guidelines.
Health Benefits of the Natural Environment (Environment Agency, 2020a)	Spending time outdoors in the environment is reported as helping to reduce mortality rates, with improved mental wellbeing through increased physical activity. Increased natural environment access could help to reduce health issues and increase social contact and community cohesion, with access to outdoor spaces particularly important as highlighted during the COVID-19 pandemic.
Environmental Inequalities and Health (Environment Agency, 2020a)	There were inequalities present across England regarding access to the natural environment, with these having impacts on life expectancy rates and deprivation; poor urban areas typically have the least access to green spaces and had increased pollution levels.
Flooding and Health (Environment Agency, 2020a)	Flood events are becoming exacerbated by climate change, and these could have significant negative impacts due to the associated disruption and displacement and potential health risks from contamination by sewage during flood events with associated mental health impacts estimated at £20 million from flood events occurring between 2019 and 2020.
Climate Change and Health (Environment Agency, 2020a)	Climate change presents a major threat to local populations, with health impacts arising due to changes in temperature, disease and pollution, and with an ageing population and those with underlying health issues particularly vulnerable. With an increased risk of heatwaves air pollution issues are likely to be exacerbated as well as potential negative outcomes for biodiversity with a risk of invasive species establishing. Rising sea-levels also present an issue for coastal communities at-risk

Theme	Key Findings
	where current sea defences are inadequate with the increased risk of major storm or flood events affecting local populations.

Table 4: Summary of the state of the environment in England, as presented in various topic-specific state of the environment reports

3.1.2 State of the Environment Reporting for Scotland

Scotland's most recent state of the environment review (Critchlow-Watton et al., 2014) found that Scotland's environment was of good quality with significant improvements. However, some habitats and species remained threatened, with concerns surrounding urban air quality impacts on population and human health, with most emissions coming from the transport industry.

The report stated that environmental regulation had been well implemented in Scotland, however it was recognised that consumerism from the Scottish economy had contributed to environmental damage and problems. Climate change was recognised as one of the main obstacles facing Scotland's environment with alterations to weather patterns and the associated impacts on people, the natural environment and industries.

A summary of the relevant aspects of the state of the environment in Scotland, as presented in the most recent state of the environment review and supplemented by information available from Scotland's Environment Web regarding updated information on the various sections (Critchlow-Watton et al., 2014), has been provided in Table 5.

State of the Environment in Scotland

Theme	Key Findings
Air	Air quality has improved significantly since the 1950s. However, airborne pollutants are having impacts on both human health and sensitive habitats, particularly acid and nitrogen-rich pollutants. Emissions primarily originated from transport, energy production and industry. There were 99 air monitoring stations and 32 Local Air Quality Management Areas (AQMQs) in Scotland in 2025. The annual mean concentration of NOx has decreased by 60% between 2005 and 2021 with a 41% decrease in fine particulate matter with most PM sources from the burning of coal and solid fuels. SO2 has decreased by 92% from 2005 to 2021. It was estimated that 2,094 people in Scotland in 2010 had died due to particulate air pollution. The National Atmospheric Emissions Inventory (NAEI) showed that all pollutants have decreased since 2000, and that transport was the largest source of NOx emissions, accounting for 29% with emissions from energy

Theme	Key Findings
	production. Ammonia emissions are predominantly emitted by agriculture (65%), and waste emissions have increased by 155% since 2008 owing to an uptake in composting and anaerobic digestion. Reducing emissions, particularly from the transport sector, is recognised as a key target, with an aim of decarbonising the public transport fleet.
Land	Land conditions across Scotland are variable; the condition of habitats is variable, with two-thirds of farmland habitats and most wetlands in favourable condition, but with 59% of lowland raised bogs in unfavourable condition, and with numbers of some associated species decreasing. Modifications to land conditions from grazing, drainage, forest planting and pollutant deposition have impacted natural habitats and species; by 2013, 18% of Scotland was covered by woodland (of which 76% was coniferous species, and 24% was broadleaved species with an annual timber harvest of 7.1 million green tonnes in 2013, 64% of the UK's total timber harvest), which represented a small increase (4.5%) from the start of the 20th Century. Further modern pressures on Scotland's land are recognised, including the development of onshore wind farms and increased built developments alongside changes to farming and forestry practices, with agriculture at the time accounting for 80% of the land area. Landscapes are culturally important, as well as important for tourism purposes, and are estimated to be worth £420 million per year to the Scottish economy. Climate change is also predicted to impact the rural character of Scotland's landscape and sense of place, with changes to climatic patterns and habitats.
Water	There had been significant reductions in pollution in Scottish Waters in the 25 years prior to the 2014 report. Two-thirds of loughs and over half of Scottish rivers were in good or better condition under the Water Framework Directive, with groundwater generally also in good condition. There were concerns noted over habitat loss due to development, nutrient enrichment from agriculture, commercial fishing and diffuse pollution in coastal areas. In 2023, all but one designated Bathing waters met the mandatory standards, while 51 of the 84 designated Shellfish waters did not achieve the required standards. Invasive non-native species are indicated as a threat to Scottish waters, with nutrient enrichment particularly affecting estuaries and coastal waters and other pressures including climate change

Theme	Key Findings
	(particularly with ocean acidification) and inshore fisheries noted for coastal environments.
Climate	Modern living is reported as having amplified climate change owing to reliance on industries and processes that are the main sources of GHG emissions. The Climate Change (Scotland) Act 2009 required a cut of GHG emissions by 80% of 1990 levels by 2050, with adjustments required from both people and industry. Scottish climate generally has cool summers, with mild winters and year-round rainfall. Within the last century due to climate change it has become warmer, with drier summer periods and wetter winters of more frequent heavy rainfall which is identified as having widespread implications for habitats and species and land use practices such as farming. The average temperature of the last decade from 2010 to 2019 was 0.7°C warmer than the average from 1961-1990 with a 9% increase in rainfall as well. Further implications of climate change identified included rising sea levels and an increased risk of flooding and landslides
People and the Environment	The report identified that the environment provides a range of benefits for human health, from the air breathed, to the food and water relied on as well as providing materials and leisure activities. Approximately 70% of the Scottish population lived in urban areas. Access to the environment is important for wellbeing, and challenges existed in balancing short-term needs to maintaining or enhancing the environment. A significant challenge existed with waste, with a need to reduce the waste being sent to landfill and increase recycling further, with a doubling of household waste recycling reported since 2004. A further challenge identified for urban populations is air quality due to transport emissions; increasing green infrastructure of trees and green corridors is considered necessary to help improve this. It is considered that pressures will emerge due to a growing population, with a predicted population of 5.76 million by 2035, and the need for increased housing, infrastructure, energy and services.

Table 5: Summary of the state of the environment in Scotland, as presented in 'Scotland's State of the Environment Report, 2014' and from Scotland's Environment Web.

3.1.3 State of the Environment Reporting for Wales

The State of Natural Resources Report (SoNaRR) for Wales, required under the Welsh Environment Act 2016, assesses the sustainable management of natural resources (SMNR) in Wales and sets out a range of opportunities for action. This is assessed against the four long-term aims of SMNR:

- Aim 1: Stocks of natural resources are safeguarded and enhanced
- Aim 2: Ecosystems are resilient to expected and unforeseen change
- Aim 3: Wales has healthy places for people, protected from environmental risks
- Aim 4: A regenerative economy with sustainable levels of production and consumption

The SoNaRR (NRW, 2020) report found the stocks and states of natural resources in Wales to be variable. Generally, air quality showed continuing improvement, while water quality showed little change since the previous report, and rates of municipal waste recycling had been steadily increasing. Significant challenges remained in reversing biodiversity declines, reducing carbon emissions and meeting EU objectives for water bodies and habitats.

The ecosystem and cross-cutting theme chapters of the SoNaRR (NRW, 2020) identified the current pressures on natural resources, both within and outside of Wales. Climate change, pollution of air and water, land use change, agricultural intensification, overexploitation and invasive species were all identified as having a significant impact.

Despite environmental regulation being well implemented in Wales, the SoNaRR (NRW, 2020) concluded that Wales was not yet meeting the four long-term aims of SMNR. It set out a number of Opportunities for Action for each of the SMNR aims to contribute to the continuing progress of meeting each.

An interim (draft) SoNaRR was published in December 2024 which set out the plans for the third SoNaRR as well as any major new evidence sources that will be used, identifies and prioritises any evidence gaps, and sets out some key messages that are emerging around sustainable management of natural resources in Wales and their implications for well-being (NRW, 2024a). The full report was published in December 2025. The focus of this report is on the main challenges to Wales' natural resources – nature loss, climate change, and pollution and waste.

A summary of the relevant aspects of the current state of the environment in Wales, as presented in the SoNaRR (NRW, 2020) and updated by the SoNaRR (NRW, 2025a) report has been provided in Table 6.

State of the Environment in Wales

Theme	Key Findings
Air Quality	Of the 44 air quality management areas (AQMAs) in Wales, 43 are designated where NO2 levels exceed or risk exceeding the Welsh Government's air quality objectives. Average concentrations of NO2 pollution in the air have reduced from 14 ug/m3 in 2007 to 8 ug/m3 in 2022. NOx emission in 2023 (38kt) had declined by 63% since 2005, mainly due to changes in transport sources and ambient levels of NO2 had generally decreased, mainly owing to decreasing fossil fuel-based power generation and improved regulation of fuels (in particular, diesel). Road transport was the main source of nitrogen dioxide, accounting for nearly one-third of all UK emissions. Estimated NH3 emissions in 2023 (23kt) were similar to 1990 values but showed an increase of 5% since 2005, driven by agricultural sources and are predicted to further increase if measures to control emissions are not implemented. Ground level ozone O3 met air quality target values for health and for the protection of vegetation in 2018, however, although pollution peaks are decreasing, background levels are slowly increasing. It was considered that this background upward trend could continue owing to the complex chemistry involved, despite progress in reducing NO2 emissions. In 2023, SO2 emissions had decreased significantly (by 84%) since 2005 and were below the EU limit value in 2016, reflecting large reductions in the amounts of coal and fuel oil being used for energy generation and other purposes following the tightening of national and international emission standards. Metallic pollutants monitored include lead, cadmium (Cd) and nickel (Ni). Annual average levels of lead (Pb) and cadmium had both reduced since 2004. Metallic pollutants in Wales were generally well below EU target and limit values except for the Swansea Urban Area which continued to exceed the EU target values for nickel. One AQMA is designated due to the risk of PM10 particulate matter levels exceeding the daily 24-hour mean air quality objective for PM10. Overall concentrations of PM2.5 in most of Wales were below WHO guidelines, although there were hotspots in industrial and densely populated urban areas. Emissions of PM2.5 in 2023 (estimated to be 4kt) had declined by 48% since 2005 and emissions of PM10 in 2023 (estimated to be 8kt) had declined by 40% since 2005. Non-exhaust road transport

Theme	Key Findings
	emissions, domestic and industrial emissions contributed to the local peaks in urban areas, while irreducible sources, such as sea salt, natural, rural and urban dusts, and biogenic secondary organic aerosols, accounted for around one third of the WHO standard for PM2.5 (10μg/m3) over areas of south Wales. The main sources of PAH emissions to air were industrial sources and the domestic burning of coal and wood. Benzo[a]pyrene is one of the more toxic PAHs and is monitored as a 'marker' for the group. The most significant source of B[a]P in Wales is from the steel works located in Port Talbot. Measured concentrations frequently exceeded the Air Quality Objective of 0.25 ng/m3 but never exceeded the EU target value of 1 ng/m3.
Climate	Since the start of the 20th century records had shown that the climate in Wales is changing. The 2008-2017 decade was 0.8°C warmer than the average temperature experienced in 1961-1990. The average annual rainfall across Wales have not changed markedly, while evidence of seasonal changes and more heavy rainfall events existed. The 2013- 2022 decade, UK winters were 8% wetter on average than 1961-1990. It is predicted that Wales will experience higher temperatures and higher sea levels over the coming decades, and very likely more drier summers and wetter winters along with greater frequency and intensity of heavy rainfall events as a result of climate change. The Interim Report (2024) notes that Wales has made great strides in reducing GHS emissions. In 2022, Wales's GHG emissions were estimated to be 36MtCO2e, a reduction of c.36% since baseline levels in 1990 (56MtCO2e). In 2018, energy supply contributed 29% of Welsh emissions and the business sector 22% of the total. Other sectors contributed much less: transport (16%), agriculture (14%), residential (10%), industrial process (5%), waste management (3%) and public (1%). Although GHG emissions produced in Wales were declining, those emissions embedded in imported goods and services represented around one-third of total territorial emissions. Wales still needs to adapt to the risks it faces from climate change, given the global trajectory of increasing greenhouse gas emissions. The third UK Climate Change Risk Assessment has highlighted associated risks in Wales with respect to the natural environment, flooding, infrastructure, people's health and cultural heritage. These require increased and urgent action.

Theme	Key Findings
	The UK Climate Change Act commits the UK to reducing emissions by 100% by 2050 from 1990 baseline levels. The UK Committee on Climate Change (UKCCC) recommended that Wales targets a 95% reduction in emissions by 2050. In 2021, Wales updated the target of an 80% reduction in emissions by 2050 set in The Environment (Wales) Act 2016 to a new target of net zero by 2050.
Water	The extent of freshwater ecosystems, particularly river flood plains and ponds, deteriorated significantly over the 20th century. More recently, declines are thought to be more gradual, partly due to increased regulation and partly because there was now limited scope for further development in flood plains. There were 558 lakes in Wales; of these, the upland lakes were generally in good condition and improving, while lowland lakes were generally in poor condition and deteriorating. Lowland lakes were significantly impacted by nutrient enrichment. Data on lake habitats protected under the Habitats Directive showed that the majority were in Unfavourable Bad condition, with some habitats in upland lakes improving. Overall, 40% of Wales' surface and groundwater bodies achieved good or better overall status in 2025. This is still low but does represent an improvement of 3% from 2015 and an 8% improvement from 2009. There are 20 major river systems in Wales, with 24,000km of rivers and streams draining 20,770km². The 2018 WFD classification showed that 44% of river waterbodies were at Good overall status, while no river waterbodies in Wales achieved High status. However, it was considered that 17 river waterbodies could achieve High status if improvements were made to their hydrology, and a further 49 if improvements were made to their morphology. The elements most often indicating that a waterbody was not achieving Good Status were fish, diatoms, phosphate, zinc, and pH. Around 12% of river waterbodies were designated as Heavily Modified Water Bodies (HMWB), a designation applying to rivers with a high degree of physical modification. The main reasons for rivers and lakes not achieving Good Status included physical modifications, rural pollution, urban and air pollution, wastewater pollution, minewater pollution, and flow and water level. Between February 2016 and April 2020, Natural Resources Wales (NRW) received 400 incident reports of river modifications (channel diversion, bank modification, culverting, damming, etc), 55 of

Theme	Key Findings
	these specified gravel removal from rivers. Between 2014-2019 NRW received 4915 substantiated reports of pollution to water. Pollution is identified as a significant water management issue, particularly in the Western Wales River Basin and the Dee River Basin, in particular pollution from wastewater, towns and cities, transport, rural areas and abandoned mines. There is a similar picture in the Severn River Basin. The connectivity between rivers and their flood plains, and the longitudinal connectivity of rivers, is reported as having been significantly disrupted. Ponds and lakes are naturally more disjunct ecosystems, but reductions in pond numbers, as well as overgrazing of pond and lake margins, modifications to marginal wetlands and lake outflows, have all combined to reduce freshwater connectivity.
Marine	In the Welsh marine environment, there are 139 Marine Protected Areas (MPAs), covering 69% of Welsh inshore waters (out to 12 nautical miles) and 50% of all Welsh waters (out to the median line). The network of MPAs comprises 15 SACs, 13 SPAs, one Marine Conservation Zone, 107 coastal SSSIs and three Ramsar sites. An indicative marine site-level assessment in 2018 showed that 46% of features were in favourable condition, 45% in unfavourable condition and 9% were unknown. The indicative feature condition assessments suggested that there are common issues impacting upon intertidal and subtidal habitats across the MPA network. In terms of water quality (Cycle 2 interim Classification 2018), 36 of 55 estuarine or coastal waterbodies failed to achieve Good Ecological Status, while 20 failed to achieve Good Chemical Status. The most widespread ecological failures were for nutrients, particularly dissolved inorganic nitrogen, while the most common failures for chemical status were for mercury or brominated diphenyl ethers. Bathing water quality in Wales has improved significantly over the previous two decades and, in 2020, 100% of designated Bathing Waters met the minimum standard, with 80% achieving the highest standard of 'Excellent'. However, 94% of designated sites were rated excellent or good in 2025. Shellfish Water Protected Areas had improved over the previous two decades, although compliance with the guideline microbial standard remained low. An assessment of UK seas under the UK Marine Strategy was undertaken in 2019 which indicated that

Theme	Key Findings
	Good Environmental Status has not been achieved for marine litter. However, between 2025 and 2020 there has been a statistically significant decrease in the number of marine litter items found in the Celtic Seas Region. Complex interactions are recognised between the pressures on the marine environment, such as climate change, exacerbating the spread of non-native species, periodic high energy storm events that cause large-scale change in marine and coastal habitats, or agricultural practices and land management influencing the condition of marine features. Considering marine biodiversity, from 1992 to 2025, the grey seal population in Welsh waters showed an upward trend in pup production over the long-term, with an increase in population abundance. There was evidence of a significant decline in the population of harbour porpoise in Celtic and Irish Sea Management Units between 2005-2022. The population of bottlenose dolphin in Welsh water was stable, but with some evidence of population shifts in the Cardigan Bay SAC. In Wales, between 2014 and 2020, many breeding seabird populations have been stable or increasing, contrary to trends elsewhere in the UK, except for storm petrel, cormorant, shag, and some gull species, while the majority of wildfowl and wader species have increased in population size over a 25-year period. The greatest pressures on marine biodiversity include pollution, climate change, invasive species, marine development and over-exploitation (historic fisheries).
Land Use and Soils	Wales is characterised by significant areas of agricultural land classified (Agricultural Land Classification or ALC) as grades 3b to 5 (80%), and upland and mountainous topography (~20% of land) and was overall subject to a wetter climate than much of the UK. As a result, 80% of agricultural land is designated as a 'less favourable area' (LFA) with a much smaller area of higher ALC grade that is best to deliver arable and horticultural crops. Welsh agriculture is dominated by permanent pasture grassland, which accounted for more than 64% of the utilised area. The main changes in land use area between 2016-2019 were an increase in tree cover on farms, more woodland, more permanent grassland, more arable land and more grass leys, whilst a decline in sole rights rough grazing and horticulture occurred. Land used for renewable energy development has continued to increase to meet the target of 70% of Wales's

Theme	Key Findings
	electricity consumption from renewable energy sources by 2030 (53% in 2023). Soil is considered a valuable and finite natural resource underpinning the delivery of ecosystem goods and services which supported every aspect of the natural and built environment on which wellbeing depended. The condition of woodland soil carbon, total nitrogen, biodiversity and bulk density were stable, with significant positive trends in soil pH. The historic loss of agricultural land by soil sealing from urbanisation from 1939-2019 represented a loss of approximately 13% of the total soil stock for Wales. The condition of agricultural soil showed topsoil carbon concentrations, phosphorous concentration and total nitrogen were stable on improved land, while soil acidity had increased, and bulk density had decreased. Land that was previously industrial or used as landfill may have been contaminated by metals, organic compound contaminants, hydrocarbons or pesticides. In Wales, the most common contaminants are benzo(a)pyrene, lead, and arsenic, all of which were identified at over 60% of contaminated land sites. The Common Agricultural Policy (CAP) has had a significant influence on agricultural land use and management since its introduction in 1974, reforms to CAP have increasingly supported more environmentally sustainable practices through agri-environment schemes. Areas of land under schemes has varied over time, and the total land area under Glastir (the Welsh Government's sustainable land management scheme) had reduced from approximately 1,041,000ha in 2018 to 849,000ha in 2019.
Biodiversity	The diverse ecosystems of Wales support rich and varied wildlife. Wales has 21 Special Protection Areas (SPAs) for rare and vulnerable birds and also migratory birds which visit Welsh shores. There are 95 Special Areas of Conservation (SACs) for other rare species and threatened natural habitats which, within Wales, cover more than 700,000 hectares (8.5% of Welsh land area). There are 1,083 Sites of Special Scientific Interest (SSSIs) in Wales, covering just over 12% of the nation's land area, as well as 76 National Nature Reserves (NNRs) in Wales that are set up to protect a wide range of wildlife, habitats or geological features of special interest. Wales continues to face biodiversity loss, with one in six species that have been assessed in Wales at risk of extinction. Of the

Theme	Key Findings
	3,902 species assessed since rigorous scientific monitoring began in the 1970s in Wales, 73 have been lost. Furthermore, the numbers of 380 Welsh species have declined by an average of 20% since 1994. The fourth Article 17 UK report (JNCC, 2019a) submitted to the EU in August 2019, found that 46% of listed species were in Favourable conservation status in Wales. In Wales, 44% of species were reported as stable, while 17% were deteriorating. In 2007, 5% of UK habitats listed in Annex I of the EU Habitats Directive were in Favourable conservation status; this figure decreased to 3% in 2013 before increasing again to 8% in 2019. In 2007, 26% of UK species listed in Annexes II, IV or V of the Habitats Directive were in Favourable conservation status; this figure increased to 39% in 2013 before decreasing to 35% in 2019. The species assessments for Wales, which contributed to the UK Habitats Directive Article 17 report, found that of the 52 species included, 25% had a stable population trend in the short-term (c.10 years) whereas only six had a stable population trend in the long-term (20-30 years). The percentage of species with declining populations was similar in the short and long-term, at 23% and 25% respectively. The biggest impacts on wildlife on land and in freshwater in Wales are arising from alteration on how land is managed for agriculture and the effects of climate change.
Waste	It is reported that Wales used many resources for activities in business and industry, farming and food production, home and office, and that this impacted on the natural environment. When waste is generated, it could be detrimental to ecosystems, biodiversity and the well-being of the population, especially where it is not managed appropriately at authorised waste sites or is managed through illegal activities. Generating waste also increased pressure on the use of natural resources. An estimated 7.5 million tonnes of waste was generated in Wales in 2019 (excluding waste from mining and quarrying, agriculture, forestry and fishing). The majority of waste generated in 2019 originated from the construction and demolition sector (46%), followed by the commercial (19%) and industrial sectors (19%), while waste generated from household sources only contributed 16% of waste. In 2019, there was a statistically significant reduction in waste generated by households, industry and commerce compared to 2012. However, there was no statistically significant difference in waste generated by the construction and demolition sector between 2012-2019. Assessing the trend of total

Theme	Key Findings
	waste generation is considered difficult in the absence of a regular comprehensive dataset. Wales has made major improvements in managing waste over the previous decade by increasing the amount sent for recycling, and reducing the amount sent for disposal. There were statistically significant improvements in the preparation for re-use, recycling and composting rates of waste generated by households and the industrial sector between 2012-2018, while the percentage of local authority municipal waste (including waste generated from households) that was prepared for re-use, recycled, or composted has increased substantially over the previous two decades from 5% in 1998/99 to 63% in 2018-19. While recent estimates of household waste not recycled per person per year were 172kg in 2022-23, whilst much still needs to be addressed to overcome waste pressure this is a decent reduction from the 217kg in 2012-23. Although the quantity of waste sent to permitted landfills located in Wales reduced by ~50% between 2016 and 2020, there was an increase of 225 thousand tonnes between 2020 and 2022, before decreasing by 162 thousand tonnes between 2022 and 2023. Waste management practices in Wales have shifted towards prioritising the recovery of materials over disposal. Despite this, evidence indicates that there are considerable amounts of recyclable material still present within the mixed residual waste streams generated by industry, commerce and households in Wales, which was sent for landfill and incineration. The Welsh Government published the 'The Beyond Recycling strategy' in 2021, which focused on making a circular economy a reality in Wales. It is reported that The Circular Economy Package will be published to introduce further steps for the reduction of waste and the aims of the Welsh Government's Beyond Recycling strategy.
Resource Efficiency - Water	NRW is responsible for issuing licences for water abstractions above 20m3/day from lakes, reservoirs, water courses and aquifers, assessing the need to abstract and the quantity requested to ensure that abstraction will have a minimal impact on the environment. There are also a significant number of private abstractions, mainly for domestic use, which are below the 20m3/day threshold requiring a licence. Only private abstractions for drinking water required registration with the local authority.

Theme	Key Findings
	In 2024, the greatest volume of licensed water abstractions was the energy sector (~81%). In comparison, 16% of the total volume of licensed abstractions was for consumptive used by the water sector. The agricultural sector accounted for 3% of licensed abstractions, showing an increase between 2019 and 2024. There are approximately 152 reservoirs for water supply in Wales managed by water companies. Water storage is considered vital to maintain water supply and to meet peak demands. Of the four water companies operating wholly or mainly within Wales (Dŵr Cymru, Hafren Dyfrdwy, Albion Eco and Leep Utilities), Dŵr Cymru is the largest, supplying just over 3 million customers and reported a reduction of water supply from 1000 megalitres per day (Ml/d) to 800Ml/d (1995 - 2020) due to a reduction in industry uptake and a reduction in leakage. Dŵr Cymru and Hafren Dyfrdwy have introduced water metering to households and businesses to help reduce demand, with a voluntary 40% uptake. It is considered that natural water recycling may not occur in the future with the desired frequency. Of CO2 emissions arising from domestic water use, 89% is associated with heating water in the home, while 11% is associated with abstracting, conveying and treating domestic water outside the home.
Resource Efficiency - Energy	There has been a considerable reduction in total electricity generation in Wales, with the trend showing significant reduction in electricity generation from coal fired power plants but an increase in gas fired powered generation, coupled with an increase in renewable energy generation for both electricity and heat since 2000. Renewable energy development has been steadily increasing both in the UK and Wales, with renewable electricity generation in Wales increasing by over 500% between 2005 and 2019. There is also significant progress in the renewable heat sector both at the UK and Welsh level. In 2023 renewable electricity generation was equivalent to 53% of Wales' electricity consumption. However, renewable energy development in Wales has slowed down due to a reduction in government support including closure of Feed in Tariff, Renewable Obligation, and supply network constraints. Total energy consumption had decreased by 22% Wales between 2005-2021, coinciding with a downward trend in energy generation within the country. Buildings and transport remained significant consumers of energy with little progress made in reducing their demand. These sectors are considered to require rapid decarbonisation with demand reduction, more efficient use

Theme	Key Findings
	of energy and electrification using low carbon sources. There is, however, a lack of strong policy and strategy to achieve this. Fuel poverty has been decreasing, however improvement in energy efficiency had slowed between 2015-2017, stalling potential progress. Wales has the oldest housing stock in the UK, including the highest proportion of houses over 100 years old of UK nations at 26%, with this housing likely to have poor thermal efficiency. Wales has been making progress in addressing its fuel poverty; the Welsh Government has set targets to eradicate fuel poverty among all vulnerable groups by 2010, in social housing by 2012, and in the general population by 2018. While there had been significant improvements, such as in the installation of energy efficiency measures in over 45,000 homes between 2011-2018, these targets were not yet met.
Invasive Non-native Species	In 2024, around 49% of the list of 350 Invasive Non-native Species (INNS) of priority to Wales are found to be present within Wales, an increase of 1% since 2020. Due to its proximity to Wales, many INNS present in England are considered to have a higher risk of being introduced to Wales relative to INNS located elsewhere. The GB INNS Strategy is owned by the Great Britain Non-native Species Secretariat (GBNNSS), with Wales contributing to this strategy and undertaking actions listed in the strategy implementation plan. It is noted that good progress has been made in fulfilling many actions of this strategy. Excellent progress has been made in relation to the actions associated with the Invasive Alien Species Regulation. Good progress has been made on some national measures relating to INNS listed under the WFD. GES had not been achieved for the NIS descriptor (2) under the UK Marine Strategy. Progress has been made in meeting some actions of the LIFE Natura 2000 Thematic Action Plan -Invasive Species and Pathogens. The Invasive Alien Species (Enforcement and Permitting) Order 2019 has been developed by the Welsh Government and the Department for Environment, Food and Rural Affairs (DEFRA) in consultation with the regulatory bodies in both England and Wales.
Economy – Global Environmental Footprint	The global environmental footprint is the area of land needed to meet the natural resource required in the production of these commodities and to assimilate the waste from their production and consumption. In 2018, the global environmental footprint of commodities annually consumed within Wales was 12.3 million global ha, which is a 28% reduction from the 17 million global ha reported in

Theme	Key Findings
	2004. Despite a reduction in footprint over the last c. 20 years, economic demands are unsustainable. If the entire population of the world lived like Wales, humanity would require 2.08 Earths.

Table 6: Summary of the current state of the environment in Wales, as presented in 'State of Natural Resources Report, 2020' and the third SoNaRR (December 2025).

3.2 Environmental Characteristics

This section describes the environmental baseline for GB, of relevance to the draft HND Implementation Plan. The baseline has been divided by topic into the issues requiring assessment under SEA legislation. The purpose of this section is to demonstrate the level of baseline environmental information to be used when assessing the potential impacts of implementing the draft HND Implementation Plan. This baseline information forms the indicators which potential offshore and onshore cabling, and associated infrastructure, will have the potential to impact upon. Future variations in these indicators owing to the implementation of the draft HND Implementation Plan will be monitored as part of the HND Implementation Plan and SEA review.

3.2.1 Biodiversity, Flora and Fauna

Biodiversity is the variety of all plants and animals, and the communities that they form. The conservation of biodiversity is important in its own right. Humans are also dependent on biodiversity for the provision of ecosystem services such as clean air and water, food, and shelter, as well as for the health and amenity value that the natural environment can provide, services that are critical to wellbeing and economic prosperity and which are consistently undervalued in decision-making (UK National Ecosystem Assessment, 2011).

Marine, intertidal, coastal and terrestrial habitats are referred to within the Biodiversity Flora and Fauna topic. Marine refers to offshore habitats, and intertidal refers to habitats located within the nearshore area exposed through the daily tidal cycles. Coastal habitats includes both marine and terrestrial elements located near the coastline and terrestrial habitats refers to those located onshore, which may also include waterbodies onshore.

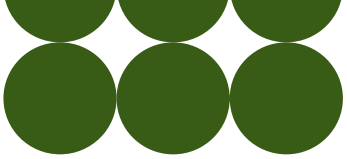
The importance of preserving biodiversity has increasingly been recognised from an international to a local level, and the UK has obligations under International and EU commitments and legislation. The UN Convention on Biological Diversity (1992) is an international legally binding treaty with three main goals: conservation of biodiversity; sustainable use of biodiversity; and the fair and equitable sharing of the benefits arising from the use of genetic resources. It requires the development of national strategies for the conservation and sustainable use of biological diversity. Following the UN Biodiversity Conference in December 2022 (COP15), a Global Biodiversity Framework (GBF) was agreed that aims to see 30% of land protected globally by 2030. Biodiversity Strategies have been published for England (DEFRA, 2011), Wales, and Scotland as nature conservation is a

devolved policy area, with a joint UK Biodiversity Framework published in 2024 aiming to coordinate efforts to meet international obligations (JNCC, 2024a).

The draft HND Implementation Plan must also have regard for the Habitats Directive (The Conservation of Habitats and Species Regulations 2017) and the Birds Directive, as transposed through national legislation, which require that any plan or project not directly connected with or necessary to the management of a European site but likely to have a significant effect on such a site, must undergo an appropriate assessment in view of best scientific knowledge and in view of the conservation objectives of the site. The draft Plan falls under this remit, and an Appropriate Assessment is being undertaken in parallel to the SEA process, to assess the potential implications of the Plan for European Sites. The draft HND Implementation Plan should also have regard to Annex I habitat features and Annex II species occurring outside designated sites.

It is considered that the key issues associated with the implementation of the draft HND Implementation Plan and Biodiversity, Flora and Fauna comprise:

- Potential for direct permanent loss of habitats and species, including protected or priority habitats and species, in the footprint of new onshore infrastructure and where cable protection materials are required for offshore cable routes in the construction, operation/maintenance and decommissioning phases.
- Potential for indirect loss of habitat and species resulting from scouring around protective structures and surface laid elements of cables or from alterations to physical processes within a wider zone of effect due to the placement of submarine structures on the seabed during construction, operation/maintenance and decommissioning phases.
- Potential for construction and decommissioning phase damage or disturbance of offshore and onshore habitats and species, or indirect changes in habitat type post-construction during operation/maintenance e.g., through changes in sediment dynamics / smothering effects, effects on water quality / temperature or onshore soil quality through construction pollution, or cable protection materials.
- Potential for benthic community alteration where cable protection materials alter the colonising habitat e.g., epifauna colonisation of hard structures at construction, operation/maintenance and decommissioning phases.
- Potential disturbance effects from visual presence, underwater sound and vibration on marine mammals, reptiles, fish and seabirds during offshore pre-construction, construction, operation/maintenance and decommissioning phases. Potential disturbance effects from visual presence and noise on terrestrial mammals and birds during onshore construction and maintenance activities.
- Potential collision risk for marine mammals, fish, seabirds (above and below the water surface), and other marine fauna with vessels during the construction, operation/maintenance and decommissioning phases, and during cable maintenance activities. Potential for collision risk for mammals and birds with vehicles during the construction, operation/maintenance and decommissioning of onshore infrastructure.
- Potential effects of heat from cables on benthic communities and fish during operation.
- Potential effects of Electromagnetic Fields (EMF) from transmission cables on fauna such as marine mammals and electrosensitive fish.
- Potential effects of noise and vibration from cables on fauna such as marine mammals and fish.
- Potential for introduction or spread of non-native species during construction, operation/maintenance and decommissioning.



3.2.1.1 Designated Sites

Overview of Designated Sites

There are a wide variety of natural habitats and species within GB. Sites have been designated to provide protection to those habitats and species considered to be of particular conservation value. These include features whose conservation is of importance at an international level, for which 598 Special Areas of Conservation (SACs), 269 Special Protection Areas (SPAs), and 134 Ramsar Sites have been designated in GB and UK offshore waters, to date. SACs and SPAs together form part of the UK's national site network. Sites are designated in England and Wales and their inshore waters (within 12 nautical miles (nm) of the coast) by the Conservation of Habitats and Species Regulations 2017 as amended, in Scotland and its inshore waters by the Conservation (Natural Habitats, &c) Regulations 1994, and in UK offshore waters by The Conservation of Offshore Marine Habitats and Species Regulations 2017. Appropriate steps must be taken to avoid the deterioration of habitats, and habitats of species, as well as significant disturbance to the species for which these sites have been designated. The Conservation Objectives safeguard the habitats of the site, the range, numbers and supporting habitats of the qualifying species. There is also one Site of Community Importance (SCI)[4] in Scotland, and one candidate SAC (cSAC)[5] in UK offshore waters.

The UK has 77 habitats listed in Annex I of the Habitats Directive for which one or more SAC is designated, of which 26 are coastal / marine, and 43 species listed in Annex II of the Directive for which one or more SAC is designated. Annex II marine and coastal species such as Common Seal and Harbour Porpoise are included within SAC designations while, in recent years, sites have also been designated solely for the protection of marine features e.g. Dogger Bank (submerged sandbanks), Solan Bank Reef (reefs), Southern North Sea (harbour porpoise), North Anglesey Marine (harbour porpoise), Moray Firth (bottlenose dolphin, submerged sandbanks). Marine and intertidal habitats and species of significance within UK waters are further discussed in the following sections.

Highly Protected Marine Areas (HPMAs) have been established to enable the protection and recovery of marine ecosystems and have the highest level of protection. These sites protect all species and habitats as well as the associated ecosystems within the boundary of the site, including the seabed and the water column. There are currently three HPMAs, all of which are in English waters; Allonby Bay, North East of Farnes Deep, and Dolphin Head. These sites were designated as Marine Conservation Zones (MCZs) under the Marine and Coastal Access Act 2009 and are provided protection through the Allonby Bay HPMA (MCZ) Designation Order 2023, the North East of Farnes Deep HPMA (MCZ) Designation Order 2023, and the Dolphin Head HPMA (MCZ) Designation Order 2023.

At a national level, Sites of Special Scientific Interest (SSSIs) have been designated to provide statutory protection for the best examples of the UK's flora, fauna, geological, or

[4] SCIs are sites that were adopted by the European Commission before the end of the Transition Period following the UK's exit from the EU, but not yet formally designated by the government of each country.

[5] cSACs are sites that were submitted to the European Commission before the end of the Transition Period following the UK's exit from the EU, but not yet formally designated.

physiographical features, of which there are 4,128 sites in England, 1,078 in Wales, and 1,422 in Scotland.

In English inshore and offshore waters, 91 MCZs have been designated under the Marine and Coastal Access Act (2009) for the protection of nationally important marine wildlife, habitats, geology and geomorphology, and there is one MCZ, Skomer, in Welsh waters, which was formerly designated as a Marine Nature Reserve. The Welsh Government launched the MPA network completion programme in November 2022 (James, 2022), which highlighted the Areas of Search from within which further possible MCZs may be identified. All of these sites are for the protection of benthic sediments. It is anticipated that, once possible sites have gone out to public consultation, they will become a material consideration under Section 126 of the Marine and Coastal Access Act (2009), meaning that any public authority when determining applications has to take into consideration the impact on the protected features of the site (e.g., Marine licensing). In addition, Defra has committed to identifying and designating compensatory MPAs to compensate for the effects of offshore wind development on seabed habitats, as part of its strategy to protect and enhance the marine environment. Nature Conservation Marine Protected Areas (NCMPAs) are an equivalent designation in Scottish territorial and offshore waters for the protection of nationally important habitats and species under the Marine (Scotland) Act 2010; there are currently 36 of these designated areas, of which 13 are situated offshore.

National Nature Reserves (NNRs) are areas established to protect nationally important habitats, species, and geology, and are declared by the statutory country conservation bodies under the National Parks and Access to the Countryside Act 1949 or the Wildlife and Countryside Act (1981) as amended. There are currently 221 NNRs in England covering a total area of over 110,000 hectares (approximately 0.8% of the country's land surface), with about two thirds managed by Natural England. There are currently 43 NNRs designated in Scotland, covering just under 2% of Scotland's land area, and 76 NNRs designated in Wales covering around 1.5% of Wales' land area.

Local Nature Reserves (LNRs) are areas of natural heritage that are at least locally important, designated by local authorities in England, Wales and Scotland under the National Parks and Access to the Countryside Act 1949 (as amended). The current national records of these sites indicates that there are 2,605 in England, 74 in Wales, and 101 in Scotland. In addition, there are 176 lands managed, leased, or owned as reserves by RSPB in GB.

Designated sites are further detailed in Table 7 and their locations are shown in Figure 8.

Designated Sites

Site Designation	Description	Number
Special Areas of Conservation (SACs)	Existing SACs in the UK were designated in accordance with the Habitats Directive (92/43/EEC) for the conservation of certain habitats and species (terrestrial or marine)	England: 242, plus 3 straddling Scotland, 7 fully marine sites in Wales with 2

Site Designation	Description	Number
	while SPAs were designated under the EU Directive on the Conservation of Wild Birds (EC/79/409), "The Birds Directive", as areas that are important for breeding, feeding, wintering or migration of rare and vulnerable bird species. Together these form the UK National Site Network of European sites, comprising existing designated sites and any further sites designated under the Habitats Regulations in each jurisdiction.	being cross-border with England, 3 in English offshore waters, and 1 in English/Welsh offshore waters. Scotland: 238, plus 2 offshore. Wales: 85, plus 2 offshore. UK Offshore Waters: 15
Special Protection Areas (SPAs)		England: 82, plus 1 straddling Scotland, 2 straddling Wales, 2 in English offshore waters, and 1 in English/Welsh offshore waters. Scotland: 160, plus 3 offshore. Wales: 17, plus 1 offshore.
Ramsar Sites	Ramsar sites are designated under the "Ramsar Convention" (Ramsar Convention on Wetlands of International Importance especially as Waterfowl Habitat, Iran 1971), an international treaty for the conservation and sustainable use of wetlands.	England: 73 Wales: 10 Scotland: 51
Highly Protected Marine Areas (HPMAs)	Highly Protected Marine Areas (HPMAs) are areas of the sea (including the shoreline) that allow the protection and full recovery of marine ecosystems. By setting aside some areas of sea with high levels of protection, HPMAs will allow nature to fully recover to a more natural state, allowing the ecosystem to thrive.	England: 3

Site Designation	Description	Number
Sites of Special Scientific Interest (SSSIs)	Sites of Special Scientific Interest (SSSIs) are those areas of land and water that are considered to best represent natural heritage in terms of their, flora, fauna, geology, geomorphology or a mixture of these natural features. SSSIs are designated in England and Wales under the Wildlife and Countryside Act (1981), as amended, and in Scotland under the Nature Conservation (Scotland) Act 2004.	England: 4128 (915 of which are purely geological sites). Wales: 1078. Scotland: 1422
Marine Conservation Zones (MCZs)	Marine Conservation Zones (MCZs) are a type of marine protected area that can be designated in English, Welsh and Northern Irish territorial and offshore waters to protect nationally important marine species, habitats and features of geological or geomorphological interest. Priority Marine Features (PMF) is a collective term for the features considered to be of conservation importance and form the basis of MCZ designation under the UK Marine and Coastal Access Act 2009 in English, Welsh and Northern Irish offshore waters. These sites should complement the marine components of sites designated under the Birds and Habitats Directives, coastal SSSIs and Ramsar sites, together forming a network of Marine Protected Areas (MPAs).	England: 91 Wales: 1
Nature Conservation Marine Protected Areas (MPAs)	Nature Conservation MPAs protect a range of nationally important habitats and species in Scottish waters and are designated under The Marine (Scotland) Act 2010. An equivalent national designation to MCZs in England and Wales.	Scotland: 36
National Nature Reserves	Statutory National Nature Reserves are areas of nationally important habitats, species and geology. They are designated under the National Parks and Access to the Countryside Act 1949 or the Wildlife and Countryside Act (1981).	England: 221 Wales: 76 Scotland: 46

Site Designation	Description	Number
Local Nature Reserves	Areas of locally important national heritage designated by local authorities in England, Wales, and Scotland under the National Parks and Access to the Countryside Act 1949 (as amended).	England: 2605 Wales: 74 Scotland: 101

Table 7: Number and type of sites designated for conservation of Biodiversity, Flora and Fauna in GB

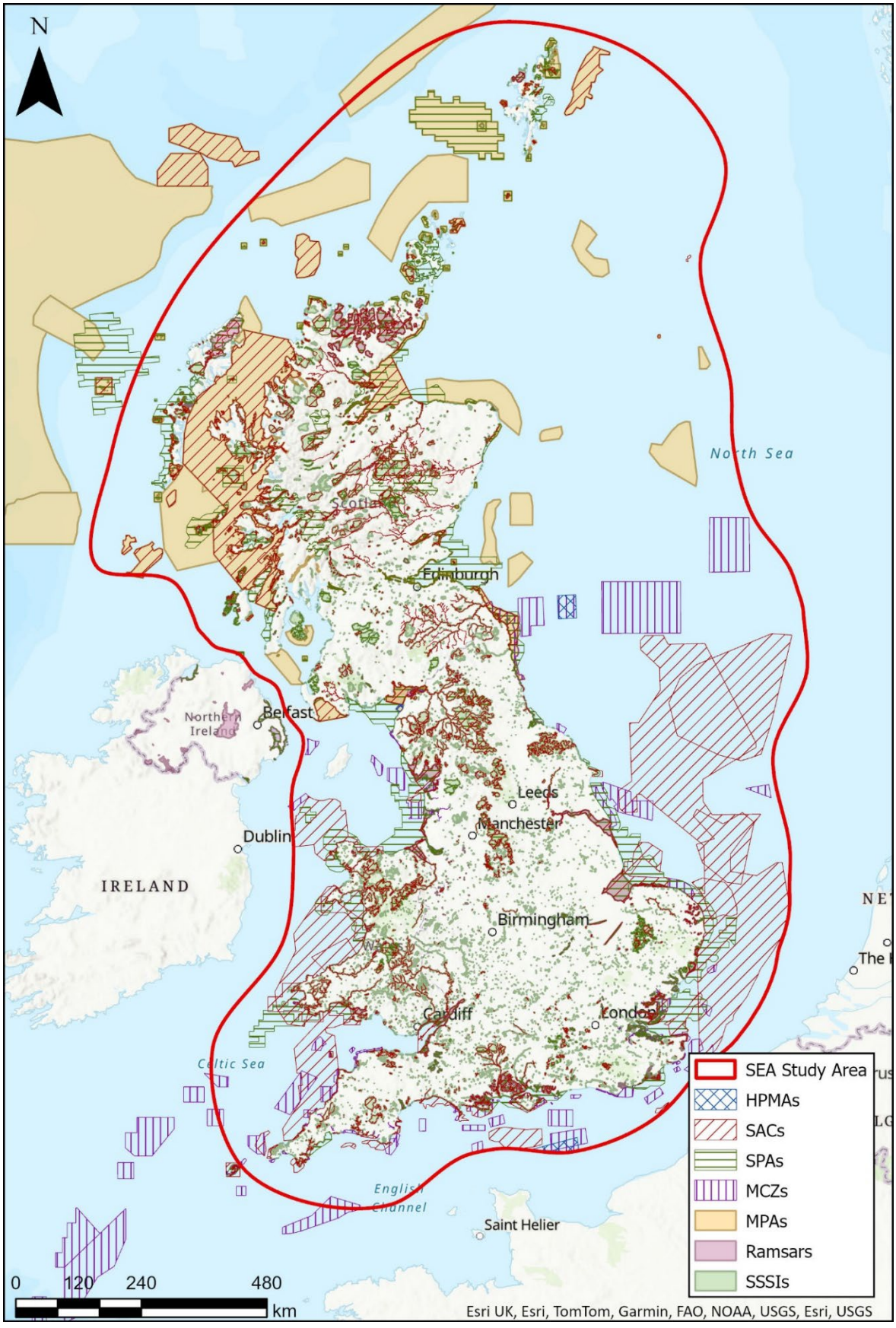


Figure 8: Designated sites in GB and GB waters

Feature Condition of Designated Sites

Article 17 of the Habitats Directive requires that, every six years, all EU Member States report on the implementation of the Directive, including on the conservation status of habitats and species (informally known as the Article 17 report). The 4th UK Habitats Directive Report was submitted to the European Commission in August 2019, and included a General Implementation Report, Habitat Reports, and Species Reports. These outlined any changes in designated habitats and species, for the UK as a whole, in the period 2013-2018 (JNCC, 2019b). Only six habitats were given an overall conservation status of 'Favourable', with eight habitats classified as 'Inadequate', 62 as 'Bad' and one classified as 'Unknown' conservation status. Of these, 22 habitats showed improvement in overall conservation status, 29 habitats showed no change, 22 habitats showed a decline, and four were uncertain in comparison with the results of the 3rd UK Habitats Directive Report. Of the designated species reported, 33 were given an overall conservation status of 'Favourable', 24 a status of 'Inadequate', 16 a status of 'Bad' and 20 a status of 'Unknown'. Of these, nine species showed improvement in overall conservation status, 47 showed no change, 12 showed decline and 25 were uncertain in comparison with the results of the 3rd UK Habitats Directive Report.

Article 12 of the Birds Directive requires that, every six years, all EU Member States report on the implementation of the Directive. The 11th UK Report for Article 12 of the EU Birds Directive was submitted to the European Commission in October 2019. The report format includes both a General Report on the implementation of the Directive (Annex A), and a Bird Species Status and Trends Report containing individual assessments for all relevant bird species (Annex B). Of the 319 birds included in this assessment (including in some cases both breeding and wintering populations separately), 131 showed a short-term decreasing population trend, while 108 showed a long-term decreasing population trend.

Following the UK's exit from the EU, reporting to the European Commission is no longer required, however, the UK statutory nature conservation authorities now report periodically every 6 years on the condition of designated features.

In England, the extent of land and sea protected in England through national and international protected areas increased from 1.3 million to 3.5 million hectares between 2005 and 2024; an increase of 170%, which included SACs, SPAs, Ramsar sites, MCZs, NNRs, and SSSIs. The condition of SSSIs is assessed in relation to the condition of special features across the whole of the site, known as Whole Feature Assessment (WFA). This indicated that in 2024 (DEFRA, 2024a):

- 40% were in a favourable condition
- 22% were in unfavourable recovering condition
- 7% were in unfavourable no change condition
- 10% were in unfavourable declining condition
- None were partially destroyed
- 21% were not recorded.

In Wales, NRW published the Protected Sites Baseline Evaluation review in 2021, aiming to improve the evidence base for the full range of protected sites in line with the NRW strategy on biodiversity, 'Vital Nature'. This focussed on qualifying features, including flora, fauna, geology and geomorphology across freshwater and terrestrial features of designated sites. It found that there was insufficient evidence to determine the condition of around half of the features on these sites (condition classed as unknown). Of those features for which an assessment was possible, the review found that:

- An estimated 20% were in a favourable condition
- Around 30% were in an unfavourable condition
- Around 50% were not in a desired state

In Scotland, the condition of the features on protected sites is assessed by NatureScot's Site Condition Monitoring (SCM) programme. This programme includes SACs, SPAs, Ramsar sites and SSSIs (excluding offshore marine sites and cSACs) and includes 5,591 designated natural features of which 5,365 have been assessed. Monitoring results, as reported by NatureScot in 2023 indicate that:

- 65.2% were in favourable SCM condition assessment
- 6.4% were in unfavourable recovering SCM condition assessment
- 4.9% were unfavourable recovering due to management change.

The proportion of features in favourable condition had increased by 5% between 2005 and 2023 but had decreased by 4% since 2016 when it peaked at 80.4%.

For the UK as a whole, the UK Biodiversity Indicator 'Extent and Condition of Protected Areas' (JNCC, 2024b) provides an overall condition of both terrestrial and coastal features designated as SSSIs in the UK as an indicator for the monitoring of condition of sites and species. The most recent assessment in 2024 showed that the extent of land and sea protected through national and international protected areas and wider landscape designations in the UK had increased by 12 million hectares between 2019 and 2024, and that the proportion of SSSIs (and ASSIs as Northern Ireland was included in the statistics) in favourable condition or in an unfavourable but recovering condition had increased from 67% in 2005 to 81% in 2024.

3.2.1.2 Marine and Benthic Habitat Features

Benthic ecology is the flora and fauna living in, on, or closely associated with the seabed. The benthic environment of GB's coastal and offshore waters is rich and varied. Marine habitats can be characterised as intertidal, subtidal or deep-sea, while the substrate character can further define these habitats. The European Marine Observation and Data Network (EMODnet) Seabed Habitats Phase 2 mapping indicates the predicted European Nature Information System (EUNIS) seabed habitat map for the UK continental shelf (EU SeaMap 2023).

In the North Sea and to the west of the Hebrides the broad habitats are mainly mud, sand and coarse sediment. Further to the west and north of Scotland, the seabed habitats are

mud and fine clay, with coarser sediments in shallower waters and banks. There are areas of rock and hard substrate to the west and south of the Hebrides and in inshore waters closer to the coastline in some areas around GB. Offshore, off the eastern coastline of England, the main habitat type is sand, with coarse substrate further inshore. To the south of England, the main offshore habitat is coarse sediment, with areas of sand, mixed sediment, and muddy sand further inshore. Offshore and inshore areas off the south-west of England are predominantly either sand or coarse substrate. Offshore of Wales, the main habitats consist of coarse substrate and sand, with areas of sediment and rock in the north, while inshore areas are mainly sand and coarse substrate. Given the diversity of benthic habitats present within UK waters, information on the specific habitats and receptors impacted by development should be further detailed and considered at the individual project level.

The main benthic marine habitat types found within the SEA study area are shown in Figure 9.

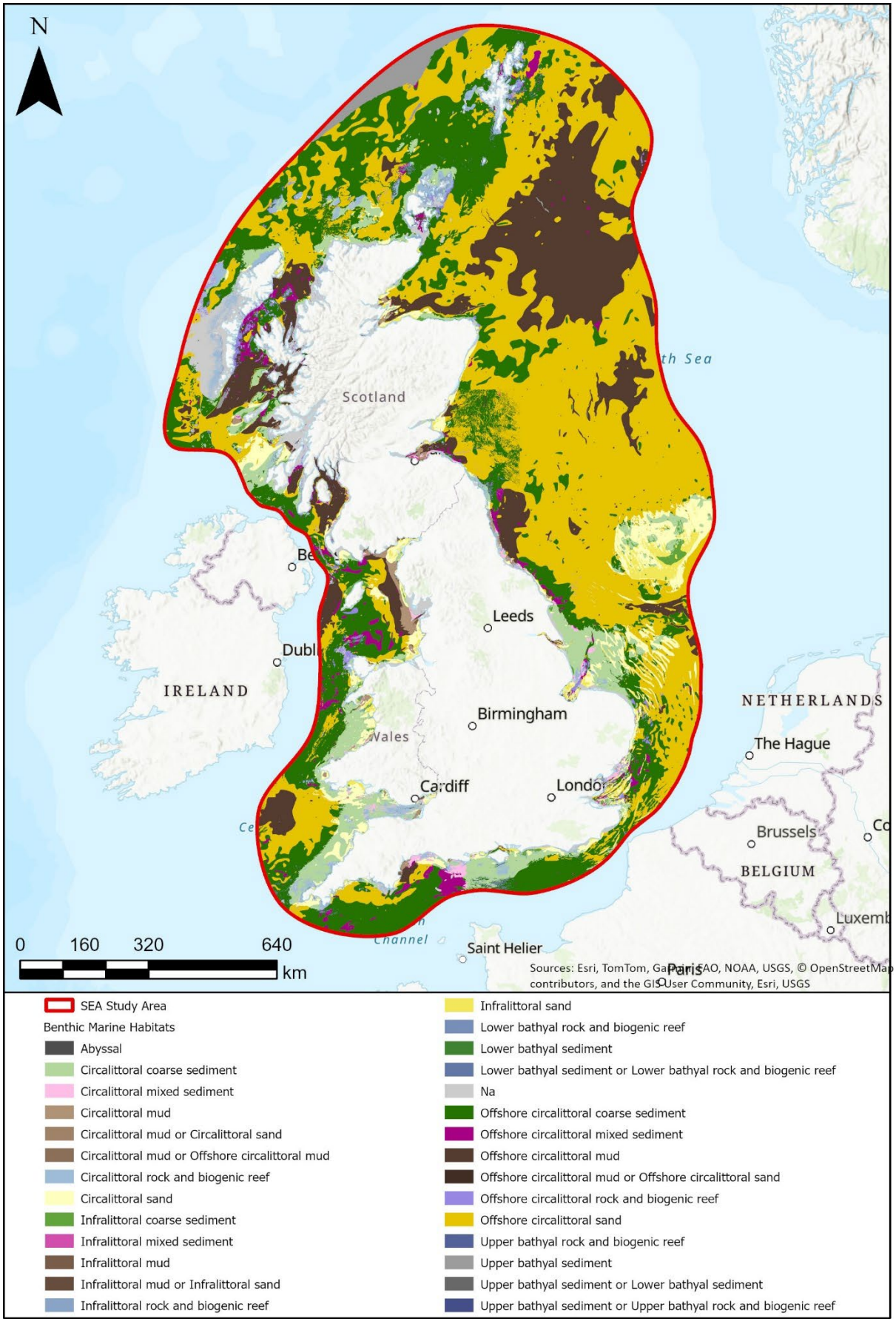


Figure 9: Benthic marine habitat types within GB waters (Source EMODnet)

Protected and Priority Habitats

The Annex I marine and coastal habitat types known to occur in GB for which one or more SACs are designated are listed in Table 8 (JNCC, no date (a)):

Marine and Coastal Annex I Habitats

Annex I Habitat	No. of SACs
1110 Sandbanks which are slightly covered by seawater at all times	31
1130 Estuaries	18
1140 Mudflats and sandflats not covered by seawater at low tide	28
1150 Coastal Lagoons	19
1160 Large shallow inlets and bays	13
1170 Reefs	54
1180 Submarine structures made by leaking gases	3
1210 Annual vegetation of drift lines	10
1220 Perennial vegetation of stony banks	11
1230 Vegetated sea cliffs of the Atlantic and Baltic coasts	38
1310 *Salicornia* and other annuals colonising mud and sand	12
1320 *Spartina* swards (*Spartinion maritimae*)	2
1330 Atlantic salt meadows (*Glauco-Puccinellietalia maritimae*)	22
1420 Mediterranean and thermo-Atlantic halophilous scrubs (*Sarcocornetea fruticosi*)	4
2110 Embryonic shifting dunes	21
2120 Shifting dunes along the shoreline with *Ammophila arenaria* ('white dunes')	30
2130 Fixed dunes with herbaceous vegetation ('grey dunes')	29
2140 Decalcified fixed dunes with *Empetrum nigrum*	2
2150 Atlantic decalcified fixed dunes (*Calluno-Ulicetea*)	9
2160 Dunes with *Hippophae rhamnoides*	2
2170 Dunes with *Salix repens* ssp. *argentea* (*Salicion arenariae*)	12
2190 Humid dune slacks	25

Annex I Habitat	No. of SACs
21A0 Machairs	8
2250 Coastal dunes with *Juniperus* spp	2

Table 8: Annex I marine and coastal habitats and SAC designations in GB

The UK Biodiversity Action Plan (BAP) recognised priority habitats identified as being the most threatened and requiring conservation action. Statutory lists of priority habitats have since been decided on a national basis, with reference to the initial BAP lists.

The Natural Environment and Rural Communities (NERC) Act 2006 required the Secretary of State to publish a list of species of flora and fauna, and habitats considered to be of principal importance for the purpose of conserving biodiversity in England. This list includes 56 habitats and 943 species as being of principal importance, which includes birds, mammals, reptiles, fish as well as species of plants such as ferns, algae, fungus and invertebrate species such as beetles, flies and moths (Natural England, no date). Of these, the 16 marine habitats and six coastal habitats are listed in Table 9. The other habitats of principal importance fall into the broad habitat types of 'arable and horticulture', 'boundary', 'freshwater', 'grassland', 'heathland', 'inland rock', 'wetland', and 'woodland'.

A draft list of the habitats of principal importance in Wales has been established under the Environment (Wales) Act 2016 with currently 55 habitats of principal important, and includes 22 marine and coastal habitats, as listed in Table 9 (Wales Biodiversity Partnership, no date): 557 species are included which includes birds, mammals, reptiles, fish as well as species of plants such as ferns, algae, fungus and invertebrate species such as beetles, flies and moths.

The Scottish Biodiversity List includes plants, animals, and habitats considered to be of principal importance for biodiversity conservation in Scotland (NatureScot, 2020). There are 41 habitats listed, which includes 20 marine and five coastal habitats, as listed in Table 9. There are 1947 terrestrial species listed, which includes birds, mammals, reptiles, fish as well as species of plants such as ferns, algae, fungus and invertebrate species as well as 156 marine species including seaweed, sponge, shark and marine mammals.

Some of the benthic habitats are also OSPAR threatened or declining habitats of the North-East (NE) Atlantic, with areas of known locations mapped (EC, no date).

Marine and Coastal Priority Habitats

Habitat	England	Wales	Scotland
Blue mussel beds	Yes	Yes	Yes
Estuarine rocky habitats	Yes	Yes	Yes
Fragile sponge and anthozoan communities on subtidal rocky habitats	Yes	Yes	Yes
Horse mussel beds	Yes	Yes	Yes
Intertidal boulder communities	Yes	Yes	Yes
Intertidal chalk	Yes	No	No
Maerl beds	Yes	Yes	Yes
File shell beds	No	No	Yes
Mud habitats in deep water	Yes	Yes	Yes
Peat and clay exposures	Yes	Yes	No
***Sabellaria alveolata* reefs**	Yes	Yes	Yes
***Sabellaria spinulosa* reefs**	Yes	Yes	No
Carbonate reefs	No	Yes	No
Carbonate mounds	No	No	Yes
Serpulid reefs	No	No	Yes
Cold-water coral reefs	No	No	Yes
Deep sea sponge communities	No	No	Yes
Seagrass beds	Yes	Yes	Yes
***Musculus discors* beds**	No	Yes	No
Seamount communities	No	No	Yes
Sheltered muddy gravels	Yes	Yes	Yes
Subtidal chalk	Yes	No	No
Subtidal sands and gravels	Yes	Yes	Yes
Subtidal mixed muddy sediments	No	Yes	No
Tide-swept channels	Yes	Yes	Yes
Coastal saltmarsh	Yes	Yes	Yes

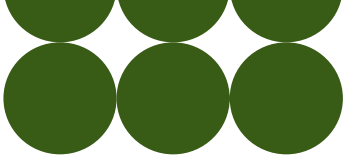
Habitat	England	Wales	Scotland
Coastal sand dunes	Yes	Yes	Yes
Coastal vegetated shingle	Yes	Yes	Yes
Intertidal mudflats	Yes	Yes	Yes
Maritime cliff and slopes	Yes	Yes	Yes
Saline lagoons	Yes	Yes	Yes
Machair	No	No	Yes

Table 9: Priority marine and coastal habitats in England, Wales and Scotland

There are currently 91 MCZs in English inshore and offshore waters and one in Welsh waters that provide protection to a range of representative and threatened rare or declining habitats and species. These include subtidal habitats such as coarse sediment, mixed sediments, chalk, sand, or mud, intertidal habitats such as biogenic reefs, coarse sediment, sand and muddy sand, high and low energy intertidal rock, and circalittoral habitats such as high or moderate energy rock. Some sites provide protection to marine species such as smelt and razorbill and include protection of supporting habitats. South Rigg MCZ is situated in Northern Irish waters in the west of the Irish Sea and has been designated for the protection of subtidal habitats and associated megafaunal communities.

Nature Conservation MPAs provide an equivalent designation in Scottish territorial waters, with 36 areas currently designated (of which 13 are situated offshore). These sites include protection of marine habitats such as offshore sublittoral sediments including burrowed mud, offshore deep-sea muds, offshore subtidal sands and gravels, cold-water coral reefs, coral gardens, and deep-sea sponge aggregations; offshore sublittoral rock such as seamount communities, inshore sublittoral sediments such as burrowed mud and circalittoral sand and mixed sediment communities, and inshore sublittoral rock such as Northern Sea fan and sponge communities. As for MCZs, some sites provide protection to mobile marine species including fish (e.g., blue ling, Gulper shark, orange roughy, Portuguese dogfish, Round-nose grenadier, sandeels, basking shark, flapper skate), marine mammals (e.g., Minke whale, Risso's dolphin), and birds (e.g., black guillemot) as well as geological and geomorphological features.

NRW have published an advice document and sensitivity mapping outlining the sensitivity of marine ecology receptors to cabling activities, while JNCC and Natural England published advice to TCE on the key sensitivities of habitats and Marine Protected Areas in English Waters to offshore wind farm cabling within the proposed Round 4 leasing areas (Natural England and JNCC, 2019). These reports provide a good summary of the types of habitats that are sensitive and the how they can be affected by the activities associated with cabling, noting, however, that any habitat can be sensitive to disturbance and habitat loss from cable protection measures, depending on-site specific sensitivities and the habitat ability to recover. Annex I marine habitats considered to be particularly sensitive to cabling include reef habitats, estuaries, large shallow inlets and bays, coastal



lagoons, mudflats and sandflats, sea caves, sandbanks, and saltmarsh habitats, as well as priority or OSPAR habitats including tide swept channels, estuarine rock, maerl beds, horse mussel beds, oyster beds, seagrass beds, sea-pen and burrowing megafauna communities, peat and clay exposures, intertidal mudflats, fragile sponge and anthozoans, and saline lagoons. Potential sensitivities of these habitats to cabling include physical damage and high sensitivity to disturbance or morphological changes. Coastal habitats such as Annex I saltmarsh, sand dune, cliff, shingle and strandline, and associated priority habitats such as coastal saltmarsh, coastal sand dunes, maritime cliff and slope, and coastal vegetated shingle are considered sensitive to cabling activities which relate to physical loss of the extent of, and damage to, the integrity of the habitat due to excavations, or the effects of cable installation on underlying hydrology and geomorphology.

Status and Vulnerability

The UK assessment of environmental status for the Marine Strategy (DEFRA, 2019a) indicates that Good Environment Status (GES) achievement is still uncertain for intertidal and soft sediment habitats; for soft sediments, the levels of physical damage were considered consistent with GES in UK waters to the west of the Celtic Seas but not in the Celtic Seas or the Greater North Sea. GES has still not been achieved for sublittoral rock and biogenic habitats.

Offshore cabling activities have the potential to adversely affect benthic habitats in a number of ways during construction and operation, including via changes in sediment dynamics / smothering effects, effects on water quality / temperature through construction pollution, or cable protection materials. There is also potential for benthic community alteration where cable protection materials alter the colonising habitat e.g., epifauna colonisation of hard structures.

Marine Strategy Descriptors that relate to habitats and species are discussed further within Section 3.2.4.

3.2.1.3 Onshore Habitats and Species

In addition to marine and coastal habitats, terrestrial and freshwater habitats, including those with legislative protection or classified as a priority, may be intersected by cable route corridors where cables will be buried onshore, or may be within the potential areas for supporting infrastructure such as substations or converter stations. These include Annex I habitats such as bogs, native woodlands, river and lake habitats and wetland habitats.

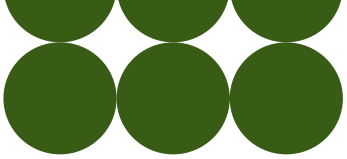
As described for marine and coastal habitats, habitats and species of priority importance in England are listed under the NERC Act 2006. Currently 56 habitats have been listed, of which 34 of these are terrestrial or freshwater habitats such as upland hay meadows, mixed deciduous woodland, and rivers. This list also includes 943 priority species, including birds, mammals, reptiles, fish as well as species of plants such as ferns, algae, fungus and invertebrate species. In Wales, there are currently 55 habitats of principal importance listed, of which 33 are terrestrial or freshwater habitats such as blanket bogs, oak woodlands, and ponds, as well as 557 species, including groups described for

England. In Scotland, of the 41 priority habitats listed, 16 are terrestrial or freshwater habitats such as native pine woodlands and machair, while 1,947 terrestrial species are also listed, including groups described for England. The majority of important habitats listed are the same across GB jurisdictions.

These onshore habitats can support a wide variety of diverse species and have the potential to be sensitive to the impacts of development. Evidence-based studies (RPS Group, 2016a) have been completed to determine the impact of transmission development on natural and semi-natural habitats in the Republic of Ireland. The construction, maintenance and decommissioning of electricity transmission infrastructure can potentially damage habitats. Habitats of particular conservation importance include those that are protected as Annex I habitats under European law including active peatlands and hay meadows. A comprehensive review of literature for the evidence-based study of effects of transmission development on natural and semi-natural habitats found that linear construction projects can affect habitats in several ways, including through habitat loss, habitat change, fragmentation and hydrological change. Some habitats are more sensitive to disturbance and therefore the potential impacts of the construction and maintenance of transmission infrastructure. Peatlands were found to be the most sensitive to construction work, while grassland habitats were found to recover rapidly following the completion of construction activity. Further information regarding the potential for effects on land use types sensitive to construction and operation of electricity transmission infrastructure, such as peatlands is provided in Section 3.2.3 of this report.

Bats are supported by a number of these onshore habitats which are potentially sensitive to the impact of development. There are eighteen species of bats in the UK; alcathoe bat; barbastelle; Bechstein's bat; Brandt's bat; Brown long-eared bat; common pipistrelle; Daubenton's bat; greater horseshoe bat; grey long-eared bat; Leisler's bat; lesser horseshoe bat; Nathusius' bat; noctule; serotine; soprano pipistrelle; whiskered bat and the greater mouse-eared bat, seventeen of which breed here. All bat species and their roosts are legally protected by both domestic and European Legislation under Regulation 43 of the Conservation of Habitats and Species Regulations 2017 and are known as European protected species. Their protection includes deliberate capture, injury killing and disturbance, as well as protection of their breeding and resting places (roosts). In England and Wales, bats are also provided protection under Section 9 of the Wildlife and Countryside Act 1981 (as amended) with it being a criminal offence if bats are intentionally or recklessly disturbed in a place or structure they are occupying as shelter or protection or intentionally or recklessly obstructed access to any place or structure that they are occupying as shelter or protection.

Evidence-based studies (RPS Group, 2016a) have been completed to determine the impact of transmission development on bats. Habitats of importance to bats include woodlands, hedgerows, ponds, caves and stone buildings. The evidence-based study found there to be little evidence of potential for direct impacts of electricity transmission infrastructure on bats, however indirect effects were found from habitat alteration to hedgerows and trees of importance for feeding and navigation (through construction phase impacts).



3.2.1.4 Fish and Shellfish

There are two main categories of fish: pelagic and demersal. Pelagic fish are those that live in the mid-water, often occurring in shoals, such as herring and mackerel. Demersal fish are those that live at, or close to, the sea floor. Of these, some have a greater association with the seabed e.g., flatfish and ray, while others forage in a layer that can be several tens of metres above the seabed e.g., cod-like fishes. Both pelagic and demersal species can make extensive migrations between spawning and feeding grounds. Pelagic fish species also undertake diurnal vertical migrations, so that they may occupy all water column depths at some point during the day, some species can reach to 100m depth.

The eggs of most finfish are pelagic, passing through larval and post-larval stages before metamorphosing into their adult form. The eggs and larval stages drift with the currents, with their destination dependent on factors including the location of the spawning area, the currents, and the duration of the larval stage. The metamorphosed juveniles may remain dispersed, or they may aggregate on nursery grounds; the latter includes herring, sprat and whiting in sea loughs or sheltered coastal areas, and plaice in the intertidal zone of sandy beaches. Owing to these characteristics, any assessment of the effects of offshore cabling activities on fish needs to consider all stages of life history, which may differ quite considerably between species. The mobility of species at different stages of their life history may also influence their ability to avoid potentially harmful devices.

The coastal waters of GB are home to approximately 300 species of regularly occurring marine fish. There is evidence of 27 species of elasmobranch fish (cartilaginous fish, comprising sharks, rays and skates) found in the North-East Atlantic, many of which are present in GB waters. The slow growth rates, late maturity and small litter characteristics of many elasmobranchs render them among the most vulnerable marine fish. Consequently, a number of elasmobranch species present in GB waters are considered endangered and included on the International Union for Conservation of Nature (IUCN) (the World Conservation Union) Red List. This species group is therefore one of particular sensitivity to the impacts of marine development.

Protected and Priority Fish and Shellfish Species

Several of the species that may be found in GB waters are listed on the IUCN Red List of Threatened Species (e.g., common skate, cod and haddock), and some are also Priority Species in GB waters (e.g., basking shark). In total, there are 57 species of marine or freshwater / marine fish species listed as GB Priority Species. These Priority Species require conservation action because of their decline, rarity, and importance in a European and GB context, and public bodies in GB must take these species into consideration and further their conservation as far as is reasonably practical as part of their biodiversity duty. Further information on the legislation and agreements protecting these species is provided in Table 10.

Priority Fish Species

Name	English Waters	Welsh Waters	Scottish Waters	IUCN	HD*	OSPAR	Wildlife Act**	EWA ***
			Bony Fish					
Common Sturgeon *Acipenser sturio*	✓	✓		CR	Annex II, IV	✓	✓ (England and Wales only)	
Allis Shad *Alosa alosa*	✓	✓	✓	CR	Annex II, V	✓	✓	
Twaite Shad *Alosa fallax*	✓	✓	✓	LC	Annex II, V		✓	
Lesser Sand eel *Ammodytes marinus*		✓	✓	LC				
Sandeel *Ammodytes tobianus*	✓	✓	✓					✓
Black Scabbardfish *Aphanopus carbo*	✓		✓	LC				
European Eel *Anguilla anguilla*	✓	✓	✓	CR		✓		✓
Herring *Clupea harengus*	✓	✓	✓	LC				✓
Spined Loach *Cobitis taenia*	✓			LC	Annex II, IV			

Name	English Waters	Welsh Waters	Scottish Waters	IUCN	HD*	OSPAR	Wildlife Act**	EWA ***
Atlantic Cod *Gadus morhua*	✓	✓	✓	LC (Eur) VU (Glo)		✓		✓
Vendace *Coregonus albula*	✓			LC	Ann ex V		✓	
Whitefish (Powan, Gwyniad or Schelly) *Coregonus lavaretus*	✓	✓		VU	Ann ex V		✓	
Roundnose Grenadier *Coryphaenoides rupestris*	✓		✓	CR				
Long-snouted Seahorse *Hippocampus guttulatus*	✓	✓	✓	LC		✓	✓ (England and Wales only)	✓
Short-snouted Seahorse *Hippocampus hippocampus*	✓					✓	✓ (England and Wales only)	
Atlantic Halibut *Hippoglossus hippoglossus*	✓		✓	NT				
Orange Roughy *Hoplostethus atlanticus*	✓		✓	VU		✓		
Sea Monkfish *Lophius piscatorius*	✓		✓	LC				✓

Name	English Waters	Welsh Waters	Scottish Waters	IUCN	HD*	OSPAR	Wildlife Act**	EWA ***
Burbot ***Lota lota***	✓			LC			✓	
Whiting ***Merlangius merlangus***	✓	✓	✓	LC				✓
European Hake ***Merluccius merluccius***	✓	✓	✓	LC				✓
Blue Whiting ***Micromesistius poutassou***	✓		✓	LC				
Blue Ling ***Molva dypterygia***	✓		✓	VU				
Ling ***Molva molva***	✓	✓	✓	LC				✓
Smelt (Sparling) ***Osmerus eperlanus***	✓	✓	✓	LC				
Plaice ***Pleuronectes platessa***	✓	✓	✓	LC				✓
Greenland Halibut ***Reinhardtius hippoglossoides***	✓		✓	NT				
Atlantic Salmon ***Salmo salar***	✓	✓	✓	NT	Annex II and V (only in fres	✓		

Name	English Waters	Welsh Waters	Scottish Waters	IUCN	HD*	OSPAR	Wildlife Act**	EWA ***
					hwater)			
Brown/Sea Trout ***Salmo trutta***	✓	✓	✓	LC				✓
Arctic Charr ***Salvelinus alpinus***	✓	✓		LC				
Mackerel ***Scomber scombrus***	✓	✓		LC				✓
Common Sole ***Solea solea***	✓	✓	✓					✓
Blue-fin Tuna ***Thunnus thynnus***	✓		✓	LC		✓		
Horse Mackerel ***Trachurus trachurus***	✓	✓		VU				✓
Norway Haddock (Redfish) ***Sebastes viviparus***			✓	LC				
Norway Pout ***Trisopterus esmarkii***			✓	LC				
			Elasmobranch					
Basking Shark ***Cetorhinus maximus***		✓	✓	E		✓	✓	✓
Gulper Shark ***Centrophorus granulosus***	✓		✓	CR (Eur) E (Glo)		✓		

Name	English Waters	Welsh Waters	Scottish Waters	IUCN	HD*	OSPAR	Wildlife Act**	EWA ***
Leafscraper Shark *Centrophorus squamosus*	✓		✓	E				
Portugese Dogfish *Centroscymnus coelolepsis*	✓		✓			✓		
Common (Blue) Skate *Dipturus batis*	✓	✓	✓	CR		✓		
Kitefin Shark *Dalatias licha*	✓		✓	VU				
Tope Shark *Galeorhinus galeus*	✓	✓	✓	CR				
Porbeagle Shark *Lamna nasus*	✓	✓	✓	VU		✓		
Blue Shark *Prionace glauca*	✓	✓	✓	NT				
Thornback Ray *Raja clavata*		✓	✓	NT		✓		
Blonde Ray *Raja brachyura*		✓		NT				
Spotted Ray *Raja montagui*	✓			LC		✓		
Undulate Ray *Raja undulata*	✓	✓		NT				
White or Bottlenosed Skate	✓	✓		CR (Eur)		✓	✓ (England and	

Name	English Waters	Welsh Waters	Scottish Waters	IUCN	HD*	OSPAR	Wildlife Act**	EWA ***
Rostroraja alba				E (Glo)			Wales only)	
Spiny Dogfish (Spurdog) ***Squalus acanthias***	✓	✓	✓	VU				
Angel Shark (Monkfish) ***Squatina squatina***		✓	✓	CR		✓	✓ (England and Wales only) (within 6 nautical miles of coastal water only)	
Sandy Ray ***Leucoraja circularis***			✓	E				
			Jawless Fish					
Sea Lamprey ***Petromyzon marinus***	✓	✓	✓	LC	Annex II, IV	✓		✓
River Lamprey ***Lampetra fluviatilis***	✓	✓	✓	NT	Annex II, IV and V			✓
Brook Lamprey ***Lampetra planeri***		✓	✓	NT	Annex II, IV			

LC=Least Concern; D=Declining; VU=Vulnerable; NT=Near Threatened; E=Endangered; CR=Critical; Eur=European Status; Glo=Global Status

*Habitats Directive

**Wildlife and Countryside Act 1981

***Environment (Wales) Act (2016) Section 7

Table 10: Priority fish species within GB waters

Under the Wildlife and Countryside Act 1981 (as amended), it is an offence (subject to exceptions) to injure, kill or otherwise disturb any wild animal included in Schedule 5 of this Act and also prohibited to interfere with places used for shelter or protection by these species. There are two lists of protected species under this Act, one for Wales and England and another for Scotland. European Protected species are listed under Annex IV(a) of the EU Habitats Directive (Council Directive 92/43/EEC) and are given protection under GB law through the Conservation of Habitats and Species Regulations 2017 for England and Wales and under the Conservation of Offshore Marine Habitats and Species Regulations 2017 for Scottish waters more than 12 nautical miles from land. Species listed under Annex II of the Habitats Directive are "species of community interest whose conservation requires the designation of special areas of conservation", those listed under Annex IV are "species of community interest in need of strict protection" and those under Annex V are "species of community interest whose taking in the wild and exploitation may be subject to management measures". For Salmon, protections under Annex V are only applicable in freshwater habitats. Priority species are also listed for England, Scotland and Wales. A number of species on this list are also listed on the OSPAR list of threatened and or declining species and on the IUCN Red list of Threatened Species.

In addition, there are 10 species of marine crustaceans (1 in Welsh waters, 3 in Scottish waters, 6 in English waters) and 35 species of marine molluscs (4 in Welsh waters, 17 in Scottish waters and 13 in English wates) included as GB Priority Species. For Welsh and Scottish waters, there are no protected species under the Habitats Directive and for English waters, there is one crustacean, the White-clawed Crayfish (Austropotamobius pallipes), and one mollusc, the Lesser Ramshorn Snail (Anisus vorticulus) protected under Annex II and IV(a) of the Habitats Directive. Of the priority species of marine molluscs and crustaceans, the Fan Mussel (Atrina fragilis), Lagoon Seaslug (Tenellia adspersa) and White-clawed Crayfish are protected under the Countryside and Wildlife Act 1981, which makes it is an offence to intentionally or recklessly, injure or kill these species.

The Ocean Quahog (Arctica islandica) is protected by Marine Conservations Zones (MCZs) in five areas to the north-east of England and in one MCZ along the south coast, Native Oysters (Ostrea edulis) are protected within a number of small MCZs along the south coast of England, these areas are also designated for the protection of the Long-snouted Seahorse (Hippocampus guttulatus) and Short-snouted Seahorse (Hippocampus hippocampus). There are also three MCZs for Fan Mussels (Atrina fragilis) in the Celtic Sea, south-east of the Plymouth peninsula and for Smelt (Osmerus eperlanus), along the west coast of England and near the Thames Estuary. There is one designated MCZ in Welsh waters, Skomer which is situated around Skomer Island and Marloes Peninsula in Pembrokeshire, south-west Wales. There are six MPAs designated for Ocean Quahogs throughout Scottish waters, mainly in the north-east. There is one MPA for Fan Mussels surrounding the Hebrides. There are also MPAs designated in Scottish waters for the priority species Blue Ling, Gulper Shark, Orange Roughy, Portuguese Dogfish, Roundnose Grenadier, Sandeels, Basking Shark and Common Skate. These MPAs are mainly located to the north and west of Scotland.

There are currently nine coastal or marine SACs in GB that are designated for the protection of marine fish or shellfish, these areas are located along the English and Welsh coasts and include:

- Tweed Estuary, Humber Estuary, Solway Firth, Dee Estuary/ Aber Dyfrdwy – Sea Lamprey
- Cardigan Bay, Dee Estuary – Sea Lamprey, River Lamprey
- Pembrokeshire Marine, Carmarthen Bay and Estuaries – Sea Lamprey, River Lamprey, Twaite Shad, Allis Shad
- Severn Estuary – Sea Lamprey, Twaite Shad
- Plymouth Sound and Estuaries – Allis Shad

There are also species of diadromous migratory species such as Atlantic Salmon, Allis Shad, and Twaite Shad, which are designated within freshwater SACs as they spend part of their lifecycle in freshwater and part at sea. These species spawn in freshwater and then migrate to sea to mature. These species may occur within coastal areas as there are a number of rivers that flow out to sea and are known to contain populations, including: Afon Cleddau SAC, Afon Tywi SAC, Afon Eden – Cors Goch Trawsfynydd SAC, Afon Gwyrfai a Llyn Cwellyn SAC, River Teifi SAC, Berriedale and Langwell Waters SAC, Langavat SAC, Little Gruinard River SAC, River Avon SAC, River Bladnoch SAC, River Dee and Bala Lake SAC, River Derwent and Bassenthwaite Lake SAC, River Eden SAC, River Naver SAC, River South Esk SAC, River Spey SAC, River Tay SAC, River Thurso SAC, River Tweed SAC, River Usk / Afon Wysg SAC, and River Wye / Afon Gwy SAC. The degree to which these areas are sensitive to interaction with offshore cabling activities will vary according to the species and the time of year. Shad, for instance, feed in estuaries before moving upstream to spawn (April – July), however juvenile shad spend the first winter in estuaries whereas adult shad will feed extensively in near shore and coastal habitats nearly year-round. Salmon, however, leave their river homes in spring and early summer, and migrate towards feeding areas in the Nordic Seas and West Greenland, however some may also migrate in the autumn. In contrast, Sea Trout (Salmo trutta) are more likely to remain in nearshore waters rather than undergoing extensive migrations. For eels, peak migration for juvenile eels (glass eels and elvers) is February to April in the coastal habitats and estuaries, and main migration period for mature (silver) eels is considered to be the autumn months. There are no SACs designated for Sea Trout or European Eels (Anguilla anguilla) which are also migratory fish species found with GB waters.

Fish species in freshwater may also be affected by activities of the draft Plan, where cable crossing of rivers or streams is necessary, or where there is potential for downstream sedimentation or pollution impacts during onshore construction works associated with onshore cabling and construction of onshore substations or convert stations.

Spawning and Nursery Grounds

Habitats of ecological importance for marine fish include those important for breeding (mating sites, spawning grounds where fish aggregate to spawn, and parturition

grounds), those important for recruitment and early-stage growth (nursery grounds) and those important for feeding and migration. Coull et al. (1998), and Ellis et al. (2012), have described and mapped known spawning and nursery grounds for selected fish species in UK waters, including species of commercial and conservation importance. This indicates that spawning grounds occur off the coastline of GB for the following species: Herring, Cod, Whiting, Blue Whiting, Blue Ling, Ling, European Hake, Anglerfish, Horse Mackerel, Sandeels, Mackerel, Plaice, Sole. The data also indicates nursery grounds for the following species: Spurdog, Tope Shark, Common Skate, Thornback Ray, Spotted Ray, Undulate Ray, Herring, Cod, Whiting, Blue Whiting, Ling, European Hake, Anglerfish, Horse Mackerel, Sandeels, Mackerel, Plaice, Sole. Areas of known mapped spawning grounds within GB waters are shown in Figure 10, and areas of known mapped nursery grounds are shown in Figure 11.

Status and Vulnerability

The UK assessment of environmental status for the Marine Strategy (2019) (DEFRA, 2019a) indicates that demersal fish communities are recovering from past over-exploitation in the UK, but that Good Environment Status (GES) has not yet been achieved in the Greater North Sea or Celtic Seas, while a partial assessment of pelagic fish did not provide a clear result.

Offshore cabling activities have the potential to adversely affect fish and shellfish in a number of ways during construction and operation, including via underwater noise during construction, EMF emitted from cables during operation, collision risk resulting in mortality / disturbance, and changes to ground conditions and supporting habitat.

Marine Strategy Descriptors that relate to habitats and species are discussed further within 3.2.4.

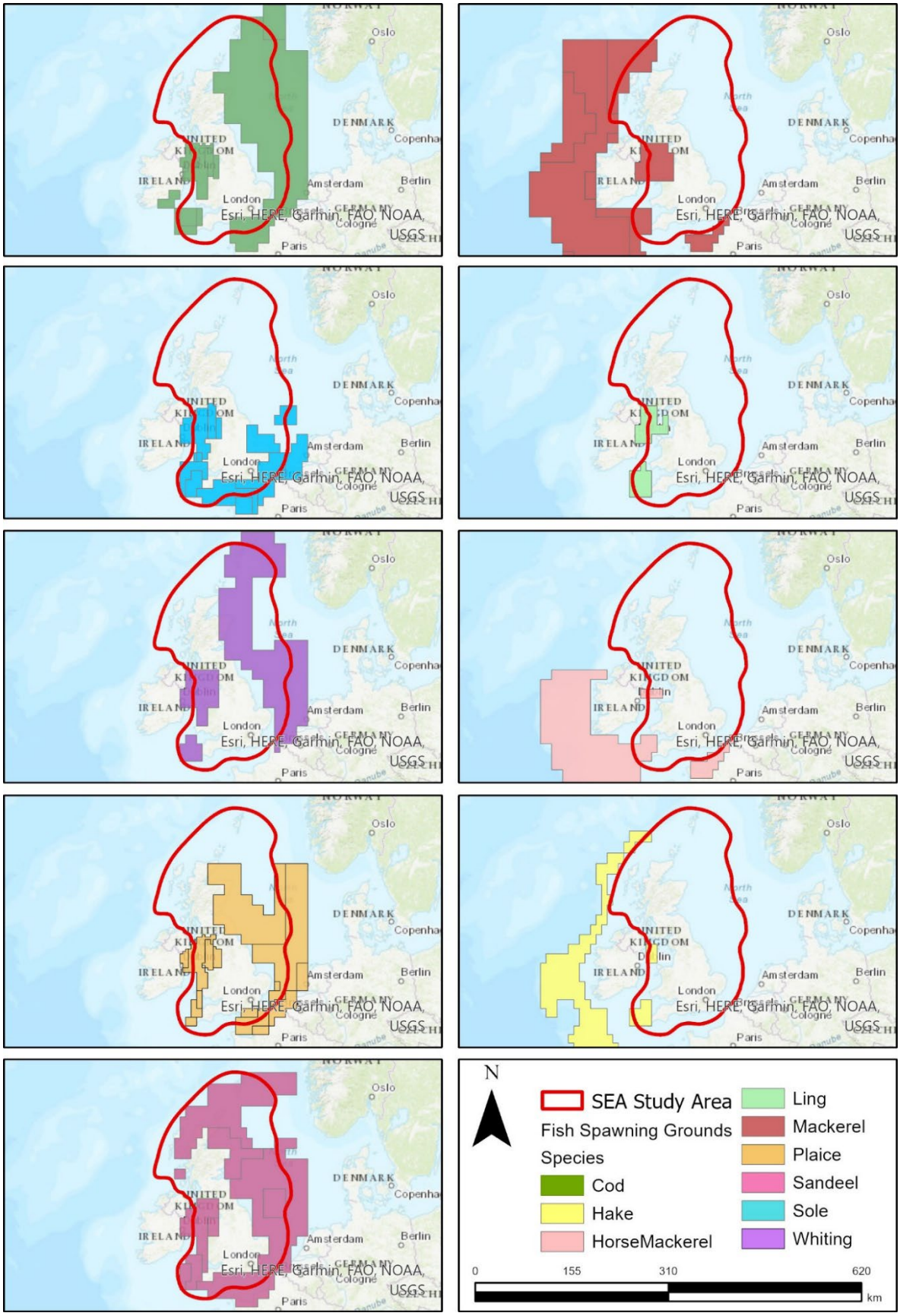


Figure 10: Known fish spawning grounds within GB waters

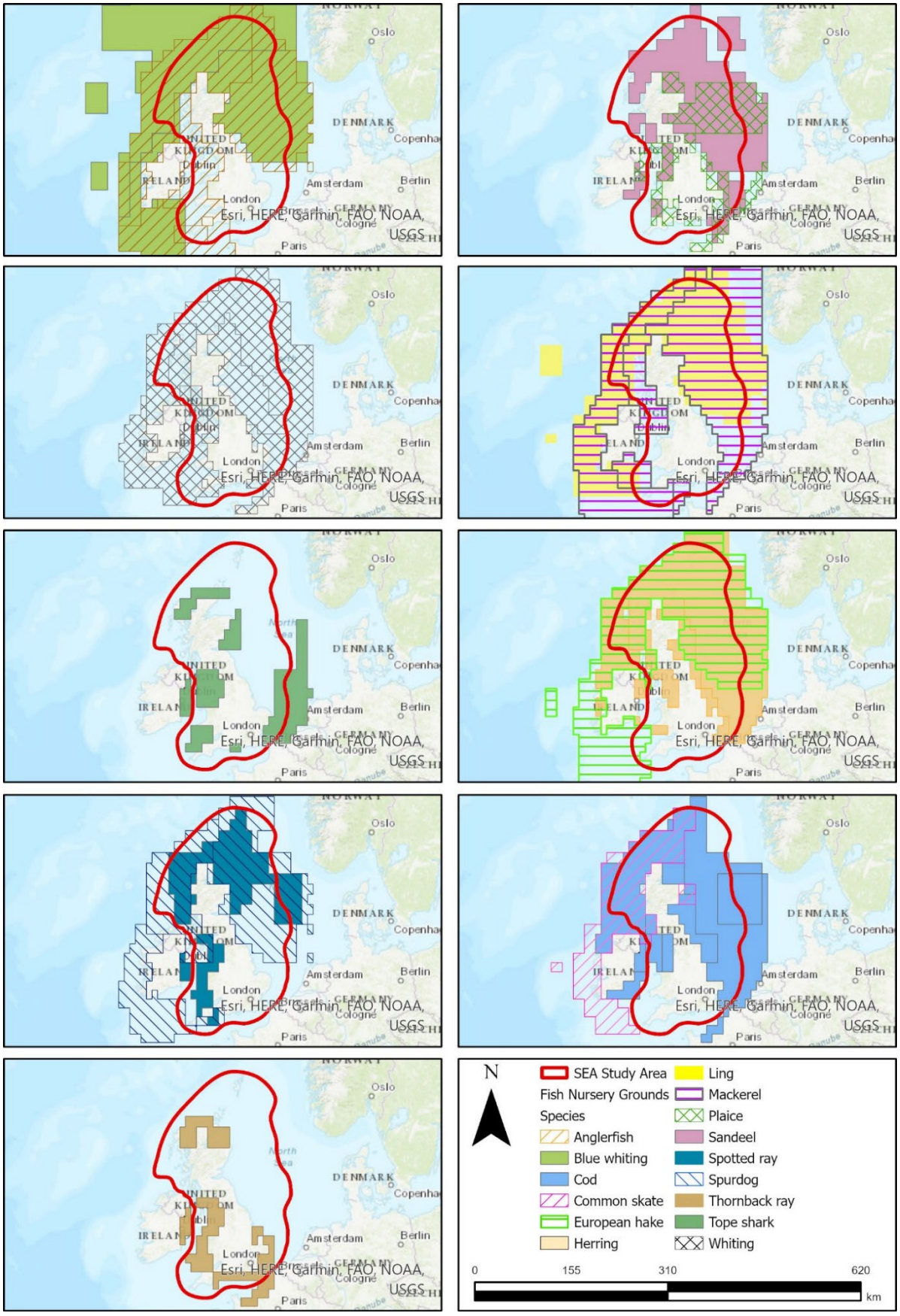


Figure 11: Known fish nursery grounds within GB waters

3.2.1.5 Marine Mammals and Reptiles

Background and Distribution of Marine Mammals

Twenty-eight species of marine mammals have been recorded in GB waters including cetaceans (whales, dolphins and porpoises), seals and otter. Of these 28 species, 12 can be regularly seen which includes minke, fin and sperm whales, harbour porpoise, four dolphin species (common, bottlenose, white beaked and Risso's), harbour and grey seals.

In Wales, two cetacean species (harbour porpoise and bottlenose dolphin) and two seal species (harbour seal and grey seal) are listed as Annex II species under the Habitats Directive and are also protected under Annex IV and are European Protected Species (NRW, no date).

The Sea Watch Foundation published the National Whale and Dolphin Watch 2022 report which provides information on the status and distribution of the species of cetaceans recorded in UK waters around the British Isles and Ireland, collating information from systematic watches occurring on land and at sea collating both scientific and non-scientific information sources. Sightings recorded in UK waters in 2022 were twelve different cetacean species including Harbour Porpoise (Phocoena phocoena), Common Dolphin (Delphinus delphis), Minke Whale (Balaenoptera acutorostrata), Bottlenose Dolphin (Tursiops truncates), White-beaked Dolphin (Lagenorhynchus albirostris), Risso's Dolphin (Grampus griseus), Killer Whale (Orcinus orca), Fin Whale (Balaenoptera physalus), Humpback Whale (Megaptera novaengliae), Sei Whale (Balaenoptera borealis), Long-Finned Pilot Whale (Globicephala melas) and Striped Dolphin (Stenella coeruleoalba).

Generally, Scotland has the highest proportion of observed cetacean species accounting for 62.31% of total sightings, England accounts for 26% of total sightings and Wales for 9.4% of total sightings.

In 2015, the Inter-Agency Marine Mammal Working Group defined Management Units (MUs) for the most common cetacean species found in UK waters of bottlenose dolphin; short-beaked common dolphin; harbour porpoise; minke whale; Risso's dolphin; white-beaked dolphin; and Atlantic white-sided dolphin. The most recent review of these MUs occurred in 2023 based on updated species abundance information (JNCC, 2023). For harbour porpoise, three MUs are defined in the North Sea, West Scotland and in the Celtic and Irish Seas Seven MUs are defined for bottlenose dolphin given the two recognised ecotypes of offshore and inshore type dolphins; coastal west Scotland and the Hebrides; coastal east Scotland; greater North Sea; offshore channel and south-west England; coastal west channel; Irish Sea; and oceanic waters. Two MUs have also been defined for the Republic of Ireland of the Shannon Estuary and the West Coast of Ireland MU for two populations of inshore bottlenose dolphins in Irish waters of the British Isles. One single MU was defined for the common dolphin given its wide coverage across all of the UK waters and its long-range movements. A single MU was defined for the white-beaked dolphin given its wide coverage across all the UK waters. For the Atlantic white-sided dolphin, one single MU was defined for the whole of the UK waters. One single MU covering all of the UK waters was defined for Risso's Dolphin as these are widely distributed and occur in shallow

waters and species, a number of small breeding colonies occur off North Wales coastlines. Around 84% of the UK population breeds in Scotland in the Hebrides and Orkney (Natural Environment Research Council Special Committee on Seals, 2022). Within Wales, Pembrokeshire Marine SAC is a key site, supporting most grey seal pupping within the Celtic and Irish Seas. Other areas in Wales and the adjacent seas are also important for pupping, and for non-breeding haul-outs, such as the West Hoyle Sandbank at the mouth of the River Dee in North Wales (NRW, 2025c).

Population trends of grey seals are assessed from pup counts during the breeding season, converted to an estimate of total population size, for the 2022 report this was based on 2019 pup surveys. In 2020, the UK had a total estimated of 162,000 with a total population of 27,000 estimated for England, 5,400 estimated for Wales and 54,050 estimated for Scotland. The UK grey seal pup production has continually increased since regular surveying began in the 1960s, pup production in west Scotland and close to shore. A single MU covering the European North Atlantic was also defined for Minke Whale given their wide but generally southern distribution.

For pinnipeds, harbour seals are widely distributed throughout UK waters (covering the North Atlantic and North Pacific Seas) and cover several SACs, largely found in Scotland on the West coast, Inner and Outer Hebrides, Orkney, and Shetland. Grey seals are also a commonly observed Orkney is stable with colonies in the North Sea increasing in pup production rates. Harbour seal population estimates are based on surveys from 2016-2021 (estimated through counts on land during their August moulting), the UK harbour seal population is estimated at 42,900, representing a decrease in the previous survey period from 2011-2015. The total UK population estimate for harbour seals was 42,900 in 2021, with England estimated as 5,100, Wales as a population <15 and 36,600 in Scotland. Concerningly trends in harbour seals showed declines in populations compared to previous survey years.

Areas of known high density use by grey seals and harbour seals that overlap with the SEA Study Area are shown in Figure 12 and Figure 13, respectively.

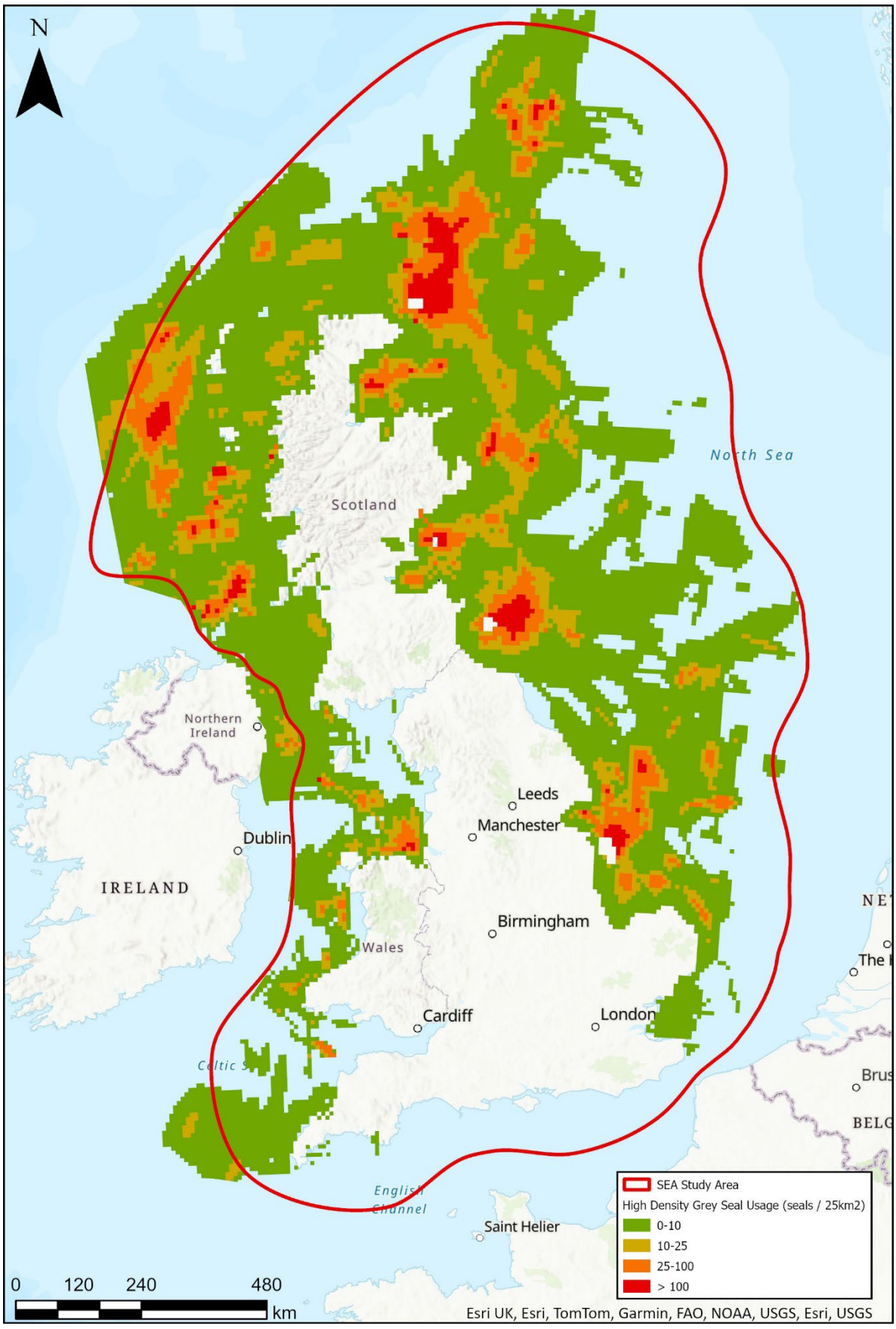


Figure 12: Areas of known high density grey seal use within the Study Area

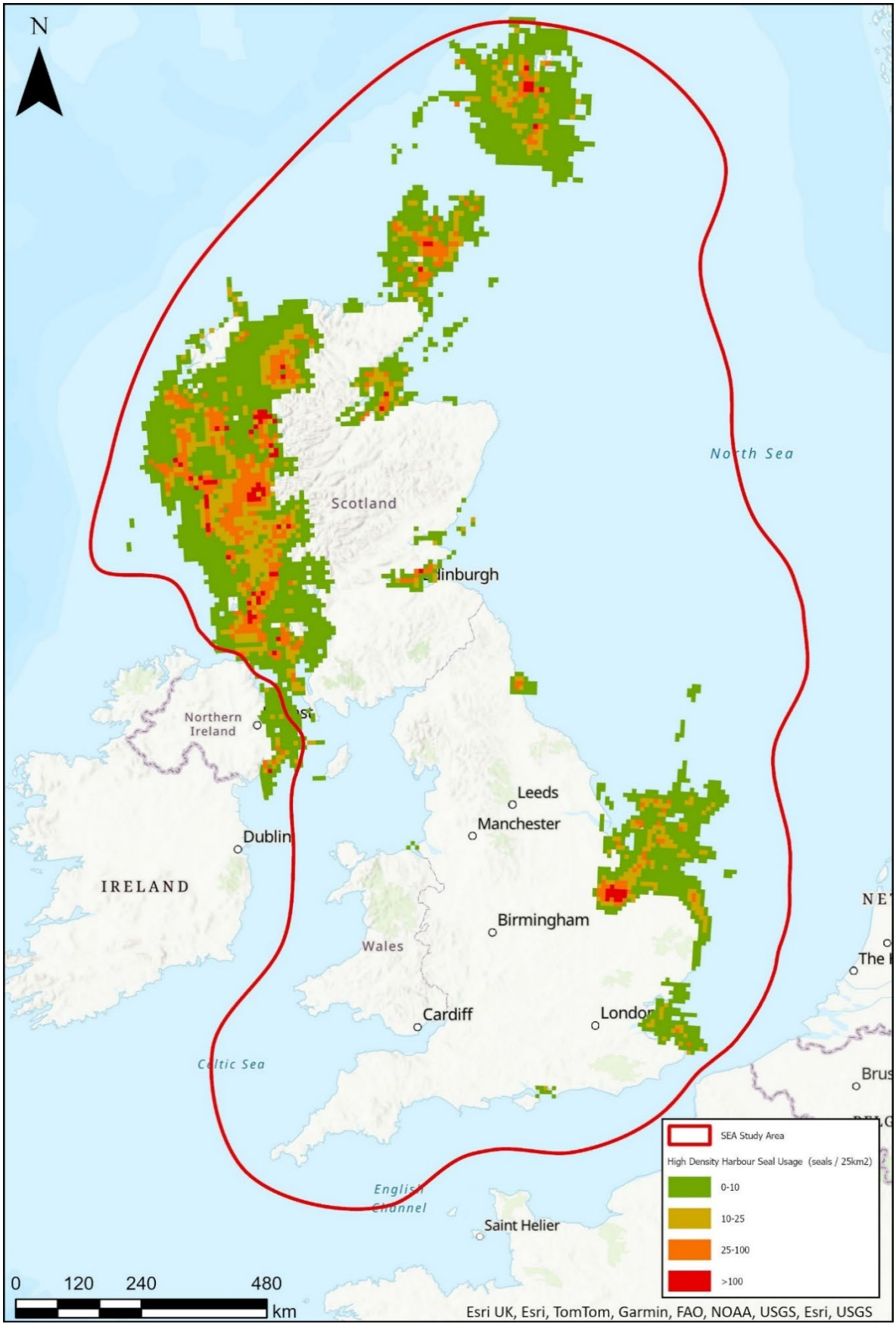


Figure 13: Areas of known high density harbour seal use within the Study Area

Protected and Priority Marine Mammals

All species of cetaceans and marine turtles are European Protected Species, as they are listed in Annex IV of the Habitats Directive and are thereby protected from killing, injury or disturbance in UK waters for England and Wales through The Conservation of Habitats and Species Regulation 2017, and The Conservation of Offshore Marine Habitats and Species Regulations 2017and in Scotland through the Habitats Regulation 1994 (as amended in Scotland). In Scotland under the Marine (Scotland) Act 2010 and under The Protection of Seals (Designation of Haul-Out Sites) (Scotland) Order 2014, it is an offence to kill, injure, take and harass a seal at the 194 designated seal haul-out sites. In England and Wales, it is illegal to kill, injure and take a seal under the Conservation of Seals Act 1970, but there is no protection from intentional and reckless disturbance. As European Protected Species, it is also an offence to intentionally or recklessly: disturb any such animal while it is occupying a structure or place which it uses for shelter or protection; damage or destroy, or obstruct access to, any structure or place which any such animal uses for shelter or protection; damage or destroy anything which conceals or protects any such structure; or to have in possession or control any live or dead wild animal included in Schedule 5 of the Wildlife and Countryside Act 1981 or any part of, or anything derived from, such an animal. In addition, grey and harbour seals, bottlenose dolphins and harbour porpoise are species where the designation of Special Areas of Conservation (SACs) is required in Annex II of the Habitats Directive.

There are several SACs designated in GB waters, either wholly or partly for the protection of marine mammals. There are 7 SACs designated for harbour porpoise, 3 SACs for bottlenose dolphins (in Wales and Scotland), 13 SACs for grey seals (5 in Scotland, 1 in Wales one SAC and 1 in England), 12 SACs for harbour seal (primarily in Scotland) and 74 SACs for otters, with the majority of these sites in Scotland due to persecution and habitat loss impacting its wider UK distribution. Several Isle of Man Marine Nature Reserves (MNRs) also protect these species: Calf of Man and Wart Bank (grey seal), Langness (common seal, grey seal, and harbour porpoise), Niarbl Bay (grey seal, harbour porpoise), West Coast (grey seal, harbour porpoise), while other cetacean species that are provided protection from Isle of Man MNRs include Risso's dolphin, bottlenose dolphin and minke whale.

Marine mammals for which sites have been designated outside of GB waters may also have potential to be affected by the implementation of the HND. The Sea Mammal Research Unit (SMRU) recommend that all SACs within 100km of a project should be screened for grey seals and all SACs within 50km should be screened for harbour seals, while all SACs within 100km should be screened for harbour porpoise based on Management Units (Department of Agriculture Environment and Rural Affairs (DAERA), 2023). Advice from NRW on screening states that all SACs within MMMUs should be screened in for an Appropriate Assessment with an in-combination assessment on any plans and projects within the MMMU, it should be noted that the use of screening distances may be appropriate, particularly for activities which will cause disturbances. These distances must be appropriate for the activity type, species and local conditions with suitable evidence to justify the use of these. In Northern Ireland, North Channel SAC has been designated for harbour porpoise and The Maidens SAC has been designated for

grey seal. In the Republic of Ireland, there are seven designated SACs which are within these distances. Horn Head and Rinclevan SAC is designated for grey seal, Rockabill to Dalkey Island SAC is designated for harbour porpoise, Codling Faut SAC is designated for harbour porpoise, Carnsore Point SAC is designated for harbour porpoise, Blackwater Bank SAC is designated for harbour porpoise, Hook Head SAC is designated for harbour porpoise and Saltee Island SAC is designated for grey seal.

In France, the Marine natural park of the Picardy estuaries and the Opal Sea, located in the north-east of France, has been designated for its population for harbour seals, grey seals, bottlenose dolphin and harbour porpoise, while Bancs des Flandres SAC and Récifs Gris-Nez Blanc-Nez SAC have both been designated for grey seal, common seal and harbour porpoise. In Belgium, five areas are defined as marine nature conservation areas under SACs of Flemish Banks (designated for sandbank features) and Vlakte van de Raan which is shared with The Netherlands which is designated for grey seal, harbour seal and harbour porpoise. Doggersbank SAC and Klaverbank SAC in The Netherlands have also been designated for grey seal, common seal and harbour porpoise.

Of the marine mammals that may be found within the SEA Study Area, several species are listed as Priority Species in UK waters. These Priority Species and the protection measures that are afforded to them are outlined in Table 11.

Priority Marine Mammals

Name	Bern Convention	IUCN	Habitats Directive	Conservation and Habitats Regs 2010	Wildlife and Countryside Act 1981
Minke Whale ***Balaenoptera acutorostrata***	Appendix 3	LC	Annex IV	Schedule 4	Schedule 5
Sei Whale ***Balaenoptera borealis***	Appendix 2	E	Annex IV	Schedule 4	Schedule 5
Blue Whale ***Balaenoptera musculus***	Appendix 2	E	Annex IV	Schedule 4	Schedule 5
Fin Whale ***Balaenoptera physalus***	Appendix 2	E	Annex IV	Schedule 4	Schedule 5
Loggerhead Turtle ***Caretta caretta***	Appendix 2	VU	Annex IV	Schedule 4	Schedule 5

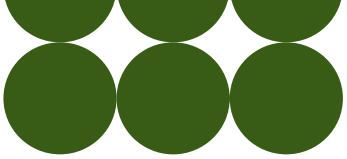
Name	Bern Convention	IUCN	Habitats Directive	Conservation and Habitats Regs 2010	Wildlife and Countryside Act 1981
Common Dolphin ***Delphinus delphis***	Appendix 2	LC	Annex IV	Schedule 4	Section 9(4A) and Schedule 5
Leatherback Turtle ***Dermochelys coriacea***	Appendix 2	VU	Annex IV	Schedule 4	Schedule 5
North Atlantic Right Whale ***Eubalaena glacialis***	Appendix 2	CR	Annex IV	Schedule 4	Schedule 5
Long-finned Pilot Whale ***Globicephala melas***	Appendix 2	LC	Annex IV	Schedule 4	Schedule 5
Northern Bottlenose Whale ***Hyperoodon ampullatus***	Appendix 3	NT	Annex IV	Schedule 4	Schedule 5
Atlantic White-side Dolphin ***Lagenorhynchus acutus***	Appendix 2	LC	Annex IV	Schedule 4	Section 9(4A) and Schedule 5
White-beaked Dolphin ***Lagenorhynchus albirostris***	Appendix 2	LC	Annex IV	Schedule 4	Section 9(4A) and Schedule 5
Humpback Whale ***Megaptera novaeangliae***	Appendix 2	LC	Annex IV	Schedule 4	Schedule 5
Sowerby's Beaked Whale ***Mesoplodon bidens***	Appendix 2	LC	Annex IV	Schedule 4	Schedule 5
True's Beaked Whale ***Mesoplodon mirus***	Appendix 2	LC	Annex IV	Schedule 4	Schedule 5

Name	Bern Convention	IUCN	Habitats Directive	Conservation and Habitats Regs 2010	Wildlife and Countryside Act 1981
Risso's Dolphin ***Grampus griseus***	Appendix 2	LC	Annex IV	Schedule 4	Section 9(4A) and Schedule 5
Grey Seal ***Halichoerus grypus***	Appendix 3	LC	Annex V	Schedule 3	
Killer Whale ***Orcinus orca***	Appendix 2	D	Annex IV	Schedule 2	Schedule 5
Harbour (or Common) Seal ***Phoca vitulina***	Appendix 3	LC	Annex II and V	Schedule 3	
Harbour (or Common) Porpoise ***Phocoena phocoena***	Appendix 2	LC	Annex II and IV	Schedule 2	Schedule 5
Sperm Whale ***Physeter catodon***	Appendix 3	VU	Annex IV	Schedule 4	Schedule 5
Striped Dolphin ***Stenella coeruleoalba***	Appendix 2	LC	Annex IV	Schedule 4	Section 9(4A) and Schedule 5
Cuvier's Beaked Whale ***Ziphius cavirostris***	Appendix 2	LC	Annex IV	Schedule 4	Schedule 5
Bottle-nosed Dolphin *Tursiops truncatus*	Appendix 2	LC	Annex II and IV	Schedule 2	Section 9(4A) and Schedule 5
Otter ***Lutra lutra***	Appendix 2	NT	Annex II and IV	Schedule 4	Schedule 5

Table 11: Priority marine mammal species in UK waters and their protection

Status and Vulnerabilities of Marine Mammals

The UK assessment of environmental status for the Marine Strategy (DEFRA, 2019a) indicates that for cetaceans in the UK, the achievement of Good Environment Status (GES) is uncertain. For grey seals, GES has been achieved for grey seals in the Celtic Seas, while,



for harbour seals in the Celtic Seas, there has been a significant increase in West Scotland, but the status is uncertain elsewhere.

Offshore cabling activities have the potential to adversely affect marine mammals in a number of ways during construction and operation, including via injury and disturbance from underwater noise generated during vessel use and other noise producing activities (e.g. site-investigation surveys prior to construction), injury/disturbance/mortality due to collision with vessels during construction or maintenance activities, electromagnetic fields (EMF) emitted from cables during operation and altered prey availability.

Of the key issues identified for Biodiversity, Flora and Fauna, those of relevance to marine mammals are:

- Potential for direct permanent loss of habitats and species, including protected or priority habitats and species, in the footprint of new onshore infrastructure and where cable protection materials are required for offshore cable routes.
- Potential for construction and decommissioning phase damage or disturbance of offshore and onshore habitats and species, or indirect changes in habitat type post-construction e.g., through changes in sediment dynamics / smothering effects, effects on water quality / temperature or onshore soil quality through construction pollution, or cable protection materials.
- Potential disturbance effects from visual presence, underwater sound and vibration on marine mammals, reptiles, fish and seabirds during offshore pre-construction, construction and decommissioning phases. Potential disturbance effects from visual presence and noise on terrestrial mammals and birds during onshore construction and maintenance activities.
- Potential collision risk for marine mammals, fish, seabirds (above and below the water surface), and other marine fauna with vessels during the construction and decommissioning phases, and during cable maintenance activities. Potential for collision risk for mammals and birds with vehicles during the construction of onshore infrastructure.
- Potential effects of Electromagnetic Fields (EMF) from transmission cables on fauna such as marine mammals and electrosensitive fish.
- Potential effects of noise and vibration from cables on fauna such as marine mammals and fish.

Marine Strategy Descriptors that relate to habitats and species are discussed further within Section 3.2.4.

Reptiles

Four species of turtle are listed as priority species in GB waters, all within Scottish waters: leatherback turtles (Dermochelys coriacea), loggerhead turtles (Caretta caretta), Green Turtles and Kemp's Ridley Turtles (Lepidochelys kempii). Leatherback turtles are the largest of all marine turtles and migrate huge distances between their feeding grounds and where they lay their eggs. The loggerhead is a wide-ranging turtle, occurring

throughout the temperate subtropical and tropical regions of the Atlantic Pacific and Indian Oceans. The most frequently sighted are Leatherback turtles, which are located along the UK coastline and Isle of Man coastline, distribution patterns relate to the migration of jellyfish during summer seasons.

All marine turtles are legally protected: they are listed on Appendix I of the Convention on the International Trade in Endangered Species of Flora and Fauna (CITES), Appendices I and II of the Bonn Convention on Migratory Species and Appendix II of the Bern Convention, and on Annex IV of the EU Habitats Directive, with the loggerhead and Green turtle also listed as a priority species Annex II of the Habitats Directive. Globally, the leatherback turtle is listed as 'Vulnerable' on the IUCN Red List of Threatened Species, while the sub-population of the north-west Atlantic (one of seven sub-populations assessed) is 'Least Concern' (ICUN, 2013). Globally, the loggerhead turtle is now also listed as 'Vulnerable', while the sub-population of the north-east Atlantic (one of ten sub-populations assessed) is 'Endangered' (ICUN, 2015). The leatherback turtle is also listed as a Priority Species for Scotland.

There were 1,500 records of sightings or strandings of turtles in GB waters between 1748-2022 (Penrose and Westfield, 2023), the majority of which were leatherback turtles. There were 10 live sitings of turtles in GB waters in 2022, two leatherbacks sighted in England, 4 in Scotland, 1 in Wales, and 3 further unidentified turtles in England. Sightings mainly occur between June and October with a peak in August, while strandings peak later around September and October. The majority of sightings between 2012-2022 occurred along the west/south-west coast of England and Wales and the west coast of Scotland, with several occurring near Orkney and the Shetland Islands. Similar to marine mammals, marine reptiles have potential to be affected by collision risk with vessels and with devices underwater, noise, exclusion from habitat, as well as indirectly via effects on water quality or marine litter.

3.2.1.6 Birds

Areas of Importance to Seabirds

The GB coastline and marine area supports nationally and internationally important populations of a large number of seabird species. It can be difficult to make accurate assessments of the temporal and spatial distribution of bird species, owing to their highly mobile nature, particularly in offshore environments. Information available on SPAs and Important Bird Areas (IBAs) provide an indication of the areas of greatest importance for seabird populations, including breeding grounds, and areas used by wintering or migratory species.

Protection is provided to certain species of breeding, migrating and wintering birds through the establishment of SPAs. There are currently 116 SPAs with marine components in GB waters protecting species such as Arctic tern (Sterna paradisaea), Atlantic puffin (Fratercula arctica), Black-legged kittiwake (Rissa tridactyla), Common guillemot (Uria aalge), Greenland white-fronted goose (Anser albifrons flavirostris), Little tern (Sterna albifrons), Northern fulmar (Fulmarus glacialis), Razorbill (Alca torda), Red-throated diver (Gavia stellata), Ringed plover (Charadrius hiaticula), and Whimbrel (Numenius

phaeopus). Offshore, there are eight SPAs which fall wholly or partly in GB waters; Skomer, Skokholm and the Seas Off Pembrokeshire SPA; Outer Thames Estuary SPA; Liverpool Bay SPA; Irish Sea Front SPA; Greater Wash SPA; Seas off Foula SPA; Seas off St Kilda SPA and Outer Firth of Forth and St Andrews Bay Complex SPA. These are designated for a variety of species including Little tern (Sterna albifrons), Manx shearwater (Puffinus puffinus), Atlantic puffin (Fractercula arctica), Common scoter (Melanitta nigra), Great Skua (Sterocorarius skua), Common eider (Somateria mollissima), Red-breasted merganser (Mergus serrator), and Black-legged kittiwake (Rissa tridactyla). Rathlin Island SPA is located outside GB waters but within the SEA Study Area and supports breeding populations of peregrine falcon, guillemot, razorbill and kittiwake, as well as breeding seabird assemblages. Work is still continuing on designating SPAs with marine components (JNCC, no date (b)). The location of these SPAs is shown in Figure 8. Species for which these sites are designated may be sensitive to disturbance from activities associated with cable installation such as vessel traffic and noise. Furthermore, there is potential for impacts to supporting habitats for these species such as feeding or roosting areas (Natural England and JNCC, 2019), including within SPAs and Ramsar Sites.

Within the SEA Study Area, there are 91 MCZs designated in England and 1 in Wales. While Rathlin Island MCZ located in Northern Ireland Inshore Waters has been designated, partly, for its importance in supporting a large population of black guillemots (Cepphus grylle). In Scotland, areas are designated as MPAs, with over 240 MPAs. The Clyde Sea Sill Nature Conservation MPA, designated under the Marine (Scotland) Act 2010, is designated in part for the protection of black guillemot.

Seabirds for which sites have been designated outside of GB waters may also have potential to be affected by the implementation of the HND. Many seabirds, such as northern gannet (Morus bassanus), fulmar (Fulmarus glacialis), and manx shearwater (Puffinus puffinus), have extensive foraging ranges, extending for several hundred kilometres from their breeding colonies (Woodward et al., 2019). There are eight SPAs located in proximity to the Study Area, within Northern Ireland Inshore Waters, these include Belfast Lough SPA, Belfast Lough Open Water SPA, Carlingford Lough SPA, Killough Bay SPA, Larne Lough SPA, Lough Foyle SPA, Outer Ards SPA and Strangford Lough SPA. SPAs in the Republic of Ireland that are in proximity to the SEA Study Area, and which include seabird species as qualifying species, include Carlingford Lough SPA, Dundalk Bay SPA, Boyne Estuary SPA, River Nanny Estuary and Shore SPA, Dalkey Islands SPA, South Dublin Bay and River Tolka Estuary SPA, North Bull Island SPA, Howth Head Coast SPA, Baldoyle Bay SPA, Ireland's Eye SPA, Malahide Estuary SPA, Rogerstown Estuary SPA, Lambay Island SPA, North-west Irish Sea SPA, Skerries Island SPA, Rockabill SPA, The Murrough SPA, Wicklow Head SPA, Cahore Marshes SPA, The Raven SPA, Wexford Harbour and Slobs SPA, the Seas off Wexford SPA and The Irish Sea Front SPA. In France, the Marine natural park of the Picardy estuaries and the Opal Sea, located in the north-east of France, has been designated for its importance as a stop-over route for several migratory bird species such as red-throated divers, several gull species such as little gull, common gull, yellow-legged gull, sandwich tern, razorbill and common guillemot, while Banc des Flandres SPA has been designated for great skua and fulmar, and Cap Griz-Nez SPA has been designated for fulmar, Manx shearwater and great skua. In the Netherlands, Bruine Bank SPA, located

in the western part of the Dutch North Sea, is designated for little gull, and migratory species of gannet, great skua, great black-backed gull, auk and guillemot.

To date, 134 Ramsar Sites have been designated in GB offshore waters with 73 Ramsar Sites in England, 10 Ramsar Sites in Wales and 51 Ramsar Sites in Scotland. Originally, these have been designated for waterbird species but increasingly non-bird features in the UK have been designated as well. Several Ramsar Sites are also designated as SPA areas for bird species.

Several of the species that may be found within the Study Area are listed as Priority Species in the UK. In total, there are 59 species of birds listed as UK Priority Species for both terrestrial and marine bird species (JNCC, 2007). Of these, there are 21 species whose broad habitat type either includes coastal habitats, marine habitats or is solely marine. These include seabird species for which SPAs have been designated, as described previously, as well as species classified as vulnerable or endangered by the IUCN (e.g., dunlin, purple sandpiper, black-headed gull, long-tailed duck, puffin, shag). In addition to designated SPAs, MPAs, and MCZs, a network of sites known as Important Bird Areas (IBAs) have been identified by BirdLife International as critical for the long-term viability of bird populations. Across the UK there are 313 IBAs identified. These sites are not afforded any statutory protection but provide an indication of those areas of UK waters of particular importance to seabirds and may overlap with statutory designations. IBAs are selected due to the numbers and species of birds that they hold and are of particular significance for those species that congregate in large numbers. There are 158 IBAs with a coastal or marine habitat component within the UK for important seabird species such as Little Auk, Razorbill and Great Auk as well as for migratory species of waterbirds and waterfowl, their locations are shown in Figure 14. The 2014 BirdLife assessment for marine Important Bird and Biodiversity Areas showed that the UK was one of the poorest performers for providing protection under the Natura 2000 network through SPAs with its progress towards Natura 2000 network coverage as poor.



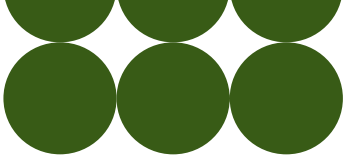
Figure 14: Location of Important Bird Areas within the SEA Study Area

Status and Vulnerabilities of Seabirds

The UK population of breeding seabirds has shown an overall decline of almost 25% since the 1980s (JNCC, 2021), while, for Scotland, this decline is as much as 49% (NatureScot, 2021). Under the UK Marine Strategy Part One (DEFRA, 2019a), the indicators of the UK target populations for non-breeding and breeding seabirds are measured. In the Greater North Sea the UK target for non-breeding waterbirds was met but in the Celtic Seas area this was not met, the target for breeding seabirds was not met in either the Greater North Sea or the Celtic Seas (UKMMAS, 2018), despite increases in seabirds breeding from 4.5 million in the 1960s to over 7 million by 2012, primarily due to impacts from climate change and fishing pressures from food chain alterations. Good Environmental Status has however been achieved for non-breeding waterbirds in the Greater North Sea, but not for the Celtic Seas or for either region for breeding seabirds due to declining food sources and a reduction in wintering waterbird abundance in the Celtic Seas with a distribution shift to north-east areas due to the UK's warming winters.

The Seabirds Count 2021 shows that for 11 of the 21 seabird species which have comparable data for since 2000 have declined (JNCC, 2021), with a 24% decline in puffins, 49% of common gulls and a decline of 66% of Arctic Skuas due to increased predation, climate change related bad weather and a decline in food sources due to overfishing in the United Kingdom, Channel Islands and Isle of Man. It should be noted that since the completion of the Seabirds Count 2021 that there has been a severe outbreak of avian flu (Highly Pathogenic Avian Influenza HPAI) which has impacted seabird colonies such as Great Skuas, Northern Gannets and Roseate Terns, however full data analysis is still underway on this information. The second IUCN Red List assessment of extinction risk for Great Britain (Balmer and Noble, 2024) showed that ten seabird species are now Red listed. The full UK list of Birds of Conservation Concern now has 73 species listed on the Red list, 99 species on the Amber list and 73 species on the Green list, with 115 of the 235 regularly occurring seabird species now assessed as being threatened with extinction from UK waters. The RSPB's Powering Healthy Seas report (2022) highlights the variety of ways in which marine infrastructure development can impact seabirds during construction and operation. The laying of cabling for offshore infrastructure can be impacted directly through habitat loss and disturbance with potential for impacts on seabird populations. Seabirds may also be affected indirectly through habitat loss and seabed alteration, affecting food sources and coastal habitats. HPAI is expected to remain as a threat to UK seabirds for several years post the 2022 outbreak due to its impacts on population mortality, and lack of information regarding the potential for populations to be replaced by either breeding or non-breeding seabirds.

Evidence-based studies (RPS Group, 2016a) have been completed to determine the impact of onshore transmission development on birds. The potential for adverse effects of electricity transmission infrastructure on birds relates primarily to the potential for temporary or permanent disturbance, loss, or fragmentation of habitat during the construction phase, that may affect roosting or nesting sites, or habitats used for foraging. The operation of this infrastructure can also pose a risk to birds through displacement or loss of habitat quality in areas used for breeding or overwintering (EirGrid, 2012). Under the Wildlife and Countryside Act 1981 is the main piece of legislation that protects all wild birds



in GB. It is illegal to intentionally or recklessly take, injure or kill any wild bird, or to take, damage or destroy an active nest or its contents.

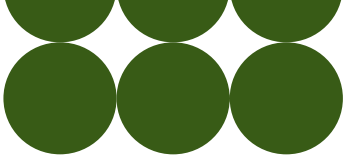
Marine Strategy Descriptors that relate to habitats and species are discussed further within Section 3.2.4

3.2.1.7 Non-indigenous Species

Non-indigenous species (NIS) comprise those species that have been introduced outside of their natural range, intentionally or unintentionally. Some of these species have the potential to thrive within their introduced environment and can out-compete native species of flora and fauna and pose a significant threat to native biodiversity. Once established, invasive species are extremely difficult and costly to control and eradicate and can have far-reaching impacts. NIS can enter GB waters from ballast water and the accumulation of organisms on ships' hulls via shipping, and through the introduction of commercial species into the wild in aquaculture. Under Section 14 of the Countryside and Wildlife Act 1981 (as amended) it is an offence to release or allow to escape into the wild any plant or animal which; a) is of a kind which is not ordinarily resident in and is not a regular visitor to Great Britain (England and Wales only) in a wild state (or is a hybrid of any animal of that kind), or b) is included in Part I of Schedule 9 (or is a hybrid of any plant or animal included in that Part). For Scotland, this section reads as, it is an offence to release or allow to escape from captivity any plant or animal (i) to a place outwith its native range or (ii) of at type the Scottish Ministers, by order, specify or b) otherwise cause any animal outwith the control of any person to be at a place outwith its native range.

The UK assessment of environmental status for the Marine Strategy (DEFRA, 2019a) indicates that for NIS in the UK, Good Environment Status (GES) has not yet been achieved but the ability to detect new NIS has improved, however, there was no significant change in the number of new records of NIS between 2003 and 2014 in either the Greater North Sea or the Celtic Seas.

The Great Britain Invasive Non-Native Species Strategy 2023-2030 (DEFRA, The Scottish Government and The Welsh Government, 2023) sets out the government strategy for all GB jurisdictions for the management of all non-native species of flora and fauna, particularly those known to be, or with the potential to be, invasive. The Strategy covers the terrestrial, freshwater and marine environments, as of 2021 approximately 2,000 non-native species are present in the UK with an increase of 10-12 each year, primarily terrestrial habitats are impacted, however aquatic species are typically more invasive than terrestrial species. It is estimated that between 10-15% of the invasive species present in the UK lead to significant adverse effects on the environment, economy and society. As part of addressing transportation pathways for the introduction or spread of these species, operators are encouraged to follow the International Maritime Organisation's (IMO) voluntary guidelines for the control and management of ships' biofouling. In addition, the UK acceded to the Ballast Water Management Convention in 2022 and introduced domestic legislation (The Merchant Shipping (Control and Management of Ships' Ballast Water and Sediments) Regulations 2022) that aims to regulate discharges of ballast water and reduce the risk of non-native species introduction.



3.2.1.8 Summary of Existing Pressures and Issues for Biodiversity, Flora and Fauna

GB contains a wide variety of natural habitats and species. Sites have been designated to provide protection to those habitats and species considered to be of particular conservation value. Marine habitats within the SEA study area are subject to several existing pressures, including loss or disturbance through destructive fishing methods, and extractive activities such as dredging as well as consequences from climate change leading to sea-level rise, alterations in sea temperatures, increases in coastal erosion and storm events, as well as encroaching developments leading to coastal squeeze. Marine fauna may be subject to direct loss through fishing (commercial fish and shellfish species), including bycatch (marine mammals), collision or behavioural avoidance due to vessel movements, and noise or visual damage, disturbance or displacement from numerous developments and activities within the marine and coastal environment. Seabird colonies have also been affected by Highly Pathogenic Avian Influenza (HPAI) in recent years, and the full UK list of Birds of Conservation Concern now has 73 species listed on the Red list, 99 species on the Amber list and 73 species on the Green list, with 115 of the 235 regularly occurring seabird species now assessed as being threatened with extinction from UK waters. The multiple stressors that may affect marine habitats and species influences their ability to recover from disturbance and can lead to ecosystems that are less resilient to invasive species, and that may have less ability to adapt to potential climate change impacts.

In addition to marine and coastal habitats, terrestrial and freshwater habitats, including those with legislative protection or classified as a priority, may be intersected by cable route corridors where cables will be buried onshore, or may be within the potential areas for supporting infrastructure such as substations or converter stations. Onshore habitats and species in GB face a range of environmental and anthropogenic pressures, including disturbance by onshore infrastructure projects and the introduction of non-invasive species which can out compete with native species and reduce biodiversity.

Implementation of the draft HND Plan, and the construction, maintenance and decommissioning activities associated with the potential offshore and onshore cabling and associated onshore infrastructure that may arise as a result, has the potential to impact on habitats and species within the GB and GB waters, including protected and priority species, within and outside designated sites.

3.2.1.9 Evolution of the Baseline in the Absence of the Plan

In the short-term, the future baseline for biodiversity, flora and fauna is likely to be driven by the current trends, as discussed. Biodiversity, flora and fauna will continue to be impacted upon by developments, human activity and population growth.

In the longer-term, the main drivers of change from the current baseline are likely to include continuing pressures from marine development, human activities and climate change. This includes fishing activities, marine and coastal developments, and other activities such as dredging, shipping and recreation, which could affect biodiversity, flora, and fauna through a variety of pathways such as direct or indirect damage to benthic

habitats, pollution events, collision, bycatch, or via effects on prey species. Seabird populations are likely to continue to be affected by HPAI, and seal populations may be further affected by phocine distemper virus. Onshore land use may alter owing to changes in land use policy such as agricultural and forestry policies and incentives.

Climate change has the potential to be a key issue influencing the future baseline for flora and fauna. Predicted further warming of sea temperatures is likely to influence the distribution of species, and the spread northwards of warmer water species. Alterations in the distributions of prey species could affect fish, bird, marine mammal and turtle populations and their distribution, and they may also be affected by a predicted increase in extreme weather events and changes in sea levels.

Marine biodiversity, flora and fauna may be provided with increased protection in the future, including through the designation of further sites e.g., the designation of offshore SACs, marine SPAs or MCZs, thus reducing the potential for marine development and activities to adversely impact their ecology within these areas. Knowledge and understanding of the baseline are likely to improve, including marine mammal and seabird distribution, abundance and habitat use.

3.2.2 Population and Human Health

Population and human health considers the presence and wellbeing of people, and their activities and use of receiving environments. Population size, growth predictions and distribution within an area can indicate both the potential pressures that people may exert on resources and infrastructure, and the potential to which they may be exposed to pollution, disturbance, or other risks. The health of a population can be adversely affected through several direct and indirect pathways, including through emissions to water and air, health and safety risks, noise and other disturbances.

It is considered that the key issues associated with the implementation of the draft HND Implementation Plan and Population and Human Health comprise:

- Potential for disturbance of the local population during construction (e.g., dust, noise) and impacts on residential amenity, including in deprived or sensitive areas.
- Potential for direct conflict with other users of the coastal and marine environment (e.g., fishing, recreation and leisure).
- Potential positive or negative effects on employment and the local economy (e.g., local community employment, fisheries, and skilled technical workers, potential for increased capital investment in the local area).
- Potential for long-term indirect health effects on the local population.
- Potential for long-term positive effects on air quality (reduced emissions).
- Potential / perception of Electromagnetic Field (EMF) risk from electricity transmission lines.
- Potential for interaction between transmission infrastructure and settlement patterns.

3.2.2.1 Population Demographics and Health

In 2021, the population of England was approximately 56.489 million and the population of Wales was approximately 3.107 million (ONS, 2022a). In Scotland, the population in 2022 was approximately 5.436 million (Scotland's Census, 2022). The total UK population in 2021 was approximately 68.265 million (ONS, no date (a)) and is predicted to increase to approximately 72.4 million individuals by 2043 (ONS, 2019).

Many major population centres in GB are situated along, or in proximity to, the coastline. These include Aberdeen, Edinburgh, Dundee, Newcastle Upon Tyne, Hartlepool, Hull, Southend-on-Sea, Margate, Brighton, Portsmouth, Southampton, Bournemouth, Torbay, Plymouth, Cardiff, Liverpool and Blackpool.

In mid-2022 the population density for the UK was 279 people / km2. The highest population density in the UK was found in the London Borough of Tower Hamlets with 16,500 people / km2. The lowest population density in the UK was found in Na h-Eileanan Siar and the Highlands with nine people / km2. Most local authorities in Scotland and Wales have lower population densities than is typical in the UK (ONS, no date (b)).

In 2020-2022, life expectancy at birth was 78.6 years for men and 82.6 for women living in the UK, an increase from 70.8 years and 76.8 years, respectively, since the base reporting period of 1980-1982. England had the highest life expectancy at birth for males and females, whilst Scotland had the lowest. In 2020-2022, life expectancy at birth in England was 78.8 years for men and 82.8 years for women. In Scotland life expectancy at birth was

76.5 years for men and 80.7 years for women. In Wales life expectancy at birth was 77.9 years for men and 82.3 years for women (ONS, no date (c)).

It is best practice in route planning to seek to avoid, whenever possible, heavily populated areas on the grounds of general amenity, to minimise the number of people affected and to reduce the potential for adverse effects of transmission development projects (National Grid, 2008). An evidence-based study has been completed to determine the effects of high voltage transmission development (including overhead lines, underground cables and substations) on patterns of settlement and land use in the Republic of Ireland (RPS Group, 2016b). A review of literature found that impacts on land use and settlement were rarely significant and tended to be local, i.e., within the vicinity of towers and circuits, while issues were more likely to arise owing to possible restrictions on future land uses, particularly in built-up areas. An investigation into transmission projects and levels of coexistence found there to be low levels of coexistence (coexistence of buildings along transmission infrastructure) found in rural areas, but significant coexistence found in urban and urban / rural areas. A study of four transmission construction sites to identify any impacts of these projects on patterns of settlement and land use found that, following the announcement of the projects, there continued to be applications for planning permission within their vicinity. This indicated that other factors were of overriding importance. No evidence was found of any significant impact arising from the construction or existence of transmission infrastructure in terms of patterns of settlement and land use; however, it was found that transmission infrastructure could pose a local physical constraint on development.

The Index of Multiple Deprivation is a small area measure of relative deprivation across the UK. Areas are ranked from most deprived to least deprived. Deprivation is measured differently across each jurisdiction, and themes include income, employment, education, health, crime, barriers to housing and services and the living environment (Consumer Data Research Centre, 2020). The English Index of Deprivation 2019 found deprivation to be spread across England (Ministry of Housing, Communities and Local Government, 2019). The highest proportion of neighbourhoods with the most deprivation was found in Middlesborough, Liverpool, Knowsley, Kingston Upon Hull and Manchester. Several London Boroughs have seen a reduction in the proportions of their neighbourhoods that are highly deprived. Seven of the ten local authority districts with the highest levels of income deprivation among older people are in London. Middlesbrough and Blackpool rank as the most deprived districts regarding income deprivation among children.

The Scottish Index of Multiple Deprivation 2020 found that the least deprived area was Stockbridge in Edinburgh with the most deprived area being Greenock town centre (Scottish Government, 2020). Inverclyde (45%) and Glasgow City (44%) had the largest percentage of areas categorised as within the 20% most deprived in Scotland. Na h-Elieanan an Iar, Shetland and Orkney contained no areas within the 20% most deprived. The Welsh Index of Multiple Deprivation 2019 found that there were pockets of high relative deprivation in south Wales' cities and valleys and in some north Wales' coastal and border towns (Welsh Government, 2019). Newport had the highest proportion of areas in the most deprived 10%, whilst Monmouthshire had no areas within the most deprived 10%. Blaenau

Gwent had the highest percentage of areas in the most deprived 50% in Wales. Areas of high deprivation throughout GB are displayed in Figure 15.

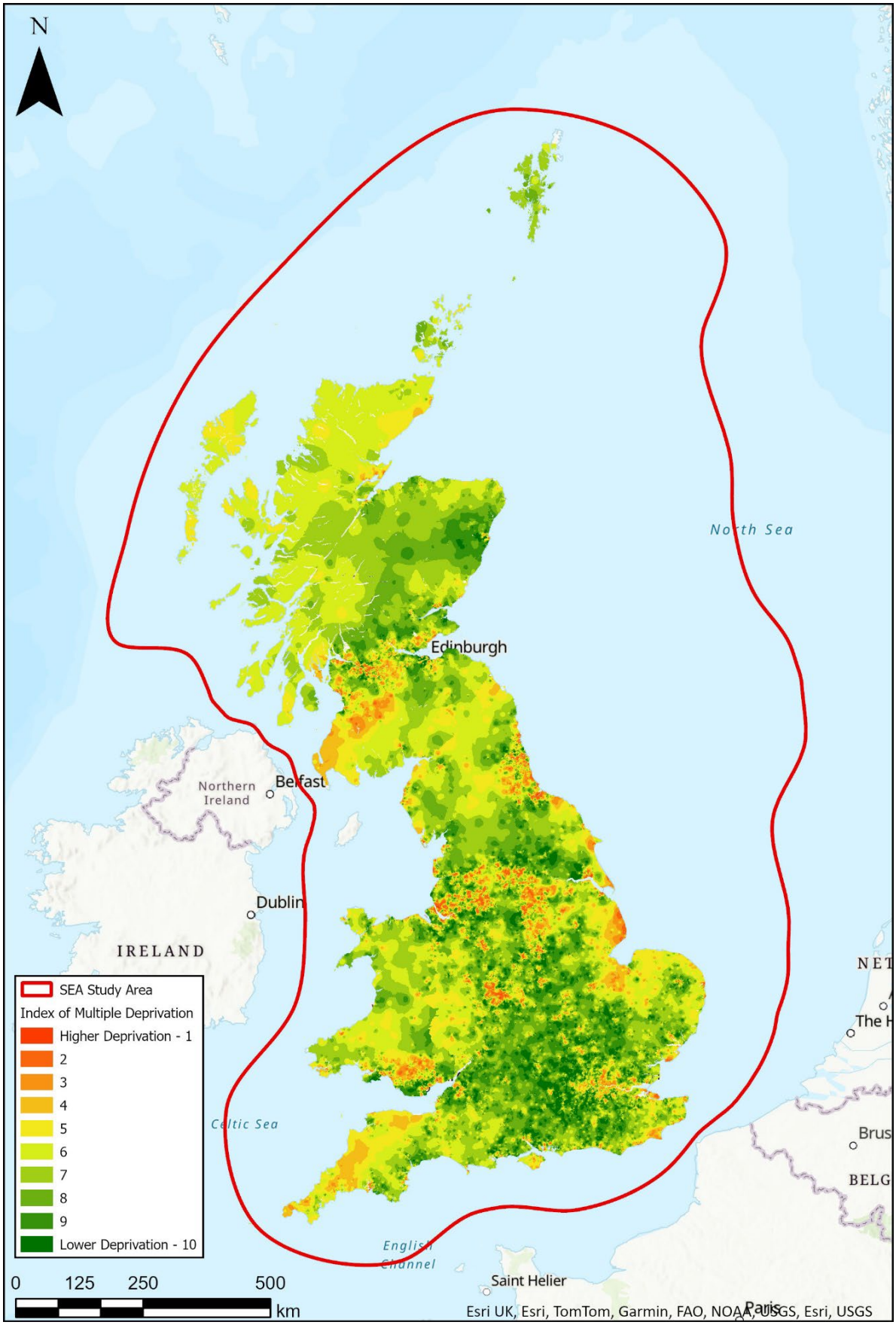


Figure 15: High deprivation areas in GB

The UK has an ageing population, with 18% aged over 65 years (ONS, 2018), and it is projected that the over 65-year population will be the greatest proportion of people from mid-2028 onwards (ONS, 2020). The primary causes of death for people in England and Wales in 2021 were Coronavirus (COVID-10) (11.5%) and dementia and Alzheimer's disease (10.4%) (ONS, 2022b). In Scotland, the primary causes of death were ischaemic heart diseases (11%) and dementia and Alzheimer's disease (10.2%) (National Records of Scotland, 2024).

In the English census in 2021, 81.7% of residents reported themselves to be of good or very good general health. The south-east region had the highest proportion of people reporting very good health (59.6%) while the north-east region had the highest proportion of people reporting very bad health (1.6%). In terms of local authorities, Kensington and Chelsea reported the highest proportion of very good health (58%) and Tower Hamlets reported the highest proportion of very bad health (2.5%). In the Welsh census in 2021, 79.1% of residents reported themselves to be of good or very good general health. In terms of local authorities, Gwynedd reported the highest proportion of very good health (51.5%), and Merthyr Tydfil reported the highest proportion of very bad health (2.4%) (ONS, 2023a). In the Scottish census in 2022, 79.2% of residents reported themselves to be of good or very good general health. East Renfrewshire had the highest proportion of people reporting very good health (56.2%) and the Glasgow City Council area had the highest proportion of people reporting bad or very bad health (2.8%) (Scotland's Census, 2024).

In England in 2021, less than one in five of the resident population (17.7%) reported a long-term health problem or disability, which limited their day-to-day activities. In Wales in 2021, more than one in five of the resident population (21.1%) reported a long-term health problem or disability, which limited their day-to-day activities (ONS, 2023b). In Scotland, more than one in five of the resident population (21.4%) also reported a long-term health problem or disability, which limited their day-to-day activities (Scotland's Census, 2024).

Construction activities associated with the development of infrastructure, including cabling and onshore substations / converter stations, may lead to short-term disturbances to local communities, including through noise disturbance. An evidence-based study (RPS Group, 2016c) has been completed to determine the noise effects of the construction and presence of high voltage transmission infrastructure, substations, in the Republic of Ireland. Noise may be generated from electricity infrastructure in several ways, which fall within four main categories:

- Audible noise associated with dirty, damaged or cracked insulators.
- Audible noise associated substation equipment.
- Audible noise associated with wind blowing through electricity infrastructure (Aeolian Noise).

A review of the literature for the evidence-based study of noise effects indicated that steady state noise levels were found in the vicinity of the boundaries of 110kV, 220kV and 400kV substations. To avoid noise impacts at sensitive receptors, it recommended that the design and siting of a new substation is a minimum of 150m between a 400kV

substation and land boundary of a noise sensitive receptor, 20m for a 220kV substation and 5m for a 110kV substation.

There can be a perception of risk from local populations to electric and magnetic fields (EMF) from electrical transmission lines. EMFs are produced when electric current flows, and EMFs from electricity are in the extremely low frequency end of the electro-magnetic spectrum. As these occur wherever electricity is generated, transmitted or used, people are regularly exposed to them from sources other than electricity lines, including at home and in places of work. Although there can be concern from the public about EMF and health, extremely low frequency EMFs have been researched and monitored and the consensus from health and regulatory authorities is that they do not pose a health risk (SONI, 2018). An evidence-based study (RPS Group, 2014a) has been completed that measured the EMF generated by transmission infrastructure including transformer substations, and underground cables at 110kV and 220kV in the Republic of Ireland. Results were compared to health protection guidelines for public exposure to EMF developed by the International Commission on Non-Ionizing Radiation Protection (ICNIRP). From this study it was found that the maximum magnetic field strength, measured at all lines and substation perimeters, was well below the ICNIRP public exposure reference level, set to protect public health. The National Policy Statement for Electricity Networks Infrastructure (EN-5) (DESNZ, 2025) provides further information on the generation of EMF, which notes that compliance with ICNIRP guidelines will ensure that any adverse indirect effects are reduced, with the use of a suite of measures should exceedances of guidelines occur. The levels of EMF produced by power lines in normal operation are typically considerably lower than the guidelines indicated by the ICNIRP, with substation EMF levels dictated by the overhead lines and cables. Organisations such as the Stakeholder Advisory Group on extremely low frequency EMF (SAGE), the National Institute for Health Protection's Centre for Radiation, Chemical and Environmental Hazards and the National Radiological Protection Board have produced advice and recommendations regarding precautionary measures that may be required to limit public exposure to EMF arising from electricity supply; this has included the adoption of the exposure guidelines published by ICNIRP regarding public exposure, as well as the ICNIRP guidelines forming the basis for the Control of Electromagnetic Fields at Work Regulations 2016. This also includes ensuring that the measures implemented comply with standards within the Electricity Safety, Quality and Continuity Regulations for any electricity installations. The EN-5 notes that the UK government has developed in conjunction with the electricity industry a Code of Practice 'Power Lines: Demonstrating compliance with EMF public exposure guidelines – a voluntary Code of Practice'. The electricity industry also currently voluntarily applies optimal phasing to 275kV and 400kV overhead lines to minimise the effects of EMF where this is operationally possible, with a voluntary Code of Practice 'Optimum Phasing of high voltage double-circuit Power Lines – A Voluntary Code of Practice' published. It is also prohibited to undertake the undergrounding of a power line solely for the purpose of reducing EMF as there is potential for high EMF to occur immediately above the cable. For communication, navigation and surveillance infrastructure, statutory technical safeguarding zones as defined in accordance with Planning Circular 01/03 must be adhered to, to avoid any unacceptable adverse impacts from EMF. Therefore, there is

unlikely to be any risk to public health from EMF resulting from projects arising from the draft HND Implementation Plan.

3.2.2.2 Employment

Just under three quarters of all residents in the UK aged 16 years and over were in employment in October 2024 (74.9%). The economic inactivity rate for people aged 16 to 64 years was estimated to be 21.7% between August to October 2024 (ONS, 2025).

Total employment in the UK in August to October 2024 was 33.77 million. There were 25.28 million individuals in full time employment and 8.49 million individuals employed on a part-time basis (Francis-Devine and Powell, 2025). Three sectors (health and social work, wholesale and retail, and education) accounted for around 40% of UK employees (ONS, 2024a).

Regarding employment in the renewables sector, estimates of the size of the UK's Low Carbon and Renewable Energy Economy (LCREE) indicated that, for the UK, the sector generated around £54.4 billion in turnover and provided 247,400 full-time equivalent jobs in 2021 (ONS, 2024b). The Green Prosperity Plan announced by the Labour Government set out a plan to make Britain a clean energy superpower. Under the plan, there would be 650,000 new high-quality jobs. Working with energy developers, the British Jobs Bonus would provide £500 million per year from 2026, to incentivise firms who offer good jobs, terms and conditions and build their manufacturing supply chains in our industrial heartlands, coastal areas, and energy communities (Labour Party, 2024).

3.2.2.3 Coastal and Marine Recreation and Leisure

Yachting is popular in the more sheltered coastal waters and bays around GB, while particular routes are followed to traverse the coast, and travel between islands. In total, there are 635 Royal Yachting Association (RYA) marinas within England, Scotland and Wales, and there are 115 areas along the coastline which are identified as RYA Boating (Sailing / Racing) Areas. There are areas of RYA leisure intensity across GB waters, areas of high intensity leisure activity include the south coast around Truro, Plymouth, Bournemouth, Portsmouth, Isle of Wight, Brighton, Folkestone and Margate. There is high leisure activity in the Thames Estuary, along the east coast towards Aldeburgh and around Liverpool in the west coast. In Scotland there is high intensity leisure activity along the west coast. In Wales there are areas of high intensity leisure activity around Cardiff, Swansea, Pembroke and Conwy Bay.

The location of RYA marinas and Sailing and Racing Areas within the SEA Study Area is shown in Figure 16.

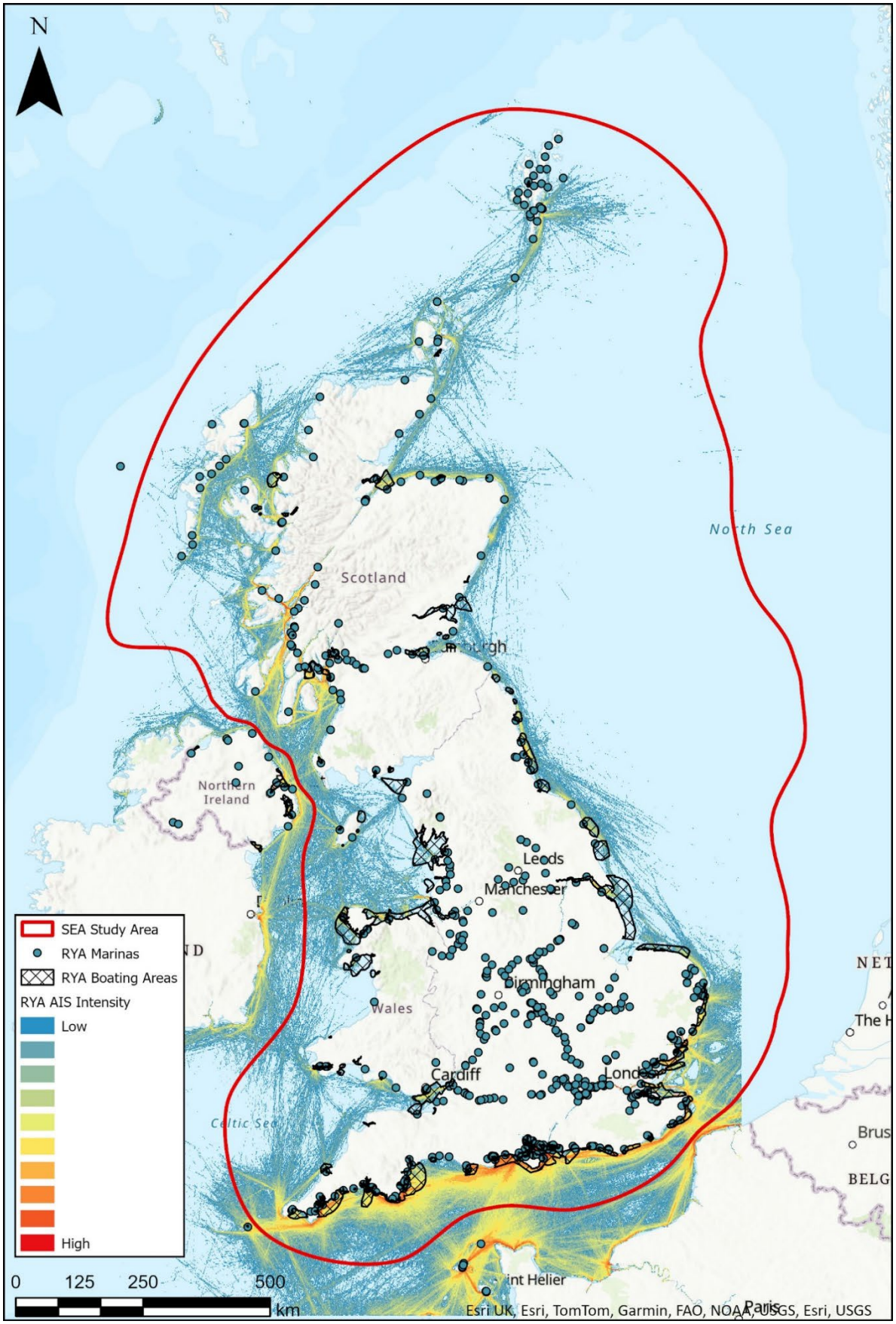


Figure 16: RYA areas within GB – marinas, sailing and racing areas

Diving attractions in GB waters include both wrecks and marine wildlife. There is localised diving around the population centres in the region, and some dive boat charters to more remote areas. There are 63 popular dive sites listed around England, of which 24 are beach dives, 22 are reef dives and 17 are wreck dives (PADI, 2025a). There is one popular dive site listed in Wales, this is a drift dive, reef dive and wall dive site (PADI, 2025b). There are 19 popular dive sites listed around Scotland, of which 12 are reef dives, ten are wall dives and eight are sea loch dives (PADI, 2025c).

Watersports occur around many coastal locations in GB, popular watersports include outdoor swimming, windsurfing, sea kayaking, surfing, paddleboarding and boating. Popular locations for watersports in the UK include Norfolk, Isle of Wight, Cornwall, Pembrokeshire, Dorset and Devon.

Sea angling is an important recreation and leisure activity, as well as a contributor to coastal tourism. Key areas for sea angling in GB include the south and north-east coasts of England and Wales. The Directory of Charter Boats UK (CBUK) holds records on 4,184 charter boats in the UK (CBUK, 2025).

In 2023 there were over 600 designated bathing waters within the UK, these are designated under the bathing waters regulations 2013. These bathing waters are mostly coastal, with a few rivers and lakes designated. In England 91.8% (413 sites) of these bathing waters met at least the minimum standard of Bathing Water Regulations, with 64.2% having met the Excellent standard (DEFRA, 2024b). In Scotland 98% (87 sites) of bathing water sites have met or exceeded the sufficient classification with 43% having met Excellent standard (SEPA, 2023a). In Wales, 98.2% (108 sites) met the minimum standard of Bathing Water Regulations, with 68.2% having met Excellent standard (NRW, 2024b).

There are currently 91 Blue Flag Beaches located across England and Wales (The Beach Guide, 2024), which have met a series of stringent environmental, educational, safety-related and access-related criteria. In Scotland there are 53 Scotland Beach Award winners (Keep Scotland Beautiful, 2024), which are the benchmark for quality, celebrating clean, well-managed and sustainable beaches.

Tourism within the natural environment within the UK contributes approximately 8% of the total estimated expenditure on all tourism and outdoor leisure related activities (ONS, 2024c). In 2019 approximately 36% of spending on outdoor tourism took place whilst walking, running or cycling, while the next highest activity, at 20% of spending, included watching wildlife such as birds and marine mammals, and visiting parks and gardens.

3.2.2.4 Summary of Existing Pressures and Issues for Population and Human Health

Across GB, increased pressures will emerge due to a growing population, with a predicted population of 72.4 million in the UK by 2043, with an increasing need for housing, infrastructure, energy and services. The environment provides a range of benefits for human health from the air breathed to the food and water relied on as well as providing materials and supporting leisure activities. According to the latest State of the Environment Reports and State of Natural Resources Reports for England, Wales and

Scotland, there are inequalities in population access to the natural environment. This impacts life expectancy rates and deprivation. Typically, poor urban areas have the least access to green spaces, coupled with increased pollution levels leading to challenges of air quality due to transport emissions. Climate change presents a major threat to local populations with health impacts arising due to changes in temperature, disease and pollution with an ageing population and those with underlying health issues particularly vulnerable.

Implementation of the draft HND Implementation Plan, and the construction and maintenance and decommissioning activities associated with the potential offshore and onshore cabling and associated onshore infrastructure that may arise as a result, has the potential to lead to positive or negative effects on employment; employment relating to fisheries and marine transport could be adversely affected through disruption or displacement during installation of infrastructure; however, renewable energy projects that are facilitated by the HND Implementation Plan have potential for positive effects on employment, both locally and more widely. Coastal communities and leisure activities have the potential to be disrupted, primarily during the installation of onshore cabling and onshore infrastructure. There is the potential for positive or negative effects on population health and settlement. Potential negative effects include localised construction-phase disturbance from noise, dust, noise disturbance during operation of transmission infrastructure, or through posing a local physical constraint on development. Potential positive effects comprise a secure and reliable ability to provide electricity to meet the future needs of the GB population.

3.2.2.5 Evolution of the Baseline in the Absence of the Plan

The future baseline for population and human health in the SEA Study Area is likely to be driven by the current trends and pressures as discussed above.

Onshore, the population is expected to continue to increase into the future, with an increase in the older cohort of the population. In the absence of the plan, the planning and development of the electricity network would be less structured, and this may lead to negative impacts on population and human health. With the projected population growth, in the medium and long-term this approach may result in a reduced potential for connection of renewable energy sources to the supply network and an ongoing reliance upon fossil fuels due to a lack of collaborative energy planning.

Coastal areas are likely to continue to be used for leisure and recreational activities such as sailing, angling, swimming and beach use, diving and water sports, as well as wildlife watching. Coastal communities are likely to be increasingly subject to coastal hazards associated with extreme weather events due to climate change and may be subject to pressures such as coastal development, noise and, in some areas, water pollution. Coastal and marine-related employment, such as in fisheries, aquaculture, and water transport will be influenced by commercial factors, demand, level of fish stocks and policy and legislative changes

3.2.3 Geology, Soils and Land Use

For the installation of offshore cables, bathymetry and physiographic features are key factors when selecting appropriate sites for their installation as these can influence the installation processes used for cable laying. The bedrock, the nature of the Quaternary deposits, and geological features are relevant to the design and siting of offshore cables, and, where these rocks occur close to the seabed, they may also exert control over sedimentary processes and affect both physical and biological habitats at the seabed. Seabed sediments, and the marine sedimentary processes of erosion, transport, and deposition that control their distribution, character, and thickness, are also relevant to the design and siting of offshore cables and the possible need for the use of protective structures around cables, with the potential for the protective materials structures and cables to have significant effects on these marine sedimentary processes. Contaminated offshore areas also have the potential to released pollutants during the cable laying process.

For the installation of onshore cables, onshore geology in terms of bedrock and geological features are key factors when selecting appropriate sites for cable installation as these can influence the installation processes used during trenching and cable laying. The onshore routing of cables from landfall to substations / converter stations can be constrained and influenced by the presence of sensitive landscapes and land uses such as peatlands or designated sites. Contaminated ground areas also have the potential to influence the routing of cables onshore, particularly if the cable route crosses former land use areas such as mines or dumping grounds which may be contaminated. The routing and presence of onshore cables and their associated infrastructure of landfall and substation / converter station sites have the potential to alter onshore sedimentary processes of erosion, transport, and deposition which can alter the distribution, character, and thickness of onshore sediments.

It is considered that the key issues associated with the implementation of the draft HND Implementation Plan and Geology, Soils and Land Use comprise:

- Potential for physical damage to the seabed from offshore cabling.
- Potential for indirect physical effects on the seabed or subsurface from offshore cabling or presence of protective materials e.g., through alteration of the sediment regime, changes to seabed morphology, depositing of dredged material.
- Potential for alteration of hydrodynamics or coastal processes from offshore cabling or presence of protective materials.
- Potential for loss or physical damage of sensitive lands or geological features onshore e.g., peatlands and agricultural land during the onshore cable installation process, landfall site or substation / converter station construction.
- Potential for release of previously contaminated materials during cable installation process both offshore and onshore.
- Potential for indirect physical effects on onshore sediment processes from onshore cabling, landfall site or substation / converter station presence.

3.2.3.1 Bathymetry and Seabed Features

GB is situated in a dynamic ocean location with the interactions between the Atlantic Ocean to the west of the British Isles, the North Sea beyond Scotland and the eastern side of England, the English Channel to the south between England and France, the Celtic Sea located between the south-west edge of England, Wales, and Ireland and the Irish Sea between the island of Ireland, the Isle of Man and England. Within these areas, there are more local sea areas such as St. George's Channel between Wales and Ireland, the Bristol Channel between the south of Wales and England, the North Channel between Northern Ireland and Scotland, and smaller areas within Scottish waters such as the Firth of Clyde, Firth of Lorn, Sound of Jura, Moray Firth and the Firth of Forth.

The bathymetry of GB's seas is highly variable and reflects the various offshore seabed features and structures that have formed during the UK's geological history and previous glaciations (DBEIS, 2022). There are broad biogeographical regions within UK waters which can be considered from the 11 Regional Sea boundaries defined by JNCC (2004). These have a variety of conditions determined by the main influencing ocean currents, bathymetry, and interactions occurring.

The UK Continental Shelf (UKCS) is the region of waters that surrounds the UK and includes areas of the North Sea, the Atlantic Ocean, the Irish Sea, and the English Channel. The UKCS has a variable bathymetry and a wide range of geological and seabed features which reflect the highly dynamic coastal and marine environments and interactions occurring, these seabed features include subtidal sediment banks, shelf mounds and pinnacles, shelf troughs, submarine canyons, deep water and carbonate mounds; in

additional to broadscale features such as continental slope, deep ocean rise, pockmark fields, and iceberg ploughmark zones. The north of Scotland and the Outer Hebrides with Shetland and Orkney Islands are located on the Hebridean Shelf bordered to the north by the Wyville Thomson Ridge, to the west of this area the Rockall Trough lies between here and the Rockall Bank and Hatton-Rockall Basin with topographic high point features of the George Bligh Bank and Rosemary Bank as well as the seamounts of Anton Dohrn and Hebrides Terrace. Within the North Channel area separating Scotland from Northern Ireland lies Beaufort's Dyke, a glacial trench of up to 312m depth. The majority of the English marine area is located on the UK Continental Shelf; however, the south-west are deep ocean as the shelf edge extends down to the Atlantic abyssal plain section of the larger Porcupine Abyssal Plain, which comprises a muddy seabed with depths ranging from 4,000 to 4,850m.

Faulting is present around GB reflecting the geological history of GB's onshore and offshore formation processes. Extensive faulting is present between Scotland and Northern Ireland and between the Scottish mainland and its islands of the Outer Hebrides and Shetland Islands. Offshore from the east of England, fold axis geological features are present covering a significant area, while to the west of England and north of Wales extensive faulting is present from the English and Welsh coastline towards the Isle of Man through the Irish Sea. Further faulting and fold axes are present in the south of Wales.

The bathymetry of GB waters within the SEA Study Area is shown in Figure 17.

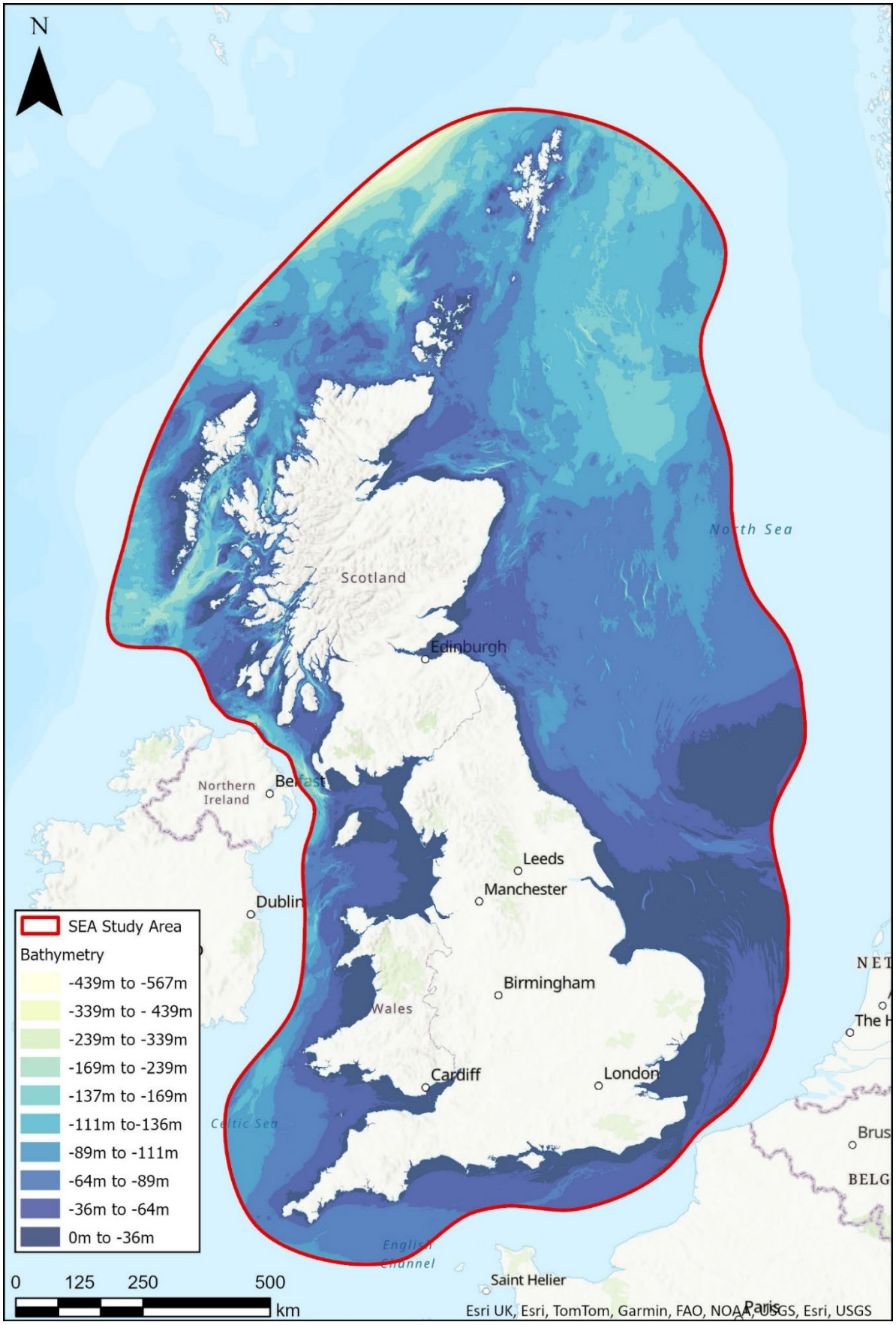


Figure 17: Bathymetry of GB waters (Source EMODnet)

3.2.3.2 Geology and Sediments

Marine and Coastal Geology

The offshore geological landscape of GB is varied and reflects a diverse geology with rock varying in age from the Proterozoic to the Cenozoic (DBEIS, 2022). The oldest offshore rocks are found in Scotland. North of Scotland towards the Shetlands, the geology is typically mudstone and siltstone of Devonian rocks with areas of conglomerate and sandstone of Permian and Triassic rock present. Further offshore, extensive Eocene and Pliocene rocks are present from the Wyville Thomson ridge to the south-west of the Hebridean Shelf, around the outer edge of the Shetland Islands and in the North Sea on the eastern side of Scotland and England. Scotland's eastern coastline is diverse with deposits of sandstone, mudstone, and limestone present in the inshore area of the Moray Firth from Inverness to Aberdeen with an extensive area of chalk, mudstone, sandstone, and lignite present moving offshore. Around Edinburgh and the Firth of Forth, there is evidence of igneous intrusions from past geological history with dykes of dolerite present.

Offshore from the west of Scotland around the Outer Hebrides, the various faulting and complex geological history is evident with several different rock types present. Across the Rockall Trough towards the Rockall Bank of the Hatton-Rockall Basin, there is a widespread deposit of Miocene rocks of sandstone, siliciclastic, argillaceous, and limestone with the presence of the seamounts of Rosemary Bank, Anton Dohrn, and Hebrides Terrace. South of the Isle of Mull along the North Channel towards Northern Ireland the geology continues to be complex with the Lewisian Complex of Gneiss present as well as further igneous intrusions and metasedimentary rocks of the Dalradian Supergroup extending across the North Channel. Extensive deposits of Triassic Rocks of mudstone and sandstone are present across the North Channel to Scotland's border with England.

Moving southwards towards the north-east area of England, further deposits of mudstone, sandstone, limestone, and gypsum are present. Around the south-east of England towards the Strait of Dover there is an extensive deposit of Eocene rocks. The south of England has a complex geology, several clay deposits are present, with a wide area of chalk present in the White Chalk subgroup. Around Plymouth and the Lyme Bay area of the south-west area of England, the geology is complex with a nearshore area of Devonian rocks of slate and sandstone with a larger area of Permian and Triassic rocks in the inshore area. Around the Channel Islands, the geology is complex with several igneous intrusions surrounded by areas of Eocene rocks of limestone. Southwards of the south-west edge of England towards the Porcupine abyssal plain, an extensive area of Miocene rocks The White Chalk subgroup deposit also continues to extend across the area towards the south coast of the Republic of Ireland with an area of Palaeogene rocks of siliciclastic, argillaceous, and sandstone present across the Celtic Sea.

Around the Bristol Channel and south of Wales the geology is complex with Lower Jurassic Rocks of mudstone and limestone present. The geology continues to be complex to the east of Wales with evidence of faulting from several dyke intrusions of dolerite present in the north-west inshore area. Lias Group mudstone and limestone deposits are present extending towards Dublin across St. George's channel interspersed with areas of Mercia Mudstone. Around the Irish Sea and the north-west coast of England with the Isle of Man,

the geology continues to be complex an extensive area of Carboniferous mudstone, sandstone, and limestone present to the west of the Isle of Man, to the east there is an extensive area of Triassic rocks.

Marine and Coastal Sediments

The coastal and marine environments in GB are highly dynamic, with erosion and deposition processes occurring from the interactions with wind, waves, currents, tides, and coastal features. The impacts from erosion and greatest areas of change are typically restricted to shallower areas due to strong wave action effects, given the slow timeframes associated with geological change; however, other rapid alterations can be associated with human interventions. Erosion is a local to regional scale process; up to 28% of the English and Welsh coastlines are reported to be affected by erosion (Climate Change Post, no date) with 19% of Scottish coastlines as being vulnerable to erosion (University of Glasgow, no date). Wider sediment transport mechanisms across GB seas are controlled by tidal influences. With human development and activities, typically most coastal change is seen at onshore and inshore coastal areas, however with the increased development and expansion of offshore renewable energy technologies there has been an increased potential for alterations in sediment transport processes which has potential implications on coastlines and underwater geological and geomorphological features and associated species and habitats.

The GB seabed comprises three main forms of hard substrates forming the seabed bedrock: unconsolidated gravel spreads and hard cohesive sediments, which formed during the frequent glaciations, and areas of rock outcrop, these are stable seabed substrates that are of operational interest for offshore projects. All three commonly occur together in the nearshore western margins of the North Sea. Large boulder and cobble features are also present, including boulder fields. These were typically formed at least 10,000 years ago and have undergone reworking during the Holocene, forming typical seabed features of large seabed sand and gravel areas and sandbanks, ridges, and small-scale sand wave features. Areas of rock and hard substrate are concentrated around areas of the Scottish Islands of the Outer Hebrides, Orkney, and Shetland Islands, the north-east, south-west and south of England. Other areas of seabed substrates present in GB waters include boulders and cobble fields and areas of sandbanks.

The seabed sediments can be considered in the context of the Regional Seas around GB (DBEIS, 2022), within Regional Sea 1 of the Northern North Sea, there are hard substrates present of unconsolidated gravel spreads, rocky outcrops, and hard cohesive sediments, with areas of boulder fields and bedrock outcrops present along the near-shore coastal area. Gravel is present in the nearshore area of Shetland extending towards Flamborough Head and around the Orkney-Shetland platform. Sand and gravelly sand predominantly cover the North Sea bed in its central and northern regions.

Within Regional Sea 2 of the Southern North Sea, the seafloor consists of Pleistocene and Holocene sediment deposits with little bedrock exposure with complex surficial sediments and consist of largely gravelly sands and sandy gravel from Flamborough Head to the outer Thames Estuary and towards the Humber and the Wash coasts. Sand dominates in the Dogger Bank, Norfolk Dank, and Southern Bight areas.

Within Regional Sea 3 of the Eastern English Channel, the seabed is variable with coarse sediments in the west transitioning to sand in the east with areas of localised rocky outcrops. Recent sediment inputs occur from riverine and coastal sources, with mud deposits found in isolated or sheltered areas.

Within Regional Seas 4 and 5 of the Western English Channel and Celtic Sea and Atlantic South West Approaches respectively, the seabed sediment is largely composed of sand and gravels with isolated rocky outcrops. The now-extinct Channel River created significant sediment deposition to form the Celtic Sea sandbanks and deep-sea fans, towards the Celtic Bank area mud and sandy mud substrates are present.

Within Regional Sea 6 of the Irish Sea, in the eastern Irish Sea coarse-grained gravel is present. There is an extensive area of mud deposited in the Eastern Irish Sea Mud Belt. Within the deeper areas of St. George's Channel and the North Channel sediments are comprised of gravel with areas of sand present on some larger bedform features.

Within Regional Sea 7 of the Minches and Western Scotland, the seabed is typically muddy sand and mud around the Sea of Hebrides and the Little Minch, although more gravel is present in the south of the region. Coarser sediments dominate in the North Channel, offshore sediment deposits around the Outer Hebrides reflect the older geological rocks found here.

Within Regional Sea 8 of the Scottish Continental Shelf, the seabed is composed of glaciogenic origin sand and coarse sediment with deeper areas containing stony ridges and areas of sandy troughs formed from iceberg ploughmarks. Deep water muds are present at depths greater than 500m with outcrops of older rock formations present from the Lewisian geology such as St. Kilda. Gravel fields have also formed as extensive areas to the north and west of Orkney. Large areas of sand deposits are present to the west of Shetland which can extend up to several kilometres long.

Within Regional Sea 9 of the Faeroe-Shetland Channel, the seabed is mainly comprised of silt and clay at the base, on the channel's flanks the sediment consists of mainly sand with some gravel areas with cobbles and boulders. There are also mud deposits on the seafloor with underlying sediment from the North Sea Fan as well as inputs of sediment from the Rona and Foula wedges along the West Shetland Slope.

Within Regional Seas 10 and 11 of Rockall Trough Bank and the Atlantic North West Approaches respectively, the majority of the seabed sediments are mud or sandy muds with seamounts of gravel or bedrock subcrops. Towards the area of the George Bligh Bank, sediments are coarser with areas of gravelly sandy mud and gravelly sand.

The broadscale seabed sediments of GB waters within the SEA Study Area are shown in Figure 18.

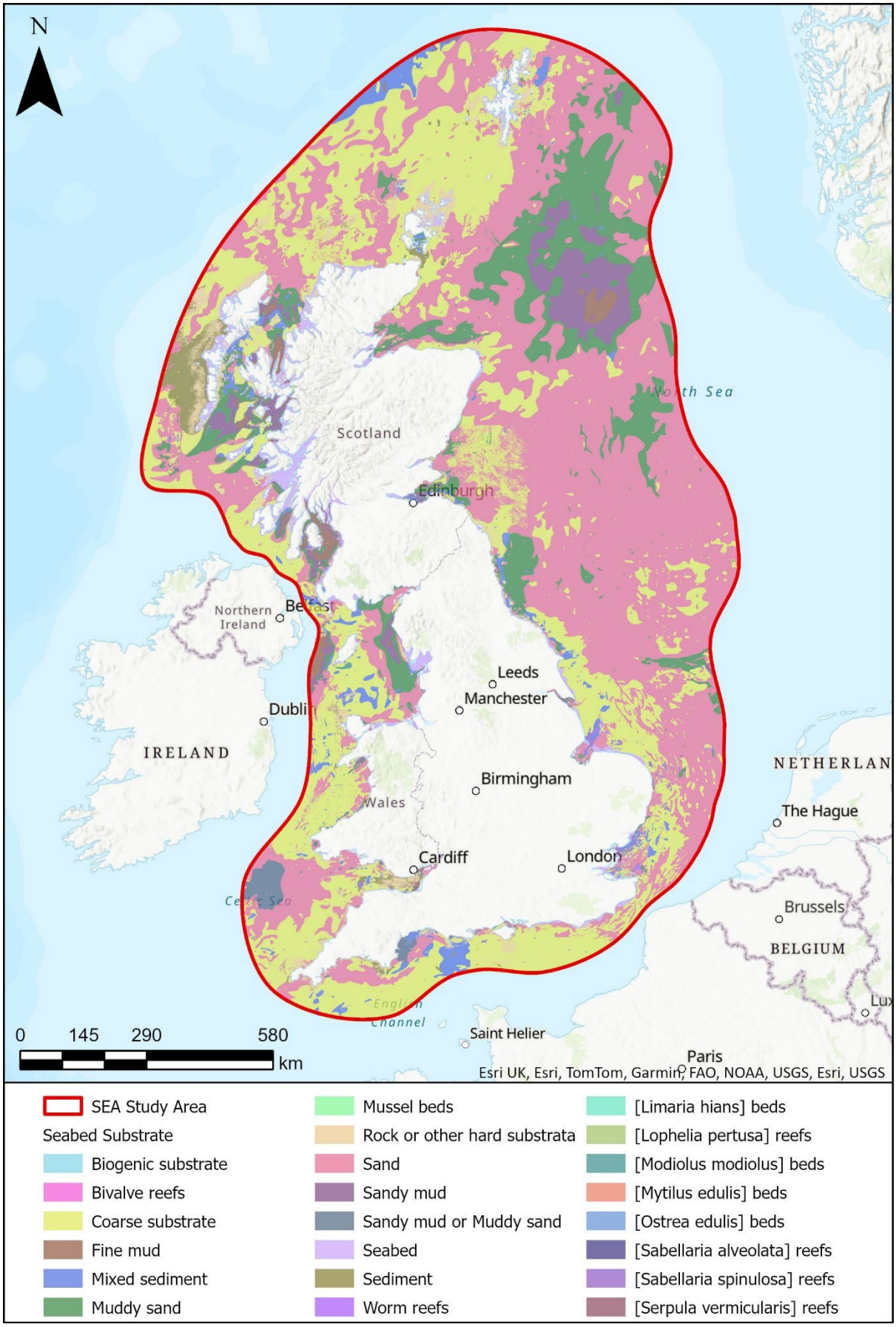


Figure 18: Seabed sediments within GB waters

Onshore Geology

The geology of GB is diverse, with rocks evident from almost all geological ages reflecting a wide variety of landscapes and landforms and the dynamic interactions having taken place through a range of plate tectonic processes, volcanism, major plate faulting and folding events, and the metamorphism of existing geological units (BGS, 2020). The oldest surface rocks are found in the north-west of Scotland from the Paleogene and Precambrian periods consisting of Lewisian gneiss of 2.7 billion years old, these rocks underlie most of the UK however these have now been covered by other younger deposits, with the youngest rocks present in south-east England of the Quaternary and Tertiary. The bedrock geology is complex and comprises older metamorphic rocks that have been overlain by different sequences of sedimentary rocks with igneous intrusions.

With further plate tectonic processes occurring in several geological periods, various geological deposits were laid down including limestone in the Carboniferous period forming parts of north and south Wales, sandstone and mudstone in the Triassic Period across central England. In the Jurassic Period, further sedimentary rocks were deposited with the formation of extensive rock units of sandstones, greensands, and limestone in southern England. Further deposition during the Cretaceous Period with chalk deposition to form the White Cliffs of Dover and Salisbury Plain. In the Palaeogene Period, the final volcanic rocks were formed which included the Antrim Plateau and granite intrusions in the Scottish Hebrides with the formation of the North Sea with the deposition of clays and mud-flats along southern England. Extensive superficial deposits of varied distribution are present on the bedrock surface which comprises younger, unconsolidated materials that may have been deposited by glaciers or other fluvial processes, these superficial deposits can often play a more important role in the consideration of construction works such as onshore cabling due to their influence on installation methods, likelihood to release contaminants or influence drainage or soil fertility. Mountain ranges in Scotland such as the North West Highlands and Grampian Highlands were formed by the folding of ocean floor sedimentary rocks, while further plate tectonic processes and uplift formed the majority of mountains across England and Wales as Ben Nevis with the deposition of numerous sedimentary rocks in lowlands and coastal regions.

Some of the unique geological features present in GB include the Jurassic Coast, several faults such as the Great Glen, Highland Boundary, and Southern Uplands, Salisbury Plain as an example of a chalk plateau, and the Cornubian batholith as an early Permian granite intrusion in the south-west of England forming landscapes such as Dartmoor as open moorland areas. Glaciation events have also produced distinctive geological features and landforms, including more recent glaciation events leaving distinct features across the landscape such as the Usk and Wye Valleys, creating the valleys of the Lake District and forming fjords along the west coast of Scotland. Isostatic rebound is continuing in GB, following the melting of the last glaciers and subsequent lifting of the weight of the ice. Scotland is currently undergoing land rebound and rising upwards whereas England and Wales are currently subsiding. When isostatic rebound exceeds the eustatic rise in sea-levels this can cause sea-levels to fall. With subsidence and eustatic sea level rise combined with global warming, there are rising sea levels that can threaten low-lying coastal areas and landforms.

The GB coastline is dynamic and varied representing its diverse geological history with a variety of landforms and features present such as islands, bays, headlands, peninsulas, caves, estuaries, and dune systems. With the diverse landforms and features present the coastline supports a wide variety of habitats and species with areas designated for their features, their outstanding natural beauty, or their heritage importance. Given the fractured and indented nature of the GB coastline, it has a high coast / area ratio.

England has 4,422km of coastline with a variable topography and geological formations, the North Sea coast is mostly flat and sandy with extensive dune systems. Moving southwards towards the English Channel, the South Coast has the iconic White Cliffs of Dover before transitioning to the Jurassic Coast of Dorset which has a variety of coastal features such as arches, coves, and sea stacks. Around Devon and Cornwall, the coastline becomes rocky and steep with numerous cliff sections moving northwards towards the Celtic Sea. The north-west English coastline is mostly flat and sandy with bays present and contains several important estuaries in the interaction area with the Irish Sea.

Wales' coastline covers 2,700km and is mostly flat to the east of Cardiff and Llandudno, there are areas of cliffs of Ordovician and Silurian age rocks at Cardigan Bay, and there are dramatic sheer drop cliffs present in Gower of Carboniferous Limestone, formed through faulting. Towards the south coast, there are limited outcrops of Triassic mudstones and sandstones which have been overlaid by Jurassic limestone to form the Vale of Glamorgan coast with these cliffs prone to erosion due to their well-jointed vertical face and structure.

Scotland's coastline covers 9,910km along the mainland; when the numerous islands (over 900) are considered, the total coastline rises to 18,672km and has an indented shape with several sea lochs located along the west coast. The east coast of Scotland has numerous large estuarine inlets such as the Ythan and Fowlsheugh estuary, firths such as Solway Firth, Firth of Clyde, Moray Firth, and Firth of Forth, and areas of large sandy bays such as Aberdeen. Areas of dune pasture known as a machair formation are also present associated with declining sea-levels of low-lying fertile pastures found across the Outer Hebrides.

Onshore Sediments

Contaminants generally pass through high permeability, well-drained soils, such as Leptosols, Cambisols, Fluvisols, etc., and can reach groundwater through locally and regionally important aquifers where they can be transported long distances where the potential for impacts may be reduced through attenuation or impact. On the other hand, poorly draining and waterlogged soils, such as organic soils (peats), Stagnosols, or Gleysols, cause increased surface run-off and siltation issues which can impact downstream surface waterbodies. With onshore cabling construction works there is potential for disturbances to soils and the release of contaminants, either from accidental chemical spills or the release of previously contaminated materials / substances.

The UK Soil Observatory (UKSO) holds data for the soil types across the UK (UKSO, 2025). Soil type was derived from the national soil map at 1:250,000 scale with 13 reference soil groups determined and recognised by The World Reference Base map: arensols;

cambisol; fluviosol; gleysol; histosol; leptosol; luvisol; phaeozem; planosol; podzol; regosol; stagnosols; and umbrisol.

England's soil types have a degree of a north / south split; generally, stagnosols are located in the north with some areas of histosols and cambisols within low-lying areas, while histosols are present in more mountainous regions in the north such as the Yorkshire Dales and North Pennines. Across the central area of England near the Peak District, planosols are present with areas of luvisols present near the Rivers Trent and Dove. Towards Peterborough and The Wash, an extensive region of gleysols is present. The south coast generally has areas of leptosols, with more extensive deposits of luvisol and planosols towards the south-west area of Plymouth and Exmouth, and an area of stagnosols and umbrisols around Dartmoor National Park.

Wales' soil types are generally podzol, histols, and umbrisols in the mountainous regions across the Cambrian Mountains and the Brecon Beacons with extensive areas of stagnosols present; there are also cambisols present in lowland areas. Fluvisol deposits are present across floodplain areas of Wales' six main rivers of the Dee, Severn, Teili, Tywi, Usk, and Wye rivers.

For Scotland the soil type was derived from the national soil map at 1:250,000 scale with 12 reference soil groups: alluvial soils; calcareous soils; brown earths; humus-iron podzols; immature soils; lochs; magnesian soils; mineral gleys; montane soils; peat; peaty gleys; and peaty podzols. Generally, peaty gleys and gleys are found to the north and north-west of Scotland around the Hebrides, mineral gleys are found predominantly around Shetland and Orkney as well as a belt across Edinburgh in the east to Ayr in the west. Areas of immature poor-quality soils are present in mountainous areas such as the Cairngorms with humus-iron podzols covering north-east and south-east areas of Scotland around Inverness, Aberdeen, and Dundee.

Areas of peatland across the UK are an important soil-carbon store and habitat, it should be noted that if these areas become degraded that there is potential for not only habitat loss and loss of a carbon store but to also emit further carbon once degraded. Peatland covers around 3 million hectares in the UK with around 22% of this remaining in a near-natural condition, around 41% of the UK peat area is under semi-natural peatland vegetation but it has been affected by human-based activities such as drainage, peat extraction, and livestock grazing. Around 16% of the UK's total peatland is covered by woodland and 15% is covered by agricultural grassland and cropland areas, these peatland areas of agriculture and woodland and those affected by other human activities contain degrade sources of peatlands at-risk of further carbon losses. The recently published England Peat Map Project (Kratz et al., 2025) as one of the most comprehensive peat maps globally in existence, highlighted that areas of peat cover approximately 8.5% of England and around 80% of these peatlands are in poor condition and degraded with an increased risk of emitting carbon to the atmosphere. Extensive peat-forming habitats are present across the Pennines, North York Moors, areas within the Lake District and areas of upland in the South West, areas of degraded peat are associated with blanket bogs within northern upland areas and lowland areas of deep peat found in the fens of East England, often associated with agricultural land practices. Within Wales, 4.3% of the land is covered by peatland, predominantly in the upland areas with at least 75% of this

degraded or impacted by human activities with an estimated emission of around 400 kt CO_2 equivalent lost per year (Evans et al., 2015). Over 20% of Scotland's land area is covered by peatlands, with around 70% of Scotland's blanket bogs and 90% of raised bogs damaged to an extent and will require restoration to minimise potential carbon losses.

Onshore Topography and Land Use

GB has a variable topography which reflects its diverse geology and associated landforms and features as well as its history of extensive glaciation and associated processes shaping the land. England covers 57% of the GB's land area and is primarily lowlands, the lowest topography in GB is in the East of England with 20% of the region below mean sea level comprising the areas of North Cambridgeshire, Norfolk, and sections of the Essex Coast. Upland areas within England are generally located to the north covering areas of the Lake District, the Pennines, and the Yorkshire Dales. To the north, Scotland is the most mountainous country in the GB, with Ben Nevis the UK's highest point at 1,345m. Scotland covers 32% of the total land area of the GB consisting of over 800 islands, located predominantly to the north and west comprising the Hebrides, Shetland, and Orkney. Scotland's topography is separated into highlands to the north and lowlands to the south by the Highland Boundary Fault running from Arran to Stonehaven. Wales has a diverse landscape despite covering less than 9% of GB's land area, with a mountainous topography (with 15 mountains) with the Brecon Beacons located in the south close to the coast and the Cambrian Mountains in Mid Wales.

The UK's total land area covers approximately 60 million acres. There are a wide variety of land uses, including a variety of natural habitats such as peatlands and waterbodies, as well as forestry, urban and industrial areas, and agricultural areas. There are several types of land use and soils across the UK that have the potential to be sensitive to onshore cabling, including cultivated lands, peatlands, ancient woodlands, and commercial forestry. Given the high use of land for agricultural across the UK and the coverage of peatlands, there is potential for impacts on these areas given that onshore cabling is likely to involve construction and installation in these areas. With the landfall of offshore cables onto onshore areas there is a risk of damage to sensitive landscapes along coastal areas which can include designated habitats, agricultural areas, peatlands, or areas designated for their visual amenity.

The UKCEH Corine Dataset includes 44 different land use types with the UK containing 39 of these, reflecting a diverse land.

Table 12 details the dominant land cover classes and the total land area covered from UKCEH (2023) data. Agriculture accounts for 70% of land use in the UK (approximately 16.8 million acres), with around 192,000 farms. Within agricultural areas, around 72% of agricultural land is grass (of this area, 29% is pastureland and over 27% is non-irrigated arable land), 26% is croplands and the remaining 2% is fallow land. Land classed as continuous urban fabric within the UK comprises just 0.1% of the total land area, reflecting the low development of the UK, with discontinuous urban fabric covering 5.3% of the total land area; however, in certain urban areas this can dominate up to 80% of the land surface. Buildings within the UK cover 1.4% of the total land area. Around 9.4% of the UK's land area is covered by peatland (nearly 3 million hectares), representing a significant

carbon store. Around 13% of the UK's total land area is used by forestry, with 2.5% of the land area covered by ancient woodland, predominantly in Scotland. Within England, 63.1% of the land is used for agriculture, followed by 20.1% for forestry, open areas, and water, and 4.9% of the area as residential gardens. Wales has 84% of its land used for farming, followed by forestry using a further 15% of the land area. Scotland is predominantly rural with 80% of the land area being used for agricultural activities, with 12.5% of the land being forested, and with 74% of these woodland areas consisting of commercial conifer forests.

The UK Agricultural Land Classification and Land Quality Survey classifies UK farmland in England and Wales into five classes with grade 1 representing "excellent quality land with no or very minor limitations" and grade 2 representing "very good quality agricultural land with minor limitations which affect crop yield, cultivations or harvesting" (Natural England, 2021a). Under the National Planning Policy Framework it is a requirement for developers to contact Natural England for development proposals which will cause or be likely to cause a loss of 20 ha or more of the "best and most versatile" agricultural land. Within Scotland, a similar system called the Land Capability for Agriculture ranks land on its potential productivity and cropping flexibility into seven classes, with Class 1 representing land that has the highest flexibility of use (The James Hutton Institute, no date).

Across England and Wales, most grade 1 land is in England, with areas of grade 2 and 3 present in the lowland areas, and the highest quality land located around Peterborough. Owing to the mountainous regions present in Wales, land quality there is typically poorer and predominantly classified as either grades 4 or 5; there are, however, some small areas of grades 1 and 2 land located around coastal areas to the north and south of Wales near Conwy and Cardiff, respectively. In Scotland, there is typically an east-west split with the highest value areas of classes 1-3 located along the eastern coastline and across the central belt of Scotland west of Edinburgh towards Ayr. The lowest-value agricultural areas are located on the islands and highland areas such as the Grampian mountains typically only being suitable for rough grazing.

Additional land types and land uses that may be constraints to the installation of onshore cabling include quarries, mines, landslide areas, unstable grounds, and potentially contaminated sites as discussed below in the Areas of Potential Contamination Section. There are over 2,000 active quarries and mines within the UK (BGS, no date), the majority of which extract raw building aggregate materials such as sand, stone, and gravel. There are around 5,000 known historic mines in England and Wales (Sinnett and Sardo, 2020) and 544 known historic mines in Scotland (Scottish Mining, 2018). There are 1,759 contaminated sites within the UK and there are over 11,000 potentially contaminated sites from historic operations within the UK (Environment Agency, 2016). Development of infrastructure through or on these sites through cable installation has the potential for mobilising contaminants to other areas, including into water bodies.

Land Cover Types

Land Cover Class	Total Land Cover (km^2)	% of Total
Pastures	71,069.2	28.7
Non-irrigated arable land	66,954.9	27.0
Peat Bogs	23,281.1	9.4
Moors and heathland	18,546.8	7.4
Natural Grassland	14,407.2	5.8
Discontinuous urban fabric	13,183.5	5.3
Coniferous forest	12,700.1	5.1
Broad-leaved forest	5,368.1	2.1
Transitional woodland-shrub	3,402.6	1.3

Table 12: Dominant land cover types within the UK derived from UKCEH Land Cover Dataset (UK Centre for Ecology and Hydrology (UKEH), 2023)

Designated Sites for Earth Science Features

GB has a variety of geological landscapes and features located both offshore and onshore which are important for nature and for cultural and heritage purposes. Some of the most outstanding examples have achieved designated status under different protective legislation such as UNESCO World Heritage Sites (WHS), UNESCO Geoparks, Marine Conservation Zones (MCZs), Marine Protected Areas (MPAs) or as Sites of Special Scientific Interest (SSSIs). There is potential for the installation of offshore and onshore buried cables to cause temporary or permanent disturbance, damage, or loss of geological landscapes and features which may or may not be designated for their significance. Given that the installation of cables will typically occur through burial and the majority of the cable routes will be located offshore with only a small onshore component for landfall and to connect into substations or converter stations, the likelihood for significant impacts is reduced in terms of spatial footprint given the small area directly affected by the cable and the possibility for micro-routing within the study corridor to avoid significant geological landscapes and features. However, the requirement for larger land areas to be taken for the construction of landfall and converter stations / substations may have more significant impacts combined with its permanent presence.

The UK Biodiversity Indicator of the Extent and Condition of Protected Areas (JNCC, 2024b) shows the condition of both terrestrial and coastal features designated as SSSIs as an indicator for monitoring site and species conditions. The most recent assessment in 2024

showed that the proportions of sites with conditions as favourable or in an unfavourable but recovering condition have increased from 67% in 2005 to 81% in 2024.

There are 35 WHS listed within the UK and nine UNESCO Geoparks, there are 91 MCZs within English Waters, one MCZ in Welsh waters, and 36 NCMPAs in Scotland. The UK currently has 377 MPAs which cover 38% of UK Seas. There are with over 6,200 SSSIs within GB. There are also local areas of important geological or geomorphological sites known as Regionally Important Geological and Geomorphological Sites (RIGS) which, whilst not under the same statutory protection as SSSIs, typically denote areas of important or significant features. These sites can also be known as Regionally Important Geodiversity Sites in Wales, Local Geological Sites in England, or Local Geodiversity Sites in Scotland. There are currently 51 RIGS throughout England, Scotland, and Wales.

There are Annex 1 Habitats within GB waters which can be considered to be comprised of geological components as these habitats are dependent on the physical geological structure / sediment for their presence, this includes reefs and sandbanks. There are several Annex I Reef habitats within GB waters, including three types of bedrock reef, stony reef, and biogenic reef (formed by animals such as Ross worms creating a network of tubes that stabilise the seafloor and create complex habitats). These can be considered as geomorphological features. These reefs are located throughout GB waters, with reefs present around the north-east of England in inshore areas and located far offshore to the west of Scotland and the north of Scotland and around Shetland and Orkney. The presence of Annex I reefs in these areas has supported their designation as SACs; Hatton Bank; North West Rockall Bank; East Rockall Bank; Anton Dohrn Seamount; Stanton Banks; Darwin Mounds; Wyville Thomson Ridge; Solan Bank Reef; Pobie Bank Reef; Pisces Reef Complex; Haig Fras; Wight-Barfleur Reef; Haisborough, Hammond and Winterton; Inner Dowsing, Race Bank and North Ridge; and North Norfolk Sandbanks and Saturn Reef.

Annex I Habitats that can be considered as geomorphological features include ‘Sandbanks which are slightly covered by seawater all the time’; these are habitats that consist of sandy sediments permanently covered by shallow seawater typically at depths less than 20m and can have distinctive habitats associated with banks of sediment that form from the horizontal or sloping plains of sandy sediment. The main sub-types of these features include gravelly and clean sands; muddy sands; eelgrass *Zostera marina* beds; and maerl beds. These sites are distributed throughout GB inshore waters and are present in offshore areas of the southern North Sea and the Irish Sea. These Annex I habitats are present in the following sites (with the Annex 1 subtidal sandbank habitats a primary reason for SAC designation); Bassurelle Sandbank; Carmarthen Bay and Estuaries; Dogger Bank; Fal and Helford; Haisborough, Hammond and Winterton; Inner Dowsing, Race Bank and North Ridge; Isles of Scilly Complex; Margate and Long Sands; North Norfolk Sandbanks and Saturn Reef; Lleyn Peninsula and the Sarnau; Plymouth Sound and estuaries; Red Bay; Shell Flat and Lune Deep; Skerries and Causeway; Solway Firth; Sound of Arisaig; Sound of Barra; The Maidens; The Wash and North Norfolk Coast; and Menai Strait. There are also several other SAC sites where Annex I subtidal sandbank habitats are present but are not the primary reason for designation; Cardigan Bay, Dornoch Firth and Morrich More; Essex Estuaries; Firth of Tay and Eden Estuary; Humber Estuary; Loch nam Madadh; Luce Bay and Sands; Lundy; Moray Firth; Morecambe Bay; Pembrokeshire Marine; Rathlin Island; Sanday; Seven Estuary; and Solent Maritime.

England has 18 UNESCO WHS, of which two have been designated for geological / geomorphological features of the Jurassic Coast and Stonehenge which have been designated due to either their natural or cultural importance or a mixture of both such as the Jurassic Coast, Stonehenge, and Canterbury Cathedral. Wales has four UNESCO WHSs, of these the Slate Landscape WHS of north-west Wales has been designated for geological features including former quarries and mining villages. There are seven UNESCO WHSs in Scotland, of these the Flow Country is designated as a blanket bog ecosystem and St Kilda is designated for its natural features.

There are three UNESCO Global Geoparks in England, Black Country, the English Riviera, and the North Pennines. There is a named Geopark of Abberley and Malvern Hills Geopark; this site has not achieved UNESCO-designated status but includes geological heritage covering 700 million years over five counties in England. Wales has two UNESCO Global Geoparks of GeoMôn and Fforest Fawr. In Scotland, there are two UNESCO Global Geoparks the North West Highlands Geopark and the Geopark Shetland. There is one aspiring UNESCO Global Geopark of Arran Geopark.

There are forty RIGS within England, some of these sites may overlap with existing geoparks or WHS. There are four RIGS within Wales, some of which overlap with existing geoparks or WHS; Cymru, Gwynedd, north-east Wales RIGS, and south-east Wales RIGS. There are seven RIGS within Scotland, some of which overlap with existing geoparks or WHS; Argyll and Islands, Fife, Kelvin Valley, Highlands, Lothian, and Borders, Strathclyde, and Tayside.

There is over 4,128 SSSIs in England covering an area of over 1.1 million hectares around 8% of the land area, of which 915 are designated for geological / geomorphological features. These sites have been designated due to the presence of flora or fauna of interest.

Geological sites and features of importance can also be designated under SSSI legislation following Geological Conservation review (GCR); under the GCR there are also sites of regional or local value of Regionally Important Geological / Geomorphological Sites (RIGS) or Local Geological Sites (LGS), however these are not protected under the same statutory protection as SSSIs. There are 1,078 SSSIs in Wales covering an area of 235,000 hectares or around 12% of the total land area; of these 99 coal tips from former mining activities in Wales are also designated as SSSIs due to their ability to support a wide range of habitats and species. Scotland has 1,422 SSSIs covering around 1,011,000ha (12.6% of Scotland's land area), many of which are also designated as SACs or SPAs, some of these sites have been designated to protect nationally important geological / geomorphological features. Within Scotland, there are nearly 900 Geological Conservation Review (GCR) sites that contain both geological and geomorphological features of national and international importance such as important rocks, minerals and fossils, landform features formed during the last Ice Age, or modern rivers and coasts of significance. Most GCR sites have statutory protection through the designation of geological features as SSSIs. However, over 230 GCR sites have no protective SSSI designation, some of these "unnotified" GCR sites are treated by local authorities as 'candidate SSSIs' and are provided the same protection as a designated SSSI.

Within English Waters, 178 Marine Protected Areas (MPAs), including Highly Protected Marine Areas (HPMAs), MCZs, SACs and SPAs, have been designated covering 51% of inshore and 37% of offshore waters. Within MPAs, HPMAs have been designated which provide the highest possible protection to allow for full recovery of marine ecosystems for all species and habitats with three designations issued in 2023 for Allonby Bay, North East of Farnes Deep and Dolphin Head. The Swallow Sand MCZ, located in the North Sea around 100km offshore from the Northumberland coast, has been designated, in part, for geological features due to the presence of the Swallow Hole Glacial Tunnel Valley in the north-west of the MCZ, which has depths varying from 50 to 150m. The Holderness Offshore MCZ, located in the southern North Sea around 11km offshore from the Holderness coast, has been partly designated for geological features due to the presence of the North Sea glacial tunnel valleys as the northern point of the Inner Silver Pit glacial tunnel. The Offshore Overfalls MCZ located in the eastern English Channel, has been designated for geological Quaternary fluvio-glacial erosion features of the English Channel outburst flood geomorphological features. The Wight-Barfleur Reef SAC is an area of bedrock and stony reef located in the centre of the English Channel and is designated for Annex 1 Reef habitats covering an area of 1,373km2. Within Scotland, approximately 22% of the sea around Scotland is protected as Marine Protected Areas (MPAs) with 231 sites designated in total which include inshore and offshore waters (designated up to 12 nautical miles) for areas that are either Nature Conservation MPAs (which comprise MPAs, SACs, SPAs and SSSIs) for biodiversity and geodiversity features, Demonstration and Research MPAs and Historic MPAs. MPAs can be designated for nature conservation, for research and demonstration purposes or to protect heritage areas and historic sites such as shipwrecks.

The Hatton-Rockall Basin MPA is located in the far west of Scotland towards the Atlantic Ocean as a deep-water basin with depths up to 1km, and has been designated, in part, for the geomorphological features of sediment drifts and polygonal faults representative of the Hatton Bank and adjacent seafloor Key Geodiversity Area. The West of Scotland MPA protects a geologically diverse and distinctive seafloor landscape with a steep continental slope to sediment plans and two isolated seamounts created by extinct volcanoes, it ranges from 400 to 2,500m in depth. The Anton Dohrn Seamount MPA, located 230km west of the Outer Hebrides, is designated for its Annex I habitat of reefs as an extinct volcano with sub-reef types of bedrock reefs and stony reefs as well as biogenic coral reefs present. Geikie Slide and Hebridean Slope MPA are located to the north-west of Scotland in the deep sea of the Rockall Trough and is designated in part for its geological slide feature and continental shelf slope. The Barra Fan and Hebrides Terrace Seamount Nature Conservation MPA located in the west of Scotland adjacent to the boundary with Irish waters, has been designated, in part, for geomorphological features representative of the Barra Fan and The Peaches Slide Complex Key Geodiversity Areas. The Firth of Forth Banks Complex Nature Conservation MPA, located in the offshore waters east of Scotland, is designated in part for its geomorphological feature of moraines and includes the Berwick, Scalp, and Montrose Banks and the Wee Bankie shelf and mounds. The Central Fladen Nature Conservation MPA, located in the northern North Sea, has been designated in partly for its geomorphological feature of sub-glacial tunnel valley. The North-West Orkney MPA is located to the north and west of the Orkney Isles on

the Scottish continental shelf and has been designated in part for its geomorphological features of sandbanks, sand wave fields, and sediment wave fields representative of the Fair Isle Strait Marine Process Bedforms Key Geodiversity Area. The Faroe-Shetland Sponge Belt MPA is located to the west of the Shetland Isles and is located near the rift basin of the Faroe-Shetland Channel which separates the Scottish and Faroese continental shelves, this site is designated in part for the geomorphological features of the West Shetland Key Geodiversity Area. North-east Faroe-Shetland Channel MPA, located to the north-east of Scotland within the Faroe-Shetland channel, has been designated in part for its geological and geomorphological features which include deep-water mud volcanoes of the pilot whale diapirs and slide features of the Millar Slide as part of the West Shetland Margin Palaeo-depositional Key Geodiversity Area. The West Coast MNR (Marine Nature Reserve) in the Isle of Man has been designated for its geological feature of rocky reefs which provides habitats and foraging locations for a variety of species.

Areas of Potential Contamination

Offshore

There is potential for contaminated areas to be present from both man-made and natural sources within offshore areas around GB. Man-made sources are primarily disposal sites which typically take dredged materials and fish industry waste such as shellfish shells; disposal of industrial waste within GB waters has been banned since 1994, while the disposal of sewage sludge was phased out in 1998. Other sources of potential contamination include historical areas used for the disposal of radioactive materials or munitions as well as potential contamination from live firing areas. There is potential for the installation of offshore buried cables to cause temporary disturbance or damage to areas of contamination, which may release these contaminants to the wider marine environment with potential for secondary impacts on significant receptors. Given the small spatial footprint directly affected by the cable and the possibility for micro-routing within the study corridor it is generally possible to avoid known areas of contamination, however there is still a risk that unknown sources of contamination could be released.

There are approximately 110 open sites designated for the disposal of dredged material (of which 82 sites are for disposal from excavated ports and navigation channels) and disposal sites around the coast of England (sites will be opened and closed every year) with approximately 40Mt are disposed to coastal sites around England annually (MMO, 2024a). The largest offshore disposal site in English waters in 2019 was Barrow D, with a disposed dry weight of 1,219,498 tonnes (DBEIS, 2022). Scotland has 63 open sites located offshore for disposal with a further 57 closed or disused sites. These sites are primarily used for the disposal of dredge material, with 4,200,000 tonnes disposed of at sea in 2018 in Scottish waters. The largest offshore disposal site in Scotland in 2019 was Aberdeen, with a disposed dry weight of 819,770 tonnes. Wales has 13 open disposal sites located offshore which receive a combined average of 3,008,129 wet tonnes of material annually. In Wales, Swansea Bay (Outer) is the largest offshore disposal site with a disposed dry weight of 966,994 tonnes in 2019.

Dredging and aggregate extraction activities can also include marine sand and gravel, which currently account for 20% of all industrial aggregates (DBEIS, 2022). Aggregate

extraction is focused within three main areas in the southern area of the North Sea: in the Greater Thames Estuary (footprint of 63.2km^2), the Humber Estuary (footprint of 122.4km^2), and east of Great Yarmouth and Lowestoft (footprint of 195.7km^2). Extraction from the Greater Thames Estuary accounted for approximately 60% of all of the UK's aggregate landings from 1998-2017 (DBEIS, 2022). Dredging and aggregate extraction occurs mainly around the south coast of England towards the Isle of Wight. Around Wales, aggregate extraction occurs around the Severn Estuary and Bristol Channel with an area licensed for extraction off the north coast of Wales near Liverpool Bay. Areas in the east Irish Sea have also been licensed for aggregate extraction. Currently, no aggregation extractions are licensed in Scotland however previous extractions have occurred in the Clyde, Firth of Forth, and Firth of Tay with potential for remnant contaminant materials from these industries. Extractions from marine mines for potash have also occurred commercially from the Boulby potash mine in the north Yorkshire coast area. Rights have also been granted for potash exploration off the Hunsdale's coast and the exploration of lithium for mining in coastal waters around Cornwall in, however, extraction has not yet commenced.

The dumping of chemical weapons and munitions at sea has occurred since the end of World War I (WWI), The full extent of this dumping is unknown, however increased seabed surveys occurring for offshore renewable energy technology have revealed an increasing number of sites, presently standing at 148 sites (OSPAR Commission, 2010). The degree of hazard posed by this waste varies depending on the condition of the dumped munition, as some of these may have broken down over time and dispersed / dissolved whereas other chemical weapons may be insoluble and pose a risk during recovery e.g., mustard gas. Beaufort's Dyke is a deep underwater trench located between Scotland and Northern Ireland in the North Channel of the Irish Sea which has been used as a munitions dump post-WWII. There are five known chemical munitions disposal areas around the coast of Scotland within inshore areas, Isle of May Firth of Forth, East of Aberdeen, Inner Sound, Loch Linnhe, and Sound of Mull. Other examples of potential munitions or explosive relics that may not be well mapped in offshore areas include scuttled warships carrying explosive materials.

There has also been historical dumping of low-level radioactive materials (originating from power plants, hospitals, and research facilities) within UK waters from 1949 until a total ban occurred in 1993. The dumping occurred at both shallow and deep-water sites within the English Channel, Irish Sea, and North Sea, with around 35,1 petabecquerels dumped (OSPAR Commission, no date). Since 1995 under OSPAR guidelines, monitoring has occurred on some North East Atlantic dump sites with some releases of radionuclides detected, but these have not been detected at a significant radiological level. Monitoring is ongoing at these sites.

Other offshore areas of potential contamination which may be more difficult to monitor and quantify can include marine litter which may be washed out from onshore areas which can include possible waste from coastal landfill sites, or be dumped/lost from vessels at sea, or actual vessels lost at sea.

Onshore

There is potential for onshore contamination sources to be present from both man-made and natural sources. Man-made sources primarily originate from waste disposal, which can include hazardous materials such as radioactive waste or industrial waste sources. Natural sources of contamination can include undiscovered gas sources or naturally radioactive materials/geological features. There is also potential for historic industrial areas to have historical land contamination present within soils or geological features; these can include sites formerly used for waste disposal or suffering from industrial pollution that is likely to present significant hazardous risks to human health e.g., disposal areas from the oil and gas industry, agricultural disposal areas, gas works, mining works, landfills, illegal chemical dumps or chemical and steel manufacturing works. There is potential for the installation of onshore buried cables and the construction of onshore substations and converter stations to cause temporary disturbance or damage to areas of contamination which may release these contaminants to the wider environment with potential for secondary impacts on significant receptors including the environment and local populations. However, as for offshore cabling, given the small spatial footprint directly affected by the cable and the possibility for micro-routing within the study corridor it is generally possible to avoid known areas of contamination, however there is still a risk that unknown sources of contamination could be released.

There are currently approximately 540 landfill sites onshore in the UK (QCR Recycling Equipment, 2024). In 2020, 191.2 million tonnes of total waste were generated in the UK with England responsible for 85% (DEFRA, 2024c). Given the significant industrial history within specific regions of GB, there is potential for former contaminated soils to be present. There are 1,759 contaminated sites across the UK covering a total land area of 41,603,277m^2 (Environment Journal, no date). In England 511 sites have been identified through the 2014 investigation into contaminated land areas (Environment Agency, 2016). Given the industrial history of Wales, there is significant historical land contamination present through the soils; there are 175 contaminated land sites currently identified within Wales (NRW, 2016a). Within Scotland, 17 known sites of contamination have been identified (Scottish Government, 2024a), which are typically heritage industry such as gas works as well as former disposal areas of old landfill sites. These identified sites are likely to present significant hazardous risks to human health. Whilst remediation works may be taking place on these identified contaminated sites, there is potential for further currently unidentified contaminated soils to be present. It is estimated that the UK has approximately 325,000 contaminated sites.

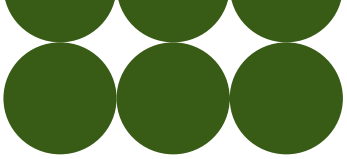
Currently in England and Wales, contaminated lands are managed at an individual council level, however certain types of contaminated land (as described in Regulation 2 of the Contaminated Land (England) Regulations 2006 are required to be designated as special sites. This transfers responsibility for site remediation to the Environment Agency rather than the Local Authority under section 78E of Part 2A of the Environmental Protection Act 1990 (Part 2A). These special sites can include features such as gasworks, former petrol/fuelling stations, former landfills, chemical workings or railway cuttings and may require remediation due to the potential release of hazardous substances, potential risks to waterbodies, or impacts to human and/or animal health. As of 2019, 54 sites are

listed as Contaminated Land Special Sites, with sites predominantly concentrated around Yorkshire and the Greater Manchester, Merseyside and Cheshire areas, likely correlating to past heavy use of these areas for industry and mining. In Scotland, the Scottish Vacant and Derelict Land Survey gives an indication of areas of potential contamination, listing sites of previous use such as manufacturing, general industry, agriculture, transport and mineral activity providing an indication of the areas of potential greatest contamination risk; sites submitted as of 2023 are predominantly concentrated around Glasgow with some areas found in Aberdeen, Dundee, Edinburgh and Irvine, with more extensive mineral activity areas recorded near Dalmellington. There are natural sources of gases present in GB, including 79 sites that have been mined as onshore oil and gas fields; these are mostly located in England, but two oil and gas fields are in Scotland. Some sites are no longer in use and can present a potential contamination risk, however others are still undergoing active extraction.

There are over 2,000 active mines and quarries within the UK mining industry as of 2020 extracting a wide range of materials including building aggregates, sand, stone, and raw materials. The actions of mining and quarrying have the potential to release chemicals into the wider environment through water sources and can include arsenic, cadmium, chlorides, chromium, copper, lead, nickel, nitrogen, phosphorus, carbon, zinc, and their associated compounds. These chemicals have the potential for environmental contamination or deterioration and may have secondary impacts on other sensitive receptors or potentially on human health. There are around 5,000 known historic mines in England and Wales and 544 known historic mines in Scotland. There is potential in former mines and quarries for disturbances through construction activities to release contaminants previously stored in soils or water sources to the wider environment, particularly from spoil heaps or acidic mine and quarry waters.

Natural radioactive sources are also present in the UK, over half of the radiation received in the UK originates from natural radon gas sources, which is produced from the decay of natural uranium found in rocks and soils (and can also occur in water sources). The areas with the highest sources of radon are located in the north and north-east of Scotland, widely across Wales, and in the south-west, north-west, and across a band running from Bristol towards Lincoln in a north-east direction. These sources are typically associated with specific geological features; the uranium content of the soil or geology relates to the rock type. Radioactive waste from nuclear power generation, hospitals, and research is also stored onshore within GB and must be disposed of safely to protect both people and the environment. Primarily this is stored at the Low-Level Waste Repository (LLWR) located in Cumbria near Drigg, the only facility currently licensed by the Office for Nuclear Regulation (UK Government, no date). Nuclear waste and the largest stockpile of plutonium is also held at Sellafield in Cumbria, with nuclear waste processing occurring here. There are however safety concerns, with Cold War era storage silos showing evidence of nuclear waste leakage. England currently processes 91% of all radioactive waste by volume, Scotland processes 6%, and Wales processes 3%.

There are 34 live MoD sites in England. These sites are primarily located onshore, however there are several sites with a coastal component; Fingringhoe; Hythe; East Kent; Lydd; Thorney Island; Chickerell; Dartmoor training area; Lulworth Ranges; and Tregantle. There



are nine live MoD sites in Scotland, all of which are located along the coast. There are five live MoD sites in Wales, all sites except Sennybridge are located in coastal areas. These MoD sites are used for military training exercises, which can include living firing, dry firing of blank ammunition, heavy weapons testing, and military practice manoeuvres. Generally, within Scotland and Wales these are located along the coast with an onshore area, whereas sites in England are typically located onshore in upland or moorland areas. There is potential for contamination of these sites from discarded ammunition and the fragmentation of ammunition or improper disposal of other chemicals or equipment associated with military training. There is also potential for contaminant bioaccumulation and secondary impacts from lead poisoning on organisms from spent ammunition with potential food chain impacts.

3.2.3.3 Summary of Existing Pressures and Issues for Geology, Soils and Land Use

Activities occurring at the seabed, such as capital and maintenance dredging, marine explorations and installations and destructive fishing methods can lead to localised changes in seabed sediments and marine sedimentary processes. The main issues affecting offshore geomorphology are related to the interaction between the energy within coastal seas and the processes of erosion, transport, and deposition. Climate change could cause an increase in the frequency of extreme weather events. The intensity of storm events could impact associated wave heights and the energy within coastal seas, in turn affecting erosion rates and impacting onshore and offshore geology and geomorphological features.

Implementation of the draft HND Implementation Plan, and the construction, maintenance, and decommissioning activities associated with the potential energy projects including offshore and onshore cabling that may arise as a result, have the potential to cause a loss of marine and onshore sediments and to affect marine and onshore sedimentary processes through the addition of protective cabling materials at or near to the seabed. Geological or geomorphological features, including those within designated sites, have the potential to be directly or indirectly damaged by invasive construction methods such as piling or cable trenching. Bathymetry, as well as the nature of the seabed geology and deposits, directly influence the siting of cabling routes and the design of necessary cabling protective materials.

3.2.3.4 Evolution of the Baseline in the Absence of the Plan

Geology, soils and land use in the SEA Study Area are likely to be affected in the long-term by marine and coastal developments and climate change. Coastal change resulting from processes such as erosion, mostly affecting onshore and inshore coastal areas, is likely to be exacerbated by the effects of climate change. Further developments within coastal areas to meet anticipated population growth, and further requirements to protect people and properties from an increased likelihood of flood events, is likely to increase compaction or loss of soils and change in land use in these areas. Cumulatively, the expansion of offshore developments has potential to affect sediment transport processes.

Marine and coastal developments and other marine activities could lead to damage or loss of geological and geomorphological landscapes and features, including those designated for their significance within MCZs or SSSIs. There may be increased protection of marine and coastal geological and geomorphological features in the future through designation of further areas e.g., as MCZs or SSSIs.

3.2.4 Water

Water is essential for the maintenance of biodiversity, supports the population through the provision of drinking water, and supports many of our core activities.

Overall assessment of 2022 UK water quality showed that 36% of surface waterbodies were either at good or high status, with results indicating that unless significant changes occur the UK is unlikely to meet its target of having good chemical and ecological status of inland and coastal waters by 2027. Assessment of the UK status of marine waters under the Marine Strategy indicates that, for several Descriptors, the achievement of good status is uncertain or has not yet been achieved.

It is considered that the key issues associated with the implementation of the draft HND Implementation Plan and Water comprise:

- Potential for the accidental release of contaminants or disturbance of historic sediment contaminants during construction, or release of contaminants from vessels, construction machinery or equipment during construction and operation.
- Potential for the disturbance and mobilisation of marine and onshore sediments and effects on turbidity of waterbodies.
- Potential for indirect effects on the water column e.g., temperature, turbidity, salinity.
- Potential for the introduction of temporary sound sources into the marine environment and onshore waterbodies.
- Potential for the introduction of non-natural EMF into the marine environment and onshore waterbodies.
- Potential for the introduction of litter and debris into the marine environment and onshore waterbodies.
- Potential to adversely affect the status and / or the potential to achieve Good Environmental Status of Marine Strategy Descriptors.
- Potential to adversely affect the status and / or the potential to achieve Good Status of WFD river, lake, transitional and coastal water bodies, and WFD Protected Areas (Bathing and Shellfish Waters).

3.2.4.1 Marine and Coastal Water Quality

The Marine Strategy and Status of Descriptors

The Marine Strategy Regulations 2010, which transposed the EU Marine Strategy Framework Directive (Directive 2008/56/EC), required action to be taken to achieve or maintain Good Environmental Status (GES) in marine waters within the marine strategy area by 2020. GES is defined in the Regulations as "the environmental status of marine waters where these provide ecologically diverse and dynamic oceans and seas which are clean, healthy and productive within their intrinsic conditions, and the use of the marine environment is at a level that is sustainable, thus safeguarding the potential for uses and activities by current and future generations".

The Regulations required the production of a Marine Strategy for UK waters, coordinated across the four UK Administrations. The Strategy aims to help in the delivery of international obligations and commitments such as those under the UN Convention on the Law of the SEA (UNCLOS), UN Sustainable Development Goal 14, OSPAR Strategy and Convention on Biological Diversity, and the OSPAR North-East Atlantic Environment Strategy (NEAES) 2030. The UK Marine Strategy applies an ecosystem-based approach to the management of human activities, and considers the following 11 quality Descriptors:

- D1 – Biological diversity (cetaceans, seals, birds, fish, pelagic habitats and benthic habitats)
- D2 – Non-indigenous species
- D3 – Commercially-exploited fish and shellfish
- D4 – Food webs (cetaceans seals, birds, fish and pelagic habitats)
- D5 – Eutrophication
- D6 – Sea-floor integrity (benthic habitats)
- D7 – Hydrographical conditions
- D8 – Contaminants
- D9 – Contaminants in fish and other seafood
- D10 – Marine litter
- D11 – Underwater noise

The UK Marine Strategy comprises three parts, to be updated every six years: assessment, monitoring programmes and a programme of measures. The first UK assessment of our seas was published in 2012 (HM Government, 2012), and set objectives, targets and indicators for achieving GES; this was updated in 2019 (DEFRA, 2019a), and the summary status of Descriptors for the UK is summarised in Table 13.

Marine Strategy Environmental Status

Descriptor	GES Achieved	Trend	Description
D1 and D4 Cetaceans	Partially	Stable / mixed	Achievement of GES was uncertain. The status of coastal bottlenose dolphins and minke whales was consistent with GES in the Greater North Sea, but unknown / uncertain elsewhere. Unknown if GES achieved for other species. Fisheries bycatch was an ongoing pressure; the target for cetacean bycatch (indicated by harbour porpoise bycatch) had been met in the North Sea, but in the Celtic Seas it was likely to have exceeded the precautionary threshold.
D1 and D4 Seals	Partially	Improving	GES achieved for grey seals in the Greater North Sea and Celtic Seas. Harbour seals had not achieved GES in the Greater North Sea; in the Celtic Sea, significant increase in West Scotland but the status was uncertain in other areas.
D1 and D4 Birds	No	Declining	GES achieved for non-breeding waterbirds in the Greater North Sea but not the Celtic Sea. Breeding seabirds had not achieved GES.
D1 and D4 Fish	No	Improving	Demersal fish communities recovering from past over-exploitation, but GES not yet achieved in the Greater North Sea or Celtic Seas. A partial assessment of pelagic shelf fish did not provide a clear result.
D1 and D4 Pelagic Habitats	Partially	Stable / mixed	Achievement of GES was uncertain; prevailing environmental conditions likely driving changes in plankton communities, but the influence of human activities was not certain.
D1 and D6 Benthic habitats	No	Stable / mixed	GES achievement was uncertain for intertidal and soft sediment habitats; for soft sediments, the levels of physical damage were considered consistent with GES in UK waters to the west of the Celtic Seas but not in the Celtic Seas or the Greater North Sea.

Descriptor	GES Achieved	Trend	Description
			GES not achieved for sublittoral rock and biogenic habitats.
D2 Non-indigenous species (NIS)	No	Stable / mixed	GES not achieved. The ability to detect new NIS had improved but no significant change in the number of new records of NIS between 2003 and 2014.
D3 Commercial fish	No	Improving	GES achieved for some commercially exploited fish. In 2015, 53% of marine fish (quota) stocks fished below maximum sustainable yield (MSY) and had increased significantly since 1990. Most national shellfish stocks had not achieved GES or their status was uncertain.
D4 Food webs	Partially	Improving	The extent to which GES had been achieved was uncertain, components of the marine food web were changing but it was not clear how they were affecting each other.
D5 Eutrophication	Yes	Stable / mixed	GES largely achieved. A small number of problems remained in coastal and estuarine waters, representing 0.03% of the UK EEZ and 0.41% of estuarine and coastal waters.
D7 Hydrographical conditions	Yes	Stable / mixed	GES continued to be achieved.
D8 Contaminants	Yes	Improving	GES largely achieved. The concentration of hazardous substances and their biological effects generally met agreed target thresholds. Highly persistent legacy chemicals such as PCBs caused few failures, mainly in coastal waters close to polluted sources.
D9 Contaminants in seafood	Yes	Improving	GES achieved a high level of compliance with agreed safety levels.
D10 Marine litter	No	Stable / mixed	GES not achieved. Beach litter levels in the Celtic Seas largely stable since assessment in 2012, whilst levels in the Greater North Sea had slightly increased.

Descriptor	GES Achieved	Trend	Description
D11 Underwater noise	Partially	Stable / mixed	Achievement of GES was uncertain, but research and monitoring programmes were improving understanding.

Table 13: Summary of 2019 UK Assessment of Environmental Status for the Marine Strategy

WFD Status of Waterbodies

The EU Water Framework Directive (WFD) (2000/60/EC) was transposed in England and Wales through 'The Water Environment (Water Framework Directive) (England and Wales) Regulations 2017'. In Scotland, the WFD was transposed through the Water Environment and Water Services (Scotland) Act 2003 (WEW Act) with further legislation of the Water Environment (Controlled Activities) (Scotland) Regulations 2011 (and further amendments) enabling control over the various activities which can impact on water quality. The "WFD Regulations", established a new legal framework for the protection, improvement and sustainable use of rivers, lakes, transitional waters, coastal waters, and groundwaters across Europe. This was undertaken to prevent deterioration and to enhance the status of aquatic ecosystems, promote sustainable water use and reduce pollution. The WFD is implemented through River Basin Management Plans (RBMPs), with the Regulations requiring the production and implementation of a RBMP for England, Wales, and Scotland every six years. The most recent in England is the third cycle RBMP published in 2022, which runs from 2022-2027. In Wales the most recent is the third cycle RBMP published in 2021, running from 2021-2027. In Scotland, the most recent is the third cycle RBMP published in 2021, running from 2021-2027.This classified the status of all WFD surface waterbodies according to chemical, biological and hydromorphological parameters, providing an overall status of either high good, moderate, poor or bad for each surface waterbody (if the surface waterbodies had been designated as artificial or heavily modified, they were classified using ecological potential rather than ecological status). Waterbodies are the basic management units for reporting and assessing compliance with the environmental objectives of the WFD Regulations. In England, 4,655 waterbodies are assessed each year including rivers, canals, lakes, estuaries and coastal waters. In Wales, 895 waterbodies are assessed each year including rivers, canals, lakes, estuaries and coastal waters. In Scotland, 3,249 waterbodies are assessed each year including rivers, canals, lakes, estuaries and coastal waters.

The third cycle RBMP for England 2022-2027 identified waterbodies at good or high ecological status with new objectives set to improve and protect each waterbody as well as defining measures to ensure that the objectives can be met, with an overall aim for England to reach good chemical and ecological status of inland and coastal waters by 2027. An updated classification for waterbodies was produced in 2019 for the reporting of the third-cycle plans. The most recent full set of classification results for English waterbodies is from 2019 (DEFRA, 2019b) (with new classifications due to be available in

2025); in 2019 16% (751) of surface waterbodies in England were at either high or good ecological status, of these 16% of rivers and canals, 14% of lakes and 29% of estuaries and coastal waters were at high or good status. A significant portion of all waterbodies monitored were at moderate status (63.9%), with 17% of all waterbodies at poor status and 2.9% at bad status.

The third cycle RBMP for Wales 2021-2027 identified waterbodies at good or high ecological status with new objectives set to improve and protect each waterbody as well as defining measures to ensure that the objectives can be met, with an overall aim for Wales to improve its water quality through the Welsh Government's Water Strategy for Wales (Welsh Government, 2015) which aims to increase resilience of the water system and environment through targeting nutrient pollution and improving the water drainage network capabilities and facilities. The most recent full set of classification results for Welsh waterbodies is from 2021 (Watts, 2023), with 40% (905) of surface waterbodies at either high or good ecological status; of these, 44% of rivers, 18.4% of lakes and 72.8% of estuaries and coastal waters were at high or good status. A significant proportion of waterbodies monitored were of moderate status (49.5%), with 9% of all waterbodies at poor status and 1.2% at bad status.

The third cycle RBMP for Scotland 2021-2027 identified waterbodies at good or high ecological status, with new objectives set to improve and protect each waterbody as well as defining measures to ensure that the objectives could be met, with an overall aim for Scotland to have 90% of surface waterbodies in good or better ecological condition by 2027, and a longer-term goal for beyond 2027 to have 98% of surface waterbodies at good or better status. The most recent full set of classification results for Scottish waterbodies is from 2020 (SEPA, 2021); 64% (2,085) of surface waterbodies were at either high or good ecological status including 56% of rivers and canals, 69% of lakes and 98% of estuaries and coastal waters at high or good status. A significant portion of all waterbodies monitored were at moderate status (22.1%), with 12% of all waterbodies at poor status and 1.9% at bad status.

England typically has the lowest percentage of river waterbodies achieving good or high overall status compared to Scotland and Wales. Generally, estuaries and coastal waterbodies for England, Wales and Scotland are in better ecological condition than rivers, with a greater percentage of these classified as good or high overall status. When the chemical status of waterbodies is considered excluding uPBTs (ubiquitous, persistent, bioaccumulative, toxic substances) substances in England for 2019 data (UK Government, 2025a), 93% of rivers achieved good chemical status, 100% of lakes achieved good status, 92% of estuaries achieved good status and 100% of coastal waters achieved good chemical status. When uPBT substances are considered, no surface waterbodies achieved good chemical status in England. For Wales for 2021 data (Welsh Parliament, 2023), 92.1% of rivers achieved good chemical status, 99.1% of lakes achieved good status, 68.8% of estuaries achieved good status and 60.9% of coastal waters achieved good chemical status. For Scotland, for 2020 data (SEPA, 2023b), 99.7% of rivers achieved good chemical status, 100% of lakes achieved good status, 100% of estuaries achieved good status and 100% of coastal waters achieved good chemical status.

At a UK level, WFD water quality status is included as one of the UK Biodiversity Indicators 2024 (JNCC, 2022), which are used for reporting to the Convention on Biological Diversity (CBD) on the UK's progress towards the goals and targets of the Kunming-Montreal Global Biodiversity Framework (GBF). This indicator considers the assessment of WFD status for 9,291 waterbodies across England, Scotland, Wales and Northern Ireland. Assessment of the long-term percentage of UK surface waterbodies at high or good ecological status from 2009 to 2022 (based on a three-year average) indicated that there was little to no overall change. Similarly, the short-term trend from 2017 to 2022 (based on a three-year average) indicated that there was little to no change for the percentage of UK surface waterbodies at high or good ecological status. In 2022, 36% (3,364) of surface waterbodies were either high or good status, of which 33% of rivers and canals, 32% of lakes and 75% of estuaries and coastal waters were either high or good status. The UK aims to achieve good chemical and ecological status in inland and coastal waters by 2027 with a series of objectives set to improve and protect the condition of waterbodies as well as introducing measures to ensure that these objectives are met. However, assessment results suggest that, unless significant improvements are made in surface water quality, the UK will fail to meet its target of having good chemical and ecological status in inland and coastal waters by 2027.

Table 14 compares the number and percentage of WFD waterbodies at good or high status in the UK as reported in the most recent classification results available through the UK Biodiversity Indicators assessment 2024; this includes data for England from 2019, Wales from 2021 and Scotland from 2022.

Water Framework Directive Status

Waterbody Type and Country	Overall Status
England	
Rivers and Canals	16%
Lakes	14%
Estuaries and Coastal	29%
Wales	
Rivers and Canals	44%
Lakes	19%
Estuaries and Coastal	22%
Scotland	
Rivers and Canals	57%
Lakes	70%
Estuaries and Coastal	98%

Table 14: Comparison of WFD Waterbodies at 'Good or Better' Overall Status in England, Wales, and Scotland, as reported in the UK Biodiversity Indicators 2024

The WFD Regulations also required the establishment of a register of protected areas for waterbodies, or parts thereof, that require additional water quality protection owing to their importance to people or wildlife. This is outlined in Article 10 of the WFD Regulations for England (Environment Agency, 2024b) and Wales (NRW, 2025c) requiring a register to be kept. In Scotland, the WFD regulations and the requirement for maintenance of a register are implemented through The Water Environment (Register of Protected Areas) (Scotland) Regulations 2004. This register includes the following protected areas of relevance to the draft HND Implementation Plan:

An area or body of water requiring special protection in accordance with any EU instrument protecting surface water, groundwater or conservation of habitats and species, including:

(i) Areas designated for the protection of economically significant aquatic species (including Shellfish Water Protected Areas and freshwater fish such as Salmonid Waters).

(ii) Bodies of water designated as recreational waters (Bathing waters).

(iii) Areas designated for the abstraction of water for human consumption (Drinking Water Protected Areas).

(iv) Areas designated as Nutrient Sensitive Areas (NSAs), which can include areas identified as Nitrate Vulnerable Zones through the Nitrates Directive or sensitive areas designated under the Urban Waste Water Treatment Directive (UWWTD).

(v) Areas designated for protection of habitats and species, where either the maintenance or improvement of the site is influenced by water, including Ramsar sites, water-dependent SACs and SPAs.

Areas can also be designated as Water Protection Zones (WPZs) according to the Water Resources Act 1991, which aims to prevent water pollution arising from activities which cannot be controlled by other permits. Within WPZs consent is required for the storage or use of certain substances at water treatment plants, industrial, storage or research sites and can also involve the banning or restriction of certain activities to reduce the risk of water pollution; if these controlled activities are to be undertaken, consent is required. In 1999, the Welsh River Dee catchment was designated as a WPZ and currently remains the only WPZ in the UK; this catchment was designated due to its importance as a drinking water source and its vulnerability to pollution.

Marine Protected Areas (MPAs) are also considered as water-designated sites in Scotland under the Marine (Scotland) Act to recognise features of natural importance and to develop a network of MPAs and works in conjunction with the Marine and Coastal Access Act. Other waterbodies which may be protected can include Principal Salmon Rivers in England and Wales for salmon (The Rivers Trust, 2024), these are waterbodies which may

be designated either as SACs, waterbodies which have a Salmon Action Plan as well as sites which are not designated as SACs or SPAs but have populations of Atlantic salmon. Scotland also has protective measures for rivers and marine areas which hold populations of Atlantic salmon.

The location of areas designated for shellfish and bathing waters within GB is shown in Figure 19.



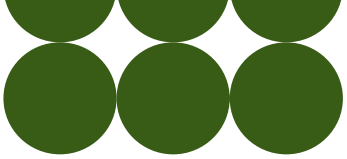
Figure 19: WFD protected Shellfish Waters and Bathing Waters in GB waters

Shellfish Areas

Shellfish water-protected areas (SWPAs) are areas designated for the protection of shellfish growth and production. Good water quality within these areas is important for the production of high-quality shellfish. Both the Shellfish Directive (79/923/EEC) and Freshwater Fish Directive (78/659/EEC) were revoked in 2013 and subsumed into the WFD. Areas previously designated under these Directives are now areas designated for the protection of economically significant aquatic species under the WFD and listed on the Protected Areas register. All SWPAs must be managed to ensure that they meet ecological and chemical objectives under the WFD. They must also meet at least Class B status classification by the Food Standards Agency (FSA) in England and Wales under the Food Hygiene Regulations, to ensure that the quality of shellfish harvested is sufficient to protect public health. The health standards are provided in Annex III of assimilated Regulation (EC) 853/2004 and Articles 53, 54, and 55 of assimilated Regulation (EU) 2019/527. SWPAs must also make progress to meet a WFD microbiological guideline standard of ≥ 75% of samples containing ≤ 230 *E.coli* in the shellfish flesh (measured per 100g) and intervalvular liquid, and the end product microbiological criteria specified in the assimilated Regulation (EC) 2073/2005 be met. Furthermore, the production areas are classified based on their contamination as either A, B, or C, with C as the most contaminated and this will determine the level of treatment required following harvesting (FSA, 2025). Two classification systems are used in England and Wales, an annual (or temporary) classification system and the long-term classification system which relies on at least 5 years of data.

Food Standards Scotland (FSS) is responsible for ensuring that areas where shellfish are harvested from are safe for consumption. Under the Retained EU Regulation 2017/625 a series of official control monitoring is required to determine if a harvesting area remains open or closed depending on the levels of microbiological and chemical contaminants. This includes sanitary surveys to identify microbiological pollution sources and an *E.coli* classification system following the health standards under Regulation (EC) 853/2004. SWPAs must also make progress to meet a WFD microbiological guideline standard of ≥ 75% of samples containing ≤ 230 *E.coli* in the shellfish flesh (measured per 100g) and intervalvular liquid (FSS, 2025). As for England and Wales, the production areas are classified based on their contamination as either A, B, or C, determining the level of treatment required following harvesting.

There are 148 SWPAs in England which are designated under Regulation 9 of The Water Environment (Water Framework Directive) (England and Wales) Regulations 2017 (DEFRA, 2022a). One area of Silloth SWPA has been designated by The Water Environment (Water Framework Directive) (Solway Tweed River Basin District) Regulations 2004 as amended (DEFRA, 2022b). There are 13 SWPAs in Wales which are designated under Regulation 9 of The Water Environment (Water Framework Directive) (England and Wales) Regulations 2017 (NRW, 2016b). Whilst improvements in sewage discharge had reduced microbiological contamination levels in SWPAs there have been failures for these schemes to comply with the specified microbial standard. The most recent classification information for England and Wales from 2024 (FSA, 2024), indicates that the majority of sites are annually classed as B, or have a long-term B class classification. Two SWPA sites



are currently banned from production due to contamination levels (Easter Reach and Bird Pile).

There are 85 SWPAs in Scotland, which are protected under the Water Environment (Shellfish Water Protected Areas: Designation) (Scotland) Order 2013 for the 2024-2025 period (FSS, 2024), it should be noted that Loch Ryan was designated separately in Scotland in 2016 under The Water Environment (Shellfish Water Protected Areas: Designation) (Scotland) Order 2016. Generally, SWPAs are located on the western coast of Scotland around the Outer Hebrides and Shetland. There is a concentration of eight SWPAs around Edinburgh. Currently, for the 2024-2025 classification period, no Scottish SWPAs are closed, with the majority of sites classified as Class A, reflecting the generally high coastal water quality around Scotland, however, two SWPAs located on the Isle of Skye are Class C (Cefas, 2025). The Scottish shellfish industry is estimated to be worth approximately £14.1 million (Scottish Government, 2024b).

Bathing Waters

The Bathing Water Directive (Directive 2006/7/EC concerning the management of bathing water quality and repealing Directive 76/160/EEC) requires member states to identify their most popular bathing waters, both at coastal and inland sites, for regular testing to ensure that a minimum quality standard is reached. In England and Wales, Bathing Water protection is implemented through the Bathing Waters Regulation 2013 (SI 2013/1675). In Scotland, Bathing Waters are designated through the Bathing Waters (Scotland) Regulation 2008. Coastal Bathing Waters can be classified into four categories either; “Excellent”, “Good”, “Sufficient”, or “Poor” (where temporary advice is issued against bathing). Classifications are based on the presence of two microbiological parameters (E.coli) and intestinal enterococci) in water samples. Individual sample results below 250 E.coli (EC) / 100ml and 100 Intestinal Enterococci (IE) / 100ml are typical of an excellent classification. Results below these values, and up to 500 EC / 100ml and 200 IE / 100ml are typical of a good or Sufficient classification. When E.coli levels exceed 1250 EC / 100ml, temporary advice against bathing is issued. Inland Bathing Waters can be classified into four categories either; “Excellent”, “Good”, “Sufficient” or “Poor” (where temporary advice is issued against bathing). Classifications are based on the presence of two microbiological parameters (Escherichia coli (E.coli) and intestinal enterococci) in water samples. Individual sample results below 500 E.coli (EC) / 100ml and 200 Intestinal Enterococci (IE) / 100ml are typical of an ‘Excellent’ classification. Results below these values, and up to 900 EC / 100ml and 330 IE / 100ml are typical of a ‘Good’ or ‘Sufficient’ classification. When E.coli levels exceed 1000 EC / 100ml, temporary advice against bathing is issued.

In the UK, since 2016 there have been only minor variations in the quality of bathing waters, typically linked to weather conditions. During wetter periods, with an increase in the operation of combined sewer outflows alongside elevated loading of diffuse urban pollution and agricultural runoff there can be decreases in bathing water quality typically in the winter period. In 2019, of the 628 UK coastal bathing waters which were reported, 66.1% were classified as “Excellent”, 22.8% as “Good”, 8.1% as “Sufficient”, and 2.4% as “Poor”, with 0.6% as “Unclassified” (DBEIS, 2022). In England, there are 451 sites designated as bathing waters. The 2024 statistics (DEFRA, 2024b), reporting for the period 2021-2024 for inland and coastal bathing water sites in England, showed that for the surveyed 450 sites

(one designated site was not surveyed due to access issues), 91.8% (413 sites) met the minimum standard required in the Bathing Waters Regulations, with 64.2% (289 sites) meeting the "Excellent" standard. 8.2% (37 sites) did not meet the minimum standard of the Regulations and were classified as "Poor". Generally, trends since 2015 showed that the 2024 classification period had the highest level of designated sites classified as "Poor". Wales has two inland bathing water sites and 108 coastal bathing water sites. For these designated sites in the 2024 Bathing Waters classification (Welsh Government, 2024a), 68.2% (75 sites) were classified as "Excellent", 25.5% were classified as "Good", 4.5% (5 sites) were classified as "Sufficient", and 1.8% (2 sites) were classified as "Poor" as these did not meet the minimum standards. Over the past two decades, bathing water quality has significantly improved in Wales, with the two sites currently failing to meet the standards (Ogmore by Sea and Rhyl EC) due to having large catchment areas with multiple pollutant sources impacting water quality (NRW, 2024b). Scotland has 89 designated bathing water sites; for the 2024 classification season (SEPA, 2023a), 85% of sites achieved the higher standards of "Excellent" or "Good", with 43% (38 sites) classified as "Excellent" and 42% (37 sites) as "Good", 13% (12 sites) as "Sufficient" with 2% (2 sites) as "Poor". There have been continual improvements in Scottish bathing waters, with an increase in the sites achieving "Excellent" classification from 17 in 2015 to 38 in 2024. The two failing sites of Kinghorn (Harbour Beach) and Lower Largo have issues from drainage network overflows and agricultural runoff.

Salmonid Waters

Salmonid waters in England and Wales can be designated as SACs or SPAs or may have a population of Atlantic salmon present. These are focused on improving and maintaining the status of stock and the salmon fisheries, however, some of these areas can be small and only support minimal rod-based catches. In England 49 rivers, and in Wales 31 rivers have salmon populations present; of these, 64 rivers (42 in England and 22 in Wales) are designated as being Principal Salmon Rivers based on projected annual rod catches of at least 50 fish during the 1996 development of Salmon Action Plans (Cefas, Environment Agency and NRW, 2022). In England, there is also one coastal fishery for salmon in the Anglian Region. Assessments on the requirement for management and conservation methods are used to provide annual advice on stock status given factors such as weather conditions, extreme river flow events and water quality.

In Scotland, fishing for wild salmon is important with the species having a cultural significance. Recently declines in numbers of Atlantic salmon since the early 1970s in fisheries areas have sparked concerns. Atlantic salmon are listed in the Scottish Biodiversity List (NatureScot, 2020) and have Priority Marine Feature status assigned to them due to the coastal component of their lifecycle (NatureScot, 2025a). In Scotland, 173 rivers are considered salmon fisheries and undergo assessment. In 2022, this assessment classified 101 of these rivers as being of poor conservation status. As a result of this, there have been several management actions introduced with the production of the Scottish wild salmon strategy by the Scottish Government (2022), intending to develop healthy rivers and coastal areas with self-sustaining populations of wild Atlantic salmon through meeting all WFD targets and actions on water quality, quantity, and habitats.

Special Areas of Conservation, Special Protection Areas and Ramsar Sites

The Conservation of Habitats and Species Regulations 2017 specifies rules for the designation and conservation of SACs to protect habitats and species identified by the EC Habitats Directive 1992. SPAs are designated and regulated under The Conservation of Habitats and Species Regulations 2017 for the protection of rare and migratory bird habitats. Ramsar sites are wetlands which are protected under the international treaty of The Ramsar Convention, wetland sites include marshes, fens, peatlands, bogs, and shallow seas and are areas of land which are either seasonally or permanently inundated with water.

In England (Environment Agency, 2024b), there are 176 SACs and 72 SPAs which have an aquatic component, these include important coastal and lake habitats as well as marshes and moors which support a variety of species and diverse ecosystems. There are also 72 sites designated as Ramsar sites for the important habitats provided for a range of bird species. In Wales, nine rivers are designated as SACs: Afonydd Cleddau, Eden, Gwyrfai, Teifi, Tywi, Glaslyn, Dee, Usk and Wye. These have been designated for species such as Atlantic salmon, freshwater pearl mussel, white-clawed crayfish, and floating water-plantain. Water quality surveys in these areas showed that many of the SAC sites failed to achieve phosphorus targets, with stricter phosphorus targets introduced in these nine SAC rivers compared to other SACs. There are 86 water-dependent SACs designated in Wales. In Wales, 24 coastal and estuary sites have been designated as SPAs, while 10 sites have been designated as Ramsar sites for the diverse ecosystems that they support and are important water-based habitats. These are discussed further in Section 3.2.1 for Biodiversity, Flora and Fauna. In Scotland, SACs and SPAs which have an aquatic component are considered under this designation as well as Ramsar sites for the diverse ecosystems that they are supporting and are important water-based habitats. There are 101 SACs (designated as either coastal or a mixed habitat of water-based and terrestrial) and 79 SPAs (12 of which are solely marine SPAs, with the remainder as a mixed habitat of water-based and terrestrial) designated for aquatic components and 51 Ramsar sites (NatureScot, no date) designated in Scotland for their diverse ecosystems and supporting water-based habitats.

Nutrient Sensitive Areas

Nutrient Sensitive Areas (NSAs) are waterbodies which are either eutrophic or are classified as being vulnerable to eutrophication through phosphate and/or nitrate pollution. Nutrient Vulnerable Zones (NVZs) are designated under the Nitrates Directive, which aims to improve water quality by promoting good agricultural practices; NVZs are areas where the concentrations of nitrates will exceed or are likely to exceed the Directive's set levels. Other areas which are sensitive to eutrophication or are currently eutrophic are designated under The Urban Waste Water Treatment (England and Wales) Regulations 1994 and under The Urban Waste Water Treatment (Scotland) Regulations, which aims to improve water quality in these areas through limits on the quantity and nutrient content of sewage treatment plant's waste discharge to these areas.

In England, catchment areas have been designated for being NSAs either wholly or partly and are due to the habitats present being in an unfavourable condition due to water

pollution from phosphorus or nitrogen. There are 18 SPAs, SACs and SSSIs designated as phosphorus-sensitive catchment areas and 12 SPAs, SACs and SSSIs designated as nitrogen-sensitive catchment areas under the Water Industry Act 1991. Under the Urban Waste Water Treatment Regulations in England, several areas have been designated as being sensitive to the effects of sewage discharge, which includes 87 sites (DEFRA, 2023) consisting of one Shellfish Water Protected Area, one Bathing Water, 83 rivers and 2 lakes. In Wales there are six sites of NSAs; Lougher Estuary; Cardiff Bay; Tawe Estuary; River Lougher; River Alyn; and River Wye. Overall, under the Nitrates Directive, all of Wales has been designated as an NVZ in 2023, with a phased implementation approach of new measures designed to improve water quality through amending and restricting agricultural activities from 2024.

Nutrient Vulnerable Zones (NVZs) are designated in Scotland under The Action Programme for Nitrate Vulnerable Zones (Scotland) Regulations 2008, currently, there are five NVZs designated in Scotland of Lower Nithsdale, Lothian and Borders, Strathmore and Fife (including Finavon), Moray, Aberdeenshire/Banff and Buchan, and Stranraer Lowlands (Scottish Government, no date). Under The Urban Waste Water Treatment (Scotland) Regulations, several areas have been designated as being sensitive to the effects of sewage discharge, which includes 222 sites consisting of five Shellfish Water Protected Areas, 21 Bathing Waters, one estuary, 170 rivers and 25 lochs.

Drinking Water Protected Areas

Protecting water quality is important for both surface (rivers and lakes) and groundwater drinking water sources to ensure good public health and maintain and protect these supplies against the effects of climate change and future pressures. Currently under the Water Supply (Water Quality) Regulations 2016 and the Water Environment (Water Framework Directive) (England and Wales) Regulations 2017, the water sources that currently supply (or are likely to supply in the future) more than 10m^3 per day or serve more than 50 people are designated as Drinking Water Protected Areas (DrWPAs) in England and Wales and are regulated by the Drinking Water Inspectorate (DWI). The main objectives for these areas under this Regulation are to ensure that the drinking water produced undergoes suitable water treatment, to protect the supply to avoid deterioration in water quality and reduce the amount of purification required, and for groundwater sources to meet good chemical status and reduce pollution levels.

In England, 30% of drinking water originates from groundwater and 70% from surface water sources (Environment Agency, 2022a). All 271 groundwater bodies in England are designated as DrWPAs and 450 (10%) of surface waters (lakes, rivers and canals) are designated as DrWPAs. Of these surface DrWPAs, 240 are classified as being at risk due to pollution. Of the designated groundwater DrWPAs, 71 (26%) failed to meet good chemical status due to nutrient pollution and heavy metal contamination. Where these DrWPAs are at risk, a non-statutory safeguard zone can be introduced to identify the land use practices and activities which are contributing to pollution to focus pollution prevention methods and introduce regulatory actions. In England, 148 surface water and 251 groundwater safeguard zones have been implemented. The 2023 DWI annual report (2024a) indicated that 99.97% of public water tests met quality standards, however for private water supplies for drinking, 3.4% of tests failed the standards. In Wales, the

management of drinking water sources is set out in The Water Supply (Water Quality) Regulations 2018. There are 47 groundwater DrWPAs and 125 surface (rivers and lakes) DrWPAs. Welsh water quality is high, with the recent 2023 DWI report (2024b) indicating that over 99.98% of public drinking water tests met quality standards. Private water supplies have lower water quality, with 3.8% of tests failing to meet the standards. Source Protection Zones are designated in Wales to provide additional protection in areas where DrWPAs are failing to meet the required standards; currently for inland waters there are 132 Source Protection Zones.

In Scotland, drinking water quality is regulated by the Drinking Water Quality Regulator through The Water Environment (Drinking Water Protected Areas) Scotland Order 2013, with Article 7 of the Water Environment and Water Services (Scotland) Act 2003 determining which areas need protection for water abstracted for human consumption. There are 596 DrWPAs in Scotland; as of 2021, 40% of extractions originate from rivers, 40% from lochs and 20% from groundwater-based sources. There are 65 waterbodies that have been identified as being adversely affected by water quality which is used for drinking water extraction (Natural Scotland, 2009). The recent Drinking Water Quality in Scotland Report in 2023 indicated that 99.88% of public drinking water tests met quality standards (Drinking Water Quality Regulator for Scotland, 2024). Compliance in private water supplies was lower with 21.2% of private water supply tests failing the coliform bacteria microbiological test due to poor use and absence of treatment of private water, while the overall compliance was 93.3%.

Flood Risk and Coastal Erosion

With climate change increasing the frequency of disruptive weather events, rainfall amounts and increasing temperatures contributing to rising sea levels, there is an increased risk of flood events, inland, at coastal locations and in combination within these areas. Where these factors can overlap with poor sewers and drainage network systems there is an elevated risk of impacts on water quality, with contamination by pollutants impacting human health and damaging properties from flood inundation. Flooding may also constrain opportunities for development, both in the present and future during planning. There can also be impacts on utilities and service networks from flooding as well as agriculture and other sensitive land use areas. In areas where there is an increased risk of flooding currently or predicted in the future, Strategic Flood Risk Assessments have been undertaken to help guide local planning and development; these collate all known information on present flooding and likely future flooding areas. The National Flood Zones in GB are shown in Figure 20.

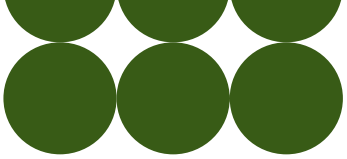


Figure 20: National Flood Zones in GB

Coastal erosion has also increased in severity and frequency due to climate change and has increased the potential for coastal flood events as well as damage and losses to infrastructure such as road networks, service utilities and properties located in coastal areas. Under the Flood and Water Management Act 2010, there is a statutory duty on the Environment Agency to develop a National Flood and Coastal Erosion Risk Management Strategy for England (Environment Agency, 2022b). In England, it is estimated that 5.2 million properties are at risk of flooding or coastal erosion; under the National Flood and Coastal Erosion Risk Management Strategy (Environment Agency, 2020b), the authorities involved in flood and coastal erosion risk management must enact plans, strategies and activities in line with this to manage the risk and consequences of all sources of flooding and coastal change. The recently published 2020 Flood and Coastal Erosion Risk Management Strategy aims to have a resilient nation for flooding and coastal change by 2100, this includes the introduction of suitable flood and coastal defences to protect properties, implementing change to allow communities and local economies to recover from flooding as well as preventing inappropriate development activities along flood zone areas or at-risk coastal sites. The East of England has the highest risk of flooding, with between 6-8% of properties at risk of flooding, particularly in London with up to 13% of properties estimated as being at flood risk due to the Thames estuary. Coastal flood events are likely to continue to impact the areas of the East Midlands, south-east England, Yorkshire and The Humber; when this combines with storm surge events there is likely to be increased coastal erosion, with estimates of up to 20,000 properties at-risk of being lost to the sea by 2100.

In Wales, a National Strategy for Flood and Coastal Erosion Risk Management was developed in 2020 (Welsh Government, 2020a). Under the Flood Risk Management Annual Report 2023-2024, an estimated 272,817 properties are at risk of flooding and an estimated 71,042 properties at risk from coastal flooding. This strategy aims to reduce the risk from flooding and coastal erosion by building resilience, improving the understanding of flooding and erosion events, and investments in at-risk areas. The development of a Flood Risk Assessment Wales Mapping and a National Coastal Erosion Risk Management Map aims to provide information for strategic planning and development to avoid areas of the highest risk as it is estimated that if coastal defences are not strengthened and maintained a further 36,000 properties will be at risk of coastal flooding by 2100. Significant coastal flood risk exists around Bangor, Morfa Bychan, Barmouth, Laugharne and Ferryside.

In Scotland, under the Flood Risk Management (Scotland) Act 2009, the second National Flood Risk Assessment was published to ensure that long-term planning and investment protects the areas most at-risk of flooding; currently over 28,000 properties are at risk of coastal flooding. Under a changing climate, it has been predicted that over 54,000 properties will be at risk of coastal flooding by 2080 with an estimated 0.9 m sea-level rise (SEPA, 2018). It is estimated that 19% of Scotland's coastline (3,802km) is at risk of coastal erosion due to rising sea levels, with negative implications for the associated properties and infrastructure developed in these areas, which includes over 9,000 properties. These coastal areas are typically those associated with softer sediments and rock types. In terms of coastal flooding, the highest risk areas for flood events are located in Falkirk, Stirling, areas of the Scottish Borders, the Orkney Islands and West Dunbartonshire. For



inland flooding, Stirling, the Scottish Borders, Perth, Kinross and Moray have the highest proportion of properties exposed to river flooding, with surface water flood risk impacting urbanised areas of Aberdeen City, and areas such as Edinburgh and Dundee (Scottish, Government, 2015).

3.2.4.2 Summary of Existing Pressures and Issues for Water

The water environment of GB is impacted by a variety of pressures including industry, power generation, agriculture and forestry, development, transport, and infrastructure pressures. Currently, issues exist with the achievement of good water quality from the perspective of the WFD with associated implications on species and habitats which are water dependent as well as impacts on designated shellfish and bathing water areas. The most recent UK Marine Strategy assessment indicated that some Descriptors have not yet achieved GES (e.g., breeding seabirds, fish, some benthic habitats, non-indigenous species, marine litter), or there is uncertainty or a lack of data to enable their status to be confidently determined. Part three of the Marine strategy has established a UK Programme of Measures with the aim of achieving GES. Abstractions and impoundments of water for drinking water supply, industry, agriculture, recreation, and hydropower can lead to pressures on water quantity and flow and can exacerbate existing water quality issues. The introduction and spread of invasive non-native species can impact native aquatic biodiversity and can adversely affect water-based recreation and leisure activities.

Implementation of the draft HND Implementation Plan, and the construction, maintenance and decommissioning activities associated with the potential energy projects including offshore and onshore cabling and associated onshore infrastructure such as converter stations that may arise as a result, has the potential to lead to negative effects on the quality of marine, coastal and inland waterbodies in GB, alone, or in combination with, these existing pressures. Consideration should be given to the potential for impacts on Marine Descriptors when planning for infrastructure in coastal, marine, and onshore environments. Construction-phase effects on water quality could occur, for instance, through the release of contaminants or from the mobilisation of sediments both from offshore and onshore sources.

3.2.4.3 Evolution of the Baseline in the Absence of the Plan

Water quality around the coastline of GB is affected primarily by marine industry and associated effects, as well as land use, and similar pressures are likely to affect the baseline into the future in the absence of the plan. The Environment Agency, SEPA and NRW are currently managing estuarine and coastal waters through RBMPs for England, Scotland and Wales, respectively, to achieve GES, as required under the WFD, and to ensure no deterioration in water quality, and managing marine waters through programmes of measures to achieve GES for Descriptors, as required by the MS. The continued management of water quality has the potential to improve the status of coastal, transitional, and marine waterbodies in the long-term. Knowledge and understanding of the baseline for MS Descriptors where there is uncertainty or a lack of data to enable their status to be confidently determined is likely to improve.

3.2.5 Air

Good air quality is vital for human health and wellbeing, for our climate, habitats and built environment. Air pollution is the result of a range of substances that are introduced into the atmosphere from a variety of different sources. Generally, air quality in the UK has improved significantly over the past few decades; in particular, concentrations of sulphur dioxide, originating from the combustion of coal and oil, have reduced. However, some pollutants are continuing to exceed air quality objectives. This has consequences on both human health and on some of our most important habitats that are sensitive to the effects of atmospheric pollutant deposition.

It is considered that the key issues associated with the implementation of the draft HND Implementation Plan and Air comprise:

- Potential for localised effects of air pollutants during the construction phase and / or operational support / maintenance (plant emissions), including in air quality sensitive areas.
- Potential for indirect positive effects on air quality in the long-term through reduction in emissions from power stations owing to new renewable energy connections.

3.2.5.1 Air Quality in the UK

Air quality in the UK is reported annually by DEFRA and the Devolved Administrations of Scotland, Wales and Northern Ireland. The most recent UK report was published for the year 2023 (DEFRA, 2024d). For the purposes of air quality monitoring and assessment of compliance with the Air Quality Standards Regulations (2010), the UK is divided into 43 zones.

The Air Quality Legislation is as follows:

- The Air Quality Standards Regulations (2010), as amended (AQSR);
- The Air Quality Standards (Scotland) Regulations (2010), as amended; and
- The Air Quality Standards (Wales) Regulations (2010), as amended.

These regulations originate from European Union Directives:

- Directive 2008/50/EC of 21st May 2008, on Ambient Air Quality and Cleaner Air for Europe (European Parliament and Council of the European Union, 2008). This is referred to in this report as 'the Air Quality Directive' and covers the following pollutants: sulphur dioxide, nitrogen oxides, particulate matter (as PM10 and PM2.5), lead, benzene, carbon monoxide and ozone. It revised and consolidated previously existing EU air quality legislation relating to the above pollutants.
- Directive 2004/107/EC of 15th December 2004 (European Parliament and Council of the European, 2004), relating to arsenic, cadmium, mercury, nickel and polycyclic

aromatic hydrocarbons in ambient air. This is referred to as 'the Fourth Daughter Directive' and covers the four elements cadmium, arsenic, nickel and mercury, together with polycyclic aromatic hydrocarbons (PAH).

Following the UK's exit from the European Union the following amendments were made:

- The Air Quality (Amendment of Domestic Regulations) (EU Exit) Regulations SI 2019/74. These amend the AQSR (2010) by introducing provisions to allow for PM_{10} limit values being exceeded due to the re-suspension of particulates following winter sanding or salting of roads and transfer responsibilities from the Member State to the Government.
- The Air Quality (Miscellaneous Amendment and Revocation of Retained Direct EU Legislation) (EU Exit) Regulations 2018 makes amendments to transfer responsibilities from the Member State to the Government.

The Air Quality Standards Regulations (2010) set 'limit values', 'target values' and 'long-term objectives' for ambient concentrations of pollutants. These limit values must not be exceeded and are set for individual pollutants and comprise a concentration value an averaging period for the concentration value, a number of exceedances allowed (per year) and a date by which this must be achieved. The UK is legally required to meet the limit values. Target Values are set for some pollutants and are set in the same way as limit values. The UK is legally required to take all necessary measures not entailing disproportionate costs to meet the target value. For ozone, there are also Long-Term Objectives (LTOs) as well as target values. These are based on the same statistics as the ozone target values but are more stringent and have no specified date by when they should be met. As with target values, the UK is legally required to take all necessary measures not entailing disproportionate costs to meet the long-term objectives, but achievement is not legally mandatory.

The following pollutants of concern were monitored in the UK in 2023: Oxides of Nitrogen ((NO_x, with those of most interest including nitric oxide (NO) and nitrogen dioxide (NO_2)), Ozone (O_3), Particulate Matter (PM_{10} and $PM_{2.5}$), Sulphur Dioxide (SO_2), Carbon Monoxide (CO), Benzene (C_6H_6), Lead (Pb), Nickel (Ni), Arsenic (As), Cadmium (Cd), Mercury (Hg), and Polycyclic Aromatic Hydrocarbons (PAH). During 2023 there were 630 national air quality monitoring sites across the UK, each with different objectives, scope and coverage.

The results of the most recent report found:

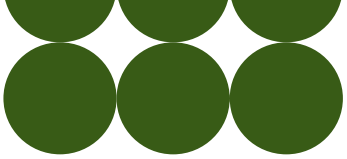
- For oxides of nitrogen, the UK met the limit value for hourly mean nitrogen dioxide (NO_2) in all 43 zones. The limit value for annual mean NO_2 was met for 34 zones, with nine zones exceeding this limit. All zones required to meet the critical level for annual NO_x set for protection of vegetation (non-agglomeration zones) did so. This has been the case since 2008.
- All zones met the limit value for daily mean concentrations and the limit value for annual mean concentrations of PM_{10}. All zones also met the limit value for annual mean concentration of $PM_{2.5}$. The UK continued to meet its 2020 national exposure reduction target for $PM_{2.5}$, based on the Average Exposure Indicator (AEI) statistic national exposure reduction target for $PM_{2.5}$, based on the Average Exposure

Indicator (AEI) statistic. In 2023, the three-year running mean AEI was 8µg m-3; this statistic has therefore remained within the target value. The Environmental Targets (Fine Particulate Matter) (England) Regulations 2023 set a legally mandatory target of 10µg m-3 for annual mean $PM_{2.5}$ concentrations to be achieved by 2040. Legal compliance is assessed using measurements from monitoring stations in England of all site types. One monitoring station in England exceeded this target in 2023 (London Marylebone Road, a roadside site in central London). In 2023 no monitoring stations exceeded the interim target of 12µg m-3, to be met by January 2028. The Environmental Targets (Fine Particulate Matter) (England) Regulations 2023 also set a legally mandatory $PM_{2.5}$ population reduction target of 35% compared to 2018 to be achieved by 2040. An interim target of 22% is to be met by January 2028. The population exposure value for 2023 was 7.88 µg m-3, which constituted a reduction of 22% from the 2018 value. Therefore in 2023 England met the interim Population Exposure Reduction Target (PERT) of 22%.

- For ozone, there were two target values which were met, and two long term objectives where there were exceedances. All zones met the target value based on the daily maximum eight-hour mean, which was set for the protection of human health. All zones met the target value which was set for the protection of vegetation. One zone out of 43 was compliant with the more stringent long-term objective for ozone, set for the protection of human health. This is based on the daily maximum eight-hour mean. There were 13 zones out of 43 compliant with the more stringent long-term objective for ozone, set for the protection of vegetation. There were 26 measured exceedances of the ozone population information threshold of 180µg m-3 in 2023.
- For other measures pollutants, all zones met the limit values for SO_2, CO, C_6H_6 and Pb, and the target values for As and Cd. Three zones out of 43 exceeded the target value for nickel, and two zones exceeded the target value for benzo[a]pyrene.

Local Air Quality Management (LAQM) provides the framework under the Environment Act 1995 (UK Government, 1995) as amended by the Environment Act 2021 (UK Government, 2021), within which air quality is managed by the UK's local authorities. Local authorities undertake review and assessment against the objectives outlined in the Air Quality Acts and in Wales the Environment Act. For locations where objectives are not expected to be met by the relevant target date, local authorities are required to declare an AQMA, and to develop an Action Plan to address the problem. As of August 2024, there are 203 Local Authorities with a total of 440 AQMAs in England, 13 Local Authorities with a total of 29 AQMAs in Scotland and 11 Local Authorities with a total of 44 AQMAs in Wales (DEFRA, no date; 2024d). These AQMAs are set for one or more of the pollutants PM_{10}, NO_2, or SO_2.

The UK National Atmospheric Emission Inventory (NAEI) is the standard reference air emissions inventory for the UK, and includes emission estimates for England, Scotland, Wales and Northern Ireland for a wide range of important pollutants including GHGs, regional pollutants leading to acid deposition and photochemical pollution, persistent organic pollutants (POPs) and other toxic pollutants such as heavy metals. The NAEI is compiled annually, when the latest set of data is added, and the full-time series updated and reported internationally. The latest report was published in October 2022 and covers



the period 2005-2020 (Garland et al., 2022). This summarises emissions in England, Scotland, Wales and Northern Ireland for the eight priority air pollutants: NH_3, CO, NO_x as NO_2, non-methane volatile organic compounds (NMVOCs), PM_{10}, $PM_{2.5}$, SO_2 and Pb. In England and Scotland, all pollutant emission levels were lower in 2020 than they were in 2005, with the greatest decline observed by SO_2 emissions. In Wales, most pollutant emission levels were lower in 2020 than they were in 2005, with the greatest decline observed by SO_2 emissions due to the retrofitting of flue gas desulphurisation and the co-firing of biomass at power stations.

Pollutants such as sulphur and nitrogen oxides emitted by the combustion of fossil fuels (e.g., power generation) can lead to acid deposition – a deposit of air pollutants from the atmosphere leading to acidification of soils and freshwaters through dry deposition of acidifying gases or wet deposition in rainfall (APIS, 2016). Oxidised and reduced nitrogen currently dominate the gases involved in acid deposition. Effects on soils from acidification include chemical changes leading to reduced fertility and nutrient deficiencies; release of toxic metal ions; and changes in microbial transformations. Effects from acidification of freshwaters include reduced viability of a range of aquatic plants from algae to macrophytes, and a loss of acid-sensitive species at all trophic levels, including primary producers, macrophytes and top predators, e.g., fish and waterfowl. Regarding vegetation, the susceptibility of an ecosystem to acid deposition is influenced by geology and soil chemistry, with those growing on acid soils with high aluminium at most risk; low pH (<4.5) results in aluminium in the form of AL^{3+}, which can have high toxicity. pH influences chlorophyll stability, and acidification can lead to reduced light capture and carbon assimilation.

The offshore oil and gas industry has reported a reduction in atmospheric emissions within the last 10 years (2009-2019). The most significant reductions have been in methane and SO_2 emissions. Overall CO_2 has reduced by 7.5%, NO_x has reduced by 9.2%, methane has reduced by 35%, nmVOC has reduced by 7.2% and SO_2 has reduced by 33% (OSPAR Commission, 2025).

3.2.5.2 Summary of Existing Pressures and Issues for Air

According to England's most recent State of the Environment reports air pollution from high levels of nitrogen dioxide, ozone and particulate matter remain as challenges in the improvement of air quality for the protection of human health, while pollutants can also lead to secondary effects on sensitive habitats. However, air quality has improved significantly over the past few decades, and the most recent air quality monitoring report shows that all pollutants, except for NO_2 have met legal limits. The government has proposed a Clean Air Strategy, which is part of the 25 Year Environment Plan. This plan aims to curb emissions from combustion plants and generators, ending the sale of new conventional petrol and diesel cars and vans by 2040, and improving industrial emissions further by building on existing good practice and a successful regulatory framework. These commitments will help with the Plan's pledge to deliver UN Sustainable Development Goals, by helping to achieve better air quality in England (Environment Agency, 2018a).

According to Wales Second State of Natural Resources Report, poor air quality contributes a large environmental risk to ecosystems and health in Wales. However, air quality has improved significantly over the past few decades, and the most recent air quality monitoring report shows that most air pollutants have declined, except for NH_3 and ozone. The Welsh Government has published a 'Clean Air Plan' which aims to meet targets set for key pollutants for both the environmental and health impact, reduce risk at sensitive receptors, complement existing legislation where possible, and consider the potential combined role of new and traditional technologies to assess exposure risks, reduce gaps in coverage and support communications of air pollution in high-risk areas (NRW, 2020).

According to Scotland's most recent State of the Environment Review there has been drastic reductions in most pollutants, however air pollution poses a risk of damage to human health and the environment (Critchlow-Watton et al., 2014). Scotland is performing well by UK, European and global comparison, with both concentrations and emissions of the main air pollutants largely continuing to fall (Scotland's Environment, 2024). 'Clean Air for Scotland 2', published in 2021, is a policy framework published by the Scottish government with actions to deliver air quality improvements (Scottish Government, 2021), with progress on actions reported on an annual basis.

Implementation of the draft HND Implementation Plan, and the construction maintenance and, where relevant, decommissioning activities associated with the potential energy projects including offshore and onshore cabling that may arise as a result, has the potential to lead to temporary, localised, increases in air pollution, including ambient PM_{10} and nitrogen dioxide emissions, resulting in short-term negative impacts upon air quality, and potential for secondary impacts on climatic factors, human health and biodiversity. There is also potential for projects associated with the draft Plan to lead to localised disturbance impacts during construction or maintenance, through dust deposition and visible plumes, resulting from ground movement and influenced by the ambient weather conditions. However, implementation of the draft HND Implementation Plan also has potential to lead to positive effects on air quality in the medium and long-term, with the potential for connection of new renewable energy generators, such as wind turbines, to the national grid expected to support a reduced dependence on fossil fuels and a net reduction in the quantity of pollutants released into the atmosphere. This could have far-reaching positive consequences upon other factors such biodiversity, climate, and human health.

3.2.5.3 Evolution of the Baseline in the Absence of the Plan

In the short-term, the future baseline for air quality in GB is likely to be driven by the current trends and pressures as discussed above. In the longer-term, targets for the decarbonisation of the energy sector have potential for reducing associated emissions to air, with potential to lessen secondary effects on human health and ecology. Changes in the baseline of other air pollutants such as ammonia will be largely driven by GB agricultural policy.

3.2.6 Climatic Factors

Climate change represents one of the most important threats to the GB environment, and to the economy. Projections indicate that hotter, drier summers and warmer wetter winters will occur over the next century because of climate change. The Paris Agreement, signed in 2015, committed to strengthening the global response to the threats of climate change, by holding the global temperature rise to no more than 2°C and preferably below 1.5°C. Key to this agreement is the reduction of GHG emissions fast enough to achieve this temperature goal.

The recent European Green Deal 2019 aims to make significant advances in climate action, providing a more sustainable low-carbon economy for the EU. It plans to boost the efficient use of resources by moving to a clean circular economy, and to restore biodiversity and cut pollution. The Deal has set a goal of net zero carbon emissions by 2050, and a 50-55% reduction in emissions by 2030. The UK Climate Change Act 2008 introduced a legally binding target for the reduction of GHG emissions in the UK by at least 80% below 1990 baseline levels by 2050. The target for the current 2018-2022 period is a reduction in emissions by 37% by 2020 and, for the next period (2025) to reduce emissions by 51%. The Act was amended in 2019 and now commits the UK to reducing emissions by 100% by 2050 from1990 baseline levels (in line with the EU's 'net zero 2050 target'). The Climate Change Act 2008 targets for 2050 for the reduction of targeted greenhouse gas emissions include; to provide for a system of carbon budgeting; to establish a Committee on Climate Change; to confer powers to establish trading schemes for the purpose of limiting greenhouse gas emissions or encouraging activities that reduce such emissions to remove greenhouse gas from the atmosphere; to make provision about adaption to climate change; to confer powers to make schemes for providing financial incentives to produce less domestic waste and to recycle more of what is produced; to make provision about the collection of household waste; to confer powers to make provision about charging for single use carrier bags; to amend the provisions of the Energy Act 2004 about renewable transport obligations; to make provision about carbon emissions reduction targets; to make other provision about climate change; and for connected purposes. The Act also brought a system of Carbon Budgeting to help the UK meet its targets. This was a series of five-year carbon budgets. The UK met its first three carbon budgets, however, is not on track to meet its Fourth (2023-27) or Fifth (2028-32) budgets.

It is considered that the key issues associated with the implementation of the draft HND Implementation Plan and Climatic Factors comprise:

- Potential to support new renewable energy connection, with potential effects on GHG reduction.
- Potential for the short-term generation of GHG emissions from machinery during construction, maintenance and decommissioning activities offshore and onshore.
- Potential for a short-term release of CO_2 from sediments offshore and onshore during construction and decommissioning phases.
- Potential for damage or loss of habitats that are valuable for carbon storage both offshore (blue carbon resources such as saltmarsh, seagrass and maerl beds) and onshore (e.g., peatlands, woodlands).

3.2.6.1 Climate

The UK's weather is variable, due to its mid-latitude location and westerly winds from the Atlantic Ocean, along with its relatively warm waters and its position close to the influences of mainland Europe. The changing topography and land use within the UK, coupled with a long coastline and numerous islands adds to the variable climate (Met Office, no date (a)). The UK has a temperate climate, with a moderate annual temperature range. Generally, the south and east regions tend to be drier, warmer, sunnier and less windy than those further west and north. The average annual precipitation in the UK ranges from approximately 800mm to 1,400mm.

3.2.6.2 GHG Emissions

The UK's GHGs are reported on three bases, territorial, residence (or production) and footprint (or consumption). Territorial emissions cover emissions which occur within the UK borders and tracks progress towards both international and domestic targets, including net zero emissions by 2050. Residence emissions are aligned with the UK National accounts, allowing emissions to be linked to economic sectors. Footprint emissions cover the consumption of all goods and services in the UK, also referred to as 'Carbon Footprint.' All three measures have seen emissions decline compared to 1990; consumption emissions have fallen at a slower rate than territorial and residence emissions (ONS, 2024d).

The UK GHG Inventory reports emissions at an international level in line with UK commitments under the Kyoto Protocol. The Inventory is updated annually, the latest available covers the period 1990-2022 (Brown et al., 2025). In 2022 the largest contribution to emissions came from CO_2 which contributed to 80% of emissions, of which the largest sources were power generation and road transport. Methane emissions accounted for 14% of total emissions, which came from agriculture, waste disposal, leakage from the gas distribution system and coal mining. N_2O contributed 4% to emissions, most of which were

generated from the agricultural sector. Emissions had decreased by 50% since 1990 from 816.4MtCO_2 to 410.3MtCO_2 in 2022.

Energy was the sector responsible for the greatest amount of GHG emissions in 2022 (78%) followed by agriculture (10%), industrial processes and product use (7%), and waste (5%) sectors. Across all sectors other than agriculture and waste management, CO_2 was the most common emitted GHG.

The UK has set out a Net Zero Strategy on how it will deliver on commitments to reach net zero emissions by 2050. The strategy outlines the measures that together aim to transition to a green and sustainable future, helping businesses and consumers to move to clean power, supporting hundreds of thousands of well-paid jobs and leveraging up to £90 billion of private investment by 2030. To reduce the UK's reliance on imported fossil fuels to protect consumers from global price spikes by boosting clean energy. The strategy sets out how the plan will reduce emissions from each sector of the economy (UK Government, 2021).

3.2.6.3 Climate Change

Climate change Projections

Human activities have caused warming of the atmosphere, ocean and land. On average this has caused temperatures to rise 1.1°C above preindustrial temperatures. The UK Climate Change Projections (UKCP18) (Met Office, no date (b)) anticipate a greater chance of hotter, drier summers and warmer, wetter winters with more extreme weather and rising sea levels. The high emission scenario for the UK indicates that, by 2070, winters could be up to 3.8°C warmer and 45% wetter and summers could be up to 5.1°C hotter and 39% drier. With increased rainfall, there is an elevated risk of surface water flooding events which could constrain potential development opportunities, particularly projections under UKCP18 have shown an increased risk of intense heavy summer rainfall events as well as an increase in the hourly rainfall intensity which will increase the frequency and severity of surface flooding events, which may overwhelm existing urban drainage infrastructure.

The emphasis of the UKCP18 marine projections is on changes in coastal sea levels, including extreme water levels that arise from storm surges and surface waves (Palmer et al., 2018). Global sea level has risen over the 20th century and will continue to rise over the coming centuries, which could affect tidal characteristics, including tidal range. The amount of sea level rise projected depends on the location around the UK and the emission scenario; under the high emission scenario, it is predicted that sea levels at London could rise by up to 150cm by 2100, while it is predicted that sea levels at Edinburgh could rise by up to 90cm by 2100. No evidence has been found for significant changes in future storm surges. The UKCP09 multi-level temperature and salinity marine data were not updated for UKCP18. Around the UK, the sea surface temperature (SST) generally shows a significant warming trend of around 0.3°C per decade over the last 40 years, with warming greatest across the southern North Sea, and a predicted warming trend in the future (Cornes et al., 2023). Research to date suggests that it is unlikely that multi-year annual mean wind speeds will change by more than a maximum of ±25% over most of Europe and North America during the present century (IPCC, 2011).

These effects of climate change are likely to increase coastal flooding and will require future development to be adaptable or resilient to future climatic changes and associated impacts. Sea level and storm surge projections, in combination with local information on coastline structure and existing coastal defences, can enable coastal vulnerability assessment. Research from the Marine Climate Change Impacts Partnership has indicated that under climate change storm will alter in their distribution around the UK with lower wave heights predicted in the north compared to an increased wave height in the south. There is predicted by 2100 to be an increase in frequency and intensity of extreme storm events with an increase likelihood of severe storms beginning to reach the UK during the autumn with an extension in the range of the region of origin of tropical cyclones (Bricheno et al., 2025).

According to the UK Climate Change Risk Assessment (CCRA) (UK Climate Risk, 2021), energy related infrastructure in the UK in general is exposed to a range of climate hazards; flooding poses the greatest long-term risk to infrastructure from climate change due to changing frequency and intensity. Disruption to energy infrastructure can also occur due to temperature changes, snow, ice, high winds, lightning and subsidence. There is a risk to offshore infrastructure due to sea level rise and more frequent extreme weather events.

The Evidence Report for the Third UK Climate Change Risk Assessment CCRA3 (Betts and Brown, 2021) assessed the risks to offshore infrastructure from the impacts of climate change, including equipment used by the oil and gas industry, wind, tidal and wave energy, and gas pipelines and power cables on or under the seabed. The vulnerabilities of these infrastructure types due to storms and high waves were considered to include the destabilisation or degradation of mechanical structures, reduced energy output and operating periods, damage to cabling systems during storms and prevention of access for maintenance and inspection activities. The current level of risk was deemed to be low, however, the future risk was allocated as medium magnitude due in part to increasing offshore renewable energy infrastructure and the presence of a large fleet of oil and gas platforms that may be repurposed for carbon capture and storage.

Carbon Sequestration Potential of Habitats

Offshore carbon sequestration (or Blue Carbon) is the carbon captured by ocean and coastal ecosystems and is typically stored in ocean plants and sediments. Blue carbon habitats include mangroves, coastal wetlands, seagrass, and saltmarsh areas, which are frequently in severe decline. Boosting carbon sequestration rates (and reducing GHG levels within the atmosphere) is an area of increased research and need, given that it is estimated that UK blue carbon ecosystems sequester an estimated 11 million tonnes of CO2 annually, representing 30% of all CO2 sequestration by UK ecosystems (Norris et al., 2021). Restoring habitats such as saltmarsh (a hectare of saltmarsh can capture two tonnes of carbon per year), and seagrass (a hectare of seagrass can store a tonne of carbon per year) can have significant potential to further sequester carbon, while the development of kelp forests can also help to increase carbon sequestration rates.

The Wildlife's Trust 'The United Kingdom's Blue Carbon Inventory' (Burrows et al., 2024) estimated that 244Mt of organic carbon is located in long-term stores across UK seas. Of this, 1.7% of total organic carbon is found in coastal vegetated blue carbon habitats (kelp

beds, intertidal macroalgae, saltmarshes and seagrass beds), these habitats represent only 1% of the total area of the UK seas. Coastal saltmarshes in the UK contain 60% of organic carbon in long-term stores in coastal vegetated blue carbon habitats, most of which are found in England and Wales. Known seagrass beds contain 8% of total organic carbon in coastal vegetated blue carbon habitats and living kelp biomass contains 35% of total organic carbon in coastal vegetated blue carbon habitats. Kelp beds are most extensive on the west coast of Scotland. Long-term stores of carbon within MPAs are estimated to contain 43% (105Mt OC) of total organic carbon stores and 45% (534Mt) of total stores of inorganic carbon, with offshore designated sites (MCZs, MPAs and SACs) containing the largest proportion of long-term carbon stores. Inshore littoral MPAs, notably the smaller marine portions of SSSIs, have the highest density and rates of organic carbon accumulation per area, including in coastal muds, saltmarshes and seagrass beds. Predominantly rocky habitat MPAs have less organic carbon in long-term stores.

Activities that are damaging or disruptive to seabed and coastal habitats (e.g., trawling and dredging) can cause the resuspension of stored sediment carbon. Planned offshore infrastructure should consider the potential damage to these habitats and release of carbon and / or reduction in carbon sequestration potential, and factor this into the consideration of overall CO2 emission reductions that may be achieved.

Onshore the natural environment can store a significant amount of carbon in soils, sediment and vegetation. The destruction and degradation of these natural habitats has resulted in a direct loss of carbon. Onshore carbon stores include woodland, trees and shrub, which have the largest carbon sequestration rates within semi-natural habitats. This occurs in woodlands, with old woodlands being important and substantial carbon stores. Open habitats and farmland including heathlands and semi-natural grasslands store more carbon than modern agricultural landscapes, however, typically store less carbon that peatlands, saltmarsh and established woodland. Blanket bogs, raised bogs and fens are the largest carbon stores of all habitats. Damaging land uses within these habitats has resulted in peatlands being a large source of GHG emission. Rivers, lakes and wetland habitats for an important element in carbon cycling by habitats due to their interactions at a catchment scale. Standing waters such as lakes may act as carbon sinks through long-term storage of carbon in sediments (Natural England, 2021b).

3.2.6.4 Summary of Existing Pressures and Issues for Climatic Factors

Climate change represents a significant challenge internationally. GHG emissions in the UK have decreased by 50% since 1990, owing to improvements in energy efficiency, switching from coal to natural gas as a fuel source, and improvements in the management of landfills. The energy supply sector has lower emissions of GHGs currently than it had in 1990. The UK has committed to a target of 100% reduction in GHG emissions by 2050.

Implementation of the draft HND Implementation Plan, and the construction, maintenance and, where relevant, decommissioning activities associated with the potential energy projects including offshore and onshore cabling that may arise as a result, has the potential to lead to temporary, localised, increases in GHG emissions and to loss of, or damage to, offshore and onshore habitats that store carbon. There is also an upfront

carbon cost and GHG emissions associated with the extraction of raw materials and the manufacture of renewable infrastructure. However, implementation of the draft HND Implementation Plan also has the potential to lead to positive effects on GHG emissions in the medium and long-term, with the potential for connection of new renewable energy generators to the national grid expected to support a reduced dependence on fossil fuels and a net reduction in the quantity of GHG released into the atmosphere. This could have far-reaching positive consequences upon other factors such biodiversity and human health.

3.2.6.5 Evolution of the Baseline in the Absence of the Plan

Climate change predictions indicate that several changes will occur in the marine environment. These include a rise in sea surface temperature, rising sea levels, a change in tidal characteristics and an increase in extreme weather and storminess. Predicted climate change effects, such as sea level rise, are likely to affect blue carbon ecosystems, with vulnerability a function of exposure, sensitivity and adaptive capacity (Lovelock and Reef, 2020). Continued disturbance of seabed sediments, through marine industry and activities, and potentially through increased storminess resulting from climate change, has the potential to release sequestered carbon. Decarbonisation of the energy sector has potential for reduced emissions in the long-term and can support the UK targets to limit GHG emissions and moderate the progression of climate change and its effects.

3.2.7 Material Assets

The term 'Material Assets' can be considered very broadly within the SEA process, encompassing for example infrastructure, settlements, transport and utilities. Given the geographic scope of the draft HND Implementation Plan and the large-scale nature of projects that may arise from its implementation, there is potential for offshore and onshore infrastructure development and operation to impact upon, or be impacted by, existing material assets.

It is considered that the key issues associated with the implementation of the draft HND Implementation Plan and Material Assets comprise:

- Potential for interaction with / disruption effects on ports, shipping and navigation during construction and decommissioning and for risks to anchors from cable protection materials or unburied cables along cable routes during operation.
- Potential for interaction (e.g., damage, disruption or access restrictions) with areas of marine infrastructure (e.g. submarine cables, gas and oil infrastructure, existing or planned renewable infrastructure and meteorological infrastructure) and onshore infrastructure (e.g. transport network, non-renewable power stations, oil and gas, renewable infrastructure, waste management infrastructure, water treatment infrastructure, met office radar and manufacturing infrastructure).
- Potential for temporary disturbance or displacement from areas of importance for commercial fisheries and aquaculture, and for long-term effects on fishing activities along cable routes (e.g., risks to fishing gear from cable protection materials, unburied cables or construction debris).
- Potential for interaction with areas used for forestry (temporary damage or access disruption during construction and decommissioning along onshore cable routes to permanent loss in the footprint of onshore infrastructure such as substations / converter stations).
- Potential for temporary damage or access restrictions to agricultural lands during onshore cabling activities, and for permanent loss in the footprint of onshore infrastructure such as substations / converter stations.
- Potential for temporary disruption effects on areas of known military / defence activity and for the presence of UXO to affect the cable installation process.
- Potential for temporary or permanent disruption effects on aviation operations, including navigational radar and telecommunications during construction due to the potential presence of tall equipment (e.g., cranes).
- Potential for indirect effects on coastal tourism, including disturbance and access restrictions.
- Potential for interaction with / disturbance of areas used for offshore disposal or for aggregate extraction and / or onshore disposal or mineral extraction.

3.2.7.1 Marine Infrastructure

Given the presence of marine infrastructure throughout GB waters there is the potential for interaction (e.g., damage, disruption or access restrictions) between the offshore

infrastructure proposed in the draft HND Implementation Plan and the areas containing marine infrastructure such as those discussed below.

Power and Telecommunications Submarine Cables

There are numerous submarine cables located within GB waters. There are 19 operational sub-sea power cables, of which 11 are domestic links or interconnectors. The largest of these are the Western HVDC Link between Hunterston (Scotland) and Connah's Quay (North Wales) which has a capacity of 2,200MW and the Caithness-Moray HVDC Link with a capacity of 1,200MW. There are eight international interconnectors operating between GB and France (3), Belgium (1), Netherlands (1), Denmark (1), Norway (1) and the Republic of Ireland (1), with a total capacity of 9,840MW. The largest of these is the Interconnexion France-Angleterre (IFA) 2000 with a capacity of 2,000MW, whilst the Viking Interconnector to Denmark and the North Sea Link to Norway both have capacities of 1,400MW, respectively. These operational cables are outlined in Table 15. There are also numerous export cables associated with the operational offshore renewable developments discussed in the Renewable Energy Infrastructure Section.

Additionally, there are 20 subsea power cables which are known to be proposed or under construction at the time of writing, with a potential total capacity of 29,270MW. Of these 11 are international interconnectors planned to operate between GB and Belgium (2), Denmark (1), France (3), Germany (2), Republic of Ireland (2) and Netherlands (1). The remaining nine planned interconnectors are domestic with a total potential capacity of 14,720MW. These planned cables are outlined within Table 15.

Subsea Power Cables

Name	Connecting Country	Capacity (MW)
Operational		
BritNed	Netherlands	1,000
Caithness-Moray HVDC Link	Within GB	1,200
Carradale - Arran	Within GB	-
ElecLink	France	1,000
Interconnexion France-Angleterre (IFA) 2000	France	2,000
IFA 2	France	1,000
Isle of Man (IOM)/UK Interconnector	Within GB	65
Isles of Scilly Interconnector	Within GB	7.5
Kerrera - Mull	Within GB	-
Kintyre – Hunterston Link	Within GB	270

Name	Connecting Country	Capacity (MW)
Moyle Interconnector	Within GB	500
Nemo Link	Belgium	1,000
North Sea Link	Norway	1,400
Shetland HVDC Connector	Within GB	600
Skye – Harris	Within GB	-
South Uist Interconnector	Within GB	-
Western HVDC Link	Within GB	2,200
Planned		
Cronos	Belgium	1,400
Nautilus	Belgium	1,400
Aminth	Denmark	1,400
AQUIND	France	2,000
France Alderney Britain (FAB) Link	France	1,250
Gridlink	France	1,250
NeuConnect	Germany	1,400
Tarchon	Germany	1,400
LionLink	Netherlands	1,800
Greenlink	Republic of Ireland	500
MaresConnect	Republic of Ireland	750
Eastern Greenlink 1	Within GB	2,000
Eastern Greenlink 2	Within GB	2,000
Eastern Greenlink 3	Within GB	2,000
Eastern Greenlink 4	Within GB	2,000
LirIC	Within GB	700
Orkney Link	Within GB	220
SeaLink	Within GB	2,000
Spittal - Peterhead	Within GB	2,000
Western Isles HVDC	Within GB	1,800

Table 15: Operational and planned subsea power cables within GB waters

GB is a key hub in global telecommunications (DBEIS, 2022). There are a significant number of subsea telecommunication cables which land in GB. These include approximately 56 major systems which connect GB to Northern Ireland (e.g. Scotland to Northen Ireland 3), Ireland (e.g. Geo-Eirgrid), British Islands (e.g. BT (British Telecommunications) Highlands and Islands Submarine Cable System), mainland Europe (e.g. Ulysses 2) and other continents including North America (e.g. EXA (EXA Infrastructure) Atlantic), Africa (e.g. West Africa Cable System) and Asia (e.g. FLAG (Fibre-optic Link Around the Globe) Europe-Asia (FEA)). Additionally, there are two known planned telecommunication systems which will connect GB to Ireland (Beaufort), and Denmark, Germany, Netherlands and Norway (IOEMA). These cables carry a substantial portion of global internet traffic, making GB a critical gateway for global data transmission.

The major operational power and telecommunications cables in GB waters are shown in Figure 21.

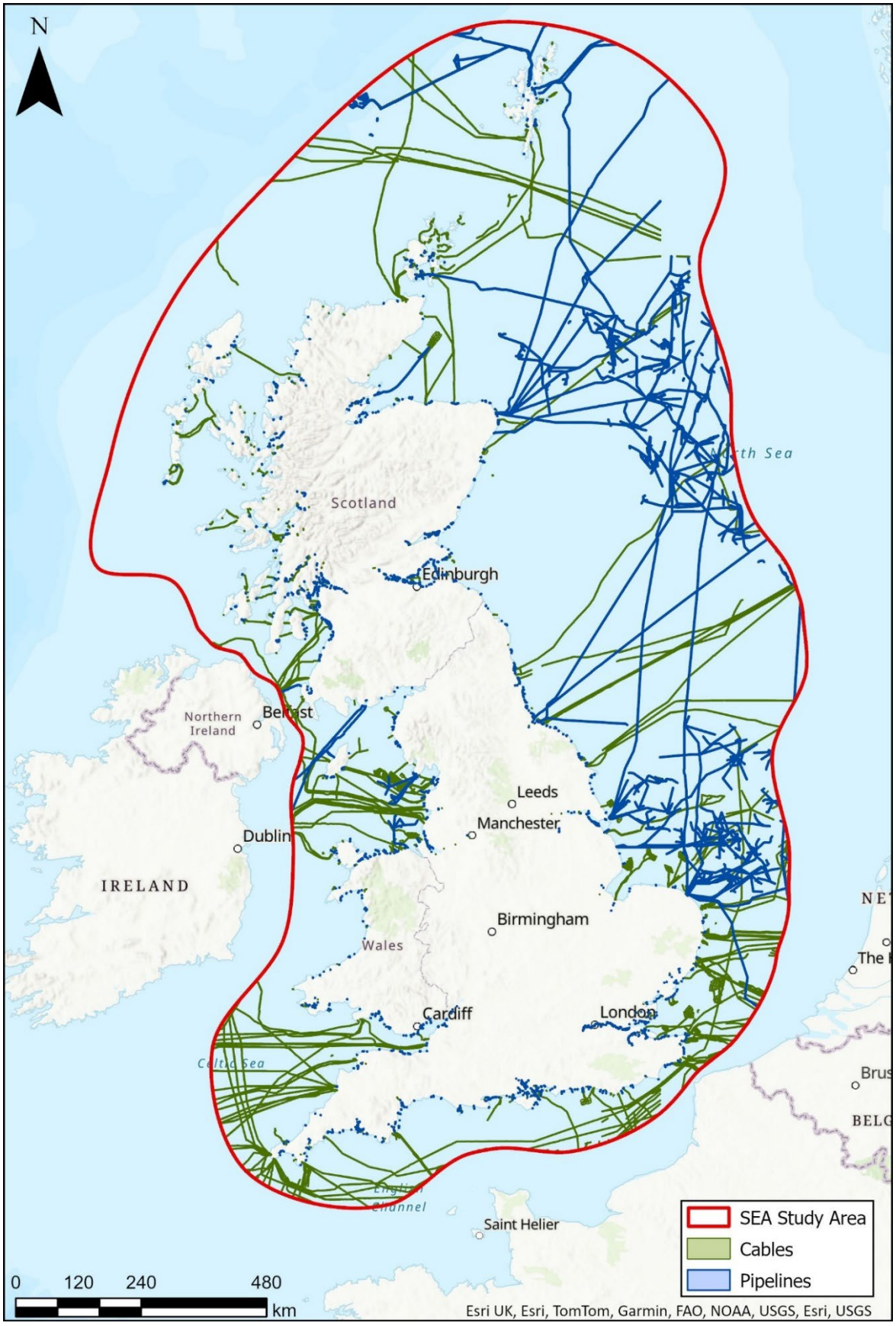


Figure 21: Locations of major operational offshore cables and pipelines in GB waters

Offshore Oil and Gas Infrastructure

Offshore oil and gas has been a significant contributor to the UK's energy sector for decades. The UK's oil and gas sector is dominated by production from offshore areas, which account for virtually all of UK output. The UK's petroleum reserves remain at a significant level with the North Sea Transition Authority (NSTA) estimating that the proven and probable UK reserve is 3.5 billion barrel of oil equivalent (boe) at the end of 2022 (NSTA, 2022). Total oil and gas production equalled c. 1.4 million boe/day in 2023, approximately 70% of this was from oil production and 30% from gas production. Offshore oil production reached a new record low of 34 million tonnes in 2023, a reduction of 11% from 2022 (Annut and Campbell, 2024), whilst gas production reduced by 9.6% in 2023 compared to 2022 as output in the North Sea declines.

The offshore oil and gas industry is mainly centred around the North Sea, west of the Shetland Isles and the East Irish Sea (DBEIS, 2022). There are currently 381 petroleum licenses, of which 83 are in the southern North Sea, 157 in the central North Sea, 97 in the northern North Sea, 11 in the Irish Sea and 33 west of the Shetland Isles (NSTA, 2025a). There are currently approximately 272 hydrocarbon fields in GB waters, of these 80 are gas fields, 155 are oil fields and 37 are gas condensate. Oil is the dominant hydrocarbon resource produced in the north and central North Sea, whilst gas is the dominant hydrocarbon resource produced in the east Irish Sea. Oil and Gas production is associated with a range of fixed infrastructure including 226 platforms.

Furthermore, there are a significant number of major pipelines within GB waters, with over 2,000 active pipelines noted by the NSTA (2025a), which are mainly associated with oil and gas activities. These pipelines carry oil, gas, gas condensate and other chemicals from offshore platforms to coastal infrastructure (such as gas terminals) and are primarily located in the south, north and central North Sea, the east of the Irish Sea and surrounding the Shetland Islands. One of the most substantial pipeline systems in the North Sea is the Forties Pipeline System. The majority of these pipelines carry gas, whilst large numbers carry condensate, oil and chemicals, and a smaller number transport methanol, hydraulic and other fluids, whilst approximately 5% of pipelines are classified as water injectors. Key coastal landfalls in GB are located at the St. Fergus Gas Terminal, the Easington Gas Terminal and the Bacton Gas Terminal at which pipeline landfalls are concentrated (see in Onshore Oil and Gas Section).

The storage of carbon dioxide produced from power generation and industrial processes within geological formations is currently at an early stage of development. There are currently 28 carbon dioxide appraisal and storage licenses located on the UK continental shelf (UKCS), including projects proposed in depleted hydrocarbon reservoirs mainly located in the North Sea, and an endurance storage site located in a saline aquifer 75km east of Flamborough Head, off Teesside on England's east coast (NSTA, 2025a).

There is one operational offshore gas storage facility in the UKCS, namely the Rough Gas Storage Facility located 18 miles off the coast of East Yorkshire, and there is a gas storage licence for a planned storage site located at the Bains gas field in the East Irish Sea.

Existing offshore oil and gas infrastructure is displayed in Figure 22.

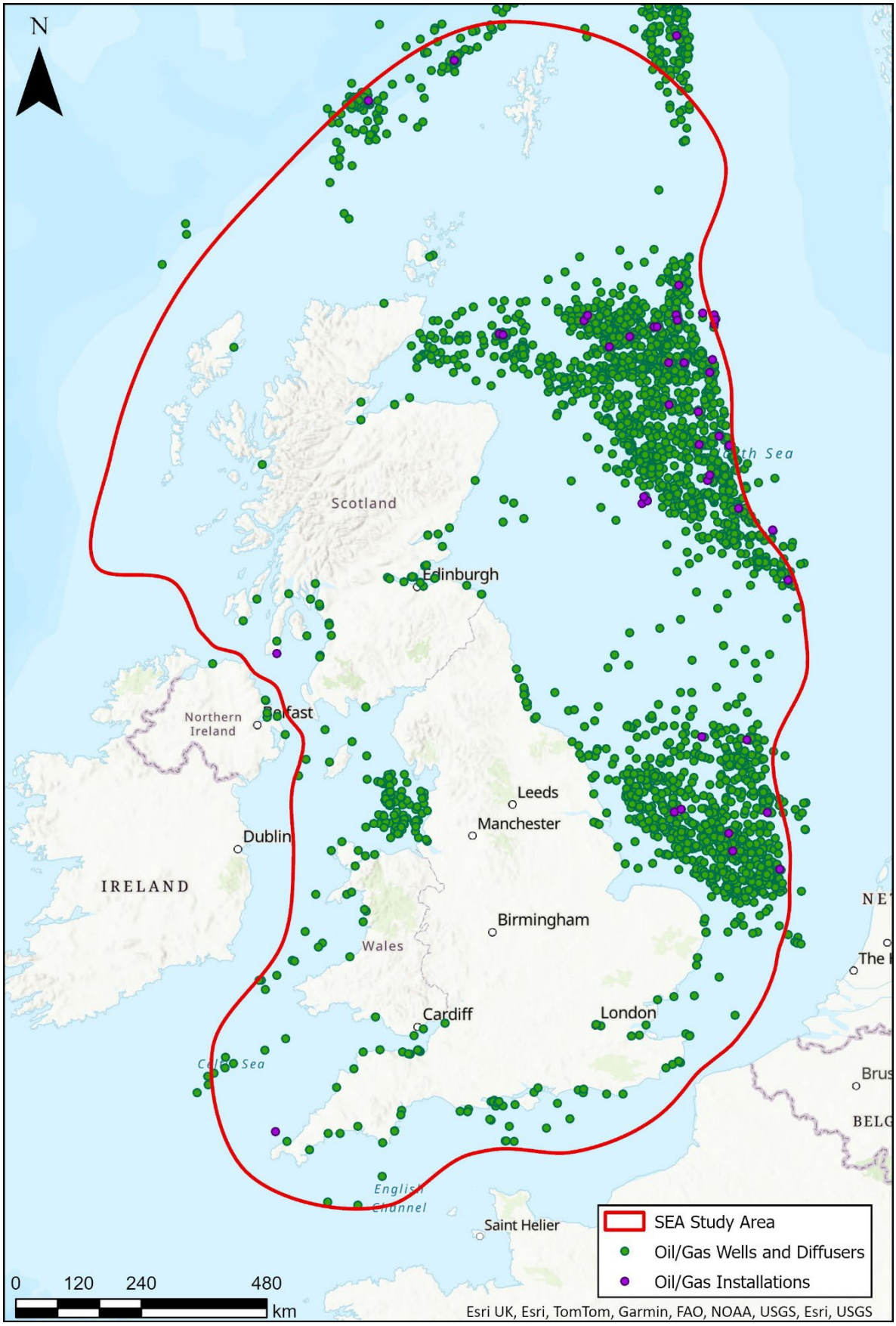


Figure 22: Locations of major offshore oil and gas infrastructure in GB waters

Renewable Energy Infrastructure

Offshore Wind

The development of offshore wind in GB waters is relatively advanced, with over 80 wind farms that are operational or in planning/development (DBEIS, 2022). There are currently 43 fully commissioned offshore wind farms which comprise 2,765 offshore turbines and have an offshore operational capacity of 14,733MW and energy production of approximately 52,500,000MWh/year (RenewableUK, 2024). The majority of these wind farms are located off the east coast of GB. There are three fully commissioned wind farms with an installed capacity greater than 1000MW, the Hornsea Project One (1218MW) and Hornsea Project Two (1386MW) in the Yorkshire and Humber Region, and the Seagreen Wind Farm (1140MW) in the Outer Firth of Forth.

There are five wind farms currently under construction, three of which are located at Dogger Bank (Sofia – 1400MW, Dogger Bank A – 1200MW, Dogger Bank B – 1200MW) whilst one is located in Outer Moray Firth (Moray West – 860MW) and one is located in Outer Firth of Forth (Neart na Gaoithe – 448MW). There are also 21 wind farms which have been consented, of which five are to be located in East Anglia and consent applications have been submitted for a further 17 planned offshore wind farms, and there are 30 offshore wind farms in concept/early planning phase of which 24 are located in Scottish Waters.

Tidal and Wave

Regarding tidal energy infrastructure, The Crown Estate have agreements for eight sites in waters surrounding GB (NSTA, 2024). Seven of these sites are located off the coast of Wales namely, three Milford Haven Estuary (META Phase 2) sites at East Pickard Bay, Warrior Bay and Dale Roads, Ramsey Sound, West Anglesey Demonstration Zone, Holyhead Deep and Bardsey Sound. Additionally, there is one consented site, Perpetuus Tidal Energy Centre (PTEC), consented off the south coast of the Isle of Wight.

Crown Estate Scotland has ten agreements for tidal energy in Scottish Waters (NSTA, 2024). Marine leases exist for six operational sites at Shapinsay Sound, Deer Sound and Fall of Warness near the Orkney Isles, Inner Sound between Gills Bay and Island of Stroma, Bluemull Sound surrounding the Shetland Isles, and Dunlossit between Islay and Jura. While there are agreements/options for lease for four projects in pre-planning at Oran na Mara between Islay and Jura, Yell Sound and Westray South at the Shetland Isles and Ness of Duncansby off the coast of Caithness. There are no tidal lagoon sites within GB waters.

In terms of wave energy infrastructure, The Crown Estate have agreements for two sites in GB waters (NSTA, 2024). FabTest at Falmouth Bay off the south coast of England is operational, whilst the South Pembrokeshire Demonstration Zone is at the pre-planning stage. There are three sites leased by Crown Estate Scotland for operational wave energy projects in Scottish Waters. All three sites are located off the Orkney Islands, namely European Marine Energy Centre (EMEC) Billa Croo, EMEC Scapa Flow and Deerness.

Offshore renewable infrastructure is displayed in Figure 23.

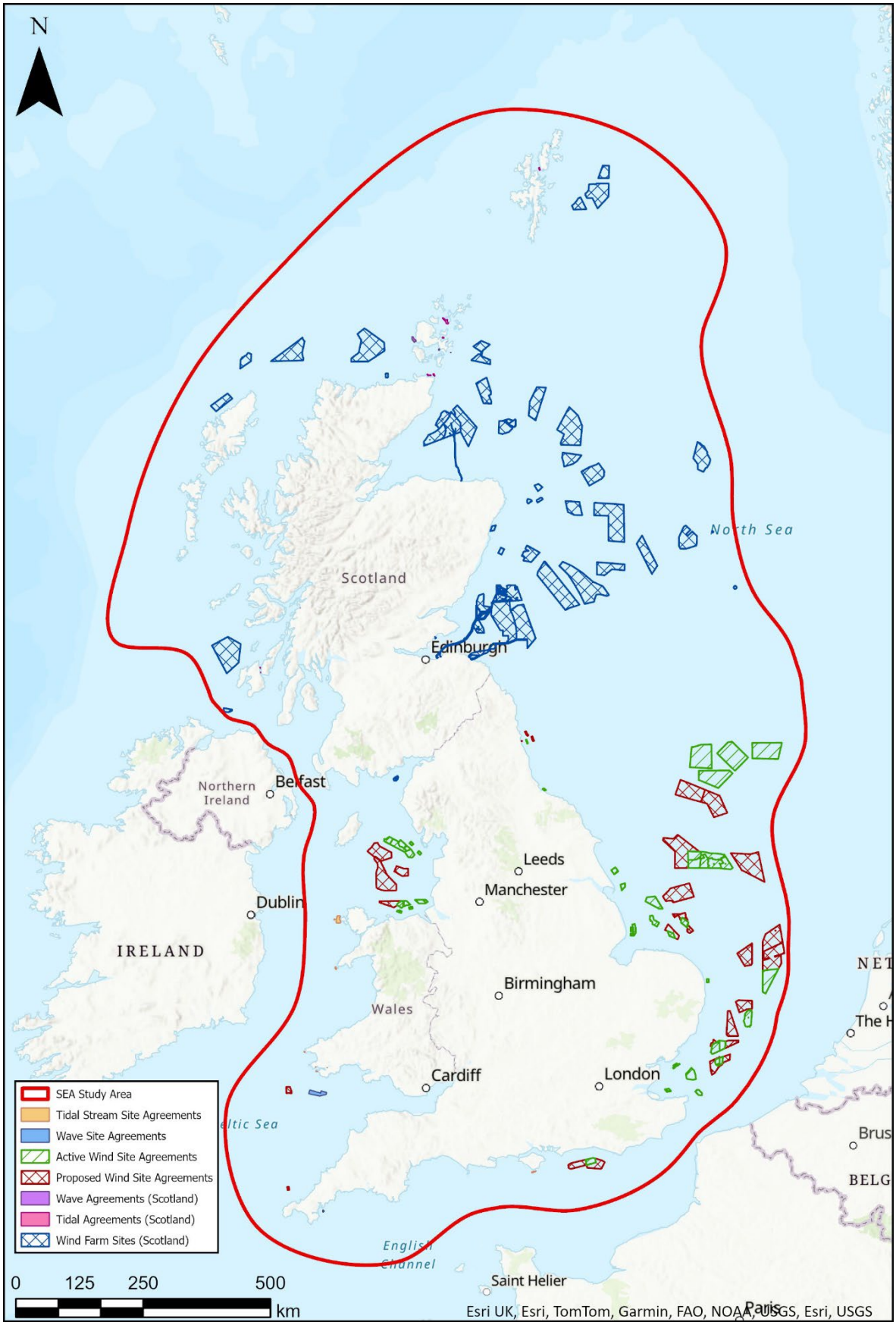
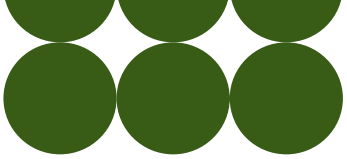


Figure 23: Offshore renewable infrastructure in GB waters



Offshore Meteorological and Oceanographic Equipment

Marine observations are gathered from five main sources from the Met Office including marine automatic weather stations (MAWS) (moored buoys, light vessels, offshore installations), voluntary observing ships, shipbourne automatic weather stations (Met Office, no date (c)). Drifting buoys and Argo floats (compact measuring devices which descend to the depths of the oceans).

Those in permanent locations are of most relevance to the draft HND Implementation Plan. Eleven moored buoys and seven systems on lightships and islands comprise the Met Office's network of MAWS. Nine moored buoys are located in GB waters with six in the open ocean to the west of the British Isles and three are located in coastal inshore waters. There are two Met Mast agreements in the southern North Sea, and one in the central North Sea. LiDAR equipment is located in the south North Sea. There are also 33 Met Office observation sites located around the GB coastline.

3.2.7.2 Onshore Infrastructure

Given the presence of onshore infrastructure throughout GB, there is the potential for interaction (e.g., damage, disruption or access restrictions) between the onshore infrastructure proposed in the draft HND Implementation Plan and the areas containing existing infrastructure such as those discussed below.

Transport Network

The road network of GB intersects both urban and rural areas in the form of major roads (motorways and A roads) and minor roads (B roads, C roads and U roads); together these comprise approximately 395,416km of public road (UK Government, 2024). Approximately 76% of all roads in GB are located in England, 15% in Scotland and 9% in Wales. Wales has the highest proportion of rural roads, (88% of A roads, 77% of minor), whilst England has the lowest (71% of A roads, 57% of minor). In Scotland 84% of A roads and 61% of minor roads are considered rural.

GB also has an established surface railway network, the mainline railway covers a distance of 15,846km, of which 39% is electrified, and comprises 2,585 stations (DfT, 2025). There are 24 Train Operating Companies (TOCs) in GB, 22 in England, one in Scotland and one in Wales (Office of Rail and Road, 2024). Approximately 20% (3,121km) of the GB mainline rail and 358 stations are located within Scotland, 12% (1,827km) of the rail network and 248 stations are located in Wales, whilst 68% (10,898km) and 1,979 stations are located in England. Additionally, there are a number of private, minor or heritage railways within GB, these privately owned railways range in size and scope of operation and are separate from the mainline railway (although some have physical connections and interworking with the mainline). The UK heritage rail sector encompasses more than 170 operational railways, running trains over nearly 965km of track and operating between some 460 stations. There are also underground (London Underground), light rail (Docklands Light Railway), and tram systems (Edinburgh Trams) located in cities across GB.

The main transport infrastructure in GB (major roads and mainline surface rail) is shown in Figure 24.

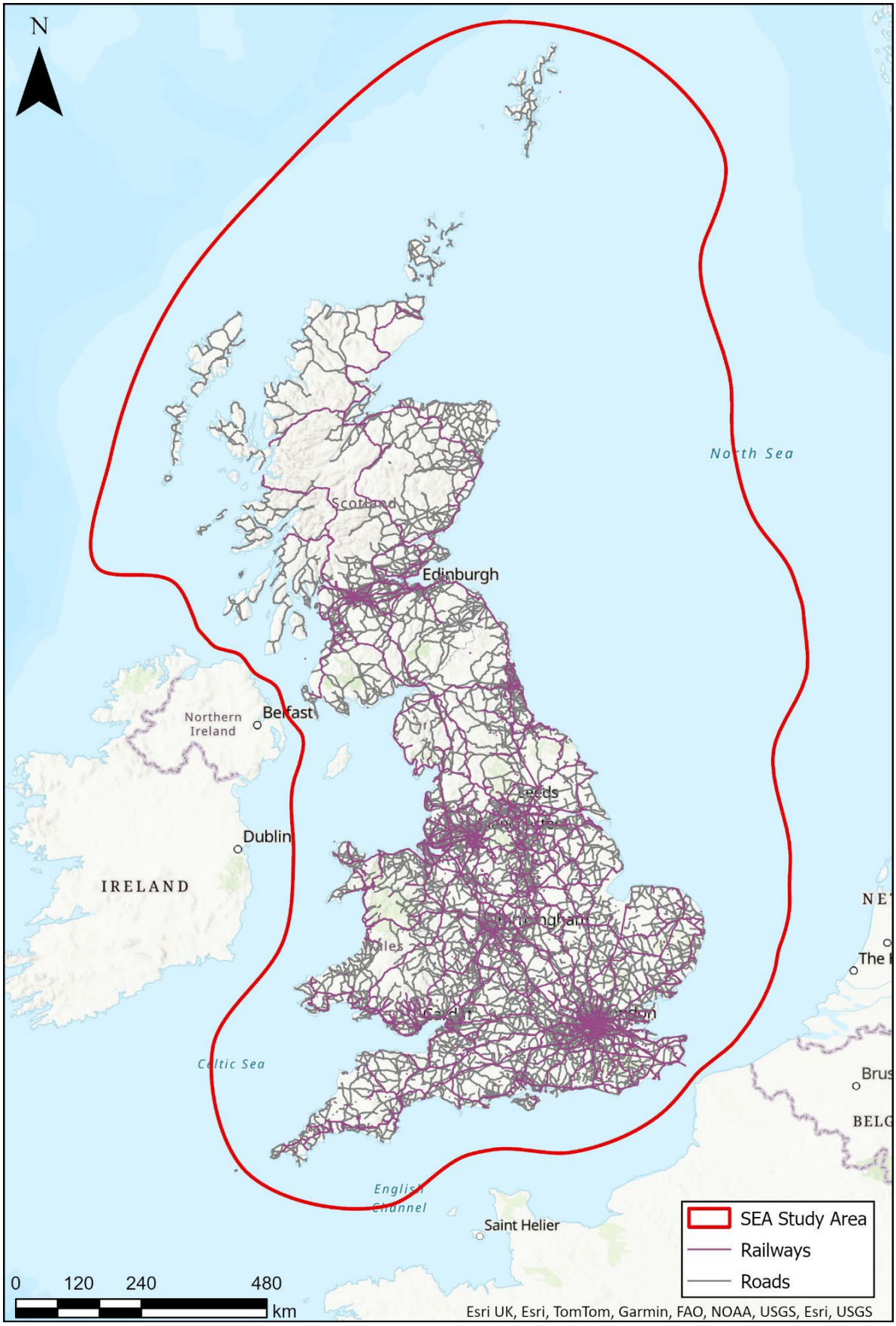


Figure 24: Location of major transport networks in GB

Non-Renewable Power Stations

Electricity generation in the UK is sourced from various fuels including fossil fuels, nuclear power, renewables and other fuels. There are 63 fossil fuel power stations in GB (DESNZ, 2024a) with an installed capacity of 32,996MW. Of these 75% (47) use natural gas as a primary fuel, 24% (15) use Diesel / Gas Oil as a primary fuel and 1% (1) use sour gas as a primary fuel. The majority (47) of the natural gas fuelled power stations are located in England primarily across the East Midlands, South East and Yorkshire and the Humber regions, often near the coast. While one is located in Peterhead in Scotland and one in Pembroke in Wales. Additionally, there is a sour gas fuelled power station located at Connah's Quay in Wales. Majority (8) of diesel / gas fuelled power stations are located in Scotland primarily in the Western Isles such as the Outer Hebrides, Isle of Tiree, Islay and Isle of Reasay, as well as the Shetland Isles and Orkney. Whilst the seven in England are located in the South East, South West, London regions as well as the East Midlands.

There are six nuclear power stations in GB with an installed capacity of 6848MW. Five of these are located in England primarily in coastal regions in the South West (Hinkley), North East (Hartlepool), North West (Heysham) and East of England (Sizewell). While one is located at Torness in Scotland.

The National Grid

The UK's National Electricity Transmission System (NETS) is formed mainly of three separately owned but connected transmission systems and a number of offshore transmission lines, with a common system operator (SO), the National Energy System Operator (NESO). As the SO, NESO is responsible for the management of the flow of electricity from generation to transmission, for planning and coordinating the design of electricity networks.

The three companies which manage the transmission systems which comprise the NETS include:

- National Grid Electricity Transmission (NGET) which manages the network in England and Wales;
- Scottish Power (SP) Transmission which manages the network across central and southern Scotland; and
- Scottish and Southern Electricity Networks (SSEN) Transmission across northern Scotland.

The NGET network consists of 522 substations with a voltage equal to or greater than 132kV, as well as a number of lower voltage substations. There are over 7000km of 400kV and 275kV overhead lines. The SP network comprises 219 substations with a voltage equal to or greater than 132kV, as well as a number of lower voltage substations. There is also over 2000km of 400kV and 275kv overhead lines. The SSEN network contains 157 substations with a voltage equal to or greater than 132kV, as well as a number of lower voltage substations. There is over 2000km of 400kV and 275kV overhead lines. Each of these networks also comprise lower voltage local distribution networks consisting of both overhead lines and cables. Some infrastructure including overhead lines, cables and

substation within each network is located in the vicinity of the coastlines of Scotland, England and Wales.

The main existing transmission network infrastructure in GB is shown in Figure 25.



Figure 25: Main existing transmission network infrastructure in GB

Onshore Oil and Gas

The gas National Transmission System (NTS) in Britain is owned, operated and managed by National Gas Transmission plc (National Gas) (National Gas, 2025). Highly pressurised gas is transported to power stations, major industries, storage facilities, over 0.5 million businesses and approximately 23 million homes. The NTS consists of more than 8,000km of pipeline across GB and more than 500 above-ground installations. There are 21 compressor stations located at intervals along the NTS pipelines, which play a vital role of maintaining gas flow. Of these, three are in Scotland, one in Wales and 17 in England.

Gas is fed into the NTS via the seven gas terminals and two non-NG owned Liquified Natural Gas (LNG) Terminals (National Gas, 2024). The gas terminals are located in proximity to the coastline at St. Fergus in Scotland, Teeside, Easington, Barrow, Theddlethorpe and Bacton, in England and Burton Point and Herbrandston in Wales. Liquefied Natural Gas (LNG) is also received into the GB gas network through key import terminals located at Milford Haven in South Wales and the Isle of Grain in south-east England. Furthermore, international interconnectors feed into the NTS, namely the Interconnector Limited (INT) interconnector between Baction and Zeebrugge, and the Balgzand to Bacton Line interconnector between Bacton and Den Helder (Netherlands).

Gas is then exported to Power Stations, energy industries, offshore or onshore storage, gas distribution networks (Cadent, Northern Gas Networks, SGN or Wales and West Utilities) or to the three gas interconnectors: INT interconnector to Belgium, Balgzand to Bacton Line (BBL) interconnector to the Netherlands and Moffat to Republic of Ireland Interconnector. There are onshore gas storage facilities in GB including Stublach and Hill Top Farm in Chesire, Hatfield Moor in Doncaster, Humbly Grove in Alton, Aldborough in East Yorkshire, Holford in Somerset and Atwick in Hornsea. These onshore gas storage facilities are located in England, with majority in relatively close proximity to the coast.

Conversely, the onshore oil pipeline network is not a single, centrally managed network, and consists of several interconnected key pipeline systems operated by various companies which transport crude oil, refined products and natural gas liquids across different regions. The principal systems which comprise this pipeline network includes the Exolum Pipeline System, the Esso pipelines and the United Kingdom Oil Pipelines (UKOP). In total, there are over 3,000km of oil pipelines.

Oil is fed into the oil pipeline system via the seven oil terminals on GB (NSTA, 2025a). The oil terminals are located in proximity to the coast at Sullom Voe, Flotta, Nigg Bay, Cruden Bay, Dundrod Point and Corsewall Point in Scotland, as well as at Teeside in England.

The oil network connects the six major oil refineries and around 60 terminals used for import, export, distribution and storage of oil products. Storage terminals are located both near the coast and inland with five located in Wales surrounding Cardiff and Pembroke, six in Scotland at Inverness, Peterhead, Aberdeen, Clydebank, Grangemouth and Finnart, and 32 in England which are primarily concentrated surrounding the Thames, the River Tees. The main six operational refineries include the Essar Stanlow Manufacturing Complex in Cheshire; the ExxonMobil Refinery at Fawley; the PetroIneos Grangemouth Refinery in Scotland; the Phillips 66 Humber and Total Lindsey Oil Refineries in Humberside; and the Valero refinery at Pembroke in Wales.

The main gas infrastructure (gas NTS) is shown in Figure 26.



Figure 26: Gas National Transmission System (NTS) in GB

Onshore Renewable Infrastructure

Onshore Wind

There is significant onshore wind infrastructure throughout GB which contributed 11.2% to the UK's total electricity generation in 2023. There are 2,654 operational onshore wind farms in GB which comprise of 9,196 wind turbines and have an onshore capacity of 15,714MW (RenewableUK, 2024). Onshore wind generation is primarily concentrated in Scotland with an installed capacity of 10,130MW across 850 wind farms. These wind farms are located throughout Scotland, across the east of the Borders, the south and north-east of Strathclyde, the north and east of Grampian, the east of Central Scotland and the north-east of the Highlands as well as the Outer Hebrides and the Shetland and Orkney Isles. They are often in proximity to the east and south-west coastlines. Whilst 766 wind farms with a capacity of 2950MW are located in England primarily across the south-west of the Southwest Region, the north-east, the south of Yorks and Humber, the south and north of the north-west, the East Midlands, and the north-east of East Anglia. Additionally, there are 222 wind farms in Wales with a capacity of 1,261MW. These are primarily located in south Wales within Mid and West Glamorgan and the south-west of Dyfed as well as the centre of Powys and within Clwyd in the north.

Solar Photovoltaics

There are currently approximately 1,334 operational solar farms in GB with an installed capacity of around 9,185MW (DESNZ, 2024b; 2024c). Solar energy generation is primarily concentrated in England within an installed capacity 8,183MW across 1,167 solar developments. High concentrations of solar farms in England are located in the South West, South East, Eastern and East Midlands regions. There are 39 solar developments across Scotland with an installed capacity of 84MW, these are primarily located in the Central and North Strathclyde regions of Scotland, with some located in the vicinity of the eastern coastline. Wales contains 128 solar developments, with an installed capacity of 912MW, the majority of which are located in south Wales with some relatively close to the coast.

Hydropower

There are currently 95 operational Hydropower facilities in GB with an installed capacity of 620MW (DESNZ, 2024b; 2024c). These facilities consist of 23 large-scale hydro facilities (installed capacity of 471MW) which harness energy from reservoirs through turbines and 72 small-scale hydro facilities (installed capacity of 149MW) which harness energy from rivers, streams and other water courses. Hydropower in GB is mainly located in Scotland, particularly in the Highlands and the central belt, with 87 hydro facilities. These include 20 large-scale hydro facilities and 67 small-scale which in total have an installed capacity of 557MW. There are six operational hydro facilities in northern and central Wales with a total installed capacity of 54.8MW, these consist of two large-scale hydro facilities and two small scale. There are only two operational hydro facilities located in England, the Keilder large-hydro facility in Northumberland and the Beeston Weir small-scale hydro scheme in Nottinghamshire, which together have an installed capacity of 7.8MW. The majority of the hydro power facilities are located inland; however, some are located relatively close to the western coastline of Scotland.

Biomass

There are 81 biomass sites across the UK with an installed capacity of 4,143MW (DESNZ, 2024b; 2024c). Of these, 57 are located in England with an installed capacity of 3,782MW, 16 in Scotland (238MW) and eight in Wales (123MW). Most sites are dedicated biomass sites, however, there are three co-firing sites; two located in Wales and one in England. Majority of biomass sites are located in inland regions although some are located within the vicinity of the east and south coastlines of England, south coast of Wales and east and west coasts of Scotland. There are also 268 landfill gas sites located across GB with an installed capacity of 750MW. The majority of these are located across England (224) with 30 and 14 located in Wales, respectively.

Anaerobic Digestion, Energy from Waste (EfW) and Advanced Conversion Technologies

There are renewable energy technology types which may also fall under the umbrella of waste management infrastructure, these include anaerobic digestion, Energy from Waste (EfW) and Advanced Conversion Technologies (e.g. gasification). Although these types of infrastructure are often located inland, some are located near the coastline as stated in the Waste Management Infrastructure Section. There are 143 anaerobic digestion sites throughout GB with an installed capacity of 322MW (DESNZ, 2024b; 2024c). Of these 124 are located in England, 14 in Scotland and 5 in Wales. There are 60 operational EfW plants in GB which have an installed energy capacity of 1,480MW. Of these 60, majority are located in England (51) with one in Wales and seven in Scotland. There are approximately eight located in proximity to the east coast of England and Scotland. The largest EfW by permit capacity is the Runcorn EfW Facility in Halton. There are 19 Advanced Conversion Technology plants across GB with an installed capacity of 227MW (DESNZ, 2024b; 2024c). Of these 12 are located in England, five in Scotland and two in Wales.

Other

There is additional renewable energy infrastructure throughout GB which are generally much less established than the renewable energy sectors discussed above (DESNZ, 2024b; 2024c). Sewage sludge digestion is undertaken at 12 sites which include sewage treatment works, wastewater treatment works and Digestion Plants, with an installed capacity of 50MW. Eleven of these sites are located in England with a few located in proximity to the eastern coastline, and one is located in Cardiff in Wales. There are four pumped storage hydroelectricity facilities in GB (two in North Wales and two in the Scottish Highlands) with an installed capacity of 2,828MW. There is one geothermal site (Eden Project) located in Cornwall in England. There is currently one compressed air energy storage, one flywheel, one hot dry rocks, one hydrogen and one liquid air storage facilities located in England. Additionally, there are 116 operation battery storage facilities in GB with 94 in England, 18 in Scotland and four in Wales.

Waste Management Infrastructure

The waste management infrastructure in GB is comprised of local and national systems designed to handle household, commercial and industrial waste. This includes a network of waste management facilities, recycling centres and waste transfer stations, as well as

incinerators, anaerobic digestors and landfill sites. Additionally, GB has invested in energy-from-waste (EfW) facilities in an attempt to reduce reliance on landfills.

As stated in Section 3.2.3, there are approximately 540 active landfill sites throughout GB. Higher concentrations of landfill sites are found across England, particularly across the Midlands, the north-east of England and the south-east of England. These are mainly located in industrial or rural areas with some still surrounding urban regions, and although the majority are located inland many are still located in proximity to the coast. There are significantly fewer number of landfill sites located in Wales, these are primarily located in coastal areas, in vicinity to urban areas such as Cardiff, Pembroke, Milford Haven, Fishguard, Aberystwyth, Holyhead and Bangor. Scotland has fewer landfill sites then England but more than Wales. Similarly, these are primarily located in industrial or rural regions, both inland and at the coast, with higher concentrations across the Central region surrounding Stirling, north Strathclyde region surrounding Glasgow, Lothian region surrounding Edinburgh and east coast of the Grampian region in proximity to Aberdeen.

Facilities such as incinerators, EfW, anaerobic digestion plants and advanced technology conversion facilities are distributed throughout GB in both inland and coastal locations, however, these are primarily located near major urban centres or industrial areas where large volumes of waste are generated such as Leeds, Liverpool, London and Birmingham. These are discussed in further detail in the Onshore Renewable Infrastructure Section.

Water Treatment Infrastructure

GB has extensive water treatment infrastructure which is designed to provide clean drinking water and safely manage wastewater across the country. Government regulated water companies primarily manage the water treatment infrastructure. This infrastructure includes Water Treatment Works (WTWs), Wastewater Treatment Works (WwTWs), desalination plants, sewerage systems and stormwater management systems. Major WTWs are located in proximity to large population centres and key water sources, as such are primarily located relatively inland. WwTWs which process sewage and other waste products are of most relevance to the HND Implementation Plan, as they are primarily located near population centres and along coastal regions to manage waste. This can be seen in Wales and England with many WwTWs located along the coastlines, 2022; Giakoumis and Voulvoulis, 2023), as well as in Scotland where higher concentrations are located on the Islands and on the west coast of the highlands (Marine Scotland, 2024a). Desalination plants are also of relevance to the draft HND Implementation Plan as they are located in proximity to the coastline as they utilise seawater as their primary source. There are 96 desalination plants in the UK; of these, 81 are located in England, 11 in Scotland, and four in Wales (EC, 2021). Additionally, temporary desalination plants may be operational during construction activities, such as at the Sizewell Nuclear Power Station in Leiston, Suffolk in England.

Met Office Radar Sites

There are 17 Met Office radar sites located throughout GB (five in Scotland, one in Wales and 11 in England), as well as seven radio sites across GB (DBEIS, 2022). As with other radar, potential interference may be generated by impositions from structures such as cranes or

transmission towers, which may adversely impact meteorological radio facilities if not sited with careful prior consideration. The Met Office protects its operational radio interests by engaging in the formal planning consultation process. This ensures that important national capabilities such as the UK Weather Radar Network which, are vital to the provision of meteorological services to aviation and other civil contingencies stakeholders, are not unduly compromised by development.

Manufacturing Infrastructure

GB has a diverse manufacturing industry with key sectors including automotive manufacturing, aerospace manufacturing, pharmaceuticals and chemicals, steel and heavy industry, and food and drink manufacturing, among others. The infrastructure associated with these key manufacturing industries is spread across GB. Much of this infrastructure is located in relatively coastal areas, benefitting from proximity to key ports and trade routes. The main hubs for automotive manufacturing include Oxford, Sunderland and Solihull. The Midlands, North West and South West regions of England are key centres for the aerospace industry. Pharmaceuticals and chemical manufacturing is particularly prevalent surrounding Manchester and London, whilst Port Talbot in South Wales and Sheffield in South Yorkshire have been important for the steel industry, however the Port Talbot Steelworks closed in 2024. Major infrastructure associated with the food and drink industry is located in Aberdeen and Edinburgh in Scotland as well as East Anglia, Yorkshire and Humber and north-west England.

3.2.7.3 Ports, Shipping and Navigation

There is potential for interaction with / disruption effects on ports, shipping and navigation in GB waters during construction and decommissioning of infrastructure proposed within the draft HND Implementation Plan and for risks to anchors from cable protection materials or unburied cables along cable routes during operation.

Commercial Ports

As an island, commercial ports are fundamental to the UK's global success as an outward-facing trading nation (DfT, 2024). Current available data indicated that approximately 95% of all goods entering and leaving Britain are transported by sea, while in 2019, the maritime sector directly contributed £18.7 billion in gross value to the UK economy. Ports in the UK are situated around the coastline, influenced by historical considerations such as advantageous geography. In terms of freight, a total of 434.9 million tonnes were handled by all UK ports in 2023.

In 2023, 51 ports were considered major ports in the UK. Of these, 28 were located in England, eleven in Scotland and seven in Wales, with the remaining five located in Northern Ireland. These ports handle at least one million tonnes of cargo annually or are strategically important. Major ports accounted for majority of all UK traffic in 2023, handling 425.9 million tonnes (98%), whereas minor ports handled just nine million tonnes (2%).

The top ten major ports by tonnage are indicated in Table 16. It was noted that in 2023, 69% of all cargo traffic at UK major ports was attributable to these. It can be observed that

London was the busiest port in the UK in 2023, accounting for 12% (equal to 51.6 million tonnes) of all UK major port tonnage traffic handled. Milford Haven was the busiest Welsh port and 3rd busiest port in the UK accounting for 8% of all UK major port tonnage handled. The busiest port in Scotland was Forth which was the 9th busiest port in the UK, accounting for 4% (equal to 18.52 million tonnes) of all UK major port tonnage handled.

Major Ports

Major Port	2023 Tonnage Handled (Millions)
London	51.6
Grimsby and Immingham	45.97
Milford Haven	34.68
Southampton	30.62
Liverpool	28.55
Tees and Hartlepool	24.02
Felixtowe	22.53
Dover	19.23
Forth	18.52
Belfast	18.44

Table 16: The top 10 major ports by tonnage handled (millions) by each port in 2023 in the UK in 2023

A total of 18,116,552 international sea passengers travelled to and from UK ports in 2023, this included 9,184,641 departures and 8,931,911 arrivals. English ports had the most total international sea passengers in 2023, comprising 88% of total passengers to the UK. Whilst the UK licensed sea fishing industry is distributed across the UK, with major fishing ports primarily located in Scotland or England. Many smaller ports around the coastline are frequently used by local fishing boats. According to the most recent UK Sea Fisheries statistics (MMO, 2024b), the most used fishing ports in the UK were located in Northern Scotland (based on the quantity of landings in kt), namely Peterhead (181.1kt) and Lerwick (54.1kt). Landings into Peterhead and Lerwick, accounted for approximately 72% of all landings by UK vessels into Scotland.

Shipping and Navigation

Shipping route density around GB can be observed in Figure 27. It can be seen that highest vessel densities are located in the English Channel particularly within the Dover Strait, the English Channel is one of the world's busiest shipping routes, linking the North-West Atlantic to the North and Baltic Seas. High densities are also observed off the east coast off England, particularly on approach and within the Thames Estuary, and within routes to

the River Humber. Some of the world's busiest shipping routes are contained within the North Sea, this is evident by the high densities which can be observed off the east coast of Scotland and England. Trading between ports on either site of the Baltic and North Seas generate significant traffic in the area (DBEIS, 2022). While some vessel activity in the North Sea is associated with North Sea Oil and Gas fields, particularly on approach to ports at Great Yarmouth in England and Aberdeen, Peterhead and Dundee in Scotland. The Irish Sea contains some areas of high shipping density associated with routes out of Heysham, Liverpool and Barrawand Scotland, between Scotland and the Orkney and Shetland Islands, between north-west Scotland and the Outer Hebrides and within the North Channel, Irish Sea and Celtic Sea.

High shipping densities are contributed to by various vessel types including cargo, passenger and tanker. These can be seen within the Marine Management Organisation's Explore Marine Plans online mapping service (UK Government, 2025b). Additionally, there are a relatively significant number of ferry routes around GB providing internal, national and international transport which are represented by high density routes in Figure 27. These include major ferry routes from southern English Ports traversing the English Channel to the Channel Islands or mainland European countries (e.g. France, Belgium, Netherlands), routes which traverse the Irish Sea from Northern Ireland and Ireland to Scotland, England and Wales, routes between Ireland and Wales or France in the Celtic Sea, ferry routes within the North Sea from mainland Scotland to Orkney and the Shetland Islands, as well as ferries to mainland Europe (DBEIS, 2022). The waters off the west coast of Scotland contain a complex ferry route network between mainland Scotland and the Inner and Outer Hebrides and various other islands. Ferries tend to take very distinct routes and in certain areas due to bathymetry and other characteristics there is no, or limited, scope for adjustment of routes.

There are 292 pilot boarding stations surrounding GB, 106 off the coast of England, 62 off the coast of Scotland and 23 off the coast of Wales. Additionally, there are over 1,000 designated anchorage areas are located around the GB coastline. Designated anchorage areas are specific locations in navigable waters where vessels are allowed to anchor. These areas are managed by harbour or port authorities to ensure safe and efficient maritime operations.

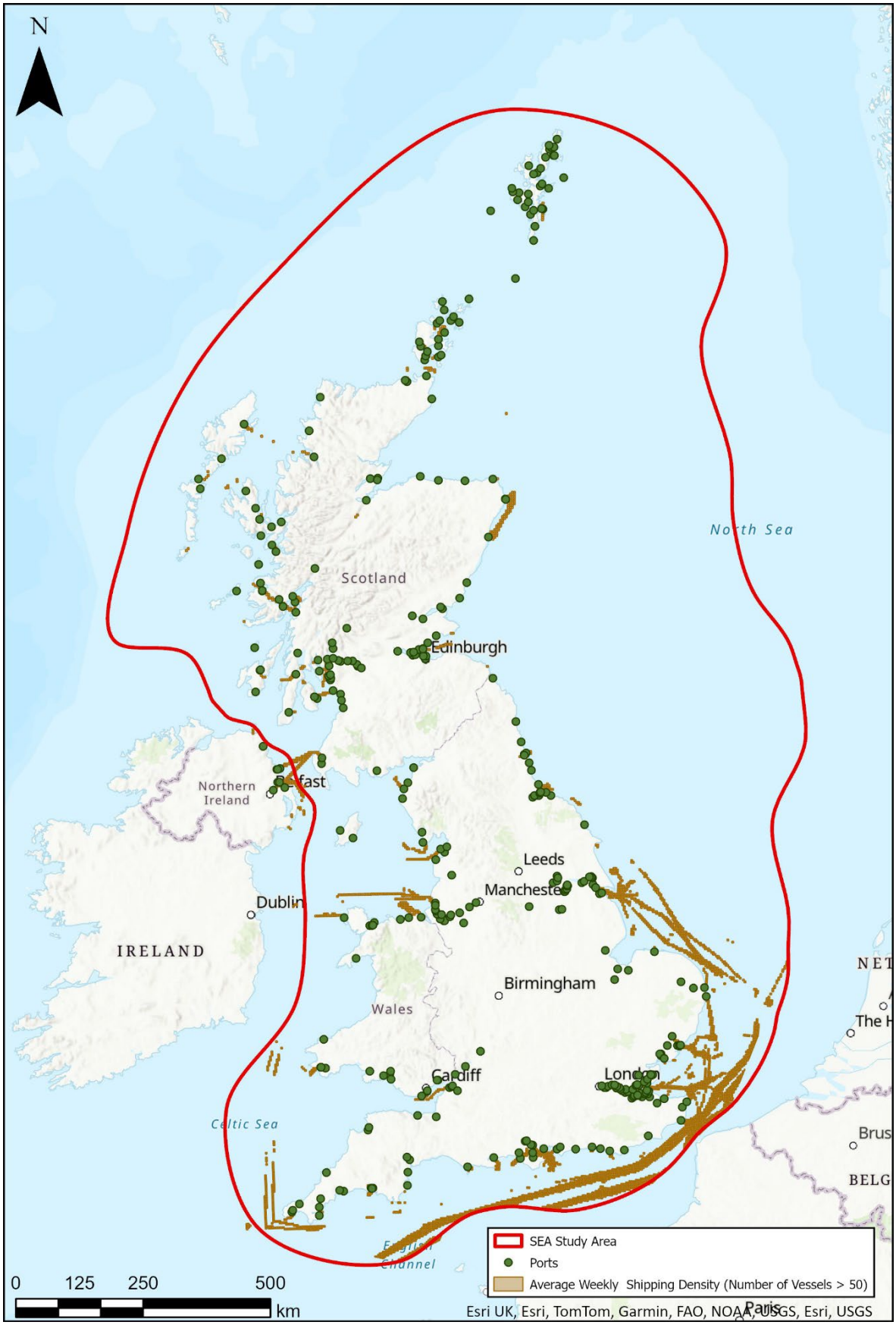


Figure 27: Location of major ports and shipping route density within the Study Area

Both the Dover Strait and the North Channel are recognised as a 'strait used for international navigation' under the UN Convention on the Law of the Sea; as such, development consent cannot be granted where installations would be likely to interfere with the shipping lanes within these straits.

The International Maritime Organisation (IMO) is an international body that adopts routing measures for international shipping to aid navigation of certain ships or ships with certain cargoes. Locations of those within GB waters are summarised in Table 17. Traffic Separation Schemes (TSS) are areas where navigation of ships is highly regulated owing to large numbers of ship movements in different directions or where there is a high risk of collision. Given the importance of the waters surrounding the British Isles to international shipping there are 18 TSS surrounding the British Isles. There are two deep water shipping routes, and one two-way route located in the English Channel. Areas to be avoided are for reasons of exceptional danger or especially sensitive ecological and environmental factors, there are seven of these within GB waters. Precautionary areas are where ships should navigate with particular caution, there are nine of these located in GB waters. There are three recommended tracks for vessels within GB waters, as well as four inshore traffic zones.

Marine Environmental High-Risk Areas (MEHRAs) have been established for the protection of environmentally sensitive marine areas that are considered to be at risk from shipping. There are 32 MEHRAs identified by the UK Government (Maritime and Coastguard Agency, 2001).

Routing Measures

Routing Measure	Number	Location
Traffic Separation Schemes (TSS)	18	Three are within the North Sea, four within the English Channel, four are within the Celtic Sea and six are within the Irish Sea, while one is located within both the English Channel and the North-Sea.
Deep water shipping routes	2	Located within the English Channel, one within the Strait of Dover and one to the west of the Outer Hebrides.
Two-way route	1	Located within the English Channel
Areas to be avoided	7	There are two areas to be avoided in the region of the Shetland Islands, one in the region of the Orkney Islands, one in the Sunk area and in the Northern Approaches to the Thames Estuary, two within the Straits of Dover, one in Liverpool Bay and one between Smalls Lighthouse and Grassholme Island.
Precautionary Areas	9	There are three precautionary areas within the region of the Shetland Islands, three on approaches to the River Humber, one in the approaches to Hook of Holland and at

Routing Measure	Number	Location
		North Hinder, one in Sunk Inner and Sunk Outer, and one in the Strait of Dover.
Recommended tracks	3	Two in the Minches and one recommended route in the English Channel.
Inshore Traffic Zones	4	There are inshore traffic zones located Off Casquets, Off Lands End between Seven Stones and Longships, surrounding the Isles of Scilly and in the Strait of Dover and adjacent waters.

Table 17: Routing measures present within GB waters

3.2.7.4 Commercial Fishing and Aquaculture

There is potential for temporary disturbance or displacement from areas of importance for commercial fisheries and aquaculture during construction of projects arising from the draft HND Implementation Plan, and for long-term effects on fishing activities along cable routes (e.g., risks to fishing gear from cable protection materials, unburied cables or construction debris) during operation.

Commercial Fishing

Commercial fishing is a significant industry in GB and is based largely around major commercial fishing ports in Scotland (Lerwick, Peterhead) and England (Newlyn and Brixham), as outlined in Section 3.2.7.3 above. In 2023, there were 5,418 registered fishing vessels in the UK. Of these, 48% are comprised of English vessels, while Scotland contributes 37% and Wales 7% (MMO, 2024b).

In 2023, the UK fleet landed a total of 719 tonnes of fish worth approximately £1.10 billion into UK ports and abroad. This comprised £384.9 million for shellfish, £388.8 million for pelagic fish and £331.1 million for demersal fish. The percentage contribution of England, Scotland and Wales to these values is provided in Table 18. It can be seen that Wales contributes very little to landings by UK vessels in terms of quantity or value. Scotland contributes the most to landings by UK vessels for all species in terms of quantity and value. While England also contributes relatively significantly to shellfish and demersal species landings in terms of quantity and value.

Fish Landings: Quantity and Value

Country	Quantity				Value			
	Demersal	Pelagic	Shell	Total	Demersal	Pelagic	Shell	Total
England	31%	13%	42%	22%	41%	9%	37%	28%
Scotland	68%	78%	42%	70%	57%	81%	49%	63%
Wales	1%	0%	4%	1%	1%	0%	2%	1%

Table 18: Percentage of landings into the UK and abroad by UK vessels in 2023 by country

The top ten landings (by species live weight) for 2023 by UK vessels are shown in Table 19 (MMO, 2024b). Three pelagic species - Mackerel, Blue Whiting and Herring – were the highest species in terms of landed weight. Around 54% of the pelagic fish landed by the UK fleet was sourced from the northern North Sea. Haddock was the highest demersal species (4th overall). Around 53% of demersal species was from the Northern North Sea. Scallops were the highest of the Shellfish species landings (5th overall). Around 27% of shellfish landed by the UK fleet was from the English Channel.

Fish Landings: Top Ten Species

Species	Species Type	Live Weight (Tonnes)	Value (£)
Mackerel	Pelagic	232,507	294,172
Blue Whiting	Pelagic	100,151	26,186
Herring	Pelagic	96,805	61,961
Haddock	Demersal	41,929	44,050
Scallops	Shellfish	33,430	63,575
Nephrops	Shellfish	30,641	119,731
Crabs	Shellfish	23,854	63,369
Cod	Demersal	18,945	58,474
Monks or Anglers	Demersal	17,563	56,624
Whelks	Shellfish	16,797	21,448

Table 19: Top ten species by live weight (tonnes) by UK vessels in 2023

Areas of high intensity fishing activity within the SEA Study Area are shown in Figure 28.

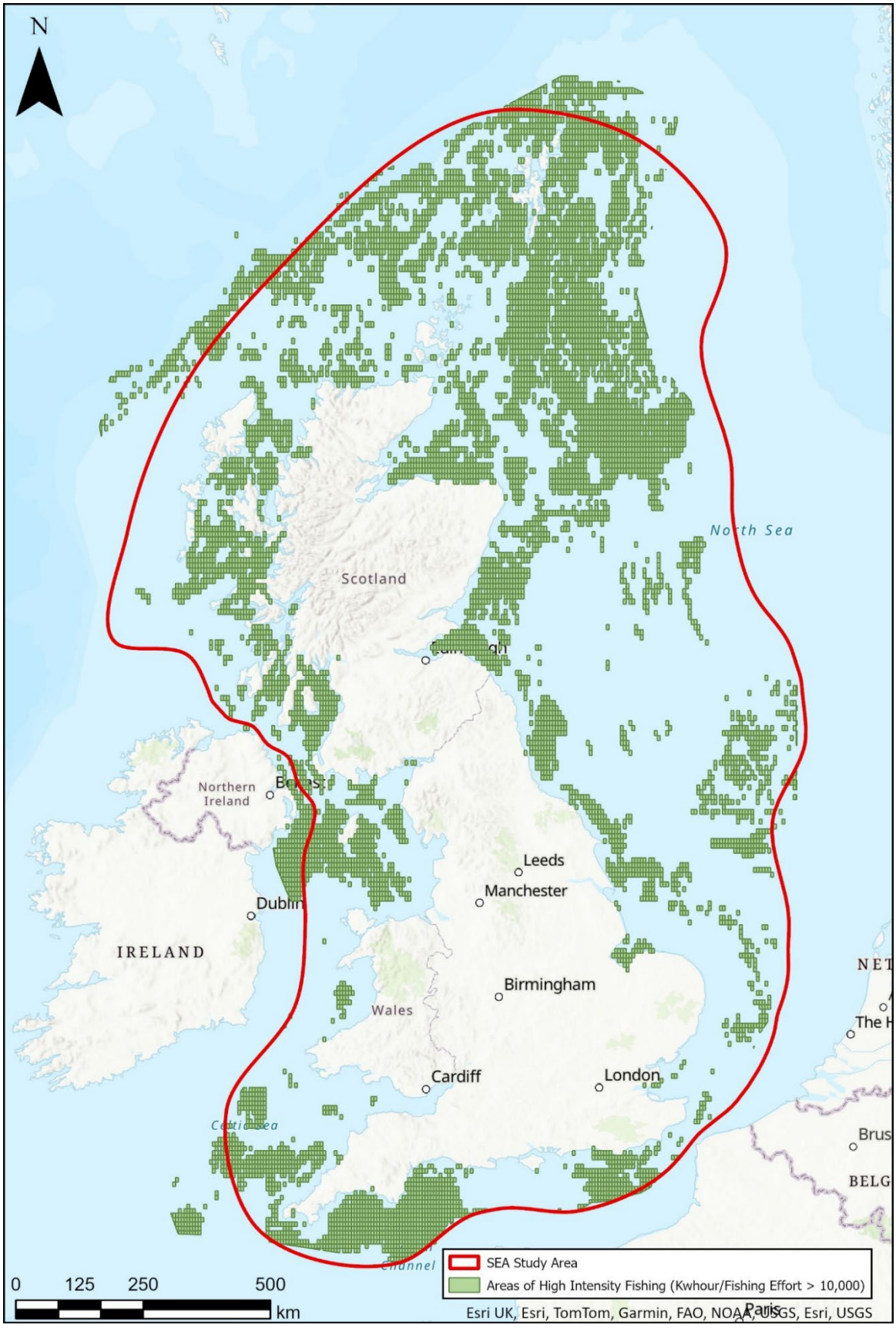


Figure 28: Areas of high intensity fishing within GB waters

Sea fishing boats registered in the Republic of Ireland may also hold a licence issued by the UK authorities to fish in UK waters in the UK Exclusive Economic Zone (EEZ) 12 - 200 Nautical Miles.

Aquaculture

Aquaculture in GB is a growing industry and was worth £1 billion, with 217,000 tonnes of fish and shellfish farmed, in 2021. Aquaculture practices and species cultured within GB waters are varied and consist of a range of both intensive finfish and extensive shellfish production practices. Yet in GB, aquaculture is dominated by farming for Atlantic salmon as shown in Table 20 which states the top five species by volume.

Aquaculture in GB is dominated by a few large companies in Scotland (ICES, 2022; Seafish, 2025). Majority of Scottish aquaculture is marine based dominated by salmonid production (Atlantic salmon), mussels, and Pacific Oysters. Majority of the sites are located in sea lochs along the western and northern coastlines. Other species cultured include rainbow trout, sea trout, European flat oysters, and scallops. In 2023, a total 150,949 tonnes of Atlantic salmon, 9,258 tonnes of Rainbow Trout, and 24 tonnes of other species (brown/sea trout, lumpsucker and several species of wrasse) were produced in Scotland (Scottish Government, 2024c). While for shellfish species a total of 10,311 tonnes of common mussel, 3.9 million Pacific oyster shells and 24,000 king scallop shells were produced. One third of the salmon production in Scotland is in the North Coast and West Highlands region, whilst 80% of Scottish mussel production takes place in the Shetland Isles.

In England and Wales, marine aquaculture mainly involves small enterprises and is largely for shellfish, particularly mussels and oysters. Shellfish production in England is concentrated in along the South Coast, and on the approaches to the Thames Estuary. The most recent production figures for England (2019) indicate that 1,793 tonnes of mussels, 964 tonnes of Pacific oyster and 8 tonnes of native oyster were produced. Shellfish culture in Wales is located in both the north and south, in 2019, 3,520 tonnes of mussels and 25 tonnes of Pacific oyster were produced. There are no marine finfish production in sea cages in England or Wales, but there are marine pump-ashore/recirculation finfish farms in the north of Wales.

Farmed Fish and Shellfish

Species	Farmed Species by Volume (Tonnes)	Farmed Species by Value (£)
Atlantic Salmon	205,400	1,000,000,000
Rainbow Trout	13,500	51,000,000
Mussels	12,200	12,000,000
Oysters	3,000	10,000,000

Species	Farmed Species by Volume (Tonnes)	Farmed Species by Value (£)
Other Salmonids	600	6,000,000

Table 20: Top five fish and shellfish species farmed in 2021

3.2.7.5 Defence / Military Activity

Military activity occurs extensively throughout the UK with much of the coastline utilised by the MoD (DBEIS, 2022). Much of this is offshore, dominated by the Navy through the use of practice and exercise areas (PEXAs) for submarine, general surface, fleet and aircraft exercises; no ammunition firing occurs in these areas. There are approximately 98 PEXAS within the UKCS. Other activities are not precluded by the presence of PEXAS, however, there are also 99 Danger Areas within which live firing may take place and where airspace restrictions may apply. It is indicated in the Marine Policy Statement that defence and national security interests must not be undermined by marine conflicts of interest where MoD areas exist, and these should be minimised by planning and consultation between the MoD and those wishing to undertake offshore infrastructure projects. Further guidance and information for developers is provided at the regional scale through the marine planning process.

The UK low flying system (LFS) allows training within the whole of the UK airspace and surrounding seas, to 3 nautical miles (nm), from the surface to 2,000 feet above the ground or mean sea level. Low flying is unlikely to impact upon offshore cable developments as designated Tactical Training Areas (TTAs) are present over the sea. TTAs are located within northern Scotland and the Borders, and central Wales, and within which fixed wing aircraft may travel at between 100 and 150ft depending on their size, as such there is some potential for onshore cable or converter station development to interfere with these areas. Military radar systems, such as the Air Surveillance and Control System (ASACS) operated by the Royal Air Force (RAF), are critical to the UK's air defence capabilities (Defense Advancement, 2022). There are nine Remote Radar Head sites located in GB, seven of these are in England and two are in Scotland.

Over two thirds of the 240,000 hectares of land owned by the MoD is held solely for the purpose of training the armed forces. There are 6 regional training areas covering the whole of the UK – East England, North England (including Otterburn), Scotland (including Northern Ireland), South East England (including Home Counties), South West England (including Salisbury Plain), and Wales and West England. Within these regions there are 49 live MoD Military Areas located in GB, including training areas, firing ranges or air weapons ranges. Of these, 35 are located in England nine in Scotland and five in Wales. Military Areas in England are primarily located in upland areas, whilst those in Scotland and Wales are situated at the coast. Military training exercises such as living firing, testing of heavy weapons, dry firing and military practice manoeuvres may be undertaken within these Military Areas. Firing times and public access restrictions for each Military Area are published by the UK Government. The location of both onshore and offshore military areas are displayed in Figure 29.

There is potential for temporary disruption effects on areas of known military / defence activity and for the presence of UXO to affect the cable installation process.

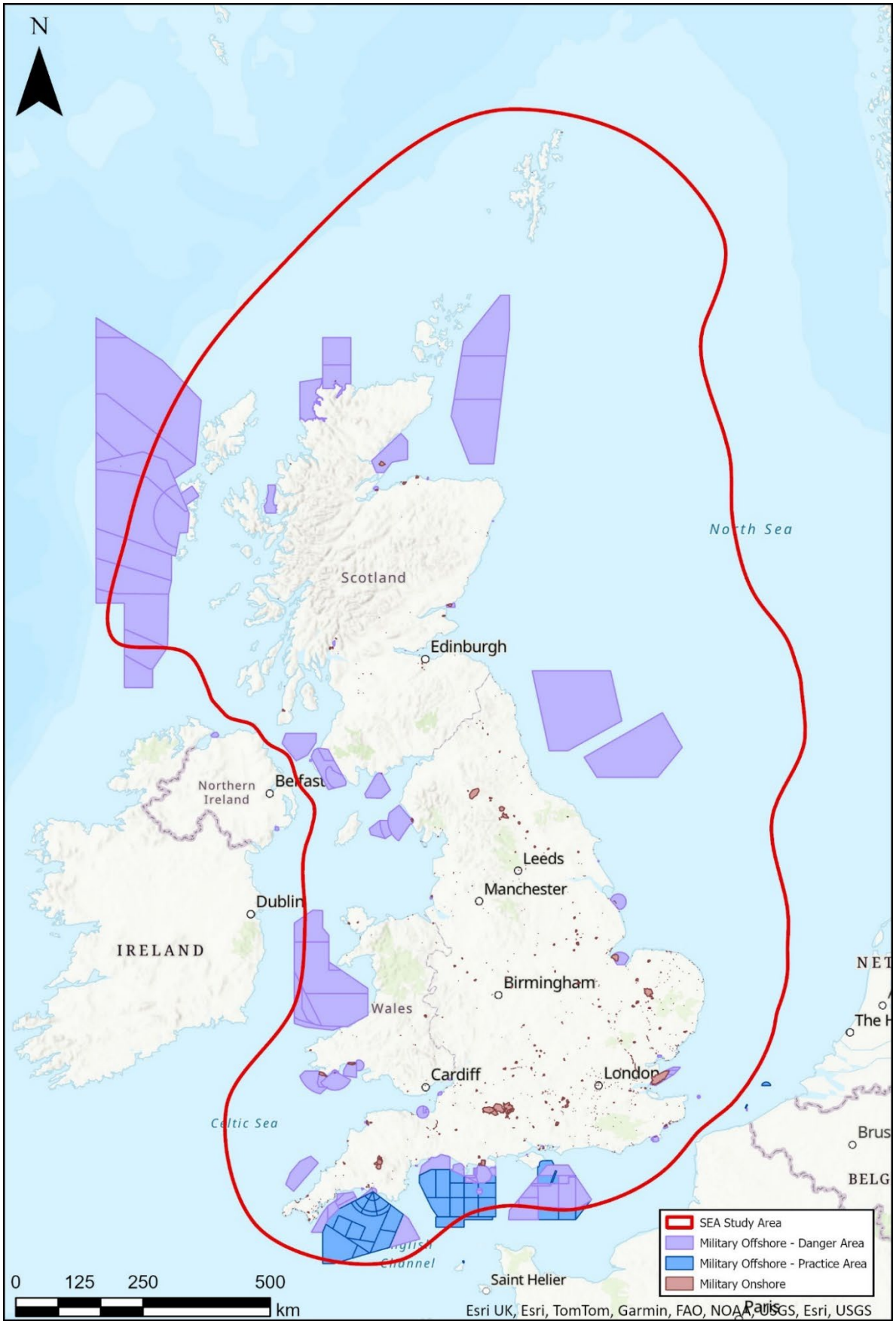


Figure 29: Location of onshore and offshore military areas in GB

3.2.7.6 Aviation

The UK contains over 60 passenger airports which the UK Civil Aviation Authority (CAA) obtains data on. In 2023, 2.7 billion passengers passed through these UK Airports (including Northern Irish airports but excluding Isle of Man and Isle of White airports) (UK CAA, 2023). The majority of the busiest airports in the UK in 2023 were located in England comprising seven of the top ten as shown in Table 21. The busiest airports in the UK (and England) were Heathrow and Gatwick comprising 29% (equal to 79 million) and 15% (41 million) of passengers at all UK airports, respectively. The busiest Scottish airport was Edinburgh with 5.3% (14 million) of passengers at all airports, whilst the busiest Welsh airport was Cardiff comprising 0.3% (837,000) of passengers.

The location of main UK airports is displayed in Figure 30.

Main UK Airports

Airport Name	Terminal Passengers in 2023	Percentage of Passengers at all UK Airports (%)
Heathrow	79,149,000	29.0
Gatwick	40,894,000	15.0
Manchester	28,078,000	10.3
Stansted	27,951,000	10.2
Luton	16,400,000	6.0
Edinburgh	14,395,000	5.3
Birmingham	11,479,000	4.2
Bristol	9,912,000	3.6
Glasgow	7,356,000	2.7
Belfast International	5,957,000	2.2

Table 21: Top 10 busiest airports in the UK (by terminal passengers in 2023)

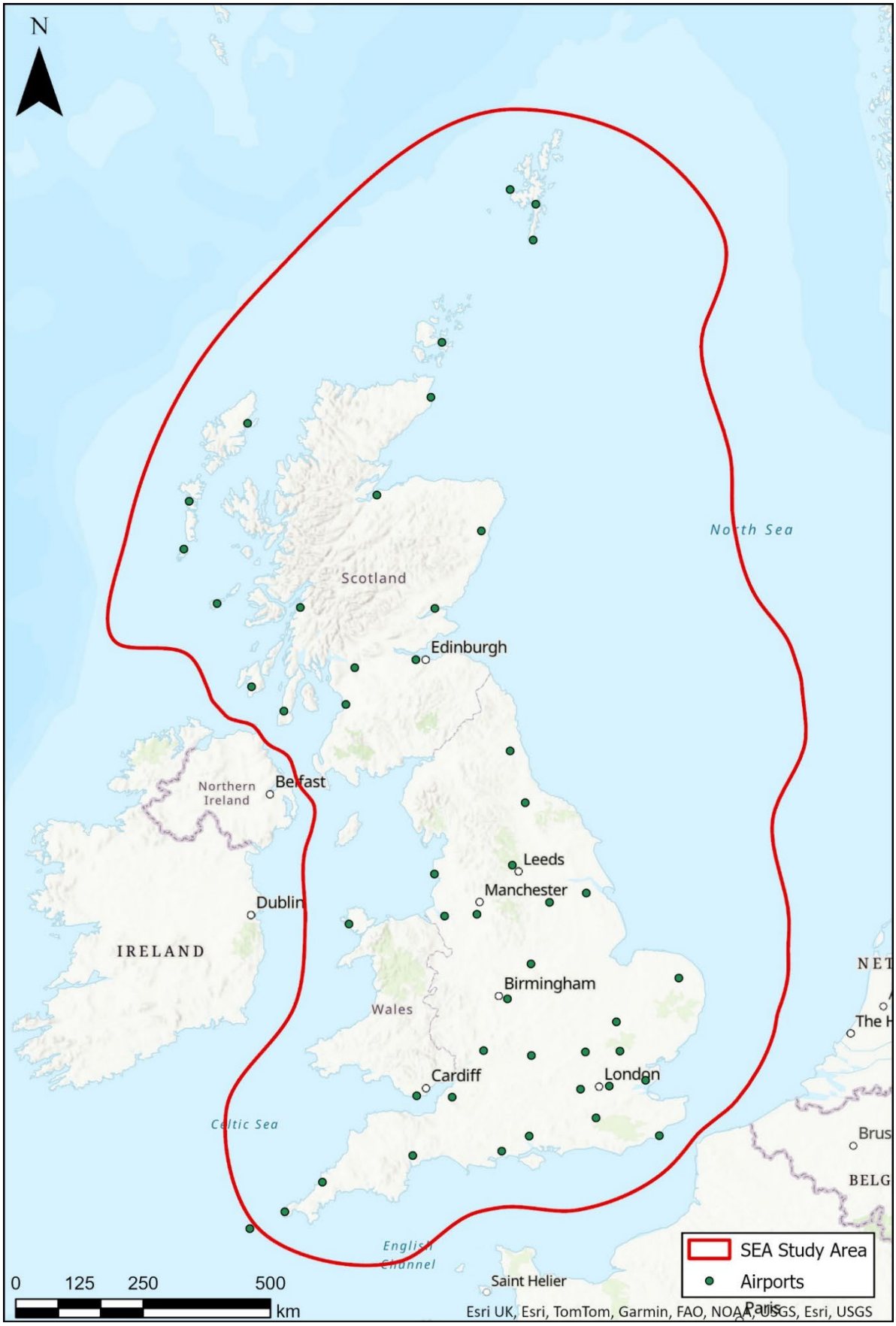


Figure 30: Location of main UK passenger airports

It is ensured that the operation of some aerodromes and technical sites is not compromised by proposed building, structures constructions through the official safeguarding of military and civilian aerodromes. This is a legal requirement under ICAO (International Civil Aviation Organisation) and the UK CAA (Civil Aviation Authority). Whilst the Authority for policy and regulation of aviation services in GB rests with the Department for Transport and the Civil Aviation Authority (CAA) (UK CAA, 2020). Onshore developments such as those within the scope of the HND Implementation Plan can result in effects that can have a negative impact on aviation. Aviation operations may be affected particularly during construction where cranes may intersect safeguarded areas or impact navigational aids and Communication, Navigation and Surveillance (CNS) equipment, or during operation where new onshore infrastructure may create obstacle-induced turbulence.

Obstacle Limitation Surfaces (OLS) protect the aerodrome surroundings, from developments that may prove a hazard to aircraft (UK CAA, 2020). These generally extend out to 15km from the Aerodrome Reference Point (ARP), this can vary between airports. Other safeguarding considerations include Instrument Flight Procedures (IFP) surface which are associated with a series of predetermined, specific procedures or flight paths an aircraft must follow when flying under instrument conditions with specified protection from obstacles. IFPs are established at many certificated and licensed aerodromes, the lateral boundaries of IFPs extend beyond the OLS. There are twelve officially safeguarded aerodromes in Scotland, 28 in England and one in Wales. The Government directs LPAs to consult with these officially safeguarded aerodromes whenever a development of a specified height is proposed within the colour-coded area and 13km (bird attractant) circle depicted on a safeguarding map.

The CAA, the MoD, and the National Air Traffic Services (NATS) have a statutory duty to safeguard certain sites and airspace from radar interference in the interests of national security and for the safe operation of passenger and military aviation. NATS has produced, and made publicly available, GIS-based maps designed as an aid to developers in understanding where interference with NERL (NATS En Route plc) infrastructure is likely (NATS, 2025). For each of the 54 air-ground-air (AGA) communication stations, 55 navigation aids and 20 secondary surveillance radar operated by NERL, a consultation zone has been provided; 10km for the air-ground-air communication stations and navigation aids and, in line with CAA publication CAP764, 15 nautical miles (nm) for the secondary surveillance radar.

A national 24-hour, helicopter-based, maritime and coastal search and rescue (SAR) emergency response service is provided throughout GB by The Maritime and Coastguard Agency (MCA), through HM Coastguard. These operate from ten GB bases including Caernarfon, Humberside, Inverness, Lee on Solent, Manston, Newquay, Prestwick, St Athan, Stornoway and Sumburgh.

Constraints related to aviation may also arise in association with offshore oil and gas related helicopter activities (routine flights, emergency evacuations and Missed Approach Procedures (MAP)), particularly within the North Sea, Irish Sea and west of Shetland. An obstacle-free zone with a radius of 6nm around installations has been recommended by the CAA, whilst a 9nm consultation zone exists surrounding

installations. Furthermore, a 2nm obstacle free zone surrounding Helicopter Main Routing Indicators (HMRIs) located in Morecambe Bay and the North Sea is recommended by the CAA.

There is potential for temporary or permanent disruption effects on aviation operations, including navigational radar and telecommunications during construction due to the potential presence of tall equipment (e.g., cranes).

3.2.7.7 Offshore Disposal Areas

The deposit of substances or articles in the sea or under the seabed within UK waters is a devolved issue. Most sites receive chemically unmodified geological material derived from the adjacent coastline. The disposal of waste at sea is strictly controlled through the Marine and Coastal Access Act (MCAA) 2009 licensing system through the MMO in England and NRW in Wales, and through Marine Scotland in Scotland. Statutory changes have occurred over recent years governing the types of waste that may be disposed of at sea. Since the end of 1998, most forms of waste disposal at sea have been prohibited including disposal of radioactive waste (since 1982); disposal of industrial waste (since 1992: and disposal of sewage sludge (since 1998).

The main types of disposal activity that remain licenced are as follows:

- Disposal of dredged material at sea (e.g., capital dredged material or maintenance dredged material).
- Miscellaneous disposal (e.g., explosives and munitions, tracers, others).
- Alternative use (e.g., habitat creation / feeding (saltmarsh and mudflat), beach nourishment).

The location of known disposal sites within GB is shown in Figure 31. It can be observed that these licensed sites are generally located in inshore waters. There are approximately 110 open sites off the coast of England, 63 off the coast of Scotland and 13 off the coast of Wales within which 40 million tonnes, 4.2 million tonnes and 3 million tonnes are disposed of annually, respectively. More information on Offshore Disposal Areas can be found in Section 3.2.3.



Figure 31: Location of known disposal sites within GB waters

3.2.7.8 Marine Aggregate Extraction

Marine aggregates are defined as sedimentary material comprised of sand or gravel of various grain and class sizes (grades) which can be a valuable contributor to infrastructure development, including for buildings and roads, and may also be used for beach nourishment and coastal defences. The extraction of marine aggregates typically involves dredging of the deposit to remove it from the seabed. The (non-energy) mineral rights to the seabed, extending from the edge of the UK continental shelf, are owned by the Crown Estate in England and Wales, who issues consents for non-exclusive sampling, and licences for commercial aggregate extraction. While the Crown Estate Scotland owns these same rights in Scotland.

Britain has one of the world's most developed marine aggregate industries, extracting 15 to 20 million tonnes from the seabed annually (MPA Marine Aggregates, 2024a; 2024b), with 19 million tonnes extracted in 2023 (MPA Marine Aggregates, 2023). The total current national primary reserves in England and Wales are estimated to be 361 million tonnes. The south coast of England comprises the most important mineral reserves in England and Wales, with the east English Channel region containing the highest proportion of national total current primary reserves (39%). There are currently seven regions in England and Wales from which marine aggregates are sourced. These include The Humber; The East Coast; The Thames Estuary; The East English Channel; the South Coast; The South West and The North West. All regions, except for Humber and the East Coast have an estimated regional reserve life of over 20 years, with the highest being North Wales at 40 years.

Statistics for each Region can be observed in Table 22. It can be seen that the Humber region had the largest licensed area during 2023 (312.21km^2) while the East English Channel has the smallest (86km^2). There are currently 66 licences areas in England and Wales, and 6 applications, the South Coast region contains the highest number of licences (15), whilst the East English Channel has the highest number of applications (3).

While there are currently no areas licensed for marine aggregate extraction in Scotland, there are two historic licensed aggregate areas located within the Firth of Forth and the Firth of Tay. Scotland is recognised as having considerable marine sand and gravel resources through an assessment undertaken by British Geological Society (BGS) in 2013, while this potential is also recognised within the Scottish National Marine Plan (SNMP).

The location of Marine aggregate extraction agreements are displayed in Figure 32.

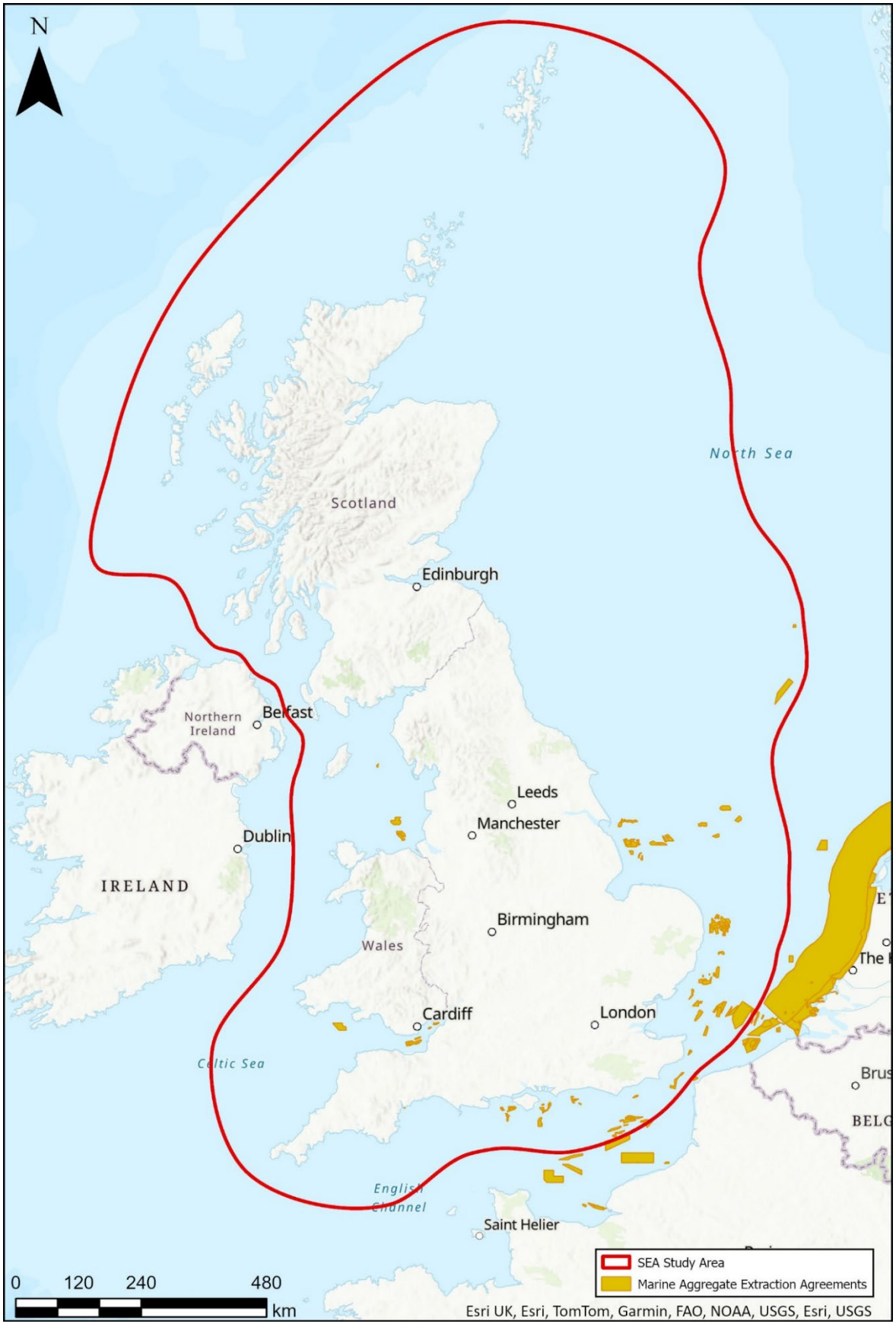


Figure 32: Location of marine aggregate extraction agreements in GB waters

Licenced Aggregate Areas

Region	Licenced Area (KM^2)*	Available Dredge Area (KM^2)*	Area Dredged (KM^2)*	Number of Licences**	Number of Applications**
Humber	312.21	190.12	35.10	10	1
East Coast	180.55	154.86	25.20	11	1
Thames Estuary	167.82	138.37	7.71	8	0
East English Channel	85.59	37.73	16.90	11	3
South Coast	139.54	57.24	16.33	15	0
South West	130.21	31.05	7.34	9	0
North West	86.65	19.46	4.23	2	1
Total	1102.57	628.83	112.81	66	6

*In 2023 **As of March 2024

Table 22: Statistics for Regional Licenced Aggregate Areas in 2023/2024

Commercial extraction of potash from marine mines has been undertaken from the Boulby potash mine, off the coast of north Yorkshire. Potash exploration rights have been granted off the coast of Huntsdale, while Corish Lithium Ltd has been granted rights for lithium exploration off the coast of Cornwall.

There is potential for interaction with / disturbance of areas used for offshore aggregate extraction.

3.2.7.9 Onshore Mineral Extraction

GB is an important producer of a range of minerals that are consumed in many sectors of the economy. In GB, 'minerals' are defined in town and country planning legislation as 'all substances in or under land of a kind ordinarily worked for removal by underground or surface working, except that it does not include peat cut for purposes other than for sale'. Mineral rights in GB are not state-owned, with the exception of oil, gas, coal, gold and silver. Minerals are generally held in private ownership, and the Land Registry holds information on mineral rights with details on land-surface ownership.

In 2022, around 185.9 million tonnes of minerals were extracted from the UK landmass for sale (Minerals UK, 2022). Of this, crushed rock (for both construction and industrial use) contributed 68% (126.4 million tonnes), sand and gravel contributed 21.7% (40.3 million tonnes), other construction materials contributed 3.5% (6.6 million tonnes), coal contributed 0.4% (0.7 million tonnes) and oil and gas (oil equivalent) contributed 0.8% (1.5 million tonnes).

Mineral resources are abundant throughout the UK and, as noted in Section 3.2.3, there are over 2000 active mines and quarries in the UK that produce the above commodities. Igneous and metamorphic rock resources (Mafic intrusive igneous rocks (dolerites), Felsic intrusive igneous rocks (granite and dolerites), extrusive igneous rocks basaltic, andesitic and rhyolitic lavas and tuffs), Gneiss and Schists and quartzites) and associated active quarries are primarily concentrated in Scotland, with some smaller areas in northern England and in Cornwall, as well as north-west Wales (Minerals UK, 2020). Limestone resources and associated active quarries are primarily located in England, particularly the south-east, as well as north and south Wales, while some smaller areas are scattered around Scotland. Superficial sand and gravel resources are widespread throughout England with some concentration in the south-east, as well as the east of Wales and along the eastern coastline of Scotland. Sandstone resources and associated active quarries are concentrated in the north/north-west and the south of England, south, north-east and north-west of Scotland and scattered across Wales. Coal resources are primarily located across the midlands and surrounding the Humber Estuary, along the English and Scottish border and surrounding Newcastle Upon Tyne and the coastline towards the English/Scottish border, surrounding Kilmarnock and the Firth of Forth in Scotland and south of Brecon Beacons National Park in Wales. Majority of active coal quarries are located surrounding Newcastle Upon Tyne, Sheffield, Kilmarnock and south Wales.

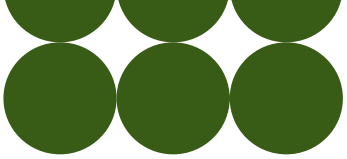
The onshore natural gas and oil resources are primarily located in England along the east coast between Redcar and Nottingham, and south England between Dorchester and Westerham (NSTA, 2025b). Many of these resources have petroleum licences and active oil/gas fields associated with them. While prospective areas are located along the Welsh/English border, Scottish/Welsh border, the north-west coastline of Scotland, and the land between the Firth of Forth and Firth of Clyde. Of these, petroleum licences are noted to the west of Chester, the land to the west of the Firth of Forth and the coastline north-west of Dunbeath in north-west Scotland (Marine Scotland, 2024b). There are currently 69 oil/gas reporting units in GB, of these 25 are dry gas fields primarily located across the East Midlands region and southern Yorkshire and Humber, with one in Scotland. The remaining 44 are onshore oil fields located across the East Midlands and the South East Regions of England. No reporting units are located in Wales.

The majority of potential gold resources in Scotland are located within the Dalradian rock sequence which runs across the Grampian Highlands. Gold resources may be found across Carmarthenshire in Wales, as well as Devon, Cornwall and the Lake District in England.

There is potential for interaction with / disturbance of areas used for onshore mineral extraction.

3.2.7.10 Agriculture

The agriculture industry in the UK is comprised of 209,000 farm holdings which utilised 70% of the UK land total in 2023 (equal to 17 million hectares of land) (DEFRA, 2024e). A total of 462,000 people were employed in the UK agriculture industry in 2023, of these 63% were employed in England, 14% in Scotland and 11% in Wales. The agriculture industry contributed 0.56% (equal to £13.7 billion) to the UK economy in 2023. Of this 73% was



contributed by England, 17% by Scotland and 5% by Wales. Livestock contributed 62% (£19.2 billion) to the value of agricultural production in the UK with dairy and beef being the largest livestock products. Crop outputs totalled £12 billion in 2023 with cereals and vegetables/flowers accounting for over half of this.

Areas of arable and horticultural crops, uncropped arable land, land for outdoor pigs, temporary grassland, permanent grassland and common rough grazing are comprised within the Utilised Agricultural Area (UAA). The livestock composition in the UK in 2023 mostly comprised of poultry (178.1 million), followed by sheep (31.8 million) and cattle (9.6 million) whilst pigs and the dairy herd contributed 4.7 million and 1.8 million, respectively.

Section 3.2.3 outlines the results of the UK Agricultural Land Classification and Land Quality Survey (England and Wales) and the Land Capability for Agriculture system (Scotland). It is noted that the higher quality land in the UK is located in coastal areas in some instances such as along the eastern coastline of Scotland, coastal areas in proximity to Cardiff (in the north) and Conwy (in the South) in Wales and surrounding the west and south shorelines of the Wash in England.

There is potential for temporary damage or access restrictions to agricultural lands during onshore cabling activities, and for permanent loss in the footprint of onshore infrastructure such as substations / converter stations.

Forestry

The area of woodland in GB is estimated to be 3.16 million hectares (Forest Research, 2025), of this total, 1.51 million hectares (48%) is in Scotland, 1.34 million hectares (42%) is in England, 0.31 million hectares (10%) is in Wales. Approximately 25% of woodland in GB is owned or managed by Forestry England, Forestry and Land Scotland, Natural Resources, whilst the remaining 75% is privately owned. Both public and private sector woodland coverage are located in inland and coastal regions throughout GB.

Wood production (also referred to as removals) refers to the harvesting of roundwood (trunk and branch wood) from coniferous (softwood) and non-coniferous (hardwood) trees. Figures are generally expressed here in green tonnes (weight when freshly felled). The figures on removals of UK roundwood are used to monitor trends in the UK forest sector. It is estimated that 5,099 thousand green tonnes of private sector soft wood were removed in GB in 2023, with 70% being sourced from Scotland. Approximately 3,684 thousand green tonnes of public sector softwoods were removed from GB in 2023, with 59% removed from Scotland.

There is potential for interaction with these areas used for forestry including temporary damage or access disruption during construction and decommissioning along onshore cable routes to permanent loss in the footprint of onshore infrastructure such as substations / converter stations.

3.2.7.11 Tourism

Tourism represents an important source of income for the GB's economy. In 2023, GB residents took 117.4 million overnight trips within GB with 340.2 million nights and an associated spend of £31.3 billion (Visit Britain, 2025). Approximately 45% of overnight trips in GB were to large cities/large towns. Of these, 99.4 million visits were to England, 11% (12.4 million) to Scotland, and 7% (8.44 million) of overnight trips were to Wales. Additionally, in 2023, there were 38 million international visits to GB and spending by overseas visitors associated with these trips was £31.1 billion. Tourism statistics show an upward trend in overseas visitor activity with a 6.8 million increase in visits from 2022 (31.2 million), there has been a slight recovery towards pre-pandemic levels of 40.9 million in 2019, while spending by overseas visitors has increased by £4.1 billion from 2019. Holidays were the main reason for visits to GB, accounting for 16 million visits (42%).

The quality of the environment, heritage and culture throughout Scotland, England and Wales has strong national and international appeal and tourism is therefore an important activity in GB. Table 23 displays the top 10 visitor attractions in GB in 2023. It can be observed none of these are coastal attractions. However, in 2019 35% of all visitors to the GB travelled to coastal locations, with coastal tourism being particularly important for regional economies, with areas such as Cornwall, Devon and Scotland's coastal regions benefiting significantly from summer holiday makers. As such the coastlines of England, Scotland and Wales have a developed tourist infrastructure and a number of coastal attractions. For example, castles such as Dover Castle in the south of England or Lindisfarne Castle on Holy Island off the Northumberland Coast are important tourist attractions. Coastal features (e.g. the White Cliffs of Dover), towns/cities (e.g. Brighton) and footways (e.g. Fife Coastal Path) are also key attractions to coastal areas.

Visitor Attractions

Attraction	Visitor Numbers (Millions)
British Musuem	5.8
Natural History Museum	5.7
Great Windsor Park	5.5
Tate Modern	4.7
Southbank Centre	3.2
V&A South Kensington	3.1
The National Gallery	3.1
Science Museum	3
Tower of London	2.8
Somerset House	2.7

Table 23: Top ten visitor attractions in the UK in 2023 (ALVA, 2023)

There are attractions for tourism offered by areas considered to be of high landscape value such as the designations discussed in Section 3.2.9. There are 91 Blue Flag Beaches in England and Wales, and the 53 Scotland Beach Award Winners and the over 600 designated bathing waters across GB. Coastal and marine recreation and leisure, including water sports, sea angling, beach use and wildlife watching within these areas as described in Section 3.2.3, are also popular with tourists. The inclusion of tourism in marine plans such as the UK Marine Policy Statement and Scotland National Marine Plan (SNMP) provides recognition of the importance of marine tourism to the UK.

There is potential for indirect effects on coastal tourism, including disturbance and access restrictions.

3.2.7.12 Summary of Existing Pressures and Issues for Material Assets

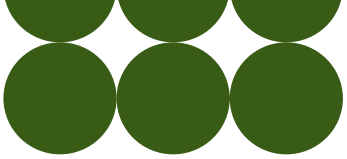
Population growth and development are placing increasing pressure on many infrastructure assets in GB, particularly in urban areas. Annual population growth has been positive for the past 25 years in GB and is projected to surpass 70 million by 2026. Industries such as commercial fisheries and shipping have been disrupted in recent years by the Covid-19 pandemic and by Britain's exit from the EU (Brexit). There has been a slower growth in tourism than in previous years, affected by uncertainty surrounding Brexit, geopolitical and trade tensions, and the global economic slowdown.

Implementation of the draft HND Implementation Plan, and the construction, maintenance, and decommissioning activities associated with the installation of offshore cabling routes have the potential to result in short to long-term disruption or displacement of other marine users (e.g., from fishing grounds or shipping routes), whilst those phases associated with the installation of onshore cables and converter station may result in displacement of other land users (e.g. agriculture or mineral extraction). The location of existing, or indeed planned, onshore and offshore infrastructure will influence the siting of both onshore and offshore infrastructure associated with the draft HND Implementation Plan, as will the level of constraint associated with areas where there is significant conflict with other users.

3.2.7.13 Evolution of the Baseline in the Absence of the Plan

Population growth is likely to increase the demand for infrastructure and the consumption of energy. In the long-term it is likely that there will be an increased need for sub-sea cabling in the SEA Study Area, to support increased telecommunications and connectivity, and to upgrade and provide for further need of renewable electricity connection and transmission. It is likely that further renewable energy developments will be planned both offshore and onshore to meet energy and climate targets. In the absence of the plan, the planning and development of the electricity network would be less structured, which may result in a reduced potential for connection of renewable energy sources to the supply network to meet population requirements.

Transport networks, housing and supporting infrastructure such as water supply and wastewater are expected to expand to meet the anticipated population growth. Vessel traffic volume and routes are driven by commercial factors. Shipping movements such as ferries, fishing, commercial shipping and recreation are largely independent of renewable



energy plans. Commercial fishing will be affected by the level of stocks (which may be affected by climate change and sea temperature rise and effects on species distribution), exploitation at a sustainable level and GB fisheries policy. There may be changes in fishing activity and the species being targeted resulting from future changes to fisheries legislation, displacement of fishing activities due to legislation (such as closed areas) and fisheries management measures. Designation of marine habitats may restrict fishing activity in specific areas or for specific types of fishing gear.

3.2.8 Cultural Heritage

Cultural heritage, including archaeological heritage and architectural heritage, considers places and objects of beauty, cultural, historic, scientific, social, or spiritual value. It includes archaeological monuments, WHS, protected structures, designed landscapes, place names, language, and inherited traditions. GB is rich in cultural, archaeological and architectural heritage, with many important archaeological sites, monuments and heritage buildings. Marine cultural heritage in GB is abundant and includes features such as submerged landscapes which were exposed during previous glacial periods, harbours and jetties, fish traps and quays and shipwrecks and aircraft losses. In coastal areas, cultural heritage includes extensive areas designated for cultural importance, as well as individual archaeological and architectural features and buildings.

It is considered that the key issues associated with the implementation of the draft HND Implementation Plan and Cultural Heritage comprise:

- Potential for direct or indirect effects on marine archaeological features (including protected features) such as historic wrecks and submerged landscapes and terrestrial archaeological features including scheduled monuments and registered battlefields during construction.
- Potential for direct or indirect effects on marine, coastal and terrestrial designated and non-designated archaeological and architectural heritage and settings due to development altering decay or erosion processes.
- Potential for direct or indirect effects on coastal designated and non-designated architectural heritage and settings during construction of new onshore infrastructure such as converter stations or offshore infrastructure.
- Potential for direct or indirect effects on terrestrial designated and non-designated archaeological heritage during construction of new onshore infrastructure such as converter stations.
- Potential for direct or indirect effects on designated and non-designated archaeological and architectural features and their settings from the presence of new onshore or offshore infrastructure.
- Potential for long-term effects on the setting of designated landscape from impacts on designated and non-designated archaeological and architectural features from the presence of new onshore infrastructure such as converter stations.
- Potential for long-term effects on the setting of archaeological and architectural features from the presence of new onshore infrastructure such as converter stations.
- Potential for the discovery of new cultural heritage features during construction, and for recording and sharing learning from these sites/ features.
- Potential for positive outcomes for conserving and enhancing the historic environment.

3.2.8.1 Onshore Designated and Important Historic Sites

In England, the National Heritage List for England (NHLE) provides an up-to-date register of all nationally protected historic buildings and sites, including listed buildings, scheduled monuments, protected wrecks, registered parks and gardens, and battlefields (Heritage Gateway, 2012).

In Wales, the government's historic environment service of Cadw provides an up-to-date register of nationally protected designated historic features and sites (CADW, 2025), while significant further historic environment information is available for Welsh archaeology, buildings, and artefacts through the Historic Wales map portal (Historic Wales, 2021).

In Scotland, features and sites afforded legislative protection are listed and detailed on the Historic Environment Scotland (HES) portal (HES, 2025). In addition, the national record of the historic environment in Scotland is catalogued through the online database Canmore (CANMORE, 2025). Canmore is managed by HES and contains more than 320,000 records and 1.3 million catalogue entries for archaeological sites, buildings, industrial and maritime heritage across Scotland (note this is being updated to Trove.Scot from June 2025).

WHS have been designated by UNESCO to meet the UK's commitments under the World Heritage Convention. These are areas considered to have globally important cultural or natural interests and require appropriate management and protection measures. There are 18 WHS in England. There are currently four UNESCO WHS in Wales: Blaenavon, Gwynedd Castles and Town Walls of King Edward, Pontcysyllte Aqueduct, and The Slate Landscape of Northwest Wales. There are six WHS in Scotland designated for cultural heritage: Frontiers of the Roman Empire Antonine Wall, Heart of Neolithic Orkney, New Lanark, The Old and New Towns of Edinburgh, St Kilda, and The Forth Bridge. The Crucible of Iron Age Shetland is also on the Tentative List for a future WHS (UNESCO World Heritage Convention, 2025).

Buildings considered to be of special architectural or historical interest can be listed, providing legal protection. Buildings can be classified as grades to indicate their relative importance, with Grade I indicating buildings of exceptional interest, Grade II* indicating particularly important buildings of more than special interest, and Grade II indicating buildings of special interest warranting preservation. Listing began in the 1940s, through the Town and Country Planning Acts of 1944 and 1947, and listed buildings are currently compiled under the terms of Section 1 of the Planning (Listed Buildings and Conservation Areas) Act 1990 in both England and Wales. In England, there are currently 379,545 entries for listed buildings recorded on the NHLE. In Wales, Ministers are responsible for compiling the register however, in practice, Cadw recommend those to be listed. There are currently 30,118 records for listed buildings recorded by Cadw in Wales. In Scotland, buildings of special architectural or historic interest are listed under the Planning (Listed Buildings and Conservation Areas) (Scotland) Act 1997. There are currently 47,632 Listed Buildings in Scotland, to note in Scotland listed buildings are classified into categories A, B, and C, rather than the use of grades like England and Wales.

The scheduling of monuments provides statutory protection to nationally important archaeological sites, e.g., standing stones, burial mounds, the remains of monastic building, and can include above and below ground features and ruins as well as structures that remain in use. Protection is provided through the Ancient Monuments and Archaeological Areas Act 1979 in England, Wales, and Scotland, which requires the Secretary of State to compile and maintain a schedule of ancient monuments of national importance. Any works to Scheduled Monuments requires a Scheduled Monument Consent. In England, there are currently 19,990 entries for Scheduled Monuments on the NHLE. In Wales, there are currently 4232 Scheduled Monuments recorded by Cadw. Of further importance in Wales is the number of Roman invasion and settlement sites, this increases a network of roads and forts associated with the Roman Fortresses located at Caerleon and Chester. In Scotland, HES maintains a list of scheduled monuments afforded

protection through the Ancient Monuments and Archaeological Areas Act 1979. There are currently 8,348 Scheduled Monuments listed. Areas may also be designated as an Area of Archaeological Importance (AAI) under the Ancient Monuments and Archaeological Areas Act 1979, with five areas currently designated, the historic centres of Canterbury, Chester, Exeter, Hereford, and York.

A Register of Parks and Gardens of Special Historic Interest in England was established under the National Heritage Act 1983 and includes designed landscapes such as parks and gardens, which are considered of national significance. There are currently 1,716 designed landscapes on the NHLE. Parks and gardens of special historic interest in Wales are recognised through registration, which provides legal protection through the Historic Environment (Wales) Act 2023. As for listed buildings, Welsh Ministers are responsible for compiling the register however, in practice, Cadw recommend those to be registered. There are currently 385 Registered Parks and Gardens recorded by Cadw. In Scotland, gardens and designed landscapes (grounds that have been purposefully laid out for artistic effect) that are considered of national importance are included in the Inventory of Gardens and Designed Landscapes and are afforded protection under the Ancient Monuments and Archaeological Areas Act 1979. There are currently 390 Gardens and Designed Landscapes in the Inventory.

The Register of Historic Battlefields identified sites of particular historical significance in England. The Register was established in 1995 and is administered by Historic England. Registered battlefields are not protected by a separate consent regime; however, local planning authorities must consider the potential impact to these sites and their conservation when considering any development that may affect them. There are currently 47 battlefields on the register in England. In Scotland, the Inventory of Historic Battlefields is a list maintained by HES of nationally important battlefields. Inventory sites must be considered in the plans, policies and decision-making processes of local planning authorities and other relevant public bodies. There are currently 40 Registered Battlefields in Scotland.

Conservation Areas are areas recognised as being of special architectural or historical interest. In England, these areas are typically designated by the local planning authority; however, Historic England can designate Conservation Areas in London, and the Secretary of State can also designate a Conservation Area anywhere in England in exceptional circumstances. There are almost 10,000 Conservation Areas in England. Conservation Areas are provided protection through the Planning (Listed Buildings and Conservation Areas) Act 1990. In Wales, Conservation Areas are also provided protection through the Planning (Listed Buildings and Conservation Areas) Act 1990. There are 529 Conservation Areas in Wales (Welsh Government, 2025). In Scotland, Conservation Areas can be designated by local authorities under the Planning (Listed Buildings and Conservation Areas) (Scotland) Act 1997; there are currently over 600 Conservation Areas, encompassing groups of buildings within a village, town, or city; historic land; battlefields, public parks, and designed landscapes or railways.

The Register of landscapes of historic interest in Wales has been compiled by Cadw to recognise landscape areas of outstanding or special historic interest of national importance in the Welsh context. There are 58 Registered Historic Landscapes recorded

on the Cadw. Inclusion on the register does not impose statutory controls, however, these areas should be given due consideration in the planning process.

In England, Historic Environment Records (HERs, which can also be referred to as Sites and Monuments Records) may be held by County Councils, District Councils or Unitary Authorities. Local authority records from over 70% of England's HERs are recorded on the NHLE. Local planning authorities can establish local lists of non-designated heritage assets, such as buildings, monuments, sites, places, areas, or landscapes, which they identify as important to consider in planning decisions, but which are not formally designated heritage assets (Historic England, 2017). HERs are also held by Local Authorities in Scotland, and some of the data in the Scottish HERs for undesignated assets may not be held on the Canmore/Trove.scot website.

The Defence of Britain Project created databases from field and documentary work undertaken between 1995 and 2001, with the purpose of recording the 20th century militarised landscape of the UK and informing the responsible heritage agencies at both local and national level with a view to the future preservation of surviving structures (Council for British Archaeology, 2006). The dataset was later revised by the Council for British Archaeology.

3.2.8.2 Offshore Designated and Important Historic Sites

Vessels Lost in Military Service

In GB waters, all crashed military aircraft (known as Military Maritime Graves) as well as certain vessels are designated under the Protection of Military Remains Act 1986, which is administered by the MoD. These wrecks can be individually designated as either Protected Places or Controlled Sites. Diving at Protected Places is allowed without permission; however, these vessels may not be entered, nor anything removed from them. Access to Controlled Sites is not permitted without permission from the MoD. These sites have a charted position, i.e. a latitude/longitude reference.

Historic Wrecks

Wreck sites are generally defined as sunken ships and aircraft, and any material associated with such vessels. This includes vessels ranging from prehistoric logboats to modern metal ships and aircraft. There are many thousands of shipwrecks that lie off the GB coastline. Known wreck sites vary from isolated items to practically complete vessels and cargoes. It is very likely that undiscovered wrecks are present in the waters off GB. All wreck sites have some historic value; however, only certain sites have been provided legal protection.

In England and Wales, wreck sites considered to be of importance can be designated either as ‘protected wreck sites’ or as maritime ‘scheduled monuments’. In England’s territorial seas, there are more than 37,000 known wrecks and recorded losses, with those protected listed on the NHLE (Historic England, 2025a). Managing the Marine Historic Environment of Wales sets out the approach of the Welsh Government to the marine historic environment and includes best-practice guidance for its protection and management (Welsh Government, 2020), while the legislative and policy framework for

underwater heritage is established by the UK Marine Policy Statement and the Welsh National Marine Plan.

Protected wrecks include the remains of ships and boats that are identified as historically, archaeologically, or artistically import, which are listed under the Protection of Wrecks Act 1973. There are 57 protected wreck sites in English waters listed on the NHLE. Of these, there are currently four wreck sites that are listed on the Heritage at Risk Register: London, Northumberland, Restoration, and Rooswijk. In the south-east, the wreck of the SS Richard Montgomery is designated as a Dangerous Wreck under Section 2 of the Protection of Wrecks Act 1973 owing to the large quantity of munitions that it contains and the potential danger that these could pose (Historic England, 2025b). There are currently six protected wrecks in Welsh waters: The Smalls Viking Wreck Site in Pembrokeshire; The Mary in Skerries, Anglesey; Pwll Fanog Wreck in the Menai Strait, Anglesey; Tal y Bont Wreck in Barmouth, Gwynedd; The Diamond in Barmouth, Gwynedd; and Resurgam Submarine in Rhyl, Denbighshire.

In Scotland, eight wreck sites were formerly designated under the Protection of Wrecks Act 1973. Historic Scotland have identified and designated ten Historic Marine Protected Areas (HMPAs) in Scottish territorial waters to protect nationally important wrecks, repealing the protection of designated wrecks under Section 1 of the Protection of Wrecks Act 1973. These designated areas aim to protect the historic environment by identifying historic assets of national importance, such as boat and aircraft wrecks, or scattered remains such as artefacts from a submerged prehistoric landscape (HES, 2021). These HMPAs are Drumbeg, Mingary, Kinlochbervie, Campania, Out Skerries, Dartmouth, Duart Point, Iona, Scapa Flow at Orkney and the Queen of Sweden off the coast of Shetland. In addition to designated sites, Historic Scotland have estimated that there are in the region of 20,000 shipwrecks in Scottish waters (Scottish Government 2011).

Important wreck sites can also be designated as Scheduled Monuments under the Ancient Monuments and Archaeological Areas Act 1979. In English waters there are 139 sites currently listed on the NHLE. A small number of undersea sites are designated as Scheduled Monuments under this Act in Scotland, including seven wrecks of the German High Seas fleet in Scapa Flow, and further maritime sites have also been designated in Welsh waters.

Figure 33 shows the location of protected wreck sites around the GB coastline, including HMPAs in Scotland.



Figure 33: Protected wreck locations within GB waters

3.2.8.3 Submerged Landscapes

A literature review of submerged archaeology in relation to the earliest occupation of Britain and the archaeological potential of the UK Continental Shelf (UKCS) was undertaken to inform the UK Offshore Energy SEA 4 (OSEA4) (DBEIS, 2022) This found knowledge of maritime sites to be relatively poor and likely subject to recording biases. Sea levels were greatly lower during periods of glaciation than in interglacial periods and areas of relatively shallow sea depths such as in the southern North Sea known as Doggerland would have been settled by early humans, as well as providing a migration route to the continent. A land bridge between GB and Ireland would also have existed until around 15,000 years ago (Montgomery et al. 2014). Research has been conducted to understand the palaeolandscapes of GB previously inhabited and their role in human prehistory. Research in the southern North Sea has included the mapping of around 45,000km2 of inundated prehistoric landscape through the North Sea Palaeolandscapes Project (Fitch et al. 2007), and seismic mapping, environmental analysis, sedimentary DNA analysis and computer simulation through the Europe's Lost Frontiers project (Gaffney and Fitch, 2022). The Life on the Edge project, based at the University of Bradford, is undertaking archaeological research into Late Palaeolithic landscapes (from 20,000 to 10,000 years ago), using new techniques and models to enable detailed mapping and identify archaeological areas of interest, and the collaborative SUBNORDICA project is undertaking work to map the seabed in the Baltic and North Seas.

Most submarine archaeological artefacts across the UKCS were found to have a theoretical maximum age of approximately 100,000 years, corresponding to the start of the Devensian glaciation period. Archaeology associated with human activity on the current seafloor of the southern North Sea and in the coastal areas and further inland on the British Isles was found to have potential to date as least as far back as 500,000 years. Earlier material may be present depending on the physical nature of artefacts and the erosional or other processes that have been at work. A good deal of the knowledge of offshore archaeological potential has been development-led, including finds from fisheries and industry such as marine aggregate extraction. It should be noted that within specific areas there can be a continuity of onshore and offshore cultural / archaeological heritage features which are of importance for consideration during planning and development.

3.2.8.4 Summary of Existing Pressures and Issues for Cultural Heritage

Heritage features can be threatened by many issues, from environmental to human impact. The overall state of historic features in England is monitored through an assessment of sites for Heritage at Risk, and Historic England updates the Heritage at Risk Register annually (Historic England, 2025c). This indicated that, for England, wreck sites are threatened by natural environmental elements as well as human activities such as commercial seabed exploitation, with four protected sites on the Heritage at Risk Register. For scheduled archaeological features, the most significant threat noted is due to damage from ploughing and arable clipping, followed by gradual degradation and decay resulting from natural processes such as tree growth, erosion, and animal activity. Registered Battlefields are noted as being most at risk from inappropriate new

development, which can also adversely affect Conservation Areas. Pressures that have been identified as affecting the historic environment in Scotland include climate change, sea level rise, and coastal change, development pressures, maintenance, pollution, and visitors (Scotland's Environment, 2023). Development pressures include those associated with impacts on the setting of coastal heritage sites that may result from large-scale renewable energy projects and their associated infrastructure (Scottish Government, 2025). HES manages the Buildings at Risk Register (BARR) for Scotland, highlighting properties that are at risk or threatened, and in Wales Cadw assesses the condition of, and risks to, listed buildings on a five-year rolling programme and has produced guidance on 'Listed buildings at risk' and 'Looking after your Scheduled Monument' and has published information on listed and scheduled assets at risk in 2024 (Welsh Government, 2024b). British Governments have recognised that many coastal heritage sites are at risk of coastal erosion, sea level rise, and extreme weather events due to climate change, which is likely to be exacerbated by climate change (Historic England, 2024; The SCAPE Trust, 2017). Scotland's Coastal Heritage at Risk Project indicated the coastal heritage sites in Scotland that are threatened by erosion, with endangered sites found in every local authority but the most vulnerable concentrated in Orkney, the Western Isles and Shetland.

Implementation of the draft HND Implementation Plan, and the construction, maintenance and, where relevant, decommissioning activities associated with the potential energy projects including offshore and onshore cabling that may arise as a result, has the potential to lead to damage or disturbance of known or as yet undiscovered heritage features in the marine environment, including wrecks and archaeological features, while onshore buried cabling and development of infrastructure such as converter stations could have the potential to directly impact on coastal architectural and archaeological features or, in the case of converter stations, affect the setting of these assets. Habitats of particular importance include peatlands and wetlands, where some of the most well-preserved and rich archaeological sites and their preserved palaeoecological and palaeoclimatic records are found, with an estimate that more than 20,500 archaeological sites exist beneath and within the peat in the UK (Gearey et al., 2010).

3.2.8.5 Evolution of the Baseline in the Absence of the Plan

Cultural heritage in the SEA Study Area is likely to be affected in the long-term by marine and coastal developments and climate change. Continuing pressures from human development will affect historic assets and their settings. The large number of visitors to heritage attractions may put increasing pressure on some sites. Pressures from climatic conditions and coastal erosion will continue to affect heritage features and be exacerbated by climate change. For coastal assets this is likely to include a greatly increased rate of loss of coastal assets e.g., through rising sea levels, impacts of adaptation schemes e.g., construction of coastal defences, and changes to salinity of groundwater affecting plant growth in historic landscapes, parks and gardens. For marine heritage this is likely to include changes to water chemistry leading to breakdown of marine heritage, and increased water temperatures leading to new pests affecting marine archaeology.

3.2.9 Landscape, Seascape and Visual Amenity

'Landscape' is defined by the European Landscape Convention as "an area as perceived by people whose character is the result of the action and interaction of natural and/or human factors' and 'it concerns landscapes that might be considered outstanding as well as every day or degraded landscapes'. Landscape and seascape form an important part of GB's identity and culture and influence the economy and the wellbeing of its population, with the UK government defining landscape character as "the distinct and recognisable pattern of elements that occur consistently in a particular type of landscape, making one landscape different from another, and contributing to a sense of place". Visual amenity can be considered to refer to the quality or character of a particular area in terms of the overall experience, quality and nature of landscape in terms of the views and outlooks available.

It is considered that the key issues associated with the implementation of the draft HND Implementation Plan and Landscape, Seascape and Visual Amenity comprise:

- Potential for effects on areas of designated landscape quality and scenic views (e.g., National Landscapes, National Scenic Areas, National Parks).
- Potential for effects on the general landscape and seascape and its sensitivity to development (potential compatibility with landscape and seascape character types).
- Potential visibility of onshore structures by human receptors.

3.2.9.1 Designated and Classified Landscapes

The value of the GB landscape is recognised through statutory designations and non-statutory classifications. National Landscapes (also formerly known as Areas of Outstanding Natural Beauty or AONBs) have been designated in England by Natural England and in Wales by Natural Resources Wales for their distinctive landscape character and high scenic value. The National Parks and Access to the Countryside Act 1949, amended by the Environment Act 1995, set out how land could be designated as AONBs, while the legal establishment of these areas is through the Countryside and Rights of Way (CROW) Act 2000. There are currently 34 National Landscapes in England and five in Wales. In Scotland, areas of land that are considered to be of national significance owing to their outstanding scenic interest are designated as National Scenic Areas (NSAs) through The Town and Country Planning (National Scenic Areas) (Scotland) Designation Directions 2010. These sites are broadly equivalent to the National Landscapes found in England and Wales. There are currently 40 NSAs covering roughly one million hectares (13%) of Scotland, of which 27 are located within or adjacent to coastal areas. NSA designations are integrated into Scottish Planning Policy; developments that could affect an NSA may only be permitted where the designation objectives and site integrity will not be compromised, and where any significant adverse effects on the special qualities of the

site would be outweighed by social, environmental, or economic benefits of national importance.

National Parks are national statutory designations that aim to preserve and enhance special landscape qualities and promote outdoor recreation. National Parks were established in England and Wales under the National Parks and Access to the Countryside Act 1949 (revised through the Environment Act 1995) to "conserve and enhance their natural beauty, wildlife and cultural heritage as well as to provide opportunities for public understanding and enjoyment ", and were introduced in Scotland under the National Parks (Scotland) Act 2000, to "conserve and enhance the cultural heritage, to promote the sustainable use of resources, to promote understanding and enjoyment of the special qualities by the public and to promote sustainable economic and social development of the area's communities". The UK Government announced its intention to introduce new legislation to provide greater protection for Protected Landscapes (National Parks and National Landscapes) in December 2024.

WHS, as described in Section 3.2.8, have been designated by UNESCO to meet the UK's commitments under the World Heritage Convention. These are areas considered to have globally important cultural or natural interest and require appropriate management and protection measures. There are three WHS' within GB designated fully, or in part, for their natural interest features: Dorset and East Devon Coast in England, and The Flow Country and St. Kilda in Scotland.

Heritage Coasts have been identified in England and Wales to conserve the best stretches of undeveloped coastline and protect these from inappropriate development. These areas are a non-statutory designation and are provided protection by development control through the planning system. Many Heritage Coasts are situated within National Landscapes or National Parks.

Locally, important landscape areas are defined by local authorities to provide protection to areas considered locally important through the planning process. In England these areas may be classified as Local Landscape Designations, Areas of Great Landscape Value, Special Landscape Areas, or Areas of Special Landscape Importance. In Scotland these areas are known as Local Landscape Areas (LLAs) and in Wales as Special Landscape Areas (SLAs).

Country Parks are areas protected as public green spaces primarily for the purpose of recreation and leisure, close to population centres, but can also have importance for conservation of natural or semi-natural habitats and landscape. These areas are declared under the Countryside Act 1968 in England and Wales, and the Countryside (Scotland) Act 1967 in Scotland. There are also three Regional Parks in Scotland (Clyde Muirshiel, Pentland Hills, and Lomond Hills).

Wild Land Areas have been defined in Scotland by NatureScot and represent nationally important and extensive areas of wilderness. They are not a statutory designation but are recognised as nationally important through Scottish Planning Policy.

National Trails are long distance walks through some high-quality landscapes in England and Wales and are administered by Natural England and Natural Resources Wales,

respectively. Together they cover over 6,000 miles. Scotland's Great Trails are equivalent trails in Scotland managed by NatureScot, with 29 routes providing over 1,900 miles of managed pathways.

National Trust lands are owned and managed by the National Trust and includes coastal, countryside and heritage landscapes, with c. 250,000 hectares of land and 500 places across England, Wales and Northern Ireland. Many of these areas are open to public access on foot, either in the case of designated 'Access Land' under the Countryside (Rights of Way) Act 2000 or by permission from National Trust, while some areas have limited access. The National Trust for Scotland also manage over 100 sites in Scotland, including outdoor areas, gardens, castles, battle sites and places that relate to famous Scots.

These landscape designations and areas of importance are summarised in Table 24 and the locations of national statutory designations are shown in Figure 34.

Designated and Important Landscape Areas

Site Designation	Description	Number
National Landscapes (Areas of Outstanding Natural Beauty)	Areas provided legal protection by the Countryside and Rights of Way Act 2000 in England and Wales because of their special landscape qualities, wildlife, geology and geography.	34 in England 5 in Wales
National Scenic Areas	Areas provided legal protection in Scotland by The Town and Country Planning (National Scenic Areas) (Scotland) Designation Directions 2010 in recognition of their significant features of scenery comprising a mixture of richly diverse landscapes including prominent landforms, coastline, sea and freshwater lochs, rivers, woodlands and moorlands.	40 in Scotland
National Parks	Areas provided legal protection by the National Parks and Access to the Countryside Act 1949 (revised through the Environment Act 1995) in England and Wales and the National Parks (Scotland) Act 2000 to preserve and enhance special landscape qualities and promote outdoor recreation.	10 in England 3 in Wales 2 in Scotland[6]

[6] Scottish Ministers have also proposed that a new National Park should be established in Galloway, with the potential area extending to parts of Dumfries and East and South Ayrshire.

Site Designation	Description	Number
World Heritage Sites	Sites designated by UNESCO for their globally important cultural and/or natural interest features. Note that the number of sites listed in this section references those sites designated for natural features or a combination of natural and cultural features.	1 in England 2 in Scotland
Heritage Coasts	Areas defined and managed by local authorities to protect coastlines from insensitive developments.	32 in England 14 in Wales
Local Landscape Designations	Areas defined by local authorities as locally important landscapes, provided protection through the planning system.	Numbers not available, as regularly updated through local plans.
Country Parks	The main purpose of these areas is for leisure and recreation; however, some contribute to the protection of natural or semi-natural habitats and landscapes. These areas are primarily set up and managed by local authorities.	415 in England 37 in Wales 40 in Scotland
Wild Land Areas	Areas selected to represent the most extensive areas of high wildness in Scotland and identified as nationally important in Scottish Planning Policy.	42 in Scotland
National Trails	Long-distance trails managed by Natural England and Natural Resources Wales.	20 in England and Wales
Scotland's Great Trails	Long-distance trails managed by NatureScot.	29 in Scotland
National Trust Lands	Lands managed by the National Trust in England and Wales and the National Trust for Scotland	Over 500 across England, Wales, and Northern Ireland Over 100 in Scotland

Table 24: GB landscape designations and areas of importance

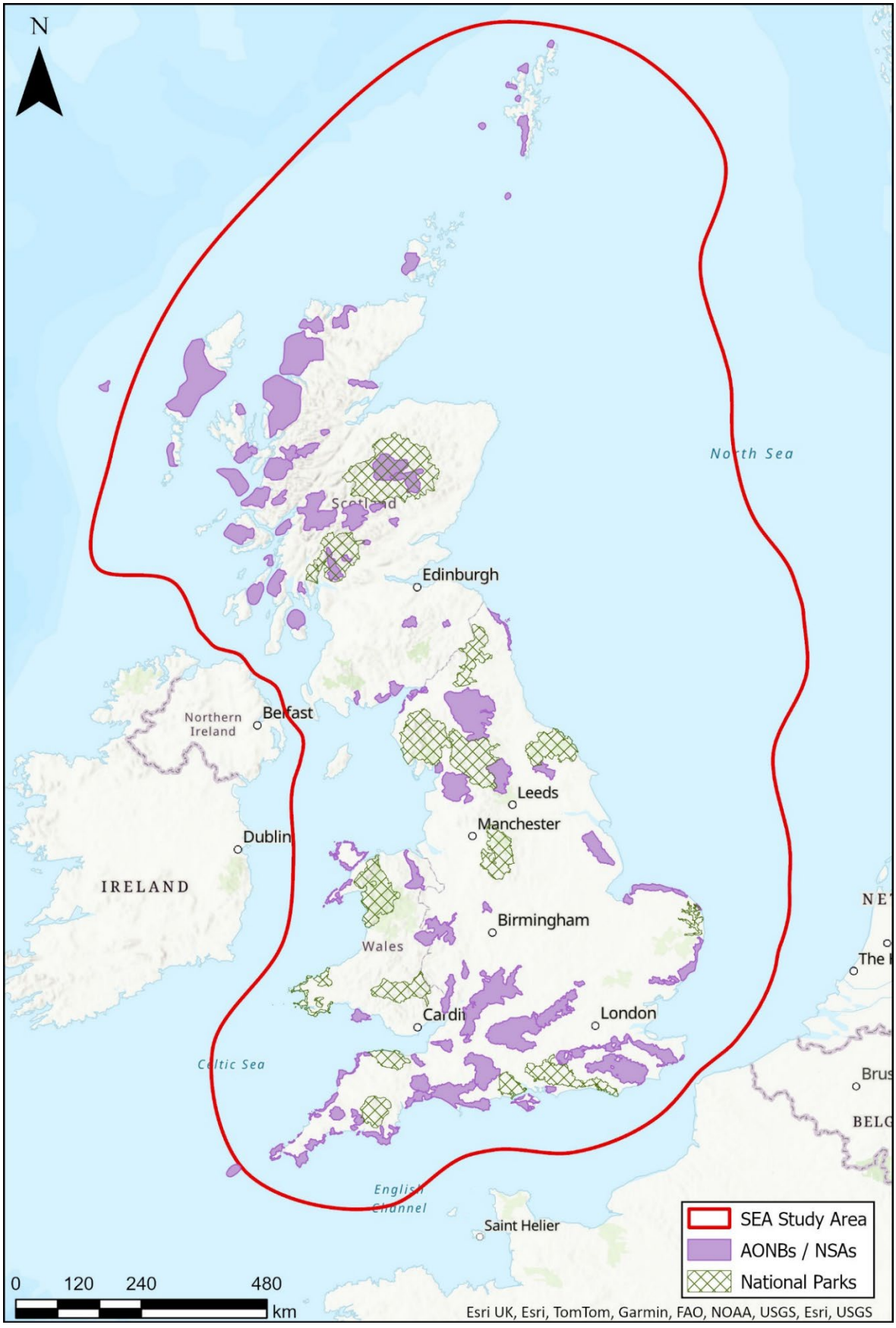


Figure 34: Areas designated for landscape in GB

3.2.9.2 Landscape and Seascape Character

Landscape Character

Landscape character assessments are used as a tool to identify the landscape features that give a locality its 'sense of place'.

In England, 159 National Character Areas (NCAs) have been defined by Natural England, with each representing an area of distinct and recognisable character at the national scale. The boundaries of these NCAs follow landscape features rather than administrative boundaries. Profiles for the NCAs have been developed by Natural England in partnership with stakeholders (Natural England, 2025a), with the information contained in these aiming to help to guide land management and other activities to strengthen landscape character and resilience to pressures including climate change. The NCA profiles include the following:

- **Summary and Headline Statements of Environmental Opportunity** – Summary of the NCA, including a general description of the landscape, and headline Statements of Environmental Opportunity.
- **Context Map** – Interactive map that provides context to the NCA and its surrounds.
- **Key Characteristics** – A list of the key characteristics of the NCA, which includes both natural and human influences on the landscape.
- **Description** – Overview of how the NCA links to others, a description of the landscape today, and a summary of how the landscape has changed over time.
- **Key Facts and Data** – Detail on the spatial distribution, type and quantity of components and features of the NCA.
- **Natural Capital and Key Ecosystem Services** – Overview of Natural Capital, and the benefits to society the NCA provides, linking to the Natural England Natural Capital Atlas.
- **Landscape Change** – Monitored landscape change within the NCA, derived from the Outcome Indicator Framework for the 25 Year Environment Plan, which includes G1: Changes in landscape and waterscape character, informed by indicator component G1a: Changes in the landscape characteristics of NCAs in England. Additional information is also provided on the changes and trends within the landscape as reported in 2014.
- **Detailed Statements of Environmental Opportunity** – Detailed lists of how each Statement of Environmental Opportunity could be achieved.
- **Analysis: Landscape Attributes and Opportunities** – This analysis section focuses on the landscape attributes and opportunities for the NCA.
- **Analysis: Ecosystem Services** – This analysis section focuses on a selection of the key provisioning, regulating and cultural ecosystem goods and services for the NCA.

The Landscape Change Evidence Hub (Natural England, 2025b) provides access to information on how, where, and why landscapes in England are changing and how to manage this change into the future and includes information on the Outcome Indicator Framework for the 25 Year Environment Plan, indicator G1, and the indicator component G1a Landscape Change Atlas and report. Landscape character at the local level in England is described through relevant local Landscape Character Assessment(s).

In Wales, 48 National Landscape Character Areas (NLCAs) have been defined at a broad landscape scale. Profiles are available for these areas, which provide a summary description and list of key characteristics linked to regional identity, as well as short descriptions of visual, geological, habitat, historic and cultural influences and can contribute to national and regional planning policy and guidance (NRW, 2023a). The NLCAs are at a comparable scale to the NCAs in England. There are also local landscape character areas in Wales, usually referred to as Special Landscape Areas (SLAs), which are published by local authorities and can form part of their Supplementary Planning Guidance. A GIS-based resource LANDMAP (NRW, 2024c), covering all of Wales, provides a detailed landscape evidence baseline and is used as the methodology for landscape assessment advocated by Planning Policy Wales.

In Scotland, a series of 30 Regional Landscape Character Area (LCA) studies were commissioned by NatureScot between 1994 and 1999, which together identified, described and mapped the landscape character of Scotland (NatureScot, 2019). Each study typically covered a local authority area, and these have been used to inform planning policy. NatureScot has since reviewed these LCA studies and produced a 2019 Landscape Character Type map and associated Landscape Character Type Descriptions which supersede those of the 1990s; however, details such as settlement pattern analysis in some of these older reports, may still be a useful resource.

Seascape Character

Similar to Landscape Character Assessment, Seascape Character Assessment (SCA) can be used to assess, characterise and describe the seascape character of areas.

In England, the Marine Management Organisation (MMO) has worked with Land Use Consultants (LUC) to undertake SCA on a regional basis, to underpin statutory marine planning (MMO, 2018). A Seascape Character Assessment technical report has been produced for each region considered. These describe the partitioning of the inshore and offshore marine plan areas into Marine Character Areas (MCAs). National Marine Character Area mapping has been produced, which is divided into 63 MCAs.

On behalf of the Welsh Government, NRW identified the broad-scale character of the seascapes of Wales and divided these seascapes into 29 MCAs; this information was used to provide strategic spatial evidence on seascapes to inform the National Marine Plan for Wales (NRW, 2023b). The area profiles for these MCAs include a description of the key characteristics of the area, including their natural, cultural and perceptual influences, as well as land – sea inter-visibility maps.

Coastal Character Assessment has also been undertaken for Scotland to inform marine plans, development plans, and specific development proposals (NatureScot, 2025b). Thirteen National Coastal Character Types have been identified at a very broad scale:

- Type 1 - Remote High Cliffs
- Type 2 - Rocky Coastline / Open Sea Views
- Type 3 - Deposition Coastline, Open Views
- Type 4 - Outer Firths
- Type 5 - Developed Inner Firths
- Type 6 - Narrow Coastal Shelf
- Type 7 - Kyles and Sea Lochs
- Type 8 – Enclosed Bays, Islands and Headlands
- Type 9 – Sounds, Narrows and Islands
- Type 10 – Outer Firth with Islands
- Type 11 – Less Developed Inner Firths
- Type 12 – Low Rocky Island Coasts

Seascape character is expected to be affected only on a temporary basis during construction activities associated with offshore and onshore cabling. Onshore, the landscape character is expected to vary in its sensitivity to renewable infrastructure development, with different landscape components and attributes influencing sensitivity to change relating to infrastructure such as substations and converter stations, as well as the transmission infrastructure leading from these assets. An evidence-based study has been undertaken on the actual visual and landscape effect of the presence of high voltage transmission infrastructure over a range of typical landscapes in Ireland (RPS Group, 2014b; Eirgrid 2016). A literature review found no studies which confirmed that existing features and conditions (e.g., low elevation, clear sky, vegetation, etc.) influence the landscape and visual impact of transmission infrastructure. As part of this study, a field study aimed to determine how landscape character affects the impact of transmission infrastructure, and how this impact changes over distance. Significant impacts were found upon a wide range of landscapes throughout Ireland, including rural lowland and upland areas, particularly within 400m of both tower and substation developments, while the distance for potentially significant effects was found to be higher for upland areas than for rural lowland areas. The study found that visual perception is determined by design, distance from the viewer, setting (i.e., hills, skyline), and visibility, as well as by the opinion of the viewer. Screening, such as from trees and hedgerows, was found to help reduce the impact of 110kV towers, while 'backclothing' (routing the towers against a background such as higher land) was found to help reduce the impact of 220kV and 400kV towers.

3.2.9.3 Summary of Existing Pressures and Issues for Landscape, Seascape and Visual Amenity

A substantial amount of GB land is protected by landscape designations that have a common aim of conserving areas that are considered to best represent natural beauty and/or distinctive character nationally. For instance, over 24% of land in England, over 20% of land in Scotland, and approximately 25% of land in Wales is covered by statutory landscape designations. Many of these designated landscape areas are at, or in proximity to, the coastline. Together these aim to retain exceptional landscapes while managing development within them and supporting continued public use and enjoyment. These designations, along with other non-statutory designations, provide a defence against inappropriate development that could detract from the scenic quality and character of an area, with nationally designated landscapes given a high protection status within the National Planning Policy Framework (NPPF) in England, the National Planning Framework 4 (NPF4) in Scotland, and the national development framework for Wales 'Future Wales: the National Plan 2040' as well as the Levelling UP and Regeneration Act (LURA) duty to protected landscapes (rather than landscape character areas).

The latest State of the Environment Report for Wales (SoNaRR 2020) identified the current pressures on natural resources, both within and outside Wales, with land use change identified as having a significant impact; land used for renewable energy development has continued to increase to meet national renewable energy targets. In Scotland, the most recent State of the Environment Report (2014) recognises that pressures to land include development of onshore wind farms, increased built developments, and changes to farming and forestry practices, with climate change also predicted to impact the rural character of Scotland's landscapes, which have cultural and economic (such as contributing to tourism value) importance.

Implementation of the draft HND Implementation Plan, and the construction, maintenance and, where relevant, decommissioning activities associated with the potential energy projects including offshore and onshore cabling and associated onshore infrastructure such as converter stations that may arise as a result, have the potential to lead to temporary (during offshore and onshore cabling works), to permanent effects (operation of onshore converter stations) on visual amenity and / or landscape character.

3.2.9.4 Evolution of the baseline in the Absence of the Plan

In the long-term, the coastal landscape and seascape of GB is likely to be changed by human development, coastal processes, and climate change. These landscapes and seascapes will be altered by coastal processes such as coastal erosion and accretion. These processes are likely to be exacerbated by climate change, such as increased erosion of more vulnerable coastlines, as well as sea level rise and increased storminess. A predicted continuing increase in the population is likely to drive further pressure for development, including an increase in offshore and onshore renewable energy developments, within marine and coastal areas and with potential to affect sensitive, designated, or valued landscapes.

4. Review of Relevant Plans and Programmes

4.1 Interaction with Other Relevant Plans and Programmes



4.1 Interaction with other Relevant Plans and Programmes

As part of the SEA process, the context of the draft HND Implementation Plan must be established with regard to other Plans and Programmes that have been adopted at International, National and Regional levels. In particular, the environmental protection objectives (EPOs) and standards included within these Plans and Programmes that will directly influence, or be influenced by, the draft HND Implementation Plan requires consideration. These EPOs have been used to create the Strategic Environmental Objectives (SEOs) that have been used for assessment of the draft HND Implementation Plan.

Table 25 identifies the main significant environmental plans, programmes and legislation, adopted at International/European level, National/Regional level or Sub-Regional level, which would be expected to influence, or be influenced by, the draft HND Implementation Plan. While it is recognised that there are many Plans, Programmes and legislation that could relate to the draft HND Implementation Plan, it is considered appropriate to only deal with those significant texts in order keep the assessment at a strategic level. More information on these Plans, Programmes and legislation, along with their potential interaction with the draft HND Implementation Plan is given in Appendix D.

Key Plans and Programmes

Level	Plan / Programme / Policy / Legislation
International / EU Level	Biodiversity • UN Convention on Biological Diversity (1992) • Kunming-Montreal Global Biodiversity Framework (GBF) • Ramsar Convention on Wetlands of International Importance (1971 and amendments) • Bern Convention (Convention on European Wildlife and Natural Habitats) (1982) • The Convention for the Protection of the Marine Environment of the North-East Atlantic (OSPAR) (1992) • Bonn Convention (Convention on the Conservation of Migratory Species of Wild Animals) (1983) • EU Biodiversity Strategy to 2030 • EU Birds Directive (Directive on the conservation of wild birds) [2009/147/EC] • EU Habitats Directive (Directive on the conservation of natural habitats and of wild fauna and flora) [92/43/EEC]

Level	Plan / Programme / Policy / Legislation
	• Convention for the Conservation of Salmon in the North Atlantic • EU Common Fisheries Policy • Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES) (1975) Climate Change • Paris Agreement (UNFCCC, 2015) • UN Kyoto Protocol, The United Nations Framework Convention on Climate Change (UNFCC, 1997) • EU 20-20-20 Climate and Energy Package Agreement (2007) • The European Green Deal 2019 • Renewable Energy Directive [2009/28/EC] and revision [Directive EU/2018/2001] • EU Strategy on Adaptation to Climate Change 2013 • Forging a climate-resilient Europe – the new EU Strategy on Adaptation to Climate Change 2021 [COM(2021)82] • Second European Climate Change Programme (ECCP II) 2005 • EU Green Infrastructure Strategy (COM(2013) 249 final) Air Quality • Stockholm Convention (2004) • World Health Organisation (WHO) Air Quality Guidelines – global update (2005) • The Gothenburg Protocol (1999) • Ambient Air Quality and Cleaner Air for Europe (CAFE) Directive [2008/50/EC] & 4th Daughter Directive of the Air Quality Framework Directive [2004/107/EC] • Industrial Emissions Directive [2010/75/EU] • National Emissions reduction Commitments (NEC) Directive [2016/2284/EU] • Geneva Convention (1979) Sustainable Development and Energy • Eighth Environmental Action Programme to 2030 of the European Community • EUROPE 2020 A strategy for smart, sustainable and inclusive growth (COM/2010/2020) • Roadmap to a Resource Efficient Europe (COM(2011) 571) • SEA Directive [2001/42/EC] • UN Convention on Environmental Impact Assessment (ESPOO Convention) and Kyiv (SEA) Protocol • EIA Directive [85/337/EEC] [2014/52/EU] • Energy Efficiency Directive [2012/27/EU]

Level	Plan / Programme / Policy / Legislation
	• UN 2030 Agenda for Sustainable Development Water • The MARPOL Convention (preventing pollution from shipping) • UNCLOS (United Nations Convention on the Law of the Sea) 1982 • European Integrated Maritime Policy 2007 • Water Framework Directive [2000/60/EC] and amendments • Marine Strategy Framework Directive [2008/56/EC] • Floods Directive [2007/60/EC] • Bathing Water Directive [2006/7/EC] • Environmental Quality Standards Directive [2008/105/EC] (also known as the Priority Substances Directive), as amended by Directive 2013/39/EU • Environmental Liability Directive [2004/35/EC] Waste • Waste Electrical and Electronic Equipment Directive [2002/96/EC], as recast by [201219/EU] • Waste Framework Directive [2008/98/EC] Cultural Heritage • Valetta Treaty (1992) • Granada Treaty (1985) • World Heritage Convention [WHC-2005/WS/02] Landscape • European Landscape Convention [ETS No. 176]
National / Regional Level	Biodiversity • Biodiversity 2020: A strategy for England's wildlife and ecosystem services • Scottish Biodiversity Strategy to 2045: Tackling the Nature Emergency in Scotland • Scottish Biodiversity Delivery Plan 2024–2030 • The Nature Recovery Action Plan for Wales: Our Strategy for Nature, 2015 • The Nature Recovery Action Plan for Wales 2020 – 21: Our Action Plan • Vital nature: Making the connections between biodiversity and the people and places of Wales. NRW's strategic steer for biodiversity to 2022 • UK Post-2020 Biodiversity Framework

Level	Plan / Programme / Policy / Legislation
	• The UK National Biodiversity Strategy and Action Plan (NBSAP) for 2030 • The Biodiversity Gain Requirements (irreplaceable habitat) Regulations 2024 • The Biodiversity Gain Requirements (Exemptions) Regulations • The Environmental (Local Nature Recovery Strategies) Procedure Regulations 2023 • Schedule 7A (Biodiversity Gain in England) Town and Country Planning Act 1990 • The Conservation of Habitats and Species Regulations 2017 • The Conservation of Habitats and Species Regulations 2010 • The Conservation of Offshore Marine Habitats and Species Regulations 2017 • The Conservation (Natural Habitats, &c.) Regulations 1994 (as amended) • The Conservation (Natural Habitats, &c.) (EU Exit) (Scotland) (Amendment) Regulations 2019 • The Wildlife and Countryside Act 1981 (as amended) • Natural Environment and Rural Communities Act 2006 • The Environment (Wales) Act 2016 • The Wildlife (Wales) Act 2010 • Nature Conservation (Scotland) Act 2004 (as amended) • The Wildlife and Natural Environment (Scotland) Act 2011 • Environmental Protection Act 1990 • Environmental Permitting Regulations 2016 • Improvement programme for England's Natura 2000 sites (IPENS) Programme Report: a summary of the Programme Findings 2015 • Natural England Site Improvement Plans for Natura 2000 sites (SPAs and SACs) • NatureScot Conservation and Advice Packages (CAPs) • NatureScot Conservation and Management Advice documents (CMAs) • Natural Resources Wales / Countryside Council for Wales Core Management Plans for SACs • Natural Resources Wales / Countryside Council for Wales Core Management Plans for SPAs • UK National Ecosystem Assessment (2011) • DEFRA Environmental Improvement Plan 2023: First revision of the 25-year environment plan. • DEFRA A Green Future: Our 25 Year Plan to Improve the Environment • Natural England Action Plan 2024 to 2025 • IUCN UK Peatland Programme

Level	Plan / Programme / Policy / Legislation
	• Making Space for Nature White Paper 2010 • The Great Britain Invasive Non-native Species Strategy: 2022 to 2030 • England Species and Habitat Action Plans • Scotland Species and Habitat Action Plans • Wales Species and Habitat Action Plans • UK Fisheries Act 2020 • The Sea Fish (Specified Sea Area) (Regulation of Nets and Prohibition of Fishing Methods) Order 1989 • The Sea Fishing (Licences and Notices) (EU Exit) (Scotland) (Amendment) Regulations 2019 • The Fisheries (Technical Conservation Measures) (EU Exit) (Scotland) (Amendment etc.) Regulations 2020 • The Prohibition of Fishing with Multiple Trawls (Scotland) Order 2017 • The Inshore Fishing (Prohibition of Fishing and Fishing Methods) (Scotland) Order 2015 • The Marine Environment (EU Exit) (Scotland) (Amendment) Regulations 2019 • The Inshore Fishing (Prohibited Methods of Fishing) (Luce Bay) Order 2015 • UK Blue Carbon Evidence Partnership Evidence Needs Statement 2023 • Marine Protected Area (MPA) Network Management: ACTION PLAN FOR WALES • English Seabird Conservation and Recovery Pathway Technical Report 2024 • Scottish Seabird Conservation Strategy (under development) • Shark, Skate and Ray Conservation Plan 2011 • A Progress Review of the Defra Shark, Skate, and Ray Conservation Plan 2013 • (Scotland) Tackling the nature emergency. Consultation on Scotland's Strategic Framework for Biodiversity • Reducing Marine Noise 2025 Policy Paper • Marine environment: unexploded ordnance clearance Joint Position Statement 2025 • Supporting minimising environmental impacts from unexploded ordnance clearance 2025 • JNCC guidelines for minimising the risk of injury to marine mammals from unexploded ordnance (UXO) clearance in the marine environment 2025

Level	Plan / Programme / Policy / Legislation
	• JNCC, Natural England and Cefas position on the use of quieter piling methods and noise abatement systems when installing offshore wind turbine foundations 2025 • Evidence on the Efficacy of Underwater Noise Abatement Climate Change / Air Quality • England's Third National Adaptation Programme (NAP3) the Fourth Strategy for Climate Adaptation Reporting 2023 – 2028 • Climate Adaptation Strategy for Wales 2024 • Prosperity for All: A Climate Conscious Wales A climate change adaptation plan for Wales 2020 – 2025 • Climate change: Scottish National Adaptation Plan 2024-2029 • Climate Emergency Skills Action Plan 2020-2025 Key Issues and Priority Actions • Securing a green recovery on a path to net zero: climate change plan 2018–2032 - update • UK Climate Change Act 2008 • Change Act 2008 (2050 Target Amendment) Order 2019 • Climate Change (Emissions Reduction Targets) (Scotland) Act 2019 • Climate Change (Scotland) Act 2009 • The Climate Change (Wales) Regulations 2021 • Historic Environment and Climate Change in Wales Sector Adaptation Plan 2020 • UK Climate Change Risk Assessment 2022 • The National Emissions Ceiling Regulations 2018 • UK National Air Pollution Control Programme (NAPCP) 2023 • The Environment (Air Quality and Soundscapes) (Wales) Act 2024 • The Environment Act 2021 • Clean Air Act 1993 • The Clean Maritime Plan (2019) • Air Quality Strategy for England, Scotland, Wales and Northern Ireland 2007 (due to be amended May 2023) • Air Quality Strategy for England 2023: framework for local authority delivery • Clean Air Strategy 2019 • Cleaner Air for Scotland 2 - Towards a Better Place for Everyone • Air Quality Standards Regulations 2010 (as amended) • Air Quality Standards (Scotland) Regulations 2010 (as amended) • Air Quality Standards (Wales) Regulations 2010 (as amended) • The Environmental Targets (Fine Particulate Matter) (England) Regulations 2023

Level	Plan / Programme / Policy / Legislation
	• The Clean Air Plan for Wales 2020: Healthy Air, Healthy Wales • The Clean Air Plan for Wales: Healthy Air, Healthy Wales. Update Report on Progress Against Actions 2024 Sustainable Development and Energy • The Crown Estate Act 2025 • Energy Act 2023 • Great British Energy Act 2025 • Powering Up Britain: Energy Security Plan • Powering up Britain: The Net Zero Growth Plan • Net Zero Strategy: Build Back Greener • Clean Power 2030 • Energy white paper: Powering our net zero future • British energy security strategy 2022 • The Ten Point Plan for a Green Industrial Revolution • Draft Energy Strategy and Just Transition Plan –delivering a fair and secure zero carbon energy system for Scotland • Scottish Energy Strategy: The future of energy in Scotland • A Blue Economy Vision for Scotland • Energy Efficiency in Wales: A strategy for the next 10 years 2016–2026 • Preparing Wales for a Renewable Energy 2050 • Welsh Government Net Zero strategic plan • Working together to reach net zero: all Wales plan • Net Zero Wales Carbon Budget 2 (2021 to 2025) • Climate Adaptation Strategy for Wales 2024 • Regional energy strategy: north Wales • Regional energy strategy: mid Wales • Regional energy strategy: South West Wales • Regional energy strategy: Cardiff Capital Region • Electricity Act 1989 • The Electricity Works (Environmental Impact Assessment) (Scotland) Regulations 2017 • The Electricity Works (Environmental Impact Assessment) (England and Wales) Regulations 2017 • The Infrastructure Planning (Environmental Impact Assessment) Regulations 2017 • Civil Nuclear: Roadmap to 2050 • Food and Environment Protection Act 1985 • Environmental Assessment (Scotland) Act 2005 • (Scotland) Environmental Assessment of Plans and Programmes (Scotland) Regulations 2004 • (England) The Environmental Assessment of Plans and Programmes Regulations 2004

Level	Plan / Programme / Policy / Legislation
	• (Wales) Environmental Assessment of Plans and Programmes (Wales) Regulations 2004 • Offshore transmission network review • The NOA 2021/22 • Pathway to 2030 Holistic Network Design • Beyond 2030 A national blueprint for a decarbonised electricity system in Great Britain • Beyond 2030: Celtic Sea • Beyond 2030 INTOG • UK Offshore Energy Plan and SEA 3 (OESEA3). Department of Energy and Climate Change 2016 • UK Offshore Energy Strategic Environmental Assessment 4 (OESEA4) 2022 • Offshore Wind Leasing Round 4 (Regions Refinement Report). The Crown Estate 2019 • Broad Horizons: Key Resource areas for offshore wind. Everoze Report, commissioned by The Crown Estate 2020 • Marine and Coastal Access Act 2009 • UK Marine Policy Statement 2011 • England National Planning Policy Framework (updated 2023) • Planning Policy Wales 2024 • Technical advice note (TAN) 15: development, flooding and coastal erosion • Welsh National Marine Plan 2019 • Future Wales: The National Plan 2040 • England Marine Plans (North East, East (note currently undergoing an update and will likely be available by 2027), South East (covering an inshore area only), South, South West and North West Marine Plans) • National Planning Framework 4 (Scotland) • (Scotland) National Marine Plan 2015 • (Scotland) Marine (Scotland) Act 2010 • (Scotland) National Marine Plan 2 (in development) • Sectoral marine plan for offshore wind energy (2020) • Draft Sectoral marine plan for offshore wind energy (2025) • (Scotland) ScotWind Offshore Wind Leasing Round (Crown Estate Scotland) • (Scotland) Sectoral Marine Plan for Offshore Wind for Innovation and Targeted Oil and Gas Decarbonisation (INTOG): Initial Plan Framework. • (Scotland) Innovation and Targeted Oil and Gas (INTOG) leasing round (Crown Estate Scotland) • The Town and Country Planning (Environmental Impact Assessment) Regulations 2017

Level	Plan / Programme / Policy / Legislation
	• The Town and Country Planning (Environmental Impact Assessment) (Wales) Regulations 2017 • The Town and Country Planning (Environmental Impact Assessment) (Scotland) Regulations 2017 • Electricity Networks: Transmission Acceleration Action Plan 2023 (TAAP) • Electricity Networks: Connections Action Plan • Air defence and offshore wind – working together towards Net Zero 2021 • Programme for Government 2024-25: Serving Scotland • Programme for Government 2025 to 2026 • Plan for Change: Milestones for Mission-Led Government • Wales Programme for government 2021 to 2026 • UK Sustainable Development Strategy • National Strategy for Economic Transformation • Prosperity for All: Economic Action Plan (Wales) • The Growth Plan 2022 (England) • A Green Future: Our 25 Year Plan to Improve the Environment • Well-being of Future Generations (Wales) Act 2015 Water • The Marine Strategy Regulations 2010 • The Water Environment (Water Framework Directive) (England and Wales) Regulations 2017 • The Water Environment and Water Services (Scotland) Act 2003 (Modification of Part 1) Regulations 2015 • Water Environment (Controlled Activities) (Scotland) Amendment Regulations 2017 (CAR) • The Water Environment (Miscellaneous) (Scotland) Regulations 2017 • The Water Environment (Remedial Measures) (Scotland) Regulations 2016 • The Water Environment (Amendment of Part IIA of the Environmental Protection Act 1990: Contaminated Land) (Scotland) Regulations 2016 • The Water Environment (River Basin Management Planning etc.) (Miscellaneous Amendments) (Scotland) Regulations 2015 • The River Basin Management Plan for Scotland 2021 – 2027 • The River Basin Management Plans – updated 2022 (England) • The River Basin Management Plans 2021-2027 (Wales) • The Shellfish Water Protected Areas (England and Wales) Directions 2016

Level	Plan / Programme / Policy / Legislation
	• The Water Environment (Shellfish Water Protected Areas: Environmental Objectives etc.) (Scotland) Regulations 2013 • The Bathing Water Regulations 2013 • The Bathing Water (Amendment) (England) Regulations 2018 • The Bathing Waters (Scotland) Amendment Regulations 2012 • National Policy Statement for Water Resource Infrastructure 2023 • The Flood Risk Regulations 2009 • Flood Risk Management (Scotland) Act 2009 • The Flood Risk Management (Flood Protection Schemes, Potentially Vulnerable Areas and Local Plan Districts) (Scotland) Regulations 2010 • Flood and Water Management Act 2010 • The Environmental Liability (Scotland) Regulations 2009 • Environmental Damage (Prevention and Remediation) Regulations 2009 • The Environmental Damage (Prevention and Remediation) (Wales) Regulations 2009 • The Pollution Prevention and Control (Designation of Directives) (England and Wales) Order 2019 • The Waste Management Licensing (Water Environment) (Scotland) Regulations 2006 • The Water Environment (Register of Protected Areas) (Scotland) Regulations 2004 Waste • The Waste (Scotland) Regulations 2012 • Circular Economy (Scotland) Act 2024 • Circular economy and waste route map to 2030: consultation • The Controlled Waste (England and Wales) Regulations 2012 • The Controlled Waste (England and Wales) (Amendment) (England) Regulations 2023 Cultural Heritage • Burials Act 1857 • Scotland's Archaeology Strategy 2015 • Historic Environment Scotland Act 2014 • Historic Environment Policy for Scotland • Our Past, Our Future – Strategy for Scotland's Historic Environment • Historic Environment (Wales) Act 2023 • Planning (Listed Buildings and Conservation Areas) Act 1990 • Planning (Listed Buildings and Conservation Areas) Regulations 1990

Level	Plan / Programme / Policy / Legislation
	• Planning and Compensation Act 1991 • National Lottery Act 1993 • Treasure Act 1996 • National Heritage Act 1997 • Dealing with Cultural Objects (Offences) Act 2003 • Enterprise and Regulatory Reform Act 2013 • The Planning (Listed Buildings and Conservation Areas) (Wales) Regulations 2012 (As amended) • The Ecclesiastical Exemption (Listed Buildings and Conservation Areas) (Wales) Order 2018 • The Ancient Monuments (Class Consents) Order 1994 • Historic Buildings and Ancient Monuments Act 1953 (as amended) • Community Empowerment (Scotland) Act 2015 • Marine (Scotland) Act 2010 • Planning (Listed Building Consent and Conservation Area Consent Procedure) (Scotland) Regulations 2015 • The Town and Country Planning (Development Management Procedure) (Scotland) Regulations 2013 • The Town and Country Planning (Neighbouring Planning Authorities and Historic Environment) (Scotland) Direction 2015 • The Scheduled Monument Consent Procedure (Scotland) Regulations 2015 • Town and Country Planning (Scotland) Act 1997 (as amended) • The Ancient Monuments (Class Consents) (Scotland) Order 1996 • Ancient Monuments and Archaeological Areas Act 1979 (as amended) • Planning (Listed Buildings and Conservation Areas) (Scotland) Act 1997 (as amended) • Environmental Assessment (Scotland) Act 2005 (as amended) • Planning (Scotland) Act 2019 • Planning (Wales) Act 2015 • Planning Act 2008 • Regional Spatial Strategy (RSS) • Future Wales: The National Plan 2040 • Wales Regional Strategic Development Plans • Scotland Regional Spatial Strategies • The Protection of Wrecks Act 1973 • The Protection of Military Remains Act 1986 • Managing Change in the Historic Environment Guidance Note – Conserving our Underwater Heritage (2025)

Level	Plan / Programme / Policy / Legislation
	Landscape • Nature Conservation (Scotland) Act 2004 • National Parks (Scotland) Act 2000 • Land Reform (Scotland) Act 2003 • Wildlife and Countryside Act 1981 • National Parks and Access to the Countryside Act 1949 • The Countryside and Rights of Way Act 2000 (CRoW Act) • Scotland's Third Land Use Strategy • Scotland's Landscape Charter • Landscape Policy Framework • Landscapes review: National Parks and AONBs • National Landscapes: Realising their Potential The Review of Designated Landscapes in Wales
Sub-Regional Level	• Local Biodiversity Action Plans (LBAPs) • Local Development Plans / Draft Plan Strategies • World Heritage Site Management Plans • National Park Management Plans • Conservation Area Character Appraisals / Plans

Table 25: Summary of key Plans and Programmes relevant to the draft HND Implementation Plan

5. HND Infrastructure Works

5.1 Offshore Corridor

5.2 Landfall (including HDD)

5.3 Onshore Corridor

5.4 Onshore Terminus

5.5 Offshore Terminus



5.1 Offshore Corridor

Renewable energy export cables associated with offshore wind farms currently involve linear connections from the offshore array to the shore, comprising numerous cables (typically up to 12) for a development. These export cables can be of two types, high voltage alternating current (HVAC) or high voltage direct current (HVDC). Cables are usually 120-350 mm in diameter and can carry voltages of up to 600kV.

A minimum spacing distance is recommended between cables that are part of the same development within a study corridor, in order to reduce the risk of damage to cables during both installation and maintenance activities. Spacing distances between cables will be influenced by water depth and other factors but are typically in the region of 50-100m. Application areas for cable licences are therefore often wide (e.g., 1km) in order to allow for sufficient separation of cables for installation and maintenance activities, to ensure a buffer area to protect installed cables, and to allow for any necessary micro routing within the study corridor. Figure 35 illustrates how submarine cables are laid.

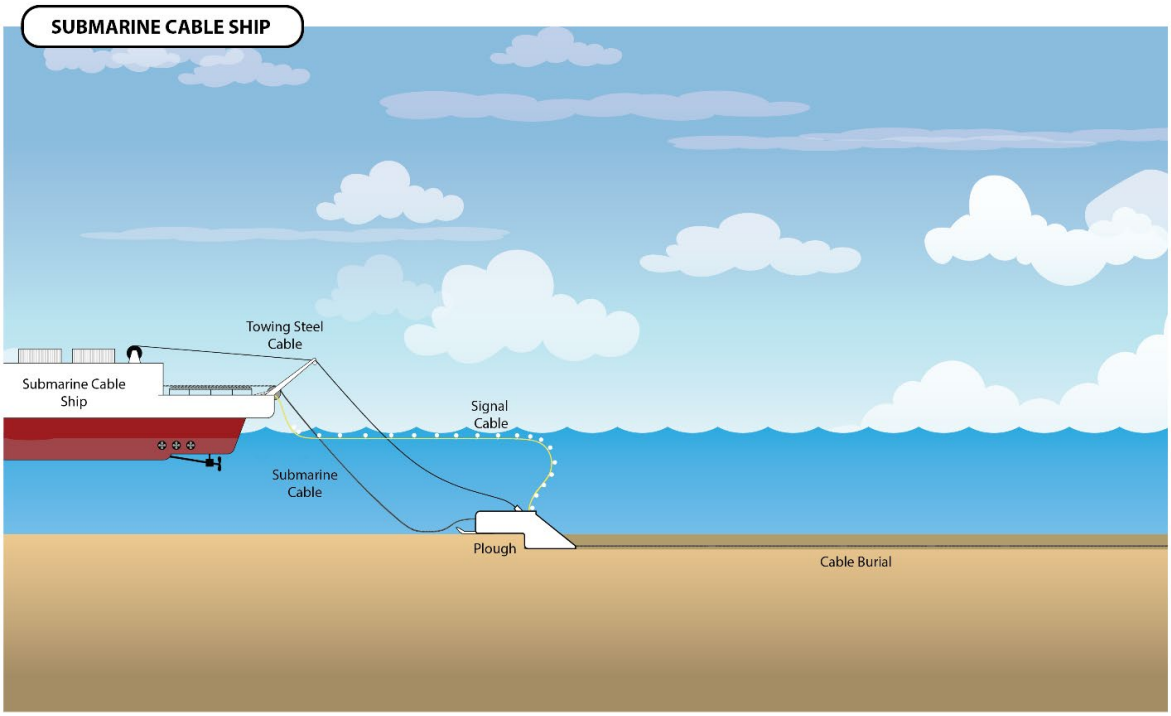
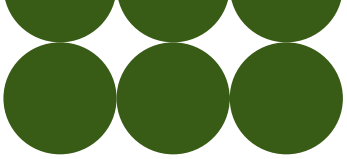


Figure 35: Typical submarine cable laying set-up

For the purposes of strategic assessment in the draft HND Implementation Plan, the following offshore study corridor assumptions have been made:

- AC cables are 1 cable per trench.
- AC cables can take up to 500MW each.
- DC cables without metallic return can be bundled into pairs, with 2 cables per trench.



- DC cables take up to 1GW each, giving a maximum capacity of 2GW for a single DC connection.
- DC cables with metallic return require 2 trenches.
- Offshore separation between cables is 100m.
- Offshore study corridors for the draft HND Implementation Plan study are 5km across.
- Detailed cable corridors are likely to be 1km across as part of project level consenting.

5.1.1 Offshore Cable Installation

The following high-level activities are associated with renewable energy export cables:

- Laying, burial and protection of power cables.
- Operation and maintenance of power cables.
- Decommissioning of power cables.
- Horizontal Directional Drilling.
- Vessel movement and anchorage associated with cable laying activities.

The installation of renewable energy export cables typically involves the burial of cables in the seabed and may include pre-sweeping of the area and clearance of boulders, the use of external cable protection or unexploded ordnance clearance. Further detail regarding these activities is given in the following sections.

5.1.2 Seabed Preparation of Cable Route

Several activities may be required along a cable route before cables are installed, with those required dependent on the environmental conditions. These include:

- **Pre-sweeping or sand wave clearance:** removal of sand waves / bedforms to ensure a flat enough surface for cable burial. This usually involves dredging techniques such as trailing suction hopper dredging or through use of mass flow excavators, while small sand waves / bedforms may be flattened using other tools, such as high-pressure water jets.
- **Pre-lay grapnel runs:** grapnel runs are typically completed along the entire cable route length and involve the towing of a grapnel along the seabed to capture and remove any debris along the planned cable route that if left, would cause issues for cable installation. Disposal is usually within the corridor.
- **Boulder clearance:** relocation of any large, individual boulders that may cause issues during cable installation (where routing around these is not possible) via a displacement plough or a subsea grab. The boulders are usually relocated within the wider seabed cable corridor.

- **Unexploded Ordnance (UXO) clearance:** if it is not possible to micro-route around a UXO, it may be necessary to relocate the UXO for disposal or detonation on land or, as a last resort, to detonate at sea.

5.13 Cable Burial

Trenching and burial of export cables provides for their protection from environmental conditions and other marine activities. Trenches are made either prior to cable laying, simultaneously during cable laying or the cable is buried post laying. The trench can be created through cutting, ploughing or jetting and is usually backfilled after cable laying using excavated sediment or may be left to backfill naturally in some circumstances. These activities occur during installation and may also be required during operation for cable maintenance, and at decommissioning.

For the purposes of strategic assessment, the following study corridor assumptions have been made:

- Offshore cables are ideally buried 2m deep in seabed.

5.1.4 Cable / Pipeline Crossing and Protection

External protection of cables may be required in certain circumstances – where there is a risk of interaction with other activities, where the target depth for burial of cables is not possible, and where a cable will cross other cables or pipelines. The external protection of cables usually consists of rock protection, with a height of 0.5-2m, or may involve the use of mattresses, split pipes or concrete shells. These activities occur during installation and may also be required during operation for cable maintenance, and at decommissioning.

For the purposes of strategic assessment, the following study corridor assumptions have been made:

- Cable protection if required ~2m depth stone protection, for buried cables or hard strata.
- Cable protection for surface cable / pipeline crossing ~4m depth stone protection.

External cable protection works associated with cable and pipeline crossing have potential to have a bearing on environmental receptors, and on environmental consenting. This will depend on the location of the activities, environmental conditions (e.g., seabed type), the location and scale of the potential impacts, and the sensitivity of the environmental receptor to the pressures that are associated with cable crossings and external cable protection.

5.1.5 Vessels

The installation of export cables requires the use of one or more vessels, whose operation can itself be associated with pressures on environmental receptors.

5.1.6 Potential Environmental Impacts of Offshore Cabling activity

The high-level activities set out above, associated with the installation, maintenance and decommissioning of export cables, can be associated with environmental pressures (mechanism by which an impact may occur). Those activities having potential to cause the most significant environmental issues, and the pressures associated with these are as follows:

- **Cable burial –** a change in the structure of the habitat through removal of material; penetration or disturbance of the substrate present below the seabed; a change in suspended solids (clarity of the water); smothering or a change in siltation rates; abrasion or disturbance of the substrate on the surface of the seabed (including abrasion); a change in water flow (tidal current) including the transport of sediment.
- **External cable protection such as rock placement –** external cable protection may be required where cables cannot be buried and is generally required where a cable will overlie another cable or pipeline; this has potential to lead to the following environmental pressures: a physical change in the seabed type (to another seabed type or sediment type); a change in suspended solids (clarity of the water); abrasion or disturbance of the substrate on the surface of the seabed; a change in water flow (tidal current) including the transport of sediment.
- **Landfall of the cable (including HDD) –** a change in the emergence regime, including a change in the tidal extent; a change in wave exposure; the introduction of substances (solids, liquids or gases); organic enrichment; introduction of a barrier to the movement of species; a change in suspended solids (clarity of the water); a change in the structure of the habitat through removal of material; penetration or disturbance of the substrate present below the seabed (including abrasion); a physical change in the seabed type (to another seabed type or sediment type); smothering or a change in siltation rates; vibration; a change in water flow (tidal current) including the transport of sediment.
- **Seabed preparation of the cable route, such as pre-sweeping, including seabed surveys –** a change in the structure of the habitat through removal of material; penetration or disturbance of the substrate present below the seabed (including abrasion); a change in suspended solids (clarity of the water; smothering or a change in siltation rates; abrasion or disturbance of the substrate on the surface of the seabed; underwater noise changes; alterations to wave propagation and currents with indirect impacts on sediment transport

In addition to these pressures, the movement and anchorage of vessels associated with cable installation can be associated with the following pressures: visual disturbance; introduction or spread of invasive non-indigenous species; penetration or disturbance of the substrate present below the seabed (including abrasion). NRW (2025) also notes

issues related to EMF (including heat production) during operation as an activity that can exert pressure on the marine environment.

5.2 Landfall (including HDD)

Where an export cable makes landfall, this may involve trenching or the use of trenchless installation techniques including horizontal directional drilling (HDD). Often ducts are installed at landfall, well in advance of cable installation, utilising the same techniques.

For a trenched landfall, a trench is excavated through the beach prior to the cable ship arriving, the cable is floated ashore (with the vessel remaining at a safe distance offshore), laid into the trench (or inserted into pre-laid duct), secured in the beach manhole, and the trench is then refilled with the excavated material. The depth of burial is approximately 2m but will vary with the site conditions.

HDD comprises the installation of underground cables without the use of a trench. It involves drilling underground and installation of a series of ducts that the cables may then be pulled through. This method can be used where the topography of the landfall site makes trenching difficult, to avoid damage to sensitive habitats, or damage to existing infrastructure.

HDD in the marine environment will include the excavation of exit pits but reduces the need for the installation of coffer dams, the use of cable protection (over ducts or cable endings), the use of jack up rigs or barges, and the use of vessels including anchorage. Figure 36 shows an indicative cross section of a landfall HDD.

For the purposes of strategic assessment in HNDFUE the following study corridor assumptions have been made:

- HDD requires cable separation of ~30m.
- Maximum HDD length ~1.5km.

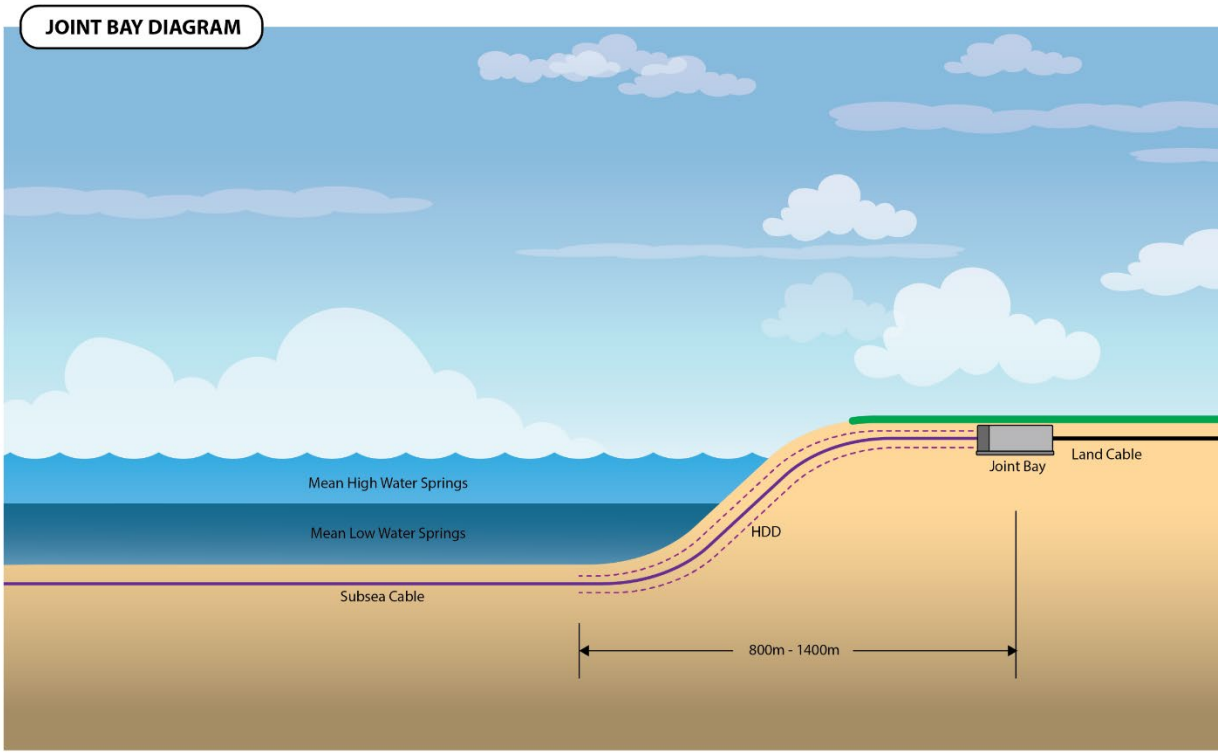


Figure 36: Landfall HDD

5.3 Onshore Corridor

Onshore cable laying will require the acquisition of a land corridor of about 40 – 60m wide, running from the landfall joint bay to the substation. Land use will, however, be reinstated on the finished surface following the cable laying.

The onshore construction corridor width is required to accommodate construction plant, haul roads, laydown areas and temporary construction compounds. The construction corridor may be narrowed at sensitive locations and for road and river crossings. Construction typically involves standard techniques of trench excavation with appropriate plant, temporary laydown of spoil, laying of cables, backfilling of trench and then reinstatement of site. Drilling may be required for road and river crossings. Single trench connections may be able to run along or beside existing roads, to reduce the potential for impacts on the natural environment.

Figure 37 demonstrates an indicative single trench working strip, while Figure 38 demonstrates an indicative double trench working strip. Note DC bundle pair of cables shown in both figures.

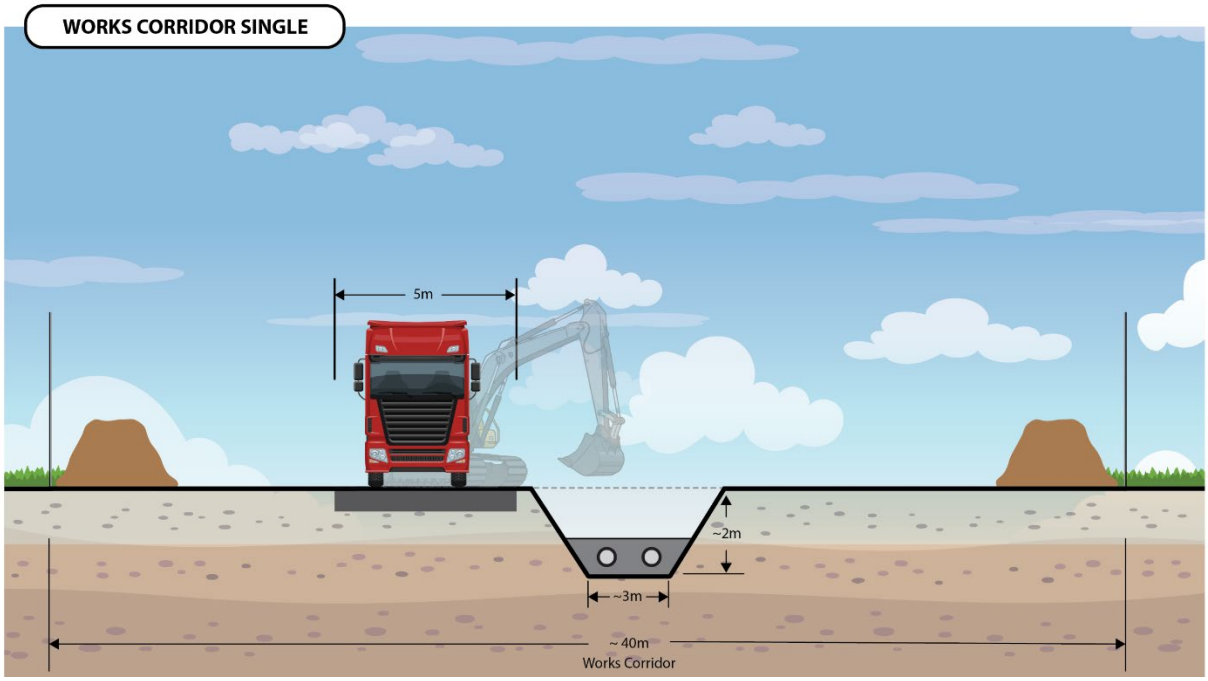


Figure 37: Example single trench working strip

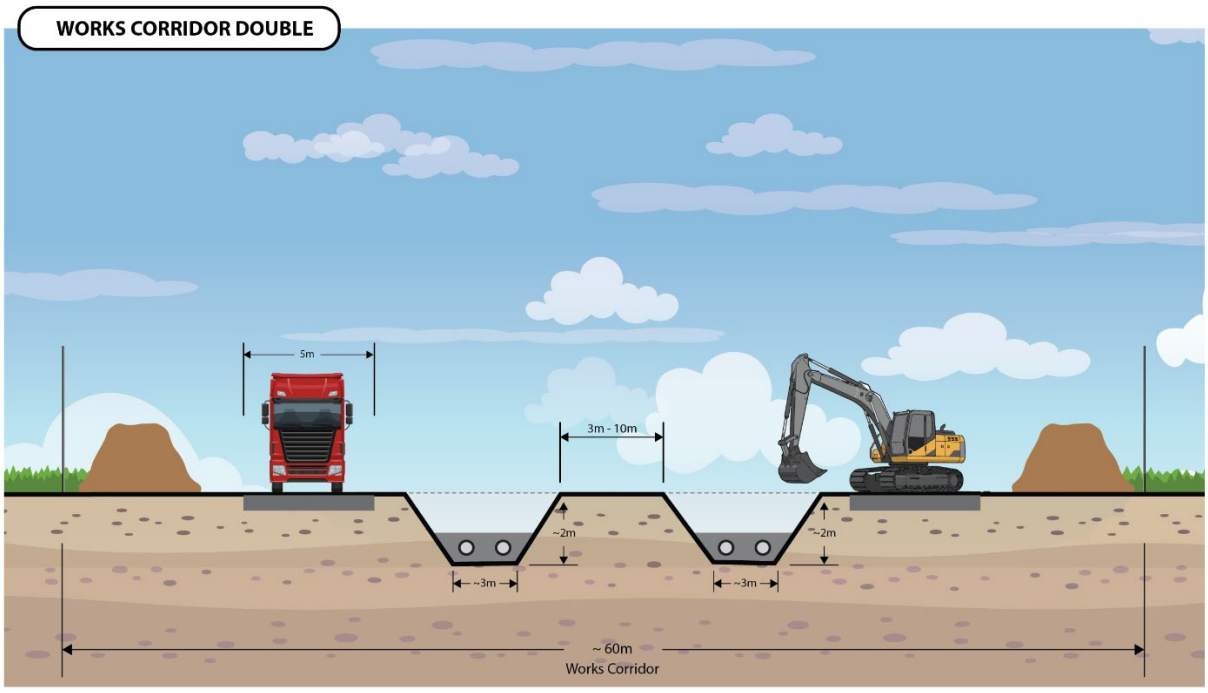


Figure 38: Example double trench working strip

For the purposes of strategic assessment, the following onshore study corridor assumptions have been made:

- Onshore working corridor for 1 trench ~40m.

- Onshore working corridor for 2 trenches ~60m.
- Onshore trench ~2m deep x ~3m wide.
- Onshore cable separation AC ~10m.
- Onshore cable separation DC ~3m.
- Onshore AC and DC cable routes can run parallel.

5.4 Onshore Terminus

Typically, a connection for an offshore wind farm will terminate in a dedicated substation (AC) or converter station (DC) close (typically within 2-5km) to the identified connection point to the existing transmission grid infrastructure. Such sites consist of a mixture of buildings and electrical switch gear and require a relatively large flat site for construction, as shown in the examples in Figure 39[7] and Figure 40[8].

The draft HND Implementation Plan assessment does not identify specific sites for such infrastructure but does consider the availability of undesignated or lightly constrained land with 5km of the identified grid connection point in considering the degree of constraint and potential for environmental effects associated with identified routes.

5.5 Offshore Terminus

For the purposes of the draft HND Implementation Plan it is assumed that the platforms or other marine structures required to accommodate the offshore substation (AC) or converter station (DC) will be located within the lease area of the proposed offshore wind farm and thus no specific assessment of constraint risk and potential for environmental effects associated with these assets is undertaken.

[7] Littlebrook 400kV substation, Dartford, Kent, England (2GW capacity). Image sourced at: New National Grid substation fully operational, transmitting clean power to 1.5 million homes | National Grid

[8] IFA-2 +320kV DC converter station (1GW capacity). Sourced at: https://www.theagilityeffect.com/en/article/supergrid-set-to-strengthen-energy-links-between-france-and-uk/



Figure 39: Example AC substation



Figure 40: Example HVDC converter station

6. SEA Framework

6.1 Approach to SEA Assessment of Effects

6.2 Difficulties and Data Gaps



6.1 Approach to SEA Assessment of Effects

Assessment of the draft HND Implementation Plan comprised an assessment of the baseline environmental information available against the high-level objectives and potential issues. This method involved an assessment against the following SEA topics:

- Biodiversity, Flora and Fauna (BFF)
- Population and Human Health (PHH)
- Geology, Soils and Land Use (GSL)
- Water (W)
- Air (A)
- Climatic Factors (CF)
- Material Assets and Infrastructure (MA)
- Cultural, Architectural and Archaeological Heritage (CH)
- Landscape, Seascape and Visual Amenity (L)

The purpose of this was to predict and evaluate, as far as possible, the environmental effects of the draft HND Implementation Plan, highlighting any significant environmental problems and/or benefits that are likely to arise from its enactment.

6.1.1 Non-Spatial Assessment of Cabling and Onshore Infrastructure

To simplify the assessment process and avoid repetition during the assessment of each proposal, the types and severity of high-level impacts that cabling (i.e., offshore cabling and onshore underground cabling) and onshore infrastructure (substations and converter stations) can have on sensitive features within each SEA topic was first considered. These potential impacts have been described based on the experience of the SEA Team, and from a review of SEA reports from several related plans (the UK Offshore Energy SEA 4 (OSEA4), the UK Offshore Energy SEA 3 (OSEA3); the Northern Ireland ORESAP SEA; the Scottish Draft Sectoral Marine Plan for Offshore Wind Energy and SEA (2019), the Scottish draft Sectoral Marine Plans for wave and tidal energy (2013); Planning Scotland's Seas: SEA of Plans for Wind, Wave and Tidal Power in Scottish Marine Waters (2013); the Scottish draft Updated Sectoral Marine Plan for Offshore Wind Energy 2025; relevant reports including 'Nature Conservation Considerations and Environmental Best Practice for subsea cables for English Inshore and UK Offshore waters' (NE / JNCC 2022), 'Marine cabling activities in Wales: information to support environmental assessment' (NRW, 2025b), OSPAR published guidelines and assessment of cable impacts, EIRGRID evidence-

based studies for impacts of cables, Taormina et al. (2018); and a comprehensive review of 168 EIA reports associated with offshore renewable energy projects in UK waters. This non-spatial environmental assessment across SEA topics is provided in Section 8.

6.1.2 Assessment of Recommended Designs

The network design and assessment methodology that was applied in the development of the four HND / HNDFUE work strands is detailed in Section 2.4.3. A significant number of potential route corridors and grouped Options were appraised, which included consideration of environmental and community constraints and sensitivities at key points in the network design process. For each of the four HND / HNDFUE work strands, the outcome of this process was the identification of a Recommended Design.

The Recommended Design(s) for the four HND / HNDFUE work strands were considered and assessed in the order in which they were developed, and the recommended network design published, i.e., HND, HNDFUE: ScotWind, HNDFUE: Celtic Sea, HNDFUE: INTOG. This recognises that earlier work strands could have in-combination and/or cumulative effects with subsequent Recommended Designs for work strands that overlap in a geographic area (e.g., the HNDFUE: ScotWind and HNDFUE: INTOG Options overlap with the HND Recommended Design. The HNDFUE Celtic Sea design superseded the HND design for the South West region and therefore there is no potential for cumulative effects in this case. Where alternative route corridors had been identified through the HRA derogation process, these were also considered within the appraisals. A summary assessment also considered the full Recommended Design of the draft HND Implementation Plan, including identification of the potential for cumulative effects across SEA topics. The steps in this process are shown in Figure 41.

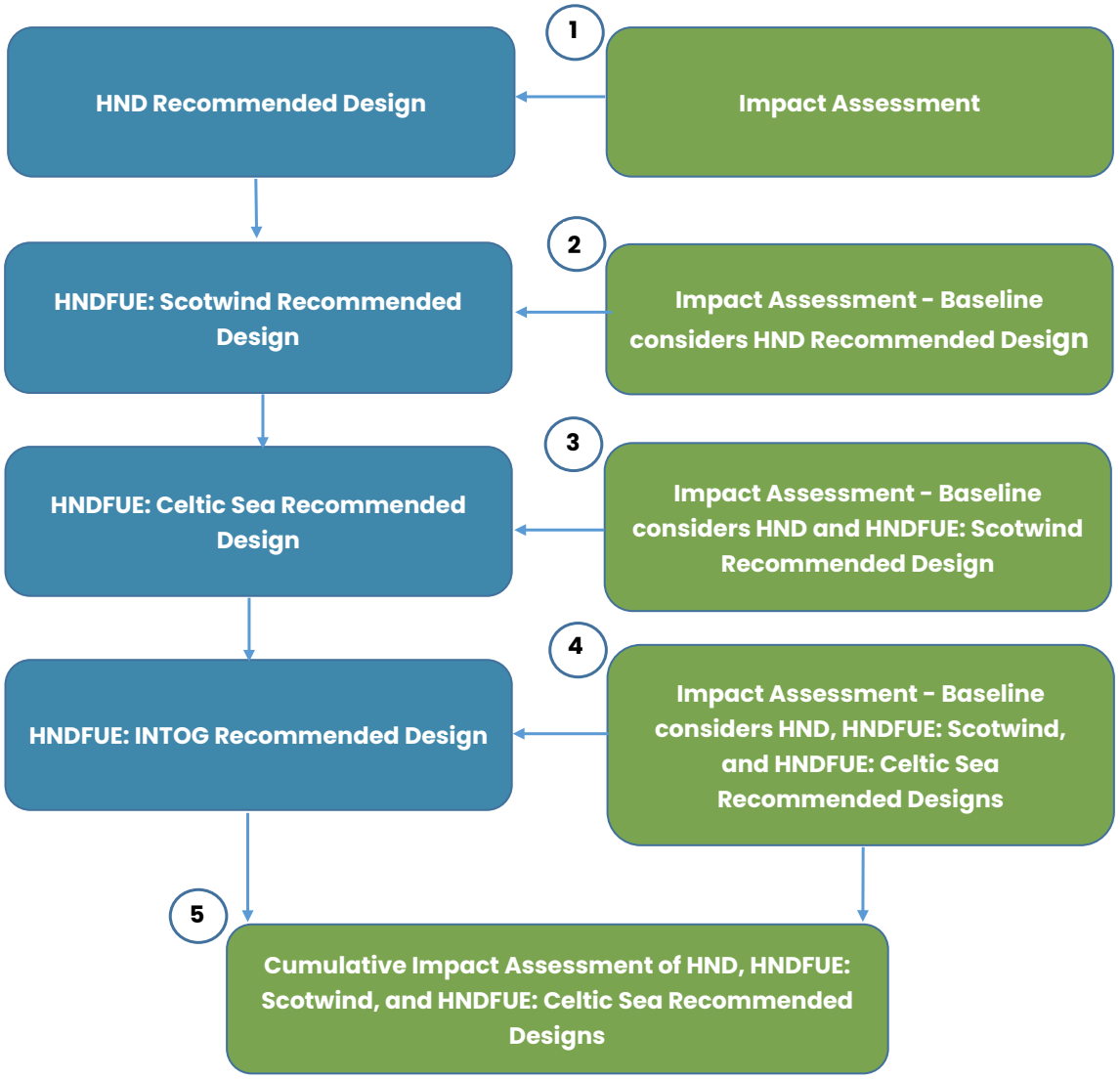


Figure 41: Stages in the assessment of Recommended Designs

The assessment of Recommended Designs was informed by the non-spatial environmental assessment of cabling and onshore infrastructure, the methodology for which is described in Section 6.1.1 and the outcomes reported in Section 8.

Assessment of the draft HND Implementation Plan is relatively strategic, with the aim of reporting likely impacts at the national and regional level to reflect the scale at which the strategic Recommended Designs and constituent route corridors have been identified. For each of the four HND / HNDFUE work strands, the potential main issues and impacts are detailed by environmental topic area.

The Recommended Designs of the draft HND Implementation Plan were assessed in terms of their potential effects, and the significance of these effects, on the environment against a set of Strategic Environmental Objectives (SEOs). These SEOs were developed in the context of broader environmental protection objectives set at both international and

national levels (outlined in Section 4 and detailed in Appendix D) and also take into account the context of potential for impacts associated with the draft HND Implementation Plan. Each of the environmental topics described in Section 3.2 was assigned at least one high-level SEO, specifying a desired outcome, against which the Recommended Designs set out in the draft HND Implementation Plan were assessed. Each high-level SEO was paired with a specific target(s), as well as indicator(s) that can be used to measure the progress towards achievement of these targets. These SEOs, Indicators and Targets are given in Table 26. The assessment examined the likely significant effects of the Recommended Designs set out by the draft HND Implementation Plan, and how their realisation will contribute to achieving these SEOs.

SEA Objectives

SEA Topic	Objective	Objective Description	Indicators	Targets
Biodiversity, Flora and Fauna	Avoid damage to, and where possible enhance, biodiversity, flora and fauna.	Preserve, protect, maintain and, where possible, enhance biodiversity and ecosystems within UK marine and coastal areas, including internationally, nationally, and locally protected sites, habitats and species, and other known species of conservation concern. Preserve, protect, maintain and enhance the connectivity	Conservation status of designated habitats and species within international and national designated sites (e.g., SACs, SPAs, Ramsar sites, MCZs, NCMPAs, SSSIs). Status of protected and priority habitats and species (e.g., Annex habitats and species, priority habitats and species). Areas of known importance for flora and fauna (e.g., fish spawning and nursery grounds, RSPB Reserves,	No negative change, or a positive change, in the conservation status of designated habitats and species within international, and national designated sites. No negative change, or a positive change, in the status of protected or priority species and habitats outside designated sites. Avoid areas of known importance for flora and fauna.

SEA Topic	Objective	Objective Description	Indicators	Targets
		between sites and ecosystems.	NRW habitats sensitive to cabling).	
Population and Human Health	Minimise disruption to the local population, and adverse effects on human health and wellbeing, while maximizing potential benefit to the population.	Avoid adverse effects on human health and safety and minimise disruption to the local population, and displacement of recreational and leisure use of the area, while supporting transition from fossil fuel use through delivery of a new secure renewable energy supply for the GB population, with potential employment and other benefit opportunities.	Population centres in proximity to onshore routes. Areas of higher deprivation in proximity to onshore routes. Use of the area by recreational and leisure users (e.g., RYA areas, Bathing waters) and status of these areas, where applicable. Potential to support new renewable energy supply for the GB population, with potential employment and other benefit opportunities.	Delivery of cables and associated infrastructure with minimal adverse nuisance to communities, including in areas of higher deprivation. Minimise the risk to, or displacement of, recreational and leisure users of the area. No negative change, or a positive change, in the status of Bathing Waters. Facilitation of renewable energy infrastructure that supports a transition away from fossil fuel use and maximises the potential benefits to the population.
Geology, Soils and Land use	Minimise damage to the function and quality of	Preserve, protect, maintain and, where	Site condition/status of protected geological/geo	No negative change, or a positive change, in the condition

SEA Topic	Objective	Objective Description	Indicators	Targets
	the seabed, and avoid significant damage to, or loss of, sensitive onshore land and soils.	possible, enhance, sites designated for geological or geomorpholo gical features, and minimize direct and indirect damage to the function and quality of the seabed and sensitive onshore land and soils.	morphological features within designated sites (WHSs, MCZs/Historic MPAs, SSSIs, UNESCO Geoparks). Interaction with known areas of potential contamination (e.g., MoD live firing areas, munition disposal areas, unexploded ordnance (UXO), dumping grounds offshore). Potential scale of loss or alteration to seabed geology and sediments. Potential scale of loss of soil resource including high-quality agricultural lands and peatlands or other carbon-rich soils.	of protected geological/geo morphological features within designated sites. Minimise potential interaction with areas of potentially contaminated sediments. Minimise potential loss or alteration to seabed geology and sediments. Minimise potential loss of sensitive land and soils including high-quality agricultural lands, peatlands and other carbon-rich soils and where possible enhance these areas.
Water	Avoid impacts on the status or quality of water bodies and avoid	Support the objectives of the WFD and MS (Marine Strategy) by	Status of WFD water bodies and protected areas (Bathing Waters, Shellfish	No negative change in the status of WFD water bodies,

SEA Topic	Objective	Objective Description	Indicators	Targets
	interaction with areas of flood risk.	avoiding damage to or deterioration of water status, quality and resource and support the objectives of the Floods Directive by avoiding interactions with national flood zones.	Waters) interacting with offshore and onshore routes. MS Environmental status of marine area (e.g., Descriptor 5, 8, 9, 10, 11). Interaction with known areas of potential contamination offshore (e.g., MoD live firing areas, munition disposal areas, UXO, dumping grounds). Potential for impacts on water quality during construction. Interaction with areas of known flood risk (national flood zones).	and protected areas. No negative change in the Environmental status of MS Descriptors. Minimise potential interaction with areas of potentially contaminated sediments. Minimise the potential for impacts on water quality during construction. Minimise potential interaction with areas of known flood risk.
Air	Minimise risk to local air quality and contribute to improving national emissions.	Minimise risk to local air quality and contribute to improving national pollutant emissions.	Sensitive receptors in proximity to routes (e.g., population centres onshore, areas of high recreational/leisure use offshore).	Minimise the potential for negative effects on air quality from vessel emissions and onshore emissions. Avoid interaction with

SEA Topic	Objective	Objective Description	Indicators	Targets
			Interaction with areas of known air quality issues onshore (e.g., Air Quality Management Areas) Capacity to support new renewable energy connection, with potential effects on pollutant reduction.	areas of known air quality issues onshore. Facilitation of renewable energy infrastructure that supports a transition away from fossil fuel use and maximises the potential for a reduction in air pollutant emissions.
Climatic Factors	Avoid impacts on carbon stocks and potential while contributing to a reduction in GHG emissions.	Minimise loss of carbon sequestering seabed and terrestrial carbon sinks while contributing to a reduction in GHG emissions from the energy supply sector in line with national commitments.	Interaction with areas of known or potential blue carbon habitats. Interaction with onshore habitats that are carbon sinks (peatlands, forests). Capacity to support new renewable energy connection, with potential effects on GHG reduction.	Minimise the potential for loss of known blue carbon habitat. Minimise the potential for loss of onshore habitats that function as carbon sinks. Facilitation of new renewable energy infrastructure that maximises the potential for a reduction of GHG emissions in line with emission reduction targets.

SEA Topic	Objective	Objective Description	Indicators	Targets
Material Assets and Infrastructure	Minimise disruption to other assets and infrastructure while providing robust new renewable energy infrastructure.	Provide robust new renewable energy infrastructure while minimising disruption to other assets and infrastructure.	Presence of offshore and onshore coastal infrastructure (e.g., cables, pipelines, roads, WWTWs). Interaction with other users of the marine area (shipping, fisheries and Shellfish Waters, military, aviation, dredging sites). Potential capacity of new renewable energy infrastructure facilitated.	Minimise the potential for loss or damage to other marine, coastal, and onshore infrastructure. Minimise the risk to, or displacement of, other users of the area (fisheries and aquaculture, shipping, military activities, aviation, dredging sites). Facilitation of new renewable energy infrastructure that maximises the potential energy output in line with government targets to decarbonise the power system by 2030.
Cultural, Architectural and Archaeological Heritage	Protect, conserve, and where possible enhance designated and non-designated heritage	Protect international, national and local heritage designations, and non-designated heritage	Interaction with known designated / non-designated marine heritage features/sites (e.g., protected wrecks, Historic MPAs).	Avoid or minimise the potential for effects on known designated marine heritage features/sites.

SEA Topic	Objective	Objective Description	Indicators	Targets
	assets and their settings.	assets, and their settings.	Interaction with known designated / non-designated coastal archaeological or architectural heritage features (e.g., listed buildings, scheduled monuments). Potential to contribute to archaeological knowledge through surveys and actions.	Minimise the potential for effects on known heritage features and their setting in development and operation of onshore infrastructure. Potential for gaining new knowledge to inform subsequent decision-making.
Landscape, Seascape and Visual Amenity	Protect, and where possible enhance, the landscape and seascape character and visual amenity of the GB shoreline.	Protect and where possible enhance the landscape and seascape character and visual amenity of the GB shoreline.	Potential for effects on visually sensitive designated areas (e.g., National Landscapes, WHSs). Population centres in proximity to onshore routes.	No long-term negative change, or a positive change, to areas designated for landscape. Delivery of cabling and associated onshore infrastructure with minimal adverse visual effects to communities.

Table 26: Strategic Environmental Objectives, Indicators and Targets

The potential for development within each Recommended Design area to have effects on SEA topics and SEOs, was assessed in the short, medium and long-term for likely effects, the significance of the effects, and whether they are positive or negative effects. Other

impacts assessed for significance were secondary effects, cumulative effects, synergistic effects, temporary and permanent effects, and the inter-relationship of effects.

All potential positive and negative impacts are presented individually, with a text description, and then a summary graphic. In addition, a summary of the overall balanced potential effect is presented for each environmental issue area. Scores are assigned to impacts, ranging from +3 to -3 as demonstrated in Table 27. The purpose of adding numerical scores is to assist in the comparison of options. Like the assessment, the scores demonstrate both the positives and the negatives and are not conveyed in terms of net benefit or net loss, which can sometimes be misleading. A guide to the scorings that have been used for this assessment is given in Appendix E; note that this provides *examples* of the types of effects that may occur and their potential significance on environmental receptors. The scoring takes into account the sensitivity of receptors and professional opinion and is linked to the potential high-level impacts identified and the baseline environment. The scoring system is intended as a guide to show how the assessment considers the full source-pathway-receptor and professional opinion, any considerations on recoverability of receptors should be considered at an individual project level rather than the strategic Plan stage.

SEA Impact Scoring

Score	Description
+3	Significant positive environmental effects
+2	Moderate positive environmental effects
+1	Slight positive environmental effects
0	No environmental effects
-1	Slight negative environmental effects
-2	Moderate negative environmental effects
-3	Significant negative environmental effects

Table 27: Description of SEA environmental impact scores

6.2 Difficulties and Data Gaps

The sourcing and compilation of data used within the constraints modelling for the development of the draft HND Implementation Plan, and within the SEA assessment, proved to be difficult and time intensive. In order for data to be used at these assessment stages, it should be reliable, published, spatial distribution data, freely available, and there had to be consistent data availability across the entire SEA Study Area. The draft Plan covers a significant geographic area across the three jurisdictions of England, Scotland

and Wales and for some topics it proved difficult to obtain high quality data with a sufficient geographical distribution across all jurisdictions covered by the draft Plan.

Stakeholders were consulted at several stages of the draft Plan and SEA development, and constraints assessment through the HND Environmental Steering Group and via SEA Scoping Consultation, to ensure that key stakeholder opinions and recommended data could be fully considered, thus ensuring a balance in the consideration of data to be used for constraints modelling and screening.

There are datasets available for some topics that provide a greater level of detail but only cover certain geographic areas of the draft Plan; where these cannot be used at this strategic level it is recommended that they are considered at the project stage for proposed new developments within those relevant areas.

Some data is not consistently available across all three jurisdictions, e.g., example a national dataset is available for Local Landscape Areas or Special Landscape Areas in Scotland and Wales, but data is not available that provides the full coverage of these landscape areas within England. Where comparable data is not available for all jurisdictions it has not been utilised in the assessments but should be considered at the project level. Where possible, comparable sensitivities have been considered across jurisdictions, e.g. Marine Character Areas are available for England and Wales, whereas Coastal Character Types are available for Scotland.

Under subsequent review of the SEA and for any project level assessment, any new emerging data sources should be considered. Sources of data due to be published by the end of 2025, but which were unable to be considered within this SEA include information from the POSEIDON project, data on Marine Irreplaceable Habitats and data on Annex I Habitats.

For some potential impacts, effects on species have been documented, but there remains uncertainty as to what, if any, effect this could have at a population level. For example, knowledge of marine species' sensitivities to EMF from subsea cables is patchy, and the knowledge base on effects, and how they could manifest at a population-level needs advancement[9]. Further available knowledge, from scientific and industry research, and projects under the TCE Offshore Wind Evidence and Change Programme should be taken on board by any projects arising from the draft HND Implementation Plan, and in any future iteration of the Plan itself.

[9] Gill, A.B., Hutchison, Z.L. and Desender, M. 2023. Electromagnetic Fields (EMFs) from subsea power cables in the natural marine environment. Cefas Project Report for Crown Estate Offshore Wind Evidence and Change Programme, pp. 66. Available at: https://tethys.pnnl.gov/sites/default/files/publications/Gill-et-al-2023-CEFAS.pdf

7. Consideration of Alternatives

7.1 Consideration of Alternatives

7.2 Consideration of Alternatives during HND Development

7.3 Consideration of Strategic-Level Alternatives



7.1 Consideration of Alternatives

The SEA process must include an evaluation of the likely environmental consequences of a range of reasonable alternative scenarios, which in this case are alternatives to the draft HND Implementation Plan. The purpose of this section is to outline the reasons for choosing the draft HND Implementation Plan as the preferred alternative in light of other reasonable alternatives being considered.

7.2 Consideration of Alternatives during HND Development

As described in Section 2.4.3, a significant number of potential route corridors, and options comprising combinations of route corridors, were appraised through the network design and assessment methodology applied for the four HND/HNDFUE work strands, with a Recommended Design identified for each. This equal footing appraisal methodology considered environmental, community and technical constraints and sensitivities at key points in the process. These constraints and sensitive features represented the topics considered in SEA and the potential impacts of cabling operations on key areas and/or features that should be avoided; therefore, during this stage of route corridor and options appraisal, all technically feasible alternative route corridors and options available to the plan were assessed, and the short-listing of potential route corridors and options was influenced by environmental and social factors.

For a total of 112 short-listed route corridors, an SEA light assessment was conducted. This was based on key indicators across SEA topics and included identification of the potential for effects on these indicators and the nature of these effects (e.g., significance and temporal nature). An SEA light assessment was also undertaken for a total of 31 short-listed options, comprised of route corridor combinations that represented potentially viable alternatives. In addition, an SEA light assessment was conducted for a total of 39 interface areas, which considered the wider area around the endpoint of route corridors where onshore infrastructure, including substations and/or converter stations would need to be developed. The SEA light assessment of all short-listed route corridors, options and interface areas is provided in Appendix F.

In summary, all technically feasible alternative route corridors and options available to the plan have already been assessed using the equal footing appraisal process, with short-listed route corridors, options and interface areas also further considered through SEA light appraisal. The identification of Recommended Designs for the draft HND Implementation Plan was informed by these outcomes.

7.3 Consideration of Strategic-Level Alternatives

The following strategic-level alternatives can be considered for the draft HND Implementation Plan:

- Strategic Alternative 1, Do Nothing approach – considers the existing approach to connection of offshore wind generation sites, whereby those awarded leasing rights for offshore wind apply for connection to the onshore electricity network independently and on a first come, first served, basis.
- Strategic Alternative 2, HND/HNDFUE network design approach – considers all Recommended Designs established by the four HND/HNDFUE work strands, representing a more coordinated approach to the connection of offshore wind sites to the onshore electricity network.

7.3.1 Strategic Alternative 1

In the absence of the draft HND Implementation Plan, offshore wind would continue to play a key role in meeting both the anticipated substantial rise in electricity needs and the UK Government's target for net zero emissions. Therefore, offshore wind would continue to be developed in GB waters and would need to be connected to the onshore electricity network. In this scenario, the developers of offshore wind projects would continue to have control of developing the offshore transmission assets required to bring generated energy onshore, with individual connections from each offshore project to the onshore network, i.e. a point-to-point or radial connection.

For Strategic Alternative 1, there is the potential for short to medium-term, negative effects on the SEOs for Biodiversity, Flora and Fauna; Geology, Soils and Land Use; Population and Human Health; Water; Cultural Heritage; and Material Assets, and potential for long-term negative effects on the SEOs for Material Assets; Air; Climatic Factors; Cultural Heritage; and Landscape and Visual Amenity.

There is potential for short to medium-term, negative effects on the SEOs for Biodiversity, Flora and Fauna, and Geology, Soils and Land Use, as there would be no strategic-level consideration of designated sites such as SACs, SPAs, MCZs, Nature Conservation MPAs and SSSIs. With a continued radial approach to the connection of offshore wind, there is greater potential for attempting to develop additional cable routes through designated sites. There would, however, be a requirement for developers and planning authorities to consider these sites at the project level through Screening for AA/AA and MCZ Assessments. In the absence of a coordinated approach, there is potential for greater disturbance to populations in proximity to cable routes and areas where onshore developments are required, with potential for short-term negative effects on the SEOs for Population and Human Health. There is also potential for greater cumulative negative

effects on water quality through subsequent routing of cables through and across the same waterbodies.

With the continued attempts for radial connections, there is potential for an increased risk to known and unknown heritage features and the SEOs for Cultural Heritage owing to the likelihood that a wider area could be affected where study corridors are not shared. In the long-term there is potential for an increased risk of negative effects on sensitive landscape areas and the SEOs for Landscape and Visual Amenity, as well as the setting of heritage assets and the SEOs for Cultural Heritage, where the cumulative impacts of interface area developments such as substations and converter stations are not considered at a strategic level. However, these potential impacts will continue to be considered at the project level.

In this scenario, there is potential for long-term positive effects on the SEOs for Material Assets, Air, Climatic Factors and Population and Human Health, owing to the development of new renewable energy infrastructure, increased connection of offshore wind to the electricity network to meet population demand and offer alternative to fossil fuel electricity generation with indirect positive effects on air and climatic emissions. However, there is potential for short-term negative effects on the SEOs for Material Assets, as a continued radial approach to the connection of electricity generated offshore is likely to lead to an increased interaction with existing and planned infrastructure both offshore and onshore, including an increased number of crossings of existing cables, pipelines and roads. There is also potential for long-term negative effects on the SEOs for Material Assets and Population and Human Health in this scenario, as a continued radial connection may lead to saturation of some areas for connection to the onshore grid and the lack of strategic planning for energy connection may leave some areas unable to meet increased electricity demand. Should saturation of areas for onshore connection and inability for additional developments to connect to the onshore grid occur, this would also result in long-term (limited) positive impacts on the SEOs for Air and Climatic Factors, as less connection of renewable energy sources to the electricity supply network is likely to result in the continued reliance upon finite fossil fuels and thus the ongoing, long-term emissions of pollutants into the atmosphere. With population growth and therefore increased electricity demands expected into the future, the severity of these impacts is likely to increase with time.

7.3.2 Strategic Alternative 2

The assessment of implementing the Recommended Designs of the HND Implementation Plan, i.e., Strategic Alternative 2, is reported in detail in Section 9. The development of the work strands of the draft HND Implementation Plan considered and assessed both the potential radial approaches and coordinated approaches to cabling connections from offshore wind farms, as shown in Table 3.

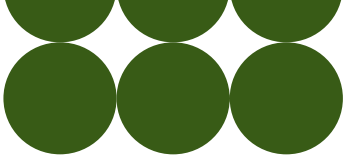
In this scenario, the potential would remain for short to medium-term negative effects across the SEOs for all topics. However, the consideration of environmental sensitivities throughout the development of the draft Plan and selection of Recommended Designs enables the minimisation of potential negative effects. This includes avoidance of designated sites, and areas protected for heritage and landscape importance.

With greater coordination in the connection of offshore wind to the onshore electricity network, there is a greater possibility of maximising the potential for positive long-term effects. In comparison to Strategic Alternative 1, there is a reduced likelihood that routes to shore will become saturated for development and greater potential for direct long-term positive effects on the SEOs for Material Assets, and indirect long-term positive effects on the SEOs for Air, Climatic Factors and Population and Human Health.

8. High-Level Environmental Assessment of HND Infrastructure

8.1 Potential Effects on SEA Topics





An overview of the construction works that are involved in offshore and onshore cabling and associated infrastructure is provided in Section 5. The offshore cabling activities having potential to cause the most significant environmental issues, and the pressures associated with these are described in Section 5.1.6.

This section provides a description of the potential high-level effects that cabling (i.e., offshore cabling and onshore underground cabling) and onshore converter stations and substations can have on sensitive features within each SEA topic, including during installation, operation and decommissioning. The methodology for this is described in Section 6.1.1. This high-level assessment is not area specific, and is technology neutral i.e., the size and type of cable, or the size of onshore converter station or substation are not pre-defined; rather, it examines the types of interactions that these offshore and onshore cables and associated infrastructure may have with the environment and the potential effects of these interactions. A subsequent assessment, that is specific to the Recommended Design areas identified for and sensitive receptors within these areas, is presented in Section 9. It should be noted that construction and decommissioning phase high-level effects are considered to be similar, however, if the decommissioning process includes the removal of cables and/or associated protective materials this may result in an additional habitat loss of the recolonised areas. Currently, a circular economy has begun to emerge on the removal of cables for either repurposing elsewhere (typically for use by less economically development countries) or for salvaging of cable's raw materials. Generally, the removal of deep ocean cables has fewer environmental impacts compared to removal in shallow ocean areas due to the increased diversity of habitats and species supported in shallower areas.

8.1 Potential Effects on SEA Topics

For Biodiversity, Flora and Fauna, the key environmental pressures that should be considered for cable installation, maintenance and decommissioning are:

- Abrasion/disturbance of the substrate on the surface of the seabed.
- Penetration and/or disturbance of the substratum below the surface of the seabed, including abrasion.
- Physical change (to another seabed type).
- Physical change (to another sediment type).
- Changes in suspended solids (water clarity).
- Smothering and siltation rate changes (Light).
- Introduction or spread of invasive non-indigenous species (INIS).
- Habitat structure changes - removal of substratum (extraction).
- Water flow (tidal current) changes, including sediment transport considerations.
- Underwater noise changes, vibration and visual disturbance.

The main effects identified at a strategic level for offshore and onshore cabling are described under the following sub-topics: designated sites; benthic habitats and species; fish and shellfish; marine mammals and reptiles; and birds and bats. NRW (2025) consider the most likely effects of cabling activity to be as follows:

- Loss or alteration of marine or benthic habitats.
- Impacts on electrosensitive species.
- Changes to the physical environment and consequent implications for protected habitats and species.

The main effects identified at a strategic level for onshore substations and converter stations are described under the following sub-topics: designated sites; terrestrial habitats and ecology; fish and amphibians; aquatic and terrestrial invertebrates; mammals; and birds and bats.

For Population and Human Health, the main effects identified at a strategic level for offshore and onshore cabling are described under the following sub-topics: human health; energy supply; and population, property and community spaces. The main effects identified at a strategic level for onshore substations and converter stations are described under the following sub-topics: human health; economic; social; energy supply; and population, property and community spaces.

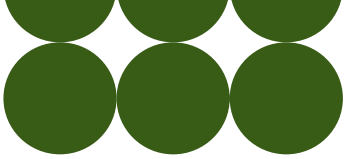
For Geology, Soils and Land use, the main effects identified at a strategic level for offshore and onshore cabling are described under the following sub-topics: geology, geomorphology, soil and sediment processes; land use; and contaminated land. The main effects identified at a strategic level for onshore substations and converter stations are described under the following sub-topics: geology and geomorphology; land use; soils; and contaminated land.

For Water, the main effects identified at a strategic level for offshore and onshore cabling are described under the following sub-topics: water quality; and flood risk. The main effects identified at a strategic level for onshore substations and converter stations are described under the following sub-topics: water quality; water quantity; flood risk; abstraction; and private water supplies.

For Air, the main effects identified at a strategic level for offshore and onshore cabling and for onshore substations and converter stations are described under the sub-topic of air quality.

For Climatic Factors, the main effects identified at a strategic level for offshore and onshore cabling and for onshore substations and converter stations are described under the following sub-topics: GHG emissions and carbon storage; and climate change effects.

For Material Assets, the main effects identified at a strategic level for offshore and onshore cabling are described under the following sub-topics: existing infrastructure: cables and pipelines; other users: commercial fisheries and aquaculture; other users: shipping and navigation; other users: commercial forestry; other users: military activities; other users:



disposal areas; other users: ports and harbours; other users: mineral resources and aggregate extraction; other users: tourism; other users: aviation; other users: road network users; and other users: agriculture. The main effects identified at a strategic level for onshore substations and converter stations are described under the following sub-topics: existing Infrastructure: cables, overhead lines and pipelines; other users: agriculture; other users: commercial forestry; other users: mineral extraction; other users: aviation; other users: road network users; other users: military activities; and other users: tourism.

For Cultural Heritage, the main effects identified at a strategic level for offshore and onshore cabling are described under the following sub-topics: archaeology and wrecks (offshore cabling) / terrestrial archaeology and heritage (onshore cabling). The main effects identified at a strategic level for onshore substations and converter stations are described under the following sub-topics: archaeology; and heritage. This also includes the potential for effects on the setting of assets.

For Landscape, Seascape and Visual Amenity, the main effects identified at a strategic level for offshore and onshore cabling and for onshore substations and converter stations are described under overall topic area of landscape, seascape and visual amenity. This also includes the potential for effects on the setting of assets.

The strategic level effects identified for offshore and onshore cabling are summarised in Table 28 and the strategic level effects identified for onshore substations and converter stations are summarised in Table 29.

SEA Topic	Offshore Cabling		Onshore Cabling	
	Pre-construction, Construction and Decommissioning	**Operation and Maintenance**	**Pre-construction, Construction and Decommissioning**	**Operation and Maintenance**
Biodiversity, Flora and Fauna	**Designated Sites** Potential for cables to affect the integrity, quality, ecology, structure, and functions of protected sites, habitats, and species; these impacts will depend on the characteristics and sensitivity of the protected sites, habitats, and species. Activities associated with the construction phase of cabling and associated impacts on habitats and general disturbances to the area should generally not be detrimental to the overall quality status of sites, representing local and temporary impacts, however the long-term presence of cables and associated protective structures may have a greater impact on the area; this will, however, be confined to the cable route itself.	**Designated Sites** Potential for cables to affect the integrity, quality, ecology, structure, and functions of protected sites, habitats, and species; these impacts will depend on the characteristics and sensitivity of the protected sites, habitats, and species. The long-term presence of cables and associated protective structures may have a greater impact on the area; this will, however, be confined to the cable route itself.	**Designated Sites** Potential for direct and indirect negative impacts on the qualifying features of statutory and non-statutory designated sites during the construction and decommissioning phases.	**Designated Sites** Potential for cables to affect the integrity, quality, ecology, structure, and functions of protected sites, habitats, and species; these impacts will depend on the characteristics and sensitivity of the protected sites, habitats, and species. However, as the cables are buried, this should minimise the potential impacts.

SEA Topic	Offshore Cabling		Onshore Cabling	
	Pre-construction, Construction and Decommissioning	**Operation and Maintenance**	**Pre-construction, Construction and Decommissioning**	**Operation and Maintenance**
	Benthic Habitats and Species The following pressures on benthic habitat are associated with cabling activity (NRW, 2025b): abrasion / disturbance / compaction of the surface substrate (seabed / intertidal); changes in suspended solids (water clarity); smothering and siltation rate changes (heavy and light); habitat structure changes - removal of substratum (extraction); contamination by Hydrocarbons, PAH, metals and other synthetic compounds and substances (solid, liquid or gas); penetration, disturbance and abrasion of the substrate below the seabed surface; physical change (to another seabed, substrate or sediment type); thermal radiation and temperature change; changes in patterns of immersion and exposure; physical loss (to land or freshwater habitat); water	**Benthic Habitats and Species** **Direct loss or damage from cabling placement:** Potential for direct permanent loss of soft-bottom seabed habitats with use of protective materials for cable life due to physical alteration of the seabed by the cable and protective structures. Potential for cable itself to undergo "self-burial" within high wave and tidal energy areas leading to a long-term strumming action of the cable against the seabed with the carving of grooves and rock abrasions by the cable, there is potential for direct loss of benthic habitats particularly for sessile species.	**Coastal and Terrestrial Habitats, Ecology and Invertebrates** **Habitat Loss:** Potential for direct and indirect negative effects on scarce, notable, or irreplaceable habitats such as ancient and native woodlands, intertidal, shoreline, peatland and wetland habitats during the construction and decommissioning phases. Micro-routing during the construction phase is recommended to prevent habitat loss of hedgerows and trees where possible. Potential for temporary short-term loss, obstruction, displacement, or disturbance of habitats during the construction and decommissioning phases which may impact on species lifecycles such as breeding and foraging activities.	**Terrestrial Habitats, Ecology and Invertebrates** **Habitat Loss:** Potential for direct and indirect negative long-term effects on scarce, notable, or irreplaceable habitats such as ancient and native woodlands, intertidal, shoreline, peatland and wetland habitats during the operation phase if these areas are permanently lost or damaged from the onshore cabling works. Potential for permanent, long-term loss, obstruction, and displacement of habitats during the operation phase if these are not reinstated following the completion of construction works which may impact on species lifecycles such as breeding and foraging activities and

SEA Topic	Offshore Cabling		Onshore Cabling	
	Pre-construction, Construction and Decommissioning	**Operation and Maintenance**	**Pre-construction, Construction and Decommissioning**	**Operation and Maintenance**
	flow (tidal current) changes, including sediment transport considerations; toxic contamination; electromagnetic fields (EMF); introduction of non-native species (INNS). **Direct damage from cable route preparation:** Potential for direct short-term damage to benthic habitats and species from pre-construction clearance, pre-sweeping, sandwave clearance, levelling, and pre-lay grapnel run (PLGR) occurring in areas of anticipated burial to clear the route of any debris for the cable within the cabling area route. The disposal of these dredged materials within the marine environment may potentially damage benthic habitats and organisms. Potential for burial of benthic organisms with the use of mechanical excavators in	**Indirect habitat loss:** Potential for an indirect loss of substrate and loss/alteration of associated benthic habitats/species from scouring around protective structures and surface laid elements of cables through changes to hydrological conditions. This can indirectly affect benthic communities by increasing food availability or habitat heterogeneity on a small, localised scale. Indirect effects can occur within a wider zone of effect, particularly through alterations to physical processes due to the placement of structures within the seabed leading to long-term and indirect alterations in seabed communities, seabed types or sediment and ecosystem	**Habitat Fragmentation:** Potential for fragmentation of habitat corridors during construction and decommissioning phases with works which can impact on the wider dispersal of species across the development area. **Coastal Habitats:** Potential for impacts on coastal shore habitats with direct loss of habitats with pre-construction clearance and construction works for cabling landfall, with shore end activities for civil works between low and high-water marks. NRW (2025) identifies the following significant pressures on coastal habitat associated with cabling activity: abrasion / disturbance / compaction of the surface substrate; smothering, burial, or disturbance e.g. removal and replacement of turfs; changes to coastal processes including	overall metapopulation dynamics. **Habitat Fragmentation:** Potential for fragmentation of habitat corridors during maintenance periods if this involves the disruption of habitats with associated vehicles and equipment.

SEA Topic	Offshore Cabling		Onshore Cabling	
	Pre-construction, Construction and Decommissioning	**Operation and Maintenance**	**Pre-construction, Construction and Decommissioning**	**Operation and Maintenance**
	inter-tidal areas with direct loss of these species depending on their sensitivity to burial and recovery. **Direct loss or damage from cabling placement:** Potential for direct short-term damage to, or loss of benthic habitats and species within cable routes, including potential for direct damage to intertidal and coastal habitats at cable landfall. Potential for direct loss of habitats and sedentary species where placement of hard cable protection is required, including potential requirements for cable protection at the decommissioning stage. Potential for greater impacts on sessile species (bivalves, tubeworms) which are unable to avoid disturbance, unlike mobile benthos. Potential for direct loss, through smothering, displacement and damage to	processes. It should be noted that at the plan stage and the focus on submarine cables the specific introduction of submarine structures will be likely be limited to areas where cable protection materials are required, these locations and requirement on exact design or extents are unlikely to be determined until the individual project level. **EMF:** Potential for long-term (cable life) behavioural effects on benthic species from Electro-Magnetic Fields (EMF), produced via power transmission and devices, the strengthen of which can be influenced by the amount of electrical power transmitted. However, current research indicates that marine	water flow (tidal current) and sediment transport; changes in suspended solids (water clarity), smothering and siltation rate changes potentially leading to habitat loss or change; disruption of soils / substratum potentially leading loss of habitat, vegetation and supported species; disturbance to hydrology / water table / channels / damage to dune aquifer; contamination by Hydrocarbons, PAH, metals, other synthetic compounds and substances (solid, liquid or gas); change in vegetation type due the changes in salt-spay inputs and light levels; damage to geomorphological landforms including those which may have a supporting role for other habitats, such as spits and shingle structures leading to habitat loss and disruption to coastal	

SEA Topic	Offshore Cabling		Onshore Cabling	
	Pre-construction, Construction and Decommissioning	**Operation and Maintenance**	**Pre-construction, Construction and Decommissioning**	**Operation and Maintenance**
	benthic species from sediment suspension and excess sedimentation, the magnitude of impact can vary depending on local hydrodynamic conditions, the sensitivity and resilience of species/communities. **Sediment disturbance:** Potential for the use of jetting for cable burial to generate short-term sediment plumes which can spread up to 2km from the installation area. This can temporarily increase turbidity and degrade water quality and can impact on photosynthetic reactions for phytoplankton or plant-based species and can impact on filter and suspension feeders of epibenthic organisms leading to mortality. For areas subject to low natural background levels of suspended sediment the fauna present within these areas is likely to have a higher	flora/macroinvertebrates are insensitive to EMF. **Direct community alteration:** Potential for direct long-term effects on community composition through colonisation of hard cable protection by benthic species, should this be required through an artificial reef effect. This may enhance habitat complexity and biodiversity within the surrounding area with indirect effects of increasing the biomass of fish and shellfish species attracted to the area for shelter and food sources. There is potential for deviation in the community structure from the naturally occurring species composition. **Heat:** Potential for long-term (cable life) increased	processes; introduction or spread of invasive non-native species, 'ruderal' or invasive native species; disturbance potentially leading loss of species reliant on coastal habitats. Impacts associated with these pressures include physical loss of habitat, change in vegetation community distribution, structure and function and may affect physical processes, while habitat loss, alteration or disturbance could impact on associated coastal species. Species groups that rely on coastal habitats e.g., for foraging, resting or breeding, can be impacted by change, including lower plants, vascular plants, reptiles, amphibians, birds, invertebrates and mammals.	

SEA Topic	Offshore Cabling		Onshore Cabling	
	Pre-construction, Construction and Decommissioning	**Operation and Maintenance**	**Pre-construction, Construction and Decommissioning**	**Operation and Maintenance**
	sensitivity with stronger impacts with a need for appropriate mitigation measures in these areas. **Displacement of hard substrates:** Potential for short-term direct loss of benthic species and communities attached to boulders which are removed from the cable route during the pre-construction phase; these boulders may be overturned with the attached fauna crushed or displaced possibly leading to damage or mortality of the benthic fauna. Recolonisation of the relocated boulders will be dependent on the original community composition. Potential for abrasion and disturbance of substrate located on the seabed as well as penetration and / or disturbance to the substratum below the seabed	temperatures in the vicinity of installed cables which may impact microbial sediment processes and benthic communities. There is potential for a change in physiology, reproduction, or mortality of certain sensitive benthic species with a potential alteration in benthic communities through emigration and immigration of species. The degree of impact of heat generation on the upper seabed layers and water column can be influenced by the burial depth of the cable and thermal resistivity of the sediment composition. Furthermore, the transmission capacity and conductor diameter of the cable will influence the degree of heat generation, with increases in these increasing heat emissions.	**Soil-borne diseases and pests:** Potential for introduction of soil borne pests and diseases from vehicles and equipment involved in construction and decommissioning phases, which may have secondary impacts on terrestrial ecology. **Invasive non-native species:** Potential for direct introduction of invasive non-native species from vehicles and equipment used during construction and decommissioning phases which may lead to secondary impacts on other species and habitats. Potential for construction and decommissioning phases to lead to the spread of existing invasive non-native species, which may lead to secondary impacts on other species and habitats.	

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	Pre-construction, Construction and Decommissioning	**Operation and Maintenance**	**Pre-construction, Construction and Decommissioning**	**Operation and Maintenance**
	surface or direct removal of substratum altering habitats. **Indirect community alteration due to non-native species:** Potential for the introduction or spread of non-native species to the area from vessels during construction/decommissioning activities. This has potential for indirect adverse effects on native species and community structure. **Direct loss from removal of structures:** Potential for a loss of benthic habitats and sedentary species colonising subsea cable structures or cable protection materials following removal at decommissioning stage.	Secondary impacts from sediment interactions, as discussed under the Geology, Soils and Land Use topic, are also possible. **Indirect community alteration due to non-native species:** Potential for the introduction of non-native species to the area from vessels during maintenance activities, with potential for indirect adverse effects on native species and community structure. The presence of artificial hard substrates from cables or cable protection may allow non-native or alternative species to colonise the surfaces if the new introduced habitat represents a changed surface from the previous structure/conditions.	**New habitat creation:** Potential for positive long-term impacts when appropriate project planning considers mitigation measures and habitat enhancement options as part of the construction phase, which may include the removal of non-native invasive species or the creation of new habitats. **Vegetation clearance:** Potential for vegetation clearance to lead to habitat loss and fragmentation during construction and decommissioning phases with potential for the clearance of riparian vegetation to indirectly impact on water quality through the loss of buffer properties for filtration. **Trampling:** Potential for damage, disturbance or mortality of fauna species through direct plant/machinery movement or	

SEA Topic	Offshore Cabling		Onshore Cabling	
	Pre-construction, Construction and Decommissioning	**Operation and Maintenance**	**Pre-construction, Construction and Decommissioning**	**Operation and Maintenance**
		Change/loss of habitats from alteration of hydrography or sedimentation: Potential for changes in hydrological conditions when cables are laid near the surface or from the presence of protective structures which can alter the near-seafloor hydrodynamic regime which may alter suspended sediment concentrations and turbidity, and indirectly affect those habitats/species sensitive to decreases in wave energy, changes to tidal flows or changes to suspended sediment levels.	trampling by construction workers. **Pollution:** Potential for pollution of the terrestrial environment from construction materials or fuel/chemical spills to impact on invertebrate species.	
	Fish and Shellfish **Behavioural and physiological effects from noise and vibration disturbance:** Potential for temporary noise disruption to species via	**Fish and Shellfish** **Behavioural and physiological effects from noise and vibration disturbance:** Potential for long-term vibration	**Fish, Amphibians and Aquatic Invertebrates** **Pollution:** Potential for increased short-term pollution and siltation of watercourses with direct impacts on aquatic	**Fish, Amphibians and Aquatic Invertebrates** **Habitat Alteration:** Potential for long-term secondary habitat loss from cables altering

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	Pre-construction, Construction and Decommissioning	**Operation and Maintenance**	**Pre-construction, Construction and Decommissioning**	**Operation and Maintenance**
	seismic surveys preconstruction. During the construction phase, potential for temporary noise disruption to species via noise generation from laying machinery, however, this is essentially silent for surface cable lay and passive plough cable burial has a low noise impact. Potential for permanent (mortality) to short-term behavioural effects (displacement) should UXO removal be required along cable routes, and for cumulative disturbance and displacement effects due to multiple noise sources and vessel disturbance during construction and decommissioning. **Direct loss or damage from cabling placement:** Potential for direct short-term damage to, or loss of shellfish habitat, and supporting habitat for fish	disruption to species through continuous vibration generation by High Voltage Alternating Current (HVAC) cables, where used, with potential behavioural effects through long-term avoidance of the area. **EMF:** Potential for adverse effects on species from device EMF generation; EMF generation is expected to be small and within the variation range of the environment but may be detectable to electro/magneto-sensitive species. EMF generated can impair the orientation of fish and impact migratory behaviours, some species are observed to avoid EMF (e.g., dogfish) which may lead to a displacement effect. EMF can be reduced through cable burial,	species such as increased mortality or injury during construction and decommissioning phases from construction earthworks, excavations and storage of topsoil and materials. **Behavioural and physiological effects from noise, light and vibration disturbance:** Potential for short-term generation of noise and vibration (particularly from horizontal directional drilling (HDD) use) to lead to disturbance during construction and decommissioning phases if works occur near waterways; potential to impact on fish and amphibian species through displacement or avoidance effects, with potential impacts on breeding, migration or foraging activities. Potential for short-term light pollution from construction works to impact	nearby watercourses through alterations in suspended sediment levels or flow concentrations leading to species displacement.

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	Pre-construction, Construction and Decommissioning	**Operation and Maintenance**	**Pre-construction, Construction and Decommissioning**	**Operation and Maintenance**
	species including spawning, nursery and effects on these key life stages and foraging habitat within cable routes, including potential for direct damage to intertidal habitats at cable landfall. Potential for direct loss of habitats and sedentary species where placement of hard cable protection is required. **Indirect loss or damage:** Potential for indirect short-term adverse effects on shellfish habitats and fish spawning and nursery grounds in the vicinity of the construction/decommissioning area from sediment dispersion and deposition due to construction activities, or the release of contaminated sediments. Potential for short-term smothering impacts on these habitats; shellfish are generally more sensitive than fish. Potential for increased	increased separation distance and the bundling of DC cables. **Heat:** Potential for adverse long-term effects on marine species due to the heat generated by installed device cables. These effects are likely to be confined to the localised area around the cable due to the dissipation of heat into the surrounding water column and sediment. **Hydraulic change due to cables:** Potential for long-term (cable life) indirect effects on sensitive species from a decrease in water flow or alterations to seafloor currents from the presence of surface-laid cables or protective materials affecting hydrological regimes.	fish behaviour and alter migration timing; if nighttime works occur during cable construction or decommissioning phases, there is potential for increased impacts. **Habitat Alteration:** Potential for short-term habitat alteration from construction or decommissioning phases altering nearby watercourses with alterations in suspended sediment levels or flow concentrations, depending on the sensitivity of the waterbody and surrounding catchment characteristics the degree of recovery achieved may be variable. There may be secondary impacts on activities such as salmon migration with alterations in channel morphology with HDD technology crossings	

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	Pre-construction, Construction and Decommissioning	**Operation and Maintenance**	**Pre-construction, Construction and Decommissioning**	**Operation and Maintenance**
	suspended sediment and turbidity to adversely affect filter feeders or pelagic species and to influence foraging and social behaviours and prey/predator interactions. Potential for increased suspended sediment to affect the growth of macrobenthos and have a lethal effect on certain species. Potential for effects on key life stages, where spawning and nursery grounds are impacted. **Sediment disturbance:** Potential for the use of jetting for cable burial to generate short-term sediment plumes which can spread up to 2km from the installation area. This can temporarily increase turbidity, degrade water quality and impact foraging activities for visual predators, reducing catch success.	**Direct loss or damage from cabling placement:** Potential for direct long-term loss of shellfish habitat, and supporting habitat for fish species including spawning, nursery and foraging habitat within cable routes with permanent changes in seabed substrate when physical protection is required. Potential for direct loss of habitats and sedentary species where placement of hard cable protection is required. Potential for the cable itself to undergo "self-burial" within high wave and tidal energy areas leading to a long-term strumming action of the cable against the seabed with the carving of grooves and rock abrasions by the cable. Potential for direct loss of	recommended for any WFD or salmonid watercourses. **Mortality and Injury:** Potential for mortality and injury risk for fish and amphibian species from construction activities, noise and vibration exposure, and potential for vibration effects to cause damage or mortality of eggs and embryos in spawning gravels which may have impacts on certain species.	

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		shellfish habitats, particularly for sessile species.		
	Marine Mammals and Reptiles **Collision risk:** Potential for short-term collision risk for seals, cetaceans, and turtles with vessels and machinery during pre-construction, installation and decommissioning of cables. **Noise effects:** Potential for underwater noise and vibration before and during installation using laying machinery and decommissioning of cables to affect sensitive marine mammals (including cetaceans and seals), particularly via seismic surveys and detonation of UXOs if present within the cabling area, detonation at sea should use low order detonation (deflagration).	**Marine Mammals and Reptiles** **Noise:** Potential for generation of noise and vibration by cables, particularly if unburied may lead to disturbances or displacement. **EMF:** Potential for adverse effects on species from device EMF generation; EMF generation is expected to be small and within the variation range of the environment but may be detectable to electro/magneto-sensitive species. EMF generated can impair the orientation of marine mammals and impact migratory behaviours. EMF can be reduced through cable	**Mammals and Reptiles** **Disturbance:** Potential for short-term direct and indirect temporary disturbance to mammals or reptiles through lighting, noise, vibration, pollution or vehicle movements associated with construction and decommissioning phases at onshore cable area and landfall site. **Collision risk:** Potential for short-term direct increases in collisions between mammals or reptiles and vehicle traffic associated with construction and decommissioning activities with potential for increased mortality. **Injury or Mortality:** Potential for increased injury or mortality for mammals or reptiles at	**Mammals and Reptiles** **Disturbance:** Potential for short-term direct and indirect temporary disturbance to mammals or reptiles with lighting, noise, vibration, pollution or vehicle movements associated with maintenance activities. **Collision risk:** Potential for short-term direct increases in collisions between mammals or reptiles and vehicle traffic associated with maintenance activities with potential for increased mortality.

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	Pre-construction, Construction and Decommissioning	**Operation and Maintenance**	**Pre-construction, Construction and Decommissioning**	**Operation and Maintenance**
	Disturbance or displacement (physical, visual and noise): Potential for short-term physical, visual, and noise disturbance of species due to the physical presence of vessels and machinery, airborne and marine noise and vibration, visual and light intensity changes, habitat disturbance and water quality changes, which could lead to displacement from the area. Timing of works must be carefully considered to minimise the potential for impacts on sensitive species (e.g., marine mammals and turtles) with aerial surveys performed to monitor the presence of sensitive species with a cessation of activities if species are found nearby. **Sediment disturbance:** Potential for the use of jetting for cable burial to generate short-term sediment plumes	burial, increased separation distance and the bundling of DC cables.	construction compounds with the potential presence of open compounds during cable trenching/burial and construction materials.	

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	Pre-construction, Construction and Decommissioning	**Operation and Maintenance**	**Pre-construction, Construction and Decommissioning**	**Operation and Maintenance**
	which can spread up to 2km from the installation area. This can temporarily increase turbidity, degrade water quality and impact foraging activities for visual predators, reducing catch success.			
	Birds and Bats NRW (2025) identifies the following key pressures on marine birds associated with cabling activity: loss of habitat, disturbance (visual and noise), loss of prey species, increased turbidity, with these leading to direct effects (physical, visual or noise related disturbances) and indirect effects (e.g., loss or change to supporting habitats and impacts on prey species and their habitats). Birds noted as most likely to be affected are wintering waterbirds and waders in estuaries, coastal breeding seabirds, and wintering sea	**Birds and Bats** **Collision risk:** Potential for long-term effects through collision risk with vessels and machinery during cable maintenance. **Disturbance or displacement (physical, visual and noise):** Potential for disturbance in the vicinity of maintenance works from noise, physical and visual presence of vessels and machinery, and the use of artificial lighting. The disturbance may lead to increased stress, disrupt breeding, and lead to site avoidance and	**Birds and Bats** **Habitat Loss:** Potential for short-term habitat loss, degradation or fragmentation through the temporary loss of foraging, nesting, landing and roosting habitats for birds and bats through vegetation felling and clearance, construction works, and use of fencing for construction areas. The removal of trees may significantly impact bat species as these can rely on trunk and branch cavities for roosting. **Disturbance and displacement:** Potential for short-term direct and indirect	**Birds and Bats** **Habitat Fragmentation:** Potential for long-term impacts on habitats used by bats for commuting and foraging with the removal of vegetation as gaps greater than 10 metres can impact flight paths. **Disturbance:** Potential for short-term direct and indirect temporary disturbance to birds and bats with lighting (and associated light spill), noise, vibration, pollution or vehicle movements

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	ducks and divers within shallow bays. **Collision risk:** Potential for short-term adverse effects on species due to collision risk with cable laying machinery and vessels during pre-construction, installation, and decommissioning; potential for collision risk with birds in flight or rafting. **Noise effects:** Potential for short-term noise and vibration during pre-construction, installation and decommissioning phases to affect birds, particularly via seismic surveys and detonation of UXOs, if present within the cable installation area; detonation should be low order detonation (deflagration). Potential for hearing injury or behavioural changes.	displacement from the area, with potential effects on foraging and breeding and energy expenditure. Timing of works must be carefully considered to minimise the potential for impacts on sensitive species.	temporary disturbance and displacement to birds and bats through lighting (and associated light spill), noise, vibration, pollution or vehicle movements associated with construction and decommissioning phases along onshore cable route and landfall sites. **Collision risk:** Potential for short-term direct increases in collisions between birds and bats and vehicle traffic associated with construction and decommissioning activities with potential for increased mortality. **Injury or Mortality:** Potential for increased injury or mortality for birds and bats at construction compounds with the potential presence of open compounds during cable trenching/burial and construction materials. Vegetation clearance activities	associated with maintenance activities. **Collision risk:** Potential for short-term direct increases in collisions between birds and vehicle traffic associated with maintenance activities with potential for increased mortality.

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	Pre-construction, Construction and Decommissioning	**Operation and Maintenance**	**Pre-construction, Construction and Decommissioning**	**Operation and Maintenance**
	Disturbance or displacement (physical, visual and noise): Potential for disturbance in the vicinity of pre-construction, installation, and decommissioning works from noise, physical and visual presence of vessels and machinery, and the use of artificial lighting. The disturbance may lead to increased stress, disrupt breeding, and lead to site avoidance and displacement from the area, with potential effects on foraging and breeding and energy expenditure. Timing of works must be carefully considered to minimise the potential for impacts on sensitive species. **Habitat loss/alteration:** Potential for seabed preparation, cable installation and decommissioning activities to damage the local benthic environment directly		occurring during the bird nesting season (typically March to August inclusive) may result in the destruction of active nests with increased likelihood of mortality or injury to unfledged birds and it should be noted that it is an offence to intentionally damage or destroy the nest of any wild bird while it is use or being built under the Wildlife and Countryside Act 1981.	

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	Pre-construction, Construction and Decommissioning	**Operation and Maintenance**	**Pre-construction, Construction and Decommissioning**	**Operation and Maintenance**
	and indirectly, which may affect invertebrates and fish, and reduce prey availability and foraging opportunities for birds. Installation and decommissioning activities also have the potential to temporarily increase turbidity, with implications for visibility and foraging and predator/prey interactions, as well as to disturb contaminated sediments, which may adversely affect sensitive species. **Sediment Disturbance:** Potential for the use of jetting for cable burial to generate short-term sediment plumes which can spread up to 2km from the installation area. This can temporarily increase turbidity, degrade water quality and can impact on foraging activities for visual predators, reducing catch success.			

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	Pre-construction, Construction and Decommissioning	**Operation and Maintenance**	**Pre-construction, Construction and Decommissioning**	**Operation and Maintenance**
Population and Human Health	**Human Health** **Population disturbance:** Potential for temporary noise, lighting and visual disturbance effects on the local population, and leisure and recreational activities due to noise generated and visual impacts during pre-construction, installation, and decommissioning activities. **Effects on marine and coastal leisure and recreation:** Potential for short-term increased collision risk and displacement for leisure and recreational marine users (e.g., recreational sailing, fishing, water sports and beach/coastal use) during pre-construction, installation, and decommissioning activities.	**Human Health** **Population disturbance:** Potential for temporary noise, lighting and visual disturbance effects on the local population and leisure and recreational activities due to the presence of vessels during cable maintenance activities; these, however, are typically uncommon for cable lifetimes with lower impacts than the construction phase. **Effects on marine and coastal leisure and recreation:** Potential for a long-term (cable life) enhanced collision risk for recreational and leisure vessels with cable protection materials, particularly in shallow waters.	**Human Health** **Population disturbance:** Potential for temporary direct disturbances on local populations from the generation of noise during the construction process and from increased road traffic and vehicles/machinery involved. Potential for short-term temporary disruption to local populations during onshore cabling construction works connection to converter stations with a requirement for cable burial to occur. This may involve the acquisition of a set area of land from the landfall site to the converter station. **Access Restrictions:** Potential for temporary restriction in access to coastal areas for marine and recreational users during pre-construction and construction phases. Potential for access restrictions for local	**Human Health** **Population disturbance:** Potential for long-term disturbances on local populations from the generation of noise during any maintenance activities or emergency repairs along the onshore cable area or landfall areas. **EMF Concerns:** Potential for perceived human health concerns regarding EMF generation from operation of cables. However, the actual risk posed by EMF from cables is low/negligible, below the ICNIRP public exposure reference level and the NPS-EN5, set to protect public health.

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	Pre-construction, Construction and Decommissioning	**Operation and Maintenance**	**Pre-construction, Construction and Decommissioning**	**Operation and Maintenance**
			communities from road closures and diversions which may exacerbate isolated/rural communities further and create a sense of severance. **Pollution:** Potential for short-term temporary increase in noise, air and light pollution and dust generated with associated infrastructure involved with the construction phase of onshore cabling activities with potential adverse effects on human health. **Major accidents or disasters:** Potential for short-term temporary increase in the potential for the occurrence of major accidents or disasters due to physical accidents, electrical incidents or fires/explosions during the construction or decommissioning processes through chemical spills or use	

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	Pre-construction, Construction and Decommissioning	**Operation and Maintenance**	**Pre-construction, Construction and Decommissioning**	**Operation and Maintenance**
			of combustible construction materials.	
	Energy Supply **Development of a secure energy supply:** None anticipated during the pre-construction, installation, or decommissioning phases. **Employment opportunities:** Potential for employment opportunities.	**Energy Supply** **Development of a secure energy supply:** Potential for long-term (cable life) positive effects for the population in the development of a new secure renewable energy supply.	**Energy Supply** **Development of a secure energy supply:** None anticipated during the pre-construction, installation, or decommissioning phases. **Employment opportunities:** Potential for employment opportunities and increased investment/expenditure within local communities during construction and decommissioning phase.	**Energy Supply** **Development of a secure energy supply:** Potential for long-term (cable life) positive effects for the population in the development of a new secure renewable energy supply. **Employment opportunities:** Potential for employment opportunities with workers required for onshore maintenance activities during onshore cable operation and landfall areas.
	Population, Property and Community Spaces None anticipated.	**Population, Property and Community Spaces** None anticipated.	**Population, Property and Community Spaces** **Population:** Potential for short-term temporary demographic increases from construction	**Property and Community Spaces** **Community Areas:** Potential for direct, long-term permanent loss or

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	Pre-construction, Construction and Decommissioning	**Operation and Maintenance**	**Pre-construction, Construction and Decommissioning**	**Operation and Maintenance**
			workers with secondary impacts on resource demands for housing and other local facilities such as medical services and schools. **Housing:** Potential for direct disturbances and potential access restrictions to private properties and housing. **Community Areas:** Potential for temporary loss or disturbances to community land areas during the construction process. **Dust Settling:** Potential for dust settling from generated construction dust to soil properties and assets with potential for human health impacts.	disturbance to community land areas during the operational phase with maintenance activities.
Geology, Soils and Land Use	**Geology, geomorphology, soil and sediment processes** **Designated sites:** Potential for short-term direct or indirect disturbance or damage to	**Geology, geomorphology, soil and sediment processes** **Designated sites:** Potential for long-term direct or	**Geology, geomorphology, soil and sediment processes** **Designated sites:** Potential for short-term direct or indirect disturbance, damage or	**Geology, geomorphology, soil and sediment processes** **Designated sites:** Potential for long-term direct or

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	Pre-construction, Construction and Decommissioning	**Operation and Maintenance**	**Pre-construction, Construction and Decommissioning**	**Operation and Maintenance**
	features within sites designated for geology or geomorphology from cable installation (including landfall of export cables) and decommissioning activities. **Loss of seabed sediments and change in morphology:** Potential for short-term direct adverse effects on the seabed from pre-construction clearance using dredging, pre-lay grapnel runs and cable trenching. Potential for a short-term increase in suspended sediment to occur during the trenching process with penetration and disturbance of substrate. Potential for physical disturbances to the seafloor with construction/decommissioning vessels anchoring to seabed, sediment reworking, compaction, displacement, resuspension and particle resettling. Potential for short-	indirect disturbance or damage to features within sites designated for geology or geomorphology from cable area if these features are not reinstated following construction phase. **Loss of seabed sediments and change in morphology:** Potential for long-term changes to the seabed morphology and structure from the presence of cable protection materials. Potential for cable itself to undergo "self-burial" within high wave and tidal energy areas leading to a long-term strumming action of the cable against the seabed with the carving of grooves and rock abrasions by the cable; potential for direct loss of benthic	removal of onshore features designated for geology or geomorphology during construction and decommissioning process. Potential for temporary access restrictions to designated sites during construction. **Loss of geomorphological features:** Potential for construction and decommissioning activities in watercourse areas for cable trenching, access works or diversions to lead to a loss of geomorphological features, with potential for secondary losses of niche habitats. **Riverbed contamination:** Potential for short-term release of contaminants from fuel or chemical spillages from construction machinery or construction processes to riverbed sediments, with a risk of resuspension during	indirect disturbance or damage to onshore features within sites designated for geology or geomorphology within the cable area if these features are not reinstated following the construction phase. **Loss of geomorphological features:** Potential for long-term permanent loss of geomorphological features from cable trenching or watercourse diversions, with potential for secondary losses of niche habitats. **Contamination:** Potential for contamination of sediments in which cables are buried owing to a potential deterioration of cable materials and components over time if these are not removed during decommissioning.

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	Pre-construction, Construction and Decommissioning	**Operation and Maintenance**	**Pre-construction, Construction and Decommissioning**	**Operation and Maintenance**
	term direct adverse effects on the seabed from the removal of cables and, if required, associated protective materials from seafloor during the decommissioning process. Potential for short-term impacts on sediment dynamics from sand wave clearance with alterations of bed-load transport mechanisms. **Seabed contamination:** Potential for short-term release of contaminants to seabed sediments during installation process using laying machinery for cables, with increased risk of resuspension when undertaking cable trenching.	habitats, particularly for sessile species. **Sediment dynamics:** Potential for long-term effects on the occurrence of longshore drift altering sediment transfer where the cables (and cable protection materials) sit on the seabed surface. **Heat:** Potential for long-term (cable life) generation of heat to raise localised seabed temperatures which may affect sediment and alter its physico-chemical conditions with the potential for an increase in bacterial activity with alterations in chemical concentrations in sediment layers. This may alter processes occurring in deeper sediment layers (which is influenced by organic matter content of	construction or decommissioning activities if these involve cable trenching. **Sediment and Soil loss:** Potential for short-term temporary loss and disturbances to soils in construction area during construction and decommissioning processes with potential for soil erosion to occur or mud generation during HDD, and potential downstream transportation, which could impact habitats and water quality, and fish species. **Soil quality:** Potential for soil compaction to occur during construction and decommissioning phases with potential for secondary impacts on soil quality and functioning, agricultural activities, flora and water quality through alterations in	**Soil loss:** Potential for long-term permanent loss and disturbances to soils in the onshore cable area if the land use fails to be reinstated to its previous use, with potential for increased susceptibility to soil erosion, particularly if as described under the Water topic alterations to catchment flow pathways and flood risk have occurred.

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		sediment layers), which may affect the wider seabed through contact with pore water (increased potential impacts are likely within shallower water depths owing to reduced dilution) and the potential for secondary impacts on benthic flora and fauna. **Contamination:** Potential for contamination of sediments in which cables are buried owing to a potential deterioration of cable materials and components over time if these are not removed during decommissioning.	soil drainage properties potentially elevating flood risks. **Soil contamination:** Potential for direct soil contamination with construction and decommissioning activities through potential release of previously contaminated materials or from fuel/chemical spills from vehicles and machinery. There may be potential for contaminant accumulation to occur with possible food web bioaccumulation	
	Land use None anticipated.	**Land use** None anticipated.	**Land use** **Loss of land use:** Potential for direct and temporary loss of agricultural land and soils during the construction period. Potential for extended land-take periods during	**Land use** **Loss of land use:** Potential for long-term direct and permanent loss of agricultural land and soils if these are unable to be reinstated following the

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	Pre-construction, Construction and Decommissioning	**Operation and Maintenance**	**Pre-construction, Construction and Decommissioning**	**Operation and Maintenance**
			construction period with certain construction infrastructure left in place for an extended time period such as haul roads, construction compounds and temporary access tracks which may have secondary impacts on the SEA topics of Air Quality, Population and Human Health and Material Assets. If underground cables are left in place following end-of-life, there are no anticipated decommissioning impacts. Potential for direct and temporary loss of forestry and woodland areas during the construction periods. If underground cables are left in place following end-of-life, there are no anticipated decommissioning impacts. Potential for cumulative temporary losses of agricultural land and soils with other developments; following	completion of construction or decommissioning works. Potential for long-term direct and permanent loss of forestry and woodland areas, if these are unable to be reinstated following the completion of construction or decommissioning works. Potential for cumulative permanent losses of agricultural land and soils with other developments.

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	Pre-construction, Construction and Decommissioning	**Operation and Maintenance**	**Pre-construction, Construction and Decommissioning**	**Operation and Maintenance**
			the completion of onshore cabling works the previous land use will be reinstated.	
	Contaminated Land **Land use areas:** Potential for construction and decommissioning phase works to disturb seabed areas which have the potential for contamination such as offshore disposal or dredging areas which may contain hazardous materials such as UXO or chemicals.	**Contaminated Land** **Land use areas:** Potential for maintenance to cables or cable protection materials during cable life cycle to release previously contaminated seabed sediments such as offshore disposal or dredging areas which may contain hazardous materials such as UXO or chemicals.	**Contaminated Land** **Land use areas:** Potential for construction and decommissioning phase works to disturb former land use areas which have the potential for contamination. Agricultural areas have potential for active and former slurry pits, herbicide or pesticide storage areas or sheep dips and could release chemicals if disturbed, while livestock burial areas also have the potential to be disturbed and possibly spread disease if these are associated with outbreaks such as hand, foot and mouth disease, with secondary impacts on human health. Railway lines if disturbed have the potential to be contaminated with hydrocarbons from leaks and	**Contaminated Land** **Human health:** Potential for interaction with contaminated land to have long-term impacts on human health for workers involved in maintenance activities (particularly if emergency repairs occur) or to populations living adjacent to the onshore cable corridor.

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	Pre-construction, Construction and Decommissioning	**Operation and Maintenance**	**Pre-construction, Construction and Decommissioning**	**Operation and Maintenance**
			spills. Historical pits or quarries, which may be unmarked, have potential to be disturbed during construction and decommissioning phases and may release hazardous compounds if these were infilled by industry or farming waste. **Gas release:** Potential for construction and decommissioning phases to disturb ground gases present such as methane or carbon dioxide if these are naturally present in the area or occur from infilled areas, this has potential for secondary impacts on GHG emissions, air quality and potentially human health. **UXO:** Potential for construction and decommissioning phases to disturb unknown UXO from former military areas or from bombing raids; this may have	

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	Pre-construction, Construction and Decommissioning	**Operation and Maintenance**	**Pre-construction, Construction and Decommissioning**	**Operation and Maintenance**
			secondary impacts on local populations through area access restrictions or road closures for safe removal/detonation. **Human health:** Potential for interaction with contaminated land to have short-term temporary impacts on human health for construction workers involved or populations living adjacent to the onshore cable corridor.	
Water	**Water Quality** **Water Quality:** Potential for temporary direct effects on water quality from pre-construction, construction and decommissioning works due to sediment generation. Potential for increased siltation to lead to poor light penetration which may have secondary impacts on aquatic plant species which can affect photosynthesis rates and the release of	**Water Quality** **Contamination:** Potential for adverse effects on water quality through accidental discharge of contaminants from vessels or machinery during cable maintenance. Potential for adverse effects on water quality with release of contaminants from cable (particularly if fluid-filled cables) if these are damaged during	**Water Quality** **Water Quality:** Potential for temporary direct poor water quality from pre-construction, construction and decommissioning works due to sediment generation. If underground cables are left in place following end-of-life, there are no anticipated decommissioning impacts.	**Water Quality** **Hydromorphological and Ecological Quality:** Potential for long-term impacts on waterways located close to cable installation areas from potential physical alterations to waterbodies; potential changes to hydromorphological and ecological quality, with

SEA Topic	Offshore Cabling		Onshore Cabling	
	Pre-construction, Construction and Decommissioning	**Operation and Maintenance**	**Pre-construction, Construction and Decommissioning**	**Operation and Maintenance**
	oxygen with potential secondary impacts on other marine species. Potential for short-term adverse effects on nearby designated shellfish and bathing waters, and increased weathering of newly exposed sediment during cable installation. **Sediment disturbance:** Potential for short-term mobilisation of sediments during pre-construction seabed preparation activities, and installation of cables, resulting in increased turbidity. Increased potential for sediment disruption when cable burial jetting activities are used for cable installation compared to trenching/ploughing actions. Potential for the use of jetting for cable burial to generate sediment plumes which can spread up to 2km from the installation area; this can	operation or are not removed at decommissioning and begin to degrade, with potential for release of heavy metals.	**Water Quantity:** Potential for loss of water sources for species and/or industries if impacted by construction works, alternative water sources must be provided if this occurs. Potential for short-term abstraction of water to occur for use in construction processes such as dust suppression during HDD process, potential for effects on water quantity which may lead to habitat loss through drying effects or degradation, there is also potential for impacts on local water supply or aquifers. **Contamination:** Potential for short-term contamination impacts on water quality due to loss of suspended solids or spillage of fuel or other chemicals associated with construction and decommissioning phase equipment or processes that may affect surface or	longer-term changes in sediment deposition. **Catchment Flows:** Potential for long-term alterations in flow within receiving watercourses and groundwater flows which can impact catchment areas and water quality with direct loss of habitats. **Water supply:** Potential for long-term alterations in amount of surface and groundwater available for abstraction for public and private water supply, for agriculture and livestock use with changes in water quantity or quality if operation and onshore cable route permanently alters catchment flow pathways. **Groundwater:** Potential for direct long-term

SEA Topic	Offshore Cabling		Onshore Cabling	
	Pre-construction, Construction and Decommissioning	**Operation and Maintenance**	**Pre-construction, Construction and Decommissioning**	**Operation and Maintenance**
	temporarily increase turbidity and degrade water quality. **Contamination:** Potential for release of substrate that may be contaminated during cable installation or decommissioning, with short-term adverse effects on water quality. The concentration of contaminants released from actions of grappling and cable removal during decommissioning is expected to be low and rapidly dispersed. Potential for adverse effects on water quality through construction discharges or accidental contaminant release from machinery and vessels during installation and decommissioning processes.		groundwater bodies. Potential for short-term adverse effects on nearby designated salmonid, shellfish, bathing waters or fisheries if a downstream hydrological connection exists. Potential for impacts on land drainage pathways to alter catchment flows and mobilise transport pathways for pollution. **Catchment Flows:** Potential for short-term alterations in flow within receiving watercourses and groundwater flows which can impact catchment areas and water quality and lead to direct loss of habitats. **Flood Risk:** Potential for short-term alterations to catchment flows or changes to natural land use surfaces with an increase in impermeable surfaces to increase flood risk. Potential for contaminants to be released if this coincides	permanent impacts on groundwater through changes in groundwater levels, flows and quality if the former catchment morphology and predominant flow pathways fail to be reinstated. Potential for underground cable heat generated to affect groundwater. **Groundwater dependent terrestrial ecosystems (GWDTEs):** Potential for direct long-term permanent impacts on GWDTEs if there are alterations to groundwater springs and flows or dewatering effects as these ecosystems are dependent on these for functioning and existence. **Recreation:** Potential for long-term permanent

SEA Topic	Offshore Cabling		Onshore Cabling	
	Pre-construction, Construction and Decommissioning	**Operation and Maintenance**	**Pre-construction, Construction and Decommissioning**	**Operation and Maintenance**
			with sewer flows, with a risk of secondary impacts on Population and Human Health on properties and spread of diseases. **Groundwater:** Potential for direct short-term temporary impacts on groundwater through changes in groundwater levels, flows and quality due to construction and decommissioning activities which can lead to dewatering, or altering catchment flow pathways with the potential for new groundwater flow pathways to develop. **Recreation:** Potential for short-term temporary impacts on recreational activities dependent on waterbodies such as wild swimming, fishing or boating, if these are impacted by short-term water quality or quantity alterations. There may also be impacts on	impacts on recreational activities dependent on waterbodies such as wild swimming, fishing, or boating, if these are impacted by water quality or quantity alterations if the previous catchment flow pathways fail to be reinstated. There may also be impacts on recreational activities focused on biodiversity if the alterations in water quality and quantity impact on habitats or fish/bird assemblages.

SEA Topic	Offshore Cabling		Onshore Cabling	
	Pre-construction, Construction and Decommissioning	**Operation and Maintenance**	**Pre-construction, Construction and Decommissioning**	**Operation and Maintenance**
			recreational activities focused on biodiversity if the alterations in water quality and quantity impact on habitats or fish/bird assemblages.	
	Flood Risk None anticipated.	**Flood Risk** None anticipated.	**Flood Risk** **Increased flood risk:** Potential for temporary short-term direct and indirect elevated risk of increased fluvial and pluvial flood due to alterations in the degree of impervious surfaces present from the construction and decommissioning phases with the introduction of temporary construction road surfaces or removal of natural materials. This has potential for impacts on downstream areas with potential flooding of private properties, commercial businesses or agricultural land areas with negative financial implications for recovery and the potential for runoff of	**Flood Risk** **Increased flood risk:** Potential for permanent long-term direct and indirect elevated risk of increased fluvial and pluvial flood due to alterations in the degree of impervious surfaces present if the surfaces disrupted by construction are not reinstated to their former land use or natural drainage conditions. Potential for long-term impacts on downstream areas with potential flooding of private properties, commercial businesses or agricultural land areas with negative

SEA Topic	Offshore Cabling		Onshore Cabling	
	Pre-construction, Construction and Decommissioning	**Operation and Maintenance**	**Pre-construction, Construction and Decommissioning**	**Operation and Maintenance**
			contaminated materials or sediment movement to impact downstream areas. **Contamination:** Potential for short-term increase in pollution risks and impacts on properties and human health if flood events lead to the interaction with sewerage water supplies with an increased risk of disease spread.	financial implications for recovery. **Contamination:** Potential for long-term increase in pollution risks and impacts on properties and human health if flood events lead to the interaction with sewerage water supplies with an increased risk of disease spread.
Air	**Air Quality** **Air emissions:** Potential for a short-term, temporary, increase in air emissions from vessels and machinery, and adverse effects on local air quality, during pre-construction, installation, and decommissioning.	**Air Quality** **Air emissions:** Potential for a short-term, temporary, increase in air emissions from vessels and machinery during maintenance. Potential for indirect long-term (cable life) positive effects on air quality as connection of new renewable energy sources supports a	**Air Quality** **Air emissions:** Potential for temporary direct declines in air quality due to construction dust and pollution generated. Potential for short-term temporary increase in emissions associated with vehicles and infrastructure involved with the construction of onshore cabling activities.	**Air Quality** **Air emissions:** Potential for a short-term, temporary, increase in air emissions from vehicles and machinery during maintenance. Potential for indirect long-term (cable life) positive effects on air quality as connection of new renewable energy sources supports a

SEA Topic	Offshore Cabling		Onshore Cabling	
	Pre-construction, Construction and Decommissioning	**Operation and Maintenance**	**Pre-construction, Construction and Decommissioning**	**Operation and Maintenance**
		transition away from fossil fuels.		transition away from fossil fuels.
Climatic Factors	**GHG Emissions and Carbon Storage** **GHG emissions:** Potential for short-term, temporary emissions from vessels and machinery during pre-construction, and decommissioning of cables. **Carbon storage:** Potential for short-term release of CO_2 due to seabed disturbance during pre-construction, construction, installation and decommissioning of cables, which may include potential for adverse effects on blue carbon habitats that are valuable carbon sinks. **Recycling:** Potential minimisation of long-term carbon footprint through recoverability and recycling of submarine cables following	**GHG Emissions and Carbon Storage** **GHG emissions:** None anticipated.	**GHG Emissions and Carbon Storage** **GHG emissions:** Potential for short-term, temporary emissions from vehicles and machinery during pre-construction, construction and decommissioning of landfall areas and cables. Potential for GHG emissions during the raw material abstraction and creation process. **Carbon storage:** Potential for short-term release of CO_2 due to ground disturbances if the construction or decommissioning phase impacts areas of carbon storage such as peatland, woodland or saltmarsh habitats. **Waste disposal:** Potential for generation of GHG emissions	**GHG Emissions and Carbon Storage** **GHG emissions:** Potential for generation of GHG emissions during any maintenance activities or the requirement to replace any onshore cables with the GHG produced during raw material abstraction and creation process. **Carbon storage:** Potential for carbon storage habitats to reduce amount of carbon sequestered if the previous land cover/habitats fail to be reinstated.

SEA Topic	Offshore Cabling		Onshore Cabling	
	Pre-construction, Construction and Decommissioning	**Operation and Maintenance**	**Pre-construction, Construction and Decommissioning**	**Operation and Maintenance**
	lifecycle (typically 20-40 years) completion.		during waste removal, transport and disposal processes for onshore infrastructure and materials during decommissioning process. **Land Use Change:** Potential for short-term increase in GHG emissions from onshore construction and decommissioning phases with change in land use practices from previous green-field agriculture sites to developed areas.	
	Climate Change Effects **Direct or indirect effects on cables:** None anticipated	**Climate Change Effects** **Direct or indirect effects on cables:** Potential for the landfall of export cables to be affected by climate change influenced coastal change. Potential for increased threats to cables offshore and at landfall in terms of increased storminess, sediment	**Climate Change Effects** **Direct or indirect effects on cables:** None anticipated	**Climate Change Effects** **Direct or indirect effects on cables:** Potential for the landfall of export cables and immediate onshore coastal area of cables to be affected by climate change influenced coastal change such as sea-level rise. Potential for impacts to immediate onshore

SEA Topic	Offshore Cabling		Onshore Cabling	
	Pre-construction, Construction and Decommissioning	**Operation and Maintenance**	**Pre-construction, Construction and Decommissioning**	**Operation and Maintenance**
		mobility or coastal erosion. There is a need to consider the potential mobility of offshore mobile habitat features (e.g., sandanks) and risk of future cable exposure and the introduction of cable protection materials throughout cable life with potential for secondary impacts on other SEA topics as discussed.		cables with coastal erosion and considerations on the introduction of cable protection materials throughout the cable life. Potential for temperature increases to result in cable operation issues which may require emergency repairs. Potential for secondary impacts throughout cable life on other SEA topics such as water quality or human health and population with an increased flood risk through increased precipitation levels.
Material Assets	**Existing Infrastructure: cables and pipelines** **Direct damage to infrastructure:** Potential for short-term damage to cables and pipelines within the cable route during cable installation; this could disrupt	**Existing Infrastructure: cables and pipelines** **Direct damage to infrastructure:** Potential for short-term damage to cables and pipelines within the cable route during maintenance, which may	**Existing Infrastructure: cables and pipelines** **Direct damage to infrastructure:** Potential for short-term damage to cables and pipelines within the onshore cable area and landfall area during	**Existing Infrastructure: cables and pipelines** **Direct damage to infrastructure:** Potential for short-term damage to cables and pipelines within the onshore cable area and landfall area during

SEA Topic	Offshore Cabling		Onshore Cabling	
	Pre-construction, Construction and Decommissioning	**Operation and Maintenance**	**Pre-construction, Construction and Decommissioning**	**Operation and Maintenance**
	telecommunications or release hazardous substances. **Access:** Potential for reduced access to existing pipelines and cables for maintenance during the installation phase. **Indirect effects on seabed morphology and benthic habitats**: Potential for indirect effects on seabed morphology and benthic habitats with the use of external cable protection as required when a cable overlies an existing cable or pipeline. **Clearance of out of service cables:** Potential for a requirement in pre-construction phase to undertake route clearance of out of service cables which may have indirect short-term impacts on seabed geomorphology and benthic	disrupt telecommunications or release hazardous substances. **Indirect effects on hydrology and sediment regimes:** Potential for long-term (cable life) indirect effects on hydrology regimes with presence of external cable protection altering water flows and sediment transport mechanisms and patterns.	construction; this could disrupt telecommunications or release hazardous substances. **Access:** Potential for reduced access to existing pipelines and cables for maintenance during the installation phase.	maintenance, which may disrupt telecommunications or release hazardous substances.

SEA Topic	Offshore Cabling		Onshore Cabling	
	Pre-construction, Construction and Decommissioning	**Operation and Maintenance**	**Pre-construction, Construction and Decommissioning**	**Operation and Maintenance**
	habitats with temporary physical disturbances.			
	Other Users: Commercial Fisheries and Aquaculture **Direct and indirect effects on fish and shellfish:** Potential for short-term direct and indirect construction and decommissioning effects on fish and shellfish, as outlined under Biodiversity, Flora, and Fauna, which could adversely affect fish and shellfish stocks. **Displacement from fishing grounds:** Potential for temporary displacement from traditional fishing grounds during the pre-construction, installation, and decommissioning phases to facilitate safety.	**Other Users: Commercial Fisheries and Aquaculture** **Direct and indirect effects on fish and shellfish:** Potential for long-term operational effects of offshore renewable energy infrastructure on EMF sensitive species, as outlined under Biodiversity, Flora, and Fauna, which could adversely affect fish stocks. **Effects on fishing activity through collision/entanglement risk along cable routes:** Potential for risks to fishing gear and anchors along cable routes with entanglement, e.g., from cable protection armouring where cables cannot be buried sufficiently.	**Other Users: Commercial Onshore Fisheries** **Access restriction:** Potential for short-term temporary access restrictions for commercial fisheries if the construction and decommissioning works result in the acquisition of land or road access restrictions to the commercial fisheries. **Water quality and quantity:** Potential for short-term temporary alterations in water quality and quantity to impact on commercial fisheries and potentially impact on fish populations with potential for negative financial and supply chain implications.	**Other Users: Commercial Fisheries** **Water quality and quantity:** Potential for long-term permanent alterations in water quality and quantity (if the catchment flows fail to be reinstated to their former state) to impact on commercial fisheries and potentially impact on fish populations with potential for negative financial and supply chain implications.

SEA Topic	Offshore Cabling		Onshore Cabling	
	Pre-construction, Construction and Decommissioning	**Operation and Maintenance**	**Pre-construction, Construction and Decommissioning**	**Operation and Maintenance**
		Mitigation measures include the use of Cable Protection Zones (CPZ) to restrict fishing activities near cables potentially leading to long-term displacement from traditional fishing grounds. Potential for increased collision risk due to the presence of device maintenance vessels. Potential for spoil, construction, or decommissioning debris on the seabed to impact commercial fisheries using bottom-towed fishing gear and the forms of fishing able to take place if protective structures have been used over the cable areas. It should be noted in areas where byelaws prevent the use of bottom-towed gear that cable protection materials are		

SEA Topic	Offshore Cabling		Onshore Cabling	
	Pre-construction, Construction and Decommissioning	**Operation and Maintenance**	**Pre-construction, Construction and Decommissioning**	**Operation and Maintenance**
		unlikely to be required, assuming suitable burial depth.		
	Other Users: Shipping and Navigation **Collision risk:** Potential for short-term risk of collision with slow moving or stationary installation and decommissioning vessels and equipment. **Displacement:** Potential for temporary displacement of vessels from the construction area due to safety exclusion zones. Potential for increased journey times/distances, which may impact shipping density. Potential trade reductions through temporary restriction of port and harbour access. **Rescue operations access:** Potential for effects on search and rescue operations that occur within the installation	**Other Users: Shipping and Navigation** **Collision risk:** Potential for short-term risk of collision with slow moving or stationary vessels and equipment during maintenance. **Entanglement risk:** Potential for entanglement of anchors with subsea cables, particularly unburied cables or entanglement with protective structures used over cables.	**Other Users: Shipping and Navigation** None anticipated.	**Other Users: Shipping and Navigation** None anticipated.

SEA Topic	Offshore Cabling		Onshore Cabling	
	Pre-construction, Construction and Decommissioning	**Operation and Maintenance**	**Pre-construction, Construction and Decommissioning**	**Operation and Maintenance**
	and decommissioning area; such activities must take into consideration the installation equipment.			
	Other Users: Commercial Forestry None anticipated.	**Other Users: Commercial Forestry** None anticipated.	**Other Users: Commercial Forestry** **Loss of Commercial Forestry:** Potential for temporary short-term loss of woodland within onshore cable corridor area if felling of woodland and commercial forestry areas required to facilitate cable installation underground, suitable financial compensation would be required and reinstatement of former land use areas.	**Other Users: Commercial Forestry** **Loss of Commercial Forestry:** Potential for permanent long-term loss of commercial forestry areas if these land areas are retained within the onshore cable areas or if the former land use fails to be reinstated reducing income levels from this activity.
	Other Users: Military Activities **UXO presence**: Short-term potential for UXO (unexploded ordnance) to impact the cable placement during pre-construction seabed preparation and installation	**Other Users: Military Activities** None anticipated.	**Other Users: Military Activities** **UXO presence:** Short-term potential for UXO to impact the development of the landfall area and onshore cable area during pre-construction, construction and	**Other Users: Military Activities** None anticipated

SEA Topic	Offshore Cabling		Onshore Cabling	
	Pre-construction, Construction and Decommissioning	**Operation and Maintenance**	**Pre-construction, Construction and Decommissioning**	**Operation and Maintenance**
	due to MoD and WWI and WWII history. Requirement to undertake in-situ detonation of UXO items deemed too dangerous to move, with potential for direct impacts on fish, marine mammals, reptiles, bird species and on population and human health due to the generation of noise associated with detonation. **Disruption or displacement:** Potential for temporary disruption of military exercises and activities during pre-construction, installation, and decommissioning.		decommissioning phases if these coincide with MoD, WWI and WWII history. Requirement to undertake in-situ detonation of UXO items deemed too dangerous to move with potential for direct impacts on onshore species and on populations and human health due to the generation of noise associated with detonation. **Disruption or displacement:** Potential for temporary disruption of military exercise and activities during pre-construction, construction and decommissioning phases if the onshore cable and landfall area impacts military practice areas.	
	Other Users: Disposal Areas **Disturbance of disposal materials:** Potential for short-term risk of previously disposed material to be released during pre-	**Other Users: Disposal Areas** None anticipated.	**Other Users: Disposal Areas** **Disruption:** Potential for disruption in access to disposal areas for local areas which may impact waste management services from	**Other Users: Disposal Areas** None anticipated.

SEA Topic	Offshore Cabling		Onshore Cabling	
	Pre-construction, Construction and Decommissioning	**Operation and Maintenance**	**Pre-construction, Construction and Decommissioning**	**Operation and Maintenance**
	construction, installation and decommissioning activities should cables be installed close to disposal areas, with potential for secondary adverse effects on ecosystems. **Disruption or displacement:** Potential for temporary disruption or displacement of vessels moving to and from disposal sites during pre-construction, installation, and decommissioning activities.		temporary road closures or access restrictions from construction phase.	
	Other Users: Ports and Harbours **Disruption:** Potential for delivery of components and construction vehicles associated with offshore cable area to use local ports and harbours for delivery which may result in disruption to normal access/operation if these are abnormal loads during the	**Other Users: Ports and Harbours** None anticipated.	**Other Users: Ports and Harbours** **Disruption:** Potential for delivery of components associated with onshore cable area, landfall and jointing bays to use local ports and harbours for delivery which may result in disruption to normal access/operation if these are abnormal loads during the	**Other Users: Ports and Harbours** None anticipated.

SEA Topic	Offshore Cabling		Onshore Cabling	
	Pre-construction, Construction and Decommissioning	**Operation and Maintenance**	**Pre-construction, Construction and Decommissioning**	**Operation and Maintenance**
	construction/decommissioning phases.		construction/decommissioning phases.	
	Other Users: Mineral Resources and Aggregate Extraction **Disruption or displacement:** Potential for disruption to aggregate extraction occurring during construction or decommissioning phases due to presence of vessels associated with offshore cable corridors preventing access. **Sterilisation:** Potential for short-term temporary sterilisation of mineral resources during construction and decommissioning phase due to seabed development from cable installation process.	**Other Users: Mineral Resources and Aggregate Extraction** **Sterilisation:** Potential for long-term temporary sterilisation of mineral resources during operation phases due to seabed development from cable protective materials or preventing extraction from occurring.	**Other Users: Mineral Resources and Aggregate Extraction** **Sterilisation:** Potential for short-term temporary sterilisation of mineral resources during construction and decommissioning phases due to surface development or preventing extraction from occurring.	**Other Users: Mineral Resources and Aggregate Extraction** **Sterilisation:** Potential for long-term temporary sterilisation of mineral resources during operation phases due to surface development or preventing extraction from occurring.
	Other Users: Tourism **Disturbance and contamination:** Potential for short-term effects on coastal	**Other Users: Tourism** **Collision risk:** Potential for a long-term (cable life) enhanced collision risk for	**Other Users: Tourism** **Disturbance and contamination:** Potential for short-term effects on coastal	**Other Users: Tourism** None anticipated.

SEA Topic	Offshore Cabling		Onshore Cabling	
	Pre-construction, Construction and Decommissioning	**Operation and Maintenance**	**Pre-construction, Construction and Decommissioning**	**Operation and Maintenance**
	tourism locations and recreational activities due to generated noise and visual impacts and the potential release of contaminants during pre-construction, installation, and decommissioning. As described under Population and Human Health, and Water topics. **Access:** Potential for temporary effects on recreational activities due to short-term access restrictions during installation and decommissioning. As described under Population and Human Health.	recreational and leisure vessels with cable protection materials. As described under Population and Human Health.	and onshore tourism locations and recreational activities due to generated noise and visual impacts and the potential release of contaminants from soils or into waterbodies during construction and decommissioning phases, as described under Population and Human Health and Water topics. **Access:** Potential for temporary effects on recreational activities due to short-term access restrictions during construction and decommissioning activities.	
	Other Users: Aviation None anticipated.	**Other Users: Aviation** None anticipated.	**Other Users: Road Network Users** **Increased travel time:** Potential for short-term temporary increased travel time for road users including public transport with construction and	**Other Users: Road Network Users** None anticipated

SEA Topic	Offshore Cabling		Onshore Cabling	
	Pre-construction, Construction and Decommissioning	**Operation and Maintenance**	**Pre-construction, Construction and Decommissioning**	**Operation and Maintenance**
			decommissioning phase with requirement to introduce road closures or road diversions which may increase driving times and distances. Journeys may also be delayed by the increased vehicle traffic from construction machinery and slow-moving vehicles carrying construction materials or abnormal loads. **Abnormal loads:** Potential for short-term temporary road access restrictions or closure to be implemented to facilitate the onshore movement of abnormal loads of construction materials. **Recreational users:** Potential for short-term temporary disruption in access to road networks or pathways by construction and decommissioning works if these result in road closures for recreational users including	

SEA Topic	Offshore Cabling		Onshore Cabling	
	Pre-construction, Construction and Decommissioning	**Operation and Maintenance**	**Pre-construction, Construction and Decommissioning**	**Operation and Maintenance**
			pedestrians, equestrians and cyclists. **Fear:** Potential for short-term temporary fear or intimidation from construction or decommissioning works or concerns regarding road safety for road users (motorised and non-motorised) with large vehicles or machinery.	
	Other Users: Agriculture None anticipated.	**Other Users: Agriculture** None anticipated.	**Other Users: Agriculture** **Loss of agricultural land:** Potential for temporary loss of agricultural land and soils during pre-construction and construction processes. If underground cables are left in place following end-of-life, there are no anticipated decommissioning impacts. **Restriction in access to agricultural land:** Potential for temporary restrictions in access to agricultural land	**Other Users: Agriculture** **Loss of agricultural land:** Potential for long-term permanent loss of agricultural land and soils if this cannot be reinstated following completion of construction or decommissioning works.

SEA Topic	Offshore Cabling		Onshore Cabling	
	Pre-construction, Construction and Decommissioning	**Operation and Maintenance**	**Pre-construction, Construction and Decommissioning**	**Operation and Maintenance**
			during construction and decommissioning activities. Potential for impacts on specific farming activities occurring depending on the timing of construction with seasonal works and potential for financial implications on farming businesses if this impacts agricultural productivity. **Damage to field drains:** Potential for direct damage to field drains due to construction activities on onshore cabling works, which would need to be remedied as part of reinstatement process. If underground cables are left in place following end-of-life, there are no anticipated decommissioning impacts. **Irrigation and livestock drinking water:** Potential for secondary impacts on agriculture where water	

SEA Topic	Offshore Cabling		Onshore Cabling	
	Pre-construction, Construction and Decommissioning	**Operation and Maintenance**	**Pre-construction, Construction and Decommissioning**	**Operation and Maintenance**
			sources are used for irrigation or as livestock source, alternative supplies would need to be provided if these are compromised by onshore construction works. If underground cables are left in place following end-of-life, there are no anticipated decommissioning impacts. **Soil pests and diseases:** Potential for indirect impacts on agriculture if introduction of soil borne pests and diseases were to occur from construction process, best practice guidelines should be followed to minimise the risk. If underground cables are left in place following end-of-life, there are no anticipated decommissioning impacts.	
Cultural Heritage	**Archaeology and Wrecks** **Direct destruction or damage to features:** Potential for direct damage to, or destruction of,	**Archaeology and Wrecks** **Indirect damage to features:** Potential for scouring and exposure to	**Terrestrial Archaeology and Heritage** **Direct destruction or damage to features:** Potential for direct	**Terrestrial Archaeology and Heritage** **Indirect damage or destruction to features:**

SEA Topic	Offshore Cabling		Onshore Cabling	
	Pre-construction, Construction and Decommissioning	**Operation and Maintenance**	**Pre-construction, Construction and Decommissioning**	**Operation and Maintenance**
	known and unknown marine and intertidal prehistoric landscapes, submerged archaeological artefacts, structures or wrecks during pre-construction surveys, works, cable laying or decommissioning activities. **Indirect destruction or damage to features:** Potential for indirect destruction, damage or disturbance to archaeological features through seabed preparation techniques, cable burial methods or the introduction of cable protection materials through alterations in the seabed morphology from suspended sediment levels and/or scour. Sediment displacement may damage artefacts or lead to the burial of sites. **Knowledge creation:** Potential for discovery of new	occur around sites or features in the vicinity of cables and cable protection materials, leading to indirect damage or degradation, sediment deposition and further burial of features in the long-term, and potential for loss of, or damage to, features during maintenance activities. There may also be potential for long-term positive effects on archaeological features that are exposed, and that may be protected through burial with alterations in suspended sediment levels. **Direct damage to coastal heritage:** None anticipated. **Setting of coastal heritage features:** None anticipated.	damage to, or destruction of known or unknown terrestrial archaeology features during pre-construction surveys, construction works, cable laying or decommissioning activities. Sediment displacement or mud generation from construction activities may damage artefacts or lead to the burial of sites within downstream or hydrologically connected areas. **Indirect destruction or damage to features:** Potential for indirect damage or destruction to terrestrial archaeology / heritage assets or structures. Sediment displacement or mud generation from construction activities may damage artefacts or lead to the burial of sites within downstream or hydrologically connected areas. Vibration from	Potential for alterations in sediment regimes or soil erosion from landscape alterations to lead to indirect damage or degradation of downstream archaeological features through mud or sediment generation. Potential for alterations in hydrological regimes to result in dewatering or flood inundation of areas which may result in damage or loss of terrestrial archaeology / heritage assets or structures. **Setting of terrestrial archaeology features:** Potential for direct and indirect permanent effects on the setting of designated and non-designated terrestrial archaeology / heritage sites and features due to

SEA Topic	Offshore Cabling		Onshore Cabling	
	Pre-construction, Construction and Decommissioning	**Operation and Maintenance**	**Pre-construction, Construction and Decommissioning**	**Operation and Maintenance**
	archaeological artefacts and structures and for data creation through surveys. **Direct or indirect damage to coastal heritage:** Potential for short-term direct or indirect damage to coastal archaeological and architectural heritage at export cable landfall. **Setting of coastal heritage features:** Potential for indirect temporary effects on the setting of designated and non-designated coastal heritage sites and features due to the presence of vessels and machinery during re-construction, installation, and decommissioning.		construction or decommissioning actions may also result in a weakening or loss of heritage assets or structures. If construction or decommissioning activities alter hydrological regimes there is potential for dewatering or an inundation of water to result in damage to or loss of terrestrial archaeology / heritage assets or structures. **Knowledge creation:** Potential for discovery of new archaeological artefacts and structures and for data creation through surveys. **Cultural significance impacts on setting:** Potential for impacts on the cultural significance of designated and non-designated terrestrial archaeology / heritage assets through physical and setting impacts during the construction and	alterations in the landscape or removal of areas for previous agricultural use, trees or landscape features associated with terrestrial archaeological / heritage asset setting, if these are not reinstated to their previous state. The permanent presence of the onshore landfall area infrastructure has potential to have direct long-term impacts on setting.

SEA Topic	Offshore Cabling		Onshore Cabling	
	Pre-construction, Construction and Decommissioning	**Operation and Maintenance**	**Pre-construction, Construction and Decommissioning**	**Operation and Maintenance**
			decommissioning phases due to the presence of machinery and equipment. The potential for impacts can be reduced with the return of the landscape to its previous state.	
Landscape, Seascape and Visual Amenity	**Landscape, Seascape and Visual Amenity** **Effects on seascapes:** Potential for short-term, temporary, effects on seascapes, landscape character areas and visual amenity, from activity of vessels and machinery, and the use of artificial lighting, during pre-construction, cable installation, and decommissioning. Potential for effects on protected landscapes and views.	**Landscape, Seascape and Visual Amenity** **Effects on seascapes:** None anticipated.	**Landscape, Seascape and Visual Amenity** **Effects on landscapes:** Potential for short-term, temporary, effects on landscapes and landscape character types, from activity of machinery, and the use of artificial lighting, during pre-construction, cable installation, and decommissioning. Potential for effects on protected landscapes and views. **Effects on visual amenity:** Potential for moderate impacts on visual amenity on residential areas, known travel routes including road and rail networks and impacts on	**Landscape, Seascape and Visual Amenity** **Effects on landscapes:** Potential for long-term permanent, effects on landscapes due to the removal of landscape elements such as trees, woodland areas, hedgerows, or agricultural land areas, if these are not reinstated following the completion of works. The permanent presence of the onshore landfall area infrastructure has potential to have direct long-term impacts on visual amenity.

SEA Topic	Offshore Cabling		Onshore Cabling	
	Pre-construction, Construction and Decommissioning	**Operation and Maintenance**	**Pre-construction, Construction and Decommissioning**	**Operation and Maintenance**
			recreational areas such as walking trails or country parks with alterations to the surrounding landscape character types or loss of landscape elements. **Effects on viewpoints:** Potential for short-term, temporary effects on viewpoints during the construction and decommissioning phases if this involves the use of heavy plant or machinery.	

Table 28: Potential high-level effects on SEA topics from offshore and onshore cabling

SEA Topic	Onshore Substations and Converter Stations	
	Pre-construction, Construction and Decommissioning	**Operation and Maintenance**
Biodiversity, Flora and Fauna	**Designated sites** Potential for construction and decommissioning activities to affect the integrity, quality, ecology, structure, and functions of protected sites, habitats, and species; these impacts will depend on the characteristics and sensitivity of the protected sites, habitats, and species.	**Designated sites** Potential for operation and maintenance activities to affect the integrity, quality, ecology, structure, and functions of protected sites, habitats, and species; these impacts will depend on the characteristics and sensitivity of the protected sites, habitats, and species.
	Terrestrial Habitats and Ecology **Habitat Loss:** Potential for direct and indirect negative effects on scarce, notable, or irreplaceable habitats such as ancient and native woodlands, intertidal, shoreline, peatland and wetland habitats due to construction and/or decommissioning activities. Potential for direct or indirect temporary, short-term loss, obstruction, displacement, or disturbance of habitats during the construction and decommissioning phases which may impact on species lifecycles such as breeding and foraging activities. **Habitat Fragmentation:** Potential for direct or indirect, short-term fragmentation of habitat corridors which would otherwise facilitate the safe dispersal of species due to the presence of construction compounds, access tracks and haul roads. **Pollution:** Potential for long-term impacts to adjacent areas of habitats (particularly hedgerows or ditches) resulting from inappropriate storage or handling of toxic or otherwise deleterious construction materials. Potential for temporary effects on ditches and watercourses resulting from inappropriate management of temporary works drainage during the construction period (and the risk of this acting as a	**Terrestrial Habitats and Ecology** **Habitat Loss:** Potential for direct and indirect, permanent loss, obstruction, displacement, or disturbance of habitats during the operation phase, which may impact on species lifecycles such as breeding and foraging activities. **Invasive non-native species**: Potential for direct introduction of invasive non-native species from vehicles and equipment used operation and maintenance, which may lead to secondary impacts on other species and habitats.

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	pathway for further contamination in the event of a spillage of material). **Ecological Impacts on Watercourses**: Potential impacts to the ecological quality of watercourses associated with works within or in close proximity to watercourses, including physical change to the watercourses and longer-term changes associated with sediment deposition. **Trampling:** Potential for damage, disturbance, or mortality of fauna species through direct plant/machinery movement or trampling by construction workers. **Vegetation Clearance:** Potential for clearance of vegetation to facilitate construction activities and infrastructure to result in habitat loss and fragmentation during the construction and decommissioning phases. **Invasive non-native species**: Potential for direct introduction of invasive non-native species from vehicles and equipment used during construction and decommissioning phases which may lead to secondary impacts on other species and habitats.	
	Fish and Amphibians **Pollution:** Potential for fish and amphibians to be impacted by short-term direct increased pollution or siltation of watercourses due to construction earthworks, excavation and storage of topsoil and materials. **Disturbance:** Potential for short-term direct or indirect disturbance to species, including protected and notable species, through noise or vibration generated by construction or	**Fish and Amphibians** **Pollution:** Potential for long-term impacts to aquatic ecology as exposed ground can lead to continued sediment loading and pollution of watercourses. Potential contamination of surface waters due to accidental release of pollutants during maintenance activities or due to converter station / substation chemical leaks and concrete leaching.

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	decommissioning activities. If any construction compounds or access tracks are located near waterways, there is potential to impact on fish and amphibian species through displacement or avoidance effects with potential impacts on breeding, migration or foraging activities.	**Disturbance:** Potential for long-term indirect disturbance to species, including protected and notable species, through noise or vibration generated by the operation of the converter station / substation in or near to watercourses.
	Aquatic and Terrestrial Invertebrates **Pollution:** Potential for aquatic invertebrates to be impacted by short-term direct increased pollution or siltation of watercourses due to construction earthworks, excavation and storage of topsoil and materials. Potential for terrestrial invertebrates to be impacted by increased short-term pollution or compaction of soils due to construction activities. **Increased Mortality:** Potential for temporary, short-term increased mortality of invertebrates due to vegetation clearance, vehicle movements, or loss of soil associated with the construction phase.	**Aquatic and Terrestrial Invertebrates:** **Pollution:** Potential for aquatic invertebrates to be impacted by long-term direct increased pollution or siltation of watercourses as exposed ground can lead to continued sediment loading and pollution of watercourses. Potential contamination of surface waters due to accidental release of pollutants during maintenance activities or due to converter station / substation chemical leaks and concrete leaching. Potential for terrestrial invertebrates to be impacted by pollution arising from operation and maintenance of the converter station / substation. **Increased Mortality:** Potential from increased mortality of invertebrates due to vehicle movements, or loss of soil associated with the operation of the converter station / substation.
	Mammals **Disturbance:** Potential for short-term direct or indirect disturbance to species through increased lighting, noise, and vibration pollution, which can arise from the movement of machinery, vehicles or construction activities during installation of the construction compounds and the converter stations / substations. Construction activities may disturb seals at haul out locations, through noise and visual disturbance.	**Mammals** **Disturbance:** Potential for long-term direct or indirect disturbance to species through increased lighting, noise, and vibration pollution, which can arise from the operation and maintenance activities at the converter station / substation. **Displacement:** Potential for the short-term direct or indirect displacement of mammal species due to habitat loss, degradation

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	Displacement: Potential for short-term direct or indirect displacement of mammal species due to habitat loss, degradation or fragmentation in relation to construction activities associated with the construction compounds and converter stations / substations. **Increased Mortality:** Potential increase in mortality of species, including protected or notable species, via traffic collisions due to increases in vehicular movement or through vegetation clearance. Potential for injury or mortality at construction compounds with open excavations and construction materials.	or fragmentation due to the presence of the converter station / substation. **Increased Mortality:** Potential increase in mortality of protected or notable species via traffic collisions due to increases in vehicular movement or loss of vegetation during operation of the converter station / substation.
	Birds and Bats **Habitat Loss:** Potential for short-term habitat loss, degradation or fragmentation through the temporary loss of foraging, nesting, landing and roosting habitats for birds and bats through vegetation felling and clearance, construction works, and use of fencing for construction areas. **Disturbance and displacement:** Potential for short-term direct and indirect temporary disturbance and displacement to birds and bats through lighting (and associated light spill), noise, vibration, pollution or vehicle movements associated with construction and decommissioning phases. **Increased Mortality:** Potential increase in mortality of species, including protected or notable species, via traffic collisions due to increases in vehicular movement within the construction areas. Potential for increased injury or mortality for birds and bats at construction compounds when construction works are underway. Vegetation clearance activities occurring during the	**Birds and Bats** **Habitat Loss:** Potential for long-term habitat loss, degradation or fragmentation through the permanent loss of foraging, nesting, landing and roosting habitats for birds and bats through land take to facilitate the converter station / substation. **Disturbance and displacement:** Potential for long-term direct and indirect temporary disturbance and displacement to birds and bats through lighting (and associated light spill), noise, vibration, pollution or vehicle movements associated with operation of the converter station / substation. These impacts are likely to be more significant during recurrent maintenances activities. **Increased Mortality:** Potential increase in mortality of species, including protected or notable species, via traffic collisions due to increases in vehicular movement at the converter station / substation, particularly during maintenance activities.

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	bird nesting season (typically March to August inclusive) may result in the destruction of active nests with increased likelihood of mortality or injury to unfledged birds and it should be noted that it is an offence to intentionally damage or destroy the nest of any wild bird while it is use or being built under the Wildlife and Countryside Act 1981.	
Population and Human Health	**Human Health** **Exposure to contaminants:** Potential impacts on the health of construction workers and future site users through exposure to hazardous contaminants (via direct ingestion and/or dermal contact). **Dust Emissions:** Potential for health effects due to the emission of dust from demolition, earthworks, construction and trackout (including PM10 concentrations), particularly due to technical failure or exceptional weather conditions.	**Human Health** **Exposure to contaminants:** Potential impacts on the health of construction workers and future site users through exposure to hazardous contaminants (via direct ingestion and/or dermal contact). **Leisure and Recreation:** Potential for long-term access restrictions to, and displacement of, leisure and recreation activities within the converter station / substation site and/or permanent access roads.
	Economic **Increase in Employment and Gross Value Added**: Potential for short-term direct and/or indirect, increased employment and GVA as the construction of the converter station / substation will require expenditure with UK-based companies.	**Economic** **Increase in Employment and Gross Value Added**: Potential for direct and/or indirect, increased employment and GVA as the operation and maintenance of the converter station / substation will require expenditure with UK-based companies.
	Social **Demographic Changes:** Potential for short-term demographic changes due to the presence of the construction workforce, this may have secondary effects on housing demand and demand	**Social** **Demographic Changes:** Potential for long-term demographic changes due to the presence of the operation workforce, this may have secondary effects on housing demand and demand on local public and private services during the operation phase.

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	on local public and private services during the construction and/or decommissioning phase. **Socio-cultural:** Potential for short-term changes in community character, quality of life and community stress and conflict or social problems resulting from the presence of construction workers. **Population Disturbance**: Potential for temporary direct disturbance of the local population due to lighting, noise and vibration generated during pre-construction, and construction from construction activities and vehicle movements. Potential for temporary annoyance due to soiling of surfaces, particularly windows, cars and laundry due to dust emissions from demolition, earthworks, construction and trackout. Potential for disturbance due to land acquisition for the construction of the converter station / substation. Potential disturbance due to increased traffic volumes on the road network or road closures due to construction activities, as well as delays to public transport services. **Leisure and Recreation:** Potential for short-term access restrictions to, and displacement of, leisure and recreation activities during pre-construction, installation and decommissioning.	**Socio-cultural:** Potential for long-term changes in community character, quality of life and community stress and conflict or social problems resulting from the presence of operation workers. **Population Disturbance**: Potential for temporary direct disturbance on the local population due to lighting, noise and vibration generated during the operation of the converter station / substation. **Leisure and Recreation:** Potential for long-term access restrictions to, and displacement of, leisure and recreation activities due to the location of the converter station / substation.
	Energy Supply **Development of a secure energy supply:** None anticipated.	**Energy Supply** **Development of a secure energy supply:** Potential for long-term (converter station / substation lifespan) positive effects for the

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		population in supporting the development of a new secure renewable energy supply.
	Property and Community Spaces **Housing:** Potential for temporary land take to private properties and housing. Potential for direct disturbances (lighting, noise, vibration) to private properties and housing. **Community Areas:** Potential for temporary loss of, or disturbances to, community land areas during the construction process.	**Property and Community Spaces** **Housing:** Potential for permanent land take to private properties and housing. Potential for direct disturbances (lighting, noise, vibration) to private properties and housing. **Community Areas:** Potential for direct permanent loss of, or disturbances to, community land areas during the operation of the converter station / substation.
Geology, Soils and Land use	**Geology and geomorphology** **Designated Sites:** Potential for short-term direct or indirect damage or disturbance to features designated for onshore geological or geomorphological importance/interest during the construction phase through partial/full removal, defacement or obscuring of rock outcrops/landforms. **Disturbance to Mineral Resource:** Potential for short-term direct or indirect localised impacts on mineral resources. Potential for sterilisation of mineral resource through developments at surface, or prevention of extraction through removal of access to mineral resource.	**Geology and geomorphology** **Designated Sites:** Potential for long-term direct or indirect damage or disturbance to features designated for onshore geological or geomorphological importance/interest through partial/full removal, defacement or obscuring of rock outcrops/landforms to facilitate the onshore converter station / substation, or through maintenance activities. **Disturbance to Mineral Resource:** Potential for long-term direct or indirect localised impacts on mineral resources. Potential for sterilisation of mineral resource through developments at surface, or prevention of extraction through removal of access to mineral resource.
	Land Use **Loss of land use:** Potential for direct temporary or permanent loss of land use during the construction period for land required	**Land Use** **Loss of land use:** Potential for direct permanent loss of land or disturbance of land required for the operation of the converter

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	for the construction and commissioning of the converter station / substation involving infrastructure such as construction compounds, haul roads and temporary access tracks. These may be in pace for extended periods of time. This may include loss of agricultural land and soils due to land take, potential loss of forestry or woodland due to felling, loss of commercial land due to land take, potential land take to private properties and housing and loss of community land/recreational resources (access land, common land and village greens, public rights of way (PRoW), cycle routes, other recreational resources). Secondary impacts may arise on Air Quality, Population and Human Health, Material Assets and Landscape, Seascape and Visual Amenity SEA topics. **Disruption and reduced access:** Potential for temporary reduced access to, or disruption to, agricultural land during construction and decommissioning of the converter station / substation. These activities may result in disruption to agricultural land quality, soils and farming operations, as well as reducing the area of land available to farmers. Potential for disruption and reduced access to recreational resources (access land, common land and village greens, PRoW, cycle routes, other recreational resources). Potential for temporary reduced access to forestry or woodland areas, or other commercial land uses.	station / substation within the site footprint. This may include loss of agricultural land and soils due to land take, potential loss of forestry or woodland due to land take/felling, commercial land use due to land take and land take to private properties and housing and loss or disturbance to community land. **Disruption and reduced access:** Potential for disruption or reduced access to forestry areas, agricultural land, commercial land use or community spaces during maintenance activities.
	Soils **Soil Loss:** Potential for temporary loss and disturbance to soils within the construction compounds, haul roads and access tracks during the construction phase and potential replacement	**Soils**

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	with impermeable surfaces within the converter station / substation site footprint. There is potential for an increased risk of soil erosion. There is potential for secondary impacts on the Water SEA topic. **Soil Quality:** Potential for soil to be compacted during the construction phase due to the use of heavy vehicles and machinery, which may impact soil quality and functioning (including drainage). Potential for physical damage to peat or carbon rich soils, resulting in loss of carbon storage. Potential for secondary impacts on the Biodiversity, Flora and Fauna, Air, Climatic Factors, Population and Human Health, Water, and Material Assets SEA Topics.	**Loss of Soils:** Potential for permanent loss of soils to facilitate the new converter station / substation and potential for replacement with impermeable surfaces elsewhere within the site.
	Contaminated Land **Legacy Contamination:** Potential for widespread contamination on site as a result of mobilising existing contaminants within the soil during pre-construction and construction activities. Impacts on human health of site users and adjacent site occupiers may arise as a result of works on potentially contaminated land. Potential for secondary impacts on the Biodiversity, Flora and Fauna, Air, Climatic Factors, Population and Human Health, Water, and Material Assets SEA Topics. **Ground Gas:** Contamination source areas and certain natural soils have the potential to generate hazardous ground gases; there is the potential for construction activities to generate new pathways for ground gas migration. **Accidental Spillage:** Potential for localised contamination of groundwater, soils or riverbed sediment due to leaks or spills of	**Contaminated Land** **Legacy Contamination:** Potential for interaction with existing contaminated land during maintenance activities, which may have impacts on human health of site users and adjacent site occupiers. **Accidental Spillage/Leaks:** Potential for direct pollution/contamination of soils due to accidental release of pollutants during maintenance activities within the converter station / substation footprint. Potential for direct pollution/contamination of soils due to converter station / substation chemical leaks and concrete leaching during the operation phase. **Ground Gas:** Contamination source areas and certain natural soils have the potential to generate hazardous ground gases; there is the potential for ground gas migration, initiated during construction activities to continue through the operation phase.

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	fuels, oils and chemicals during the construction phase. Impacts on human health of site users and adjacent site occupiers may arise as a result of works on potentially contaminated land. Potential for secondary impacts on the Biodiversity, Flora and Fauna, Air, Climatic Factors, Population and Human Health, Water, and Material Assets SEA Topics. **UXO:** Potential for UXO to be encountered and disturbed within construction areas during the construction phase.	
Water	**Water Quality** **Surface Water Quality:** Potential for ground disturbance during land preparation works (earthworks, dewatering, stockpiling – if not stored correctly, vegetation clearance and excavation of converter station / substation foundations) or via large vehicle movements, which may increase soil erosion resulting in sediment loading and pollution of surface waters. Potential impacts on surface water quality through the accidental discharge of fine sediments or chemicals, including hydrocarbons associated with construction and decommissioning activities. Potential for surface water quality to be affected where works require groundwater control measures, such as local groundwater level reduction or removal of the water from the excavation (dewatering), by the discharge of removed groundwater into surface watercourses primarily through sediment release but also if the removed groundwater is contaminated. These contaminants and pollutants may include fuels, oils, chemicals and concrete. Potential for reduced surface water quality due to the poor-quality groundwater discharging to surface water, particularly during baseflow.	**Water Quality** **Surface Water Quality:** Potential for exposed ground to lead to continued sediment loading and pollution of watercourses. Potential contamination of surface waters due to accidental release of pollutants during maintenance activities. Potential contamination of surface waters due to converter station / substation chemical leaks and concrete leaching. **Groundwater Quality:** Potential direct short-term contamination of groundwater due to accidental release of pollutants during maintenance activities. Potential contamination of groundwater due to mobilisation of existing areas of contamination or converter station / substation chemical leaks and concrete leaching.

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	Discharge of water from construction works may also distribute contaminants and pollutants to surface water receptors or their catchments. It may also create an accumulation of these substances where soakaway basins are used. **Groundwater Quality:** Potential for direct short-term deterioration of groundwater quality due to the mobilisation of existing areas of contamination during construction or decommissioning activities including excavation, which may result in the introduction of hazardous or non-hazardous substances to shallow groundwater. Potential for direct short-term deterioration of groundwater quality due to the accidental release of pollutants such as fuels, oils, chemicals and concrete during construction. Potential for pollutants to leach into groundwater due to the increased removal of topsoil or hardstanding and exposure of underlying soils to increased rainwater infiltration, as well as ground investigations and pilling boreholes which may create pathways to sensitive aquifers through relatively low permeability formations. Potential for contaminants and pollutants to be distributed throughout the aquifer through the discharge of water from construction works; this may result in an accumulation of these substances where soakaway basins are used without appropriate treatment.	
	Water Quantity **Surface Water Quantity**: Potential for redirection of surface water flows to different catchments due to excavation of the construction compounds and development of the converter station / substation creating a barrier for springs that feed into the surface watercourses. This could reduce catchment areas	**Water Quantity** None anticipated.

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	and change the flow regime within receiving surface waters. This may also have secondary effects on aquatic ecology. Potential for reduction in the quantity of surface water fed by groundwater during the construction and decommissioning phase. **Groundwater Quantity**: Potential for direct or indirect, short-term impact on groundwater levels or flow in sensitive groundwater sites during construction or decommissioning phases. Activities required to facilitate construction and decommissioning of the converter station / substation, including subsurface excavation, dewatering, runoff management and discharge, may locally reduce the rate of recharge to aquifers where the runoff is managed; discharge may reduce groundwater levels as well as groundwater flow (direction and quantity). This has the potential to reduce the flow available to springs and groundwater features. This water may also be connected to spring systems which feed into local watercourse baseflows.	
	Flood Risk **Flood Risk:** Potential for short-term increased risk of flooding during construction from activities required to facilitate the construction of the converter station / substation such as the presence of temporary construction compounds, increase in impermeable surfaces, removal of surface vegetation, changes in ground levels, compaction of soils, excavations and dewatering. Such activities may alter drainage patterns and surface water runoff rates onsite by modifying flood flows and reducing the land's ability to absorb water leading to an	**Flood Risk** **Flood Risk:** Potential for long-term increased risk of flooding during operation as the presence of the converter station / substation would result in additional impermeable land, which may alter drainage patterns and surface runoff rates onsite, increasing flood risk within the site and the surrounding area.

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	increase in flood risk within the construction areas and the surrounding area. Potential for blockages in watercourses to arise from increased runoff from temporary bare ground which may also increase flood risk. Potential for increased flood risk arising from damage to existing flood defences due to construction and decommissioning activities, which may impact the efficacy of the flood defence infrastructure.	
	Abstraction **Abstraction:** Construction works may require abstractions from surface water features to provide a source of water for processes such as dampening down/dust suppression. Abstraction from watercourses has the potential to affect the quantity of water within the waterbody, which may impact hydromorphological processes and biodiversity.	A**bstraction** None anticipated.
	Private Water Supplies (PWS) **Private Water Supplies:** Potential impact of reduced groundwater quality or quantity in aquifer units, on protected groundwater abstraction areas (licensed or non-licensed) and/or change in groundwater resource availability during construction and decommissioning. Risk of contamination through direct interaction with the PWS source or associated infrastructure, overland flow, shallow groundwater flow, and spillage or pollution upslope from the source.	**Private Water Supplies** **Private Water Supplies:** Potential impact of reduced groundwater quality or quantity in aquifer units, on protected groundwater abstraction areas (licensed or non-licensed) and/or change in groundwater resource availability during operation. Risk of contamination through direct interaction with the PWS source or associated infrastructure, overland flow, shallow groundwater flow, and spillage or pollution upslope from the source.
Air Quality	**Air Quality** **Dust Emissions:** Potential for short-term, temporary, dust and PM_{10} emissions from construction activities such as demolition,	**Air Quality** **Dust Emissions:** Potential for short-term, temporary, dust and PM_{10} emissions from maintenance activities**.** This can impact human

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	earthworks, construction and trackout. This can impact human receptors (in terms of dust soiling and health impacts) as well as ecological receptors. **Vehicle Emissions:** Potential for short-term, temporary increases in road traffic volumes on the public road network and within the construction areas generated by construction activities to result in adverse effects on local air quality, during pre-construction, installation, and decommissioning. Potential to impact human and ecological receptors through a deterioration of local air quality via increased exposure to vehicle emissions.	receptors (in terms of dust soiling and health impacts) as well as ecological receptors. **Vehicle Emissions:** Potential for intermittent/infrequent operation phase maintenance activities to temporarily increase traffic volumes and result in adverse effects on local air quality. Potential to impact human and ecological receptors through a deterioration of local air quality via increased exposure to vehicle emissions.
Climatic Factors	**GHG Emissions and Carbon Storage** **GHG Emissions:** Potential for short-term direct and indirect GHG emissions to be generated by the construction process through the production of materials, transport of materials and onsite energy consumption. Potential for short-term, temporary emissions from vehicles and machinery during pre-construction, construction and decommissioning of the converter station / substation. **Land use emissions**: Potential for the temporary or permanent loss of habitats and change in land use practices to result in short-term increases in GHG emissions. **Carbon storage:** Potential for short-term release of CO_2 due to ground disturbances within areas of carbon storage potential such as peatlands, bogs or salt marsh habitats, due to the	**GHG Emissions and Carbon Storage** **GHG Emissions:** Potential for direct and indirect GHG emissions to be generated by the consumption of materials, any maintenance activities including replacement of infrastructure, or vehicle movements required to facilitate the operation phase of the converter station / substation. These would contribute to the lifecycle total and net GHG balance. **Reduced Carbon Storage:** Potential for the permanent loss of carbon sequestering habitats and loss/disturbance of peat soil to result in reduced carbon storage/sequestration locally.

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	activities required to facilitate the construction and decommissioning of the converter station / substation. **Waste disposal:** Potential for short-term generation of GHG emissions during waste removal, transport and disposal processes for the converter station / substation and materials during the construction and decommissioning phases.	
	Climate Change Effects **Heat:** Potential for extreme high temperatures to result in malfunctioning of equipment; risks to assets; and heat health risks to staff during the construction phase. **Storms:** Potential for storms (including high wind and lightning) to result in physical damage to assets; construction delays; as well as health and safety risks for staff during the construction phase. **Drought:** Climate change has the potential to increase drought due to reduced summer rainfall and increased dry spells. Potential for drought to cause ground cracking and subsistence, with potential secondary impacts for roads, car parks and drainage systems. **Precipitation:** Potential for heavy rainfall and related surface water flooding to pose several impacts including direct damage to assets from flooding, and interference with construction processes.	**Climate Change Effects** **Heat:** Extreme heat is projected to become more frequent and more intense over the next 30 years during the likely operation phase with more days experiencing temperatures above 25℃ (the definition of a heat wave in the UK). This has the potential to cause the malfunctioning of equipment, more rapid asset deterioration and heat health risks to staff. **Storms:** Potential for storms (including high wind and lightning) to result in physical damage to assets, as well as health and safety risks for staff over the next 30 years during the likely operation phase. **Drought:** Climate change has the potential to increase drought due to reduced summer rainfall and increased dry spells. Potential for drought to cause ground cracking and subsistence, with potential secondary impacts for roads, car parks and drainage systems. **Precipitation:** Potential for heavy rainfall and related surface water flooding to pose several impacts including direct damage to assets, and interference with operation of the converter station / substation.

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Material Assets	**Existing Infrastructure: cables, overhead lines and pipelines** **Damage to infrastructure:** Potential for short-term damage to existing cables, overhead lines, and gas/oil and water pipelines due to the activities required to facilitate construction and decommissioning of the converter station / substation. This may result in disturbance to utilities or release hazardous materials into the environment. **Access:** Potential for short-term reduced access to existing pipelines and cables for maintenance due to the activities required to facilitate the construction and decommissioning of the converter station / substation.	**Existing Infrastructure: cables, overhead lines and pipelines** **Direct damage to infrastructure:** Potential for damage to existing cables, overhead lines, and gas/oil and water pipelines due to the activities required to facilitate the operation and maintenance (recurrent, short-term) of the converter station / substation. **Access:** Potential for long-term reduced access to certain lengths of existing pipelines or cables for maintenance due to the activities required to facilitate the operation of the converter station / substation.
	Other Users: Agriculture **Loss of Land:** Potential for temporary and direct loss of, or disturbance to, agricultural land during the construction period due to land take required for the construction of the converter station / substation, involving infrastructure such as construction compounds, haul roads and temporary access tracks. These may be in place for extended periods of time. **Damage to field drainage:** Potential for direct damage to field drains or the structure of the agricultural soils due to construction activities. **Irrigation and livestock drinking water:** Potential for secondary impacts on agriculture where water sources used for irrigation are a livestock drinking source; alternative supplies would need to be provided if these are compromised by onshore construction works.	**Other Users: Agriculture** **Loss of Land:** Potential for permanent and direct loss of, or disturbance to, agricultural land during the operation period due to land take required for the operation of the converter station / substation.

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	Soil pests and diseases: Potential for indirect impacts on agriculture if introduction of soil borne pests and diseases were to occur from construction.	
	Other Users: Commercial Forestry **Loss of Land:** Potential for temporary and direct loss of, or disturbance to, commercial forestry land during the construction period due to land take or felling on land required for the construction of the converter station / substation, involving infrastructure such as construction compounds, haul roads and temporary access tracks. These may be in place for extended periods of time.	**Other Users: Commercial Forestry** **Loss of Land:** Potential for permanent and direct loss of, or disturbance to, commercial forestry land during the operation period due to land take or felling on land required for the converter station / substation.
	Other Users: Mineral Extraction **Disturbance to Mineral Resource:** Potential for short-term direct or indirect localised impacts on mineral resources. Potential for sterilisation of mineral resource through developments at surface, or prevention of extraction through removal of access to mineral resource.	**Other Users: Mineral Extraction** **Disturbance to Mineral Resource:** Potential for long-term direct or indirect localised impacts on mineral resources. Potential for sterilisation of mineral resource through developments at surface, or prevention of extraction through removal of access to mineral resource.
	Other Users: Aviation **Physical Obstacle:** Potential for short-term disturbance to flight and aviation ground-based radio/radar as excavation, construction equipment (plant), construction compound berms and fencing associated with the construction of the converter station / substation have the potential to create multiple obstacles to radio/radar propagation. Potential for short-term disturbance to aviation as construction equipment and/or	**Other Users: Aviation** **Physical Obstacle:** Potential for long-term (converter station / substation lifetime) disturbance to flight and aviation ground-based radio/radar as remaining above ground infrastructure within the site or maintenance equipment may have the potential to create obstacles for radio/radar propagation. Potential for long-term disturbance to aviation as remaining above ground infrastructure or

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	construction compounds could penetrate aviation safeguarded/protected surfaces.	maintenance equipment could penetrate aviation safeguarded/protected surfaces.
	Other Users: Road Network Users **Increased travel time:** Potential for short-term temporary increased travel time for road users including public transport due to activities required to facilitate the construction and decommissioning of the converter station / substation such as road closures or road diversions, which may increase driving times and distances. Potential for short-term journey delays due to increased vehicle traffic from construction machinery and slow-moving vehicles carrying construction materials or abnormal loads. **Disruption of public transport services**: Potential for short-term temporary restrictions or amendments to typical public transport routes due to activities required to facilitate the construction and decommissioning of the converter station / substation such as road closures or road diversions. **Abnormal loads:** Potential for short-term temporary restrictions to road access or for road closures to be implemented to facilitate the onshore movement of abnormal loads of construction materials. **Recreational users:** Potential for short-term temporary disruption in access to road networks or pathways for recreational activities such as walking, running, cycling or equestrian users due to activities required to facilitate the	**Other Users: Road Network Users** None anticipated

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	construction or decommissioning of the converter station / substation. **Fear:** Potential for road users to experience short-term temporary fear or intimidation or have concerns regarding health and safety due to the activated required to facilitate the construction or decommissioning of the converter station / substation.	
	Other Users: Military Activities **Disruption to Military Practice Areas**: Potential for short-term direct or indirect disruption of military practice activities due to activities required to facilitate the construction or decommissioning of the converter station / substation. **UXO presence:** Short-term potential for UXO to impact the development of the converter station during pre-construction and construction activities.	**Other Users: Military Activities** **Disruption to Military Practice Areas**: Potential for long-term direct or indirect disturbance of military practice activities due to activities required to facilitate the operation and maintenance of the converter station / substation.
	Other Users: Tourism **Disturbance and contamination:** Potential for short-term effects on onshore tourism locations and recreational activities due to activities required to facilitate the construction and decommissioning of the converter station / substation, which may generate noise, cause visual impacts or release of contaminants from soils or into waterbodies. **Access:** Potential for temporary effects on tourism or recreational activities due to short-term access restrictions	**Other Users: Tourism** **Disturbance and contamination:** Potential for long-term effects on onshore tourism locations and recreational activities due to activities required to facilitate the operation and maintenance of the converter station / substation, which may generate noise, cause visual impacts or release of contaminants from soils or into waterbodies. **Access:** Potential for permanent effects on tourism or recreational activities due to long-term access restrictions from activities

SEA Topic	Onshore Substations and Converter Stations	
	Pre-construction, Construction and Decommissioning	**Operation and Maintenance**
	from activities required to facilitate the construction and decommissioning of the converter station / substation. **Visitor Behaviour:** Potential temporary changes to visitor behaviour such as exhibiting a lower likelihood of visiting affected tourism and recreational assets may arise from changes to onshore activity associated with the construction of the converter station / substation and associated visual impacts. This may result in reduced visitor numbers.	required to facilitate the operation and maintenance of the converter station / substation. **Visitor Behaviour:** Potential permanent changes to visitor behaviour such as exhibiting a lower likelihood of visiting affected tourism and recreational assets may arise from changes to onshore activity associated with the operation of the converter station / substation, as well as potential visual impacts arising from the presence of the converter station / substation and operation and maintenance activities. This may result in reduced visitor numbers.
Cultural Heritage	**Archaeology** **Direct partial or complete loss to features:** Potential for, where present, buried archaeological remains within the converter station / substation site or construction compounds to be impacted (destroyed or damaged) by site-based activities that involve groundbreaking and ground reduction, including foundations and the installation of services. Damage may impact the cultural significance of artefacts. **Indirect partial or complete loss to features:** Potential for indirect damage or destruction of below and above ground archaeological assets or structures due to activities required to facilitate the construction or decommissioning of the converter station / substation. Construction activities may result in the displacement of sediment or generation of mud, which may damage artefacts or lead to their burial. Physical impacts (vibration) due to construction activities or vehicle movements may damage archaeological features. Hydrological regimes may be altered, resulting in potential for dewatering or an	**Archaeology** **Setting of features:** Potential for impacts on the setting of archaeological features due to the presence of the converter station / substation during the operation phase. **Indirect damage or destruction to features:** Potential for the cultural significance of below and above ground archaeological assets to experience long-term impacts through indirect physical impacts (vibration) due to construction activities or vehicle movements; through land alteration impacting sediment regimes resulting in displacement of sediment or generation of mud from construction activities which may damage artefacts or lead to the burial of a site; or from alteration of hydrological regimes resulting in potential for dewatering or an inundation of water to result in damage to, or loss of, terrestrial archaeological assets or structures.

SEA Topic	Onshore Substations and Converter Stations	
	Pre-construction, Construction and Decommissioning	**Operation and Maintenance**
	inundation of water to result in damage to, or loss of, terrestrial archaeological assets or structures. Damage may impact the cultural significance of artefacts. **Setting of features**: Potential for impacts on the setting of archaeological features due to the activities required to facilitate the construction and decommissioning of the converter station / substation as a result of the presence of equipment and machinery, and temporary increases in air pollution, traffic, and noise and vibration.	
	Heritage **Direct damage to heritage assets:** Potential for impacts on the cultural significance of heritage assets through direct physical impacts due to construction activities such as groundbreaking and ground reduction, including foundations and the installation of services. **Indirect damage to heritage assets:** Potential for the cultural significance of heritage assets (architectural, landscape, artistic) to experience short-term impacts through indirect physical impacts (vibration) due to construction activities or vehicle movements, through displacement of sediment or generation of mud from construction activities which may damage artefacts or lead to the burial of a site, or from alteration of hydrological regimes resulting in potential for dewatering or an inundation of water to result in damage to, or loss of, terrestrial archaeology assets or structures. **Setting of heritage features:** Potential for the setting of above ground heritage assets to be disturbed by the temporary	**Heritage** **Setting of heritage features:** Potential for long-term, but reversible, impacts to the settings and cultural significance of heritage assets during the operation phase due to potential increases in air pollution, traffic, noise and vibration. **Historic Environment:** Potential for long-term but reversible impacts on the character of the historic landscape due to the presence and operation of the converter station / substation. **Indirect damage or destruction to features:** Potential for the cultural significance of heritage assets (architectural, landscape, artistic) to experience long-term impacts through indirect physical impacts (vibration) due to construction activities or vehicle movements; through land alteration to impact sediment regimes resulting in displacement of sediment or generation of mud from construction activities which may damage artefacts or lead to the burial of a site; or from alteration of hydrological regimes resulting in potential for

SEA Topic	Onshore Substations and Converter Stations	
	Pre-construction, Construction and Decommissioning	**Operation and Maintenance**
	increase in air pollution, traffic, noise and vibration, and presence of equipment and machinery. **Historic Environment:** Potential for temporary impacts on the character of the historic landscape due to the construction and decommissioning of the converter station / substation.	dewatering or an inundation of water to result in damage to, or loss of, terrestrial archaeology assets or structures.
Landscape, Seascape and Visual Amenity	**Landscape, Seascape and Visual Amenity** **Effects on Landscape Elements:** Potential direct temporary or permanent loss of landscape elements to facilitate construction works including construction compounds and facilities, storage areas, the presence of plant, access routes, earthworks, Sustainable Drainage Systems (SuDS) and construction of emerging structures. **Effects on Landscape Character:** Potential impacts to landscape character due to the presence of construction activities which often involve construction compounds and facilities, storage areas, the presence of plant, access routes, earthworks, Sustainable Drainage Systems (SuDS) and construction of emerging structures, excavation works, cranes and some elevated activities, construction traffic on roads, and nighttime security lighting of the site. **Effects on Visual Amenity:** Potential temporary change to publicly accessible views and visual amenity due to the visibility of activities required for the construction and decommissioning of the converter station / substation.	**Landscape, Seascape and Visual Amenity** **Effects on Landscape Elements:** Potential direct permanent loss of landscape elements to facilitate the converter station / substation and permanent access routes. **Effects on Landscape Character:** Potential impacts to landscape character due to the presence of the converter station / substation. **Effects on Visual Amenity:** Potential permanent change to publicly accessible views and visual amenity due to the visibility of the converter station / substation.

Table 29: Potential high-level effects on SEA topics from onshore substations and converter stations

9. Environmental Assessment of Recommended Designs

9.1 Assessment of Recommended Designs

9.2 Cumulative / In-Combination Effects



9.1 Assessment of Recommended Designs

The purpose of this section is to evaluate as far as is possible the environmental effects of implementing the Recommended Designs of the draft HND Implementation Plan.

The Recommended Design for the draft HND Implementation Plan comprises the following components:

The Recommended Design for HND.

The Recommended Design for HNDFUE ScotWind.

The Recommended Design for HNDFUE Celtic Sea.

The Recommended Design for INTOG.

As described in Section 6.1.2**,** the Recommended Design(s) for the four HND / HNDFUE work strands were considered and assessed in the order in which they were developed, and the preferred network design published, i.e., HND, HNDFUE: ScotWind, HNDFUE: Celtic Sea, HNDFUE: INTOG, recognising that earlier work strands could have in-combination and/or cumulative effects with subsequent Recommended Designs for work strands that overlap in a geographic area.

The potential environmental effects from implementing each of these Recommended Designs is considered and assessed in the following sections. A summary is also provided of the potential environmental effects of implementing the draft HND Implementation Plan i.e., all Recommended Designs.

9.1.1 HND – Recommended Design

The HND Recommended Design contains the proposed connections shown in Table 30. The HND Recommended Design Study Area is shown in Figure 42.

Start Point	End Point	Interface Requirements	Capacity
R4_4 (Mona)	Bodelwyddan	1 AC Substation	1500MW HVAC
R4_5 (Morecambe)	Penwortham	1 AC Substation	480MW HVAC
R4_6 (Morgan)	Penwortham	1 AC Substation	1500MW HVAC
SW_W1 (Machair)	Ballantrae Tee	Busbar Station	2000MW HVDC
Ballantrae Tee	Kilmarnock South	1 DC Converter Station	2000MW HVDC
Ballantrae Tee	Pentir	1 DC Converter Station	2000MW HVDC
R4_1 (Dogger Bank South West)	Birkhill Wood	1 DC Converter Station	1440MW HVDC
R4_2 (Dogger Bank South East)	Birkhill Wood	1 DC Converter Station	1440MW HVDC
R4_3 (Outer Dowsing)	Weston Marsh	1 AC Substation	1500MW HVAC
PA_1 (Dogger Bank D)	Birkhill Wood Alternative	1 DC Converter Station	1440MW HVDC
PA_2 (Berwick Bank)	Near Blyth	1 DC Converter Station	1800MW HVDC
SW_NE4 (Caledonia)	New Deer	1 AC Substation	1500MW HVAC
SW_NE7 (Marram)	Peterhead 2 / DCSS	1 DC Converter Station	1500MW HVDC
SW_E1a (Morven)	Hurlie	1 DC Converter Station	2000MW HVAC
SW_E1a (Morven)	Hawthorn Pit	1 DC Converter Station	1800MW HVDC
SW_E1a (Morven)	Lincolnshire Connection Node	1 DC Converter Station	1800MW HVDC
SW_E1b (Bell Rock)	Morven	N/A	1200MW HVAC
SW_N1 (West of Orkney)	Banniskirk/Spittal	1 AC Substation	2250MW HVAC
SW_N4 (Spiorad na Mara)	Arnish	1 AC Substation	740MW HVAC

Table 30: HND Recommended Design proposed connections

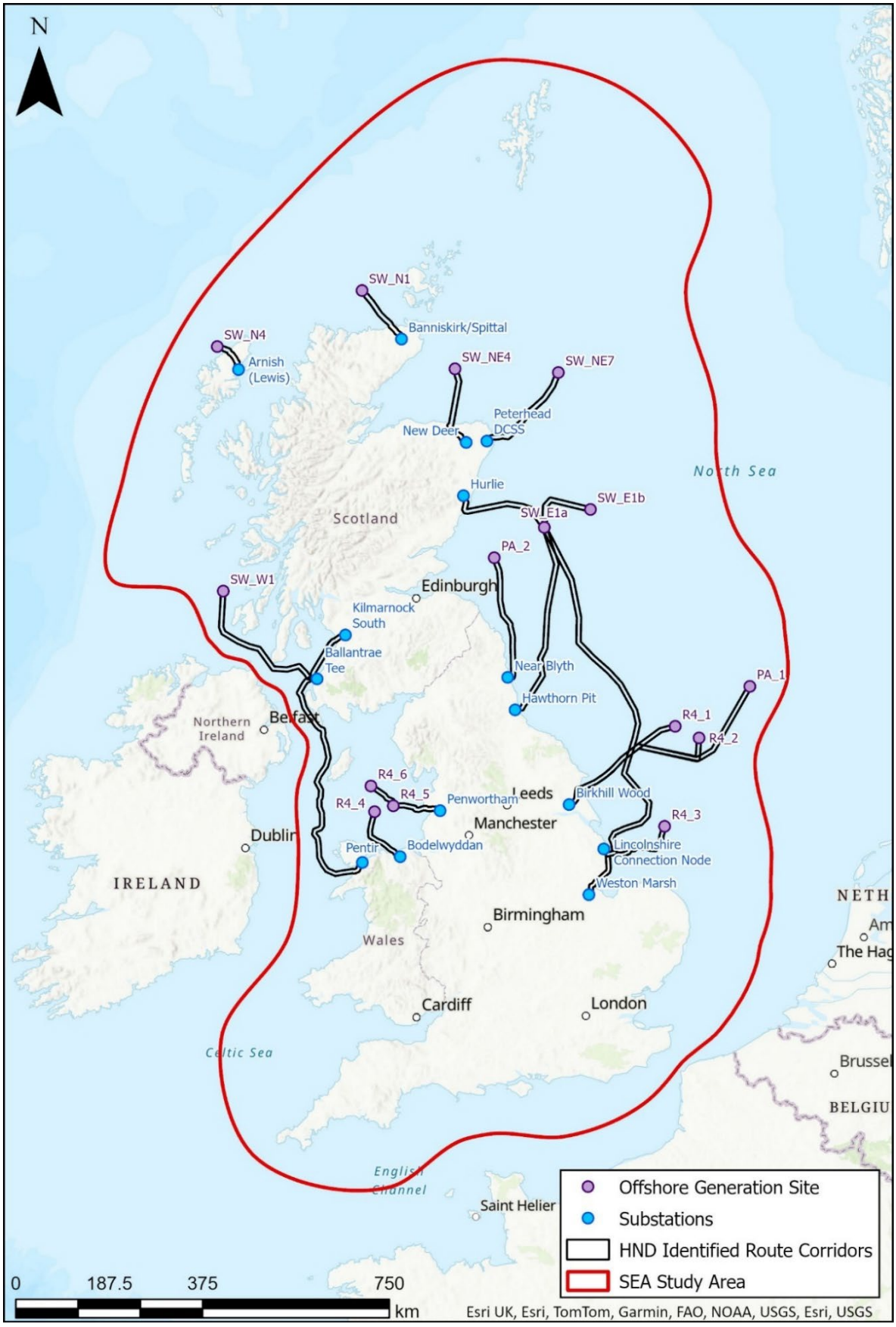


Figure 42: HND Recommended Design Study Area

Environmental Baseline and Key Issues within the Study Area

Biodiversity, Flora and Fauna

There are numerous designated sites that are within the identified route corridors. This includes 18 Special Areas of Conservation (SACs), Afon Gwyrfai a Llyn Cwellyn SAC, Berwickshire and North Northumberland Coast SAC, Buchan Ness to Collieston SAC, Coedwigoedd Dyffryn Elwy / Elwy Valley Woods SAC, Dogger Bank SAC, Durham Coast SAC, Glynllifon SAC, Inner Dowsing, Race Bank and North Ridge SAC, Inner Hebrides and the Minches SAC, Lendalfoot Hills Complex SAC, Lewis Peatlands SAC, Mull of Galloway SAC, North Anglesey Marine / Gogledd Môn Forol SAC, River Thurso SAC, Southern North Sea SAC, The Wash and North Norfolk Coast SAC, Menai Strait and Conwy Bay / Y Fenai a Bae Conwy SAC, and Abermenai to Aberffraw Dunes / Y Twyni o Abermenai i Aberffraw SAC. There are 11 Special Protection Areas (SPAs) within the identified route corridors, including North Caithness Cliffs SPA, Lewis Peatlands SPA, Ness and Barvas, Lewis SPA, Buchan Ness to Collieston Coast SPA, Ribble and Alt Estuaries SPA, Northumbria Coast SPA, The Wash SPA, Liverpool Bay / Bae Lerpwl SPA, Northumberland Marine SPA, Irish Sea Front SPA, and Greater Wash SPA. There are also four Ramsar sites within the identified route corridors, Lewis Peatlands, Northumbria Coast, Gibraltor Point, and Ribble and Alt Estuaries. The Saltfleetby-Teddlethrope Dunes and Gibraltar Point SAC, Snowdonia / Eryri SAC, Glen App and Galloway Moors SPA, and Humber Estuary SPA are also within the wider vicinity of interface areas.

There are nine Marine Conservation Zones (MCZs) within the identified route corridors, Holderness Inshore MCZ, Farnes East MCZ, Fylde MCZ, North East of Farnes Deep MCZ, Coquet to St Marys MCZ, Ribble Estuary MCZ, Holderness Offshore MCZ, Berwick to St Mary's MCZ. In Scottish waters, there are also nine Nature Conservation MPAs within the identified route corridors, North-east Lewis MPA, Clyde Sea Sill MPA, Southern Trench MPA, Berwickshire and North Northumberland Coast MPA, Buchan Ness to Collieston Coast MPA, North Caithness Cliffs MPA, Clyde Sea Sill MPA, Inner Hebrides and the Minches MPA, and Berwick to St Mary's MPA. The North East of Farnes Deep Highly Protected Marine Area (HPMA) is adjacent to the route corridor from SW_E1a (Morven) to Hawthorn Pit.

There are 32 Sites of Special Scientific Interest (SSSIs) designated for ecological features that are within the identified route corridors. These are Bennane Head Grasslands SSSI, Bullers of Buchan Coast SSSI, Cullen to Stake Ness Coast SSSI, Knockdolian Hill SSSI, Littleton and Balhamie Hills SSSI, Loch Lieurary SSSI, Mull of Galloway SSSI, Newlands of Geise Mire SSSI, River Thurso SSSI, Tong Saltings SSSI, Troon Golf Links and Foreshore SSSI, Ushat Head SSSI, Afon Gwyrfai a Llyn Cwellyn SSSI, Coed y Gopa SSSI, Glynllifon SSSI, Morfa Dinlle SSSI, Pant Cae Haidd SSSI, Traeth Pensarn SSSI, Afon Gwyrfai a Llyn Cwellyn SSSI, Cresswell and Newbiggin Shores SSSI, Teesmouth and Cleveland Coast SSSI, Eppleton Grassland SSSI, Hawthorn Dene SSSI, Hesledon Moor East SSSI, Hesledon Moor West SSSI, Leven Canal SSSI, Lytham St Annes Dunes SSSI, Newton Marsh SSSI, Bamburgh Dunes SSSI, Pig Hill SSSI, Sea Bank Clay Pits SSSI, and Gibraltar Point SSSI. There are also additional SSSIs within the wider vicinity of interface areas.

There are two National Nature Reserves (NNRs) within the identified route corridors, the Ribble Estuary NNR and The Wash NNR. The Lincolnshire Coronation Coast NNR is within the wider vicinity of the Lincolnshire Connection Node interface area. The West Coast Marine Nature Reserve (MNR) in Isle of Man waters also lies within an identified route corridor.

In England and Wales, the Local Nature Reserves (LNRs) of Bedlington Country Park, Beverley Parks, Ha'penny Woods, Lytham St Annes, Havenside, Noses Point, Fishwick Bottoms, Easington, Dudley Quarry, and Y Foryd are within the identified route corridors, while in Scotland there are 25 Local Nature Conservation Sites (LNCSs) that lie within the identified route corridors: Annies Dam; Arbuthnott; Benholm, Cullen to Whitehills; Skelmuir Hill, Stirling Hill, Dudwick; Todhead Point to Johnshaven Coast; Auchneight Moor and Crammag Head; Carmell and Cessnock Water; Caprington Castle and Estate; Dallars Mains; Howcommon (Craigie Hill); Inchgotrick Quarry; Riccarton Moss (Crossbush); Treesbank Estate; Loans Goose Fields; Coodham; Knockdolian; Fullarton Wood; Ballantrae to Girvan; Carnell and Cessnock Water; Darley Plantation, Troon; Dundonald Hills; Knockdaw Hill and Knockormal Hill; River Stinchar (Knockenfinnick to Knockdolian); and Troon South Wood. There are also additional LNRs and LNCSs within the wider vicinity of interface areas. The Biosphere Reserves of Galloway and Southern Ayrshire are also within the identified route corridor to Ballantrae.

There are four RSPB sites that lie within the identified route corridors: Frampton Marsh, Loch na Muilne, Freiston Shore, and Morfa Dinlle. There are also nine Important Bird Areas (IBAs): Buchan Ness to Collieston Coast IBA; Lewis Peatlands IBA; Northumbria Coast IBA; Ribble and Alt Estuaries IBA; The Wash IBA; West Coast, Lewis (Corncrake) IBA; North Wales Coast IBA; Stornoway to Back, Lewis IBA; and Trefor IBA. The seabird at sea density within the route corridors is of relatively low to moderate density for the study area, with an area of relatively high density in the identified route corridor from SW_E1a (Morven) to Lincolnshire Connection Node. There are areas of relatively moderate to high modelled density for Atlantic puffin within the identified routes to Arnish, Spittal, and north-east England; relatively moderate to high density for black-legged kittiwake within identified route corridors off the north and east coast of Scotland and north-east England; relatively high density for herring gull within the identified route corridor to Hurlie; relatively high density for lesser black-backed gull within the identified route corridor to Penwortham; relatively moderate to high density for common guillemot within identified route corridors off Scotland and north-east England; relatively low to moderate density for European shag within identified route corridors off the coast of Scotland; relatively moderate to high density for northern fulmar off the coast of Scotland and north-east England; generally low to moderate density for northern gannet, with relatively high density within identified route corridors to Arnish, Spittal and Kilmarnock South; and generally low density for razorbill, with relatively moderate to high density within identified route corridors to Arnish, Spittal and Hurlie

The predominant seabed habitat types within identified route corridors include deep circalittoral coarse sediment, deep circalittoral mud and deep circalittoral sand. There are known areas of Annex I sandbank within the identified route corridors, including the routes from Dogger Bank, and offshore of Birkhill Wood, Lincolnshire Connection Node,

Bodelwyddan, and Penwortham. Known areas of Annex I saltmarsh occur within the identified route corridors offshore of Kilmarnock south and Penwortham and within the routes to Arnish and Weston Marsh. Known areas of Annex I Reef also occur within the majority of identified route corridors. Onshore, there are areas of ancient woodland within some of the identified route corridors.

There are OSPAR habitats within the identified route corridors, including sea-pen and burrowing megafauna communities, intertidal Mytilus edulis beds, kelp forests, intertidal mudflats, Sabellaria spinulosa reefs, Zostera beds, peat and clay exposures, mixed muddy sediments, seagrass beds, mud habitats in deep water, tide swept channels, intertidal underboulder, estuarine rock, horse mussel Modiolus beds, and saltmarsh. There are seagrass beds off the west coast of England and north Wales in the identified route corridor from Ballantrae to Pentir. In Scottish waters there are Priority Marine Features (PMFs) within the identified route corridors, including circalittoral fine sand or muddy sand; circalittoral coarse sediment; sea-pens and burrowing megafauna in circalittoral fine mud; offshore circalittoral sand; offshore circalittoral coarse sediment; offshore circalittoral mud; and offshore subtidal sands and gravels. In English and Welsh waters there are Features of Conservation Interest (FOCIs) within the identified route corridors, including tide-swept channels; estuarine rocky habitats; blue mussel beds; sea-pens and burrowing megafauna; Sabellaria spinulosa reefs; and seagrass beds. There are also habitats identified by Natural Resources Wales (NRW) as sensitive to cabling activities within identified route corridors in Welsh waters, including horse mussel (Modiolus modiolus) beds; mudflats and sandflats not covered by sea water at low tide; peat and clay exposures; reefs; and seagrass beds.

There are identified route corridors that lie within the Celtic and Greater North Seas Marine Mammal Management Unit (MU) for the White-sided dolphin, White-beaked dolphin, Risso's dolphin, Minke whale, Harbour porpoise, and Common dolphin, and within the Irish Sea, Coastal East Scotland, Greater North Sea, Coastal West Scotland, and Oceanic waters MUs for Bottlenose dolphin. Within the identified route corridors, there are areas of relatively moderate to very high density for minke whale off the north-west coast and north-east coasts of Scotland and off the west coast within the identified route corridors to Ballantrae. There is relatively moderate to very high density for beaked whale off the west coast of Scotland and relatively moderate to high density for white-beaked dolphin within identified route corridors off the coast of Scotland and north-east England. There are areas of relatively moderate to high density for harbour porpoise within identified route corridors off the east coast of Scotland and England, south-west of England and north Wales; areas of relatively moderate to high density for fin whale within east coast identified route corridors; areas of relatively moderate to high density for bottlenose dolphin off the west coast of England; and areas of relatively moderate density for Risso's dolphin within the identified route corridors to Arnish and Spittal.

There are no designated seal haul-out sites within the identified route corridors. For grey seal, there are areas of relatively very high density within identified route corridors in the region between Blyth and Branxton, relatively high density offshore of Dounreay, Peterhead, Blyth, Lincolnshire Connection Node, and within the identified route corridor

to Ballantrae, off the Isle of Islay. There are also areas of relatively moderate density off Dounreay/Spittal, Blackhillock, Peterhead, Hurlie, Blyth, Hawthorn Pit, Birkhill Wood, Lincolnshire Connection Node, Bodelwyddan, and Ballantrae. For harbour seals, there are areas of relatively very high density within the identified route corridors to Ballantrae, Lincolnshire Connection Node and Weston Marsh, areas of relatively high density within identified route corridors to Ballantrae, Kilmarnock South, Bodelwyddan, Arnish, Dounreay, Spittal, Blackhillock, Peterhead, Hurlie, Hawthorn Pit, Birkhill Wood, Lincolnshire Connection Node, Weston Marsh and relatively moderate density within all identified route corridors.

There are areas of known ecological importance for fish within the identified route corridors. This includes high intensity spawning grounds for sole and plaice off the west coast of England and north Wales within identified routes to Penwortham and Bodelwyddan; for sandeel off the east coast of Scotland, east coast of England and north Wales; for cod within several identified routes throughout the study area; and for plaice off the north coast of Wales and west England for identified routes to Penwortham and Bodelwyddan, as well as off the east coast of England within identified routes to Birkhill Wood, Lincolnshire Connection Node and Weston Marsh. This also includes low intensity spawning grounds for whiting, ling, horse mackerel, hake and nephrops. There are also high intensity nursery grounds for whiting within many identified route corridors; for spurdog within identified routes off the west of England and Scotland; for sole off Wales within routes to Penwortham, Bodelwyddan and Pentir; for blue whiting within identified routes off the north and west of Scotland; for anglerfish within identified routes off the north and north-east of Scotland; and for herring and cod within several identified routes throughout the study area. There are also low intensity nursery grounds for tope shark, thornback ray, spotted ray, sandeel, plaice, ling, mackerel, hake, common skate and nephrops within the identified route corridors.

Population and Human Health

The settlements within the identified route corridors of the HND recommended design include urban areas in the north-west of England and Wales, Abergele, Llanddulas, Bodelwyddan, St Asaph, Blackpool, St Annes, Warton/Kirkham, Groeslon, Bontnewydd, Waunfawr, Caernarfon, Llanrug and Bethel. Within the south-west of Scotland, the settlements include Troon, Symington and Kilmarnock. Within the east of England, the settlements include Beeford, Brandesburton, Leven, Beverly, Woodmansey, Cottingham, Skegness, Boston, Blyth, Bedlington, Seaham, Dawdon, Murton, South Hetton, Easington Lane and Sandilands. Within east Scotland the settlements include Banff, Whitehills, Cuminestown, Peterhead and Stonehaven Within north Scotland, settlements include Halkirk and Stornoway. There are areas of relatively higher population density at Blackpool and Hull, with areas of relatively moderate population density at Penwortham, South Hetton and Kingswood. There are areas of highest perceived deprivation in Gwynedd, Abergele, Blackpool, Ashton Bank, Shortlees, Blyth, Seaham, Dalton-le-Dale, South Hetton, Haswell, Eastington Colliery, Mabelthorpe and Skegness. There are areas of higher perceived deprivation in Towyn, Warton, Freckleton, Clifton, Preston, Ballantrae, Symington, Hawthorn, Skipsea, Beeford, Skidby, Huttoft, Maltby le Marsh, Wrangle and Kirton. There are also areas of moderate perceived deprivation in Waunfawr, Pentir,

Bodelwyddan, Higher Ballam, Lower Ballam, Westby, Monkton, Coodham, Kilmarnock South, Stornoway, Spittal, Ladysbridge, Kind Edward, New Deer, Longside, Benholm, Murton, Sigglesthorne, Long Riston, Woodmansey, Wyberton and Weston Marsh.

There are bathing waters within the identified route corridors, including Abergele (Pensarn), Anderby, Blackpool South, Inverboyndie, Kinmel Bay (Sandy Cove), Moggs Eye, Morfa Dinlle, Prestwick, Skipsea, St Annes, St Annes North and Troon (South Beach). There are also additional bathing water sites within the vicinity of the route corridors.

There are marinas within the identified route corridors, including Banff Harbour Marina, Comhairlie nan Eilean Siar, Seaham Bay Marina, Stornoway Marina and Whitehills Marina. There are areas of boating activity located along the coastline within some identified route corridors. There are areas of high intensity leisure boating activity inshore around Isle of Man, offshore of Gwynedd, within the North Channel, within Firth of Clyde, off Kintyre, within Moray Firth along the coastline and at Newcastle.

There is one Blue Flag Beach within an identified route corridor, at Central Beach. There are two Scotland Award Beaches within the identified route corridors, at Prestwick and Inverboyndie Beach.

There are no known underwater dive sites within the identified route corridors.

There are a significant number (962) of onshore recreation sites within the identified route corridors, including public parks or gardens, playing fields, play spaces, cemeteries, allotments, religious grounds, tennis courts, bowling greens, golf courses, and other sports grounds.

Geology, Soils and Land Use

There are sensitive areas for Geology, Soils and Land Use within the identified route corridors. Within the offshore section of eight identified route corridors, there are several designations for marine areas which are unavoidable: the Berwick to St. Mary's MCZ, the Flyde MCZ, the Southern Trench MPA, the Inner Dowsing, Race Bank and North Ridge MPA, and the Clyde Sea Sill MPA. Within a further four identified route corridors the Firth of Forth Banks Complex MPA, the Holderness Inshore MCZ and the Holderness Offshore MCZ are present, however these are avoidable, albeit with limited scope to do so. There are two WHSs present within the Pentir area of the Pontcysyllte Aqueduct and Conwy Castle, however these are avoidable, reducing the potential for effects. There are no UNESCO Geoparks within the identified route corridors or interface areas.

Generally, the identified route corridors to the north-east of Scotland and east of England cross areas of sand, muddy sand and coarse-grained sediments, with nearshore areas of rocks and boulders. For the identified route corridors within the west of Scotland, the seabed substrate is complex, consisting mainly of sand, muddy sand, mud and areas of mixed and coarse-grained sediments interspersed with areas of rock and boulders. For the identified route corridors within the north-west coast of Wales, the seabed substrate is also complex, and mainly consists of sand, mixed and coarse-grained sediment.

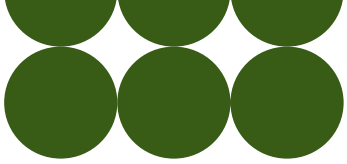
Several areas of Annex I habitats of sandbanks and reefs are encountered by the identified route corridors, for 13 identified route corridors these habitats are unavoidable, with other identified route corridors showing limited scope to avoid these areas. With the R4_3 to Weston Marsh identified route corridor, Annex I sandbank and Annex I reef habitats are unavoidable, additionally this identified route corridor intersects the Inner Dowsing, Race Bank and North Ridge MPA and SAC, which has a wide range of sandbank types and biogenic reef present. Several SSSIs located within the identified route corridors and interface areas are avoidable. There are several SSSIs which are unavoidable within the identified route corridors; Durham Coast SSSI, Garron Point SSSI, Bamburgh Dunes SSSI, and the Northumberland Shore SSSI are within three identified route corridors.

Areas of potential contamination are present within seven of the offshore identified route corridors, which are mainly dredge and spoil dumping grounds, however these are avoidable. The Ballantrae to Pentir identified route corridor crosses the edge of Beaufort's Dyke, a dumping ground for explosive munitions, however this area is avoidable. Several military danger and practice areas are present within the offshore identified route corridors, of which the Campbelltown Military Danger Area off the south-west of Scotland is unavoidable for the SW_W1 to Ballantrae and the Ballantrae to Pentir identified route corridors, the Moray Firth South Military Danger Area is unavoidable for the SW_NE4 to New Deer identified route corridor to the east of Scotland, with the Druridge Bay and Staxton Military Danger areas are unavoidable for identified route corridors to the north-east of England.

Within the onshore identified route corridors, areas of peatland are present within four identified route corridors. Typically, these are avoidable, however for the SW_N4 to Arnish identified route corridor a peatland area is unavoidable within the route corridor. Five onshore identified route corridors contain areas of shallow soils and exposed rock, with limited scope to avoid these areas as four of the five identified route corridors directly intersect these areas. There is an area of peatland within the Penwortham interface area, however this is avoidable. Typically, the onshore identified route corridors cross some areas of agricultural land of very good and good quality, which cannot be avoided, with one identified route corridor from R4_3 to Weston Marsh, encountering areas of excellent quality agricultural land and there are areas of unavoidable excellent quality agricultural land in the Weston Marsh and Pentir interface areas. There are landfills within seven of the onshore identified route corridors, however these are avoidable.

Water

Seven of the identified route corridors are located within the MSFD Celtic Seas sub region to the north of Scotland and north-west of Wales, where Good Environmental Status has not been achieved for all descriptors due to a variety of pressures, including from commercial fisheries, non-native species and climate change. The remaining twelve identified route corridors are located within the MSFD Greater North Sea sub region to the east of England and south-east of Scotland where Good Environmental Status has also not been achieved for all descriptors due to a variety of pressures,



including those relating to demersal fish species composition and declines of breeding bird populations.

The identified route corridors encounter several coastal WFD waterbodies. The coastal waterbodies located within Scotland are typically of good or high WFD ecological status, while those located along the east coast of England and north-west coast of Wales are typically of moderate ecological status.

The average wave height around Scotland ranges between 1.3m to 2.5m, compared to the east coast of England ranging between 1.2m to 1.7m and to the north-west of Wales ranging between 0.9m to 1.2m. Greater variability in the mean spring peak flow of tides is observed around the north-west of Wales, ranging between 1.01m/s to 2.51m/s; around Scotland and the east-coast of England, the mean spring peak flow of tides ranges between <0.11m/s to 0.76m/s.

Aside from SW_E1b to Morven, which is entirely offshore, lakes and/or rivers are present within all identified route corridors and interface areas. These are generally avoidable; however, there are instances where these must be crossed for onshore cable routing. There are National Flood Zones present within some identified route corridors onshore and at landfall, which are typically unavoidable. For all routes landing in Scotland, areas of coastal flood risk are unavoidable at landfall. Within the interface areas, there are areas of National Flood Zones present, these however are typically avoidable aside from the Penwortham, Lincolnshire Connection Node and Weston Marsh interface areas (R4_5 to Penwortham, R4_6 to Penwortham, SW_E1a to Lincolnshire Connection Node, and R4_3 to Weston Marsh route corridors).

Several bathing waters are within the identified route corridors, mainly located off the north-west coast of Wales, around Scotland and to the east coast of England, however, these are avoidable. No shellfish waters are located within the identified route corridors. Areas of potential contamination are present within seven of the offshore identified route corridors, which are mainly dredge and spoil dumping grounds, however these are avoidable. The Ballantrae to Pentir identified route corridor intersects the edge of Beaufort's Dyke, which was a dumping ground for explosive munitions, however the area is avoidable.

Several military danger and practices areas are present within the offshore identified route corridors of which the Campbelltown Military Danger Area, off the south-west of Scotland is unavoidable for the SW_W1 to Ballantrae to Pentir identified route corridor, the Moray Firth South Military Danger Area is unavoidable for the SW_NE4 to New Deer identified route corridor, and the Druridge Bay and Staxton Military Danger areas are unavoidable for identified route corridors to the north-east of England.

Air

There are settlements within the identified route corridors. In the north-west of England and Wales, these include the urban areas of Abergele, Llanddulas, Bodelwyddan, St Asaph, Blackpool, St Annes, Warton/Kirkham, Groeslon, Bontnewydd, Waunfawr, Caernarfon, Llanrug and Bethel. Within the south-west of Scotland, the settlements include Troon, Symington and Kilmarnock. Within the east of England, the settlements

include Beeford, Brandesburton, Leven, Beverly, Hull, Woodmansey, Cottingham, Skegness, Boston, Blyth, Bedlington, Seaham, Dawdon, Murton, South Hetton, Easington Lane and Sandilands. Within east Scotland, the settlements include Banff, Whitehills, Cuminestown, Peterhead and Stonehaven. Within north Scotland, the settlements include Halkirk and Stornoway. There are areas of higher relative population density at Blackpool and Hull, with areas of moderate relative population density at Penwortham, South Hetton and Kingswood.

There are areas of relatively highest deprivation in Gwynedd, Abergele, Blackpool, Ashton Bank, Shortlees, Blyth, Seaham, Dalton-le-Dale, South Hetton, Haswell, Eastington Colliery, Mabelthorpe and Skegness. There are areas of relatively higher deprivation in Towyn, Warton, Freckleton, Clifton, Preston, Ballantrae, Symington, Hawthorn, Skipsea, Beeford, Skidby, Huttoft, Maltby le Marsh, Wrangle and Kirton. There are also areas of relatively moderate deprivation in Waunfawr, Pentir, Bodelwyddan, Higher Ballam, Lower Ballam, Westby, Monkton, Coodham, Kilmarnock South, Stornoway, Spittal, Ladysbridge, Kind Edward, New Deer, Longside, Benholm, Murton, Sigglesthorne, Long Riston, Woodmansey, Wyberton and Weston Marsh.

There is one Air Quality Management Area encountered by routes to Penwortham, at South Ribble.

There are areas of relatively high intensity leisure boating activity in the inshore areas around the Isle of Man, offshore of Gwynedd, within the North Channel, within the Firth of Clyde, off Kintyre, within the Moray Firth and at Newcastle.

Climatic Factors

Within the identified route corridors there are areas of high blue carbon potential within routes to Weston Marsh, Hawthorn Pit, Blyth, Spittal, New Deer, Arnish, Kilmarnock South and Pentir. There is an area of Annex I saltmarsh located within Pow Burn at Kilmarnock South. There are shellfish waters located within the Ribble and at West Wash. There are kelp forests located along the coastline at Crosskirk Bay (Spittal), Blyth, Seaham and Arnish. There are intertidal seaweeds located at Crosskirk Bay (Spittal), Blyth, Seaham, Blackpool and Gwynedd Bay (Pentir). There are also seagrass beds within the Menai Strait.

Onshore, there are areas with potential to be carbon sinks, such as peatland located at Banniskirk, Thurso, Halkirk, Arnish and Blackpool. There are ancient woodlands located at Penisarwaun, Bodelwyddan, Lytham St Annes, Penwortham, Hawthorn Wood and Boston. There are also areas of forest located within all onshore routes.

Material Assets

There are numerous submarine cables located within GB waters. Approximately 74 offshore cable connections are intersected by the identified route corridors; of these, 15 are telephone cable connections, 47 are power connections, and 12 are undefined connections. The majority of these offshore cables are crossed by the identified route corridors off the east coast of England, as well as within the Irish Sea, off the north-west coast of England and the south-west coast of Scotland.

There are approximately 106 offshore oil and gas pipeline connections crossed by the identified route corridors. The majority of pipeline crossings are located in the North Sea near landfall locations in the vicinity of Peterhead, Teeside, Easington, Theddlethorpe St Helen and Bacton, where key gas terminals are located, whilst some are crossed within the Irish Sea and the North Channel. The majority of these offshore pipelines are unavoidable. Twenty-two avoidable offshore platforms are located within the cable route corridors; eight of these are located in the eastern Irish Sea, whilst the remaining 14 are situated off the east coast of England in the North Sea. Five avoidable oil/gas diffusers are located within the cable route corridors; four of these are off the north-east coast of England, whilst one is located off the coast of Stornoway. Additionally, there are 78 avoidable oil/gas wells located within the study area, which are mainly located in the North Sea off the east coast of England and the north-east coast of Scotland, as well as within the eastern Irish Sea. There are no oil/gas installations, gas storage sites or gas storage pipeline agreements within the study area.

The NOAH Meteorological Mast, which is located off the coast of Newcastle upon Tyne is located within the study area, however, is avoidable by the identified route corridors. There is one offshore carbon capture and storage site agreement located within the study area, the Endurance CO2 Storage Facility and Pipeline; the pipelines are not avoidable.

There are two avoidable existing offshore wind farms which are encountered by identified route corridors, namely Blyth Demo Wind Farm located off the coast of Blyth and the Race Bank Wind Farm off the coast of Sutton-on-Sea. There are eight export cables from existing wind farms which are intersected by the identified route corridors, which are accounted for in the 74 submarine cables above. These are mainly located off the east coast of England, as well as a smaller number located off the north-east coast of Scotland and the north coast of Wales. There are no existing tidal or wave energy generation sites located within the identified route corridors. There are a number of proposed offshore wind energy generation sites within the identified route corridors, and the HND Implementation Plan is planning to develop connections to these sites in a coordinated manner. There are no proposed tidal or wave energy generation sites within the identified route corridors.

A significant amount of onshore infrastructure is located within the identified cable routes, which comprise the HND recommended design. A number of roads and railways located throughout England, Scotland and Wales will have to be crossed by the onshore sections of the identified cable route corridors and areas for new infrastructure. Roads which require crossing include A roads, B roads, local, minor, primary, and tunnels. Railway lines which require crossing include multi-track, single track, narrow gauge and tunnels. It is possible to avoid these roads and railways with the new interface infrastructure; however, construction vehicles may have to utilise roads temporarily.

There are two avoidable fossil fuel power stations located within identified route corridors. These are located in Scotland at Arnish and Stornoway, within the Arnish interface area. These are all avoidable by both onshoring cabling and new interface infrastructure.

Onshore National Grid and Scottish Power transmission infrastructure in England, Wales and Scotland are located within the route corridors and interface areas, including underground cables and overhead lines operating at 400kV, 275kV, and 132kV, their associated transmission network towers/poles. There are 24 substations operating at 400kV, 275kV and 132kV within the identified route corridors, and 20 substations operating at 400kV, 275kV and 132kV within the interface areas. The majority of the overhead lines are unavoidable within the route corridors, whilst all are avoidable by new interface infrastructure. The cables and substations are avoidable within the identified route corridors by both onshore cabling and the new interface infrastructure, except where substations are the desired endpoint for some connections.

In terms of onshore gas infrastructure, there are nine onshore pipelines intersected by the identified cable routes in the vicinity of Hull, Preston, Hornsea, Spalding and Drumlithie, of which four are avoidable and five are unavoidable. Eight of these onshore pipelines are within interface areas (Birkhill Wood, Weston Marsh, Penwortham, Hurlie and Peterhead, these are all avoidable by new interface infrastructure. There are no petroleum terminals, LNG facilities or crude oil refineries within the identified route corridors or interface areas.

There are 31 avoidable, operational, onshore renewable energy sites with a generation capacity over 150kW located within the identified route corridors, of which 15 are in interface areas. There are eleven wind farms, eight of which are located in Scotland and three of which are located in England. Six of the wind farms are located within interface areas (three in England and three in Scotland). There are eleven solar photovoltaic sites, nine of which are located in England, one in Wales and one in Scotland. Four of the solar photovoltaic sites are located in interface areas in (all four are in England). Additionally, in England, two landfill gas sites, four battery storage sites, two anaerobic digestion sites and one advanced conversion technology site are also located within the identified route corridors. One landfill gas site and all four battery storage sites are located within interface areas. There are no air source heat pumps, biomass, hydrogen, geothermal, landfill gas, hydroelectricity or sewage sludge digestion facilities with a generation capacity greater than 150kW within the identified route corridors. In terms of non-renewable energy producing waste management facilities, there are no energy from waste (EfW) facilities with a generation capacity greater than 150KW within the area of the identified route corridors or interface areas.

Avoidable wastewater management infrastructure is also located within the identified route corridors, including 15 wastewater treatment/sewage works. One of these is located in Scotland and three are in Wales, whilst eleven are located in England. Seven of these wastewater/sewage works are located within interface areas, four are in England, one in Scotland and two are in Wales. Additionally, there are two desalination plants within the route approaching Hawthorn Pit.

All identified route corridors are within areas where shipping activity occurs; as such, shipping activity is unavoidable. The cable route corridors are mainly located within areas of relatively lower shipping density; however, closer inshore around the entirety of GB, the shipping density tends to increase to relatively moderate shipping density. These areas of relatively moderate shipping density are unavoidable. The identified

route corridors encounter unavoidable areas of relatively high shipping density generally within the inshore area connecting busy ferry and fishing harbours and ports. There are large, widespread areas of relatively higher shipping density located off the east coast of England and Scotland, with large areas of relatively high shipping density crossed around Peterhead, Lincolnshire, East Riding of Yorkshire, within the River Hull, North Yorkshire, Northumberland, Durham, Scottish Borders, East Lothian and Aberdeenshire. Whilst on the west coast of GB, areas of relatively higher shipping density are concentrated into distinct shipping lanes throughout the Irish Sea, North Channel and the Minches, and are particularly high in the Liverpool Bay, Morecombe Bay and Firth of Clyde. Ten avoidable ports are located within the identified route corridors, including the ports of Blyth, Boston, Macduff, Preston, Seaham, Stornoway, Troon, Llanddulas and two ports at Peterhead. Eight avoidable harbour areas are located within the identified route corridors, including Blyth Harbour Commission, Caernarfon Harbour Limit, Macduff Harbour, Peterhead Bay Harbour, Peterhead Port Authority, Port of Boston Authority, Seaham Port and Stornoway Harbour.

There are three avoidable traffic separation zones partially located within identified route corridors. These include the North Channel TSS, Off of Skerries TSS and the TSS in the approaches to the River Humber (eastern and south-eastern approaches). Other ship routing measures within the identified route corridors include a route fairway off the coast of Stornoway.

There are four avoidable designated anchorage areas located within the identified route corridors, including off the coast of Macduff and Stornoway, on approach to Preston and within the River Blyth. There are three avoidable pilot boarding stations located off the coast of Banff, Caernarfon and Stornoway.

GB waters are heavily used by commercial fisheries. All identified route corridors which comprise the HND recommended design are within areas where fishing activity occurs; as such, fishing activity is unavoidable. The identified route corridors are mainly located within areas of relatively lower fishing activity. However, there are areas of unavoidable relatively moderate and high fishing activity located within the identified route corridors. Areas with relatively high fishing activity that need to be crossed within the North Sea include Moray Firth, off the coast of Aberdeenshire and Angus, within the Firth of Forth, off the coast of Northumberland, Durham, North Yorkshire and East Riding of Yorkshire and within the Wash. In the Irish Sea on the west coast, areas of relatively high fishing activity that need to be crossed by the identified route corridors are primarily located in the Minches, the Firth of Clyde and surrounding the Isle of Man. Fleets which are known to operate within the identified route corridors include whiting, sprat, sole, plaice, Norway pout, mackerel, horse mackerel, herring, hake, haddock, cod, blue whiting and angler. Areas of relative importance for each of these species are crossed by a number of identified route corridors. There are no marine fish farms or aquaculture sites within the identified route corridors.

There are unavoidable known fish spawning grounds located within identified route corridors. These include spawning grounds for sprat, nephrops, cod, whiting, herring, lemon sole, mackerel, Norway pout, sandeel and sole in various locations across the North Sea, Irish Sea and within the Minches. Additionally, there are unavoidable known

nursery grounds for nephrops, cod, herring, whiting, plaice, blue whiting, haddock, Norway pout, saithe, lemon sole, mackerel, sole and sprat.

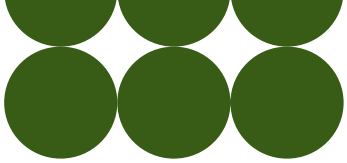
There are 25 avoidable onshore military areas located within the identified route corridors, which are primarily located along the coastline of the east of England, concentrated in the vicinity of Boston. Only one of these (Drill Hall in Stornoway) is located within an interface area. A further military practice area located within the identified route corridors, namely X5406: Juniper Rock off the west coast of Scotland is avoidable. There are also six offshore military danger areas, of which two are avoidable, X5406: Juniper Rock and D307: Donna Nook, and four that are unavoidable, D412: Staxton, D509: Campbeltown, D513: Druridge Bay and D809(S) Moray Firth (South).

There are eleven avoidable dredge spoil dumping sites located within the identified route corridors. The Beaufort Dyke explosives dumping ground is adjacent to the Ballantrae to Pentir identified route corridor, which is avoidable. There are four avoidable dredging navigation areas at Blyth, Macduff, on the River Ribble on approach to Preston, and on the Haven River on approach to Boston. Six areas of aggregate dredging are located off the coast of Sutton-on-Sea on the east coast of England, which are all avoidable within the relevant route corridors. There are also five offshore aggregate site agreements located off the coast of Sutton-on-Sea. There are no offshore mining agreements within the identified route corridors.

The identified cable route corridors and interface areas intersect areas of unavoidable potential prime agricultural land. All routes intersect areas of good quality prime agricultural land, with smaller areas of very good quality prime agricultural land. However, one route crosses a relatively significant area of excellent quality prime agricultural land in Lincolnshire along the northern coast of the Wash.

Cable route corridors and interface areas within the HND recommended design intersect areas of woodland, which may be utilised for commercial forestry. These include areas of broadleaved woodland, conifer woodland, and mixed woodland, as well as areas of young trees. It may be difficult to completely avoid all areas of woodland within every route corridor.

There are a number of recreational sites with the potential to be tourist attractions located within the identified route corridors. There are 12 bathing waters and two Blue Flag Beaches within the identified route corridors. Tourist activities within the marine cable corridors are likely to include water sports, sailing, and fishing within inshore areas, and there are areas of relatively high-intensity RYA leisure boating activity within the identified route areas. There are 962 onshore recreation sites within the route corridors of the HND recommended design, whilst 402 of these are within interface areas. These include public parks or gardens, playing fields, play spaces, cemeteries, allotments, religious grounds, tennis courts, bowling greens, golf courses, and other sports grounds. The Durham Coast Heritage Coast in England is located within one identified route corridor. Additionally, short sections of the Ayrshire Coastal Path and the Formantine and Buchan Way in Scotland, significant long-distance walking routes, have to be crossed by identified route corridors and are located within interface areas.



Cultural, Architectural and Archaeological Heritage

There are numerous (385) known shipwrecks located within the identified route corridors and also many (791) marine Trove Heritage assets within the identified route corridors within Scottish offshore waters (the Trove Heritage Asset dataset only covers Scottish Waters). The identified route corridor from PA_2 (Berwick BanK) to Blyth contains the greatest number of shipwrecks (58), whilst the identified route corridor from SW_N4 (Spiorad na Mara) to Arnish contains the greatest amount of Trove Heritage assets (167). There is potential to avoid these assets with offshore cabling. There are no known protected wrecks, or Historic Marine Protected Areas within the identified route corridors. There is potential for unknown marine and intertidal prehistoric landscapes, submerged archaeological artefacts, structures or wrecks to be located within the identified route corridors.

There are a total of 18 Parks and Gardens/Designed Landscapes encountered by the identified route corridors. Thirteen Parks and Gardens are located within the identified route corridors in England and Wales, whilst five Garden and Designed Landscape features are located within identified route corridors in Scotland. The identified R4_4 (Mona) to Bodelwyddan, R4_5 (Morecambe) to Penwortham and the R4_6 (Morgan) to Penwortham route corridors contain the greatest numbers of these features (4). There are nine Parks and Gardens/Designed Landscapes within interface areas, these are located in the vicinity of Arnish, Pentwortham, Bodelwyddan, Birkhill Wood, Kilmarnock South, Ballantrae and New Deer, with the Bodelwyddan interface area containing the greatest number (4).

There are also 137 Scheduled Monuments within the identified route corridors, with the Ballantrae Tee to Pentir route corridor containing the greatest number (40). Of these, 67 are located within interface areas the Pentir interface area containing the greatest number (15). There are 2,971 terrestrial Trove Heritage Assets situated within the identified route corridors, with the SW_NE4 (Caledonia) to New Deer route containing 965 of these. The interface areas contain 1,060 Trove Heritage Assets, with the Arnish interface area containing the greatest number (384). There are 1,706 Listed Buildings within the identified route corridors, of which the greatest number are also located within the SW_NE4 (Caledonia) to New Deer route corridor (401). The interface areas contain 489 Listed Buildings, with the Bodelwyddan interface areas containing the largest number (175). There are 43 Conservation Areas, of which the greatest number (8) are within the identified R4_1 (Dogger Bank SW) to Birkhill Wood, R4_2 (Dogger Bank SE) to Birkhill Wood and PA_1 (Dogger Bank C) to Birkhill Wood route corridors. Of these, 17 are located within interface areas, with the greatest number being located within the Pentwortham interface area (4). There are 88 Defence of Britain Sites located within the identified route corridors, of which the largest number are within the R4_3 (Outer Dowsing) to Weston Marsh route corridor. Whilst 17 Defence of Britain Sites are located within interface areas, with the greatest number being contained within the Near Blyth interface area (7). There is potential to avoid all terrestrial heritage assets with onshore cabling. There are no World Heritage Sites or Battlefields located within the identified route corridors or interface areas.

Additionally, there are some important Cultural, Architectural and Archaeological Heritage indicators in the immediate vicinity of the onshore sections of the identified route corridors and interface areas, including the Slate Landscape of Northwest Wales UNESCO World Heritage Site, Conservation Areas, Parks and Gardens/ Gardens and Designed Landscapes, Trove Heritage assets, Defence of Britain Sites, Listed Buildings and Scheduled Monuments.

Landscape, Seascape and Visual Amenity

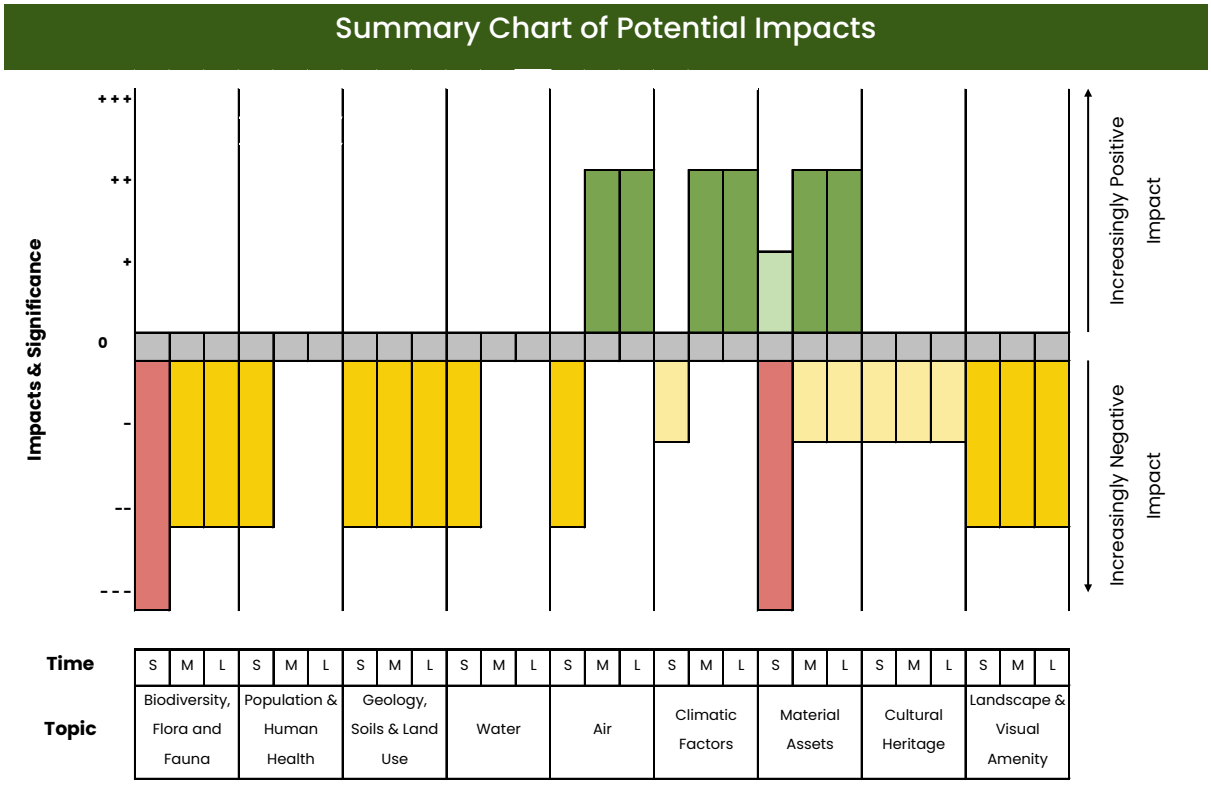
There are areas of sensitivity for Landscape, Seascape and Visual Amenity (LSVA) located within the identified route corridors. The offshore sections of the identified route corridors cross 23 Marine Character Areas located off the coasts of England (17) and Wales (6), which cannot be avoided by offshore cabling. Marine Character Areas have not been identified in Scotland; however, there are Coastal Character Types identified for stretches of the Scottish coastline. The area types identified at landfall for the identified route corridors include Rocky Coastline / Open Sea Views; Deposition Coastline, Open Views; Remote High Cliffs; and Narrow Coastal Shelf.

Within the onshore sections, there are seven National Landscape Character Areas encountered by the identified route corridors and interface areas in England and two in Wales, whilst in Scotland, 24 National Landscape Character Types are encountered within identified route corridors and 14 within interface areas.

There are no World Heritage Sites, National Parks, National Landscapes (AONBs) or National Scenic Areas located within the identified route corridors or interface areas. The Durham Heritage Coast is partially located within the identified SW_E1a (Morven) to Hawthorn Pit route corridor. Two National Trails are partially located within the identified route corridors and interface areas, the Ayrshire Coastal Path, which is within the identified Ballantrae Tee to Kilmarnock South, SW_W1 (Machair) to Ballantrae Tee and Ballantrae Tee to Pentir route corridors and the Ballantrae interface area, and the Formartine to Buchan Way, which is within the identified SW_NE7 (Marram) to Peterhead DCSS route corridor and the Peterhead DCSS interface area. Four avoidable Country Parks are located within the identified route corridors, namely Glynllifon, Havenside, Hetton Lyons and Wansbeck Riverside Park. Two of these Country Parks are located within interface areas; the Hetton Lyons Country Park is marginally within the Hawthorn Pit interface area, whilst the Wansbeck Country Park is located within the Near Blyth interface area.

Environmental Assessment			
Environmental Assessment	Short-term	Medium-term	Long-term
Biodiversity, Flora and Fauna (BFF)	-3	-2	-2
Population and Human Health (PHH)	-2	0	0
Geology, Soils and Land Use (GSL)	-2	-2	-2
Water (W)	-2	0	0
Air (A)	-2	+2	+2
Climatic Factors (CF)	-1	+2	+2
Material Assets and Infrastructure (MA)	-3 / +1	-1 / +2	-1 / +2
Cultural, Architectural and Archaeological Heritage (CH)	-1	-1	-1
Landscape / Seascape and Visual Amenity (L)	-2	-2	-2

Table 31: HND Recommended Design summary scoring table



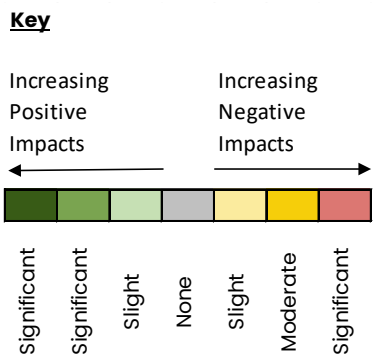


Figure 43: HND Recommended Design summary scoring chart

Discussion of Potential Effects

Biodiversity, Flora and Fauna

Cabling:

There are designated sites that are not possible to avoid within the identified HND route corridors.

The North Anglesey Marine SAC (designated for harbour porpoise), Afon Gwyrfai a Llyn Cwellyn SAC (designated for freshwater habitats and species), Dogger Bank SAC (designated for sublittoral sandbank habitat), Southern North Sea SAC (designated for harbour porpoise), Inner Dowsing, Race Bank and North Ridge SAC (designated for sandbank habitat), Berwickshire and North Northumberland Coast SAC (designated for large shallow inlets and bays, mudflats and sandflats, reefs sea caves), and River Thurso SAC (designated for fish species including Atlantic salmon) are unavoidable within the identified route corridors, while there is also limited potential to avoid the Garron Point SAC (designated for narrow-mouth whorl snail) and Durham Coast SAC (designated for vegetated sea cliffs) within identified route corridors at landfall. If not mitigated there is potential for direct and indirect, short to medium-term, temporary negative effects within these sites in the construction and decommissioning phases and during cable maintenance activities. This could include direct and indirect damage to habitats, and damage to, disturbance and displacement of species, as well as damage to supporting habitats and displacement of prey species (-3). Potential impacts on marine mammals will be short-term intermittent (during construction, maintenance, and decommissioning) but the impact has the potential to have a permanent effect for species if mortality occurs.

The Liverpool Bay SPA (designated for bird species including red-throated diver, little gull, common scoter, little tern and common tern), Greater Wash SPA (designated for non-breeding red-throated diver, common scoter, and little gull, and breeding sandwich tern, common tern and little tern), Northumberland Marine SPA (designated for breeding tern species and migratory species such as puffin and guillemot) and Lewis Peatlands SPA (designated for breeding Black-throated diver, Dunlin, Golden Eagle, Golden plover, Greenshank, Merlin, Red-throated diver) and Ramsar site are unavoidable within the identified route corridors. There is potential for direct and

indirect, temporary negative effects within these sites in the short-term construction and decommissioning phases and during cable maintenance activities, including damage to, disturbance and displacement of bird species and short to medium-term (until re-establishment) damage to supporting habitats and displacement of prey species (-3). Avoidance of sensitive times or specific areas used by sensitive species such as red-throated divers should be considered at the detailed design stage. The Greater Wash SPA already has a large amount of disturbance impact on the red throated diver from vessel traffic and offshore wind farm developments, and this should be considered at the project stage.

In Scottish waters the identified offshore routes cannot avoid the Clyde Sea Sill MPA (designated for sand and coarse sediment communities, fronts and black guillemot) and Southern Trench MPA (designated features include burrowed mud communities, fronts, shelf deeps and minke whale), and in English and Welsh waters the identified offshore routes cannot avoid the Fylde MCZ (designated for subtidal sediment habitats, flora and fauna), Berwick to St Mary's MCZ (designated for common eider), Coquet to St Marys MCZ (designated for rock and sediment communities on the shoreline and on the seabed), and have limited potential to avoid the Holderness Inshore MCZ (designated for muds, sands, rock and coarse and mixed sediments). There is potential for direct and indirect, negative effects within these sites in the short-term construction and decommissioning phases and during cable maintenance activities, including damage to protected habitat and disturbance and displacement of protected species as well as damage to supporting habitats (-3). The shelf feature of the Southern Trench MPA can be avoided by the identified cable routes, including known locations of protected habitat. The Holderness Offshore MCZ (designated for the protection of the seabed habitats subtidal coarse sediment, subtidal mixed sediments and subtidal sand, parts of a glacial tunnel-valley, and the bivalve ocean quahog) should be avoidable within the offshore route, and should be further considered at the project level.

The majority of SSSIs that are within the identified cable route corridors can be avoided; however, the Afon Gwyrfai a Llyn Cwellyn SSSI (designated for freshwater habitats and species), and Northumberland Shore SSSI are unavoidable, and there is limited potential to avoid the Garron Point SSSI and Durham Coast SSSI. There is potential for direct and indirect, negative effects within these sites in the short-term construction and decommissioning phases and during cable maintenance activities (-3).

All other designated sites that are within the identified route corridors can be avoided by cable routes within these corridors, avoiding the potential for direct negative effects. There may be potential for short-term, indirect, negative effects on protected features within these sites, which need to be considered further in micro-routing at the detailed design stage.

NRW habitats identified as sensitive to cabling can be avoided by cable routes within the identified corridors; there may be potential for short-term, indirect, negative effects on these habitats during the construction phase and during cable decommissioning, which will need to be considered at the project stage. There are areas of Annex I reef and sandbank habitats that cannot be avoided, or there is limited potential to avoid within the identified route corridors. There is potential for direct and indirect, negative

effects during construction and decommissioning and cable maintenance activities; direct effects have the potential to be long-term or permanent (-2). Other sensitive habitats and features such as OSPAR threatened habitats, PMFs and FOCI are likely to be avoidable through micro-routing considerations at the project stage; however, the potential for short-term direct and indirect negative effects on these features will need to be considered. There is also potential for direct negative effects on areas of ancient woodland, which are unavoidable for the identified onshore cable route to New Deer, with direct effects having the potential to be long-term to permanent in the footprint of cable working areas.

All NNRs that are within the identified cable route corridors can be avoided, as can the West Coast MNR in IOM waters. The potential for indirect effects on these sites should be considered at the project stage. There may be potential for direct or indirect, negative effects on flora and fauna within the Galloway and Southern Ayrshire Biosphere Reserve and the Lewis Peatlands and the West Coast Lewis IBAs, which are unavoidable within identified cable route corridors (-1). There is potential to avoid all LNRs within the identified cable route corridors; however, it may not be possible to avoid several Local Nature Conservation sites, including the Ballantrae to Girvan site for the routes to Ballantrae, the Rattray Head to Peterhead site for the route to Peterhead 2 / DCSS, and the Todhead Point to Johnshaven Coast site for the route to Hurlie. There may be potential for short-term direct and indirect, negative effects within these sites during the construction and decommissioning phases and during cable maintenance activities (-1). There are areas of known high density for harbour seals and grey seals within the identified route from Ballantrae to Pentir and for grey seals within the identified routes to Blyth and Lincolnshire Connection Node that cannot be avoided, while areas of moderate to high density for cetacean species within identified cable route corridors may not be possible to avoid. There may be potential for short-term disturbance and displacement of marine mammal species during the construction and decommissioning phases and during cable maintenance activities, as well as short-term damage to supporting habitats and disturbance of prey species (-1).

Areas of ecological importance for fish species such as spawning and nursery habitat may not be avoidable within some identified route corridors, and there is potential for short-term disturbance to and displacement of, species and short-term damage to supporting habitats within the construction and decommissioning phases (-1).

There is potential for short-term disturbance to and displacement of seabirds, as well as birds within the identified onshore cable routes during the construction and decommissioning phases and during cable maintenance activities, including within areas of relatively high seabird density in the route corridor from SW_E1a (Morven) to Lincolnshire Connection Node (-1).

In general, there is also potential for direct and indirect negative effects from disturbance or damage to local habitats and species outside of designated sites during the construction and decommissioning phases and during any cable maintenance activities (-1).

Onshore Infrastructure:

There are designated sites within the vicinity of the onshore interface areas; however, all of these sites can be avoided by the required substation and converter station developments, avoiding the potential for direct negative effects on designated habitats and species. The designated sites within the vicinity of interface areas include the SACs, Inner Hebrides and the Minches SAC, Saltfleetby-Teddlethrope Dunes and Gibraltar Point SAC, Elwy Valley Woods / Coedwigoedd Dyffryn Elwy SAC, Lendalfoot Hills Complex SAC, Menai Strait and Conwy Bay / Y Fenai a Bae Conwy SAC, and Snowdonia / Eryri SAC, the SPAs of Ribble and Alt Estuaries SPA, Glen App and Galloway Moors SPA, Northumberland Marine SPA, Humber Estuary SPA, and Greater Wash SPA, and the Ramsar sites of Ribble and Alt Estuaries and Northumbria Coast. There are also SSSIs designated for ecological features, namely Tong Saltings SSSI, Ribble and Alt Estuaries SSSI, Newton Marsh SSSI, Girvan to Ballantrae Coast Section SSSI, Bennane Head Grasslands SSSI, Littleton and Balhamie Hills SSSI, Knockdolian Hill SSSI, Knockdaw Hill SSSI, Craig Wood SSSI, Glen App and Galloway Moors SSSI, Ballantrae Shingle Beach SSSI, Afon Gwyrfai a Llyn Cwellyn SSSI, Moelyci a Chors Ty'n y Caeau SSSI, Caeau Tyddyn Dicwm SSSI, Eithinog SSSI, Coedydd Afon Menai SSSI, Cadnant Dingle SSSI, Burton Bushes SSSI, Surfleet Lows SSSI, Cresswell and Newbiggin Shores SSSI, Bamburgh Dunes SSSI, Dabble Bank SSSI, Eppleton Grassland SSSI, Hawthorn Dene SSSI, Hesledon Moor East SSSI, Hesledon Moor West SSSI, Hetton Bogs SSSI, High Moorsley SSSI, Moorsley Banks SSSI, Pig Hill SSSI, Tuthill Quarry SSSI, and Saltfleetby - Theddlethorpe Dunes SSSI. There may be potential for short-term, temporary, indirect negative effects on protected features within these sites, which will need to be considered further at the detailed design stage, such as water quality impacts on hydrologically connected sites, and disturbance of protected species of sites within the vicinity of works areas.

The Lincolnshire Coronation Coast NNR in the vicinity of the interface area at Lincolnshire Connection Node can be avoided by the required infrastructure developments, as can LNCSs within the vicinity of the interface areas at Bodelwyddan, Ballantrae Tee, Kilmarnock South, New Deer, Peterhead 2 / DCSS and Hurlie, and LNRs within the vicinity of the interface areas at Penwortham, Pentir, Birkhill Wood, Near Blyth, and Hawthorn Pit. The Biosphere Reserve of Galloway and Southern Ay in the vicinity of Ballantrae Tee can be avoided, as can IBAs in the vicinity of Penwortham, Ballantrae Tee, Weston Marsh, Near Blyth, Lincolnshire Connection Node, and Arnish, and areas of ancient woodland in the vicinity of many of the interface areas.

If the construction works for new substations and converter stations are undertaken within areas of lower sensitivity, the potential for significant negative effects on BFF should be avoidable. There is potential for direct, long-term loss of local habitats and species in the footprint of the new infrastructure and any required access roads, and for temporary, medium-term negative effects on BFF within the wider temporary work areas, which could include disturbance and displacement of species and temporary loss of supporting habitats (-1).

Developments occurring in England will need to comply with requirements for Biodiversity Net Gain (BNG); therefore, potential loss of local habitats within development areas will require suitable habitat creation or enhancement, with a net

gain of 10%. For developments within Wales development will need to comply with the requirements for Net Benefit for Biodiversity (NBB), with local planning authorities responsible for determining the appropriate level of biodiversity gain for each development. For developments within Scotland BNG is not yet mandatory but is being actively encouraged.

The HRA assessed the potential for negative effects on SACs and SPAs within the identified route corridors and a relevant zone of influence as follows:

- Potential for temporary physical disturbance of subtidal and/or intertidal habitats.
- Potential for permanent loss of seabed or intertidal habitats.
- Potential for temporary disturbance as a result of increased suspended sediment concentrations and sediment deposition.
- Potential for adverse effects on site integrity via changes in water quality.
- Potential for adverse effects on site integrity via effects of the introduction of INNS on benthic habitats and species.
- Potential for adverse effects on site integrity via EMF impacts.
- Potential for adverse effects on site integrity due to subsea cable thermal emissions.
- Potential for adverse effects on site integrity due to impacts on marine mammals and fish from underwater sound.
- Potential for adverse effects on site integrity due to barriers to migration.
- Potential for adverse effects on site integrity due to changes in prey availability.
- Potential for adverse effects on site integrity due to collision risk with vessels.
- Potential for airborne sound and visual disturbance to marine mammals and seabirds.
- Potential for adverse effects on site integrity due to noise and visual impacts to birds from landfall / onshore works.
- Potential for adverse effects on site integrity due to risk of bird strike from onshore overhead line.
- Potential for a temporary or permanent loss or removal of terrestrial habitats.
- Potential for impacts on terrestrial functionally linked habitats.
- Potential for impacts via maintenance activities and cable repair.

The HRA set out mitigation measures required to avoid adverse effects on these sites via these impact pathways, including through micro-routing.

Three routes were further considered through the derogation process for the potential for permanent loss of seabed or intertidal habitats, as the generation sites are within the Dogger Bank SAC, with a need for several cable crossings. These were PA_1 to Birkhill Wood Alternative, R4_1 to Birkhill Wood and R4_2 to Birkhill Wood.

The identified route corridor SW_N4 to Arnish was further considered through the derogation process due to the potential for direct habitat loss or indirect loss via hydrological changes within the Lewis Peatlands SPA/Ramsar.

The MCZ assessed the potential for negative effects on MCZs, HPMAs and Nature Conservation MPAs within the identified route corridors and a relevant zone of influence as follows:

- Potential for temporary physical disturbance - subtidal benthic habitats and species.
- Potential for permanent loss - subtidal benthic habitats and species.
- Potential for the introduction of INNS - subtidal benthic habitats and species.
- Potential for changes in prey availability.
- Potential collision risk – marine mammals.
- Potential for thermal emissions - subtidal benthic habitats and species.
- Potential for EMF - subtidal benthic habitats and species, marine mammals, fish, and invertebrates.
- Potential for airborne sound and visual disturbance – marine mammals and birds.
- Potential for underwater sound – marine mammals, fish, and shellfish.
- Potential for increased suspended sediment concentrations - subtidal benthic habitats and species, marine mammals, fish, and invertebrates.
- Potential impacts on water quality - subtidal benthic habitats and species, marine mammals, fish, and invertebrates.
- Potential barriers to migration – migratory fish.

The MCZ Stage 1 set out mitigation measures to avoid adverse effects on these sites via these impact pathways. Six routes were further considered at the MCZ Stage 2 (derogation).

Population and Human Health

Cabling:

There are major settlements within the identified route corridors. There is the potential for slight negative, short-term effects on the local population from cable laying, such as noise, lighting, visual and disturbance during the construction and decommissioning phases and during cable maintenance activities (-1). Within routes to Penwortham, Hawthorn Pit and Birkhill Wood there is potential for moderate negative, short-term

effects on the local population such as noise, lighting, visual and disturbance effects to many receptors within these higher populated areas during the construction and decommissioning phases and during cable maintenance activities (-2). There is not expected to be any direct, medium, or long-term, disturbance of local populations due to noise or disturbance effects during the operational phase (0). There are areas of perceived moderate deprivation within all identified route corridors. There are areas of perceived highest deprivation within routes to Pentir, Bodelwyddan, Penwortham, Kilmarnock South, Blyth, Hawthorn Pit, Lincolnshire Connection Node, Weston Marsh and Birkhill Wood. In the route to Weston Marsh these areas of perceived highest deprivation cannot be avoided and populations in these areas may be of lower health status and therefore more susceptible to health effects linked to disturbance. There is the potential for perceived human health concerns regarding EMF generation from the operation of electrical transmission cables.

There are boating areas within the identified route corridors which cannot be avoided, including areas of high intensity leisure boating activity. There is potential for slight negative, temporary, direct and indirect, negative effects on leisure and recreational marine users due to an increased collision risk, access restrictions and displacement, or water quality effects, during the construction and decommissioning phases and during cable maintenance activities (-1). The potential for negative direct or indirect effects on these users in the medium to long-term during the operational phase is considered to be negligible (0).

There are bathing water sites located within the identified route corridors; however, these can be avoided. There may be potential for short-term, indirect, negative effects such as noise, disturbance and water quality impacts to these areas during the construction and decommissioning phases and during cable maintenance activities (-1). Within the route to New Deer the bathing waters may be unavoidable due to other sensitivities in the area that would need to be avoided, such as settlements. There is potential for short-term, negative effects on water quality to this bathing water area during the construction and decommissioning phases and during cable maintenance activities (-1).

There are recreation sites within all onshore route corridors, however these can be avoided. There is potential for short-term indirect, slight negative, temporary disruption to these recreational areas during construction and decommissioning works (-1).

Onshore Infrastructure:

There are settlements within the vicinity of onshore interface areas at Pentir, Bodelwyddan, Penwortham, Kilmarnock South, Arnish, Spittal, New Deer, Peterhead, Blyth, Hawthorn Pit, Birkhill Wood, Lincolnshire Connection Node and Weston Marsh. There is the potential for temporary direct disturbance on the local population due to lighting, noise and vibration generated during pre-construction, and construction from construction activities and vehicle movements (-1). Potential for temporary direct disturbance on the local population due to lighting, noise and vibration generated during the operation of the converter station (-1). Potential indirect positive long-term

effects at GB level through facilitation of renewable energy connection to meet population demand while supporting a transition away from fossil fuels. There are areas of perceived highest deprivation within the vicinity of onshore interface areas of Penwortham, Kilmarnock South, Blyth, Hawthorn Pit, Birkhill Wood and Lincolnshire Connection Node with areas of perceived high deprivation within the vicinity of onshore interface areas of Bodelwyddan, Penwortham, Ballantrae, Kilmarnock South, Arnish, Blyth, Hawthorn Pit, Birkhill Wood, Lincolnshire Connection Node and Weston Marsh. There is the potential for impacts on the human health of construction workers and future site users through exposure to hazardous contaminants during pre-construction, construction, and decommissioning. Potential for health effects due to the emission of dust from demolition, earthworks, construction and trackout during pre-construction, construction & decommissioning, operation and maintenance (-1).

There are Marinas within the vicinity of onshore interface areas at Arnish and Blyth. There are recreational boating areas within the Lincolnshire Connection Node, Pentir and Blyth interface areas and areas of high intensity leisure boating activity within the vicinity of the Arnish and Blyth interface areas. Potential for short-term access restrictions to and displacement of leisure and recreation activities during pre-construction, installation and decommissioning. Potential for long-term access restrictions to and displacement of leisure and recreation activities within the converter station site and/or permanent access roads (-1).

There are recreation sites within the vicinity of all onshore interface areas. There is potential for temporary loss or disturbances to community land areas during the construction process. Potential for direct permanent loss or disturbances to community land areas during the operation of the converter station (-1).

Geology, Soils and Land Use

Cabling:

For Geology, Soils and Land Use, the development of cabling has the potential for direct negative effects within the several offshore MCZs and MPAs which are unavoidable, the Berwick to St. Mary's MCZ, the Flyde MCZ, the Southern Trench MPA, the Inner Dowsing, Race Bank and North Ridge MPA, and the Clyde Sea Sill MPA, as well as the Firth of Forth Banks Complex MPA, the Holderness Inshore MCZ and the Holderness Offshore MCZ should these be unavoidable at the project stage. There is potential for short-term direct, moderate negative effects within these sites through loss of the soil resource during cabling installation, cable protection laying and decommissioning with cable removal (-2), with potential for slight negative (-1) permanent effects in the long-term if there is damage to protected features that cannot recover. There is also potential for short to long-term, slight, indirect negative effects through alterations to local sediment regimes impacting geomorphological features within these sites. This has the potential to impact both unavoidable designated sites and avoidable sites within proximity to these activities (-2).

The laying of offshore cabling and cable protection works has the potential for short to long-term, direct negative effects on Annex I habitats and SSSIs (located at landfall) which cannot be avoided through damage to features in the footprint of works (-2).

There is also potential for short to long-term indirect negative effects if seabed geomorphological features are lost or altered through changes to local sediment regimes. This may impact both unavoidable designated sites and avoidable sites within proximity to these activities (-2).

The potential for these effects can be minimised through the use of suitable mitigation at the project stage; this may include the use of bubble curtains to reduce sediment dispersal, or less geologically disruptive construction techniques, and projects will also be subject to project-specific implementation plans such as Construction Environmental Management Plans (CEMPs) and subject to regulatory compliance, which should minimise potential effects.

Within the offshore areas of identified route corridors, there is the potential for short-term direct, negative effects on soils from the release of contaminated sediments/materials during cable construction, maintenance or decommissioning phases. However, within the recommended design, all dredge and spoil dumping grounds are avoidable, reducing the potential for negative effects (-1). There is potential for short-term, direct, negative effects on soils and overlying water quality owing to the risk of release of contaminants such as from UXOs or chemicals from the munitions dumping grounds of Beaufort's Dyke, during cable installation, maintenance or decommissioning phases. However, within the Ballantrae to Pentir identified route corridor that crosses this area, this can be avoided by the cable route, reducing the potential for negative effects (-1). There are several Military Danger Areas which are unavoidable within the offshore identified route corridors, and there is potential for the release of explosives, chemicals and/or other contaminants during cable installation, maintenance or decommissioning phases in these areas, with the potential for short-term, direct, negative effects on soils and secondary effects on water quality (-2). The use of mitigation measures such as pre-construction surveys can help to identify potential sources of seabed contamination, and the potential impacts minimised through avoidance of these areas for development.

Onshore, there is potential for short to long-term direct negative effects on peatlands, which are unavoidable within the SW_N4 to Arnish identified route corridor. The disturbance of soils during cable installation and decommissioning phases has the potential to lead to a loss or degradation of the peatland habitat, with secondary direct medium-term effects on carbon sequestration within these habitats if reestablishment does not occur quickly (-2). However, generally these habitats are avoidable by the identified route corridors, reducing the potential for effects (-1). There are areas of excellent, very good and good quality agricultural land which cannot be avoided by the identified route corridors. There is potential for short-term direct loss of soil in the footprint of cabling works, and the potential for direct effects on land use in the long-term if the former land use is not re-established (-1). Within the onshore identified route corridors, there are areas of shallow soils and exposed rock which are unavoidable, there is potential for short-term, direct, negative effects through the loss of soils in these areas and long-term, direct, negative effects through the permanent loss of geological material in these areas during cable installation and decommissioning phases (-1).

There is potential for short-term, direct, negative effects from the release of contaminants within onshore landfill areas within the identified route corridors during cable construction, maintenance and decommissioning phases, which may negatively affect the surrounding soil quality; however, as these landfill areas are avoidable, this reduces and potentially eliminates the potential for effects (0).

Generally, during cable construction, maintenance and decommissioning phases there is potential for short to medium-term, direct, negative effects due to localised loss of the soil resource. There is the potential for secondary, negative effects on Water through temporary increased suspended sediment losses impacting on water quality during construction and decommissioning (-1). Mitigation measures at the project stage, such as CEMPs, can reduce the potential for erosion or sediment loss, and may include appropriately timing works to avoid periods of elevated risk of soil loss/erosion such as the winter of high rainfall and runoff rates, or the use of interception techniques to reduce downstream sediment transfer to waterbodies.

Onshore Infrastructure:

There is potential for negative effects on Geology, Soils and Land Use within the vicinity of onshore interface areas from the development of new infrastructure. There are geological designations within the vicinity of onshore interface areas, including two WHS within Pentir and several SSSIs within eight interface areas, however, as these are avoidable, there should be no potential for direct negative effects within these areas. The potential for indirect negative effects on these sites should be considered at the project stage (-1). There are no UNESCO Geoparks within the interface areas.

Within the vicinity of onshore interface area of Penwortham there is potential for short to long-term direct negative effects on peatlands through the loss or degradation of the peatland habitat, with secondary indirect medium-term effects on carbon sequestration within these habitats if these do not re-establish quickly, however these are generally avoidable within the interface area, reducing the potential for effects (-1).

Generally, within the vicinity of onshore interface areas the agricultural land is of good to moderate quality with some areas of poor quality, although there are areas of unavoidable excellent quality agricultural land in the Weston Marsh and Pentir interface areas and very-high quality agricultural land within the Lincolnshire Connection Node interface area; in these areas there is potential for a short to long-term direct loss of the soil resource and the potential for direct effects on land use in the long-term if the former land use is not re-established (-2). This may lead to secondary effects on Material Assets through a temporary loss of agricultural farming areas and overall agricultural productivity, and on Water through a temporary increased risk of sediment losses or soil erosion in the short-term, with exposed bare ground impacting on water quality (-1).

There is potential for short-term, direct, negative effects from the release of contaminants from onshore landfill areas within five interface areas during construction, maintenance and decommissioning phases, which may negatively affect

the surrounding soil quality, however, as these landfill areas are avoidable, this reduces and potentially eliminates the potential for effects (0).

Generally, during the construction, maintenance, and decommissioning phases for new infrastructure there is potential for short-term direct and indirect negative effects through a loss of the soil resource within the footprint of new infrastructure and working areas (-1). As for cabling, the introduction of mitigation measures at the project stage, such as CEMPs, can reduce the potential for erosion or sediment loss within interface areas.

Water

Cabling:

The development of cabling has the potential for negative effects offshore within the short to medium-term on the achievement of Good Environmental Status for the MSFD for the Celtic Seas and Greater North Sea sub regions, which are failing to achieve Good Environmental Status. There is the potential for indirect effects from the release of sediment or chemicals used during cable installation, decommissioning and maintenance phases, or through alterations to sediment regimes with the use of cable protection materials impacting on Descriptors assessed under the MSFD (-1). However, with the application of good working practices, negative effects are expected to be temporary and there is not anticipated to be potential for significant effects in the medium to long-term (0).

Within the offshore component of the identified route corridors, there is the potential for short-term direct effects on water quality from the release of contaminated sediments/materials during cable construction, maintenance or decommissioning phases; however, all dredge and spoil dumping grounds that are within the identified route corridors are avoidable, reducing the potential for impacts (-1). There is potential for short-term direct effects from the release of contaminants from the munitions dumping grounds at Beaufort's Dyke, however within the Ballantrae to Pentir identified route corridor this area is avoidable, reducing the potential for effects (-1). There are several Military Danger Areas which are unavoidable within the offshore identified route corridors, and there is potential for the release of explosives and/or other contaminants during cable installation, maintenance or decommissioning phases with short-term direct effects on water quality (-2). The use of good working practices such as pre-construction surveys regarding the presence and clearance of UXOs, can minimise the potential for effects (-1).

At landfall, within the identified route corridors there is potential for short-term negative effects on bathing water quality during the installation, maintenance or decommissioning phases of cables from the release of sediment, however all bathing waters are likely avoidable reducing the potential for impacts (-1). Within the WFD coastal waterbodies present at landfall throughout the identified route corridors, aside from SW_E1b to Morven, which is located entirely offshore, during cable construction, maintenance and decommissioning phases there is the potential for short-term direct effects on water quality through the release of sediment associated with cable trenching or the release of chemicals associated with the construction, maintenance

and decommissioning phases (-1). Similarly, onshore, during cable construction, decommissioning and maintenance phases there is a potential for short-term direct and indirect effects on water quality through the release of sediment or alterations to local hydrological regimes where rivers or lakes are unavoidable within the identified route corridors (-1).

The onshore identified route corridor of R4_6 to Penwortham interacts with unavoidable flood defences, with potential for short-term direct effects on flood risk due to construction activities potentially altering local flood regimes and the effectiveness of defences (-1). Aside from SW_E1b to Morven, which is located entirely offshore, National Flood Zones are present within the onshore identified route corridors and at landfall. Typically, these are avoidable at landfall, however there is limited scope to avoid these within the onshore identified route corridors, with potential for short-term direct and indirect effects through potential for increased flood risk or alterations to local hydrological regimes during cable construction, maintenance, and decommissioning phases (-1).

Onshore Infrastructure:

There is potential for negative effects on water within the vicinity of onshore interface areas from the development of new infrastructure. During the construction, maintenance, and decommissioning phases for new infrastructure, there is potential for short-term direct and indirect effects on water quality through the release of sediment or alterations to local hydrological regimes to rivers and lakes although typically these are avoidable, reducing the potential for negative effects to those associated with downstream indirect negative impacts (-1). At the Weston Marsh and Lincolnshire Connection Node interface areas such impacts may not be avoidable (-2). Within the WFD waterbodies present within the vicinity of onshore interface areas, there is potential for short-term direct effects on water quality through the release of sediment associated the development of new infrastructure or the release of chemicals associated with the construction, maintenance, and decommissioning phases (-1). There is also potential for indirect short-term effects on water quality within bathing waters, which are present downstream within the interface areas through the release of sediment or contaminants during the interface construction, maintenance, and decommissioning phases. However, these are avoidable within the vicinity of onshore interface areas, reducing the potential for negative effects to those associated with downstream indirect negative impacts (-1). There are no shellfish waters present within the interface areas.

Air

Cabling:

There is one known location of an air quality management area (AQMA) within an identified onshore route corridor, however this can be avoided, avoiding the potential for increased air emissions within this sensitive area. Generally, there is potential for slight negative, direct, short-term temporary effects on local air quality due to dust

generation and air emissions from vehicles and machinery in the vicinity of the works during the construction and decommissioning phases and during any cable maintenance activities (-1). There is also the potential for slight negative, short-term, temporary emissions from vessels due to maintenance activities during the operational phase. It is not expected that there will be any negative direct or indirect, medium or long-term effects on sensitive receptors from air emissions / pollution during the construction, operational and decommissioning phases (0).

There are major settlements within identified route corridors. Within routes to Penwortham, Hawthorn Pit and Birkhill Wood there is potential for moderate negative, short-term effects on the local population through dust and traffic/machinery emissions, as well as noise emissions which may affect many receptors within these higher populated areas during the construction and decommissioning phases and during cable maintenance activities (-2). There are areas of perceived moderate deprivation within all identified route corridors. There are areas of perceived highest deprivation within routes to Pentir, Bodelwyddan, Penwortham, Kilmarnock South, Blyth, Hawthorn Pit, Lincolnshire Connection Node, Weston Marsh and Birkhill Wood. In the route to Weston Marsh these areas of perceived highest deprivation that cannot be avoided. Populations in these areas may be of lower health status and may be of greater risk of health impacts, such as those affecting the lungs due to existing health conditions in the areas of higher sensitivity (-1).

There is potential for moderate positive, indirect effects on regional air quality in the medium to long-term from facilitation of new renewable energy infrastructure, supporting decarbonisation of the energy sector (+2).

Onshore Infrastructure:

There are settlements within the vicinity of onshore interface areas at Pentir, Bodelwyddan, Penwortham, Kilmarnock South, Arnish, Spittal, New Deer, Peterhead, Blyth, Hawthorn Pit, Birkhill Wood, Lincolnshire Connection Node and Weston Marsh. Potential for a short-term, temporary increases in road traffic volumes on the public road network and within the construction areas generated by construction activities to result in adverse effects on local air quality, during pre-construction, installation, and decommissioning. Potential for intermittent/infrequent operational phase maintenance activities to temporarily increase traffic volumes and result in adverse effects in local air quality. Potential to impact local populations through a deterioration of local air quality via increased exposure to vehicle emissions. There are areas of perceived highest deprivation within the vicinity of the onshore interface areas of Penwortham, Kilmarnock South, Blyth, Hawthorn Pit, Birkhill Wood and Lincolnshire Connection Node with areas of perceived high deprivation within the vicinity of the onshore interface areas of Bodelwyddan, Penwortham, Ballantrae, Kilmarnock South, Arnish, Blyth, Hawthorn Pit, Birkhill Wood, Lincolnshire Connection Node and Weston Marsh. There is potential for slight negative, direct, short-term temporary effects on local air quality due to dust generation and air emissions from vehicles and machinery in the vicinity of the works

during the construction and decommissioning phases and during any maintenance activities (-1).

There is potential for moderate positive, indirect effects on regional air quality in the medium to long-term from facilitation of new renewable energy infrastructure, supporting decarbonisation of the energy sector (+2).

Climatic Factors

Cabling:

There are known locations of blue carbon habitat within the identified route corridors. There is unlikely to be potential for significant negative effects on blue carbon habitat within the identified route corridors during the construction, operational and decommissioning phases (0), cabling can avoid these areas of high blue carbon potential. Generally, there is potential for slight negative, short-term effects on sediment carbon storage, due to a localised release of CO2 from seabed disturbance during the construction and decommissioning phases (-1).

There is potential for slight negative, short-term, temporary effects on localised GHG concentrations due to GHG emissions from vehicles and machinery in the vicinity of the works during the construction and decommissioning phases and during any cable maintenance activities (-1). There is also potential for the temporary loss of GHG sequestering material in the vicinity of the works during the construction and decommissioning phases and during any cable maintenance activities (-1).

There is potential for moderate positive, medium to long-term effects during the operational phase, from facilitation of new renewable energy infrastructure, supporting decarbonisation of the energy sector, diversification of electricity supply and energy security, and meeting of energy objectives and climate change emission reduction targets (+2).

Onshore Infrastructure:

There are onshore carbon sinks within the vicinity of all onshore interface areas of the recommended HND1 design. There are areas of peatland within the vicinity of the onshore interface areas of Peterhead, Spittal, Arnish, Ballantrae and Penwortham. There is potential for short-term release of CO2 due to ground disturbances on areas of carbon storage such as peatlands, bogs or salt marshes habitats, due to the activities required to facilitate the construction and decommissioning of the converter station (-1). There is potential for short-term direct and indirect GHG emissions to be generated by the construction process through the production of materials, transport of materials and onsite energy consumption. Potential for short-term, temporary emissions from vehicles and machinery during pre-construction, construction and decommissioning of the converter station. There is potential for slight positive, medium to long-term effects during the operational phase, from facilitation of new renewable energy infrastructure, supporting decarbonisation of the energy sector, diversification of electricity supply and

energy security, and meeting of energy objectives and climate change emission reduction targets (+2).

Material Assets

Cabling:

There is a significant amount of unavoidable offshore infrastructure encountered by the identified route corridors. In total, there are approximately 74 submarine cable connection crossings, 106 offshore gas/oil pipeline crossings and one pipeline crossing associated with the Endurance CO2 Storage Facility within GB waters. The Endurance CO2 pipeline and the majority of these cables and oil/gas pipelines are unavoidable and will need to be crossed in the North Sea. Four routes cross the Endurance CO2 pipeline, whilst fourteen routes cross submarine cable connections and 16 cross oil/gas pipelines. The greatest number of cable and pipeline connections are crossed by the route from SW_E1a (Morven) to Lincolnshire Connection Node. There is potential for telecommunications and energy supplies of high importance within GB waters to be disrupted during the construction, operation, and decommissioning phases. There is potential for significant negative, direct, short-term effects due to damage to these cables, and subsequent disruption to telecommunications and energy supplies, during the construction and decommissioning phases (-3), as well as potential for slight negative medium to long-term (cable lifetime) direct effects in the operational phase during recurrent maintenance operations (-1). There is also potential for significant negative indirect effects to telecommunications and energy supplies in the short-term during the construction and decommissioning phases, as access to these existing cables for maintenance may be reduced temporarily (-3), as well as for slight negative effects in the medium to long-term during the operational phase due to access issues during periods of maintenance (-1). Thus, given the high importance of the existing infrastructure that is unavoidable, there is potential for significant negative effects on this infrastructure in the short-term, and slight negative effects in the medium to long-term, although good working practices may eliminate or minimise the potential for these effects to occur.

There are five unavoidable onshore pipelines intersected by the identified route corridors in the vicinity of Hull, Preston, Hornsea and Spalding. There are unavoidable overhead lines which are intersected by three identified route corridors. There is the potential for moderate, direct short-term, negative effects due to damage to the pipelines or overhead lines, and subsequent disruption to energy supplies and services, during the construction and decommissioning phases (-2), as well as potential for slight negative, medium to long-term (cable lifetime) direct effects in the operational phase during recurrent maintenance operations (-1). There is also the potential for slight negative indirect effects to energy supplies and services in the short-term during the construction and decommissioning phases, as access to these existing pipelines and cables for maintenance may be reduced temporarily (-1), as well as for slight negative effects in the medium to long-term during the operational phase due to access issues during periods of maintenance (-1). Furthermore, there is the potential for moderate negative, direct short-term effects during construction due to the potential requirement for permanent relocation or repositioning of existing overhead lines;

services should return to normal once this has occurred. All potential negative effects on onshore energy infrastructure are, however, likely to be temporary and localised to the asset crossing locations. The use of directional drilling may also reduce or eliminate many of these issues onshore.

A number of roads will need to be crossed, with all identified route corridors containing unavoidable roads. The R4_3 (Outer Dowsing) to Weston Marsh route comprises the longest onshore cable section and contains the greatest number of road crossings. Twelve routes encounter unavoidable railway lines. The SW_N1 (West of Orkney) to Spittal and the R4_6 (Morgan) and R4_5 (Morecambe) routes to Penwortham intersect the greatest number of railway lines. As such, there is potential for moderate, direct, short-term negative effects due to the disruption of access to roads and railway lines due to road closures or road diversions, or restrictions/amendments to public transport routes during the construction and decommissioning phases (-2). This may result in a temporary increase in travel time for road and public transport users. There is also potential for moderate negative, direct short-term effects due to journeys being delayed by the potential increased vehicle traffic from construction machinery (-2), as well as short-term temporary road access restrictions, closures or slow-moving vehicle traffic to accommodate construction vehicles transporting abnormal loads (-2). There is the potential for slight negative, indirect short-term effects due to disruption from construction or decommissioning works or concerns regarding road safety for road users (motorised and non-motorised) with large vehicles or machinery (-1). All potential negative effects on transport infrastructure are, however, likely to be temporary and localised to the route crossing locations. The use of directional drilling may also reduce or eliminate many of these issues onshore.

All identified route corridors are within areas where shipping activity occurs. Fifteen identified route corridors encounter areas of unavoidable high shipping density. This is generally encountered in the inshore areas close to the coastline, with larger areas present off the east coast of England and Scotland. The route from SW_E1a (Morven) to Lincolnshire Connection Node crosses the largest area of high shipping density, followed by Ballantrae to Pentir and SW_E1a (Morven) to Hawthorn Pit routes. There is potential for significant, direct negative effects on shipping and navigation in the short-term due to displacement of vessels during the construction and decommissioning phases (-3), which can result in temporary disruption to vessel routing and timetables. There is potential for significant negative effects in the short-term during the construction and decommissioning phases due to the risk of collision and allision with vessels associated with cabling, which may result in injury or death and hazardous cargo or oil spillage (-3). There is potential for slight negative, medium and long-term effects during the operational phase due to the risk of collision or allision with slow-moving or stationary vessels and equipment during maintenance (-1). There is also potential for slight negative, medium and long-term effects during the operation phase due to the risk of entanglement of anchors with subsea cables or protective structures used over cables (-1). Furthermore, there is potential for significant negative effects within installation and decommissioning areas in the short-term construction and decommissioning phases, as the presence of installation vessels and equipment may adversely impact the efficiency of search and rescue operations (-3). It is, however, likely that these potential

effects can be mitigated by adherence to appropriate navigational safety planning and procedures.

There are relatively high-intensity fishing areas located within the identified route corridors. There is potential for moderate direct negative, short-term effects on commercial fisheries operations due to temporary displacement from traditional fishing grounds during the construction and decommissioning phases (-2), as well as potential for slight, medium and long-term negative effects due to displacement during maintenance within the operational phase (-1). Displacement of fishing activity could result in increased competition for alternate fishing grounds, with potential to adversely affect fish stocks and, by extension, landings, in nearby areas. There is potential for moderate negative direct effects due to an increased collision risk of fishing vessels with vessels associated with cable installation in the short-term during the construction and decommissioning phases (-2), and slight negative effects in the medium to long-term during recurrent maintenance activities in the operational phase (-1). There is also potential for slight negative effects on fishing activities in the operational phase, due to the risk of entanglement of fishing gear with cables or damage to fishing gear due to cable protection infrastructure where cables cannot be buried sufficiently, which may lead to avoidance of the area by fishing vessels (-1). There is potential for short-term negative effects on commercial fish species and their key habitats. There is potential for moderate negative direct effects in the short-term construction (-2), and slight negative direct effects in the medium-to long-term operational phase due to the potential for a direct loss of supporting habitats, such as spawning and nursery grounds. There is potential for moderate indirect negative effects on the profitability of commercial fishing in the short- term (-2) and slight indirect negative effects in the medium and long-term (-1). This includes the potential for reduced quotas, increased resource competition for fishing, and reduced landings in both tonnage and economic value.

There are a total of four unavoidable offshore military danger areas encountered by five of the identified route corridors, namely D412: Staxton, D509: Campbeltown, D513: Druridge Bay and D809(S) Moray Firth (South). The SW_E1a (Morven) to Lincolnshire Connection Node route crosses both the Druridge Bay and Staxton military areas, whilst two routes cross both the Druridge Bay and Campeltown military areas. There is potential for moderate negative effects on military activities, including short-term temporary disruption of military exercises and activities within these military danger areas during the pre-construction and decommissioning phases (-2). There is also the risk of encountering UXOs in these military danger areas.

Sixteen identified route corridors cross areas of unavoidable potential prime agricultural land. A significant portion of this land is in Lincolnshire, crossed by the R4_3 (Outer Dowsing) to Weston Marsh route. There is potential for direct, slight, short-term negative effects on agriculture due to the temporary loss of agricultural land and soils during the pre-construction, construction and decommissioning phase (-1). There is also potential for short-term, direct, slight negative effects due to temporary restrictions in access to agricultural land during construction and decommissioning activities (-1). There is potential for short-term, direct damage to field drains due to construction and

decommissioning activities (-1), as well as the potential for indirect, short-term secondary negative effects on agriculture during construction and decommissioning activities, including through pollution of water sources used for irrigation or for livestock or through the introduction of soil-borne pests and diseases.

Eighteen of the identified route corridors encounter relatively small, unavoidable areas of either broadleaved woodland, conifer woodland, and mixed woodland, which may be utilised for commercial forestry. There is potential for direct, slight negative effects on commercial forestry due to the loss of woodland within the onshore route corridors if felling of woodland and commercial forestry areas is required to facilitate cable installation in the short-term construction phase (-1). There is also potential for direct, slight negative effects on commercial forestry in the medium and long-term due to a permanent localised loss of woodland within working areas if these land areas are retained or if the former land use fails to be reinstated (-1). This could result in a reduction in income levels for this industry.

The potential for effects on tourism is considered indirectly within the topics of Landscape, Seascape and Visual Amenity (visibility of construction activity), Population and Human Health (recreational use), and Biodiversity, Flora, and Fauna (effects on wildlife). As discussed in the Landscape, Seascape and Visual Amenity Section, there is the potential for slight negative effects in the short-term on Landscape, Seascape and Visual Amenity, which may result in secondary negative effects on tourism, as this may act as a deterrent to tourists. As discussed in Population and Human Health, there is a moderate potential for negative effects on recreational activities due to increased noise, lighting, visual and disturbance effects in the short-term, as such tourism is unlikely to be impacted significantly by these potential effects, albeit temporary and localised. There is potential for slight negative, temporary direct and indirect effects on leisure and recreational users due to an increased collision risk or water quality effects, as well as access restrictions and displacement for marine and onshore recreational users during the construction (and decommissioning) phase, which may indirectly negatively affect tourism temporarily. Lastly, as discussed in Biodiversity, Flora and Fauna, there is potential for the construction phase to negatively affect wildlife, which may result in a secondary impact on tourism activities. Any impact on tourism is expected to be temporary, localised and not significant.

The HND recommended design has the potential to connect 29.9GW of renewable energy generation to the GB grid. As such, there is potential for positive effects in the short-term (+1) and moderate positive effects in the medium to long-term, owing to the facilitation of new renewable energy infrastructure (+2) and the associated reduction in reliance on fossil fuel generation.

Onshore Infrastructure:

Thirteen of the potential areas where interface infrastructure may be located contain sections of high-voltage overhead lines. Where there is limited interface infrastructure required, these overhead lines should be able to be avoided by new interface infrastructure. However, in some cases free space may be limited and overhead lines

may not be avoidable. There is the potential for slight adverse, direct short-term, negative effects due to damage to the overhead lines, and subsequent disruption to energy supplies and services, due to the activities required to facilitate construction and decommissioning of the infrastructure during the construction and decommissioning phases (-1). There is potential for slight negative, medium to long-term (interface infrastructure lifetime) direct effects in the operational phase due to the recurrent maintenance activities required to facilitate the operation and maintenance (recurrent, short-term) (-1). There is also the potential for slight negative indirect effects to energy supplies and services in the short-term during the construction and decommissioning phases, as access to these existing overhead lines for maintenance may be reduced temporarily due to the activities required to facilitate construction and decommissioning of the infrastructure (-1), as well as for slight negative effects in the medium to long-term during the operational phase due to access issues during periods of maintenance (-1). Furthermore, there is the potential for slight negative, direct short-term effects during construction due to the permanent relocation or repositioning of existing overhead lines, services should return to normal once this has occurred. All potential negative effects on onshore energy infrastructure are, however, likely to be temporary and localised to the location of new interface infrastructure.

All of the potential areas where interface infrastructure may be located contain a number of roads. Although these roads can be avoided by the new interface infrastructure, vehicles associated with the construction and decommissioning phases will have to utilise these local roads to facilitate the construction and decommissioning of the interface infrastructure. As such, there is potential for slight adverse, indirect, short-term negative effects due to the disruption of access to roads due to activities required to facilitate the construction and decommissioning of the interface infrastructure, such as road closures or road diversions, or restrictions/amendments to public transport routes (-1). This may result in a temporary increase in travel time for road and public transport users. There is also potential for slight negative, indirect short-term effects due to journeys being delayed by the potential increased vehicle traffic from construction machinery (-1), as well as short-term temporary road access restrictions, closures or slow-moving vehicle traffic to accommodate construction vehicles transporting abnormal loads (-1) will be required. There is the potential for slight negative, indirect short-term effects due to disruption from construction or decommissioning works or concerns regarding road safety for road users (motorised and non-motorised) with large vehicles or machinery (-1). All potential negative effects on transport infrastructure are, however, likely to be temporary and localised to the roads surrounding the construction and decommissioning works.

Ten potential areas where interface infrastructure may be located contain areas of prime agricultural land. A significant portion of this prime agricultural land is in Lincolnshire, surrounding the Weston Marsh interface point. Given the amount of required interface infrastructure associated with the recommended design, there is potential for direct, moderate, short-term negative effects on agriculture through the temporary loss or disturbance of agricultural land and soils during pre-construction, construction and decommissioning phases (-2). This is due to land take requirements for construction compounds, haul roads and temporary access tracks during the

construction and commissioning of the interface infrastructure. There is also potential for direct, moderate, medium and long-term negative effects on agriculture due to the permanent loss or disturbance of agricultural land and soils *during the operation period due to land take required for the permanent works, substations and converter stations* (-2). There is also potential for short-term, direct, slight negative effects due to temporary restrictions in access to agricultural land with construction and decommissioning activities (-1). There is potential for short-term, direct damage to field drains or the structure of agricultural land due to construction and decommissioning activities (-2), as well as the potential for indirect, short-term secondary negative effects on agriculture due to pollution of water sources being used for irrigation or as a livestock source during construction and decommissioning activities (-2). There is potential for short-term, indirect, slight negative short-term effects on agriculture through the introduction of soil borne pests and diseases were to occur from the construction process (-1).

All fifteen of the potential areas where interface infrastructure may be located contain relatively small areas of either broadleaved woodland, conifer woodland, and mixed woodland, which may be utilised for commercial forestry. These may be difficult to avoid completely given the volume of required interface infrastructure associated with the recommended design. There is potential for direct, slight negative effects on commercial forestry due to the loss or disturbance of woodland within the interface areas due to land take or felling requirements for construction compounds, haul roads and temporary access tracks during the construction and commissioning of the interface infrastructure (-1). There is also potential for the direct, slight negative effects on commercial forestry in the medium and long-term due to the permanent loss or disturbance of woodland within the interface area during the operation phase due to land take requirements for the operation of interface infrastructure. This could result in a reduction in income levels for this industry.

The potential for effects on tourism is considered indirectly within the topics of Landscape, Seascape and Visual Amenity (visibility of construction and operation/maintenance activity), Population and Human Health (recreational use), and Biodiversity, Flora, and Fauna (effects on wildlife). As discussed in the Landscape, Seascape and Visual Amenity Section, there is the potential for moderate negative effects in the short-term on Landscape, Seascape and Visual Amenity, which may result in secondary adverse effects on tourism, as this may act as a deterrent to tourists. As discussed in Population and Human Health, there is a slight potential for negative effects on the population due to increased noise release in the short-term, as such, tourism is unlikely to be impacted significantly by these potential effects, albeit temporary and localised. There is also potential for temporary direct disturbance on the local population due to lighting, noise and vibration generated during the operation of the converter station and substations. There is potential for slight negative, temporary direct and indirect effects on access restrictions and displacement for onshore recreational users during the construction (and decommissioning) phase, which may indirectly negatively affect tourism temporarily, as well as direct permanent loss or disturbances to community land areas during the operation of the converter station and substations. Lastly, as discussed in Biodiversity, Flora and Fauna, there is potential

for the construction, decommissioning and operation phases to adversely affect wildlife, which may result in a secondary impact on tourism activities. Any impact on tourism will likely be temporary, localised and not significant.

The HND recommended design has the potential to connect 29.9GW of renewable energy generation to the GB grid. As such, there is potential for positive effects in the short-term (+1) and moderate positive effects in the medium to long-term, owing to the facilitation of new renewable energy infrastructure (+2) and the associated reduction in reliance on fossil fuel generation.

Cultural, Architectural and Archaeological Heritage

Cabling:

There are a significant number (at least 1,176) of marine archaeological/heritage assets located within the offshore sections of the 19 identified route corridors, including 385 known shipwrecks and 791 marine Trove Heritage assets. The identified SW_N4 (Spiorad na Mara) to Arnish identified route corridor contains the greatest number of known marine heritage assets (192), although there is potential to avoid all marine archaeological/heritage assets within the 5km-wide identified route corridors, avoiding the potential for direct effects. There is potential for indirect short-term moderate negative effects on these marine archaeological/heritage assets during the construction and decommissioning phases, due to indirect damage or disturbance to known and unknown features through alterations in the seabed morphology from suspended sediment levels and/or scour due to seabed preparation techniques and cable burial methods (-1).

Furthermore, there is potential for unknown marine and intertidal prehistoric landscapes, submerged archaeological artefacts, structures or wrecks to be discovered within the identified route corridors. There is potential for slight negative temporary to permanent effects, which may be due to direct damage or disturbance to unknown features within the identified route corridors during surveys, pre-construction works, cable laying or decommissioning activities (-1). There is also the potential for surveys and actions to contribute to archaeological knowledge and to inform subsequent decision-making.

There is also potential for slight negative indirect effects on known and unknown features within the vicinity of cables in the identified route corridors in the medium to long-term operational phase owing to the potential for scouring and exposure to occur around features in the vicinity of cables and cable protection materials, leading to indirect damage or degradation, sediment deposition and further burial of features in the long-term (-1) and potential for loss of, or damage to, features during maintenance activities (-1). There may also be potential for long-term positive effects on archaeological features that are exposed, and that may be protected through burial with alterations in suspended sediment levels (+1).

There are a significant number (at least 4,963) terrestrial heritage assets located within the onshore sections of the identified route corridors. These include 18 Parks and Gardens/Garden and Designed Landscapes (within 11 route corridors), 137 Scheduled

Monuments (within 15 route corridors), 2,971 Trove Heritage assets (within eight route corridors, this dataset is only available for Scotland), 1,706 Listed Buildings (within 18 route corridors), 41 Conservation Areas (within 14 route corridors) and 88 Defence of Britain Sites (within 12 route corridors). The identified SW_NE4 (Caledonia) to New Deer route corridor contains the greatest number of terrestrial heritage assets (1,382). There is potential for all known terrestrial heritage assets to be avoided within the identified route corridors, avoiding the potential for direct effects. However, there is potential for slight direct negative effects on unknown buried terrestrial heritage assets in the short-term due to potential damage within the identified onshore route corridors during pre-construction surveys, construction works, cable laying or decommissioning activities (-1).

There is also potential for slight indirect negative effects on known and unknown terrestrial archaeological assets within the identified onshore route corridors, as well as assets within the immediate vicinity of the identified route corridor, e.g., through sediment displacement or mud generation leading to burial of downstream sites, or hydrological regime alteration resulting in inundation or dewatering (-1) and from short-term, indirect temporary effects on the setting and cultural significance of designated and non-designated terrestrial heritage sites and archaeological assets, including coastal heritage assets (-1).

At the project planning phase, any sites of archaeological potential should be identified and exclusion zones established around these, with site surveys or trial trenching conducted before any potentially damaging activities take place, to inform any appropriate mitigation. Within the marine environment, modelling of hydrodynamic and sediment transport processes may be necessary to determine potential effects on surrounding archaeological features and determine any appropriate mitigation required.

Onshore Infrastructure:

In total, at least 1,659 terrestrial heritage assets are located within the vicinity of onshore interface areas. These include 67 Scheduled Monuments (within all 15 interface areas), 489 Listed Buildings (within 11 interface areas), 17 Conservation Areas (within seven interface areas), nine Parks and Gardens/Garden and Designed Landscapes (within six interface areas), 1,060 terrestrial Trove Heritage assets (within seven interface areas – this data is only available in Scotland) and 17 Defence of Britain Sites (within five interface areas). The Arnish interface area vicinity contains the greatest amount of terrestrial heritage assets (496).

There is potential for all known terrestrial heritage assets to be avoided within the interface areas, avoiding the potential for direct effects. There is potential for slight direct negative effects on unknown buried terrestrial heritage assets in the short-term due to damage, partial or complete loss to unknown buried terrestrial archaeology assets, discovered in the converter station site or construction compounds, by site-based activities that involve groundbreaking and ground reduction, including foundations and the installation of services, and decommissioning activities (-1). There

is also the potential for surveys and actions to contribute to archaeological knowledge and to inform subsequent decision-making. There is also potential for slight negative effects on known or unknown buried terrestrial archaeological assets within the interface areas through indirect damage to terrestrial archaeology assets or structures due to activities required to facilitate the construction or decommissioning of the converter station such as through sediment displacement or mud generation leading to burial of downstream sites, or hydrological regime alteration resulting in inundation or dewatering, as well as vibration from construction or decommissioning activities or vehicle movements (-1). Any damage to or loss of archaeological assets may affect the cultural significance of the assets.

There is potential for slight negative effects in the medium and long-term due to alterations in sediment and hydrological regimes from maintenance activities or permanent land alteration to lead to indirect damage or degradation of downstream archaeological features (-1).

Due to the relatively significant number of new interface infrastructure required as part of the Recommend HND Design, there is potential for moderate, short-term, indirect temporary effects on the setting and cultural significance of designated and non-designated terrestrial heritage sites and archaeological assets, including coastal heritage assets, due to the activities required to facilitate the construction and decommissioning of the converter station as a result of the presence of equipment and machinery, and temporary increases in air pollution, traffic, and noise and vibration (-2).

There is also potential for moderate indirect permanent effects in the medium and long-term on the setting and cultural significance of designated and non-designated terrestrial heritage sites and features, including coastal heritage assets due to the physical presence of the interface infrastructure and any associated alterations in the landscape or removal of areas for previous agricultural use, trees or landscape features associated with onshore heritage setting, as well as to the activities required to facilitate the operation and maintenance of the converter station due to potential increases in air pollution, traffic, noise and vibration (-2).

At the project planning phase, any sites of archaeological potential should be identified and exclusion zones established around these, with site surveys or trial trenching conducted before any potentially damaging activities take place, to inform any appropriate mitigation. Within the marine environment, modelling of hydrodynamic and sediment transport processes may be necessary to determine potential effects on surrounding archaeological features and determine whether any appropriate mitigation is required.

Landscape, Seascape and Visual Amenity

Cabling:

Eleven of the identified route corridors cross a total of 23 English and Welsh Marine Character Areas, with the SW_E1a (Morven) to Lincolnshire Connection Node route encountering the highest number of areas (8). Identified route corridors also encounter

four Coastal Character Types at cable landfall locations in Scotland. Although these Marine Character Areas and Coastal Character Types are unavoidable, given the temporary nature of offshore cable laying, there is very limited potential for short-term, temporary effects on seascapes and visual amenity (0), as well as no anticipated effects on seascapes in the medium to long-term operation phase (0).

In total, there are 33 National Landscape Character Areas encountered by 16 of the identified route corridors. Despite being unavoidable, there is also very limited potential for short-term, temporary negative landscape effects on the National Landscape Character Areas within the identified route corridors, given the temporary and relatively small-scale works involved with onshore cabling laying (0), as well as no anticipated effects on these areas in the medium to long-term operational phase as cables will be buried (0).

Short sections of the Ayrshire Coastal Path, which is within the identified Ballantrae Tee to Kilmarnock South, SW_W1 (Machair) to Ballantrae Tee and Ballantrae Tee to Pentir route corridors and the Formartine to Buchan Way, which is within the identified SW_NE7 (Marram) to Peterhead 2 / DCSS route corridor, cannot be avoided and will need to be crossed. As such, there is potential for slight direct localised negative effects on the walking trails in the short-term due to localised construction plant activity, and the use of artificial lighting, during pre-construction, cable installation, and decommissioning and potential localised alterations to the surrounding landscape character types or loss of landscape elements (-1). Furthermore, there is potential for slight direct negative effects on these walking routes in the medium-term due to the localised removal of landscape elements such as trees, and hedgerows until they reestablish, if these are not reinstated following the completion of works (-1).

The Durham National Trust Land (Durham Coast) and Durham Heritage Coast, which are partially situated within the identified SW_E1a (Morven) to Hawthorn Pit route corridor, and the four Country Parks, which are located within four identified route corridors (Ballantrae Tee to Pentir, R4_3 (Outer Dowsing) to Weston Marsh, PA_2 (Berwick Bank) to Blyth and SW_E1a (Morven) to Hawthorn Pit), are avoidable by onshore cabling, avoiding the potential for direct effects. However, there may be potential for slight indirect negative landscape and visual amenity effects of these sites in the short-term due to the potential proximity of machinery, and the use of artificial lighting, during pre-construction, cable installation, and decommissioning (-1).

Seventeen of the identified route corridors encounter a total of 39 urban areas. There are unavoidable urban areas and areas of moderate population density within the identified R4_5 (Morecambe) to Penwortham and R4_6 (Morgan) to Penwortham route corridors, as well as the presence of areas of high population density within the identified R4_1 (Dogger Bank SW), R4_2 (Dogger Bank SE) and PA_1 (Dogger Bank D) to Birkhill Wood and SW_E1a (Morven) to Hawthorn Pit route corridors. Construction activity within these higher populated areas has the potential to be visible to a greater number of people; however, this will be short-term and temporary and there will be no permanent visible infrastructure associated with buried cabling. As such, there is potential for slight visual effects in the short-term due to localised construction plant

activity, and the use of artificial lighting, during pre-construction, cable installation, and decommissioning (-1).

Areas of the highest landscape and seascape sensitivity should be avoided, where possible at the project planning phase, and a SLVIA should be undertaken which should inform project design and appropriate mitigation to minimise adverse effects.

Onshore Infrastructure:

There are 23 National Landscape Character Areas in the vicinity of onshore interface areas. These cannot be avoided within the areas where new interface infrastructure is required. This includes Landscape Character Areas considered to be highly sensitive to new development. These comprise Boggy Moorland - Outer Hebrides (landscape character type 22) at Arnish; Farmed Lowland Plain (Landscape Character Type 143) at Banniskirk/Spittal; Coastal Agricultural Plain - Aberdeenshire (Landscape Character Type 17) at Peterhead DCSS; Coastal Farmed Ridges and Hills - Arberdeenshire (Landscape Character Type 24) at Hurlie; Lincolnshire Coast and Marshes (National Character Area 42) at Lincolnshire Connection Node; and The Fens (National Character Area 46) at Weston Marsh. The development of new substations or converter stations within these areas has greater potential for long-term negative effects on the landscape character, which should be taken into consideration at the project level. Given the amount of new infrastructure and landscape sensitivity, there is potential for moderate direct short-term, temporary negative landscape effects on the landscape elements within and overall landscape character within the interface areas during construction through the temporary or permanent loss of landscape elements to facilitate construction works including construction compounds and facilities, storage areas, the presence of plant, access routes, earthworks, Sustainable Drainage Systems (SuDS) and construction of emerging structures (-2). Furthermore, there is potential for moderate direct medium to long-term negative effects on landscape elements within and overall landscape character of National Landscape Character Areas due to the physical presence of the interface infrastructure and the permanent loss of landscape elements to facilitate the operational phase of the interface infrastructure (-2).

There is potential to avoid the short sections of the Formartine and Buchan Way National Trail that is encountered within the vicinity of the DCSS interface area, the Ayrshire Coastal Path within the Ballantrae interface area, the Hetton Lyons Country Park within the vicinity of the Hawthorn Pit interface area and the Wansbeck Riverside Park Country Park in the vicinity of the Near Blyth interface area, thus avoiding the potential for direct negative effects. However, given the amount of interface infrastructure required, there is the potential for moderate indirect negative landscape and visual amenity effects within these sensitive areas in the short-term due to the visibility of activities required for the construction and decommissioning of the interface infrastructure and any subsequent removal of landscape elements (-2). There is also potential for moderate indirect negative landscape and visual amenity effects within these areas in the medium to long-term due to the visibility of the interface infrastructure and activities required for facilitating the operation and maintenance of

the interface infrastructure, as well as any subsequent removal of landscape elements (-2).

There are 35 urban areas within, or partially within, 13 of the interface areas. However, there is potential to avoid these urban areas for new developments of interface infrastructure, avoiding the potential for direct effects. Given the developed character of these urban areas, there is potential for slight indirect negative visual amenity effects in the short-term due to the potential visibility of activities in proximity to these areas, required for the construction and decommissioning of the interface infrastructure (-1). Development away from urban areas has the potential for long-term negative visual effects for the local population (-1). If new infrastructure is developed in proximity to high populated areas, there is greater potential for medium to long-term visual effects for a greater number of people due to the visibility of the interface infrastructure and activities required for facilitating the operation and maintenance of the interface infrastructure.

Areas of the highest landscape and seascape sensitivity should be avoided, where possible at the project planning phase, and a SLVIA should be undertaken which should inform project design and establish appropriate mitigation to minimise adverse effects.

Potential for Cumulative / In-Combination Effects

Biodiversity, Flora and Fauna

There is potential for cumulative negative effects on designated sandbank habitat within the Dogger Bank SAC from cabling within routes R4_1 to Birkhill Wood, R4_2 to Birkhill Wood, and PA1 to Birkhill Wood.

There is potential for short-term disturbance and displacement effects, and negative effects on supporting habitats within the Southern North Sea SAC from cabling within routes R4_1 to Birkhill Wood, R4_2 to Birkhill Wood, PA1 to Birkhill Wood, and SW_E1a to Lincolnshire Connection Node.

There is potential for cumulative negative effects on designated bird species and supporting habitats within the Liverpool Bay SPA from cable routes R4_4 to Bodelwyddan, R4_5 to Penwortham, and R4_6 to Penwortham and within the Greater Wash SPA from cabling within routes R4_1 to Birkhill Wood, R4_2 to Birkhill Wood, R4_3 to Weston Marsh, PA1 to Birkhill Wood, and SW_E1a to Lincolnshire Connection Node.

There is potential for cumulative negative effects on protected features within the Southern Trench MPA from cabling within routes SW_NE4 to New Deer, and SW_NE7 to Peterhead 2 / DCSS.

There is potential for cumulative negative effects on protected habitats and species within the Clyde Sea Sill MPA from cabling within routes SW_W1 to Ballantrae, and Ballantrae to Pentir, and for protected habitats and seabirds within the Fylde MCZ from cabling within routes R4_5 to Penwortham, and R4_6 – Penwortham.

There is potential for short-term cumulative direct and indirect negative effects on flora and fauna within the Galloway and Southern Ayrshire Biosphere Reserve from cabling

within routes SW_W1 to Ballantrae, Ballantrae to Kilmarnock South, and Ballantrae to Pentir.

There is potential for cumulative effects on the overall condition of Annex I reef due to direct or indirect damage to habitat from cabling within routes R4_4 to Bodelwyddan, SW_W1 to Ballantrae, Ballantrae to Kilmarnock South, Ballantrae to Pentir, PA2 to near Blyth, SW_E1a to Hurlie, and SW_N1 to Banniskirk/Spittal. Similarly, there is potential for cumulative effects on the overall condition of Annex I sandbank habitats due to direct or indirect damage to habitat from cabling within routes R4_4 to Bodelwyddan, R4_5 to Penwortham, R4_6 to Penwortham, R4_1 to Birkhill Wood, R4_2 to Birkhill Wood, and PA1 to Birkhill Wood.

There is potential for cumulative short-term disturbance and displacement effects on grey seals within areas of known higher density from cabling within routes Ballantrae to Pentir, PA2 to near Blyth, and SW_E1a to Lincolnshire Connection Node. In general, there is also potential for cumulative negative effects on marine mammal species and seabirds where cabling activities take place within the same region.

Population and Human Health

There is potential for cumulative effects on the local population within the identified route corridors R4_5 to Penwortham and R4_6 to Penwortham, where being in closer proximity urban areas is unavoidable.

There is potential for cumulative effects on the local population within the identified route corridors to Birkhill Wood.

There is potential for cumulative effects on bathing waters / water quality for identified route corridors into Weston Marsh and Lincolnshire Connection Node and for the identified route corridors into Birkhill Wood and into Penwortham.

There is potential for cumulative effects on recreational boating areas for identified route corridors into Weston Marsh and Lincolnshire Connection Node and for identified route corridors into Birkhill Wood.

Geology, Soils and Land Use

There is potential for a short-term cumulative loss of the soil resource across identified route corridors.

There is potential for a cumulative loss of soil and/or exposure of bare soil from construction within the Penwortham and Birkhill Wood interface areas from the R4_5 to Penwortham, R4_6 to Penwortham, R4_1 to Birkhill Wood, R4_2 to Birkhill Wood and PA_1 to Birkhill Wood Alternative route corridors leading to increase soil erosion with the potential for secondary short-term effects on Material Assets (agriculture) for soil health and also secondary short-term impacts on Water owing to the potential for increased suspended sediment losses degrading water quality.

There is potential for a cumulative loss of soil, habitats and peatlands with short to long-term negative effects on Biodiversity, Flora and Fauna through alteration of supporting habitats for specific species. There is potential for a cumulative loss of areas

of peatland to lead to indirect medium-term negative effects on Climatic Factors through a loss of carbon storage areas prior to re-establishment.

Water

There is potential for cumulative effects on water quality within the Lincolnshire coastal waterbody and Steeping and Eaus waterbody from works within the identified route corridors R4_3 to Weston Marsh and SW_E1a to Lincolnshire Connection Node and within the Ribble Estuary waterbody and the Tara Carr Gutter waterbody within the identified route corridors of R4_5 to Penwortham and the R4_6 to Penwortham. The Yorkshire South waterbody and the Beverley and Barmston Drain waterbody have potential for cumulative effects on water quality from works within the identified route corridors of R4_1 to Birkhill Wood, R4_2 to Birkhill Wood and PA_1 to Birkhill Wood Alternative

There is potential for cumulative effects on water quality within the Ballantrae waterbody, Firth of Clyde Outer (Offshore) waterbody, Girvan waterbody and Loch Ryan Offshore waterbody from works within the identified route corridors Ballantrae to Pentir, Kilmarnock South to Ballantrae, and SW_SW1 to Ballantrae.

There is potential for cumulative effects on flood risk within these identified route corridors on National Flood Zones.

Air

There is potential for cumulative effects on local air quality from works within identified routes into Penwortham and Birkhill Wood.

There is potential for cumulative effects with air quality issues in AQMAs for works within identified routes into Penwortham.

Climatic Factors

There is potential for cumulative effects on blue carbon habitats within routes into Penwortham.

Material Assets

Offshore Infrastructure

There is potential for cumulative negative effects on unavoidable offshore infrastructure (cables and/or pipelines) from cabling within identified route corridors R4_5 to Penwortham and R4_6 to Pentwortham, as well as within identified route corridors PA_1 to Birkhill Wood, R4_1 to Birkhill Wood and R4_2 to Birkhill Wood; and R4_3 to Weston Marsh and SW_E1a to Lincolnshire Connection Node. In all cases, there is potential for subsequent disruption to services provided by offshore infrastructure due to multiple routes being planned in one corridor. If not carried out in a coordinated and well-planned manner, there is potential for such infrastructure to be impacted multiple times over a prolonged time span.

Onshore Infrastructure

There is potential for cumulative effects on unavoidable onshore infrastructure from cabling within the identified route corridors R4_5 to Pentwortham and R4_6 to Pentwortham; and the identified route corridors PA_1 to Birkhill Wood, R4_1 to Birkhill Wood and R4_2 to Birkhill Wood. Whilst potentially affected interface areas include Penwortham, and Birkhill Wood. There is potential for subsequent disruption to the services these onshore infrastructures provide due to multiple routes being planned in one corridor or interface area. If not carried out in a coordinated and well-planned manner, there is potential for such infrastructure to be impacted multiple times over a prolonged time span.

There is potential for cumulative negative effects on roads and/or railway lines from cabling within the identified route corridors Kilmarnock South to Ballantrae, Ballantrae to Pentir and SW_W1 to Ballantrae; R4_5 to Penwortham and R4_6 to Pentwortham; PA_1 to Birkhill Wood, R4_1 to Birkhill Wood and R4_2 to Birkhill Wood (roads and railway lines); and R4_3 to Weston Marsh and SW_E1a to Lincolnshire Connection Node. The potentially affected interface areas include Ballantrae, Pentwortham and BCNirkhill Wood. There is potential for subsequent disruption to the service these transport routes provide due to multiple routes being planned in one corridor. If not carried out in a coordinated and well-planned manner, there is potential for such infrastructure to be impacted multiple times over a prolonged time span.

Shipping and Navigation

There is potential for cumulative negative effects on shipping and navigation from cabling within identified route corridors Kilmarnock South to Ballantrae, Ballantrae to Pentir and SW_W1 to Ballantrae Tee; R4_5 to Penwortham and R4_6 to Pentwortham; R4_3 to Weston Marsh and SW_E1a to Lincolnshire Connection Node; SW_E1a to Lincolnshire Connection Node and SW_E1a to Hawthorn Pit; PA_1 to Birkhill Wood, R4_1 to Birkhill Wood and R4_2 to Birkhill Wood; and PA_1 to Birkhill Wood, R4_1 to Birkhill Wood, R4_2 to Birkhill Wood and SW_E1a to Lincolnshire Connection Node. Potential cumulative effects include displacement of vessels, risk of collision and allision, risk of entanglement of anchors with subsea cables or protective structures used over cables and impacts on search and rescue, primarily due to multiple routes being planned in one corridor. If not carried out in a coordinated and well-planned manner, there is potential for shipping and navigation to be impacted multiple times over a prolonged time span.

Commercial Fisheries

There is potential for cumulative negative effects on commercial fisheries operations from cabling within identified route corridors Kilmarnock South to Ballantrae, Ballantrae to Pentir and SW_W1 to Ballantrae Tee; R4_5 to Penwortham and R4_6 to Pentwortham; R4_3 to Weston Marsh and SW_E1a to Lincolnshire Connection Node; SW_E1a to Lincolnshire Connection Node and SW_E1a to Hawthorn Pit; PA_1 to Birkhill Wood, R4_1 to Birkhill Wood and R4_2 to Birkhill Wood; and PA_1 to Birkhill Wood, R4_1 to Birkhill Wood, R4_2 to Birkhill Wood and SW_E1a to Lincolnshire Connection Node. Potential cumulative effects may be due to temporary displacement from traditional fishing grounds, increased collision risk of fishing vessels, risk of entanglement of fishing gear, which is primarily due to multiple routes being planned in one corridor. If not carried out in a

coordinated and well-planned manner, there is potential for commercial fisheries to be impacted multiple times over a prolonged time span. There is potential for negative cumulative effects on the profitability of commercial fishing. This includes the potential for reduced quotas, increased resource competition for fishing, and reduced landings in both tonnage and economic value.

There is potential for negative cumulative negative effects within these identified corridors on commercial fish species and their key habitats due to the potential for a direct loss of supporting habitats, such as spawning and nursery grounds, due to sediment mobilisation, and effects due to EMFs from cables impacting EMF-sensitive species. These could have an indirect effect on fishing activity through an alteration of fishing stocks.

Military

There is potential for cumulative negative effects on military activities, including disruption of military exercises and activities within military danger areas, which is primarily due to multiple routes being located within one military area. Identified route corridors SW_E1a to Hawthorn Pit and SW_E1a to Lincolnshire Connection Node both cross the Druridge Bay Military Danger Area, whilst the Ballantrae to Pentir and SW_W1 to Ballantrae Tee identified route corridors both cross the Campbeltown Military Danger Area. If not carried out in a coordinated and well-planned manner, there is potential for military activities to be impacted multiple times over a prolonged time span.

Agriculture

There is potential for cumulative negative effects on agriculture from cabling within the identified route corridors from PA_1 to Birkhill Wood, R4_1 to Birkhill Wood and R4_2 to Birkhill Wood; R4_3 to Weston Marsh and SW_E1a to Lincolnshire Connection Node; and R4_5 to Penwortham and R4_6 to Pentwortham. Potentially affected interface areas include Pentwortham and Birkhill Wood. Potential cumulative effects may be due to an increased loss of agricultural land and soils, restrictions in access to agricultural land, direct damage to field drains, secondary effects on agriculture due to pollution of water sources being used for irrigation or as a livestock source and introduction of soil-borne pests and diseases were to occur from construction process. This is primarily due to multiple routes being planned in one corridor. If not carried out in a coordinated and well-planned manner, there is potential for agriculture to be impacted multiple times over a prolonged time span.

Commercial Forestry

There is potential for cumulative negative effects on commercial forestry due to increased loss of woodland within the onshore cable corridors and interface areas. Potentially affected identified route corridors include Kilmarnock South to Ballantrae, Ballantrae to Pentir and SW_W1 to Ballantrae Tee; R4_5 to Penwortham and R4_6 to Pentwortham; PA_1 to Birkhill Wood, R4_1 to Birkhill Wood and R4_2 to Birkhill Wood; and R4_3 to Weston Marsh and SW_E1a to Lincolnshire Connection Node. Potentially affected interface areas include Ballantrae, Pentwortham and Birkhill Wood. Cumulative effects could result in a reduction in income levels for this industry. If not carried out in a

coordinated and well-planned manner, there is potential for commercial forestry to be impacted multiple times over a prolonged time span.

Cultural Heritage

There is potential for cumulative negative indirect effects on marine archaeological/heritage assets during the construction and decommissioning phases, where assets are avoided but are in proximity to more than one route. Potentially affected identified route corridors include SW_E1a to Hawthorn Pit and SW_E1a to Lincolnshire Connection Node; PA_1 to Birkhill Wood, R4_1 to Birkhill Wood and R4_2 to Birkhill Wood; R4_6 to Penwortham and R4_t to Penwortham; and Kilmarnock South to Ballantrae, Ballantrae to Pentir and SW_SW1 to Ballantrae Tee. Cumulative effects may be due to indirect destruction, damage or disturbance to known and unknown features through alterations in the seabed morphology from suspended sediment levels and/or scour due to seabed preparation techniques and cable burial methods. This could also include the potential for indirect effects in the medium to long-term operational phase owing to the potential for scouring and exposure to occur around features in the vicinity of cables and cable protection materials, leading to indirect damage or degradation, sediment deposition and further burial of features in proximity to more than one cable route.

There is potential for cumulative negative indirect effects on terrestrial heritage assets through indirect damage, where assets are avoided but are in proximity to more than one route. Potentially affected route corridors include Kilmarnock South to Ballantrae, Ballantrae to Pentir and SW_W1 to Ballantrae Tee; R4_5 to Penwortham and R4_6 to Pentwortham; PA_1 to Birkhill Wood, R4_1 to Birkhill Wood and R4_2 to Birkhill Wood; and R4_3 to Weston Marsh and SW_E1a to Lincolnshire Connection Node. Whilst the potentially affected interface areas include Birkhill Wood, Ballantrae and Penwortham.

There is potential for cumulative effects on the setting of designated and non-designated terrestrial heritage sites and archaeological features, as well as coastal heritage assets within the routes and interface areas stated above. These are due to the presence of machinery and equipment involved in construction and decommissioning phases, or if landscape elements are not reinstated post-construction, where heritage assets are in proximity to more than one cable route and where new infrastructure is required within interface areas for more than one identified route corridor.

There is also potential for cumulative negative long-term effects on the setting of heritage assets in these areas in the operational phase due to the presence of new interface infrastructure within the interface areas stated above, including through alterations in the landscape/removal of vegetation to facilitate development.

Landscape, Seascape and Visual Amenity

There is potential for cumulative negative short-term landscape effects where identified route corridors or interface areas are within the same National Landscape Character Areas. The identified route corridors, which fall within the same National Landscape Character Area, include Kilmarnock South to Ballantrae, Ballantrae to Pentir and SW_W1 to Ballantrae Tee; R4_5 to Pentwortham and R4_6 to Pentwortham; PA_1 to Birkhill

Wood, R4_1 to Birkhill Wood and R4_2 to Birkhill Wood; and R4_3 to Weston Marsh and SW_E1a to Lincolnshire Connection Node. If corridors are not spatially and temporally planned in a coordinated manner, there could be an increased area and timescale of impacts on these. There is potential for cumulative negative medium to long-term landscape effects where new infrastructure is required within interface areas for more than one identified route corridor, particularly where the Landscape Character types are recognised as sensitive to new development. Interface areas which may be impacted by cumulative effects in association with the interface infrastructure include Birkhill Wood, Ballantrae and Pentwortham.

There is potential for cumulative negative short-term visual effects on local populations where identified route corridors are in proximity. Potentially affected corridors include R4_5 to Penwortham and R4_6 to Penwortham; and PA_1, R4_1, and R4_2 to Birkhill Wood. There is potential for cumulative negative medium to long-term landscape effects where new infrastructure is required within interface areas for more than one identified route corridor. Potentially impacted interface areas include Birkhill Wood and Pentwortham. If development is not spatially and temporally planned in a coordinated manner within these interface areas and identified route corridors, there could be an increased timescale of impacts on these.

Consideration of Alternatives

Alternative SW_N4 to Arnish Alternative

Biodiversity, Flora and Fauna

The alternative route avoids the Lewis Peatlands SAC but passes through the Inner Hebrides and the Minches and the North East Lewis MPA and still passes through the Lewis Peatlands SPA and Ramsar site. Tong Saltings SSSI and Gress Saltings SSSI are within the route corridor but should be avoidable. There are areas of moderate to very high relative density for harbour seal within the route corridor and the seal haul out site of Sgeir Leathann (Broad Bay) is also within the corridor. There are areas of relatively moderate to very high density for minke whale, moderate to high density for white-beaked dolphin, moderate density for harbour porpoise and for seabirds.

Population and Human Health

There are no additional sensitivities within the alternative route.

Geology, Soils and Land Use

The Alternative SW_N4 to Arnish Alternative identified route corridor has key environmental constraints and sensitivities which have potential to be impacted upon by the laying of cabling. The North-east Lewis MPA is unavoidable within the offshore identified route corridor, which is designated for its geodiversity of quaternary geology and marine geomorphology of the Scottish Shelf Seabed. The seabed substrate primarily consists of coarse-grained sediments with extensive areas of offshore rock and sand present which are unavoidable. Annex 1 reef habitats are present within the identified route corridor; however, these are avoidable. An area of potential contamination is present in the form of a dredge spoil dumping site within the identified

route corridor; however, this is avoidable. Within the onshore identified route corridor, areas of peatland are unavoidable, there are areas of shallow soils of exposed rock onshore which are avoidable. The onshore identified route corridor crosses areas of agricultural land primarily of poor quality.

Water

The Alternative SW_N4 to Arnish identified route corridor is no different than the identified route corridor of SW_N4 to Arnish. This identified route corridor is located within the MSFD Celtic Seas sub region where GES has not been achieved for all descriptors due to a variety of pressures from commercial fisheries, non-native species and from climate change. Several coastal waterbodies are within the identified route corridor of which these are either high or good status. Several lakes are located onshore; however, these are avoidable, while rivers present within the onshore identified route corridor have limited scope to be avoided. There are National Flood Zones present within the onshore identified route corridor and at landfall, with limited scope to avoid these within the onshore identified route corridor. No bathing waters or shellfish waters are located within the identified route corridor. A dredge spoil dumping ground is present within the offshore identified route corridor; however, this is avoidable.

Air

There are no additional sensitivities within the alternative route.

Climatic Factors

There are no additional sensitivities within the alternative route.

Material Assets

There are two additional avoidable offshore outfall pipelines (a total of 11) located around the coast within the alternative route corridor at Stornoway. Additionally, the alternative route corridor does not contain the oil diffuser in Stornoway Bay present in the identified route corridor. There are marginally fewer unavoidable roads present within the alternative route corridor. There is one avoidable wind farm at Beinn Ghrideag Farm present within the alternative route corridor.

The majority of the alternative route corridor encounters larger, unavoidable areas of moderate and low shipping density around the mouth of Broad Bay and within the Northern Minch. There are also avoidable areas of high shipping density within the Northern Minch that are not present within the original SW_N4 to Arnish identified route corridor. There are two avoidable anchorage areas within the Alternative route corridor at Broad Bay and Stornoway Bay, respectively; only the Stornoway Bay anchorage area is present in the original SW_N4 to Arnish identified route corridor.

The alternative route crosses larger areas of unavoidable low fishing activity, as well as areas of moderate fishing activity and a small area of high fishing activity north-east of Stornoway, which are also unavoidable. There are unavoidable areas that are important to commercial fish species, including unavoidable spawning grounds for nephrops, cod, herring, lemon sole, Norway pout, Plaice, Saithe, Sandeel, sprat and whiting, the spawning areas for Plaice, Saithe, Sandeel and whiting are not located within the

original route. There are also unavoidable nursery areas for nephrops, haddock, mackerel, Norway pout, saithe, sand eel, whiting, lemon sole and plaice within the alternative route corridor, saithe, sand eel, whiting and plaice nursery grounds are not located in the original SW_N4 to Arnish identified route corridor.

There are marginally more avoidable areas of woodland within the Alternative route corridor.

Cultural Heritage

There are similar numbers of avoidable shipwrecks (27 instead of 25), and avoidable marine Trove Heritage assets (171 instead of 164) located within the alternative route corridor.

There are slightly fewer terrestrial Trove Heritage Points (512 instead of 577) and Listed Buildings (199 instead of 218) in the alternative route corridor. However, the alternative route corridor encounters slightly more Scheduled Monuments (six instead of four) and the same number of Parks and Gardens (1) and Conservation Areas (1). In both corridors, the Scheduled Monuments, Listed Buildings, Parks and Gardens, and Conservation Areas are likely to be avoidable. There are no significant features outside either identified route corridor at risk from secondary impacts.

Landscape, Seascape and Visual Amenity

There are no known seascape designations within the offshore sections of either the identified route corridor in the SW_N4 to Arnish identified route corridor or the alternative route corridor.

There are also no Landscape Designations within the onshore sections of either route corridor. There are five National Landscape Areas within the identified route corridor and only three within the alternative route corridor. For the onshore section of the route corridor, there are slightly fewer urban areas within the alternative route corridor compared to the identified route corridor (three instead of 5), all of which have the potential to be avoided. Areas of low population density are present within both route corridors.

Dogger Bank D PA_1 to Birkhill Wood

Biodiversity, Flora and Fauna

The alternative route also passes through both the Dogger Bank SAC and the Southern North Sea SAC, as well as the Greater Wash SPA, which cannot be avoided. The Holderness Offshore and Holderness Inshore MCZs are within the route corridor but should be avoidable. As for the route PA_1 to Birkhill Wood, the Leven Canal SSSI is also within the alternative route, but should be possible to avoid. There are no NNRs or LNRs within the alternative route corridor. As for the route PA_1 to Birkhill Wood, there are areas of relatively moderate density for grey seal and relatively moderate to high density for harbour seal within the route corridor offshore of Birkhill Wood. There are also areas of relatively moderate density for harbour porpoise and relatively moderate to high density for fin whale. There are areas of ancient woodland within the onshore route corridor which should be possible to avoid. The alternative route corridor avoids the

FOCI habitat of tide-swept channels. Similar to the route PA_1 to Birkhill Wood, there are areas of Annex I sandbank that cannot be avoided within the route corridor and areas of Annex I reef that should be possible to avoid.

Population and Human Health

There are no additional sensitivities within the alternative route.

Geology, Soils and Land Use

The Dogger Bank to Birkhill Wood identified route corridor has key environmental constraints and sensitivities which have potential to be impacted upon by the laying of cabling. The Dogger Bank SAC is unavoidable within the offshore identified route corridor as the generation site is within the SAC, which is designated for sublittoral sandbank habitat. Annex I sandbanks are unavoidable within the identified route corridor. The seabed substrate primarily consists of extensive areas of sand, coarse-grained sand and muddy sand. The onshore identified route corridor intersects areas of agricultural land primarily of very good or good quality.

Water

The Dogger Bank to Birkhill Wood identified route corridor is located within the MSFD Greater North Sea sub region where GES has not been achieved for all descriptors due to a variety of pressures including those on demersal fish species composition and declines on breeding bird populations. The Yorkshire South coastal waterbody is within the identified route corridor and is of moderate ecological status. Several lakes are located onshore; however, these are avoidable, while rivers present within the onshore identified route corridor have limited scope to be avoided. There are National Flood Zones present within the onshore identified route corridor and at landfall, with limited scope to avoid these within the onshore identified route corridor. No bathing waters or shellfish waters are located within the identified route corridor. The Staxton Military Danger area is unavoidable within the offshore identified route corridor.

Air

There are no additional sensitivities within the alternative route.

Climatic Factors

There are no additional sensitivities within the alternative route.

Material Assets

There are five offshore cables within the alternative route corridor, of which four are unavoidable. These include three telephone, one powerline and one undefined cable. The original SW_N4 to Arnish identified route contains four unavoidable offshore cables. In terms of offshore gas infrastructure, there are six unavoidable offshore pipelines in the original SW_N4 to Arnish identified route corridor and only three in the alternative route (route (one avoidable and two unavoidable). There are 13 avoidable oil/gas wells within the original SW_N4 to Arnish identified route corridor and only and three avoidable oil/gas wells in the alternative route corridor. The alternative route also crosses a shorter length of the unavoidable offshore wind farm cable (Dogger Bank A),

as well as roughly the same length of the unavoidable Endurance C02 storage pipeline within the route corridor.

The same onshore infrastructure is encountered within both route corridors.

Both route corridors predominantly cross areas of moderate shipping density, with significant areas of high shipping density along busy ferry and shipping lanes along the coast; however, the alternative route crosses slightly more areas of moderate shipping density.

Both route corridors predominantly cross unavoidable areas of moderate fishing activity, with some areas of high fishing activity present, however, the alternative route crosses slightly less areas of low or moderate fishing activity. There are unavoidable areas that are important to commercial fish species, including unavoidable spawning grounds for cod, herring, lemon sole, mackerel, plaice, sole, sandeel, sprat and whiting are present in both routes. Unavoidable nursery areas for cod, sandeel, sprat, whiting, lemon sole and plaice are also present in both routes.

The Staxton Danger Area (D412) is not impacted by the alternative route corridor, however, the avoidable onshore military area, namely Skipsea ROC Post, is present in both route corridors.

Both route corridors encounter roughly the same large areas of unavoidable moderate-quality prime agricultural land.

Both route corridors encounter roughly the same potentially avoidable areas of woodland.

Cultural Heritage

There are 35 shipwrecks located within both the identified and alternative route corridor, all of which are likely to be avoidable. There are slightly more Scheduled Monuments (24 instead of 23), 85 Listed Buildings (100 instead of 85), and Defence Heritage Sites (16 instead of 11) located within the alternative route corridor. Both corridors have the same number of Parks or Gardens (1) and Conservation Areas (8). The Park or Gardens, Scheduled Monuments, Listed Buildings, Defence Heritage Sites and Conservation Areas are all likely to be avoidable in both route corridors. There are also heritage assets located in proximity to both corridors, which may be at risk from secondary impacts.

Landscape, Seascape and Visual Amenity

There are no known Seascape designations within the offshore sections of either the identified route corridor in the recommended design or the alternative route corridor.

There are also no Landscape Designations within the onshore sections of either route corridor. There are five National Landscape Areas within the identified route corridor and only three within the alternative route corridor. For the onshore section of the route corridor, there are slightly fewer urban areas within the alternative route corridor compared to the identified route corridor (three instead of 5), all of which have the potential to be avoided. Areas of low population density are present within both route corridors.

In comparison to the identified route corridor, there are more Marine Character Areas crosses by the offshore section of the alternative route corridor (six instead of five), namely Breagh Oil and Gas Field, Dogger Bank, Dogger Bank Edge (not within identified route corridor), Dogger Deep Water Channel, Holderness Coastal Waters and North Yorkshire Coastal Waters. There is no potential to avoid any of these Marine Character Areas in either route corridor.

There are no landscape designations within the onshore section of the identified or alternative route corridors. The onshore sections of both corridors are extremely similar and, as such, the same sensitivities are encountered.

9.1.2 HNDFUE Scotwind – Recommended Design

The HNDFUE Scotwind Recommended Design contains the proposed connections shown in Table 32. The HNDFUE Scotwind Recommended Design Study Area is shown in Figure 44.

Start Point	End Point	Interface Requirements	Capacity
SW_N3 (Talisk)	Arnish	1 Developer AC Substation	500 HVAC
SW_N2 (Havbredey)	Dounreay	1 AC Developer Substation	1,500 HVAC
SW_NE2 (Ayre)	Banniskirk	1 AC Developer Substation	1,050 HVAC
SW_NE3 (Stromar)	New Deer 2/Greens	1 AC Developer substation, 1 AC Transmission Owner (TO) Substation	1,000 HVAC
SW_NE4 (Caledonia)	New Deer	1 AC Developer Substation	550 HVAC
SW_NE6 (Broadshore)	Peterhead 2 / DCSS	1 AC Developer Substation	1,000 HVAC
SW_NE7 (Marram)	Peterhead 2 / DCSS	1 DC Developer Connection	1,500 HVAC
SW_NE8 (Buchan)	Peterhead 1	1 AC Developer Substation	1,000 HVAC
SW_E2b (Muir Mhor)	Peterhead 2 / DCSS	1 AC Developer Substation	2,000 HVAC
SW_E2b (Muir Mhor)	SW_E2a_1 (Campion)	N/A	2,000 HVAC
SW_E3 (Bowdun)	Fiddes	1 AC Developer Substation	1,050 HVAC
SW_E2a_1 (Campion)	SW_E2a_2	N/A	2,500 HVAC
SW_E2a_2 (Campion)	SW_E1c_1 (Ossian)	N/A	2,000 HVAC
SW_E2a_2 (Campion)	Richborough	1 Developer DC Converter Station	2,000 HVDC
SW_E1a (Morven)	Branxton	1 DC Developer Converter Station	1,500 HVDC
SW_E1a (Morven)	SW_E1c_2	N/A	2,000 HVAC
SW_E1c_1 (Ossian)	SW_E1c_2	N/A	1,000 HVAC

Start Point	End Point	Interface Requirements	Capacity
SW_E1c_1 (Ossian)	Lincolnshire Connection Node	1 Developer DC Converter Stations	2,000 HVDC
SW_E1c_2 (Ossian)	Weston Marsh	1 Developer DC Converter Station	2,000 HVDC
SW_NE1a (Stoura)	Shetland Hub	1 AC Developer Substation	500 HVAC
SW_NE1b (Arven)	Shetland Hub	1 AC Developer Substation	1,800 HVAC
SW_NE1c (Arven)	Shetland Hub	1 AC Developer Substation	500 HVAC
Shetland Hub	Blackhillock	1 DC Transmission Owner (TO) Converter Station	1,800 HVDC

Table 32: HNDFUE Scotwind Recommended Design proposed connections

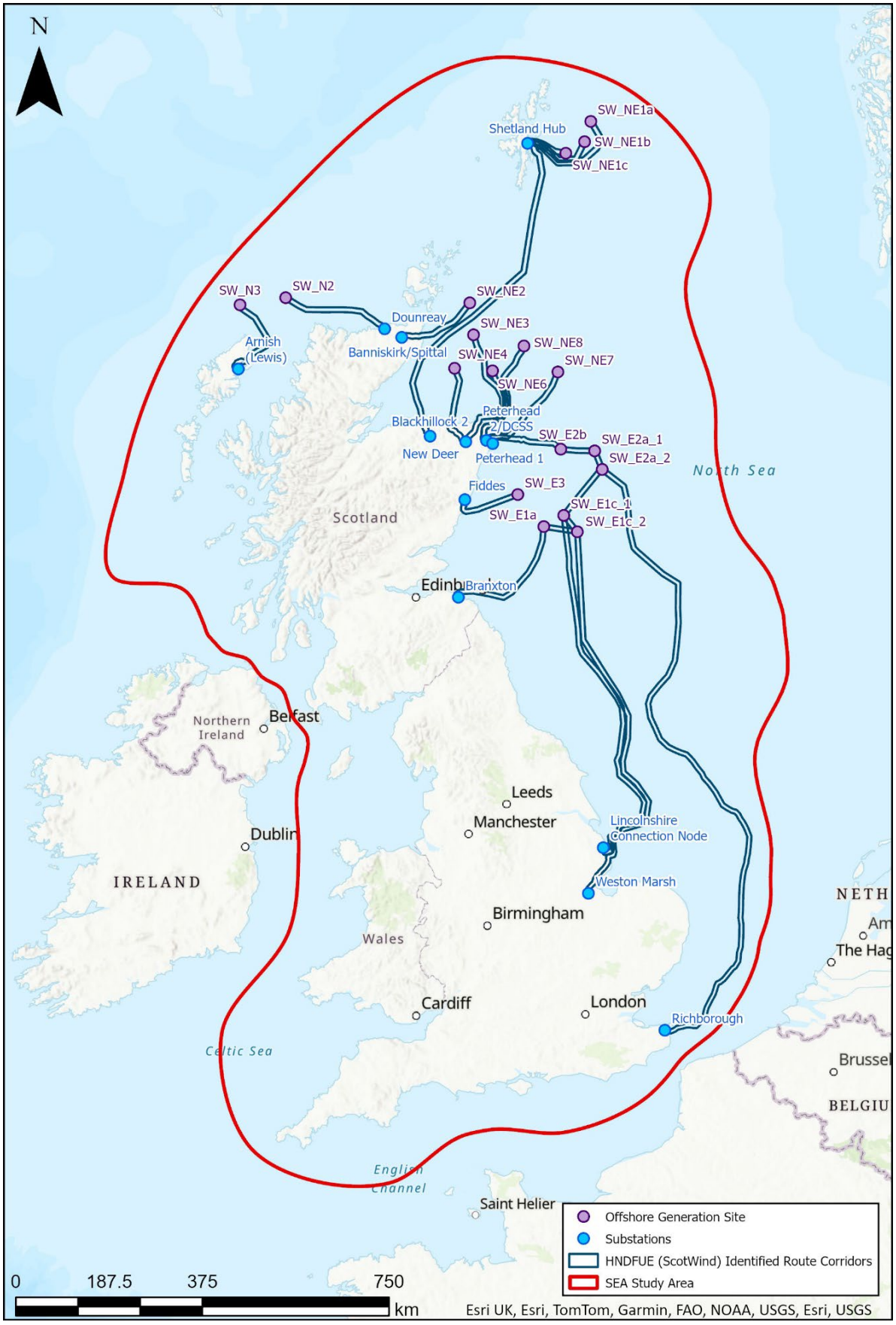


Figure 44: HNDFUE Scotwind Recommended Design Study Area

Environmental Baseline and Key Issues within the Study Area

Biodiversity, Flora and Fauna

There are numerous designated sites that are within the identified route corridors. This includes 12 SACs namely the Inner Hebrides and the Minches SAC, Lewis Peatlands SAC, Caithness and Sutherland Peatlands SAC, Loch of Wester SAC, Loch Watten SAC, Southern North Sea SAC, Sandwich Bay SAC, Thanet Coast SAC, The Wash and North Norfolk Coast SAC, Buchan Ness to Collieston SAC, River Spey SAC, and Lower River Spey- Spey Bay SAC. There are 14 SPAs within the identified route corridors, including Lewis Peatlands SPA, North Caithness Cliffs SPA, Caithness and Sutherland Peatlands SPA, Caithness Lochs SPA, Buchan Ness to Collieston Coast SPA, Loch of Strathbeg SPA, Thanet Coast and Sandwich Bay SPA, Outer Firth of Forth and St Andrews Bay Complex SPA, Greater Wash SPA, The Wash SPA, East Mainland Coast, Shetland SPA, Moray Firth SPA, The Noss SPA, and Moray and Nairn Coast SPA. There are also seven Ramsar sites within the identified route corridors, Lewis Peatlands, Caithness and Sutherland Peatlands, Caithness Lochs, Loch of Strathbeg, Thanet Coast and Sandwich Bay, The Wash, and Moray and Nairn Coast. The River Thurso SAC, Saltfleetby-Teddlethrope Dunes and Gibraltar Point SAC, and Humber Estuary SPA and Ramsar site are also within the wider vicinity of interface areas.

There are two MCZs within the identified route corridors, both of which are within the route corridor to Richborough; these are Thanet Coast MCZ and Goodwin Sands MCZ. In Scottish waters, there are also five Nature Conservation MPAs within the identified route corridors, North-east Lewis MPA, Noss Head MPA, Southern Trench MPA, Turbot Bank MPA, and Firth of Forth Banks Complex MPA.

There are 20 SSSIs designated for ecological features that are within the identified route corridors. These are Gress Saltings SSSI, Tong Saltings SSSI, Sandside Bay SSSI, Red Point Coast SSSI, East Halladale SSSI, Loch of Wester SSSI, Loch of Winless SSSI, Loch Scarmclate SSSI, Moss of Killimster SSSI, Rosehearty to Fraserburgh Coast SSSI, Loch of Strathbeg SSSI, Rora Moss SSSI, Sandwich Bay to Hacklinge Marshes SSSI, Barns Ness Coast SSSI, Sea Bank Clay Pits SSSI, The Wash SSSI, Bratoft Meadows SSSI, Spey Bay SSSI, Lower River Spey SSSI, and River Spey SSSI. There are also additional SSSIs within the wider vicinity of interface areas.

There is one NNR within the identified route corridor to Richborough, the Sandwich and Pegwell Bay NNR. The Lincolnshire Coronation Coast NNR is within the wider vicinity of the Lincolnshire Connection Node interface area. In England and Wales, the LNRs of Havenside and Prince's Beachlands are within the identified route corridors, while in Scotland there are 24 Local Nature Conservation Sites for biology / biodiversity that lie within the identified route corridors: Aberdour Bay to Kinnaird Head; Annies Dam; Arbuthnott; Benholm; Cairnbulg to St Combs; Cortes Reedbed; Cullen to Whitehills; Middlemuir; Rattray Head to Peterhead; Rora Moss; Sinclair Hills; Skelmanae Raised Bogs; Strathbeg to Rattray; Todhead Point to Johnshaven Coast; Spott Burn Valley; Bilsdean Coast; Dryburn Valley; Dunglass Burn; Thurston Burn Valley 2; Dunglass Dean and Berwick Burn; Grunna Water; Catfirth; Loch of Benston; and Loch of Kirkabister.

There are three RSPB sites that lie within the identified route corridors: Frampton Marsh and Freiston Shore within the route corridor to Weston Marsh, and Loch of Strathbeg within route corridors to Peterhead 1 and Peterhead 2 / DCSS. There are also 12 IBAs: Buchan Ness to Collieston Coast IBA; Caithness Cliffs IBA; Caithness Lochs IBA; Lewis Peatlands IBA; Loch of Strathbeg IBA; Moorland Areas, Central Shetland IBA; Moray Basin, Firths and Bays IBA; Caithness and Sutherland Peatlands IBA; Rosehearty to Fraserburgh Coast IBA; Thanet Coast and Sandwich Bay IBA; The Wash IBA; and Stornoway to Back, Lewis IBA. The seabird density within the identified route corridors is generally of relatively low to moderate density, with areas of relatively moderate to high density in the identified route corridors to Richborough, Lincolnshire Connection Node, Weston Marsh, Peterhead1, Peterhead 2 / DCSS and Shetland. There are areas of relatively moderate to high modelled density for Atlantic puffin within the identified route corridors to Arnish, Spittal, Dounreay, and north-east England; relatively moderate to high density for black-legged kittiwake within identified route corridors off the north and east coast of Scotland and north-east England; relatively high density for herring gull within the identified route corridor to Fiddes; relatively moderate to high density for common guillemot within identified route corridors off Scotland and north-east England; relatively low to moderate density for European shag within identified route corridors off the coast of Scotland; relatively moderate to high density for northern fulmar off the coast of Scotland and north-east England; generally low to moderate density for northern gannet, with relatively high density within identified route corridors to Arnish, Dounreay and Shetland; and generally low density for razorbill, with relatively moderate to high density within identified route corridors to Arnish, Spittal, Dounreay and Fiddes.

The predominant seabed habitat types within the identified route corridors include deep circalittoral sand, deep circalittoral coarse sediment, and deep circalittoral mud. There is a known area of Annex I sandbank within the identified route corridor to Richborough in the outer Thames estuary, while large areas of Annex I sandbank such as Dogger Bank and the North Norfolk sandbanks are adjacent to but avoided by the identified route corridor to Richborough. Known areas of Annex I saltmarsh occur within the identified route corridors to Arnish, Spittal, Blackhillock, Peterhead 1, Peterhead 2 / DCSS, and Weston Marsh. Known areas of Annex I Reef also occur within the majority of identified route corridors. Onshore, there are areas of ancient woodland within the identified route corridors, including those to Dounreay, New Deer, Peterhead 2 / DCSS, Peterhead 1, Fiddes, Branxton, and Blackhillock.

There are OSPAR habitats within the identified route corridors, including kelp forests, Modiolus modiolus horse mussel beds, sea-pen and burrowing megafauna communities, littoral chalk communities, intertidal mudflats, and Sabellaria spinulosa reefs. In Scottish waters there are PMF habitats within the identified route corridors, including many areas of offshore subtidal sands and gravels, as well as horse mussel beds, offshore deep-sea muds, and burrowed mud (sea-pen and burrowing megafauna in circalittoral fine mud). In English and Welsh waters there are FOCI within the identified route corridors to Lincolnshire Connection Node and Weston Marsh, including subtidal chalk, littoral chalk communities, and tide-swept channels.

There are identified route corridors that lie within the Celtic and Greater North Seas MU for the White-sided dolphin, White-beaked dolphin, Risso's dolphin, Minke whale, Harbour porpoise, and Common dolphin, and within the Irish Sea, Coastal East Scotland, Greater North Sea, Coastal West Scotland, and Oceanic waters Mus for Bottlenose dolphin. Within the identified route corridors, there are areas of relatively moderate to high density for minke whale off the north-west and north-east coasts of Scotland. There is relatively moderate to high density for white-beaked dolphin within identified route corridors off the coast of Scotland and north-east England. There are areas of relatively moderate to high density for harbour porpoise within identified route corridors off the north-west of Scotland and off the east coast of Scotland and England; areas of relatively moderate to high density for fin whale within east coast route corridors; relatively moderate density for beaked whale off the Isle of Lewis in north-west Scotland; and areas of relatively moderate density for Risso's dolphin within the route corridors to Arnish, Dounreay and Spittal.

There are four designated seal haul-out sites within the identified route corridors, including Sgeir Leathann (Broad Bay) in the route corridor from SW_N3 to Arnish, Scudills Wick and Eswick Holm in the route corridors to Shetland Hub, and Hoo Stack in the route corridor from Shetland Hub to Blackhillock. For grey seals, there is an area of relatively very high density within the identified route corridor from SW_NE2 to Spittal, and relatively moderate to high density within several route corridors off the east of Scotland as well as in the route corridors to Lincolnshire Connection Node and Weston Marsh. For harbour seals, there are areas of relatively high to very high density within identified route corridors off Scotland and south-east England, and relatively moderate density for all route corridors, with the exception of those route corridors that are solely in offshore regions.

There are areas of known ecological importance for fish within the identified route corridors. This includes high intensity spawning grounds for sole of the south-east of England within the route corridor to Richborough, for sandeel within many of the route corridors off the east coast of Scotland and within the route corridor to Richborough, and for Plaice within the route corridors off the east of England to Lincolnshire Connection Node, Weston Marsh and Richborough. This also includes low intensity spawning grounds for whiting off the east coast of Scotland and England, horse mackerel off south-east England, mackerel off north-west Scotland, and nephrops off Scotland and eastern England. There are also high intensity nursery grounds for whiting within many identified route corridors; for spurdog within route corridors off the north-west of Scotland; for blue whiting within route corridors off the north of Scotland; for anglerfish within route corridors off the north and north-east of Scotland; and for herring and cod within several route corridors throughout the study area. There are also low intensity nursery grounds for tope shark, thornback ray, spotted ray, sole, sandeel, plaice, ling, mackerel, hake, common skate and nephrops within the route corridors.

Population and Human Health

The settlements within the identified route corridors of the HNDFUE (ScotWind) recommended design include the urban areas of Dounreay, Bac, Tunga and Stornoway in the north of Scotland. In the north-east of Scotland, the settlements include Keith,

Banff, Whitehills, Fraserburgh, Mintlaw, Longside and Peterhead. In the east of England, the settlements include Sandilands, Chapel Saint Leonards, Hogsthorpe, Burgh Le Marsh, Wainfleet All Saints, Friskney, Wrangle, Old Leake, Leake Commonside, Boston, Benington, Butterwick, Fishtoft, Kirton, Sutterton, Ramsgate St Lawrence and Cliffsend. There are areas of moderate population density at Ciffsend / Ramsgate. There are areas of the highest perceived deprivation at Ramsgate, Mabelthorpe, Skegness, Peterhead and Fraserburgh. There are areas of relatively higher perceived deprivation at Cliffsend, Maltby le Marsh, Wrangle, Kirton, Banff, Keith and Stornoway, and areas of relatively moderate perceived deprivation at Minster, Frampton, Weston Marsh, Innerwick, Lathallan, Longhaven, Longside, Fiddler's Green, Nittanshead, New Deer, King Edward, Ladysbridge, Keith, Myrelandhorn, Spittal, Dounreay and Arnish.

There are bathing waters within the identified route corridors, including Anderby, Chapel St Leonards, Fraserburgh (Tiger Hill), Inverboyndie, Moggs Eye, Peterhead (Lido), Ramsgate Sands, Ramsgate Western Undercliffe, Sandwich Bay, Sutton-on-Sea, Thorntonloch and Whitesands. There are also additional bathing water sites within the vicinity of the identified route corridors.

There are marinas within the identified route corridors, including Banff Harbour Marina, Comhairlie nan Eilean Siar, Peterhead Bay Marina, Port of Ramsgate, Portgordon Harbour, Royal Harbour Marina Ramsgate, Sandhaven & Pitullie Harbour, Stornoway Marina and Whitehills Marina. There are areas of recreational boating activity located along the coastline within some identified route corridors. There are areas of high intensity leisure boating activity inshore around Richborough, Peterhead, within the Moray Firth, around Shetland and Stornoway.

There is one Blue Flag Beach within an identified route corridor, at Central Beach. There are two Scotland Award Beaches within the identified route corridors, at Peterhead Lido and Inverboyndie Beach.

There are no known underwater dive sites within the identified route corridors.

There are a significant number (431) of onshore recreation sites within the identified route corridors, including public parks or gardens, playing fields, play spaces, cemeteries, allotments, religious grounds, tennis courts, bowling greens, golf courses, and other sports grounds.

Geology, Soils and Land Use

There are sensitive areas for Geology, Soils and Land Use within the identified route corridors that have the potential to be impacted upon by the development of infrastructure. MPAs are encountered within the offshore section of seven of the identified route corridors; the North-east Lewis MPA is within the SW_N3 (Talisk) to Arnish identified route corridor, with the Southern Trench MPA affected by six identified route corridors. The Thanet Coast MCZ and Goodwin Sands MCZ are encountered within the identified route corridor from SW_E2a_2 (Campion) to Richborough, while the Firth of Forth Banks Complex MPA is partially within the SW_E1a (Morven) to Branxton identified route corridor, however, these are avoidable. The Flow Country WHS is partially within the identified SW_N2 (Havbredey) to Dounreay route corridor, but is avoidable, and the

Shetlands Geopark is present within the identified SW_NE1a (Stoura) to Shetland Hub, SW_NE1b (Arven) to Shetland Hub, and SW_NE1c (Arven) to Shetland Hub route corridors and Shetland Hub interface; however, this is also avoidable.

Generally, the identified route corridors to the north-east of Scotland and east of England feature offshore seabed substrate consisting primarily of sand, muddy sand, and coarse-grained sediments with nearshore areas of rocks and boulders. The identified route corridors in the north-west of Scotland, encounter a complex seabed substrate consisting primarily of sand, muddy sand, mud, and areas of mixed and coarse-grained sediments. The identified route corridors to the south-east of England, also encounter a complex cx I habitats, sandbanks and reefs are encountered by the identified route corridors; reefs are the habitat primarily encountered, given the rocky nature of the coastline around Scotland. For 11 identified route corridors, these habitats are unavoidable, with other identified route corridors having limited scope to avoid these areas. The Pobie Bank Reef SAC is unavoidable within the SW_NE1a (Stoura) to Shetland Hub, SW_NE1b (Arven) to Shetland Hub, and SW_NE1c (Arven) to Shetland Hub identified route corridors. Several SSSIs are located within the identified route corridors and interface areas, and while these can mostly be avoided, there can be limited scope for this, with SSSIs unavoidable for eight identified route corridors.

Areas of potential contamination, dredge disposal and spoil dumping rounds, are present within four of the identified offshore route corridors; however, these are avoidable. There are several unavoidable Military Danger Areas within seven of the identified offshore route corridors, primarily concentrated around the Moray Firth Danger Areas for the SW_NE2 (Ayre) to Banniskirk, SW_NE3 (Stromar) to New Deer 2, the Cape Wrath Danger Areas for SW_N2 (Havbredey) to Dounreay, and the SW_NE4 (Caledonia) New Deer identified route corridors to the north-east of Scotland and the north-east of England around the Staxton and Druridge Bay Danger Areas for the SW_E1c_1 (Ossian) to Lincolnshire Connection Node and SW_E1c_2 (Ossian) to Weston Marsh identified route corridors. Within a further five of the identified offshore route corridors, there are avoidable Military Danger Areas. There are no dumping grounds for explosive munitions present within the identified offshore route corridors or interface areas.

Onshore, there are areas of peatland present within the identified route corridors and interface areas. Typically, these are avoidable; however, for the identified route corridors to the Shetland Hub and the Shetland Hub interface area, areas of peatland are unavoidable. Six identified onshore route corridors contain areas of shallow soils and exposed rock; within the Shetland route corridors and Shetland Hub interface area these are unavoidable. Typically, the identified onshore route corridors and interface areas cross areas of agricultural land of primarily good to moderate quality, which often cannot be avoided for lower quality areas; there are, however, areas of unavoidable excellent quality agricultural land in the identified SW_E1c_2 (Ossian) to Weston Marsh route corridor and very-high quality agricultural land within the identified SW_E1c_1 (Ossian) to Lincolnshire Connection Node identified route corridor. Five of the identified onshore route corridors and four interface areas contain landfills; however, these are avoidable.

Water

Two of the identified route corridors are located within the MSFD Celtic Seas sub region to the north-west of Scotland, where Good Environmental Status has not been achieved for all descriptors due to a variety of pressures from commercial fisheries, non-native species, and from climate change. The remaining identified route corridors are located within the MSFD Greater North Sea sub regions to the east and south-east of England and to the north-east and south-east of Scotland, where Good Environmental Status has also not been achieved for all descriptors due to a variety of pressures, including those on demersal fish species composition and declines in breeding bird populations.

The identified route corridors and interface areas encounter several coastal waterbodies and inland waterbodies. Typically, those coastal waterbodies located within Scotland are of good or high status; while along the east and south-east coast of England, these coastal waterbodies are typically of moderate ecological status, with onshore waterbodies of moderate status in England.

The average wave height around Scotland ranges between 1.3m to 2.5m, compared to the east coast of England, which ranges between 1.2m to 1.7m, and around the south-east coast of England, where it ranges between 0.8m to 1.3m. Greater variability in the mean spring peak flow of tides is observed around the south-east coast of England, ranging between 0.76m/s to 1.76m/s, around Scotland and the east-coast of England, the mean spring peak flow of tides ranges between <0.11m/s to 0.76m/s with lower variability.

For virtually all identified onshore route corridors, rivers are present, and these are typically unavoidable. There are National Flood Zones present within the identified route corridors, onshore and at landfall, which are typically unavoidable, or there is limited scope to avoid. Onshore, lakes, rivers, and national flood zones are present within interface areas; however, these are generally avoidable aside from the Shetland Hub, Weston Marsh, and Lincolnshire Connection Node interface areas. For all identified route corridors around Scotland, areas of coastal flood risk are unavoidable at landfall.

Bathing waters are present within three identified route corridors and within the interface areas of Branxton and Lincolnshire Connection Node; however, these are avoidable. Two shellfish waters are present within two identified route corridors and within the Shetland Hub interface area; however, these are avoidable. Areas of potential contamination are present within four of the identified offshore route corridors, in the form of dredge and spoil dumping grounds; however, these are avoidable.

There are several unavoidable Military Danger Areas within seven of the identified offshore route corridors, primarily concentrated around the Moray Firth Danger Areas for the SW_NE2 (Ayre) to Banniskirk, SW_NE3 (Stromar) to New Deer 2, and the SW_NE4 (Caledonia) to New Deer identified route corridors to the north-east of Scotland, the Cape Wrath Danger Areas for SW_N2 (Havbredey) to Dounreay identified route corridor, and the Staxton and Druridge Bay Danger Areas for the SW_E1c_1 (Ossian) to Lincolnshire Connection Node and SW_E1c_2 (Ossian) to Weston Marsh identified route corridors off the north-east of England. Within five identified offshore route corridors, there are also avoidable Military Danger Areas. There are no dumping grounds for

explosive munitions present within the identified offshore route corridors or interface areas.

Air

There are settlements within the identified route corridors. In the north of Scotland, this includes the urban areas of Dounreay, Bac, Tunga and Stornoway. In the north-east of Scotland, the settlements include Keith, Banff, Whitehills, Fraserburgh, Mintlaw, Longside and Peterhead. In the east of England, the settlements include Sandilands, Chapel Saint Leonards, Hogsthorpe, Burgh Le Marsh, Wainfleet All Saints, Friskney, Wrangle, Old Leake, Leake Commonside, Boston, Benington, Butterwick, Fishtoft, Kirton, Sutterton, Ramsgate St Lawrence and Cliffsend. There are areas of relatively moderate population density at Ciffsend / Ramsgate. There are areas of highest perceived deprivation at Ramsgate, Mabelthorpe, Skegness, Peterhead and Fraserburgh. There are also areas of relatively higher perceived deprivation at Cliffsend, Maltby le Marsh, Wrangle, Kirton, Banff, Keith and Stornoway, and areas of relatively moderate perceived deprivation at Minster, Frampton, Weston Marsh, Innerwick, Lathallan, Longhaven, Longside, Fiddler's Green, Nittanshead, New Deer, King Edward, Ladysbridge, Keith, Myrelandhorn, Spittal, Dounreay and Arnish.

There is one Air Quality Management Area located at Thanet.

There are areas of relatively high intensity leisure boating activity in the inshore areas around Richborough, Peterhead, Shetland, Stornoway and within the Moray Firth.

Climatic Factors

Within the identified route corridors there are areas of high blue carbon potential within routes to Shetland, Arnish, New Deer, Blackhillock, Peterhead, Branxton, Weston Marsh and Richborough. There are shellfish waters located with the identified route corridor to Weston Marsh within The Wash. There are kelp forests and intertidal seaweeds located along the coastline at Broad Bay, Shetland, Sandhaven, Peterhead, Branxton and Richborough.

Onshore, there are areas with potential to be carbon sinks, such as peatland located at Arnish, Dounreay, Myrelandhorn Blackhillock, Shetland, Nittanshead and Peterhead. There are ancient woodlands located at Branxton and Weston Marsh, and areas of woodland (identified through carbon code projects) at Blackhillock. There are also areas of forest located within all onshore routes.

Material Assets

There are numerous submarine cables located within GB waters. Approximately 71 offshore cable connections are intersected by the identified cable route corridors; of these, 20 are telecommunications, 34 are power and 17 are undefined connections. The majority of these cables are encountered in areas off the coasts of Northumberland, Yorkshire, Lincolnshire, Norfolk, Suffolk and Kent.

There are approximately 106 offshore oil and gas pipelines crossed by the identified cable route corridors. The majority of these pipeline crossings are in areas offshore from Peterhead in Scotland, although some are encountered off the coasts of the North

Riding of Yorkshire, Lincolnshire and Norfolk in England. The majority of these offshore pipelines are unavoidable. Fifteen avoidable offshore platforms are located within the identified route corridors; these are all located off the coast of England between the North Riding of Yorkshire and Norfolk. One avoidable outfall diffuser is located within the identified cable route corridors; this is located off the coast of Dounreay in northern Scotland. Additionally, there are 110 avoidable oil/gas wells located within the general area covered by the HNDFUE (ScotWind) recommended design, which are located off the coast of Scotland and England. There is one avoidable oil/gas installation within the identified cable route corridors, which is located offshore of Angus. There are no gas storage sites or gas storage pipeline agreements within the identified route corridors.

There is one offshore carbon capture and storage site agreement located within an identified route corridor, for the Endurance CO2 Storage Facility and Pipelines; the pipelines are not avoidable.

There is one avoidable operational offshore wind farm, located within the identified offshore route corridors, namely the Buchan Deep Demo Wind Farm. There are eight export cables from existing wind farms which are intersected by the identified route corridors, which are accounted for in the 71 submarine cables above. These are mainly located off the east coast of England from the East Riding of Yorkshire through Lincolnshire and Kent, as well as off the north-east coast of Scotland from Moray to Aberdeenshire. Four of these are avoidable, whilst four are unavoidable; the unavoidable cables are located off the coast of the East Riding of Yorkshire and Lincolnshire. There are no existing tidal or wave energy generation sites located within the identified route corridors. There are a number of proposed offshore wind energy generation sites within the identified route corridors, and the HND Implementation Plan is planning to develop connections to these sites in a co-ordinated manner. There are no proposed tidal or wave energy generation sites within the identified route corridors.

A significant amount of onshore infrastructure is located within the identified route corridors. A number of roads and railways located within England and Scotland will need to be crossed by the onshore sections of the identified route corridors and within potential areas for new interface infrastructure. Roads which require crossing include A roads, B roads, local, minor and primary. Railway lines which require crossing include multi-track, single-track, narrow gauge and tunnels. It is possible to avoid these roads and railways with the new interface infrastructure; however, construction vehicles may have to utilise roads temporarily.

There are three fossil fuel power stations located within the identified route corridors. All three are located in Scotland at Arnish, Stornoway and Peterhead, respectively, within potential areas for both onshore cabling and new interface infrastructure. It is possible to avoid these power stations for both the onshore cabling and new interface infrastructure.

Onshore National Grid and Scottish Power transmission infrastructure in England and Scotland are located within the identified route corridors and potential interface areas. This infrastructure includes cables and overhead lines operating at 400kV and 132kV and their associated transmission network towers/poles. There are 15 substations

operating at 400kV, 275kV and 132kV within identified route corridors, and 14 substations within potential interface areas. The majority of the overhead lines are unavoidable by onshore cabling within the identified route corridors, whilst all are avoidable by new interface infrastructure. The cables and substations are avoidable within the identified route corridors by both onshore cabling and the new interface infrastructure, except where substations are the desired end point for some connections.

In terms of onshore gas infrastructure, there are ten onshore pipelines located within the identified route corridors and eight within the interface areas in the vicinity of Peterhead, Hurlie, LCN, and Weston Marsh. Six pipelines are unavoidable for onshore cabling within the identified route corridors, whilst there is potential to avoid all eight pipelines with new interface infrastructure. The St. Fergus Petroleum Terminal is located within the identified route corridors but is avoidable for both onshore cabling and interface infrastructure. There are no LNG facilities or crude oil refineries within any of the identified route corridors.

There are 23 avoidable onshore operational renewable energy sites with a generation capacity over 150kW located within the identified route corridors, of which 12 are located within the interface areas. There are eight wind farms within the identified route corridors, five located in Scotland and three in England. Three of the wind farms are within interface areas (two in England and one in Scotland). There are seven solar photovoltaic sites within the identified route corridors, six of which are located in England and one in Scotland. Three of the solar photovoltaic sites are within the interface areas, all in England. Additionally, four landfill gas sites are located within the identified route corridors, three in Scotland, and one in Lincolnshire in England, and three are located within Scottish interface areas. There are three battery storage sites located within the identified route corridors and the interface areas, one in Scotland and two in Kent in England. In Lincolnshire, there is one advanced conversion technology site located within the identified route corridors. There are no aerobic digestion facilities, air source heat pumps, biomass, hydrogen, geothermal, hydroelectricity or sewage sludge digestion facilities with a generation capacity over 150kW within any of the identified route corridors. In terms of non-renewable energy producing waste management facilities, there is one energy from waste (EfW) facility with a generation capacity over 150kW within the identified route corridors and interface areas, which is located in Lothian in Scotland. All onshore renewable infrastructure and energy from waste infrastructure can be avoided by the onshore cabling and the interface infrastructure.

Wastewater management infrastructure is also located within the identified route corridors, including 13 wastewater treatment/sewage works. Five of these are located in Scotland, whilst eight are located in the onshore sections of identified route corridors in England. Only six of the wastewater treatment/sewage works are within the interface areas; three of these are located in England and three are in Scotland. There are no desalination plants within the identified route corridors or interface areas. All wastewater management infrastructure can be avoided by both the onshore cabling and the new interface infrastructure.

All identified route corridors that comprise the recommended design are within areas where shipping activity occurs; as such, shipping activity is unavoidable. The identified

route corridors are mainly located within areas of relatively lower shipping density; however, closer to the inshore area around the entirety of GB, the shipping density tends to increase to relatively moderate shipping density. These areas of relatively moderate shipping density are unavoidable. The identified route corridors encounter areas of unavoidable relatively high shipping density, generally within inshore areas, where shipping routes connect busy ferry and fishing harbours and ports. There are large, widespread areas of relatively higher shipping density located off the east coast of England and Scotland, with significant areas of high shipping density crossed on approach to Peterhead, Aberdeen and Edinburgh in Scotland, and off the coast from Lincolnshire, Norfolk, Suffolk and Essex in England. Seven avoidable ports are located within the identified route corridors, including ports at Boston, Fraserburgh, Macduff, Ramsgate, Stornoway and two ports at Peterhead. Nine avoidable harbour areas are located within the identified route corridors, including Fraserburgh Harbour, Macduff Harbour, Peterhead Bay Harbour, Peterhead Port Authority, Lerwick Port Authority, Port of Boston Authority, Ramsgate Harbour, Sandwich Port and Haven Commissioners, and Stornoway Harbour.

There are three traffic separation zones located within the identified route corridors. These are all located in the southern North Sea or at the mouth of the Strait of Dover and include the TSS in the approaches to Hook of Holland and at North Hinder (avoidable), the TSS off Botney Ground (unavoidable) and the TSS in the Strait of Dover and adjacent waters (unavoidable). Other ship routing measures within the identified route corridors include an avoidable shipping fairway off the coast of Stornoway, one unavoidable Precautionary Area in the region of the Shetland Isles, an avoidable Precautionary Area in the Strait of Dover and adjacent waters, and two unavoidable deep-water routes within the southern North Sea, namely North Hinder to Indefatigable Bank and North Hinder to off Brown Ridge.

There are five avoidable designated anchorage areas located within the identified route corridors, including one off the coast of Macduff, two off the coast of Stornoway, and two on approach to Ramsgate. There are two avoidable pilot boarding stations located off the coast of Ramsgate and Stornoway.

GB waters are heavily used by commercial fisheries. All identified route corridors which comprise the recommended design are within areas where fishing activity occurs; as such, fishing activity is unavoidable. The identified route corridors are mainly located within areas of relatively lower fishing activity. However, there are areas of unavoidable relatively moderate and high fishing activity located within the identified route corridors. Significant areas of relatively high fishing activity that need to be crossed are located within Moray Firth, south of Shetland, the entrance of the Firth of Forth and off the coast of Aberdeenshire, East Lothian, Lincolnshire and Norfolk. Fleets which are known to operate within the identified route corridors include those targeting whiting, sprat, sole, plaice, Norway pout, mackerel, horse mackerel, herring, hake, haddock, cod, blue whiting, and angler. Areas of relative importance for each of these species are crossed by a number of identified route corridors forming the recommended design. There is one avoidable Salmonid marine fish farm located within an identified route corridor, which is located off the east coast of Shetland.

There are unavoidable known fish spawning grounds located within the identified route corridors. These include sprat, nephrops, cod, haddock, whiting, herring, lemon sole, horse mackerel, mackerel, Norway pout, plaice, saithe, sandeel and sole in various locations across the North Sea. Additionally, there are unavoidable known fish nursery grounds for nephrops, cod, herring, whiting, plaice, blue whiting, haddock, Norway pout, saithe, sandeel, lemon sole, mackerel, sole, sprat, tope shark, thornback ray, spurdog, spotted ray, ling, European hake, common skate and anglerfish.

There are seven onshore military areas located within the identified route corridors, which are mainly located along the coastline of Lincolnshire. Only one of these is located within an interface area at Stornoway. All onshore military areas can be avoided by onshore cabling and interface infrastructure. There are six offshore military danger areas within the identified cable route corridors, of which one is avoidable, X5123 off the coast of Kent, and five are unavoidable, D307: Donna Nook, D412: Staxton, D801/2: Cape Wrath (North West/South East), D513: Druridge Bay and D809 (S, N and C): Moray Firth (South, North and Central). There is also the risk of encountering UXOs in these military danger areas.

There are no airports affected by the recommended design.

There are ten avoidable dredge spoil dumping sites located within the identified route corridors, located off the coasts of Stornoway, Peterhead, Boston and Ramsgate. There are four avoidable dredging navigation areas at Kingston on Spey, Fraserburgh, Macduff and on the Haven River. Five areas of aggregate dredging are located off the coast of England, four of which are off the coast of Lincolnshire, whilst one is off the coast of Kent. These are all avoidable within the relevant route corridors. There are also five offshore aggregate site agreements; four are located off the coast of Lincolnshire and one is off the coast of Kent. These are all avoidable. There are no offshore mining agreements within the identified route corridors.

The identified route corridors and interface areas cross areas of unavoidable potential prime agricultural land. All routes and interface areas contain areas of good quality prime agricultural land, with smaller areas of very good quality prime agricultural land. However, two identified route corridors and their associated interface areas cross relatively significant areas of excellent quality prime agricultural land in Lincolnshire and Kent, respectively. It is not possible for prime agricultural land to be completely avoided by onshore cabling or interface infrastructure.

The identified route corridors and interface areas intersect areas of woodland, which may be utilised for commercial forestry. These include areas of broadleaved woodland, conifer woodland, and mixed woodland, as well as areas of young trees. It may be difficult to completely avoid all areas of woodland within every route corridor and interface area.

There are a number of recreational sites with the potential to be tourist attractions located within the identified route corridors. There are 12 bathing waters and one Blue Flag Beach, while other tourist activities within the marine portion of the identified route corridors are likely to include water sports, sailing, and fishing within inshore areas. There are areas of known relatively high-intensity leisure boating activity within the

identified route corridors. There are a significant number (431) of onshore recreation sites within the identified route corridors, including public parks or gardens, playing fields, play spaces, cemeteries, allotments, religious grounds, tennis courts, bowling greens, golf courses, and other sports grounds. Additionally, the Formartine and Buchan Way National Trail, Moray Coast National Trail and Speyside Way National Trail are partially located within the onshore sections of the identified route corridors, with the Formartine and Buchan Way National Trail also located within interface areas. The Flow Country World Heritage Site is partially located within one identified route corridor and the Dounreay interface area. Country Parks are also located within the identified route corridors and within one interface area.

Cultural, Architectural and Archaeological Heritage

There are numerous (386) known shipwrecks within the identified route corridors, and also many (1,276) marine Trove Heritage Assets within the identified route corridors within Scottish offshore waters (the Trove Heritage Asset dataset only covers Scottish Waters). The identified route corridor from SW_E2a_2 (Campion) to Richborough contains the greatest number of shipwrecks (111), whilst the identified route corridor from SW_NE8 (Buchan) to Peterhead 1 contains the greatest amount of Trove Heritage Assets (189). There is potential to avoid these assets with offshore cabling. There are no known protected wrecks or Historic Marine Protected Areas within the identified route corridors. There is the potential for unknown marine and intertidal prehistoric landscapes, submerged archaeological artefacts, structures or wrecks to be located within the identified route corridors.

There are nine Garden and Designed Landscapes located within identified route corridors in Scotland with the identified SW_NE4 (Caledonia) to New Deer, SW_NE6 (Broadshore) to Peterhead 2 / DCSS, SW_NE8 (Buchan) to Peterhead 1 and SW_E1a (Morven) to Branxton identified route corridors containing the greatest number of these features (2). There are three Gardens and Designed Landscapes encountered by interface areas, these are located in the vicinity of Arnish, Branxton and New Deer 2, respectively.

There are numerous (4,585) terrestrial Trove heritage assets within the identified route corridors, of which 953 are located within the identified SW_NE4 (Caledonia) to New Deer route corridor. There are also many (2,089) Trove Heritage assets located within interface areas, with the area surrounding Peterhead containing the greatest number (384). There are 155 Scheduled Monuments situated within the identified route corridors, with the SW_NE1c (Shetland NE1 Ocean Winds) to Shetland Hub identified route corridor containing the greatest number (31). Interface areas contain 91 scheduled monuments, with the Shetland interface area containing the greatest number. There are 1,586 Listed Buildings situated within identified route corridors, with the identified SW_NE4 (Caledonia) to New Deer route corridor containing the greatest number of listed buildings (409). There are 458 Listed Buildings within the interface areas, with the Arnish interface areas containing the greatest number (100).

There are 25 Conservation Areas within identified route corridors, with the SW_E1c_2 (Ossian) to Weston Marsh identified route corridor containing the greatest number (six).

There are ten Conservation Areas encountered by the interface areas; the Peterhead interface area contains the greatest number (3). Approximately 131 Defence of Britain Sites are located within the identified route corridors, with the SW_E1c_2 (Ossian) to Weston Marsh identified route corridor containing the greatest number (60). There are 36 Defence of Britain Sites within interface areas; the Richborough interface area contains 24 of these features. One UNESCO World Heritage Site (Flow Country) is partially located within the SW_N2 (Northland Power) to Dounreay identified route corridor and within the Dounreay interface area. Two battlefield sites are located within the SW_E1a (Morven) to Branxton identified route corridor and the Branxton interface area. All Scheduled Monuments, Listed Buildings, Conservation Areas, Defence of Britain Sites, battlefield sites, terrestrial Trove Heritage Assets and the World Heritage Site are likely to be avoidable by both onshore cabling and new interface infrastructure.

Additionally, there are some important Cultural, Architectural and Archaeological Heritage sensitive areas in the immediate vicinity of the onshore sections of the identified route corridors, including Parks and Gardens/ Gardens and Designed Landscapes, Trove Heritage Assets, Listed Buildings and Scheduled Monuments.

Landscape, Seascape and Visual Amenity

There are sensitive areas for Landscape, Seascape and Visual Amenity (LSVA) located within the identified route corridors. The offshore sections of the identified route corridors cross 14 Marine Character Areas located off the coast of England. In addition, part of the identified SW_E2a_2 (Campion) to Richborough route corridor crosses the Goodwin Sand and North Dover Strait Marine Character Area along the River Stour. Marine Character Areas have not been identified in Scotland; however, there are Coastal Character Types identified for stretches of the Scottish coastline. The area types identified at landfall for the identified route corridors include Low Rocky Island Coasts; Rocky Coastline / Open Sea Views; and Deposition Coastline, Open Views.

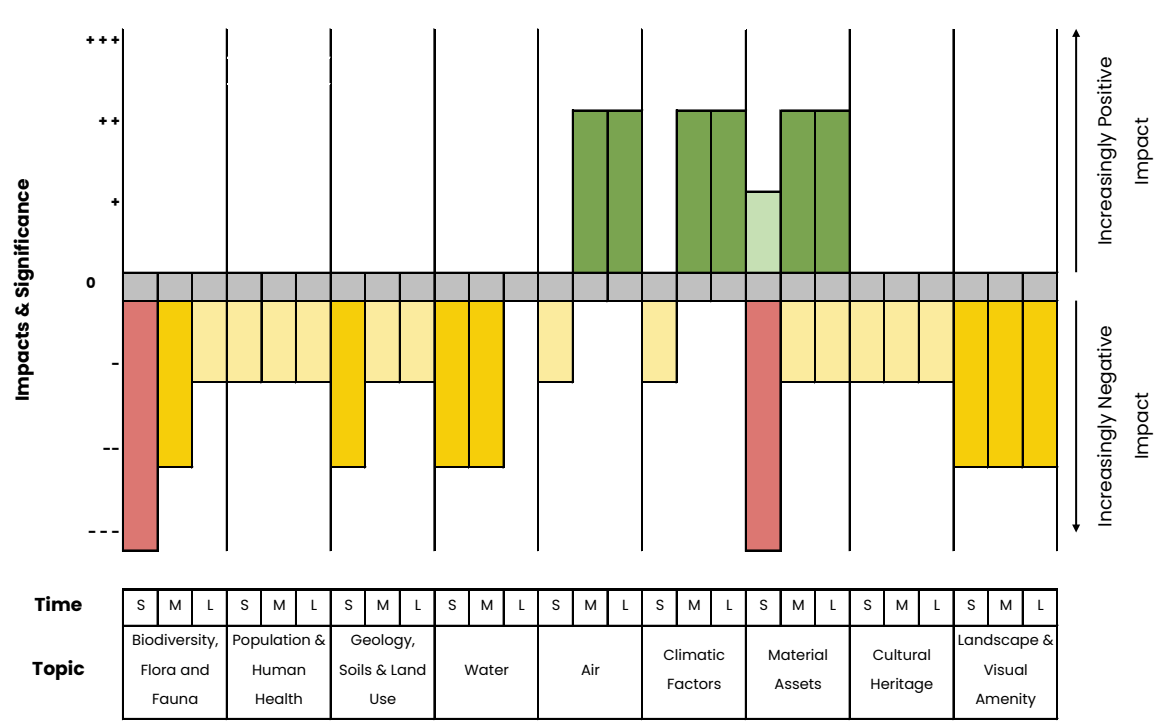
Onshore, there are three National Landscape Character Areas encountered by identified route corridors in England, whilst in Scotland, 32 National Landscape Character Types are encountered. Additionally, there are three National Landscape Character Areas encompassed by interface points in England, whilst 12 National Landscape Character Types are encompassed by interface points in Scotland.

There are no National Landscapes (AONBs), National Scenic Areas or National Parks located within any of the identified route corridors or interface areas. The Flow Country World Heritage Site is just within the western boundary of the SW_N2 (Havbredey) to Dounreay route and Dounreay Interface Area; however, there is potential to avoid the WHS with both onshore cabling and new interface infrastructure. Three National Trails are partially located within the identified route corridors, namely the Formartine and Buchan Way, Moray Coast Trail and the Speyside Way. Short sections of these National Trials cannot be avoided and will need to be crossed. The Formartine and Buchan Way National Trail is partially located within the Interface Areas in the vicinity of Peterhead although there is potential to avoid this with new interface infrastructure. Two avoidable Country Parks, Havenside and Pegwell Bay, are located within the identified route

corridors. Pegwell Bay is also located with the Richborough interface area, however, there is potential to avoid this with new interface infrastructure.

Environmental Assessment			
Environmental Assessment	Short-term	Medium-term	Long-term
Biodiversity, Flora and Fauna (BFF)	-3	-2	-1
Population and Human Health (PHH)	-1	-1	-1
Geology, Soils and Land Use (GSL)	-2	-1	-1
Water (W)	-2	-2	0
Air (A)	-1	+2	+2
Climatic Factors (CF)	-1	+2	+2
Material Assets and Infrastructure (MA)	-3 / +1	-1 / +2	-1 / +2
Cultural, Architectural and Archaeological Heritage (CH)	-1	-1	-1
Landscape / Seascape and Visual Amenity (L)	-2	-2	-2

Table 33: HNDFUE Scotwind Recommended Design summary scoring table



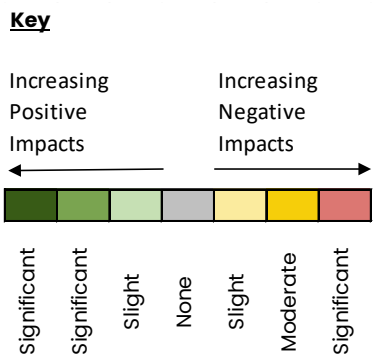


Figure 45: HNDFUE Scotwind Recommended Design summary scoring chart

Discussion of Potential Effects

Biodiversity, Flora and Fauna

Cabling:

There are designated sites that are not possible to avoid within the recommended HNDFUE ScotWind design.

The Southern North Sea SAC (designated for harbour porpoise) is unavoidable for the identified route corridors to Richborough, Weston Marsh and Lincolnshire Connection Node, while the Inner Hebrides and the Minches SAC (also designated for harbour porpoise) is unavoidable for the route corridor to Arnish. If not mitigated there is potential for direct and indirect, temporary, negative effects within these sites in the construction and decommissioning phases and during cable maintenance activities. This could include short-term damage to, disturbance and displacement of harbour porpoise, as well as short-term displacement of prey species such as sandeels and short to medium-term (including re-establishment) damage to supporting habitats (-3). Potential impacts on marine mammals will be short-term intermittent (during construction, maintenance, and decommissioning) but the impact has the potential to have a permanent effect for species if mortality occurs. The Sandwich Bay SAC (designated for dune habitats) is unavoidable for the identified route to Richborough. If not mitigated there is potential for direct and indirect, short to medium-term temporary negative effects within this site in the construction and decommissioning phases and during cable maintenance activities. This could include direct and indirect damage to designated dune habitats (-3). It should be possible to avoid designated habitats at the project stage through micro-routing or through construction methodology such as the use of HDD. The Thanet Coast SAC (designated reefs and submerged sea caves) and The Wash and North Norfolk Coast SAC (designated for sandbanks, mudflats and sandflats, large shallow inlets and bays, reefs, Atlantic salt meadows, Salicornia, Mediterranean and thermos-Atlantic scrub, coastal lagoons, harbour seals and otter) are within identified route corridors but can be avoided; the potential for indirect negative effects on the designated features of these sites should be considered at the project stage owing to their recognised sensitivity to cabling activities.

The Thanet Coast and Sandwich Bay SPA (designated for European golden plover, ruddy turnstone, and little tern) and Ramsar site (designated for wetlands, turnstone, four wader species: ringed plover, golden plover, grey plover and sanderling, as well as Lapland bunting), Outer Firth of Forth and St Andrews Bay Complex SPA (designated for nine species of breeding seabirds and 16 species of non-breeding seabirds and waterfowl, as well as its overall waterfowl, breeding seabird and non-breeding seabird assemblages), Greater Wash SPA (designated for non-breeding red-throated diver, common scoter, and little gull, and breeding sandwich tern, common tern and little tern), East Mainland Coast, Shetland SPA designated for breeding Red-throated diver and non-breeding Great northern diver, and Slavonian grebe), and Moray Firth SPA designated for breeding Red-throated diver and non-breeding Great northern diver, and Slavonian grebe) are unavoidable within identified route corridors, and there is limited scope to avoid the North Caithness Cliffs SPA (designated for breeding seabirds such as peregrine and guillemot). There is potential for direct and indirect, temporary effects within these sites in the short-term construction and decommissioning phases and short-term intermittent effects during cable maintenance activities, including damage to, disturbance and displacement of designated bird species and short to medium-term (re-establishment) damage to supporting habitats and displacement of prey species (-3). There is potential for long-term effects on supporting habitat within the Greater Wash SPA due to cable crossings within the site that could require the use of external protection, and which should be minimised at the project stage. The Greater Wash SPA already has a large amount of disturbance impact on the red throated diver from vessel traffic and offshore wind farm developments. Avoidance of sensitive times or specific areas used by species that are sensitive to cabling activities such as divers within the Greater Wash SPA and Moray Firth SPA should be considered at the detailed design stage. The Wash SPA and Ramsar site is within the identified route corridor to Weston Marsh but can be avoided; the potential for indirect negative effects on the designated species of these sites need to be considered at the project stage owing to their recognised sensitivity to cabling activities.

In English and Welsh waters, there are no MCZs within the identified route corridors that are unavoidable. In Scottish waters there are several offshore routes that cannot avoid the Southern Trench MPA (designated features include burrowed mud communities, fronts, shelf deeps and minke whale), while the route to Arnish cannot avoid the North-East Lewis MPA (designated, in part, for Risso's dolphin and sandeels); both sites are protected for features that are sensitive to cabling activities. There is potential for temporary, direct and indirect negative effects within these sites in the short-term construction and decommissioning phases and during cable maintenance activities, including damage to protected habitat and disturbance and displacement of protected species as well as damage to supporting habitats (-3). The shelf feature of the Southern Trench MPA can be avoided by the identified cable routes, including known locations of protected habitat. The Turbot Bank MPA, Thanet Coast MCZ and Goodwin Sands MCZ are within the identified route corridors but can be avoided; the potential for indirect negative effects on the designated features of these sites need to be considered at the project stage owing to their recognised sensitivity to cabling activities.

The majority of SSSIs that are within the identified cable route corridors can be avoided; however, the Sandside Bay SSSI, Rosehearty to Fraserburgh Coast SSSI, Loch of Strathbeg SSSI, Sandwich Bay to Hacklinge Marshes SSSI, Barns Ness Coast SSSI, and Spey Bay SSSI are unavoidable. There is potential for direct and indirect, negative effects within these sites in the short-term construction and decommissioning phases and during cable maintenance activities (-3).

All other designated sites that are within the identified route corridors can be avoided by cable routes within these corridors, avoiding the potential for direct negative effects. There may be potential for short-term, temporary, indirect negative effects on protected features within these sites, which need to be considered further in micro-routing at the detailed design stage.

There are areas of Annex I reef habitat that cannot be avoided, or there is limited potential to avoid, by cable routes within several of the identified route corridors, and areas of Annex I sandbank that are unavoidable by the identified route corridor to Richborough. There is potential for direct and indirect, negative effects during construction and decommissioning and cable maintenance activities; direct effects have the potential to be long-term or permanent (-2). Other sensitive habitats and features such as OSPAR threatened habitats, PMFs and FOCI are likely to be avoidable through micro-routing considerations at the project stage; however, the potential for short-term, direct and indirect negative effects on these features will need to be considered. There is also potential for direct negative effects on areas of ancient woodland, which are unavoidable for the onshore cable routes to New Deer and Blackhillock, with direct effects having the potential to be long-term to permanent in the footprint of cable working areas.

The Sandwich and Pegwell Bay NNR within the identified route corridors can be avoided. The potential for indirect negative effects on this site should be considered at the project stage. There may be potential for direct or indirect, negative effects on birds and supporting habitats within the Stornoway to Back, Lewis IBA, Lewis Peatlands IBA, Rosehearty to Fraserburgh Coast IBA, Thanet Coast and Sandwich Bay IBA, and Loch of Strathbeg IBA and RSPB site, which are unavoidable within the identified cable route corridors (-1). There is potential to avoid both LNRs within the identified cable route corridors; however, it may not be possible to avoid several Local Nature Conservation sites, including the Cairnbulg to St Combs, Cairnbulg to St Combs, and the Rattray Head to Peterhead LNCS for the routes to Peterhead 1 or Peterhead 2 / DCSS; Todhead Point to Johnshaven Coast LNCS for the route to Fiddes; Spott Burn Valley LNCS for the route to Branxton; and the Aberdour Bay to Kinnaird Head LNCS for the route to New Deer. There may be potential for short-term direct and indirect, negative effects within these sites during the construction and decommissioning phases and during cable maintenance activities (-1). There are areas of known high density for grey seals and harbour seals that may not be possible to avoid, including within the identified routes to Shetland Hub, Lincolnshire Connection Node and Weston Marsh, while areas of moderate to very high density for cetacean species within the identified cable route corridors may not be possible to avoid. There may be potential for short-term disturbance and displacement of marine mammal species during the construction and decommissioning phases and

during cable maintenance activities, as well as short-term damage to supporting habitats and disturbance of prey species (-1).

Areas of ecological importance for fish species such as spawning and nursery habitat may not be avoidable within some identified route corridors, and there is potential for short-term disturbance to, and displacement of, species and short-term damage to supporting habitats within the construction and decommissioning phases (-1).

There is potential for short-term disturbance to, and displacement of, seabirds as well as birds within the identified onshore cable routes during the construction and decommissioning phases and during cable maintenance activities, including within the areas of higher density in route corridors to Richborough, Lincolnshire Connection Node, Weston Marsh, Peterhead 1, Peterhead 2 / DCSS and Shetland.

In general, there is also potential for direct and indirect negative effects from disturbance or damage to local habitats and species outside of designated sites during the construction and decommissioning phases and during any cable maintenance activities (-1).

Onshore Infrastructure:

There are designated sites within the vicinity of the onshore interface areas; however, all of these sites can be avoided by the required substation and converter station developments, avoiding the potential for direct negative effects on designated habitats and species. The designated sites within the vicinity of interface areas include the SACs, Inner Hebrides and the Minches SAC, Caithness and Sutherland Peatlands SAC, River Thurso SAC, Loch Watten SAC, Buchan Ness to Collieston SAC, Sandwich Bay SAC, Saltfleetby-Teddlethrope Dunes and Gibraltar Point SAC, the SPAs of Caithness and Sutherland Peatlands SPA, North Caithness Cliffs SPA, Caithness Lochs SPA, Buchan Ness to Collieston Coast SPA, Thanet Coast and Sandwich Bay SPA, Humber Estuary SPA, and East Mainland Coast, Shetland SPA, and the Ramsar sites of Caithness and Sutherland Peatlands, Caithness Lochs, Thanet Coast and Sandwich Bay, and Humber Estuary. There are also SSSIs designated for ecological features, namely Tong Saltings, East Halladale SSSI, Red Point Coast SSSI, Sandside Bay SSSI, Loch Scarmclate SSSI, Loch Wattern SSSI, Bullers of Buchan Coast SSSI, Sandwich Bay to Hacklinge Marshes SSSI, Saltfleetby – Theddlethorpe Dunes SSSI, Surfleet Lows SSSI, Catfirth SSSI, Loch of Girlsta SSSI, Sandwater SSSI, and Mill Wood SSSI. There may be potential for short-term, temporary, indirect negative effects on protected features within these sites, which will need to be considered further at the detailed design stage, such as water quality impacts on hydrologically connected sites, and disturbance of protected species of sites within the vicinity of works areas.

NNRs in the vicinity of the interface areas at Lincolnshire Connection Node and Richborough can be avoided by the required infrastructure developments, as can LNCSs within the vicinity of the interface areas at Shetland Hub, Blackhillock, New Deer, Hurlie, Fiddes, Branxton, Peterhead 1 and Peterhead 2 / DCSS. The Nature Reserves of Sandwich

and Pegwell Bay and Lincolnshire Coronation Coast can be avoided within the interface areas, as can several IBAs and areas of ancient woodland.

If the construction works for new substations and converter stations are undertaken within areas of lower sensitivity, the potential for significant negative effects on BFF should be avoidable. There is potential for direct, long-term loss of local habitats and species in the footprint of the new infrastructure and any required access roads, and for temporary, medium-term negative effects on BFF within the wider temporary work areas, which could include disturbance and displacement of species and temporary loss of supporting habitats (-1).

Developments occurring in England will need to comply with requirements for Biodiversity Net Gain (BNG); therefore, potential loss of local habitats within development areas will require suitable habitat creation or enhancement, with a net gain of 10%. For developments within Scotland BNG is not yet mandatory but is being actively encouraged.

The HRA assessed the potential for negative effects on SACs and SPAs within the identified route corridors and a relevant zone of influence as follows:

- Potential for temporary physical disturbance of subtidal and/or intertidal habitats.
- Potential for permanent loss of seabed or intertidal habitats.
- Potential for temporary disturbance as a result of increased suspended sediment concentrations and sediment deposition.
- Potential for adverse effects on site integrity via changes in water quality.
- Potential for adverse effects on site integrity via effects of the introduction of INNS on benthic habitats and species.
- Potential for adverse effects on site integrity via EMF impacts.
- Potential for adverse effects on site integrity due to subsea cable thermal emissions.
- Potential for adverse effects on site integrity due to impacts on marine mammals and fish from underwater sound.
- Potential for adverse effects on site integrity due to barriers to migration.
- Potential for adverse effects on site integrity due to changes in prey availability.
- Potential for adverse effects on site integrity due to collision risk with vessels.
- Potential for airborne sound and visual disturbance to marine mammals and seabirds.

- Potential for adverse effects on site integrity due to noise and visual impacts to birds from landfall / onshore works.
- Potential for adverse effects on site integrity due to risk of bird strike from onshore overhead line.
- Potential for a temporary or permanent loss or removal of terrestrial habitats.
- Potential for impacts on terrestrial functionally linked habitats.
- Potential for impacts via maintenance activities and cable repair.

The HRA set out mitigation measures required to avoid adverse effects on these sites via these impact pathways, including through micro routing.

The MCZ assessed the potential for negative effects on MCZs, HPMAs and Nature Conservation MPAs within the identified route corridors and a relevant zone of influence as follows:

- Potential for temporary physical disturbance - subtidal benthic habitats and species.
- Potential for permanent loss - subtidal benthic habitats and species.
- Potential for the introduction of INNS - subtidal benthic habitats and species.
- Potential for changes in prey availability.
- Potential for thermal emissions - subtidal benthic habitats and species.
- Potential for EMF - subtidal benthic habitats and species, marine mammals, fish, and invertebrates.
- Potential for airborne sound and visual disturbance – marine mammals and birds.
- Potential for increased suspended sediment concentrations - subtidal benthic habitats and species, marine mammals, fish, and invertebrates.
- Potential impacts on water quality - subtidal benthic habitats and species, marine mammals, fish, and invertebrates.

The MCZ Stage 1 set out mitigation measures to avoid adverse effects on these sites via these impact pathways. One route corridor was further considered at the MCZ Stage 2 (derogation), SW_NE7 to Peterhead 2 / DCSS.

Population and Human Health

Cabling:

There are major settlements within the identified route corridors. Generally, there is the potential for slight negative, short-term effects on the local population from cable laying, such as noise, lighting, visual and disturbance during the construction and decommissioning phases and during cable maintenance activities; in areas of higher population, there is potential for effects on a greater number of receptors (-1). There is not expected to be any direct, medium, or long-term, disturbance of local populations

due to noise or disturbance effects during the operational phase (0). There are areas of perceived moderate deprivation within the identified route corridors. There are areas of perceived highest deprivation within route corridors to Peterhead 1, Lincolnshire Connection Node, Weston Marsh and Richborough. In the route corridor to Weston Marsh these areas of perceived highest deprivation cannot be avoided and populations in these areas may be of lower health status and therefore more susceptible to health effects linked to disturbance. There is the potential for perceived human health concerns regarding EMF generation from the operation of electrical transmission cables.

There are recreational boating areas within the identified route corridors to Lincolnshire Connection Node, Weston Marsh and Richborough which cannot be avoided, including areas of high intensity leisure boating activity. There is potential for slight negative, temporary, direct and indirect, negative effects on leisure and recreational marine users due to an increased collision risk, access restrictions and displacement, or water quality effects, during the construction and decommissioning phases and during cable maintenance activities (-1). The potential for negative direct or indirect effects on these users in the medium to long-term during the operational phase is considered to be negligible (0).

There are bathing water sites located within the identified route corridors; however, these can be avoided. There may be potential for short-term, indirect, negative effects such as noise, disturbance and water quality impacts to these areas during the construction and decommissioning phases and during cable maintenance activities (-1). Within the route corridor to New Deer the bathing waters may be unavoidable due to other sensitivities in the area that would need to be avoided, such as settlements. There is potential for short-term, negative effects on water quality to this bathing water area during the construction and decommissioning phases and during cable maintenance activities (-1).

There are recreation sites within all onshore identified onshore route corridors, however these can be avoided. There is potential for short-term, slight negative, temporary disruption to these recreational areas during construction and decommissioning works. (-1).

Onshore Infrastructure:

There are settlements within the interface areas at Richborough, Weston Marsh, Lincolnshire Connection Node, Peterhead 1, New Deer, Blackhillock, Spittal, Dounreay and Arnish. There is the potential for temporary direct disturbance of the local populations due to lighting, noise and vibration generated during pre-construction, and construction from construction activities and vehicle movements (-1). There is also the potential for temporary direct disturbance of the local population due to lighting, noise and vibration generated during the operation of the substations / converter stations (-1).

There are areas of perceived highest deprivation within the interface areas of Peterhead 1 and Lincolnshire Connection Node, and areas of perceived high deprivation within the interface areas of Richborough, Weston Marsh, Lincolnshire Connection Node, Arnish, Peterhead 1 and Blackhillock. There is the potential for impacts on the health of construction workers and future site users through exposure to hazardous contaminants during pre-construction, construction, and decommissioning. There is potential for health effects due to the emission of dust from demolition, earthworks, construction and track out during pre-construction, construction and decommissioning, operation and maintenance (-1).

There is potential for indirect positive long-term effects for the population at GB level through facilitation of renewable energy connection to meet population demand while supporting a transition away from fossil fuels.

There are recreation sites within all interface areas. There is potential for temporary loss or disturbances to community land areas within the site footprint and wider working area during the construction process, and potential for direct permanent loss or disturbances to community land areas during the operation of the converter station (-1).

Geology, Soils and Land Use

Cabling:

Cabling has the potential for negative effects on Geology, Soils, and Land Use within offshore sites protected for geology/geomorphology. This includes the offshore MPAs, which are unavoidable, namely the North-east Lewis MPA within the identified SW_N3 (Talisk) to Arnish route corridor, and the Southern Trench MPA within six of the identified route corridors. The Pobie Bank Reef SAC is unavoidable within the SW_NE1a (Stoura) to Shetland Hub, SW_NE1b (Arven) to Shetland Hub, and SW_NE1c (Arven) to Shetland Hub identified route corridors, There is potential for short-term direct, moderate effects through loss of the soil resource during cabling installation, cable protection laying, and decommissioning if cables are removed (-2), with slight negative (-1) permanent effects in the long-term if there is damage to protected features that cannot recover.

There are designations within other identified route corridors, the Flow Country WHS in the SW_N2 (Havbredey) to Dounreay identified route corridor, the Thanet Coast MCZ and Goodwin Sands MCZ within the SW_E2a_2 (Campion) to Richborough identified route corridor, the Firth of Forth Banks Complex MPA within the SW_E1a (Morven) to Branxton identified route corridor and the Shetland Geopark within the SW_NE1a (Stoura) to Shetland Hub, SW_NE1b (Arven) to Shetland Hub and SW_NE1c (Arven) to Shetland Hub identified route corridors. However, as these sites can be avoided, the risk of direct negative effects can be avoided (-1). There is also potential for short to long-term, slight, indirect effects on features within designate sites, such as through alterations to local sediment regimes, which could impact geomorphological features. This has the potential to impact both avoidable and unavoidable designated sites within the identified route corridors (-2).

The laying of offshore cabling and cable protection works has the potential for short to long-term, direct effects on Annex I habitats and SSSIs (located at landfall), which cannot be avoided through damage to features in the footprint of works (-2). Within the identified route corridors, extensive sand is present and unavoidable within many offshore areas, and several identified route corridors have unavoidable areas of rock located at the coastline with potential for short-term direct effects on water quality through the release of sand and sediment sources during cable construction and decommissioning phases (-1).

The potential for these effects can be minimised through the use of suitable mitigation at the project stage; this may include the use of bubble curtains to reduce sediment dispersal, or less geologically disruptive construction techniques, and projects will also be subject to project-specific implementation plans such as Construction Environmental Management Plans (CEMPs) and subject to regulatory compliance, which should minimise potential effects.

Within the offshore areas of identified route corridors, there is the potential for short-term direct, negative effects on soils from the release of contaminated sediments/materials during cable construction, maintenance, or decommissioning phases. However, within the recommended design, all dredge and spoil dumping grounds are avoidable, reducing the potential for negative effects (-1). There is potential for short-term, direct, negative effects on soils and overlying water quality during cable installation, maintenance or decommissioning phases from the release of contaminants such as from UXOs or chemicals from the Military Danger Areas which are unavoidable within the identified offshore route corridors (-2). The use of mitigation measures, such as pre-construction surveys, can help to identify potential sources of seabed contamination, and the potential impacts minimised through avoidance of these areas for development.

Onshore, there is potential for short to long-term direct negative effects on peatlands, which are unavoidable within five identified route corridors, particularly within SW_NE1a (Stoura) to Shetland Hub, SW_NE1b (Arven) to Shetland Hub and SW_NE1c (Arven) to Shetland Hub identified route corridors. The disturbance of soils during cable installation and decommissioning phases has the potential to lead to a loss or degradation of the peatland habitat, with secondary direct medium-term effects on carbon sequestration within these habitats if reestablishment does not occur quickly (-2). However, generally these habitats are avoidable by the identified route corridors, reducing the potential for effects (-1). Generally, within the identified route corridors the agricultural land is of good to moderate quality with areas of poor quality, while there are areas of unavoidable excellent quality agricultural land within the SW_E1c_2 (Ossian) to Weston Marsh identified route corridor and very-high quality agricultural land within the SW_E1c_1 (Ossian) to Lincolnshire Connection Node identified route corridor. There is potential for short-term direct loss of soil in the footprint of cabling works, and the potential for direct effects on land use in the long-term if the former land use is not re-established (-1). Within the onshore areas of identified route corridors, there are areas of shallow soils of exposed rock which are unavoidable, there is potential for short-term, direct, negative effects through the loss of soils in these areas and long-term, direct,

negative effects through the permanent loss of geological material in these areas during cable installation and decommissioning phases (-1).

There is potential for short-term, direct, negative effects from the release of contaminants within onshore landfill areas within the identified route corridors during cable construction, maintenance and decommissioning phases, which may negatively affect the surrounding soil quality; however, as these landfill areas are avoidable, this reduces and potentially eliminates the potential for effects (0).

Generally, during cable construction, maintenance, and decommissioning phases, there is potential for short to medium-term, direct, negative effects due to localised loss of the soil resource. There is the potential for secondary, negative effects on Water through temporary increased suspended sediment losses impacting on water quality during construction and decommissioning (-1). Mitigation measures at the project stage, such as CEMPs, can reduce the potential for erosion or sediment loss, and may include appropriately timing works to avoid periods of elevated risk of soil loss/erosion such as the winter of high rainfall and runoff rates, or the use of interception techniques to reduce downstream sediment transfer to waterbodies.

Onshore Infrastructure:

There is potential for negative effects on Geology, Soils and Land Use within the identified interface areas from the development of new infrastructure. There are geological designations within interface areas, including the Flow Country WHS within the Dounreay interface area and the Shetland Geopark within the Shetland Hub interface area, as well as several SSSIs within nine other interface areas; however, as these are avoidable, there should be no potential for direct negative effects within these areas. The potential for indirect negative effects on these sites should be considered at the project stage (-1).

Within the interface areas there is potential for short to long-term direct negative effects on peatlands which are unavoidable, particularly within the Shetland Hub interface area from a loss of soils from during the construction and decommissioning phases; this may lead to the loss or degradation of the peatland habitat, with secondary indirect medium-term effects on carbon sequestration within these habitats if these do not re-establish quickly (-2). However, generally these habitats are avoidable, reducing the potential for effects (-1).

Generally, within the interface areas the agricultural land is of good to moderate quality with some areas of poor quality, although there are areas of unavoidable excellent quality agricultural land in the Weston Marsh interface area and very-high quality agricultural land within the Lincolnshire Connection Node interface area; in these areas there is potential for a short to long-term direct loss of the soil resource and the potential for direct effects on land use in the long-term if the former land use is not re-established (-2). This may lead to secondary effects on Material Assets through a temporary loss of agricultural farming areas and overall agricultural productivity, and

on Water through a temporary increased risk of sediment losses or soil erosion in the short-term, with exposed bare ground impacting on water quality (-1).

Within the interface areas, there are areas of shallow soils of exposed rock which are generally unavoidable or there is limited scope to avoid, particularly within the Shetland Hub interface area, and there is potential for short-term, direct, negative effects through the loss of soils in these areas and long-term, direct, negative effects through the permanent loss of geological material in these areas during cable installation and decommissioning phases (-1).

There is potential for short-term, direct, negative effects from the release of contaminants from onshore landfill areas within the interface areas during construction, maintenance and decommissioning phases, which may negatively affect the surrounding soil quality, however, as these landfill areas are avoidable, this reduces and potentially eliminates the potential for effects (0).

Generally, during the construction, maintenance, and decommissioning phases for new infrastructure there is potential for short-term direct and indirect negative effects through a loss of the soil resource within the footprint of new infrastructure and working areas (-1). As for cabling, the introduction of mitigation measures at the project stage, such as CEMPs, can reduce the potential for erosion or sediment loss within interface areas.

Water

Cabling:

The development of cabling has the potential for negative effects offshore within the short to medium-term on the achievement of Good Environmental Status for the MSFD for the Celtic Seas and Greater North Sea sub regions, both of which are currently failing to achieve Good Environmental Status. There is the potential for indirect effects from the release of sediment or chemicals used during cable installation, decommissioning and maintenance phases, or through alterations to sediment regimes with the use of cable protection materials impacting on Descriptors assessed under the MSFD (-1). However, with the application of good working practices, negative effects are expected to be temporary and there is not anticipated to be potential for significant effects in the medium to long-term (0).

Within the offshore component of the identified route corridors, there is the potential for short-term direct effects on water quality from the release of contaminated sediments/materials during cable construction, maintenance or decommissioning phases; however, all dredge and spoil dumping grounds that are within the identified route corridors are avoidable, reducing the potential for impacts (-1). There are no explosive munitions grounds within the identified offshore route corridors. There are several Military Danger Areas which are unavoidable within the offshore identified route corridors, and there is potential for the release of explosives and/or other contaminants during cable installation, maintenance or decommissioning phases with short-term direct effects on water quality (-2). The use of good working practices such as pre-

construction surveys regarding the presence and clearance of UXOs, can minimise the potential for effects (-1).

At landfall, within the identified route corridors, there is potential for short-term indirect effects on bathing water quality during the installation, maintenance, or decommissioning phases of cables associated with the release of sediment, however, all bathing waters are avoidable, reducing the potential for impacts (-1). At landfall, within the identified route corridors, there is potential for short-term indirect effects on water quality within shellfish waters during the installation, maintenance, or decommissioning phases of cables from the release of sediment, however, all shellfish waters are avoidable, reducing the potential for impacts (-1).

Within the WFD coastal waterbodies present at landfall throughout the identified route corridors there is potential for short-term direct effects on water quality through the release of sediment associated with cable trenching or the release of chemicals associated with the construction, maintenance and decommissioning phases (-1). Similarly, onshore, during cable construction, decommissioning, and maintenance phases, there is a potential for short-term direct and indirect effects on water quality through the release of sediment or alterations to local hydrological regimes where rivers or lakes are unavoidable within ten of the identified route corridors (-1).

National Flood Zones are present at landfall and onshore within many of the identified route corridors. These are unavoidable within nine of the identified route corridors and there may be limited scope to avoid these within the remaining identified route corridors. Thus, there is potential for short to medium-term direct and indirect effects through a potential for increased flood risk or alterations to local hydrological regimes during cable construction, maintenance, and decommissioning phases (-2).

Onshore Infrastructure:

There is potential for negative effects on water within the identified interface areas from the development of new infrastructure. During the construction, maintenance, and decommissioning phases for new infrastructure, there is potential for short-term direct and indirect effects on water quality through the release of sediment or alterations to local hydrological regimes to rivers and lakes although typically these are avoidable, reducing the potential for negative effects to those associated with downstream indirect negative impacts (-1). At the Shetland Hub, Weston Marsh and Lincolnshire Connection Node interface areas such impacts may not be avoidable (-2). Within the WFD waterbodies present within the interface areas, there is potential for short-term direct effects on water quality through the release of sediment associated the development of new infrastructure or the release of chemicals associated with the construction, maintenance, and decommissioning phases (-1). There is also potential for indirect short-term effects on water quality within bathing waters and shellfish waters, which are present within the interface areas through the release of sediment or contaminants during the interface construction, maintenance, and decommissioning phases. However, these are avoidable within the interface areas, reducing the potential

for negative effects to those associated with downstream indirect negative impacts (-1).

Air

Cabling:

There is one known location of an air quality management area (AQMA) within an identified route corridor, however this can be avoided. Generally, there is potential for slight negative, direct, short-term temporary effects on local air quality due to dust generation and air emissions from vehicles and machinery in the vicinity of the works during the construction and decommissioning phases and during any cable maintenance activities (-1). There is also the potential for slight negative, short-term, temporary emissions from vehicles onshore and vessels offshore due to maintenance activities during the operational phase. It is not expected that there will be any negative direct or indirect, medium or long-term effects on sensitive receptors from air emissions / pollution during the construction, operational and decommissioning phases (0).

There are major settlements within identified route corridors. Within the route to Richborough there is potential for moderate negative, short-term effects on the local population through dust and traffic/machinery emissions, as well as noise emissions which may affect many receptors within these higher populated areas during the construction and decommissioning phases and during cable maintenance activities (-1). There are areas of perceived highest deprivation within routes to Richborough, Weston Marsh, Lincolnshire Connection Node, Peterhead 1, New Deer and there are areas of perceived high deprivation within routes to Arnish, Blackhillock, New Deer, Peterhead 1, Lincolnshire Connection Node, Weston Marsh and Richborough. In the route to Weston Marsh these areas of perceived highest deprivation cannot be avoided. Populations in these areas may be of lower health status and may be of greater risk of health impacts such as those affecting the lungs due to existing health conditions in the areas of higher sensitivity (-1).

There is potential for moderate positive, indirect effects on regional air quality in the medium to long-term from facilitation of new renewable energy infrastructure, supporting decarbonisation of the energy sector (+2).

Onshore Infrastructure:

There are major settlements within interface areas of the recommended HNDFUE (ScotWind) design. There is potential for short-term, temporary increases in road traffic volumes on the public road network and within the construction areas generated by construction activities to result in temporary negative effects on local air quality, during pre-construction, installation, and decommissioning. There is potential for intermittent/infrequent operational phase maintenance activities to temporarily increase traffic volumes and result in temporary negative effects on local air quality.

There is potential for temporary negative effects on local populations through a deterioration of local air quality via increased exposure to vehicle emissions. There are

areas of perceived highest deprivation within routes to Lincolnshire Connection Node and Peterhead 1, and there are areas of perceived high deprivation within routes to Arnish, Blackhillock, Peterhead 1, Lincolnshire Connection Node, Weston Marsh and Richborough. There is potential for slight negative, direct, short-term temporary effects on local air quality due to dust generation and air emissions from vehicles and machinery in the vicinity of the works during the construction and decommissioning phases and during any maintenance activities (-1).

There is potential for moderate positive, indirect effects on regional air quality in the medium to long-term from facilitation of new renewable energy infrastructure, supporting decarbonisation of the energy sector (+2).

Climatic Factors

Cabling:

There are known locations of blue carbon habitat within the identified route corridors. There is unlikely to be potential for significant negative effects on blue carbon habitat within the identified route corridors during the construction, operational and decommissioning phases (0), as cabling can avoid these areas of high blue carbon potential. Generally, there is potential for slight negative, short-term effects on sediment carbon storage, due to a localised release of CO2 from seabed disturbance during the construction and decommissioning phases (-1).

There is potential for slight negative, short-term, temporary effects on localised GHG concentrations due to GHG emissions from vehicles and machinery in the vicinity of the works during the construction and decommissioning phases and during any cable maintenance activities (-1). There is also potential for the temporary loss of GHG sequestering material in the vicinity of the works during the construction and decommissioning phases and during any cable maintenance activities (-1).

There is potential for moderate positive, medium to long-term effects during the operational phase, from facilitation of new renewable energy infrastructure, supporting decarbonisation of the energy sector, diversification of electricity supply and energy security, and meeting of energy objectives and climate change emission reduction targets (+2).

Onshore Infrastructure:

There are areas with potential to act as carbon sinks within all interface areas of the recommended HNDFUE (ScotWind) design. There are areas of peatland within the interface areas of Peterhead, Fiddes, Blackhillock, Arnish, Spittal, Dounreay and Shetland. There is potential for short-term release of CO2 due to ground disturbances within areas of potential carbon storage such as peatlands, bogs or saltmarshes habitats, due to the activities required to facilitate the construction and decommissioning of the onshore infrastructure (-1).

There is potential for short-term direct and indirect GHG emissions to be generated by the construction process through the production of materials, transport of materials

and onsite energy consumption. There is potential for short-term, temporary emissions from vehicles and machinery during pre-construction, construction and decommissioning of the onshore infrastructure.

There is potential for moderate positive, medium to long-term effects during the operational phase, from facilitation of new renewable energy infrastructure, supporting decarbonisation of the energy sector, diversification of electricity supply and energy security, and meeting of energy objectives and climate change emission reduction targets (+2).

Material Assets

Cabling:

There is a significant amount of unavoidable offshore infrastructure encountered by the identified route corridors. In total, there are approximately 71 submarine cable connection crossings, 106 offshore gas/oil pipeline crossings and one pipeline crossing associated with the Endurance CO2 Storage Facility within the identified route corridors. The Endurance CO2 pipeline and the majority of these cables and oil/gas pipelines are unavoidable and will need to be crossed in the North Sea. Two identified route corridors cross the Endurance CO2 pipeline, whilst eight identified route corridors cross submarine cable connections and 16 cross oil/gas pipelines. The greatest number of cable (35) and pipeline (33) connection crossings is associated with the identified route corridor from SW_E2a_2 (Campion) to Richborough. There is potential for telecommunications and energy supplies of high importance within GB waters to be disrupted during the construction, operation, and decommissioning phases. There is potential for significant negative, direct, short-term effects due to damage to these cables and pipelines, and subsequent disruption to telecommunications and energy supplies, during the construction and decommissioning phases (-3), as well as potential for slight negative medium to long-term (cable lifetime) direct effects in the operational phase during recurrent maintenance operations (-1). There is also potential for significant negative indirect effects to telecommunications and energy supplies in the short-term during the construction and decommissioning phases, as access to these existing cables and pipelines for maintenance may be reduced temporarily (-3), as well as for slight negative effects in the medium to long-term during the operational phase due to access issues during periods of maintenance (-1). Thus, given the high importance of the existing infrastructure that is unavoidable, there is potential for significant negative effects on this infrastructure in the short-term (-3) and slight negative effects in the medium, and long-term (-1), although good working practices may eliminate or minimise the potential for these effects to occur.

There are six unavoidable onshore pipelines that are encountered by the identified route corridors. In total, five of the identified route corridors cross these pipelines within the vicinity of Peterhead and Spalding. There are unavoidable National Grid and Scottish Power overhead lines, which are crossed by eight identified route corridors. There is the potential for moderate, direct short-term, negative effects due to damage to the pipelines or overhead lines, and subsequent disruption to energy supplies and services, during the construction and decommissioning phases (-2), as well as potential for

slight negative, medium to long-term (cable lifetime) direct effects in the operational phase during recurrent maintenance operations (-1). There is also the potential for slight negative indirect effects to energy supplies and services in the short-term during the construction and decommissioning phases, as access to these existing pipelines and cables for maintenance may be reduced temporarily (-1), as well as for slight negative effects in the medium to long-term during the operational phase due to access issues during periods of maintenance (-1). Furthermore, there is the potential for moderate negative, direct short-term effects during construction due to the potential requirement for permanent relocation or repositioning of existing overhead lines; services should return to normal once this has occurred. All potential negative effects on onshore energy infrastructure are, however, likely to be temporary and localised to the asset crossing locations. The use of directional drilling may also reduce or eliminate many of these issues onshore.

A number of roads will need to be crossed, with all identified route corridors containing unavoidable roads. The SW_E1c_2 (Ossian) to Weston Marsh route comprises the longest onshore cable section and has the greatest number of road crossings. Six identified route corridors encounter unavoidable railway lines. The SW_E2a_2 (Campion) to Richborough route comprises the greatest number of railway lines. As such, there is potential for moderate, direct, short-term negative effects due to the disruption of access to roads and railway lines due to road closures or road diversions, or restrictions/amendments to public transport routes during construction and decommissioning phases (-2). This may result in a temporary increase in travel time for road and public transport users. There is also potential for moderate negative, direct short-term effects due to journeys being delayed by the potential increased vehicle traffic from construction machinery (-2) as well as short-term temporary road access restrictions, closures or slow-moving vehicle traffic to accommodate construction vehicles transporting abnormal loads (-2). There is the potential for slight negative, indirect short-term effects due to disruption from construction or decommissioning works or concerns regarding road safety for road users (motorised and non-motorised) with large vehicles or machinery (-1). All potential negative effects on transport infrastructure are, however, likely to be temporary and localised to the route crossing locations. The use of directional drilling may also reduce or eliminate many of these issues onshore.

All identified route corridors are within areas where shipping activity occurs. Fifteen identified route corridors encounter areas of unavoidable high shipping density. This is generally encountered in the inshore areas, with larger areas present off the east coast of England and Scotland. The identified route corridor from SW_E2a_2 (Campion) to Richborough crosses the largest area of high shipping density. Additionally, there are two unavoidable traffic separation zones (the TSS off Botney Ground and the TSS in the Strait of Dover and adjacent waters), one unavoidable Precautionary Area in the region of the Shetland Isles, and two unavoidable deep-water routes (namely North Hinder to Indefatigable Bank and North Hinder to off Brown Ridge).

There is potential for significant, direct negative effects on shipping and navigation in the short-term due to displacement of vessels during the construction and

decommissioning phases (-3), which can result in temporary disruption to vessel routing and timetables. There is potential for significant negative effects in the short-term during the construction and decommissioning phases due to the risk of collision and allision with vessels associated with cabling, which may result in injury or death and hazardous cargo or oil spillage (-3). There is potential for slight negative, medium and long-term effects during the operation phase due to the risk of collision or allision with slow-moving or stationary vessels and equipment during maintenance (-1). There is also potential for slight negative, medium and long-term effects during the operational phase due to the risk of entanglement of anchors with subsea cables or protective structures used over cables (-1). Furthermore, there is potential for significant negative effects within installation and decommissioning areas in the short-term construction and decommissioning phases, as the presence of installation vessels and equipment may adversely impact the efficiency of search and rescue operations (-3). It is, however, likely that all these potential effects can be mitigated by adherence to appropriate navigational safety planning and procedures.

There are relatively high-intensity fishing areas affected by identified route corridors, the majority of which are encountered in offshore areas off the coast of Shetland, Norfolk and Lincolnshire, and inshore areas within Moray Firth, the entrance of the Firth of Forth and off the coast of Aberdeenshire and East Lothian. There is potential for moderate direct negative, short-term effects on commercial fisheries operations due to temporary displacement from traditional fishing grounds during the construction and decommissioning phases (-2), as well as potential for slight, medium and long-term negative effects due to displacement during maintenance within the operational phase (-1). Displacement of fishing activity could result in increased competition for alternate fishing grounds, with potential to adversely affect fish stocks and, by extension, landings, in nearby areas. There is potential for moderate negative direct effects due to an increased collision risk of fishing vessels with vessels associated with cable installation in the short-term during the construction and decommissioning phases (-2), and slight negative effects in the medium to long-term during recurrent maintenance activities in the operational phase (-1). There is also potential for slight negative effects on fishing activities within the identified cable route corridors in the operational phase, due to the risk of entanglement of fishing gear with cables or damage to fishing gear due to cable protection infrastructure where cables cannot be buried sufficiently, which may lead to avoidance of the area by fishing vessels (-1). There is potential for short-term negative effects on commercial fish species and their key habitats within the identified route corridors. There is potential for moderate negative direct effects in the short-term construction (-2), and slight negative direct effects in the medium-to long-term operational phase due to the potential for a direct loss of supporting habitats, such as spawning and nursery grounds. There is potential for moderate indirect negative effects on the profitability of commercial fishing in the short- term (-2) and slight indirect negative effects in the medium and long-term (-1). This includes the potential for reduced quotas, increased resource competition for fishing, and reduced landings in both tonnage and economic value.

There are five unavoidable military danger areas encountered by eight of the identified route corridors, namely D307: Donna Nook, D412: Staxton, D801/2: Cape Wrath (North

West/South East), D513: Druridge Bay and D809 (S, N and C): Moray Firth (South, North and Central). The SW_E1c_1 (Ossian) to Lincolnshire Connection Node route crosses the Donna Nook, Druridge Bay and Staxton military areas, whilst the SW_E1c_2 (Ossian) to Weston Marsh crosses Druridge Bay and Staxton. Four routes (SW_NE4 (Caledonia) to New Deer, SW_NE3 (Stromar) to New Deer 2, Shetland to Blackhillock and SW_NE2 (Ayre) to Spittal) cross the Moray Firth military area. There is potential for moderate negative effects on military activities, including temporary (short-term) disruption of military exercises and activities within these military danger areas during pre-construction and decommissioning (-2) phases. There is also the greater risk of encountering UXOs in these areas.

Twelve identified route corridors intersect areas of unavoidable potential prime agricultural land. A significant portion of this prime agricultural land is in Lincolnshire, crossed by the SW_E1c_2 (Ossian) to Weston Marsh route corridor. There is potential for direct, slight, short-term negative effects on agriculture due to the temporary loss of agricultural land and soils during pre-construction, construction and decommissioning processes (-1). There is also potential for short-term, direct, slight negative effects due to temporary restrictions in access to agricultural land with construction and decommissioning activities (-1). There is potential for short-term, direct damage to field drains due to construction and decommissioning activities (-1), as well as the potential for indirect, short-term secondary negative effects on agriculture during construction and decommissioning activities, including through pollution of water sources used for irrigation or for livestock or through the introduction of soil borne pests and diseases (-1).

Twelve of the identified route corridors encounter relatively small areas of either broadleaved woodland, conifer woodland, and mixed woodland, which may be utilised for commercial forestry, that may be difficult to avoid completely. There is potential for direct, slight negative effects on commercial forestry due to the loss of woodland within the onshore route corridors if felling of woodland and commercial forestry areas is required to facilitate cable installation in the short-term construction phase (-1). There is also potential for the direct, slight negative effects on commercial forestry in the medium and long-term due to a permanent localised loss of woodland within working areas if these land areas are retained or if the former land use fails to be reinstated (-1). This could result in a reduction in income levels for this industry.

The potential for effects on tourism is considered indirectly within the topics of Landscape, Seascape and Visual Amenity (visibility of construction activity), Population and Human Health (recreational use), and Biodiversity, Flora, and Fauna (effects on wildlife). As discussed in the Landscape, Seascape and Visual Amenity Section, there is the potential for slight to moderate negative effects in the short-term on Landscape, Seascape and Visual Amenity, which may result in secondary negative effects on tourism, as this may act as a deterrent to tourists. As discussed in Population and Human Health, there is a slight potential for negative effects on the population due to increased noise release in the short-term, as such tourism is unlikely to be impacted significantly by these potential effects, albeit temporary and localised. There is potential for slight negative, temporary direct and indirect effects on leisure and recreational

marine users due to an increased collision risk or water quality effects, as well as access restrictions and displacement for marine and onshore recreational users during the construction (and decommissioning) phase, which may indirectly negatively affect tourism temporarily. Lastly, as discussed in Biodiversity, Flora and Fauna, there is potential for the construction phase to negatively affect wildlife, which may result in a secondary impact on tourism activities. Any impact on tourism will likely be temporary, localised and not significant.

The HNDFUE (ScotWind) recommended design has the potential to connect approximately 32.8GW of offshore renewable energy generation to the GB grid. As such, there is potential for positive effects in the short-term (+1) and moderate positive effects in the medium to long-term, owing to the facilitation of new renewable energy infrastructure (+2) and the associated reduction in reliance of fossil fuel generation.

Onshore Infrastructure:

Fourteen of the potential areas where interface infrastructure may be located contain sections of high-voltage overhead lines. Where there is limited interface infrastructure required, these overhead lines should be able to be avoided by new interface infrastructure. However, in many cases, a large volume of new interface infrastructure is required, particularly at Peterhead 2 / DCSS. As such, due to the presence of other assets, free space may be limited, and overhead lines may not be avoidable. There is the potential for moderate, direct short-term, negative effects due to the potential for damage to the overhead lines, and subsequent disruption to energy supplies and services, due to the activities required to facilitate construction and decommissioning of the interface infrastructure during the construction and decommissioning phases (-2). There is potential for slight negative, medium to long-term (interface infrastructure lifetime) direct effects in the operational phase due to the recurrent maintenance activities required to facilitate the operation and maintenance (recurrent, short-term) (-1). There is also the potential for slight negative indirect effects to energy supplies and services in the short-term during the construction and decommissioning phases, as access to these existing overhead lines for maintenance may be reduced temporarily due to the activities required to facilitate construction and decommissioning of the infrastructure (-1), as well as for slight negative effects in the medium to long-term during the operational phase due to access issues during periods of maintenance (-1). Furthermore, there is the potential for moderate negative, direct short-term effects during construction due to the potential requirement for permanent relocation or repositioning of existing overhead lines; services should return to normal once this has occurred. All potential negative effects on onshore energy infrastructure are, however, likely to be temporary and localised to the location of new interface infrastructure.

All of the potential areas where interface infrastructure may be located contain a number of roads. Although these roads can be avoided by the new interface infrastructure, vehicles associated with the construction and decommissioning phases will have to utilise local roads to facilitate the construction and decommissioning of the interface infrastructure. As such, there is potential for slight adverse, indirect, short-term negative effects due to the disruption of access to roads due to activities required to

facilitate the construction and decommissioning of the interface infrastructure, such as road closures or road diversions, or restrictions/amendments to public transport routes (-1). This may result in a temporary increase in travel time for road and public transport users. There is also potential for slight negative, indirect short-term effects due to journeys being delayed by the potential increased vehicle traffic from construction machinery (-1), as well as short-term temporary road access restrictions, closures or slow-moving vehicle traffic to accommodate construction vehicles transporting abnormal loads (-1) will be required. There is the potential for slight negative, indirect short-term effects due to disruption from construction or decommissioning works or concerns regarding road safety for road users (motorised and non-motorised) with large vehicles or machinery (-1). All potential negative effects on transport infrastructure are, however, likely to be temporary and localised to the roads surrounding the construction and decommissioning works.

Eleven potential areas where interface infrastructure may be located contain areas of prime agricultural land. A significant portion of this prime agricultural land is in Lincolnshire, surrounding the Weston Marsh interface point, and Kent, surrounding the Richborough interface area. Given the amount of required interface infrastructure associated with the recommended design, there is potential for direct, moderate, short-term negative effects on agriculture through the temporary loss or disturbance of agricultural land and soils during pre-construction, construction and decommissioning phases (-2). This is due to land take requirements for construction compounds, haul roads and temporary access tracks during the construction and commissioning of the interface infrastructure. There is also potential for direct, moderate, medium and long-term negative effects on agriculture due to the permanent loss or disturbance of agricultural land and soils *during the operational period due to land take required for the permanent works, substations and converter stations* (-2). There is also potential for short-term, direct, slight negative effects due to temporary restrictions in access to agricultural land with construction and decommissioning activities (-1). There is potential for short-term, direct damage to field drains or the structure of agricultural land due to construction and decommissioning activities (-2), as well as the potential for indirect, short-term secondary negative effects on agriculture including through pollution of water sources used for irrigation or for livestock or through the introduction of soil borne pests and diseases (-2).

Eighteen of the potential areas where interface infrastructure may be located contain relatively small areas of either broadleaved woodland, conifer woodland, or mixed woodland, which may be utilised for commercial forestry. These may be difficult to avoid completely given the volume of required interface infrastructure associated with the recommended design. There is potential for direct, slight negative effects on commercial forestry due to a loss or disturbance of woodland within the interface areas from land take or felling requirements for construction compounds, haul roads and temporary access tracks during the construction and commissioning of the interface infrastructure (-1). There is also potential for the direct, slight negative effects on commercial forestry in the medium and long-term due to the permanent loss or disturbance of woodland within the interface area during the operation phase due to

land take requirements for the operation of interface infrastructure (-1). This could result in a reduction in income levels for this industry.

The potential for effects on tourism is considered indirectly within the topics of Landscape, Seascape and Visual Amenity (visibility of construction and operation/maintenance activity), Population and Human Health (recreational use), and Biodiversity, Flora, and Fauna (effects on wildlife). As discussed in the Landscape, Seascape and Visual Amenity Section, there is the potential for moderate negative effects in the short-term on Landscape, Seascape and Visual Amenity, which may result in secondary adverse effects on tourism, as this may act as a deterrent to tourists. As discussed in Population and Human Health, there is a slight potential for negative effects on the population due to increased noise release in the short-term, as such, tourism is unlikely to be impacted significantly by these potential effects, albeit temporary and localised. There is also potential for temporary direct disturbance on the local population due to lighting, noise and vibration generated during the operation of the converter station and substations. There is potential for slight negative, temporary direct and indirect effects on access restrictions and displacement for onshore recreational users during the construction (and decommissioning) phase, which may indirectly negatively affect tourism temporarily, as well as direct permanent loss or disturbances to community land areas during the operation of the converter station and substations. Lastly, as discussed in Biodiversity, Flora and Fauna, there is potential for the construction, decommissioning and operation phases to adversely affect wildlife, which may result in a secondary impact on tourism activities. Any impact on tourism will likely be temporary, localised and not significant.

The HNDFUE (ScotWind) recommended design has the potential to connect approximately 32.8GW of offshore renewable energy generation to the GB grid. As such, there is potential for positive effects in the short-term (+1) and moderate positive effects in the medium to long-term, owing to the facilitation of new renewable energy infrastructure (+2) and the associated reduction if reliance of fossil fuel generation.

Cultural, Architectural and Archaeological Heritage

Cabling:

There are a significant number (at least 1,661) marine archaeological/heritage assets located within the offshore sections of the identified route corridors, including 386 shipwrecks encountered by 19 identified route corridors and 1,276 marine Trove Heritage Assets encountered by 20 identified route corridors. The SW_NE8 (Buchan) to Peterhead 1 identified route corridor contains the greatest number of marine heritage assets (210). There is potential to avoid all marine archaeological/heritage assets within the 5km-wide identified route corridors, avoiding the potential for direct effects. There is potential for indirect short-term slight negative effects on these marine archaeological/heritage assets during the construction and decommissioning phases, due to indirect damage or disturbance to known and unknown features through alterations in the seabed morphology from suspended sediment levels and/or scour due to seabed preparation techniques and cable burial methods (-1).

Furthermore, there is potential for unknown marine and intertidal prehistoric landscapes, submerged archaeological artefacts, structures or wrecks to be discovered within the identified route corridors. There is potential for slight negative temporary to permanent effects, which may be due to direct damage or disturbance to unknown assets within the identified route corridors during surveys, works, cable laying or decommissioning activities (-1). There is also the potential for surveys and actions to contribute to archaeological knowledge and to inform subsequent decision-making.

There is also potential for slight negative indirect effects on known and unknown assets within the vicinity of cables in the identified route corridors in the medium to long-term operational phase owing to the potential for scouring and exposure to occur around features in the vicinity of cables and cable protection materials, leading to indirect damage or degradation, sediment deposition and further burial of features in the long-term (-1) and potential for loss of, or damage to, features during maintenance activities (-1). There may also be potential for long-term positive effects on archaeological features that are exposed, and that may be protected through burial with alterations in suspended sediment levels (+1).

There are a significant number (at least 6,494) terrestrial heritage assets located within the onshore sections of the identified route corridors. These include nine Garden and Designed Landscapes (within seven identified route corridors), 155 Scheduled Monuments (within 18 identified route corridors), 4,585 Trove Heritage assets (within 15 identified route corridors, this dataset is only available for Scotland), 1,586 Listed Buildings (within 18 identified route corridors), 25 Conservation Areas (within ten identified route corridors), one UNESCO WHS (within one identified route corridor), two battlefields (within one identified route corridor) and 131 Defence of Britain Sites (within ten identified route corridors). The SW_NE4 (Caledonia) to New Deer identified route corridor contains the greatest number of terrestrial heritage assets (1,378). There is potential for all known terrestrial heritage assets to be avoided within the identified route corridors, avoiding the potential for direct effects. However, there is potential for slight direct negative effects on unknown buried terrestrial heritage assets in the short-term due to potential damage within the identified onshore route corridors during pre-construction surveys, construction works, cable laying or decommissioning activities (-1).

There is also potential for slight indirect negative effects on known and unknown terrestrial archaeological assets within the identified onshore route corridors, as well as assets within the immediate vicinity of the identified route corridors, e.g., through sediment displacement or mud generation leading to burial of downstream sites, or hydrological regime alteration resulting in inundation or dewatering (-1) and from short-term, indirect temporary effects on the setting and cultural significance of designated and non-designated terrestrial heritage sites and archaeological assets, including coastal heritage assets (-1).

At the project planning phase, any sites of archaeological potential should be identified and exclusion zones established around these, with site surveys or trial trenching conducted before any potentially damaging activities take place, to inform any appropriate mitigation. Within the marine environment modelling of hydrodynamic and

sediment transport processes may be necessary to determine potential effects on surrounding archaeological features and determine any appropriate mitigation required.

Onshore Infrastructure:

There are a significant number (at least 2,690) terrestrial heritage assets located within the identified interface areas. These include 91 Scheduled Monuments (within all 16 interface areas), 458 Listed Buildings (within 16 interface areas), ten Conservation Areas (within four interface areas), one WHS (within one interface area), nine Garden and Designed Landscapes (within three interface areas), 4,585 terrestrial Trove Heritage assets (within 16 interface areas), two battlefields (within one interface area) and 36 Defence of Britain Sites (within seven interface areas). The identified Peterhead 1 interface area contains the greatest amount of terrestrial heritage assets (484). There is potential for all known terrestrial heritage assets to be avoided within the interface areas, avoiding the potential for direct effects. There is potential for slight direct negative effects on unknown buried terrestrial heritage assets in the short-term due to damage, partial or complete loss to unknown buried terrestrial archaeology assets, discovered in the development site or construction compounds, by site-based activities that involve groundbreaking and ground reduction, including foundations and the installation of services, and decommissioning activities (-1). There is also the potential for surveys and actions to contribute to archaeological knowledge and to inform subsequent decision-making. There is also potential for slight negative effects on known or unknown buried terrestrial archaeological assets within the interface areas through indirect damage to terrestrial archaeology assets or structures due to activities required to facilitate the construction or decommissioning of the interface infrastructure e.g., through sediment displacement or mud generation leading to burial of downstream sites, or hydrological regime alteration resulting in inundation or dewatering (-1). Any damage to or loss of archaeological assets may affect the cultural significance of the assets.

Due to the relatively significant number of new interface infrastructure required as part of the recommend design for HNDFUE (ScotWind), there is potential for moderate, short-term, indirect temporary effects on the setting and cultural significance of designated and non-designated terrestrial heritage sites and archaeological assets, including coastal heritage assets, due to the activities required to facilitate the construction and decommissioning of the interface infrastructure as a result of the presence of equipment and machinery, and temporary increases in air pollution, traffic, and noise and vibration (-2). There is also potential for moderate indirect long-term effects in the medium and long-term on the setting and cultural significance of designated and non-designated terrestrial heritage sites and features in the vicinity of new interface infrastructure, including coastal heritage assets due to the physical presence of the interface infrastructure and any associated alterations in the landscape or removal of areas for previous agricultural use, trees or landscape features associated with onshore heritage setting, as well as to the activities required to facilitate the operation and

maintenance of the new infrastructure due to potential increases in air pollution, traffic, noise and vibration (-2).

At the project planning phase, any sites of archaeological potential should be identified and exclusion zones established around these, with site surveys or trial trenching conducted before any potentially damaging activities take place, to inform any appropriate mitigation.

Landscape, Seascape and Visual Amenity

Cabling:

Four of the identified route corridors cross a total of 14 Marine Character Areas, with the SW_E2a_2 (Campion) to Richborough, SW_E1c_2 (Ossian) to Weston Marsh and SW_E1c1 (Ossian) to Lincolnshire Connection Node identified route corridors encountering the highest number of areas (9). Identified route corridors also encounter three Coastal Character Types at cable landfall locations in Scotland. Although these Marine Character Areas and Coastal Character Types are unavoidable, given the temporary nature of offshore cable laying, there is very limited potential for short-term, temporary effects on seascapes and visual amenity (0), as well as no anticipated effects on seascapes in the medium to long-term operation phase (0).

In total, there are 35 National Landscape Character Areas encountered by 18 of the identified route corridors. Despite being unavoidable, there is also very limited potential for short-term, temporary negative landscape effects on the Landscape Character Areas within the identified route corridors given the temporary and relatively small-scale works involved with onshore cabling laying (0), as well as no anticipated effects on these areas in the medium to long-term operational phase as cables will be buried (0).

There are short sections of the Formartine and Buchan Way (within the identified cable route corridors into Peterhead 1, and Peterhead 2/ DCSS), Moray Coast Trail (within the Shetland to Blackhillock identified route corridor) and the Speyside Way (within the Shetland to Blackhillock identified route corridor) that cannot be avoided and will need to be crossed by the identified cable routes. As such, there is potential for slight direct localised negative effects within these walking trails in the short-term due to localised construction plant activity, and the use of artificial lighting, during pre-construction, cable installation, and decommissioning and potential localised loss of landscape elements (-2). There may be potential for slight direct negative effects on these walking routes in the long-term should there be a need for localised removal of landscape elements such as trees, woodland areas, hedgerows, or agricultural land areas, if these are not reinstated following the completion of works (-1).

The Flow Country WHS, which extends partially into the identified SW_N2 (Havbredey) to Dounreay route corridor, and the two Country Parks, which are located within the identified route corridors from SW_E1c_2 (Ossian) to Weston Marsh and SW_E2a_2 (Campion) to Richborough, can be avoided by onshore cabling, avoiding the potential for direct effects. There may be potential for slight indirect negative landscape and visual amenity effects within these sites in the short-term due to the proximity of

construction plant activity, and the use of artificial lighting, during pre-construction, cable installation, and decommissioning (-1).

There are 28 urban areas encountered by 14 of the identified route corridors. There are avoidable urban areas and areas of moderate population density within the identified R4_5 (Morecambe) to Penwortham and R4_6 (Morgan) to Penwortham route corridors, as well as the presence of areas of moderate population density within the vicinity of the identified SW_E2a_2 (Campion) to Richborough route corridors. Construction activity within areas of higher population density has the potential to affect the localised visual amenity for a greater number of people. There is potential for slight short-term, temporary visual effects due to localised construction plant activity, and the use of artificial lighting, during pre-construction, cable installation, and decommissioning (-1).

Areas of the highest landscape and seascape sensitivity should be avoided, where possible at the project planning phase, and a SLVIA should be undertaken which should inform project design and include appropriate mitigation to minimise adverse effects.

Onshore Infrastructure:

There are 15 National Landscape Character Areas encountered by the interface areas. These cannot be avoided within these areas where new interface infrastructure is required. This includes Landscape Character Areas considered to be highly sensitive to new development. These comprise Boggy Moorland - Outer Hebrides (landscape character type 22) at Arnish; Farmed Lowland Plain (Landscape Character Type 143) at Dounreay and Banniskirk; Coastal Agricultural Plain - Aberdeenshire (Landscape Character Type 17) at Peterhead 2 / DCSS; Beaches, Dunes and Links - Aberdeenshire (Landscape Character Type 12) at Peterhead 1; Coastal Farmland – Borders (Landscape Character Type 110) at Branxton; Coastal Farmed Ridges and Hills - Arberdeenshire (Landscape Character Type 24) at Fiddes; Farmed and Settled Lowlands and Coast (Landscape Character Type 353) at Shetland Hub; Lincolnshire Coast and Marshes (National Character Area 42) at Lincolnshire Connection Node; The Fens (National Character Area 46) at Weston Marsh; and Upland Farmland (Landscape Character Type 288) at Blackhillock. The development of new substations or converter stations within these areas has greater potential for long-term negative effects on the landscape character, which should be taken into consideration at the project level. Given the amount of new infrastructure and landscape sensitivity, there is potential for moderate direct short-term, temporary negative landscape effects on the landscape elements within and overall landscape character within the interface areas during construction through the temporary or permanent loss of landscape elements to facilitate construction works including construction compounds and facilities, storage areas, the presence of plant, access routes, earthworks, Sustainable Drainage Systems (SuDS) and construction of emerging structures (-2). Furthermore, there is potential for moderate direct medium to long-term negative effects on landscape elements within and overall landscape character of National Landscape Character Areas due to the

physical presence of the interface infrastructure and the permanent loss of landscape elements to facilitate the operational phase of the interface infrastructure (-2).

There is potential to avoid the short sections of the Formartine and Buchan Way National Trail that is encountered within the Peterhead 1, and Peterhead 2 / DCSS interface areas, the Flow Country WHS (which covers part of the Dounreay interface area) and the Pegwell Bay Country Park (which covers part of the Richborough interface area), thus avoiding the potential for direct negative effects. However, given the amount of interface infrastructure required, there is the potential for moderate indirect negative landscape and visual amenity effects within these sensitive areas in the short-term due to the visibility of activities required for the construction and decommissioning of the interface infrastructure and any subsequent removal of landscape elements (-2). There is also potential for moderate indirect negative landscape and visual amenity effects within these areas in the medium to long-term due to the visibility of the interface infrastructure and activities required for facilitating the operation and maintenance of the interface infrastructure, as well as any subsequent removal of landscape elements (-2).

There are 17 urban areas within, or partially within, 11 of the interface areas. However, there is potential to avoid these urban areas for new developments of interface infrastructure, avoiding the potential for direct effects. Given the developed character of these urban areas, there is potential for slight indirect negative visual amenity effects in the short-term due to the potential visibility of activities in proximity to these areas, required for the construction and decommissioning of the interface infrastructure (-1). Development away from urban areas has the potential for long-term negative visual effects for the local population (-1). If new infrastructure is developed in proximity to high populated areas, there is greater potential for medium to long-term visual effects for a greater number of people due to the visibility of the interface infrastructure and activities required for facilitating the operation and maintenance of the interface infrastructure.

Areas of the highest landscape and seascape sensitivity should be avoided, where possible at the project planning phase, and a SLVIA should be undertaken which should inform project design and establish appropriate mitigation to minimise adverse effects.

Potential for Cumulative / In-Combination Effects

Biodiversity, Flora and Fauna

There is potential for short-term disturbance and displacement effects, and negative effects on supporting habitats within the Southern North Sea SAC from cabling within the identified routes SW_E2a2 (Campion) to Richborough, SW_E1c1 (Ossian) to Lincolnshire Connection Node, SW_E1c2 (Ossian) to Weston Marsh. There is also potential for cumulative effects from cabling within the HND preferred routes R4_1 to Birkhill Wood, R4_2 to Birkhill Wood, PA1 to Birkhill Wood, and SW_E1a (Morven) to Lincolnshire Connection Node.

There is potential for cumulative negative effects on designated bird species and supporting habitats within the Greater Wash SPA from cabling within the preferred routes SW_E1c1 (Ossian) to Lincolnshire Connection Node and SW_E1c2 (Ossian) to

Weston Marsh, and from cabling within the preferred HND routes R4_1 to Birkhill Wood, R4_2 to Birkhill Wood, R4_3 to Weston Marsh, PA1 to Birkhill Wood, and SW_E1a (Morven) to Lincolnshire Connection Node. There is also potential for cumulative effects within the East Mainland Coast, Shetland SPA from cabling within routes SW_NE1a to Shetland Hub, SW_NE1b to Shetland Hub, SW_NE1c to Shetland Hub, and Shetland Hub to Blackhillock.

There is potential for cumulative negative effects on protected features within the Southern Trench MPA from cabling within the preferred routes SW_NE3 (Stromar) to New Deer 2, SW_NE4 (Caledonia) to New Deer 2, SW_NE6 (Broadshore) to Peterhead 2 / DCSS, SW_NE7 (Marram) to Peterhead 2 /DCSS, SW_NE8 (Buchan) to Peterhead 1, and SW_E2b (Muir Mhor) to Peterhead 2 / DCSS. There is also potential for cumulative effects from cabling within the HND preferred routes of SW_NE4 (Caledonia) to New Deer, and SW_NE7 (Marram) to Peterhead 2 / DCSS.

There is potential for cumulative negative effects on protected features within the Loch of Strathbeg SSSI and for short-term cumulative direct and indirect negative effects on birds and supporting habitats within the Loch of Strathbeg RSPB site from cabling within the preferred routes SW_NE6 (Broadshore) to Peterhead 2 / DCSS and SW_NE8 (Buchan) to Peterhead 1.

There is potential for cumulative negative effects on the overall condition of Annex I reef due to direct or indirect damage to habitat from cabling within the preferred routes SW_N2 (Havbredey) to Dounreay, SW_E3 (Bowdun) to Fiddes, SW_E2a2 (Campion) to Richborough, SW_E1a (Morven) to Branxton, SW_E1c2 (Ossian) to Weston Marsh, SW_NE1a to Shetland Hub, SW_NE1b to Shetland Hub, SW_NE1c to Shetland Hub, and Shetland Hub to Blackhillock, as well as from cabling within the HND identified routes.

There is potential for cumulative negative effects within the Rattray Head to Peterhead LNCS from cabling within identified routes of HNDFUE ScotWind and HND.

There is potential for cumulative short-term disturbance and displacement effects on grey seals within areas of known higher density from cabling within the identified routes SW_E1c1 (Ossian) to Lincolnshire Connection Node, SW_E1c2 (Ossian) to Weston Marsh, SW_NE1a to Shetland Hub, SW_NE1b to Shetland Hub, SW_NE1c to Shetland Hub, and Shetland Hub to Blackhillock. In general, there is also potential for cumulative negative effects on marine mammal species and seabirds where cabling activities take place within the same region, including from cabling within the identified routes for HND.

There is potential for cumulative indirect negative effects on protected features within designated sites that are in the vicinity of new substations / converter stations for HND and HNDFUE Scotwind at Arnish, Spittal, Peterhead 2 / DCSS, New Deer, Lincolnshire Connection Node, and Weston Marsh. This could include the Inner Hebrides and the Minches SAC, Tong Saltings SSSI and Stornoway to Back, Lewis IBA in the vicinity of Arnish; Rora Moss LNCS in the vicinity of Peterhead 2 / DCSS; Macterry Moss, Windyhills, and Gight LCNS in the vicinity of New Deer; the Saltfleetby-Theddlethorpe Dunes and Gibraltar Point SAC, Humber Estuary SPA and Ramsar, Greater Wash SPA, Saltfleetby - Theddlethorpe Dunes SSSI, Lincolnshire Coronation Coast NNR, and Humber Estuary IBA in the vicinity of Lincolnshire Connection Node; the Surfleet Lows SSSI and The Wash IBA

in the vicinity of Weston Marsh; and areas of ancient woodland in the vicinity of Banniskirk/Spittal, Peterhead 2/DCSS, New Deer, and Lincolnshire Connection Node.

Population and Human Health

There is potential for cumulative negative effects on high intensity leisure boating in the Shetland area from cabling within the identified route corridors Shetland to Blackhillock, SW_NE1a (Stoura) to Shetland, SW_NE1b (Arven) to Shetland and SW_NE1c (Arven) to Shetland.

There is potential for cumulative negative effects on high intensity leisure boating in the Arnish area from cabling within the identified route corridor for SW_N3 (Talisk) to Arnish and identified HND route corridor for SW_N4 (Spiorad na Mara) to Arnish.

There is potential for cumulative negative effects on local population / human health in the Lincolnshire Connection Node area from cabling within the identified route corridor for SE_E1c_1 (Ossian) to Lincolnshire Connection Node and identified HND route corridor for SW_E1a (Morven) to Lincolnshire Connection Node. In the Weston Marsh area from cabling within the identified route corridor for SW_E1c_2 (Ossian) to Weston Marsh and identified HND route corridor for R4_3 (Outer Dowsing) to Weston Marsh.

There is potential for cumulative negative effects on areas of high intensity leisure boating in the Peterhead area from cabling within the identified HNDFUE route corridors for SW_E2b (Muir Mhor) to Peterhead 2 / DCSS, SW_NE6 (Broadshore) to Peterhead 2 / DCSS, SW_NE7 (Marram) to Peterhead 2 /DCSS and SW_NE8 (Buchan) to Peterhead 1 and identified HND route corridor for SW_NE7 (Marram) to Peterhead 2 /DCSS.

Geology, Soils and Land Use

There is potential for cumulative negative effects within the Southern Trench MPA through the potential for sedimentation associated with several identified route corridors intersecting this area, with potential for secondary impacts on Water through increased suspended sediments.

There is potential for a cumulative loss of the soil resource in the footprint of infrastructure across routes to have negative effects on farming (Material Assets), with loss of productive areas (short-term/temporary). Cumulative loss of soil/exposure of bare soil from construction leading to increased soil erosion with secondary effects on Material Assets for soil health, and also secondary impacts on Water with potential for increased suspended sediment losses, degrading water quality (short to medium-term). There is potential for cumulative effects within the areas associated with the HND1 interface areas and associated route corridors of the New Deer, Lincolnshire Connection Node, Banniskirk/Spittal and Arnish interface areas.

There is potential for a cumulative loss of soil, habitats, and peatlands with potential negative effects on Biodiversity, Flora and Fauna through altering supporting habitats for specific species (short to long-term), particularly in Shetland. Potential cumulative loss of areas of peatland may lead to negative indirect effects in the medium to long-term on Climatic Factors through a loss of carbon storage areas before re-establishment, particularly in Shetland.

Water

There is potential for cumulative effects within the Shetland Hub interface area and associated waterbodies, with three developments proposed to connect to this interface area, and potential for elevated sediment losses and poor water quality in the short to medium-term if cable construction works are inappropriately timed. There is potential for cumulative effects within the waterbodies associated with the HND1 interface areas and associated route corridors of the New Deer, Lincolnshire Connection Node, Banniskirk/Spittal and Arnish interface areas, with potential for elevated sediment losses and poor water quality in the short to medium-term if construction works are inappropriately timed.

There is potential for cumulative effects with the release of contaminants in the Moray Firth area, with multiple route corridors intersecting Military Danger Areas.

Air

There is potential for cumulative negative effects on relatively high intensity leisure boating in the Shetland area from cabling within the identified route corridors of Shetland to Blackhillock, SW_NE1a to Shetland, SW_NE1b to Shetland and SW_NE1c to Shetland.

There is potential for cumulative negative effects on relatively high intensity leisure boating in the Arnish area from cabling within the identified route corridor SW_N3 to Arnish and identified HND route corridor SW_N4 to Arnish.

There is potential for cumulative negative effects on the local population / human health in the Lincolnshire Connection Node area from cabling within the identified route corridor SE_E1c_1 (Ossian) to Lincolnshire Connection Node and the HND identified route corridor SW_E1a (Morven) to Lincolnshire Connection Node. Similarly in the Weston Marsh area, cabling within the identified route corridor SW_E1c_2 (Ossian) to Weston Marsh and HND route corridor R4_3 (ODOW) to Weston Marsh have potential for cumulative effects.

There is potential for cumulative negative effects on areas of relatively high intensity leisure boating in the Peterhead area from cabling within the identified HNDFUE route corridors SW_E2b (Muir Mhor) to Peterhead 2 / DCSS, SW_NE6 (Broadshore) to Peterhead 2 / DCSS, SW_NE7 (Marram) to Peterhead 2 / DCSS and SW_NE8 (Buchan) to Peterhead 1 and HND route corridor SW_NE7 (Marram) to Peterhead 2 /DCSS.

Climatic Factors

There is potential for cumulative negative effects on blue carbon habitats in the Shetland area from cabling within the identified route corridors Shetland to Blackhillock, SW_NE1a to Shetland, SW_NE1b to Shetland and SW_NE1c to Shetland.

There is potential for cumulative negative effects on onshore carbon sinks in the Shetland area from cabling within the identified route corridors Shetland to Blackhillock, SW_NE1a to Shetland, SW_NE1b to Shetland and SW_NE1c to Shetland, and in the Weston Marsh area from cabling within the identified route corridor SW_E1c_2 (Ossian) to Weston Marsh and HND identified route corridor R4_3 (ODOW) to Weston Marsh.

Material Assets

Offshore Infrastructure

There is potential for cumulative negative effects on unavoidable offshore infrastructure (cables and/or pipelines) from cabling within the identified route corridors SW_E2a_2 to Richborough, SW_E1c_2 to Weston Marsh and SW_E1c_1 to Lincolnshire Connection Node; SW_NE1a to Shetland, SW_NE1b to Shetland and SW_NE1c to Shetland Hub; Shetland Hub to Blackhillock and SW_NE2 to Banniskirk. If not carried out in a coordinated and well-planned manner, there is potential for such infrastructure to be impacted multiple times over a prolonged time span.

This includes the potential for intra-plan in-combination negative effects on unavoidable offshore infrastructure from cabling within SW_NE4 to New Deer HND identified route corridor and SW_NE4 to New Deer HNDFUE (Scotwind) identified route corridor; SW_NE7 to Peterhead DCSS HND identified route corridor and the SW_NE7 to Peterhead 2/DCSS HNDFUE (Scotwind) identified route corridor; the R4_3 to Weston Marsh and SW_E1a to Lincolnshire Connection Node HND identified route corridors, and the SW_E1c_2 to Weston Marsh and SW_E1c_1 to Lincolnshire Connection Node HNDFUE (Scotwind) identified route corridors; the PA_1 to Birkhill Wood, R4_1 to Birkhill Wood and R4_2 to Birkhill Wood HND identified route corridors, and the SW_E1c_2 to Weston Marsh and SW_E1c_1 to Lincolnshire Connection Node HNDFUE (Scotwind route corridors); the PA_1 to Birkhill Wood, R4_2 to Birkhill Wood and R4_2 to Birkhill Wood HND identified route corridors and the SW_E2a_2 to Richborough HNDFUE (Scotwind) identified route corridors.

Onshore Infrastructure

There is potential for cumulative negative effects on unavoidable onshore infrastructure (pipelines and/or overhead lines) from cabling within the identified route corridors SW_E2b to Peterhead 2/DCSS, SW_NE7 to Peterhead 2/DCSS, SW_NE6 to Peterhead 2/DCSS and SW_NE8 to Peterhead 1; and SW_NE3 to New Deer 2 and SW_NE4 to New Deer. There is also potential for cumulative effects due to cabling and interface infrastructure within the Peterhead 1 and Peterhead 2/DCSS; and the New Deer and New Deer 2 interface areas. There is potential for subsequent disruption to the services provided by the onshore infrastructure due to multiple routes and being planned in similar or the same corridor, and cabling and interface infrastructure being planned within the same or similar interface area. If not carried out in a coordinated and well-planned manner, there is potential for such infrastructure to be impacted multiple times over a prolonged time span.

This includes the potential for intra-plan in-combination negative effects on unavoidable onshore infrastructure from cabling within the SW_N1 to Banniskirk/Spittal HND identified route corridor and the SW_NE2 to Banniskrik HNDFUE (Scotwind) identified route corridor; SW_NE4 to New Deer HND identified route corridor and SW_NE4 to New Deer HNDFUE (Scotwind) identified route corridor; SW_NE7 to Peterhead DCSS HND identified route corridor and the SW_E2b to Peterhead 2/DCSS, SW_NE7 to Peterhead 2/DCSS; SW_NE6 to Peterhead 2/DCSS and SW_NE8 to Peterhead 1 HNDFUE (Scotwind) identified route corridors; the SW_E1a to Hurlie HND identified route corridor and the

SW_E3 to Fiddes HNDFUE (Scotwind) identified route corridor; and the R4_3 to Weston Marsh and SW_E1a to Lincolnshire Connection Node HND identified route corridors, and the SW_E1c_2 to Weston Marsh and SW_E1c_1 to Lincolnshire Connection Node HNDFUE (Scotwind) identified route corridors. As well as potential for intra-plan in-combination negative effects on onshore infrastructure from cabling and interface infrastructure within the Arnish, Banniskirk, New Deer, New Deer 2, Peterhead 1, Peterhead 2/DCSS, Fiddes, Lincolnshire Connection Node and Weston Marsh.

There is potential for cumulative negative effects on roads and/or railway lines from cabling within the within the identified route corridors SW_NE1a to Shetland Hub, SW_NE1b to Shetland Hub, SW_NE1c to Shetland Hub and Shetland Hub to Blackhillock; SW_E2b to Peterhead 2/DCSS, SW_NE7 to Peterhead 2/DCSS; SW_NE6 to Peterhead 2/DCSS and SW_NE8 to Peterhead 1; and SW_NE3 to New Deer 2 and SW_NE4 to New Deer. There is also potential for cumulative effects due to cabling and interface infrastructure within the Shetland Hub, Peterhead 1, Peterhead 2/DCSS, New Deer and New Deer 2 interface areas. There is potential for subsequent disruption to the services provided by transport infrastructure due to multiple routes being planned in similar or the same corridor, and cabling and interface infrastructure being planned within the same or similar interface area. If not carried out in a coordinated and well-planned manner, there is potential for such infrastructure to be impacted multiple times over a prolonged time span.

This includes the potential for intra-plan in-combination negative effects on transport infrastructure from cabling within SW_N4 to Arnish HND identified route corridor and SW_N3 to Arnish HNDFUE (Scotwind) identified route corridor; SW_N1 to Banniskirk/Spittal HND identified route corridor and SW_NE2 to Banniskirk HNDFUE (Scotwind) identified route corridor; SW_NE4 to New Deer HND identified route corridor and SW_NE4 to New Deer HNDFUE (Scotwind) identified route corridor; SW_NE7 to Peterhead DCSS HND identified route corridor and the SW_E2b to Peterhead 2/DCSS, SW_NE7 to Peterhead 2/DCSS; SW_NE6 to Peterhead 2/DCSS and SW_NE8 to Peterhead 1 HNDFUE (Scotwind) identified route corridors; SW_E1a to Hurlie HND identified route corridor and SW_E3 to Fiddes HNDFUE (Scotwind) identified route corridor; the R4_3 to Weston Marsh and SW_E1a to Lincolnshire Connection Node HND identified route corridors, and the SW_E1c_2 to Weston Marsh and SW_E1c_1 to Lincolnshire Connection Node HNDFUE (Scotwind) identified route corridors. As well as potential for intra-plan in-combination negative effects on transport infrastructure from cabling and interface infrastructure within the Arnish, Banniskirk, New Deer, New Deer 2, Peterhead 1, Peterhead 2/DCSS, Fiddes, Lincolnshire Connection Node and Weston Marsh.

Shipping and Navigation

There is potential for cumulative effects on shipping and navigation from cabling within the identified route corridors SW_NE1a to Shetland Hub, SW_NE1b to Shetland Hub, SW_NE1c to Shetland Hub and Shetland Hub to Blackhillock; SW_NE3 to New Deer 2, SW_NE6 to Peterhead 2/DCSS and SW_NE8 to Peterhead 1; SW_E2b to Peterhead 2/DCSS and SW_NE7 to Peterhead 2/DCSS; SW_E1a to SW_E1c_2 and SW_E1c_1 to Lincolnshire Connection Node; and SW_E1c_2 to Weston Marsh and SW_E1c_1 to Lincolnshire Connection Node. Cumulative effects include displacement of vessels, risk

of collision and allision, risk of entanglement of anchors with subsea cables or protective structures used over cables and impacts on search and rescue, primarily due to multiple routes being planned in similar or the same corridor. If not carried out in a coordinated and well-planned manner, there is potential for shipping and navigation to be impacted multiple times over a prolonged time span.

This includes the potential for intra-plan in-combination negative effects on shipping and navigation from cabling within SW_NE4 to New Deer HND identified route corridor and SW_NE4 to New Deer HNDFUE (Scotwind) identified route corridor; SW_NE7 to Peterhead DCSS HND identified route corridor and the SW_NE7 to Peterhead 2/DCSS HNDFUE (Scotwind) identified route corridor; the SW_E1a to Hurlie HND identified route corridor and the SW_E3 to Fiddes HNDFUE (Scotwind) identified route corridor; the SW_E1a to SW_E1b HND identified route corridor and the SW_E2a_2 to SW_E1C_1 HNDFUE (Scotwind) identified route corridor; the PA_2 to Near Blyth HND identified route corridor and the SW_E1a to Branxton HNDFUE (Scotwind) identified route corridor; R4_3 to Weston Marsh and SW_E1a to Lincolnshire Connection Node HND identified route corridors, and the SW_E1c_2 to Weston Marsh and SW_E1c_1 to Lincolnshire Connection Node HNDFUE (Scotwind) identified route corridors; the PA_1 to Birkhill Wood, R4_1 to Birkhill Wood and R4_2 to Birkhill Wood HND identified route corridors, and the SW_E1c_2 to Weston Marsh and SW_E1c_1 to Lincolnshire Connection Node HNDFUE (Scotwind route corridors); the PA_1 to Birkhill Wood, R4_1 to Birkhill Wood and R4_2 to Birkhill Wood HND identified route corridors and the SW_E2a_2 to Richborough HNDFUE (Scotwind) identified route corridors.

Commercial Fisheries

There is potential for cumulative negative effects on commercial fisheries operations from cabling within the identified route corriodrs SW_NE1a to Shetland Hub, SW_NE1b to Shetland Hub, SW_NE1c to Shetland Hub and Shetland Hub to Blackhillock; SW_NE3 to New Deer 2, SW_NE6 to Peterhead 2/DCSS and SW_NE8 to Peterhead 1; SW_E2b to Peterhead 2/DCSS and SW_NE7 to Peterhead 2/DCSS; SW_E1a to SW_E1c_2 and SW_E1c_1 to Lincolnshire Connection Node; and SW_E1c_2 to Weston Marsh and SW_E1c_1 to Lincolnshire Connection Node. Potential cumulative effects are due to temporary displacement from traditional fishing grounds, increased collision risk of fishing vessels, risk of entanglement of fishing gear. If not carried out in a coordinated and well-planned manner, there is potential for commercial fisheries to be impacted multiple times over a prolonged time span. There is potential for negative cumulative effects on the profitability of commercial fishing. This includes the potential for reduced quotas, increased resource competition for fishing, and reduced landings in both tonnage and economic value.

There is potential for negative cumulative effects on commercial fish species and their key habitats within the identified route corridors stated above due to the potential for a direct loss of supporting habitats, such as spawning and nursery grounds, due to sediment mobilisation, effects due to EMFs from cables impact EMF sensitive species. These could have an indirect effect on fishing activity through an alteration of fishing stocks.

This includes the potential for intra-plan in-combination negative effects on commercial fisheries from cabling within SW_NE4 to New Deer HND identified route corridor and SW_NE4 to New Deer HNDFUE (Scotwind) identified route corridor; SW_NE7 to Peterhead DCSS HND identified route corridor and the SW_NE7 to Peterhead 2/DCSS HNDFUE (Scotwind) identified route corridor; the SW_E1a to Hurlie HND identified route corridor and the SW_E3 to Fiddes HNDFUE (Scotwind) identified route corridor; the SW_E1a to SW_E1b HND identified route corridor and the SW_E2a_2 to SW_E1C_1 HNDFUE (Scotwind) identified route corridor; the PA_2 to Near Blyth HND identified route corridor and the SW_E1a to Branxton HNDFUE (Scotwind) identified route corridor; R4_3 to Weston Marsh and SW_E1a to Lincolnshire Connection Node HND identified route corridors, and the SW_E1c_2 to Weston Marsh and SW_E1c_1 to Lincolnshire Connection Node HNDFUE (Scotwind) identified route corridors; the PA_1 to Birkhill Wood, R4_1 to Birkhill Wood and R4_2 to Birkhill Wood HND identified route corridors, and the SW_E1c_2 to Near Spalding North (Weston Marsh) and SW_E1c_1 to Lincolnshire Connection Node HNDFUE (Scotwind route corridors); the PA_1 to Birkhill Wood, R4_1 to Birkhill Wood and R4_2 to Birkhill Wood HND identified route corridors and the SW_E2a_2 to Richborough HNDFUE (Scotwind) identified route corridors.

Military

There is potential for cumulative negative effects on military activities, including disruption of military exercises and activities within military danger areas, which is primarily due to multiple routes being located within one military area. Identified route corridors SW_NE3 to New Deer 2, Shetland Hub to Blackhillock and SW_NE2 to Banniskirk are located within the Moray Firth (North) Danger Area; SW_NE3 to New Deer 2 and SW_NE4 to New Deer are within the Moray Firth (South) Danger Area; SW_E1c_1 to Lincolnshire Connection Node and SW_E1c_2 to Weston Marsh are within the Druridge Bay Danger Area; and SW_E2a_2 to Richborough, SW_E1c_1 to Lincolnshire Connection Node and SW_E1c_2 to Weston Marsh are within the Staxton Danger Area. If not carried out in a coordinated and well-planned manner, there is potential for military activities to be impacted multiple times over a prolonged time span.

This includes the potential for intra-plan in-combination negative effects on military activities from cabling within SW_NE4 to New Deer HND identified route corridor and SW_NE4 to New Deer HNDFUE (Scotwind) identified route corridor; the SW_E1a to Lincolnshire Connection Node HND identified route corridor, and the SW_E1c_2 to Weston Marsh and SW_E1c_1 to Lincolnshire Connection Node HNDFUE (Scotwind) identified route corridors.

Agriculture

There is potential for cumulative negative effects on agriculture from cabling within the identified route corridors SW_E2b to Peterhead 2/DCSS, SW_NE7 to Peterhead 2/DCSS; SW_NE6 to Peterhead 2/DCSS and SW_NE8 to Peterhead 1; and SW_NE3 to New Deer 2 and SW_NE4 to New Deer. There is also potential for cumulative effects due to cabling and interface infrastructure within the Peterhead 1, Peterhead 2/DCSS, New Deer and New Deer 2 interface areas. Cumulative effects may be due to an increased loss of agricultural land and soils, restrictions in access to agricultural land, direct damage to field drains, secondary effects on agriculture due to pollution of water sources being

used for irrigation or as a livestock source and introduction of soil borne pests and diseases were to occur from construction process. This is primarily due to multiple routes being planned in the same or similar corridor. If not carried out in a coordinated and well-planned manner, there is potential for agriculture to be impacted multiple times over a prolonged time span.

This includes the potential for intra-plan in-combination negative effects on transport infrastructure from cabling within SW_NE4 to New Deer HND identified route corridor and SW_NE4 to New Deer HNDFUE (Scotwind) identified route corridor; SW_NE7 to Peterhead DCSS HND identified route corridor and the SW_E2b to Peterhead 2/DCSS, SW_NE7 to Peterhead 2/DCSS; SW_NE6 to Peterhead 2/DCSS and SW_NE8 to Peterhead 1 HNDFUE (Scotwind) identified route corridors; SW_E1a to Hurlie HND identified route corridor and SW_E3 to Fiddes HNDFUE (Scotwind) identified route corridor; the R4_3 to Weston Marsh and SW_E1a to Lincolnshire Connection Node HND identified route corridors, and the SW_E1c_2 to Weston Marsh and SW_E1c_1 to Lincolnshire Connection Node HNDFUE (Scotwind) identified route corridors. As well as potential for intra-plan in-combination negative effects on transport infrastructure from cabling and interface infrastructure within the New Deer, New Deer 2, Peterhead 1, Peterhead 2/DCSS, Fiddes, Lincolnshire Connection Node and Weston Marsh interface areas.

Commercial Forestry

There is potential for cumulative negative effects on woodland which may be used for commercial forestry from cabling within the within the identified route corridors SW_E2b to Peterhead 2/DCSS, SW_NE7 to Peterhead 2/DCSS; SW_NE6 to Peterhead 2/DCSS and SW_NE8 to Peterhead 1; and SW_NE3 to New Deer 2 and SW_NE4 to New Deer. There is also potential for cumulative effects due to cabling and interface infrastructure within the Peterhead 1, Peterhead 2/DCSS, New Deer and New Deer 2 interface areas. Cumulative effects may be due to an increased loss of commercial forestry, restrictions in access to forestry land and direct damage to drainage systems. This is primarily due to multiple routes being planned in the same or similar corridor or interface area. If not carried out in a coordinated and well-planned manner, there is potential for agriculture to be impacted multiple times over a prolonged time span.

This includes the potential for intra-plan in-combination negative effects on commercial forestry from cabling within the SW_N1 to Spittal/Banniskirk HND identified route corridor and SW_NE2 to Banniskirk HNDFUE (Scotwind) identified route corridor; SW_NE4 to New Deer HND identified route corridor and SW_NE4 to New Deer HNDFUE (Scotwind) identified route corridor; SW_NE7 to Peterhead DCSS HND identified route corridor and the SW_E2b to Peterhead 2/DCSS, SW_NE7 to Peterhead 2/DCSS; SW_NE6 to Peterhead 2/DCSS and SW_NE8 to Peterhead 1 HNDFUE (Scotwind) identified route corridors; SW_E1a to Hurlie HND identified route corridor and SW_E3 to Fiddes HNDFUE (Scotwind) identified route corridor. As well as potential for intra-plan in-combination negative effects on transport infrastructure from cabling and interface infrastructure within the Banniskirk, New Deer, New Deer 2, Peterhead 1, Peterhead 2/DCSS and Fiddes.

Cultural Heritage

There is potential for cumulative negative indirect effects on marine archaeological/heritage assets during the construction and decommissioning phases, where assets are avoided but are in proximity to more than one route. Potential routes which may experience cumulative effects include SW_NE1a to Shetland Hub, SW_NE1b to Shetland Hub, SW_NE1c to Shetland Hub and Shetland Hub to Blackhillock; SW_NE3 to New Deer 2, SW_NE6 to Peterhead 2/DCSS and SW_NE8 to Peterhead 1; SW_E2b to Peterhead 2/DCSS and SW_NE7 to Peterhead 2/DCSS; SW_E1a to SW_E1c_2 and SW_E1c_1 to Lincolnshire Connection Node; and SW_E1c_2 to Weston Marsh and SW_E1c_1 to Lincolnshire Connection Node. Cumulative effects may be due to indirect destruction, damage or disturbance to known and unknown features through alterations in the seabed morphology from suspended sediment levels and/or scour due to seabed preparation techniques and cable burial methods.

This could also include the potential for indirect effects in the medium to long-term operational phase owing to the potential for scouring and exposure to occur around features in the vicinity of cables and cable protection materials, leading to indirect damage or degradation, sediment deposition and further burial of features in proximity to more than one cable route.

This includes the potential for intra-plan in-combination negative effects on marine archaeological/heritage assets from construction/decommissioning within SW_NE4 to New Deer HND identified route corridor and SW_NE4 to New Deer HNDFUE (Scotwind) identified route corridor; SW_NE7 to Peterhead DCSS HND identified route corridor and the SW_NE7 to Peterhead 2/DCSS HNDFUE (Scotwind) identified route corridor; the SW_E1a to Hurlie HND identified route corridor and the SW_E3 to Fiddes HNDFUE (Scotwind) identified route corridor; the SW_E1a to SW_E1b HND identified route corridor and the SW_E2a_2 to SW_E1C_1 HNDFUE (Scotwind) identified route corridor; the PA_2 to Near Blyth HND identified route corridor and the SW_E1a to Branxton HNDFUE (Scotwind) identified route corridor; R4_3 to Weston Marsh and SW_E1a to Lincolnshire Connection Node HND identified route corridors, and the SW_E1c_2 to Weston Marsh and SW_E1c_1 to Lincolnshire Connection Node HNDFUE (Scotwind) identified route corridors; the PA_1 to Birkhill Wood, R4_1 to Birkhill Wood and R4_2 to Birkhill Wood HND identified route corridors, and the SW_E1c_2 to Weston Marsh SW_E1c_1 to Lincolnshire Connection Node HNDFUE (Scotwind route corridors); the PA_1 to Birkhill Wood, R4_1 to Birkhill Wood and R4_2 to Birkhill Wood HND identified route corridors and the SW_E2a_2 to Richborough HNDFUE (Scotwind) identified route corridors.

There is potential for cumulative negative indirect effects on terrestrial heritage assets through indirect damage, where assets are avoided but are in proximity to more than one route. Potential routes which may experience cumulative effects include SW_NE1a to Shetland Hub, SW_NE1b to Shetland Hub, SW_NE1c to Shetland Hub and Shetland Hub to Blackhillock; SW_E2b to Peterhead 2/DCSS, SW_NE7 to Peterhead 2/DCSS; SW_NE6 to Peterhead 2/DCSS and SW_NE8 to Peterhead 1; and SW_NE3 to New Deer 2 and SW_NE4 to New Deer. As well as potential cumulative effects on the Shetland Hub, New Deer, New Deer 2, Peterhead 2/DCSS and Peterhead 1 interface areas.

There is potential for cumulative effects on the setting of designated and non-designated terrestrial heritage sites and archaeological features, as well as coastal heritage assets within the routes and interface areas stated above. These are due to the presence of machinery and equipment involved in construction and decommissioning phases, or if landscape elements are not reinstated post-construction, where heritage assets are in proximity to more than one cable route and where new infrastructure is required within interface areas for more than one identified route corridor.

There is also potential for cumulative negative long-term effects on the setting of heritage assets in these areas in the operational phase due to the presence of new interface infrastructure within the interface areas stated above, including through alterations in the landscape/removal of vegetation to facilitate development.

This includes the potential for intra-plan in-combination negative effects on terrestrial and coastal heritage from cabling within SW_N4 to Arnish HND identified route corridor and SW_N3 to Arnish HNDFUE (Scotwind) identified route corridor; SW_N1 to Spittal/Banniskirk HND identified route corridor and SW_NE2 to Banniskirk HNDFUE (Scotwind) identified route corridor; SW_NE4 to New Deer HND identified route corridor and SW_NE4 to New Deer HNDFUE (Scotwind) identified route corridor; SW_NE7 to Peterhead DCSS HND identified route corridor and the SW_E2b to Peterhead 2/DCSS, SW_NE7 to Peterhead 2/DCSS; SW_NE6 to Peterhead 2/DCSS and SW_NE8 to Peterhead 1 HNDFUE (Scotwind) identified route corridors; SW_E1a to Hurlie HND identified route corridor and SW_E3 to Fiddes HNDFUE (Scotwind) identified route corridor; the R4_3 to Weston Marsh and SW_E1a to Lincolnshire Connection Node HND identified route corridors, and the SW_E1c_2 to Weston Marsh and SW_E1c_1 to Lincolnshire Connection Node HNDFUE (Scotwind) identified route corridors. As well as potential for intra-plan in-combination negative effects on transport infrastructure from cabling and interface infrastructure within the Arnish, Banniskirk, New Deer, New Deer 2, Peterhead 1, Peterhead 2/DCSS, Fiddes, Lincolnshire Connection Node and Weston Marsh.

Landscape, Seascape and Visual Amenity

There is potential for cumulative negative short-term landscape effects where identified route corridors or interface areas are within the same National Landscape Character Areas. The identified route corridors, which fall within the same National Landscape Character Area, include SW_N2 to Dounreay and SW_NE2 to Banniskirk; SW_NE3 to New Deer 2 and SW_NE4 to New Deer; SW_E2b to Peterhead 2/DCSS, SW_NE7 to Peterhead 2/DCSS, SW_NE6 to Peterhead 2/DCSS and SW_NE8 to Peterhead 1; and SW_E1c_1 to Lincolnshire Connection Node and SW_E1c_2 to Weston Marsh. If corridors are not spatially and temporally planned in a coordinated manner, there could be an increased area and timescale of impacts on these. There is potential for cumulative negative medium to long-term landscape effects where new infrastructure is required within interface areas for more than one identified route corridor, particularly where the Landscape Character types are recognised as sensitive to new development. Interface areas which may be impacted by cumulative effects in association with the interface infrastructure include New Deer, New Deer 2, Peterhead 1, Peterhead 2/DCSS, Lincolnshire Connection Node and Weston Marsh.

There is potential for cumulative negative short-term visual effects on local populations where identified route corridors are in proximity. Potentially affected corridors include SW_NE3 to New Deer 2 and SW_NE4 to New Deer; SW_E2b to Peterhead 2/DCSS, SW_NE7 to Peterhead 2/DCSS, SW_NE6 to Peterhead 2/DCSS and SW_NE8 to Peterhead 1; and SW_E1c_1 to Lincolnshire Connection Node and SW_E1c_2 to Weston Marsh. There is potential for cumulative negative medium to long-term landscape effects where new infrastructure is required within interface areas for more than one identified route corridor. Potentially impacted interface areas include New Deer, New Deer 2, Peterhead 1, Peterhead 2/DCSS, Lincolnshire Connection Node and Weston Marsh. If development is not spatially and temporally planned in a coordinated manner within these interface areas and identified route corridors, there could be an increased timescale of impacts on these.

This includes the potential for intra-plan in-combination negative landscape and visual effects from cabling within SW_N4 to Arnish HND identified route corridor and SW_N3 to Arnish HNDFUE (Scotwind) identified route corridor; SW_N1 to Spittal/Banniskirk HND identified route corridor and SW_NE2 to Banniskirk HNDFUE (Scotwind) identified route corridor; SW_NE4 to New Deer HND identified route corridor and SW_NE4 to New Deer HNDFUE (Scotwind) identified route corridor; SW_NE7 to Peterhead DCSS HND identified route corridor and the SW_E2b to Peterhead 2/DCSS, SW_NE7 to Peterhead 2/DCSS; SW_NE6 to Peterhead 2/DCSS and SW_NE8 to Peterhead 1 HNDFUE (Scotwind) identified route corridors; SW_E1a to Hurlie HND identified route corridor and SW_E3 to Fiddes HNDFUE (Scotwind) identified route corridor; the R4_3 to Weston Marsh and SW_E1a to Lincolnshire Connection Node HND identified route corridors, and the Weston Marsh and SW_E1c_1 to Lincolnshire Connection Node HNDFUE (Scotwind) identified route corridors. As well as potential for intra-plan in-combination negative effects from cabling and interface infrastructure within the Arnish, Spittal, New Deer, New Deer 2, Peterhead 1, Peterhead 2/DCSS, Fiddes, Lincolnshire Connection Node and Weston Marsh.

9.1.3 HNDFUE Celtic Sea – Recommended Design

The HNDFUE Recommended Design for the Celtic Sea contains the proposed connections shown in Table 34. The HNDFUE Recommended Design Study Area for the Celtic Sea is shown in Figure 46.

Start Point	End Point	Interface Requirements	Capacity
PDA1	Carmarthen	1 Developer AC Substation and 1 Transmission Owner (TO) Substation	1500MW HVAC
PDA2	South Wales Connection Node	1 Developer DC Converter station and 1 Transmission	1500MW HVDC

		Owner (TO) Substation	
PDA3	North Devon	1 Developer AC Substation and 1 Transmission Owner (TO) Substation	1500MW HVAC

Table 34: HNDFUE Celtic Sea Recommended Design proposed connections

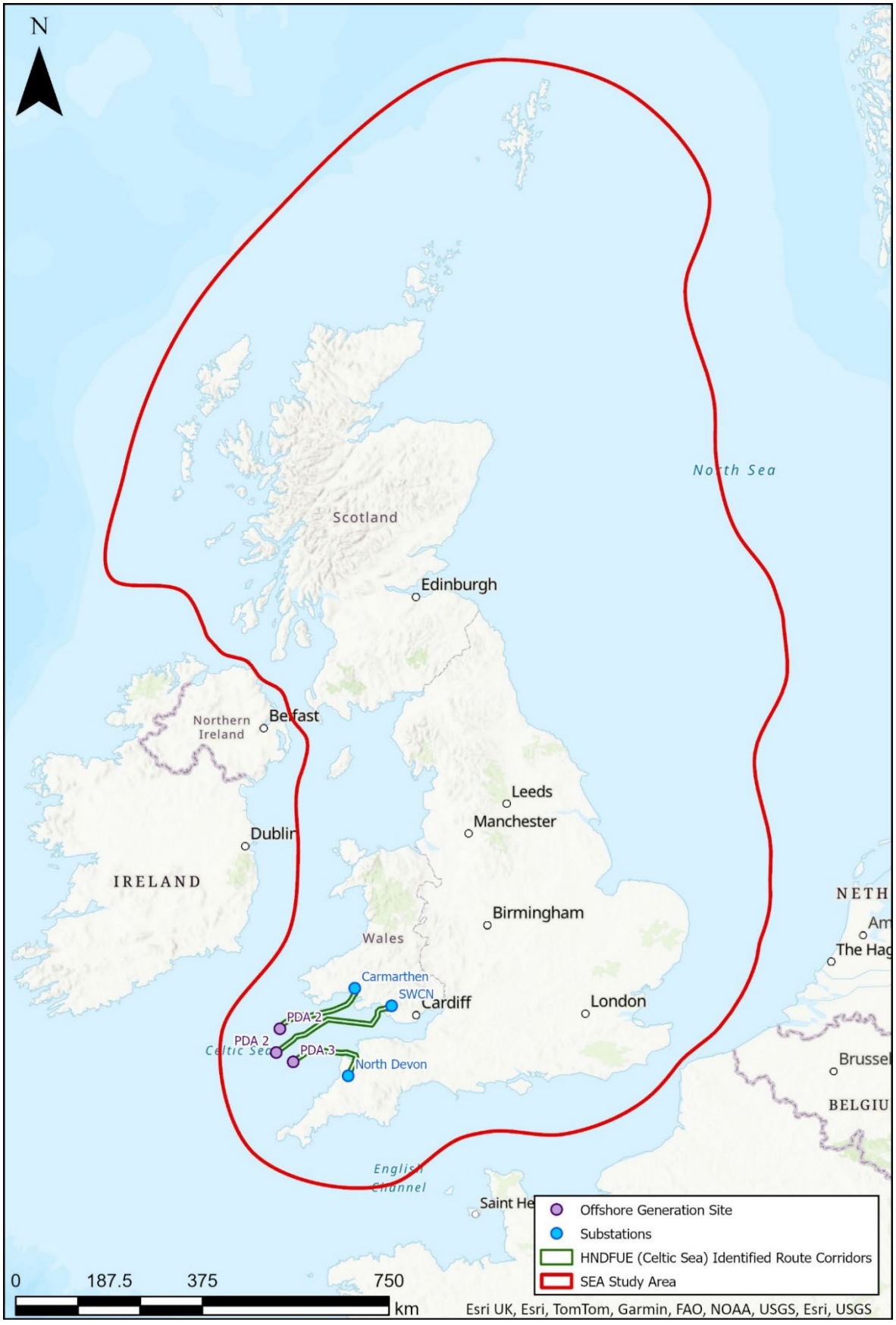


Figure 46: HNDFUE Celtic Sea Recommended Design Study Area

Environmental Baseline and Key Issues within the Study Area

Biodiversity, Flora and Fauna

There are designated sites that interact with the identified route corridors. This includes eight SACs, Bristol Channel Approaches (Dynesfeydd Mor Hafren) SAC, Carmarthen Bay Dunes (Twyni Bae Caerfyrddin) SAC, Culm Grasslands SAC, Kenfig (Cynffig) SAC, Pembrokeshire Marine (Sir Benfro Forol) SAC, Tintagel-Marsland-Clovelly Coast SAC, West Wales Marine (Gorllewin Cymru Forol) SAC, and Carmarthen Bay and Estuaries SAC. There are also three SPAs that interact with the identified route corridors, including Skomer, Skokholm and the Seas off Pembrokeshire (Sgomer, Sgogwm a Moroedd Penfro) SPA, Carmarthen Bay (Bae Caerfyrddin) SPA and Burry Inlet SPA. The Ramsar site of Burry Inlet is also affected by the identified route corridor from PDA1 to Carmarthen.

There is one MCZ potentially affected by the identified route corridors, the Bideford to Foreland Point MCZ. There are 18 SSSIs designated for ecological features that are potentially affected by identified route corridors. These are the Pembrey Coast SSSI, Coed Gwempa SSSI, Cwm Clydach, Cydweli SSSI, Cwm Du Woodlands SSSI, Kenfig (Cynffig) SSSI, Eglwys Nunydd Reservoir SSSI, Gwernydd Penbre SSSI, Smarts Quarry SSSI, Waun Cimla SSSI, Common Moor, East Putford SSSI, Dunsdon Farm SSSI, Hobby to Peppercombe SSSI, Kingford Fen SSSI, Kismeldon Meadows SSSI, Mambury and Stowford Moors SSSI, Mermaid's Pool to Rowden Gut SSSI, Small Brook SSSI, and Northam Burrows SSSI. There are also additional SSSIs within the wider vicinity of interface areas.

The Kenfig Pool and Dunes NNRs interacts with the identified route corridor from PDA2 to South Wales Connection Node, and the LNRs of Glan-Yr-Afon, Kenfig Pool and Dunes, Pembrey Burrows and Saltings, and Bedford Park also interact with the identified route corridors. The North Devon Biosphere reserve interacts with the identified route corridor from PDA3 to North Devon.

There are two IBAs that interact with the identified route corridor from PDA1 to Carmarthen, the Carmarthen Bay IBA and the Burry Inlet IBA. Generally, the seabird at sea density is relatively low within the identified route corridors. There are areas of relatively low modelled density for black-legged kittiwake, herring gull, lesser black-backed gull, common guillemot, northern fulmar, European storm petrel, and razorbill within the identified route corridors. There are also areas of relatively low modelled density for Manx shearwater and northern gannet; however, there are areas of relatively high density for these species in proximity to the identified route corridors.

The seabed habitats within the identified route corridors are predominantly deep circalittoral sand and deep circalittoral coarse sediment with smaller areas of other habitats such as Atlantic and Mediterranean high energy circalittoral rock closer to shore. There are known areas of Annex I reef and sandbank within the identified route corridors, and habitats identified by NRW as sensitive to cabling activities within identified route corridors in Welsh waters, including large shallow inlets and bays, mudflats and sandflats not covered by seawater at low tide and seagrass beds. There are OSPAR habitats within the identified route corridors, including intertidal mudflats, Sabellaria spinulosa reefs, saltmarsh, mixed muddy sediments, mud habitats in deep water, Honeycomb worm Sabellaria alveolata reef, and peat and clay exposures. There

are also FOCIs within the identified route corridors, including tide-swept channels; Ross worm (Sabellaria spinulosa) reefs; honeycomb worm (Sabellaria alveolate) reefs; and peat and clay exposures. Onshore, there are areas of ancient woodland within all of the identified route corridors.

There are identified route corridors that lie within the Celtic and Greater North Seas MU for the White-sided dolphin, White-beaked dolphin, Risso's dolphin, Minke whale, Harbour porpoise, and Common dolphin, and within the Offshore Channel, Celtic Sea and SW England MU for Bottlenose dolphin. Within the identified route corridors, there are areas of relatively moderate to high density for fin whale, common dolphin and bottlenose dolphin, areas of relatively moderate to very high density for common striped dolphin, areas of relatively low to moderate density for harbour porpoise, and areas of relatively low density for minke whale, Risso's dolphin and short-beaked common dolphin. There is generally a relatively low density for harbour seal and grey seal within the identified route corridors.

There are areas of known ecological importance for fish within the identified route corridors. This includes high intensity spawning grounds for sole, sandeel, plaice and cod, and low intensity spawning grounds for whiting, mackerel, ling, horse mackerel and nephrops, as well as low intensity nursery grounds for tope shark, thornback ray, spotted ray, sandeel, sole, plaice, hake, anglerfish, herring and whiting.

Population and Human Health

The settlements within the identified route corridors of the HNDFUE (Celtic Sea) recommended design include the urban areas of Pembrey, Kidwelly, Trimsaran, Margam, Pyle, Llangynwyd, Maesteg, Abbotsham/Bideford and Holsworthy. There are areas of relatively moderate population density with the identified route corridor into the South Wales Connection Node. There are areas of highest perceived deprivation at Kidwelly, Trimsaran, Shwt and Maesteg. There are also areas of higher perceived deprivation at Pembrey, Pontyates, Llangynwyd, Pyle, Margam, East Putford, West Putford, Sutcombe and Pyworthy and areas of moderate perceived deprivation at Mynyddygarreg, Garth, Cefn Cribw, Abbotsham and Parkham.

The bathing waters of Pembrey and Westward Ho! are within the identified route corridors.

There are no marinas or boating areas within the identified route corridors. There are areas of high intensity leisure boating activity within the identified route corridor into the South Wales Connection Node at Swansea Bay.

There is one Blue Flag Beach within an identified route corridor, Cefn Sidan at Pembrey Country Park.

There are no known underwater dive sites within the identified route corridors.

There are 119 onshore recreation sites within the identified route corridors, including public parks or gardens, playing fields, play spaces, cemeteries, allotments, religious grounds, tennis courts, bowling greens, golf courses, and other sports grounds.

Geology, Soils and Land Use

There are sensitive areas for Geology, Soils and Land Use within the identified route corridors that have the potential to be impacted upon by the development of infrastructure. The Bideford to Foreland Point MCZ is within the offshore component of the PDA3 to North Devon identified route corridor but can be avoided. There are no WHSs or Geoparks within the identified route corridors or interface areas of the recommended design.

The seabed substrate within the Bristol Channel is diverse but it is primarily composed of extensive areas of sand offshore interspersed with areas of muddy sand and gravelly sand; towards the inshore area this transitions to a mixture of gravel and sandy gravel with areas of rocks and boulders in the nearshore area.

Several areas of the Annex I habitats of reefs and sandbanks are encountered by the identified route corridors; reefs are the habitat primarily encountered, reflected by the extensive offshore areas of rock. Within the PDA1 to Carmathen identified route corridor, Annex I reefs are avoidable; however, there is limited scope to avoid the Annex I reefs for the PDA3 to North Devon identified route corridor, and Annex I sandbanks are unavoidable for the PDA2 to South Wales Connection Node identified route corridor. Several SSSIs are located within the identified route corridors and interface areas. Generally, these are avoidable; however, for the PDA1 to Carmathen identified route corridor the Aber Taf/Taf Estuary SSSI is unavoidable.

No dredge and point dumping grounds or Military Danger Areas are present within the offshore areas of identified route corridors; however, there are areas of potential contamination, and several unavoidable Military Practice Areas present within the PDA1 to Carmarthen identified route corridor offshore of Castlemartin (comprising two areas), Manorbier, Pendine and Pembrey Military Practice Areas. The Manorbier Military Practice Area is avoidable within the PDA2 to South Wales Connection Node identified route corridor.

Within the onshore component of the identified route corridors, and interface areas, areas of shallow exposed soils are present, however these are avoidable. There are no areas of peatland present within the onshore areas of identified route corridors or interface areas of the recommended design. Typically, the onshore areas of identified route corridors and interface areas encounter areas of moderate quality agricultural land, however for the PDA2 to South Wales Connection Node interface area there is limited scope to avoid good quality agricultural land. There are landfills present within the identified route corridor and interface area for the PDA3 to North Devon connection; however, these are avoidable.

Water

All of the identified route corridors are located within the MSFD Celtic Seas sub region to the south-west of Wales and England, where Good Environmental Status has not been achieved for all Descriptors due to pressures from commercial fisheries, non-native species and from climate change.

The average wave height around the south-west of Wales and England ranges between 1.0m to 2.25m. Within this area, in the inshore area the mean spring peak flow of tides

ranges from 0.51m/s to 0.76m/s, within the inshore area greater variability is observed between 0.11m/s to 1.26m/s.

Several coastal waterbodies and inland waterbodies are within the identified route corridors and interface areas within England and Wales; these are typically of moderate status both inland and along the coast. Within the onshore areas of identified route corridors, several rivers and lakes are present with limited scope to completely avoid these. Several rivers and lakes are also present within the interface areas. Within all three identified route corridors, there are unavoidable National Flood Zones present at landfall.

Bathing waters are present within the identified route corridors from PDA1 to Carmarthen and PDA2 to the South Wales Connection Node. The Pembrey and Aberafan Bathing Waters are avoidable within the identified route corridor to Carmarthen, however within the PDA2 to South Wales Connection Node route corridor and interface area the three Bathing Waters of Rest Bay, Sandy Bay and Trecco Bay associated with Porthcawl are unavoidable. Shellfish waters are also present within the identified PDA1 to Carmarthen and PDA2 to South Wales Connection Node route corridors but are avoidable. No dredge spoil dumping grounds or Military Danger Areas are present within the offshore areas of identified route corridors; however, there are areas of potential contamination present with several unavoidable Military Practice Areas present within the PDA1 to Carmarthen identified route corridor offshore of Castlemartin (the Manorbier, Pendine and Pembrey Military Practice Areas). The Manorbier Military Practice Area is avoidable within the PDA2 to waters are also present within the identified PDA1 to Carmarthen and PDA2 to South identified route corridor.

Air

There are settlements within the identified route corridors of the recommended HNDFUE (Celtic Sea) design, including the urban areas of Pembrey, Kidwelly, Trimsaran, Margam, Pyle, Llangynwyd, Maesteg, Abbotsham/Bideford and Holsworthy. There are areas of relatively moderate population density with the identified route corridor into South Wales Connection Node. There are areas of highest perceived deprivation at Kidwelly, Trimsaran, Shwt and Maesteg. There are also areas of higher perceived deprivation at Pembrey, Pontyates, Llangynwyd, Pyle, Margam, East Putford, West Putford, Sutcombe and Pyworthy and areas of moderate perceived deprivation at Mynyddygarreg, Garth, Cefn Cribw, Abbotsham and Parkham.

There is one Air Quality Management Area located in the area affected by the recommended HNDFUE (Celtic Sea) design, the Neath Port Talbot AQMA Taibach/Margam.

There are areas of high intensity leisure boating activity within Swansea Bay.

Climatic Factors

Within the identified route corridors there are areas of high blue carbon potential within the identified route corridor to North Devon. There are kelp forests and intertidal seaweeds located along the coastline at Bideford Bay.

Onshore there are areas with potential to be carbon sinks, such as ancient trees located within Margam Country Park and at Woodtown. There are areas of forest located within onshore areas of all identified route corridors.

Material Assets

There are numerous submarine cables located within GB waters, with approximately 11 offshore cable connections interacting with the identified route corridors; of these, nine are telecommunications connections and two are undefined. All cable crossings are unavoidable.

There are no offshore oil and gas pipeline connections crossed by the identified route corridors. There is one avoidable diffuser located near landfall within the identified PDA 3 to North Devon route corridor. There are no offshore platforms, oil/gas wells, oil/gas installations, gas storage sites or gas storage pipeline agreements within the identified route corridors.

The Scarweather Sands Met Mast is located within the identified PDA2 to South Wales Connection Node route corridor but is avoidable. There are no offshore carbon capture and storage site agreements located within the study area.

There are no operational offshore wind farms or export cables within the identified route corridors. There are no proposed offshore wind energy generation sites within the identified route corridors, however, the consented Erebus Floating Wind Demo export cable is located adjacent to the identified PDA 1 to Carmarthen identified route corridor. There are no operational or proposed tidal energy generation sites within the identified route corridors. There are no operational wave energy generation sites within the identified route corridors, however, the South Pembrokeshire Demonstration Zone, which is currently at the pre-planning application stage is just within the PDA 1 to Carmarthen identified route corridor.

A significant amount of onshore infrastructure is located within the identified route corridors, comprising the recommended HNDFUE (Celtic Sea) design. A number of roads and railways located within Wales and south-west England will need to be crossed by the onshore sections of the identified route corridors and are located within potential areas for new interface infrastructure. Roads which require crossing include A roads, B roads, local, minor, motorways, primary and restricted roads. Railway lines which require crossing include multi-track, single-track, narrow gauge and tunnels. It is possible to avoid these roads and railways with the new interface infrastructure; however, construction vehicles may have to utilise roads temporarily.

There are no fossil fuel power stations located within the identified route corridors.

Existing National Grid transmission infrastructure is located within the identified route corridors and potential interface areas. This infrastructure includes underground cables and overhead lines operating at 400kV, 257kV and 66kV, and their associated towers/poles. There are four substations operating at 275kV, 132kV and 65kV within the identified PDA2 to South Wales Connection Node route corridor; however, no existing substations are located within the potential interface areas. The majority of the overhead lines are unavoidable by onshore cabling within the identified route corridors, whilst all are avoidable by new interface infrastructure. The underground cables and

substations are avoidable within the identified route corridors by onshore cabling and the new interface infrastructure.

In terms of onshore gas infrastructure, there is one onshore pipeline (Herbrandston to Felindre) located within the PDA1 to Carmathen identified route corridor and within the vicinity of the Carmarthen interface area. This pipeline is unavoidable for onshore cabling within the identified route corridor, whilst there is potential to avoid this pipeline with new interface infrastructure. There are no petroleum terminals, LNG facilities or crude oil refineries within any of the identified route corridors.

There are nine avoidable onshore operational renewable energy sites with a generation capacity over 150kW located within the identified route corridors, of which four are also within the interface areas. There is one wind farm within the PDA2 to South Wales Connection Node identified route corridor, which is located in Wales. There are five solar photovoltaic sites within the identified route corridors, four are located England and one is in Wales. The four solar photovoltaic sites in England are within the North Devon interface area. Additionally, one anaerobic digestion site is located in the identified route corridor in England. There are two biomass sites located within the PDA2 to South Wales Connection Node identified route corridor in Wales. There are no advanced conversion technology sites, landfill gas sites, air source heat pumps, battery storage, hydrogen, geothermal, hydroelectricity or sewage sludge digestion facilities with a generation capacity over 150kW within the identified route corridors or interface areas. In terms of non-renewable energy producing waste management facilities, there are no energy from waste (EfW) facilities with a generation capacity over 150kW within the identified route corridors and interface area. All onshore renewable infrastructure can be avoided by the onshore cabling and the interface infrastructure.

Wastewater management infrastructure is also located within the identified route corridors, including five wastewater treatment/sewage works. One of these is located in England, whilst four are located in the onshore sections of identified route corridors in Wales. Only one of the wastewater treatment/sewage works is within an interface area, in the vicinity of the South Wales Connection Node. There are no desalination plants within the identified route corridors or interface areas. All wastewater management infrastructure can be avoided by both the onshore cabling and the new interface infrastructure.

All identified route corridors which comprise the recommended HNDFUE (Celtic Sea) design are within areas where shipping activity occurs; as such, shipping activity is unavoidable. The identified route corridors are mainly located within areas of lower shipping density; however, areas of moderate shipping density are generally crossed within inshore areas with a large area of moderate shipping density crossed south of St. Ann's head. These areas of moderate shipping density are unavoidable. The identified route corridors also encounter areas of unavoidable high shipping density, generally within inshore areas, where shipping routes are entering/exiting the Bristol Channel. There are large, areas of higher shipping density are crossed on approach to Port Talbot, south of St. Ann's Head and off the coast of Devon in England. One avoidable port/harbour area is located within the identified route corridors at Port Talbot. There are no shipping route measures, including traffic separation zones, located within the

identified route corridors. There are no designated anchorage areas or pilot boarding stations located within the identified route corridors.

GB waters are heavily used for commercial fisheries. All identified offshore route corridors which comprise the recommended HNDFUE (Celtic Sea) design are within areas where fishing activity occurs; as such, fishing activity is unavoidable. The identified route corridors are mainly located within areas of relatively lower fishing activity within the Bristol Channel. However, there are areas of unavoidable moderate and high fishing activity located within two of the identified route corridors, further from the coast. Significant areas of high fishing activity that need to be crossed are located within the Celtic Sea, 12.3km and 29km south of Castlemartin Ranges. Fleets which are known to operate within the identified route corridors include those targeting whiting, sprat, sole, plaice, Norway pout, mackerel, horse mackerel, herring, hake, haddock, cod, blue whiting, and anglerfish. There are no marine fish farms located within the identified route corridors. There are unavoidable known fish spawning grounds located within the identified route corridors. These include sprat, nephrops, hake, cod, whiting, lemon sole, horse mackerel, mackerel, ling, plaice, sandeel and sole in various locations across the Celtic Sea. Additionally, there are unavoidable known fish nursery grounds for nephrops, herring, whiting, plaice, sandeel, lemon Sole, mackerel, sole, tope shark, thornback ray, spotted ray, European hake, and anglerfish within the identified route corridors.

There is one onshore military area located within the identified route corridors, namely Graig Fawr 'Chain Home Low' Radar Station (WWII), which is located near Margam outside of the interface area. This onshore military area can be avoided by onshore cabling and interface infrastructure. There are four offshore military danger areas within the identified route corridors, including D113(A&B): Castlemartin, D115: Manobrier, D117: Pendine and D118: Pembrey. None of these offshore military areas can be avoided within the identified route corridors.

There are no airports within the identified route corridors.

There are no dredge spoil dumping sites, munition dumping grounds, dredging navigation areas, aggregate dredging areas, offshore aggregate site agreements or offshore mining agreements located within the identified route corridors.

The identified route corridors and interface areas intersect areas of unavoidable prime agricultural land. All identified route corridors and interface areas contain areas of good quality prime agricultural land, with smaller areas of very good quality prime agricultural land. It is not possible for prime agricultural land to be completely avoided by all onshore cabling or all interface infrastructure.

The identified route corridors and interface areas intersect areas of woodland, which may be utilised for commercial forestry. These include areas of broadleaved woodland, conifer woodland, and mixed woodland, as well as areas of young trees. It may be difficult to completely avoid all areas of woodland within every identified route corridor and interface area.

There are a number of recreational sites with the potential to act as tourist attractions located within the identified route corridors, two bathing waters and one Blue Flag Beach. Tourist activities within the marine portion of identified route corridors are likely

to include water sports, sailing, and fishing within inshore areas, and there are areas of known relatively high-intensity leisure boating activity within the identified route corridors. There are 119 onshore recreation sites within the identified route corridors, including public parks or gardens, playing fields, play spaces, cemeteries, allotments, religious grounds, tennis courts, bowling greens, golf courses, and other sports grounds. Additionally, the North Devon AONB, the South West Coast Path National Trail, the Hartland (Devon) Heritage Coast and two National Trust Lands (Kipling Tors Westward Ho and Portledge) are encountered within the onshore sections of the identified route corridors.

Cultural, Architectural and Archaeological Heritage

There are many (44) known shipwrecks within the identified route corridors, the greatest number of which are located in the PDA2 to South Wales Connection Node identified route corridor. There is potential to avoid these shipwrecks with offshore cabling. There are no Historic Marine Protected Areas, or designated wrecks located within the recommended HNDFUE (Celtic Sea) design area. However, there is the potential for unknown marine and intertidal prehistoric landscapes, submerged archaeological artefacts, structures or wrecks to be located within the identified route corridors.

Three Parks and Gardens are located within the identified route corridors, whilst none are present within the interface areas. There are many (245) Listed Buildings within the identified route corridors, with the identified PDA_3 to Celtic Sea route corridor containing the greatest number of Listed Buildings (129). There are also 53 Listed Buildings within the interface areas, with the greatest number surrounding the South Wales Connection Node. Approximately 62 Scheduled Monuments are within the identified route corridors, with the PDA2 to South Wales Connection Node and PDA3 to North Devon identified route corridors containing the greatest number (23). There are also 26 Scheduled Monuments located within the interface areas, the greatest number of which are surrounding South Wales Connection Node.

Four Conservation Areas are situated within the identified route corridors, the greatest number of which are within the identified PDA2 to South Wales Connection Node identified route corridor. There are also two within interface areas, with one present in each of the South Wales Connection Node and Carmarthen interface areas. There are 58 Defence of Britain Sites located within the onshore section of the identified route corridors, all of which are within the PDA1 to Carmarthen identified route corridor. There are also four within the Carmarthen interface area. There is potential to avoid all terrestrial heritage assets with onshore cabling and new interface infrastructure. There are no WHSs or Battlefields within the onshore section of the identified route corridors. There is potential for unknown terrestrial heritage assets, including coastal heritage assets, to be present within the identified route corridors.

Additionally, there are some important Cultural, Architectural and Archaeological Heritage sensitive areas in the immediate vicinity of the onshore sections of the identified route corridors, including Defence of Britain Sites, Listed Buildings and Scheduled Monuments.

Landscape, Seascape and Visual Amenity

There are sensitive areas for Landscape, Seascape and Visual Amenity (LSVA) located within the identified route corridors. There are 10 Marine Character Areas associated with the offshore sections of the identified route corridors, five English and five Welsh. There is no potential to avoid these; however, they are unlikely to be impacted by offshore cabling.

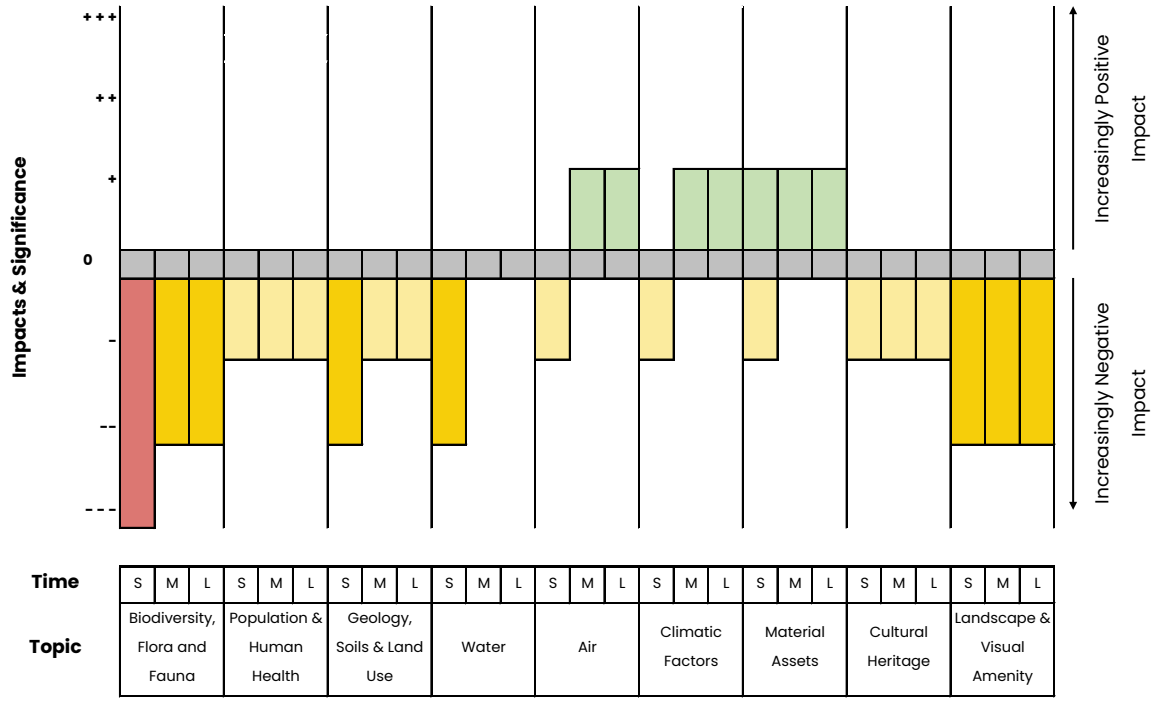
Within the onshore sections, there are three National Landscape Character Areas encountered by the identified route corridors in England, whilst four are encountered in Wales. These are unavoidable; however, they are unlikely to be significantly impacted by onshore cabling. Additionally, there is one National Landscape Character Area (The Culm) located within the North Devon interface area, whilst three National Landscape Character Areas are encountered in Wales. There is no potential to avoid these for the new interface infrastructure. There are eleven Special Landscape Areas located within the identified route corridors in Wales.

There are no WHSs, or National Parks located within the identified route corridors or interface areas. There is one National Landscape (AONB) within the identified route corridors, namely the North Devon AONB. This covers part of the PDA3 to North Devon identified route corridor and cannot be avoided. There is one Heritage Coast encountered by the PDA3 to North Devon identified route corridor, namely the Hartland (Devon) Heritage Coast), which cannot be avoided if cabling is to be brought onshore. One National Trail intersects the PDA3 to North Devon identified route corridor, namely the Southwest Coast Path. A short section of this National Trial cannot be avoided and will need to be crossed by onshore cabling. Two avoidable Country Parks are located within the identified route corridors in Wales, namely Margam Park and Pembrey. There are no National Landscapes, Heritage Coasts, National Trails or Country Parks located within the interface areas.

Environmental Assessment			
Environmental Assessment	Short-term	Medium-term	Long-term
Biodiversity, Flora and Fauna (BFF)	-3	-2	-2
Population and Human Health (PHH)	-1	-1	-1
Geology, Soils and Land Use (GSL)	-2	-1	-1
Water (W)	-2	0	0
Air (A)	-1	+1	+1
Climatic Factors (CF)	-1	+1	+1
Material Assets and Infrastructure (MA)	-1 / +1	+1	+1
Cultural, Architectural and Archaeological Heritage (CH)	-1	-1	-1
Landscape / Seascape and Visual Amenity (L)	-2	-2	-2

Table 35: HNDFUE Celtic Sea Recommended Design summary scoring table

Summary Chart of Potential Impacts



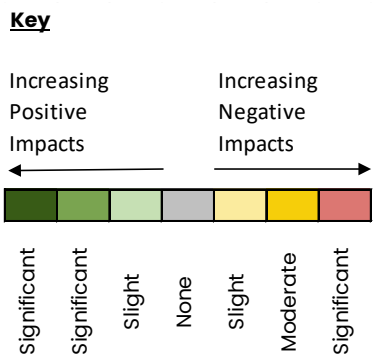


Figure 47: HNDFUE Celtic Sea Recommended Design summary scoring chart

Discussion of Potential Effects

Biodiversity, Flora and Fauna

Cabling:

There are designated sites that are not possible to avoid within the identified HNDFUE Celtic Sea route corridors.

The Bristol Channel Approaches SAC (designated for harbour porpoise) is unavoidable within all of the identified route corridors, if the proposed development areas are to be connected to the grid. If not mitigated there is potential for direct and indirect, short to medium-term, temporary negative effects within this site in the construction and decommissioning phases and during cable maintenance activities. This could include damage to, disturbance and displacement of species, as well as damage to supporting habitats and displacement of prey species (-3). Potential impacts on marine mammals will be short-term intermittent (during construction, maintenance, and decommissioning) but the impact has the potential to have a permanent effect for species if mortality occurs. The Carmarthen Bay and Estuaries SAC (designated for estuaries, subtidal sandbanks, mudflats and sandflats, shallow inlets and bays, Salicornia habitat, Atlantic salt meadows, Twaite and allis shad, river and sea lamprey and otter) is unavoidable within the identified route corridor for PDA1 to Carmarthen. If not mitigated there is potential for direct and indirect, short to medium-term, temporary negative effects within these sites in the construction and decommissioning phases and during cable maintenance activities. This could include direct and indirect damage to habitats, and damage to, disturbance and displacement of species, as well as damage to supporting habitats of designated species (-3). If habitats that are sensitive to cabling activities such as saltmarsh are unavoidable by micro-routing at the project level recovery may be long-term, with the potential for long-term negative effects (-3).

The Carmarthen Bay SPA (designated for common scoter) is unavoidable within the identified route corridor from PDA1 to Carmarthen. There is potential for direct and indirect, temporary negative effects within this site in the short-term construction and decommissioning phases and temporary intermittent effects during cable maintenance activities, including damage to, disturbance and displacement of birds

and short to medium-term (re-establishment) damage to supporting habitats and displacement of prey species (-3). Avoidance of sensitive times or specific areas should be considered at the detailed design stage.

The majority of SSSIs that are within the identified cable route corridors can be avoided; however, the Pembrey Coast SSSI (designated for intertidal, saltmarsh and sand dune habitats) is unavoidable within the identified route corridor from PDA1 to Carmarthen, and there is limited potential to avoid the Mermaid's Pool to Rowden Gut SSSI within the identified route corridor from PDA3 to North Devon, owing to a small gap of 80m between this site and the geological SSSI of Westward Ho! Cliffs. There is potential for direct and indirect, negative effects within these sites in the short-term construction and decommissioning phases and during cable maintenance activities (-2). If habitats that are sensitive to cabling activities such as saltmarsh are unavoidable by micro-routing at the project level recovery may be long-term, with the potential for long-term negative effects (-2).

All other designated sites that are within the identified route corridors can be avoided by cable routes within these corridors, avoiding the potential for direct negative effects. There may be potential for short-term, indirect, negative effects on protected features within these sites, which will need to be considered further in micro-routing at the detailed design stage.

NRW habitats identified as sensitive to cabling are within the identified route corridor from PDA1 to Carmarthen; large shallow inlets and bays, mudflats and sandflats are unavoidable within the route corridor. There is potential for direct and indirect, negative effects on these habitats during construction and decommissioning and cable maintenance activities; direct effects have the potential to be long-term (-2). There are areas of Annex I reef and sandbank habitats that cannot be avoided, or there is limited potential to avoid within the route corridors. There is potential for direct and indirect, negative effects during construction and decommissioning and cable maintenance activities; direct effects have the potential to be long-term or permanent (-2). There are areas of OSPAR and FOCI Sabellaria spinulosa reefs and FOCI sensitive habitats of tide swept channels that are difficult to avoid within the identified route corridor from PDA2 to South Wales Connection Node. Avoidance of these habitats should be considered through micro-routing considerations at the project stage, and the potential for short-term direct and indirect negative effects on sensitive and threatened habitat features will need to be considered. There is also potential for direct negative effects on areas of ancient woodland, which are unavoidable for the identified onshore cable route from PDA2 to South Wales Connection Node, with direct effects having the potential to be long-term to permanent in the footprint of cable working areas (-2).

The NNR and the LNRs that are within the identified cable route corridors can be avoided. The potential for indirect effects on these sites should be considered at the project stage. There may be potential for direct or indirect, negative effects on flora and fauna within the North Devon Biosphere reserve and the Carmarthen Bay IBA, which are unavoidable within the identified cable route corridors (-1).

There may be potential for short-term disturbance and displacement of marine mammal species during the construction and decommissioning phases and during

cable maintenance activities, as well as short-term damage to supporting habitats and disturbance of prey species (-1). Areas of ecological importance for fish species such as spawning and nursery habitat may not be avoidable within the identified route corridors, and there is potential for short-term disturbance to and displacement of, species and short-term damage to supporting habitats within the construction and decommissioning phases (-1). There is potential for short-term disturbance to and displacement of seabirds, as well as birds within the preferred onshore cable routes during the construction and decommissioning phases and during cable maintenance activities (-1).

In general, there is also potential for direct and indirect negative effects from disturbance or damage to local habitats and species outside of designated sites during the construction and decommissioning phases and during any cable maintenance activities (-1).

Onshore Infrastructure:

There are designated sites within the vicinity of the onshore interface areas; however, all of these sites can be avoided by the required substation developments, avoiding the potential for direct negative effects on designated habitats and species. The designated sites within the vicinity of interface areas include the Carmarthen Bay and Estuaries SAC, and the following SSSIs designated for ecological features; Taf Estuary (Aber Taf) SSSI, Cwm Clydach and Cydweli SSSI, Coed Gwempa SSSI, Coedydd Capel Dyddgen SSSI, Cwm Du Woodlands SSSI, Cwm Cyffog SSSI, Cwm Risca Meadow SSSI, Brendon and Vealand Fern SSSI, Kingford Fen SSSI and Small Brook SSSI. There may be potential for short-term, temporary, indirect negative effects on protected features within these sites, which will need to be considered further at the detailed design stage, such as water quality impacts on hydrologically connected sites, and disturbance of protected species of sites within the vicinity of works areas. The IBA of Carmarthen Bay can be avoided as well as areas of ancient woodland.

If the construction works for new substations and converter stations are undertaken within areas of lower sensitivity, the potential for significant negative effects on Biodiversity, Flora and Fauna should be avoidable. There is potential for direct, long-term loss of local habitats and species in the footprint of the new infrastructure and any required access roads, and for temporary, medium-term negative effects on Biodiversity, Flora and Fauna within the wider temporary work areas, which could include disturbance and displacement of species and temporary loss of supporting habitats (-1).

Developments occurring in England will need to comply with requirements for Biodiversity Net Gain (BNG); therefore, potential loss of local habitats within development areas will require suitable habitat creation or enhancement, with a net gain of 10%. For developments within Wales development will need to comply with the requirements for Net Benefit for Biodiversity (NBB), with local planning authorities responsible for determining the appropriate level of biodiversity gain for each development.

The HRA assessed the potential for negative effects on SACs and SPAs within the identified route corridors and a relevant zone of influence as follows:

- Potential for temporary physical disturbance of subtidal and/or intertidal habitats.
- Potential for permanent loss of seabed or intertidal habitats.
- Potential for temporary disturbance as a result of increased suspended sediment concentrations and sediment deposition.
- Potential for adverse effects on site integrity via changes in water quality.
- Potential for adverse effects on site integrity via effects of the introduction of INNS on benthic habitats and species.
- Potential for adverse effects on site integrity via EMF impacts.
- Potential for adverse effects on site integrity due to subsea cable thermal emissions.
- Potential for adverse effects on site integrity due to impacts on marine mammals and fish from underwater sound.
- Potential for adverse effects on site integrity due to barriers to migration.
- Potential for adverse effects on site integrity due to changes in prey availability.
- Potential for adverse effects on site integrity due to collision risk with vessels.
- Potential for airborne sound and visual disturbance to marine mammals and seabirds.
- Potential for adverse effects on site integrity due to noise and visual impacts to birds from landfall / onshore works.
- Potential for adverse effects on site integrity due to risk of bird strike from onshore overhead line.
- Potential for a temporary or permanent loss or removal of terrestrial habitats.
- Potential for impacts on terrestrial functionally linked habitats.
- Potential for impacts via maintenance activities and cable repair.

The HRA set out mitigation measures required to avoid adverse effects on these sites via these impact pathways, including through micro routing.

The MCZ assessed the potential for negative effects on MCZs, HPMAs and Nature Conservation MPAs within the identified route corridors and a relevant zone of influence as follows:

- Potential for temporary physical disturbance - subtidal benthic habitats and species (INTOG)

- Potential for permanent loss - subtidal benthic habitats and species (INTOG)
- Potential for the introduction of INNS - subtidal benthic habitats and species (INTOG)
- Potential for EMF - subtidal benthic habitats and species, marine mammals, fish, and invertebrates (INTOG)
- Potential for increased suspended sediment concentrations - subtidal benthic habitats and species, marine mammals, fish, and invertebrates (INTOG)
- Potential impacts on water quality - subtidal benthic habitats and species, marine mammals, fish, and invertebrates (INTOG)

The MCZ Stage 1 set out mitigation measures to avoid adverse effects on these sites via these impact pathways.

Population and Human Health

Cabling:

There are settlements within the identified route corridors. Generally, there is the potential for slight negative, short-term effects on the local population from cable laying, such as noise, lighting, visual and disturbance during the construction and decommissioning phases and during cable maintenance activities; in areas of higher population, there is potential for effects on a greater number of receptors (-1). There is not expected to be any direct, medium, or long-term, disturbance of local populations due to noise or disturbance effects during the operational phases (0). There are areas of perceived moderate or high deprivation within the identified route corridors, and areas of perceived highest deprivation within the identified route corridors to Carmarthen and the South Wales Connection Node. Populations in these areas may be of lower health status and therefore more susceptible to health effects linked to disturbance. There is the potential for perceived human health concerns regarding EMF generation from the operation of electrical transmission cables.

There are areas of relatively moderate intensity leisure boating activity within the identified route corridor to the South Wales Connection Node. There is potential for slight negative, temporary, direct and indirect, negative effects on leisure and recreational marine users due to an increased collision risk, access restrictions and displacement, or water quality effects, during the construction and decommissioning phases and during cable maintenance activities (-1). The potential for negative direct or indirect effects on these users in the medium to long-term during the operational phase is considered to be negligible (0).

There are bathing waters sites located within the identified route corridors; however, these can be avoided. There may be potential for short-term, indirect, negative effects such as noise, disturbance and water quality impacts to these areas during the construction and decommissioning phases and during cable maintenance activities owing to proximity and hydrological connectivity (-1).

There are onshore recreation sites within all identified route corridors, however these can be avoided. There may be potential for short-term indirect, slight negative,

temporary disruption to these recreational areas during construction and decommissioning works, depending on proximity to the working areas (-1).

Onshore Infrastructure:

There are settlements within the interface areas for the HNDFUE (Celtic Sea) recommended design, hence there is the potential for temporary direct disturbance on the local populations due to lighting, noise and vibration generated during pre-construction, and construction from construction activities and vehicle movements (-1). There is also potential for temporary direct disturbance on the local populations due to lighting, noise and vibration generated during the operation of the converter station and substations (-1).

There are areas of perceived highest deprivation within the interface areas of South Wales Connection Node and Carmarthen, with areas of perceived high deprivation within the interface areas of Carmarthen, South Wales Connection Node and North Devon. There is the potential for impacts on the health of construction workers and future site users through exposure to hazardous contaminants during pre-construction, construction, and decommissioning. Potential for health effects due to the emission of dust from demolition, earthworks, construction and track out during pre-construction, construction & decommissioning, operation and maintenance (-1).

There is potential for indirect positive long-term effects for the population at GB level through facilitation of renewable energy connection to meet population demand while supporting a transition away from fossil fuels.

There are recreation sites within all interface areas. There is potential for temporary loss or disturbances to community land areas within the site footprint and wider working area during the construction process, and potential for direct permanent loss or disturbances to community land areas during the operation of the converter station and substations (-1).

Geology, Soils and Land Use

Cabling:

The laying of offshore cabling and cable protection works has the potential for short to long-term, direct effects on Annex I habitats and SSSIs (located at landfall) which cannot be avoided, through loss of or damage to geological/geomorphological features in the footprint of works (-2). Generally, the installation of cabling has the potential for short-term direct, slight negative effects through loss of the soil resource during cabling installation, cable protection laying, and decommissioning if cables are removed (-2), with slight negative (-1) permanent effects in the long-term if there is damage to features that cannot recover. There is also potential for short to long-term, slight, indirect effects through alterations to local sediment regimes impacting geomorphological features. This has the potential to impact both avoidable and unavoidable designated sites (-2). Within the identified route corridors, extensive sand is present and unavoidable within offshore areas, and several routes coming onshore have areas of unavoidable rock located at the coastline with potential for short-term

direct effects on water quality through the release of sand and sediment sources during cable construction and decommissioning phases (-1).

The potential for these effects can be minimised through the use of suitable mitigation at the project stage; this may include the use of bubble curtains to reduce sediment dispersal, or less geologically disruptive construction techniques, and projects will also be subject to project-specific implementation plans such as Construction Environmental Management Plans (CEMPs) and subject to regulatory compliance, which should minimise potential effects.

Within the offshore areas of identified route corridors, there is the potential for short-term direct negative effects on soils from the release of contaminated sediments/materials during cable construction, maintenance, or decommissioning phases. However, within the recommended design, there are no dredge and spoil dumping grounds, explosive munitions grounds, or Military Danger Areas within the identified offshore route corridors, reducing the potential for impacts (-1). There are several Military Practice Areas which are unavoidable within the offshore areas of identified route corridors, with the potential for the release of explosives and/or other contaminants during cable installation, maintenance, or decommissioning phases, with short-term direct effects on sediment and secondary impacts on water quality (-2). The use of mitigation measures, such as pre-construction surveys, can help to identify potential sources of seabed contamination, and the potential impacts minimised.

Generally, within the identified route corridors the agricultural land is of moderate quality with areas of poor quality, while there are areas of good quality agricultural land in the identified route corridor from PDA2 to the South Wales Connection Node with limited scope to be avoided. There is potential for short to long-term direct loss of soil and the potential for direct effects on land use in the long-term if the former land use is not re-established (-1). This may lead to secondary effects on Material Assets through a temporary loss of agricultural farming areas and overall agricultural productivity, and on Water, through a temporary increased risk of sediment losses or soil erosion in the short-term, with exposed bare ground impacting on water quality (-2).

There is potential for short-term, direct, negative effects from the release of contaminants within onshore landfill areas within the identified route corridors during cable construction, maintenance and decommissioning phases, which may negatively affect the surrounding soil and sediment quality with indirect, negative effects on overall water quality, however as these landfill areas are avoidable, this reduces and potentially eliminates the potential for effects (0).

Generally, during cable construction, maintenance, and decommissioning phases, there is potential for short to medium-term, direct, negative effects due to localised loss of the soil resource. There is the potential for secondary, negative effects on Water through temporary increased suspended sediment losses impacting on water quality during construction and decommissioning (-1). Mitigation measures at the project stage, such as CEMPs, can reduce the potential for erosion or sediment loss, and may include appropriately timing works to avoid periods of elevated risk of soil loss/erosion such as the winter of high rainfall and runoff rates, or the use of interception techniques to reduce downstream sediment transfer to waterbodies.

Onshore Infrastructure:

There is potential for negative effects on Geology, Soils and Land Use within the identified interface areas from the development of new infrastructure. There are geological designations within the interface areas of SSSIs; however, these are avoidable, avoiding the potential for direct negative effects. The potential for indirect negative effects should be considered at the project stage.

Generally, within the interface areas the agricultural land is of moderate quality with areas of poor quality, although there are areas of good quality agricultural land in the South Wales Connection Node interface area, with limited scope to avoid this. There is potential for short to long-term direct loss of the soil resource and the potential for direct effects on land use in the long-term if the former land use is not re-established (-2). This may lead to secondary effects on Material Assets through a temporary loss of agricultural farming areas and overall agricultural productivity, and on Water through a temporary increased risk of sediment losses or soil erosion in the short-term, with exposed bare ground impacting on water quality (-2).

Within the interface areas, there are areas of shallow soils of exposed rock which are generally avoidable, reducing the potential for short-term, direct, negative effects through the loss of soils in these areas and long-term, direct, negative effects through the permanent loss of geological material in these areas during cable installation and decommissioning phases (-1).

There is potential for short-term, direct, negative effects from the release of contaminants within onshore landfill areas within the interface areas during interface construction, maintenance and decommissioning phases, which may negatively affect the surrounding soil quality with indirect, negative effects on overall water quality; however, as these landfill areas are avoidable, this reduces and potentially eliminates the potential for effects (-1). There are no Military Danger Areas, Military Practice Areas, dredge or spoil dumping grounds, or explosives munitions dumping grounds present within the interface areas.

Generally, during the construction, maintenance, and decommissioning phases for new infrastructure there is potential for short-term direct and indirect negative effects through a loss of the soil resource within the footprint of new infrastructure and working areas (-1). As for cabling, the introduction of mitigation measures at the project stage, such as CEMPs, can reduce the potential for erosion or sediment loss within interface areas.

Water

Cabling:

The development of cabling has the potential for negative effects offshore within the short to medium-term on the achievement of Good Environmental Status for the MSFD Celtic Seas sub region, which is currently failing to achieve Good Environmental Status. There is the potential for indirect effects from the release of sediment or chemicals used during cable installation, decommissioning and maintenance phases, or through

alterations to sediment regimes with the use of cable protection materials impacting on Descriptors assessed under the MSFD (-1). However, with the application of good working practices, negative effects are expected to be temporary and there is not anticipated to be potential for significant effects in the medium to long-term (0).

Within the offshore component of the identified route corridors, there is the potential for short-term direct effects on water quality from the release of contaminated sediments/materials during cable construction, maintenance, or decommissioning phases; however, within this recommended design, there are no dredge and spoil dumping grounds, explosive munitions grounds, or Military Danger Areas, reducing the potential for impacts (-1). There are several Military Practice Areas which are unavoidable within the offshore areas of identified route corridors, and there is potential for the release of explosives and/or other contaminants during cable installation, maintenance, or decommissioning phases, with short-term direct effects on water quality (-2). The use of good working practices such as pre-construction surveys regarding the presence and clearance of UXOs, can minimise the potential for effects (-1).

At landfall, within the identified route corridors, there is potential for short-term indirect effects on bathing water quality during the installation, maintenance, or decommissioning phases of cables from the release of sediment or contaminants, and as not all bathing waters are avoidable, there is potential for impacts (-2). At landfall, within the identified route corridors of the recommended design, there is potential for short-term indirect effects on water quality within shellfish waters during the installation, maintenance, or decommissioning phases of cables from the release of sediment; however, within the recommended design, all shellfish waters are avoidable, reducing the potential for impacts (-1).

Within the WFD coastal waterbodies present at landfall throughout the identified route corridors, during cable construction, maintenance and decommissioning phases there is potential for short-term direct effects on water quality through the release of sediment associated with cable trenching or the release of chemicals associated with the construction, maintenance and decommissioning phases (-1). Similarly, onshore, during cable construction, decommissioning, and maintenance phases, there is a potential for short-term direct and indirect effects on water quality through the release of sediment or alterations to local hydrological regimes given the limited scope to avoid rivers and lakes within the three identified route corridors (-1).

National Flood Zones are present within the identified onshore route corridors and at landfall, these are unavoidable, with the potential for short to medium-term direct and indirect effects through potential for increased flood risk or alterations to local hydrological regimes during cable construction, maintenance, and decommissioning phases (-2).

Onshore Infrastructure:

There is potential for negative effects on water within the identified interface areas from the development of new infrastructure. During the construction, maintenance, and

decommissioning phases for new infrastructure, there is potential for short-term direct and indirect effects on water quality through the release of sediment or alterations to local hydrological regimes to rivers and lakes although typically these are avoidable, reducing the potential for negative effects to those associated with downstream indirect negative impacts (-1). Within the WFD waterbodies present within the interface areas, during interface construction, maintenance, and decommissioning phases, there is potential for short-term direct effects on water quality through the release of sediment associated with interface development or the release of chemicals associated with the construction, maintenance, and decommissioning phases (-1).

Air

Cabling:

There is one known AQMA within the onshore area of an identified route corridor; however, this can be avoided. Generally, there is potential for slight negative, direct, short-term temporary effects on local air quality due to dust generation and air emissions from vehicles and machinery in the vicinity of the works during the construction and decommissioning phases and during any cable maintenance activities (-1). There is also the potential for slight negative, short-term, temporary emissions from vessels due to maintenance activities during the operational phase. It is not expected that there will be any negative direct or indirect, medium or long-term effects on sensitive receptors from air emissions / pollution during the construction, operational and decommissioning phases (0).

There are major settlements within identified route corridors. There is potential for slight negative, short-term effects on the local population through dust and traffic/machinery emissions, as well as noise emissions which may affect many receptors within these higher populated areas during the construction and decommissioning phases and during cable maintenance activities (-1). There are areas of perceived highest deprivation within the identified route corridors to Carmarthen and South Wales Connection Node and there are areas of perceived high deprivation within all identified route corridors. Populations in these areas may be of lower health status and may be of greater risk of health impacts such as those affecting the lungs due to existing health conditions in the areas of higher sensitivity (-1).

There is potential for slight positive, indirect effects on regional air quality in the medium to long-term from facilitation of new renewable energy infrastructure, supporting decarbonisation of the energy sector (+1).

Onshore Infrastructure:

There are settlements within interface areas of the recommended HNDFUE (Celtic Sea) design. There is potential for a short-term, temporary increases in road traffic volumes on the public road network and within the construction areas generated by construction activities to result in adverse effects on local air quality, during pre-construction, installation, and decommissioning. There is potential for intermittent/infrequent

operational phase maintenance activities to temporarily increase traffic volumes and result in adverse effects in local air quality.

There is potential for temporary negative effects on local populations through a deterioration of local air quality via increased exposure to vehicle emissions. There are areas of perceived highest deprivation within the identified route corridors to South Wales Connection Node and Carmarthen, and there are areas of perceived high deprivation within all identified route corridors. There is potential for slight negative, direct, short-term temporary effects on local air quality due to dust generation and air emissions from vehicles and machinery in the vicinity of the works during the construction and decommissioning phases and during any maintenance activities (-1).

There is potential for slight positive, indirect effects on regional air quality in the medium to long-term from facilitation of new renewable energy infrastructure, supporting decarbonisation of the energy sector (+1).

Climatic Factors

Cabling:

There are known locations of blue carbon habitat within the identified route corridors of the recommended design. There is unlikely to be potential for significant negative effects on blue carbon habitat within the identified route corridors during the construction, operational and decommissioning phases (0), as the identified route corridors can avoid the areas of high blue carbon potential. There is potential for slight negative, short-term effects on sediment carbon storage, due to a localised release of CO2 from seabed disturbance during the construction and decommissioning phases (-1). There is potential for slight negative, short-term, temporary effects on localised Green House Gas (GHG) concentrations due to GHG emissions from vehicles and machinery in the vicinity of the works during the construction and decommissioning phases and during any cable maintenance activities (-1). There is also potential for the temporary loss of GHG sequestering material in the vicinity of the works during the construction and decommissioning phases and during any cable maintenance activities (-1).

There is potential for slight positive, medium to long-term effects during the operational phase, from facilitation of new renewable energy infrastructure, supporting decarbonisation of the energy sector, diversification of electricity supply and energy security, and meeting of energy objectives and climate change emission reduction targets (+1).

Onshore Infrastructure:

There are onshore carbon sinks within all interface areas of the recommended design. There is potential for short-term release of CO2 due to ground disturbances on areas of carbon storage, due to the activities required to facilitate the construction and decommissioning of the substations and converter station (-1). There is potential for short-term direct and indirect GHG emissions to be generated by the construction process through the production of materials, transport of materials and onsite energy consumption. Potential for short-term, temporary emissions from vehicles and

machinery during pre-construction, construction and decommissioning of the converter station.

There is potential for slight positive, medium to long-term effects during the operational phase, from facilitation of new renewable energy infrastructure, supporting decarbonisation of the energy sector, diversification of electricity supply and energy security, and meeting of energy objectives and climate change emission reduction targets (+1).

Material Assets

Cabling:

There is unavoidable offshore infrastructure encountered by the recommended design. In total, there are approximately 11 unavoidable submarine cable crossings within the identified route corridors. All three identified route corridors cross existing submarine cables. The greatest number of cable (8) crossings is by the identified route corridor from PDA2 to South Wales Connection Node. There is potential for telecommunications and energy connections of high importance within GB waters to be disrupted during the construction, operation, and decommissioning phases. There is potential for slight negative, direct, short-term effects due to possible damage to these cables, and subsequent disruption to telecommunications and energy supplies, during the construction and decommissioning phases (-1), as well as potential for slight negative medium to long-term (cable lifetime) direct effects in the operational phase during recurrent maintenance operations (-1). There is also potential for slight negative indirect effects to telecommunications and energy supplies in the short-term during the construction and decommissioning phases, as access to these existing cables for maintenance may be reduced temporarily (-1), as well as for slight negative effects in the medium to long-term during the operational phase due to access issues during periods of maintenance (-1). Thus, given the relatively low number existing infrastructure, which cannot be avoided within the identified route corridors, there is potential for slight negative effects on this infrastructure in the short-term (-1) and slight negative effects in the medium, and long-term (-1), although good working practices may eliminate or minimise the potential for these effects to occur.

There is one unavoidable onshore pipeline that is encountered by the identified route corridor from PDA1 to Carmarthen which crosses this pipeline in the vicinity of Llandyfaelog. There are unavoidable National Grid overhead lines which are encountered by all three identified route corridors. There is the potential for slight adverse, direct short-term, negative effects due to damage to the pipelines or overhead lines, and subsequent disruption to energy supplies and services, during the construction and decommissioning phases (-1), as well as potential for slight negative, medium to long-term (cable lifetime) direct effects in the operational phase during recurrent maintenance operations (-1). There is also the potential for slight negative indirect effects to energy supplies and services in the short-term during the construction and decommissioning phases, as access to these existing pipelines and overhead lines for maintenance may be reduced temporarily (-1), as well as for slight negative effects in the medium to long-term during the operational phase due to access issues during periods of maintenance (-1). Furthermore, there is the potential for

slight negative, direct short-term effects during construction due to the potential requirement for permanent relocation or repositioning of existing overhead lines; services should return to normal once this has occurred (-1). All potential negative effects on onshore energy infrastructure are, however, likely to be temporary and localised to the asset crossing locations. The use of directional drilling may also reduce or eliminate many of these issues onshore.

A number of roads will need to be crossed by the identified route corridors, with the PDA3 to North Devon route corridor containing the greatest number of road crossings. The PDA1 to Carmarthen and PDA2 to South Wales Connection Node identified route corridors encounter unavoidable railway lines. As such, there is potential for slight adverse, direct, short-term negative effects due to the disruption of access to roads and railway lines due to road closures or road diversions, or restrictions/amendments to public transport routes during construction and decommissioning phases (-1). This may result in a temporary increase in travel time for road and public transport users. There is also potential for slight negative, direct short-term effects due to journeys being delayed by the potential increased vehicle traffic from construction machinery (-1), as well as short-term temporary road access restrictions, closures or slow-moving vehicle traffic to accommodate construction vehicles transporting abnormal loads (-1). There is the potential for slight negative, indirect short-term effects due to disruption from construction or decommissioning works or concerns regarding road safety for road users (motorised and non-motorised) with large vehicles or machinery (-1). All potential negative effects on transport infrastructure are, however, likely to be temporary and localised to the route crossing locations. The use of directional drilling may also reduce or eliminate many of these issues onshore.

All identified route corridors which comprise the recommended HNDFUE (Celtic Sea) design are within areas where shipping activity occurs. All three identified route corridors encounter areas of unavoidable high shipping density. This is generally encountered in the inshore areas, within or on approach to the Bristol Channel. The identified route corridor from PDA2 to South Wales Connection Node crosses the largest area of high shipping density. There is potential for moderate, direct negative effects on shipping and navigation within the recommended HNDFUE (Celtic Sea) design in the short-term due to displacement of vessels during the construction and decommissioning phases (-2), which can result in temporary disruption to vessel routing and timetables. There is potential for moderate negative effects in the short-term during the construction and decommissioning phases due to the risk of collision and allision with vessels associated with cabling, which may result in injury or death and hazardous cargo or oil spillage (-2). There is potential for slight negative, medium and long-term effects during the operation phase due to the risk of collision or allision with slow-moving or stationary vessels and equipment during maintenance (-1). There is also potential for slight negative, medium and long-term effects during the operational phase due to the risk of entanglement of anchors with subsea cables or protective structures used over cables (-1). Furthermore, there is potential for moderate negative effects within installation and decommissioning areas in the short-term construction and decommissioning phases, as the presence of installation vessels and equipment may adversely impact the efficiency of search and rescue operations (-2). It is,

however, likely that all these potential effects can be mitigated by adherence to appropriate navigational safety planning and procedures.

There are small areas of relatively high-intensity fishing located within the identified PDA1 to Carmarthen and PDA2 to South Wales Connection Node identified route corridors, in inshore areas located to the west of the Bristol Channel. There is potential for slight direct negative, short-term effects on commercial fisheries operations due to temporary displacement from traditional fishing grounds during the construction and decommissioning phases (-1), as well as potential for slight, medium and long-term negative effects due to displacement during maintenance within the operational phase (-1). Displacement of fishing activity could result in increased competition for alternate fishing grounds, with potential to adversely affect fish stocks and, by extension, landings, in nearby areas. There is also potential for slight negative direct effects due to an increased collision risk of fishing vessels with vessels associated with cable installation in the short-term during the construction and decommissioning phases (-1), and slight negative effects in the medium to long-term during recurrent maintenance activities in the operational phase (-1). There is also potential for slight negative effects on fishing activities within the identified route corridors in the operational phase, due to the risk of entanglement of fishing gear with cables or damage to fishing gear due to cable protection infrastructure where cables cannot be buried sufficiently, which may lead to avoidance of the area by fishing vessels (-1). There is potential for effects on commercial fish species and their key habitats within the identified route corridors. There is potential for slight negative direct effects in the short-term construction (-1), and slight negative direct effects in the medium-to long-term operational phase due to the potential for a direct loss of supporting habitats, such as spawning and nursery grounds. There is potential for slight indirect negative effects on the profitability of commercial fishing in the short- term (-1) and slight indirect negative effects in the medium and long-term (-1). This includes the potential for reduced quotas, increased resource competition for fishing, and reduced landings in both tonnage and economic value.

The identified PDA1 to Carmarthen route corridor crosses four unavoidable military danger areas, namely D113(A&B): Castlemartin, D115: Manobrier, D117: Pendine and D118: Pembrey. There is potential for moderate negative effects on military activities, including temporary (short-term) disruption of military exercises and activities within these military danger areas during pre-construction, construction and decommissioning (-2) phases. There is also the greater risk of encountering UXOs in these areas.

All three identified route corridors intersect areas of unavoidable prime agricultural land. A significant portion of this prime agricultural land is in Devon, crossed by the PDA3 to North Devon identified route corridor. There is potential for direct, slight, short-term negative effects on agriculture due to the temporary loss of agricultural land and soils during pre-construction, construction and decommissioning processes (-1). There is also potential for short-term, direct, slight negative effects due to temporary restrictions in access to agricultural land with construction and decommissioning activities (-1). There is potential for short-term, direct damage to field drains due to construction and decommissioning activities (-1), as well as the potential for indirect, short-term

secondary negative effects on agriculture during construction and decommissioning activities, including through pollution of water sources used for irrigation or for livestock or through the introduction of soil borne pests and diseases (-1).

All of the identified route corridors intersect relatively small areas of either broadleaved woodland, conifer woodland, and mixed woodland, which may be utilised for commercial forestry, that may be difficult to avoid completely. There is potential for direct, slight negative effects on commercial forestry due to the loss of woodland within the onshore study corridor if felling of woodland and commercial forestry areas is required to facilitate cable installation in the short-term construction phase (-1). There is also potential for the direct, slight negative effects on commercial forestry in the medium and long-term due to the permanent loss of woodland within the onshore route corridors (-1) This could result in a reduction in income levels for this industry.

The potential for effects on tourism is considered indirectly within the topics of Landscape, Seascape and Visual Amenity (visibility of construction activity), Population and Human Health (recreational use), and Biodiversity, Flora, and Fauna (effects on wildlife). As discussed in the Landscape, Seascape and Visual Amenity Section, there is the potential for slight to moderate negative effects in the short-term on Landscape, Seascape and Visual Amenity, which may result in secondary adverse effects on tourism, as this may act as a deterrent to tourists. As discussed in Population and Human Health, there is a slight potential for negative effects on the population due to increased noise release in the short-term, as such tourism is unlikely to be impacted significantly by these potential effects, albeit temporary and localised. There is potential for slight negative, temporary direct and indirect effects on leisure and recreational marine users due to an increased collision risk or water quality effects, as well as access restrictions and displacement for marine and onshore recreational users during the construction (and decommissioning) phase, which may indirectly negatively affect tourism temporarily. Lastly, as discussed in Biodiversity, Flora and Fauna, there is potential for the construction phase to adversely affect wildlife, which may result in a secondary impact on tourism activities. Any impact on tourism will likely be temporary, localised and not significant.

The recommended HNDFUE (Celtic Sea) design has the potential to connect 4.5GW of renewable energy generation to the GB grid. As such, there is potential for slight positive effects in the short-term (+1) and slight positive effects in the medium to long-term, owing to the facilitation of new renewable energy infrastructure (+1) and the associated reduction in reliance on fossil fuel generation.

Onshore Infrastructure:

All three of the potential areas where interface infrastructure may be located contain existing National Grid overhead lines. Although there is potential to avoid the overhead lines, due to the presence of other assets, free space may be limited, and overhead lines may not be avoidable. There is the potential for slight adverse, direct short-term, negative effects due to damage to the overhead lines, and subsequent disruption to energy supplies and services, due to the activities required to facilitate construction and

decommissioning of the infrastructure during the construction and decommissioning phases (-1). There is potential for slight negative, medium to long-term (interface infrastructure lifetime) direct effects in the operational phase due to the recurrent maintenance activities required to facilitate the operation and maintenance (recurrent, short-term) (-1). There is also the potential for slight negative indirect effects to energy supplies and services in the short-term during the construction and decommissioning phases, as access to these existing overhead lines for maintenance may be reduced temporarily due to the activities required to facilitate construction and decommissioning of the infrastructure (-1), as well as for slight negative effects in the medium to long-term during the operational phase due to access issues during periods of maintenance (-1). Furthermore, there is the potential for moderate negative, direct short-term effects during construction due to the potential requirement for permanent relocation or repositioning of existing overhead lines; services should return to normal once this has occurred. All potential negative effects on onshore energy infrastructure are, however, likely to be temporary and localised to the location of new interface infrastructure.

All of the potential areas where interface infrastructure may be located contain a number of roads. Although these roads can be avoided by the new interface infrastructure, vehicles associated with the construction and decommissioning phases will have to utilise these local roads to facilitate the construction and decommissioning of the interface infrastructure. As such, there is potential for slight adverse, indirect, short-term negative effects due to the disruption of access to roads due to activities required to facilitate the construction and decommissioning of the interface infrastructure, such as road closures or road diversions, or restrictions/amendments to public transport routes (-1). This may result in a temporary increase in travel time for road and public transport users. There is also potential for slight negative, indirect short-term effects due to journeys being delayed by the potential increased vehicle traffic from construction machinery (-1), as well as short-term temporary road access restrictions, closures or slow-moving vehicle traffic to accommodate construction vehicles transporting abnormal loads (-1). There is the potential for slight negative, indirect short-term effects due to disruption from construction or decommissioning works or concerns regarding road safety for road users (motorised and non-motorised) with large vehicles or machinery (-1). All potential negative effects on transport infrastructure are, however, likely to be temporary and localised to the roads surrounding the construction and decommissioning works.

The North Devon and Carmarthen interface points are surrounded by areas of prime agricultural land, in locations where interface infrastructure may be located. Given the relatively low amount of required interface infrastructure within the recommended HNDFUE (Celtic Sea) design, there is potential for direct, slight, short-term negative effects on agriculture through the temporary loss or disturbance of agricultural land and soils during pre-construction, construction and decommissioning phases (-1). This is due to land take requirements for construction compounds, haul roads and temporary access tracks during the construction and commissioning of the interface infrastructure. There is also potential for direct, slight, medium and long-term negative effects on agriculture due to the permanent loss or disturbance of agricultural land and

soils during the operation period due to land take required for the permanent works, converter station and substations (-1). There is also potential for short-term, direct, slight negative effects due to temporary restrictions in access to agricultural land with construction and decommissioning activities (-1). There is potential for short-term, direct damage to field drains or the structure of agricultural land due to construction and decommissioning activities (-1), as well as the potential for indirect, short-term secondary negative effects on agriculture including through pollution of water sources used for irrigation or for livestock, or through the introduction of soil borne pests and diseases (-1).

All three of the potential areas where interface infrastructure may be located contain relatively small areas of either broadleaved woodland, conifer woodland, and mixed woodland, which may be utilised for commercial forestry. These may be difficult to avoid completely by the required interface infrastructure. There is potential for direct, slight negative effects on commercial forestry due to the loss or disturbance of woodland within the interface areas due to land take or felling requirements for construction compounds, haul roads and temporary access tracks during the construction and commissioning of the interface infrastructure (-1). There is also potential for the direct, slight negative effects on commercial forestry in the medium and long-term due to the permanent loss or disturbance of woodland within the interface area during the operation phase due to land take requirements for the operation of interface infrastructure. This could result in a reduction in income levels for this industry.

The potential for effects on tourism is considered indirectly within the topics of Landscape, Seascape and Visual Amenity (visibility of construction and operation/maintenance activity), Population and Human Health (recreational use), and Biodiversity, Flora, and Fauna (effects on wildlife). As discussed in the Landscape, Seascape and Visual Amenity Section, there is the potential for slight negative effects in the short-term on Landscape, Seascape and Visual Amenity, which may result in secondary adverse effects on tourism, as this may act as a deterrent to tourists. As discussed in Population and Human Health, there is a slight potential for negative effects on the population due to increased noise release in the short-term, as such, tourism is unlikely to be impacted significantly by these potential effects, albeit temporary and localised. There is also potential for temporary direct disturbance on the local population due to lighting, noise and vibration generated during the operation of the converter station and substations. There is potential for slight negative, temporary direct and indirect effects on access restrictions and displacement for onshore recreational users during the construction (and decommissioning) phase, which may indirectly negatively affect tourism temporarily, as well as direct permanent loss or disturbances to community land areas during the operation of the converter station and substations. Lastly, as discussed in Biodiversity, Flora and Fauna, there is potential for the construction, decommissioning and operation phases to adversely affect wildlife, which may result in a secondary impact on tourism activities. Any impact on tourism will likely be temporary, localised and not significant.

The HND recommended design has the potential to connect 4.5GW of renewable energy generation to the GB grid. As such, there is potential for slight positive effects in the

short-term (+1) and slight positive effects in the medium to long-term, owing to the facilitation of new renewable energy infrastructure (+1) and the associated reduction in reliance on fossil fuel generation.

Cultural, Architectural and Archaeological Heritage

Cabling:

There are many (at least 44) marine archaeological/heritage assets located within the offshore section of the three identified route corridors; these are all shipwrecks. The PDA2 to South Wales Connection Node identified route corridor contains the greatest number of shipwrecks (18), although there is potential to avoid all marine archaeological/heritage assets within the 5km-wide identified route corridors, avoiding the potential for direct effects. There is potential for indirect short-term slight negative effects on these marine archaeological/heritage assets during the construction and decommissioning phases, due to indirect damage or disturbance to known and unknown features through alterations in the seabed morphology from suspended sediment levels and/or scour due to seabed preparation techniques and cable burial methods (-1).

Furthermore, there is potential for unknown marine and intertidal prehistoric landscapes, submerged archaeological artefacts, structures or wrecks to be discovered within the identified route corridors. There is potential for slight negative temporary to permanent effects, which may be due to direct damage or disturbance to unknown assets within the identified route corridors during surveys, works, cable laying or decommissioning activities (-1). There is also the potential for surveys and actions to contribute to archaeological knowledge and to inform subsequent decision-making.

There is also potential for slight negative indirect effects on known and unknown assets within the identified route corridors in the medium to long-term operational phase owing to the potential for scouring and exposure to occur around assets in the vicinity of cables and cable protection materials, leading to indirect damage or degradation, sediment deposition and further burial of assets in the long-term (-1) and potential for loss of, or damage to, assets during maintenance activities (-1). There may also be potential for long-term positive effects on archaeological assets that are exposed, and that may be protected through burial with alterations in suspended sediment levels (+1).

There are many (at least 416) terrestrial heritage assets located within the onshore sections of the identified route corridors. These include three Parks and Gardens (within the PDA2 to South Wales Connection Node identified route corridor), 62 Scheduled Monuments (within all three identified route corridors), 245 Listed Buildings (within all three identified route corridors), four Conservation Areas (within all three identified route corridors) and 58 Defence of Britain Sites (within the PDA1 to Carmarthen identified route corridor). The PDA3 to North Devon identified route corridor contains the greatest amount of terrestrial heritage assets (153). There is potential for all known terrestrial heritage assets to be avoided within the identified route corridors, avoiding the potential for direct effects. However, there is potential for slight direct negative effects on unknown terrestrial heritage assets in the short-term due to damage within the

identified onshore route corridors during pre-construction surveys, construction works, cable laying or decommissioning activities (-1).

There is also potential for slight negative effects on known or unknown terrestrial archaeological assets within the identified onshore route corridors, as well as assets within the immediate vicinity of the onshore identified route corridor, e.g., through sediment displacement or mud generation leading to burial of downstream sites, or hydrological regime alteration resulting in inundation or dewatering (-1), and from short-term, indirect temporary effects on the setting and cultural significance of designated and non-designated terrestrial heritage sites and archaeological assets, including coastal heritage assets (-1).

At the project planning phase, any sites of archaeological potential should be identified and exclusion zones established around these, with site surveys or trial trenching conducted before any potentially damaging activities take place, to inform any appropriate mitigation. Within the marine environment, modelling of hydrodynamic and sediment transport processes may be necessary to determine potential effects on surrounding archaeological features and determine any appropriate mitigation required.

Onshore Infrastructure:

Three are 85 terrestrial heritage assets located within the identified interface areas. These include 26 Scheduled Monuments (within all three interface areas), 53 Listed Buildings (within all three interface areas), two Conservation Areas (within Carmarthen and South Wales Connection Node interface areas) and four Defence of Britain Sites (within Carmarthen interface areas). The identified South Wales Connection Node interface area contains the greatest amount of terrestrial heritage assets (32). There is potential for all known terrestrial heritage assets to be avoided within the interface areas, avoiding the potential for direct effects. There is potential for slight direct negative effects on unknown buried terrestrial heritage assets in the short-term due to damage, partial or complete loss to unknown buried terrestrial archaeology assets, discovered in the development site or construction compounds, by site-based activities that involve groundbreaking and ground reduction, including foundations and the installation of services, and decommissioning activities (-1). There is also the potential for surveys and actions to contribute to archaeological knowledge and to inform subsequent decision-making. There is also potential for slight negative effects on known or unknown buried terrestrial archaeological assets within the interface areas through indirect damage to terrestrial archaeology assets or structures due to activities required to facilitate the construction or decommissioning of the interface infrastructure, e.g., through sediment displacement or mud generation leading to burial of downstream sites, or hydrological regime alteration resulting in inundation or dewatering (-1). Any damage to or loss of archaeological assets may affect the cultural significance of the assets.

Due to the relatively limited number of new interface infrastructure required as part of the recommended HNDFUE (Celtic Sea) Design, there is potential for slight, short-term,

indirect temporary effects on the setting and cultural significance of designated and non-designated terrestrial heritage sites and archaeological assets, including coastal heritage assets, due to the activities required to facilitate the construction and decommissioning of the converter station as a result of the presence of equipment and machinery, and temporary increases in air pollution, traffic, and noise and vibration (-1). There is also potential for slight indirect permanent effects in the medium and long-term on the setting and cultural significance of designated and non-designated terrestrial heritage sites and features, including coastal heritage assets due to the physical presence of the interface infrastructure and any associated alterations in the landscape or removal of areas for previous agricultural use, trees or landscape features associated with onshore heritage setting, as well as to the activities required to facilitate the operation and maintenance of the converter station due to potential increases in air pollution, traffic, noise and vibration (-1).

At the project planning phase, any sites of archaeological potential should be identified and exclusion zones established around these, with site surveys or trial trenching conducted before any potentially damaging activities take place, to inform any appropriate mitigation.

Landscape, Seascape and Visual Amenity

Cabling:

The three identified route corridors cross nine Marine Character Areas. Although these Marine Character Areas are unavoidable, given the temporary nature of offshore cable laying, there is very limited potential for short-term, temporary effects on seascapes and visual amenity (0), as well as no anticipated effects on seascapes in the medium to long-term operation phase (0).

There are seven Landscape Character Areas encountered by the three identified route corridors. Despite being unavoidable, there is also very limited potential for short-term, temporary negative landscape effects on the National Landscape Character Areas within the identified route corridors (0), as well as no anticipated effects on these areas in the medium to long-term operation phase (0), given the temporary and relatively small-scale works involved with onshore cabling laying.

The North Devon National Landscape (AONB) has to be crossed by onshore cabling within the PDA3 to North Devon identified route corridor. As such, there is potential for direct localised negative effects on this National Landscape in the short-term due to the localised activity of machinery, and the use of artificial lighting, during pre-construction, cable installation, and decommissioning and potential localised alterations to the surrounding landscape character types or loss of landscape elements; however, these will be reinstated post-construction (-2). Furthermore, there is potential for slight direct negative effects on this National Landscape in the long-term due to the localised removal of landscape elements such as trees, woodland areas, hedgerows, or agricultural land areas, if these are not reinstated following the completion of works (-1).

Short sections of the Hartland (Devon) Heritage Coast and the Southwest Coast Path National Trail need to be crossed by onshore cabling within the identified PDA3 to North Devon route corridor. As such, there is potential for slight direct localised negative

effects on the walking trails in the short-term due to the localised activity of machinery, and the use of artificial lighting, during pre-construction, cable installation, and decommissioning and potential localised alterations to the surrounding landscape character types or loss of landscape elements (-1). Furthermore, there is potential for slight direct negative effects on these walking routes in the long-term due to the localised removal of landscape elements such as trees, woodland areas, hedgerows, or agricultural land areas, if these are not reinstated following the completion of works (-1).

The Margam Park Country Park is located within the PDA2 to South Wales Connection Node identified route corridor, whilst the Pembrey Country Park is located within the PDA_1 to Carmarthen identified route corridor. There is potential to avoid these Country Parks with onshore cabling, avoiding the potential for direct effects. However, there is the potential for slight indirect negative landscape and visual amenity effects of these sites in the short to medium-term due to the localised activity of machinery, and the use of artificial lighting, during pre-construction, cable installation, and decommissioning (-1).

Areas of the highest landscape and seascape sensitivity should be avoided, where possible at the project planning phase, and a SLVIA should be undertaken which should inform project design and appropriate mitigation to minimise the potential for negative effects.

Onshore Infrastructure:

The North Devon Interface Area is located within the Culm National Landscape Character Area. This is considered to be moderately sensitive to new development. The three National Landscape Character Areas in Wales include the Gwendraeth Vales (moderately sensitive) and Taf, Tywi and Gwendraeth Estuaries (highly sensitive), in which the Carmarthen interface area is located, and the South Wales Valleys (low sensitivity) and Swansea Bay (low sensitivity) in which the South Wales Connection Node interface area is located. These cannot be avoided within these areas where new interface infrastructure is required. The development of new infrastructure within the Landscape Character Areas of higher sensitivity has greater potential for long-term negative effects on the landscape character, which should be taken into consideration at the project level. Given the amount of new infrastructure and overall sensitivity of the landscape, there is potential for slight direct short-term, temporary negative landscape effects on the landscape elements within and overall landscape character of these areas within the identified route corridors during construction through the temporary or permanent loss of landscape elements to facilitate construction works including construction compounds and facilities, storage areas, the presence of plant, access routes, earthworks, Sustainable Drainage Systems (SuDS) and construction of emerging structures (-1). Furthermore, there is potential for slight direct medium to long-term negative effects on landscape elements within and overall landscape character of National Landscape Character Areas due to the physical presence of the interface infrastructure and the permanent loss of landscape elements to facilitate the operational phase of the interface infrastructure (-1).

The three interface areas encounter a total of four urban areas, although there is potential to avoid these urban areas with interface infrastructure, avoiding the potential for direct effects. Given the developed character of these urban areas, there is potential for slight indirect negative visual amenity effects in the short-term due to the visibility of activities required for the construction and decommissioning of the interface infrastructure (-1). There is also potential for slight indirect negative visual amenity effects of these urban areas in the medium to long-term due to the visibility of the interface infrastructure and activities required for facilitating the operation and maintenance of the interface infrastructure (-1).

Areas of the highest landscape and seascape sensitivity should be avoided, where possible at the project planning phase, and a SLVIA should be undertaken which should inform project design and appropriate mitigation to minimise adverse effects.

Potential for Cumulative / In-Combination Effects

Biodiversity, Flora and Fauna

There is potential for short-term disturbance and displacement effects, and negative effects on supporting habitats within the Bristol Channel Approaches SAC from cabling within all identified route corridors.

There is potential for cumulative effects on the overall condition of Annex I reef due to direct or indirect damage to habitat from cabling within identified routes.

There is potential for cumulative effects on protected fish receptors from cabling within identified route corridors.

In general, there is also potential for cumulative negative effects on marine mammal species and seabirds where cabling activities take place within the same region.

Population and Human Health

There is not considered to be potential for cumulative effects within the identified route corridors comprising the recommended HNDFUE (Celtic Sea) design.

Geology, Soils and Land Use

There is potential for a cumulative loss of soil across routes, with loss of productive agricultural areas (short-term/temporary).

Water

There is potential for cumulative effects on flood risk with above routes on National Flood Zones through alterations to local hydrological conditions.

Air

There is not considered to be potential for cumulative effects within the identified route corridors comprising the recommended HNDFUE (Celtic Sea) design.

Climatic Factors

There is not considered to be potential for cumulative effects within the identified route corridors comprising the recommended HNDFUE (Celtic Sea) design.

Material Assets

Offshore Infrastructure

There is potential for cumulative negative effects on unavoidable offshore infrastructure (cables) from cabling within all three identified route corridors within the HNDFUE (Celtic Sea) Design, as they to cross the same offshore cables in some instances. If not carried out in a coordinated and well-planned manner, there is potential for such infrastructure to be impacted multiple times over a prolonged time span.

There is no potential for intra-plan in-combination negative effects on offshore infrastructure with the HND, HNDFUE (Scotwind), and HNDFUE (INTOG) identified route corridors.

Onshore Infrastructure

There is no potential for cumulative negative effects on unavoidable onshore infrastructure (pipelines and/or overhead lines) or transport infrastructure from cabling within the identified route corridors or interface infrastructure within interface areas. There is also no potential for intra-plan in-combination negative effects on offshore infrastructure with the HND, HNDFUE (Scotwind), and HNDFUE (INTOG) identified route corridors or interface areas.

Shipping and Navigation

There is potential for cumulative effects on shipping and navigation from cabling within all three identified route corridors within the HNDFUE (Celtic Sea) Design, as key navigation routes in the area are crossed. Cumulative effects include displacement of vessels, risk of collision and allision, risk of entanglement of anchors with subsea cables or protective structures used over cables and impacts on search and rescue, primarily due to multiple routes being planned in similar or the same corridor. If not carried out in a coordinated and well-planned manner, there is potential for shipping and navigation to be impacted multiple times over a prolonged time span.

There is no potential for intra-plan in-combination negative effects on offshore infrastructure with the HND, HNDFUE (Scotwind), and HNDFUE (INTOG) identified route corridors.

Commercial Fisheries

There is potential for cumulative effects on commercial fisheries from cabling within all three identified route corridors within the HNDFUE (Celtic Sea) Design. Potential cumulative effects are due to temporary displacement from traditional fishing grounds, increased collision risk of fishing vessels, risk of entanglement of fishing gear. If not carried out in a coordinated and well-planned manner, there is potential for commercial fisheries to be impacted multiple times over a prolonged time span. There is potential for negative cumulative effects on the profitability of commercial fishing. This includes the potential for reduced quotas, increased resource competition for fishing, and reduced landings in both tonnage and economic value.

There is potential for negative cumulative effects on commercial fish species and their key habitats within the identified route corridors stated above due to the potential for a

direct loss of supporting habitats, such as spawning and nursery grounds, due to sediment mobilisation, effects due to EMFs from cables impact EMF sensitive species. These could have an indirect effect on fishing activity through an alteration of fishing stocks.

There is no potential for intra-plan in-combination negative effects on offshore infrastructure with the HND, HNDFUE (Scotwind), and HNDFUE (INTOG) identified route corridors.

Military

There is not considered to be potential for cumulative effects within the identified route corridors comprising the recommended HNDFUE (Celtic Sea) design. There is no potential for intra-plan in-combination negative effects on military activities with the HND, HNDFUE (Scotwind), and HNDFUE (INTOG) identified route corridors.

Agriculture

There is not considered to be potential for cumulative effects within the identified route corridors comprising the recommended HNDFUE (Celtic Sea) design. There is no potential for intra-plan in-combination negative effects on military activities with the HND, HNDFUE (Scotwind), and HNDFUE (INTOG) identified route corridors.

Commercial Forestry

There is not considered to be potential for cumulative effects within the identified route corridors comprising the recommended HNDFUE (Celtic Sea) design. There is no potential for intra-plan in-combination negative effects on military activities with the HND, HNDFUE (Scotwind), and HNDFUE (INTOG) identified route corridors.

Cultural Heritage

There is not considered to be potential for cumulative effects within the identified route corridors comprising the recommended HNDFUE (Celtic Sea) design.

Landscape, Seascape and Visual Amenity

There is potential for cumulative negative short-term landscape effects where identified route corridors are within the same National Landscape Character Areas. The identified route corridors, which fall within the same National Landscape Character Area, include PDA 1 to Carmarthen and PDA to SWCN. If corridors are not spatially and temporally planned in a coordinated manner, there could be an increased area and timescale of impacts on these. There is no potential for cumulative negative medium to long-term landscape effects where new infrastructure is required within interface areas.

There is no potential for cumulative negative short-term visual effects on local populations where identified route corridors are in proximity within the HNDFUE (INTOG) Design.

There is also no potential for intra-plan in-combination negative effects on offshore infrastructure with the HND, HNDFUE (Scotwind), and HNDFUE (INTOG) identified route corridors or interface areas.

9.1.4 HNDFUE INTOG – Recommended Design

The HNDFUE Recommended Design for the INTOG area contains the proposed connections shown in Table 36. The HNDFUE Recommended Design Study Area for the INTOG area is shown in Figure 48.

Start Point	End Point	Interface Requirements	Capacity
Aspen	Fetteresso	1 Developer DC Converter Station	1,500 HVDC
Aspen	Cedar	N/A	1,000 HVAC
Beech	Aspen	N/A	500 HVAC
Beech	Cedar	N/A	500 HVAC
Cedar	Branxton	1 Developer DC Converter Station	2000 HVDC
Cenos	Peterhead 1	1 Developer DC Converter Station	1,400 HVDC
Sinclair	Scaraben	N/A	100 HVAC
Scaraben	Peterhead 2 / DCSS	1 Developer AC Substation	200 HVAC
North Connect	Cenos	N/A	1,400 HVDC
Beech	Beech MPI	N/A	2,000 HVAC

Table 36: HNDFUE INTOG Recommended Design proposed connections

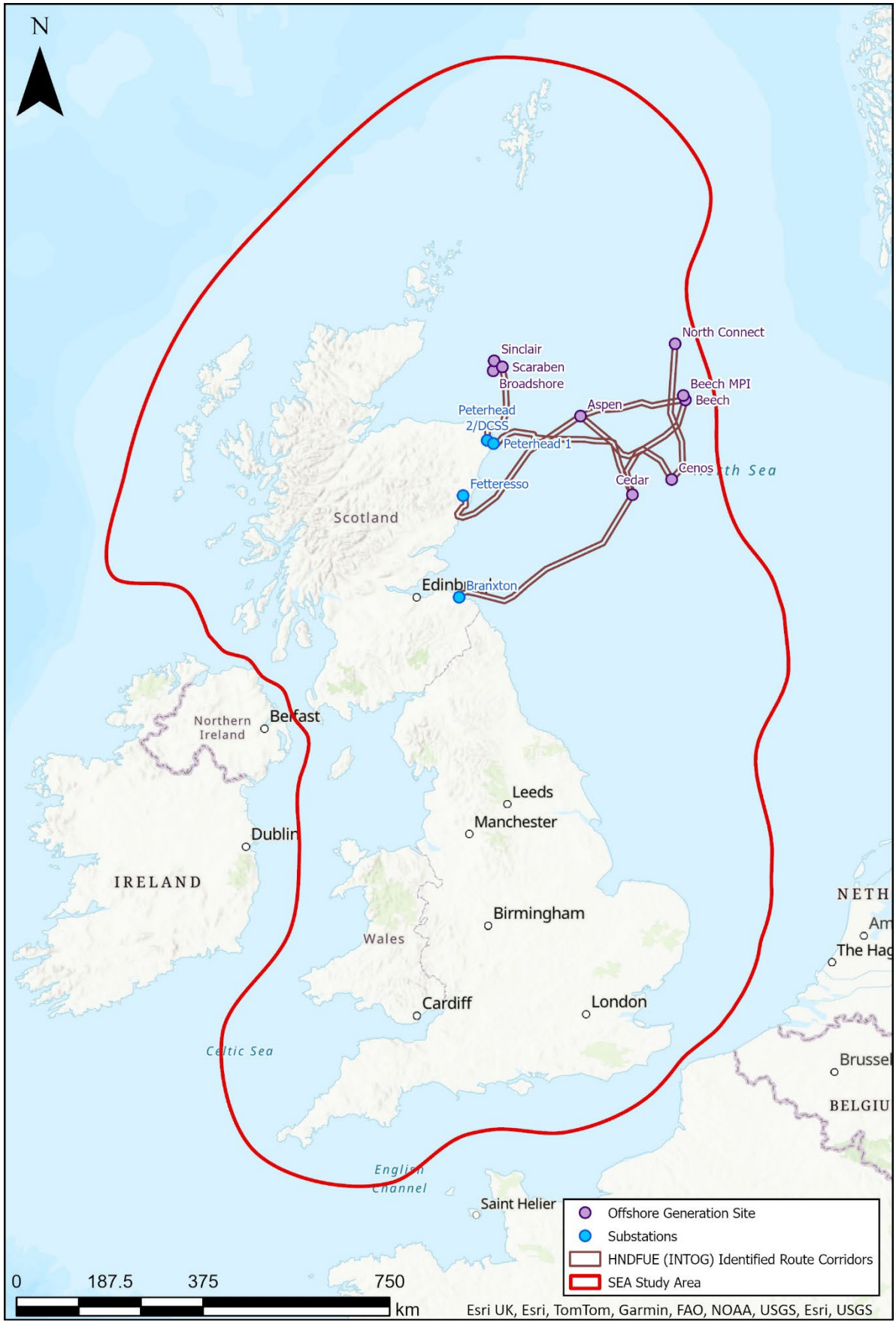


Figure 48: HNDFUE INTOG Recommended Design Study Area

Environmental Baseline and Key Issues within the Study Area

Biodiversity, Flora and Fauna

There are designated sites that interact with the identified route corridors. This includes the Buchan Ness to Collieston SAC, Buchan Ness to Collieston Coast SPA, Outer Firth of Forth and St Andrews Bay Complex SPA, and Loch of Strathbeg SPA and Ramsar site. There are two Nature Conservation MPAs that interact with the identified route corridors, the Southern Trench MPA, and the East of Gannet and Montrose Fields MPA. There are also seven SSSIs designated for ecological features potentially affected by the identified route corridors. These are the Barns Ness Coast SSSI, Bullers of Buchan Coast SSSI, Pease Bay Coast SSSI, St Cyrus and Kinnaber Links SSSI, West Bradieston and Craig of Garvock SSSI, Loch of Strathbeg SSSI, and Rora Moss SSSI. There are also additional SSSIs within the wider vicinity of interface areas.

There is one NNR that interacts with the identified route corridor from Aspen to Fetteresso, the St Cyrus NNR. There are also 17 Local Nature Conservation Sites (LNCS) for biology / biodiversity interact with identified route corridors: Annies Dam, Arbuthnott, Fetteresso, Den of Morphie, Elfhill, Mergie, St Cyrus, Whitewater Moss, Bilsdean Coast, Dryburn Valley, Dunglass Burn, Thorntonloch, Thurston Burn Valley 2, Dunglass Dean and Berwick Burn, Cairnbulg to St Combs, Rora Moss, and Strathbeg to Rattray.

The Loch of Strathbeg RSPB site interacts with the identified route corridor from Scaraben to Peterhead 2 / DCSS, while the Buchan Ness to Collieston Coast IBA and the Loch of Strathbeg IBA also interact with identified route corridors and the Buchan Ness to Collieston Coast IBA is within the wider vicinity of interface areas. The seabird at sea density within the identified route corridors is of relatively low to moderate density for the study area. There are areas of relatively moderate to high density for black-legged kittiwake, herring gull, common guillemot, northern fulmar, northern gannet, and razorbill within the identified route corridors.

The predominant seabed habitat types within the identified route corridors include deep circalittoral sand, deep circalittoral coarse sediment, and deep circalittoral mud. Known areas of Annex I saltmarsh occur within the identified route corridors to Peterhead 1, Peterhead 2 / DCSS, and Fetteresso. Known areas of Annex I Reef also occur within several of the identified route corridors. Onshore, there are areas of ancient woodland within the identified route corridors, including those to Fetteresso, Branxton and Peterhead 2 / DCSS.

There are OSPAR habitats within the identified route corridors, including kelp forests, and sea-pen and burrowing megafauna communities. There are also Priority Marine Features (PMF) within the identified route corridors, including many areas of offshore subtidal sands and gravels, as well as areas of offshore deep-sea muds and burrowed mud.

There are identified route corridors that lie within the Celtic and Greater North Seas Management Unit (MU) for the White-sided dolphin, White-beaked dolphin, Risso's dolphin, Minke whale, Harbour porpoise, and Common dolphin, and within the Greater North Sea and Coastal East Scotland MUs for Bottlenose dolphin. Within the identified

route corridors, there are areas of relatively moderate to high density for minke whale, relatively moderate to very high density for harbour porpoise, and relatively moderate to high density for fin whale and white-beaked dolphin. There are also areas of relatively moderate to high density for harbour seal and grey seal within the identified route corridors.

There are areas of known ecological importance for fish within the identified route corridors. This includes high intensity spawning grounds for sandeel, and low intensity spawning grounds for whiting, plaice and cod. There are also high intensity nursery grounds for whiting, herring, cod, and anglerfish, and low intensity nursery grounds for topeshark, spurdog, spotted ray, sole, sandeel, plaice, ling, mackerel, hake, skate, and blue whiting within the identified route corridors.

Population and Human Health

The settlements within the identified route corridors of the HNDFUE (INTOG) recommended design include the urban areas of St Cyrus, Longside, Peterhead and Boddam. There are no areas of relatively high population density within the identified route corridors. There are areas of higher perceived deprivation at Boddam and Crimond and areas of moderate perceived deprivation at Inneriwck, Dunglass, St Cyrus, Lathallan, Longhaven, Fiddler's Green and Longside.

There is a bathing water within the identified route corridors at Thorntonloch. There are no Scotland Award Beaches within the identified route corridors.

There are no marinas within the identified route corridors. There is an area of recreational boating located along the coastline at Montrose. There are areas of high intensity leisure boating activity inshore around Peterhead. There are no known underwater dive sites within the identified route corridors.

There are 51 onshore recreation sites within the identified route corridors, including public parks or gardens, playing fields, play spaces, cemeteries, religious grounds, tennis courts, bowling greens, golf course, and other sports grounds.

Geology, Soils and Land Use

There are sensitive areas for Geology, Soils and Land Use within the identified route corridors that have the potential to be impacted upon by the development of infrastructure. Within the offshore component of the identified route corridors, the Southern Trench MPA is within the Cenos to Peterhead 1 and Scaraben to Peterhead 2 / DCSS corridors and is unavoidable. There are no WHSs or Geoparks within the identified route corridors or interface areas.

Within the offshore component of the identified route corridors, complex seabed substrates primarily composed of sand with areas of sandy gravel and gravel are present, while further offshore there are areas of sandy mud and gravelly sandy mud. Extensive areas of offshore sand are present, which is unavoidable for all of the identified route corridors, and areas of offshore rock are also present close to the coastline.

The identified route corridors of Aspen to Cedar, Beech to Aspen, Beech to Cedar, Sinclair to Scaraben, North Connect to Cenos and Beech to Beech MPI are all located entirely offshore. There are areas of unavoidable Annex I reef habitat encountered by the identified route corridors that connect to shore given the rocky nature of the coastline around Scotland. There are several SSSIs located within the identified route corridors and interface areas; while many can be avoided, there is limited scope to avoid SSSIs within three identified route corridors.

An area of potential contamination is present within the Cenos to Peterhead 1 identified route corridor in the form of a dredge spoil dumping site near landfall, however this is avoidable. No areas of explosive munitions dumping grounds, Military Danger Areas or Military Practice areas are present within the identified route corridors or interface areas.

Within the onshore component of the identified route corridors, an area of unavoidable peatland is located within the Scaraben to Peterhead 2 / DCSS corridor. Avoidable areas of peatland are also present within the Peterhead 1 interface area. There are areas of unavoidable shallow exposed soils present within the identified route corridors. Typically, the onshore route corridors and interface areas cross areas of good and moderate quality agricultural land, with the areas of good quality agricultural land unavoidable. There are no landfills within the identified route corridors or interface areas.

Water

All of the identified route corridors are located within the MSFD Greater North Sea sub region to the north-east of Scotland where Good Environmental Status has not been achieved for Descriptors due to a variety of pressures including those on demersal fish species composition and declines on breeding bird populations.

The average wave heights are variable off the north-east of Scotland, typically nearshore and inshore areas range from 0.76m to 1.50m, within the offshore area ranges between 1.51m to 2.50m. The mean spring peak flow tides shows less variability to the north-east of Scotland with values ranging from 0.26m/s to 0.50m/s. The inshore area around Edinburgh to Aberdeen coastline shows greater variability of the mean spring peak flow rides ranging from 0.75m/s to 1.51m/s.

Several coastal waterbodies are within the identified route corridors that are of good or high WFD ecological status. The identified route corridors of Aspen to Cedar, Beech to Aspen, Beech to Cedar, Sinclair to Scaraben, North Connect to Cenos and Beech to Beech MPI are all located offshore. For all onshore identified route corridors, several lakes, rivers and National Flood Zones are present. While these are all avoidable within the interface areas, the rivers and National Flood Zones are typically unavoidable for the onshore component of the identified route corridors.

There are no bathing waters or shellfish waters within the identified route corridors. An area of potential contamination is present within the Cenos to Peterhead 1 identified route corridor, which is a dredge spoil dumping site near landfall; however, this is avoidable. No areas of explosive munitions dumping grounds, Military Danger Areas or

Military Practice areas are present within the identified route corridors or interface areas.

Air

There are settlements within the identified route corridors, including the urban areas of St Cyrus, Longside, Peterhead and Boddam. There are no areas of relatively high population density within the identified route corridors. There are areas of higher perceived deprivation at Boddam and Crimond, and areas of moderate perceived deprivation at Innerwick, Dunglass, St Cyrus, Lathallan, Longhaven, Fiddler's Green and Longside.

There are no known Air Quality Management Areas within the identified route corridors.

There are areas of relatively high intensity leisure boating activity inshore around Peterhead.

Climatic Factors

There are areas of high blue carbon potential within all identified route corridors. There is Annex I saltmarsh located at Loch of Strathbeg and within River North Esk and there are kelp forests and intertidal seaweeds located along the coastline at Peterhead and Branxton.

Onshore there are areas with potential to be carbon sinks, such as peatland located at Peterhead. There are ancient trees located at Branxton, St Cyrus and Garvock and areas of forest located within all identified onshore route corridors.

Material Assets

There are numerous submarine cables located within GB waters. Three offshore cable connections are encountered within the identified INTOG route corridors; of these, two are telecommunications connections and one is a power connection. These are crossed offshore of Peterhead.

There are approximately 42 offshore oil and gas pipeline connections crossed by the identified route corridors. The majority of these pipeline crossings are in offshore areas between Rattray Head and Stonehaven in Scotland and are unavoidable. Six avoidable offshore platforms are located within the identified route corridors; these are all located off the coast of Aberdeenshire. One avoidable diffuser is located within the identified route corridor, off the coast at Branxton. Additionally, there are 132 avoidable oil/gas wells located within the area of the identified route corridors forming the HNDFUE (INTOG) recommended design. There is one avoidable oil/gas installation within the identified route corridors, offshore of Peterhead. There are no gas storage sites or gas storage pipeline agreements within the area of the identified route corridors. There are also no offshore carbon capture and storage site agreements or meteorological and oceanographic equipment located within the identified route corridors.

There are no operational offshore wind farms nor existing or proposed tidal or wave energy generation sites located within the identified route corridors. There are a number of proposed offshore wind energy generation sites within the identified route

corridors, and the HND Implementation Plan is planning to develop connections to these sites in a co-ordinated manner with INTOG.

A significant amount of onshore infrastructure is located within the identified route corridors. A number of roads and railways will need to be crossed by the onshore sections of the identified route corridors and within potential areas for new interface infrastructure. Roads which require crossing include A roads, B roads, local, minor, primary, and restricted roads. Railway lines which require crossing include multi-track and single-track. It is possible to avoid these roads and railways with the new interface infrastructure; however, construction vehicles may have to utilise roads temporarily.

There is one fossil fuel power station located within an identified route corridor, and within the potential area for new interface infrastructure at Peterhead 1. It is possible to avoid this power station with both the onshore cabling and the new interface infrastructure.

Onshore electrical transmission infrastructure is located within the identified route corridors and potential interface areas. This infrastructure includes overhead lines operating at 400kV, 275kV and 132kV and their associated transmission network towers/poles. There are six substations operating at 400kV, 275kV and 132kV within identified route corridors, and five substations within potential interface areas. The majority of the overhead lines are unavoidable by onshore cabling within the identified route corridors, whilst all should be avoidable by new interface infrastructure although a connection will be required. The substations are avoidable within the route corridors by onshore cabling and the new interface infrastructure, although some substations are the desired endpoint for some of the recommended connections.

In terms of onshore gas infrastructure, there are seven onshore pipelines located within the identified route corridors and six within the interface areas in the vicinity of Peterhead and Fetteresso. The six pipelines are unavoidable for onshore cabling within the identified route corridors, whilst there is potential to avoid all six pipelines with new interface infrastructure. There are no petroleum terminals, LNG facilities or crude oil refineries within the identified route corridors or interface areas.

There are 11 avoidable onshore operational renewable energy sites located with a generation capacity over 150kW within the identified route corridors, all of which are onshore wind farms, although two of the wind farms are within the interface areas (one in the vicinity of Fetteresso and one in proximity to Branxton). There are no solar photovoltaic sites, landfill gas sites, battery storage sites, advanced conversion technology sites, aerobic digestion facilities, air source heat pumps, biomass, hydrogen, geothermal, hydroelectricity or sewage sludge digestion facilities with a generation capacity over 150kW within the identified route corridors or interface areas. In terms of non-renewable energy producing waste management facilities, there are no energy from waste (EfW) facilities with a generation capacity over 150kWwithin the identified route corridors and interface areas. All onshore renewable infrastructure can be avoided by the onshore cabling and the interface infrastructure.

There is no wastewater management infrastructure, including wastewater treatment/sewage works or desalination plants, located within the identified route corridors.

All identified route corridors which comprise the HNDFUE (INTOG) recommended design are within areas where shipping activity occurs; as such, shipping activity is unavoidable. The identified route corridors are mainly located within areas of lower shipping density; however, they cross moderate shipping density closer to the inshore area. These areas of moderate shipping density are unavoidable. The identified route corridors also encounter areas of unavoidable high shipping density, generally within inshore areas, where shipping routes connect busy fishing harbours and ports although there are large, widespread areas of higher shipping density located off the east coast of Scotland, with significant areas of high shipping density crossed on approach to Rattray Head, Peterhead and Branxton. One avoidable port is located within the identified route corridors, namely Peterhead Port. There are no ship routing measures, including traffic separation schemes, located within the identified route corridors. There are no designated anchorage areas located within the identified route corridors. There is one avoidable pilot boarding station located off the coast of Peterhead.

GB waters are heavily used by commercial fisheries. All identified route corridors which comprise the HNDFUE (INTOG) recommended design are within areas where fishing activity occurs; as such, fishing activity is unavoidable. The identified route corridors are mainly located within areas of relatively lower fishing activity. However, there are areas of unavoidable moderate and high fishing activity located within the identified route corridors, mainly in inshore areas off the coast of Branxton, St. Cyrus and Peterhead. Fleets which are known to operate within the identified route corridors include those targeting whiting, sprat, sole, plaice, Norway pout, mackerel, horse mackerel, herring, hake, haddock, cod, blue whiting, and anglerfish. Areas of relative importance for each of these species are crossed by a number of the identified route corridors. There are no marine fish farms located within any of the identified route corridors. There are unavoidable known fish spawning grounds located within the identified route corridors, including areas for sprat, nephrops, cod, whiting, herring, lemon sole, mackerel, Norway pout, plaice and sandeel. Additionally, there are unavoidable known fish nursery grounds for nephrops, cod, herring, whiting, plaice, blue whiting, haddock, Norway pout, saithe, sandeel, lemon sole, mackerel, sprat, tope shark, spurdog, spotted ray, ling, European hake, common skate and anglerfish.

There are no airports within the identified route corridors or interface areas.

There is one onshore military area located within the identified route corridors, which is located near Kinnaber and is not within an interface area. This onshore military area can be avoided by onshore cabling and interface infrastructure. There are no offshore military areas within the identified route corridors.

There are two avoidable dredge spoil dumping sites located within the identified route corridors, located off the coast at Peterhead. There are no navigational or aggregate dredging areas located within the identified route corridors. There are also no offshore

aggregate site agreements or offshore mining agreements within the identified route corridors.

The identified route corridors and interface areas intersect areas of unavoidable potential prime agricultural land. All route corridors and interface areas contain areas of good quality prime agricultural land. Two identified route corridors (Aspen to Fetteresso and Cedar to Branxton) and one interface area (Branxton) also contain areas of very good quality prime agricultural land. It is unlikely that prime agricultural land will be completely avoided by onshore cabling or interface infrastructure.

The identified route corridors and interface areas intersect areas of woodland, which may be utilised for commercial forestry. These include areas of broadleaved woodland, conifer woodland, and mixed woodland, as well as areas of young trees. It may be difficult to completely avoid all areas of woodland within every route corridor and interface area.

There are a number of recreational sites with the potential to act as tourist attractions located within the identified route corridors and interface areas, including one bathing water. Tourist activities within the marine portion of the identified route corridors are likely to include water sports, sailing, and fishing within inshore areas, and there are areas of known relatively high-intensity leisure boating activity within the identified route corridors. There are 51 onshore recreation sites within the identified route corridors, including public parks or gardens, playing fields, play spaces, cemeteries, allotments, religious grounds, tennis courts, bowling greens, golf courses, and other sports grounds. Additionally, the Formartine and Buchan Way National Trail, intersects onshore sections of the identified route corridors, with part of the Formartine and Buchan Way National Trail also located within an interface area.

Cultural, Architectural and Archaeological Heritage

There are 82 shipwrecks within the identified route corridors, as well as 401 marine Trove Heritage assets located within the identified route corridors within Scottish offshore waters (the Trove Heritage Asset dataset only covers Scottish Waters). The Cedar to Branxton identified route corridor contains the greatest number of shipwrecks (22), whilst the Cenos to Peterhead 1 identified route corridor contains the greatest amount of Trove Heritage Assets (133). There is potential to avoid these assets with offshore cabling. There are no known designated wrecks or Historic Marine Protected Areas within the identified route corridors. However, there is the potential for unknown marine and intertidal prehistoric landscapes, submerged archaeological artefacts, structures or wrecks to be located within the identified route corridors.

Four Garden and Designed Landscapes are located within the identified route corridors, with the identified Scaraben to Peterhead 2 / DCSS route corridor containing the greatest number of these (2). One Garden and Designed Landscape is within the Branxton interface area. There are 1,123 terrestrial Trove heritage features within the preferred route corridors; the identified Aspen to Fetteresso route corridor contains the greatest number of Trove Heritage assets (455). There are also 650 Trove Heritage assets within interface areas. The Branxton interface area contains the greatest number of these assets (213). There are 208 Listed Buildings within the identified route corridors,

with the identified Cenos to Peterhead 1 containing the greatest number (64). There are also 124 within the interface areas, with the Peterhead interface areas containing the greatest number of these features. There are 41 Scheduled Monuments situated within the identified route corridors, with the Cedar to Branxton identified route corridor containing the largest number (20). There are also 28 within interface areas, with the Branxton interface area containing the greatest number (20). Four Conservation Areas are located within the identified route corridors, with the Cedar to Branxton identified route corridor containing the greatest number (2). There are also three within the interface areas, with the Branxton interface area containing the greatest number (2). Approximately 18 Defence of Britain Sites are located within the onshore section of the identified route corridors, with Aspen to Fetteresso containing the greatest number (nine). There are also 12 within the interface areas, with the Peterhead 2 / DCSS interface area containing the largest number (6). There is potential to avoid all known terrestrial heritage assets, including coastal heritage assets, with interface infrastructure.

Additionally, there are some important Cultural, Architectural and Archaeological Heritage indicators in the immediate vicinity of the onshore sections of the identified route corridors, including Defence of Britain Sites, Listed Buildings and Scheduled Monuments.

Landscape, Seascape and Visual Amenity

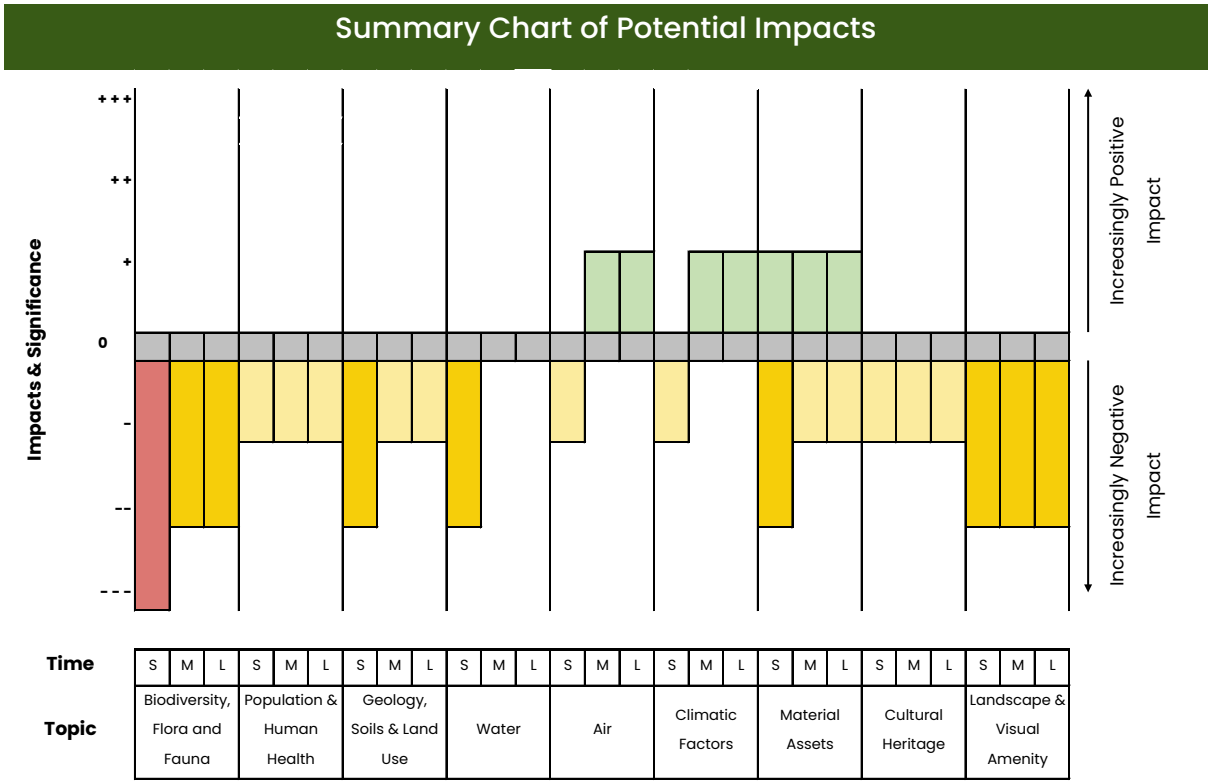
There are sensitive areas for Landscape, Seascape and Visual Amenity (LSVA) located within the identified route corridors. The offshore sections of the identified route corridors cross two Marine Character Areas (Berwick Bank and Swallow Hole Plain) in English waters. There is no potential to avoid these; however, they are unlikely to be impacted by offshore cabling. Marine Character Areas have not been identified in Scotland; however, there are Coastal Character Types identified for stretches of the Scottish coastline. The area types identified at landfall for the identified route corridors include Rocky Coastline / Open Sea Views and Deposition Coastline, Open Views.

Onshore, there are 12 National Landscape Character Types encountered by the identified route corridors. These are unavoidable; however, they are unlikely to be impacted by onshore cabling. Additionally, there are eight Landscape Character Types within the interface areas, that cannot be avoided with the new interface infrastructure.

There are no National Landscapes (AONBs), WHSs, Heritage Coasts, Country Parks or National Parks located within the identified route corridors or interface areas. One National Trail is encountered by the identified route corridor into Peterhead 2 / DCSS, namely the Formartine and Buchan Way. A short section of this National Trial cannot be avoided and will need to be crossed by onshore cabling. This National Trail also crosses the Peterhead 2 / DCSS interface area, where there is potential to avoid it with the interface infrastructure.

Environmental Assessment			
Environmental Assessment	Short-term	Medium-term	Long-term
Biodiversity, Flora and Fauna (BFF)	-3	-2	-2
Population and Human Health (PHH)	-1	-1	-1
Geology, Soils and Land Use (GSL)	-2	-1	-1
Water (W)	-2	0	0
Air (A)	-1	+1	+1
Climatic Factors (CF)	-1	+1	+1
Material Assets and Infrastructure (MA)	-2 / +1	-1 / +1	-1 / +1
Cultural, Architectural and Archaeological Heritage (CH)	-1	-1	-1
Landscape / Seascape and Visual Amenity (L)	-2	-2	-2

Table 37: HNDFUE INTOG Recommended Design summary scoring table



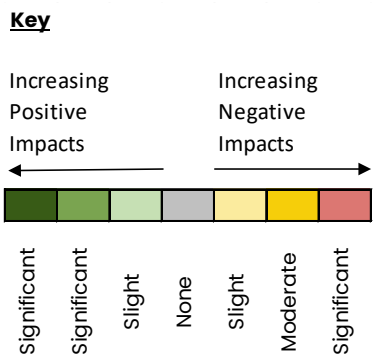


Figure 49: HNDFUE INTOG Recommended Design summary scoring chart

Discussion of Potential Effects

Biodiversity, Flora and Fauna

Cabling:

There are designated sites that are not possible to avoid within the identified route corridors of the HNDFUE INTOG recommended design.

The Outer Firth of Forth and St Andrews Bay Complex SPA (designated for nine species of breeding seabirds and 16 species of non-breeding seabirds and waterfowl, as well as its overall waterfowl, breeding seabird and non-breeding seabird assemblages) is unavoidable within the identified route from Cedar to Branxton, and the Buchan Ness to Collieston SPA (designated for seabirds, including black-legged kittiwake, common guillemot, herring gull, European shag and northern fulmar) is unavoidable within the identified route corridor from Cenos to Peterhead 1. There is potential for direct and indirect, temporary effects within these sites in the short-term construction and decommissioning phases and during cable maintenance activities, including damage to, disturbance and displacement of designated bird species and short to medium-term (re-establishment) damage to supporting habitats and displacement of prey species (-3).

The East of Gannet and Montrose Fields MPA is unavoidable within the identified route corridors to and from Cenos, as the offshore generation site lies within this MPA. The site is dominated by sands and gravels, which are the preferred habitat of the ocean quahog (Arctica islandica). Many types of worms and mollusc live buried in the mud and provide an important food source for fish. The Southern Trench MPA (designated features include burrowed mud communities, fronts, shelf deeps and minke whale) is also unavoidable within the identified route corridors from Cenos to Peterhead 1 and Scaraben to Peterhead 2 / DCSS. There is potential for temporary, direct and indirect negative effects within these sites in the short-term construction and decommissioning phases and temporary intermittent effects during cable maintenance activities, including damage to protected habitat and disturbance and displacement of protected species as well as damage to supporting habitats (-3). The shelf feature of the Southern Trench MPA can be avoided by the identified route corridors, as can the known locations of protected habitat.

The majority of SSSIs that are within the identified route corridors can be avoided; however, the Loch of Strathbeg SSSI (designated for a breeding bird assemblage, non-breeding populations of goldeneye, greylag goose, pink-footed goose and whooper swan, eutrophic waterbody, sand dunes, salt marsh, fen meadow and open water transition fen) is unavoidable within the route corridor from Scaraben to Peterhead 2 / DCSS, while there is limited potential to avoid the St Cyrus and Kinnaber Links SSSI (designated for birds, grassland, moths and saltmarsh) within the identified route corridor from Aspen to Fetteresso and the Bullers of Buchan Coast SSSI within the identified route corridor from Cenos to Peterhead 1. There is potential for direct and indirect, negative effects within these sites in the short-term construction and decommissioning phases and during cable maintenance activities (-2).

All other designated sites that are within the identified route corridors can be avoided by cables within these corridors, avoiding the potential for direct negative effects. There may be potential for short-term, temporary, indirect negative effects on protected features within these sites, which need to be considered further in micro-routing at the detailed design stage.

There are areas of Annex I reef habitat that cannot be avoided, or there is limited potential to avoid, by cables within the identified route corridors from Cedar to Branxton and Cenos to Peterhead 1. There is potential for direct and indirect, negative effects during construction and decommissioning and cable maintenance activities; direct effects have the potential to be long-term or permanent (-2). Other sensitive habitats and features such as OSPAR threatened habitats and PMFs are likely to be avoidable through micro-routing considerations at the project stage; however, the potential for short-term, direct and indirect negative effects on these features will need to be considered.

The NNR within the identified route corridors can be avoided. The potential for indirect negative effects on this site should be considered at the project stage. There may be potential for direct or indirect, negative effects on birds and supporting habitats within the Buchan Ness to Collieston Coast IBA, and the Loch of Strathbeg RSPB site, which are unavoidable within the identified route corridors (-1). There is potential to avoid most LNCS; however, there is limited potential to avoid the St Cyrus LNCS within the identified route corridor from Aspen to Fetteresso and the Strathbeg to Rattray LNCS within the identified route corridor from Scaraben to Peterhead 2 / DCSS. There may be potential for short-term direct and indirect, negative effects within these sites during the construction and decommissioning phases and during cable maintenance activities (-1). There are areas of known high density for grey seals and harbour seals that may not be possible to avoid within the identified route corridors, while areas of moderate to very high density for cetacean species within the identified route corridors also may not be possible to avoid. There may be potential for short-term disturbance and displacement of marine mammal species during the construction and decommissioning phases and during cable maintenance activities, as well as short-term damage to supporting habitats and disturbance of prey species (-1).

Areas of ecological importance for fish species such as spawning and nursery habitat may not be avoidable within some identified route corridors, and there is potential for

short-term disturbance to, and displacement of, species and short-term damage to supporting habitats within the construction and decommissioning phases (-1).

There is potential for short-term disturbance to, and displacement of, seabirds as well as birds within the identified onshore route corridors during the construction and decommissioning phases and during cable maintenance activities.

In general, there is also potential for direct and indirect negative effects from disturbance or damage to local habitats and species outside of designated sites during the construction and decommissioning phases and during any cable maintenance activities (-1).

Onshore Infrastructure:

There are designated sites within the vicinity of the onshore interface areas; however, all of these sites can be avoided by the required onshore infrastructure developments, avoiding the potential for direct negative effects on designated habitats and species. The designated sites within the vicinity of interface areas include the Buchan Ness to Collieston SAC, Buchan Ness to Collieston Coast SPA, Outer Firth of Forth and St. Andrews Bay Complex SPA, Barn Ness Coast SSSI, Pease Bay Coast SSSI, Lammermuir Deans SSSI, Bullers of Buchan Coast SSSI, and Hill of Longhaven SSSI. There may be potential for short-term, temporary, indirect negative effects on protected features within these sites, which will need to be considered further at the detailed design stage, such as water quality impacts on hydrologically connected sites, and disturbance of protected species of sites within the vicinity of works areas.

The Buchan Ness to Collieston Coast IBA and areas of ancient woodland can be avoided within the interface areas. LNCSs within the vicinity of the interface areas at Branxton, Fetteresso, Peterhead 1 and Peterhead 2 / DCSS should also be possible to avoid.

If the construction works for new onshore infrastructure are undertaken within areas of lower sensitivity, the potential for significant negative effects on Biodiversity, Flora and Fauna should be avoidable. There is potential for direct, long-term loss of local habitats and species in the footprint of the new infrastructure and any required access roads, and for temporary, medium-term negative effects on Biodiversity, Flora and Fauna within the wider temporary work areas, which could include disturbance and displacement of species and temporary loss of supporting habitats (-1).

Developments occurring in Scotland are not currently be required to consider BNG as a mandatory requirement; however, this is being actively developed.

The HRA assessed the potential for negative effects on SACs and SPAs within the identified route corridors and a relevant zone of influence as follows:

- Potential for temporary disturbance as a result of increased suspended sediment concentrations and sediment deposition.

- Potential for adverse effects on site integrity via changes in water quality.
- Potential for adverse effects on site integrity due to changes in prey availability.
- Potential for airborne sound and visual disturbance to marine mammals and seabirds.
- Potential for adverse effects on site integrity due to noise and visual impacts to birds from landfall / onshore works.
- Potential for a temporary or permanent loss or removal of terrestrial habitats.
- Potential for impacts via maintenance activities and cable repair.

The HRA set out mitigation measures required to avoid adverse effects on these sites via these impact pathways, including through micro routing.

The MCZ assessed the potential for negative effects on MCZs, HPMAs and Nature Conservation MPAs within the identified route corridors and a relevant zone of influence as follows:

- Potential for temporary physical disturbance - subtidal benthic habitats and species.
- Potential for permanent loss - subtidal benthic habitats and species.
- Potential for the introduction of INNS - subtidal benthic habitats and species.
- Potential for changes in prey availability.
- Potential for thermal emissions - subtidal benthic habitats and species.
- Potential for EMF - subtidal benthic habitats and species, marine mammals, fish, and invertebrates.
- Potential for increased suspended sediment concentrations - subtidal benthic habitats and species, marine mammals, fish, and invertebrates.
- Potential impacts on water quality - subtidal benthic habitats and species, marine mammals, fish, and invertebrates.

The MCZ Stage 1 set out mitigation measures to avoid adverse effects on these sites via these impact pathways. One route corridor was further considered at the MCZ Stage 2 (derogation), Cenos to Peterhead 1.

Population and Human Health

Cabling:

There are major settlements within the identified route corridors, which can be avoided and no areas of relatively higher population density. Generally, there is the potential for slight negative, short-term effects on the local population from cable laying, such as noise, lighting, visual and disturbance during the construction and decommissioning phases and during cable maintenance activities (-1). There is potential for slight negative, short-term effects on the local population such as noise, lighting, visual and

disturbance effects to many receptors within moderately populated areas during the construction and decommissioning phases and during cable maintenance activities (-1). There is not expected to be any direct, medium, or long-term, disturbance of local populations due to noise or disturbance effects during the operational phases (0). There are areas of perceived moderate deprivation within the identified route corridors. There are areas of perceived higher deprivation within the identified route corridors to Peterhead. Populations in these areas may be of lower health status and therefore more susceptible to health effects linked to disturbance. There is the potential for perceived human health concerns regarding EMF generation from the operation of electrical transmission cables.

There are areas of high intensity leisure boating activity within the identified route corridors around Peterhead. There is potential for slight negative, temporary, direct and indirect, negative effects on leisure and recreational marine users due to an increased collision risk, access restrictions and displacement, or water quality effects, during the construction and decommissioning phases and during cable maintenance activities (-1). The potential for negative direct or indirect effects on these users in the medium to long-term during the operational phase is considered to be negligible (0).

There is a bathing water site located within the identified route corridors; however, this can be avoided. There is potential for short -erm, indirect, negative effects such as noise, disturbance and water quality impacts to these areas during the construction and decommissioning phases and during cable maintenance activities (-1).

There are onshore recreation sites within all identified route corridors, however these can be avoided. There is potential for short-term, slight negative, temporary disruption to these recreational areas during construction and decommissioning works (-1).

Onshore Infrastructure:

There are major settlements within the interface areas at Peterhead 1; however, these should be avoidable. There is the potential for temporary direct disturbance on the local population due to lighting, noise and vibration generated during pre-construction, and construction from construction activities and vehicle movements (-1). There is potential for temporary direct disturbance on the local population due to lighting, noise and vibration generated during the operation of the converter station (-1). There are areas of perceived highest deprivation within the interface area at Peterhead 1. There are potential impacts on the health of construction workers and future site users through exposure to hazardous contaminants during pre-construction, construction, and decommissioning. There is potential for health effects due to the emission of dust from demolition, earthworks, construction and track out during pre-construction, construction & decommissioning, operation and maintenance (-1).

There are onshore recreation sites within all interface areas, however these can be avoided. There is potential for short-term, slight negative, temporary disruption to these recreational areas during construction and decommissioning works (-1).

Geology, Soils and Land Use

Cabling:

Cabling has the potential for negative effects on Geology, Soils, and Land Use within offshore sites protected for geology/geomorphology. The Southern Trench MPA is unavoidable with the Cenos to Peterhead 1 and Scaraben to Peterhead 2 / DCSS identified route corridors. There is potential for short-term direct, moderate effects through loss of the soil resource during cabling installation, cable protection laying, and decommissioning if cables are removed (-2), with slight negative (-1) permanent effects in the long-term if there is damage to protected features that cannot recover. There is also potential for short to long-term, slight, indirect effects through alterations to local sediment regimes impacting geomorphological features (-1).

The laying of offshore cabling and cable protection works has the potential for short to long-term, direct effects on Annex I habitats and SSSIs (located at landfall), which cannot be avoided through damage to features in the footprint of works (-2). Within the identified route corridors, extensive sand is present and unavoidable within offshore areas, and several corridors coming onshore have areas of unavoidable rock located at the coastline with potential for short-term direct effects on water quality through the release of sand and sediment sources during cable construction and decommissioning phases (-1).

The potential for these effects can be minimised through the use of suitable mitigation at the project stage; this may include the use of bubble curtains to reduce sediment dispersal, or less geologically disruptive construction techniques, and projects will also be subject to project-specific implementation plans such as Construction Environmental Management Plans (CEMPs) and subject to regulatory compliance, which should minimise potential effects.

Within the offshore areas of identified route corridors, there is the potential for short-term direct negative effects on soils from the release of contaminated sediments/materials during cable construction, maintenance, or decommissioning phases. However, within the recommended design, the dredge spoil dumping ground within the Cenos to Peterhead 1 identified route corridor is avoidable, reducing the potential for negative effects (-1). No explosive munitions dumping grounds, Military Danger Areas or Military Practice areas are present within the identified route corridors. Generally, there is potential for short-term, direct, negative effects on soils and overlying water quality from the release of contaminants during cable installation, maintenance or decommissioning phases with the potential for short-term, direct, negative effects on sediment and secondary effects on water quality (-1). The use of mitigation measures, such as pre-construction surveys, can help to identify potential sources of seabed contamination, and the potential impacts minimised through avoidance of these areas for development.

Within the identified onshore route corridors there is potential for short to long-term direct negative effects on peatlands which are unavoidable within the Scaraben to

Peterhead 2 / DCSS identified route corridor, with the loss of sediments and soils from cable installation and decommissioning phases, this may lead to the loss or degradation of the peatland habitat, with secondary direct medium -term effects on carbon sequestration within these habitats if they don't re-establish quickly (-2).

Generally, within the identified route corridors the agricultural land is of good to moderate quality with areas of poor quality, there are areas of unavoidable good quality agricultural land. There is potential for short to long-term direct loss of soil and the potential for direct effects on land use in the long-term if the former land use is not re-established (-1).

Within the onshore areas of identified route corridors, there are areas of shallow soils of exposed rock which are unavoidable, there is potential for short-term, direct, negative effects through the loss of soils in these areas and long-term, direct, negative effects through the permanent loss of geological material in these areas during cable installation and decommissioning phases (-1).

Generally, during cable construction, maintenance, and decommissioning phases, there is potential for short to medium-term, direct, negative effects due to localised loss of the soil resource. There is the potential for secondary, negative effects on Water through temporary increased suspended sediment losses impacting on water quality during construction and decommissioning (-1). Mitigation measures at the project stage, such as CEMPs, can reduce the potential for erosion or sediment loss, and may include appropriately timing works to avoid periods of elevated risk of soil loss/erosion such as the winter of high rainfall and runoff rates, or the use of interception techniques to reduce downstream sediment transfer to waterbodies.

<u>Onshore Infrastructure:</u>

There is potential for negative effects on Geology, Soils and Land Use within the identified interface areas from the development of new infrastructure. There are areas designated for geological/geomorphological features within the interface areas; however, as these are avoidable, there should be no potential for direct negative effects within these areas. The potential for indirect negative effects on these sites should be considered at the project stage (-1).

There is potential for short to long-term direct negative effects on peatlands within the Peterhead 1 interface area, this may lead to the loss or degradation of the peatland habitat, with secondary direct medium-term effects on carbon sequestration within these habitats if these do not re-establish quickly (-2). However, these habitats are avoidable, reducing the potential for effects (-1).

Generally, within the interface areas the agricultural land is of good to moderate quality with areas of poor quality, there are areas of unavoidable good quality agricultural land; in these areas there is potential for a short to long-term direct loss of the soil resource and the potential for direct effects on land use in the long-term if the former land use is not re-established (-2). This may lead to secondary effects on Material Assets through a temporary loss of agricultural farming areas and overall agricultural productivity, and

on Water through a temporary increased risk of sediment losses or soil erosion in the short-term, with exposed bare ground impacting on water quality (-2).

Within the interface areas, there are areas of shallow soils of exposed rock, there is potential for short-term, direct, negative effects through the loss of soils in these areas and long-term, direct, negative effects through the permanent loss of geological material in these areas during cable installation and decommissioning phases (-1), however as these are avoidable it reduces the potential for effects (-1). There are no landfills areas within the interface areas.

Generally, during the construction, maintenance, and decommissioning phases for new infrastructure there is potential for short-term direct and indirect negative effects through a loss of the soil resource within the footprint of new infrastructure and working areas (-1). As for cabling, the introduction of mitigation measures at the project stage, such as CEMPs, can reduce the potential for erosion or sediment loss within interface areas.

Water

Cabling:

The development of cabling has the potential for negative effects offshore within the short to medium-term on the achievement of Good Environmental Status for the MSFD Greater North Sea sub region, which is failing to achieve Good Environmental Status. There is the potential for indirect effects from the release of sediment or chemicals used during cable installation, decommissioning and maintenance phases, or through alterations to sediment regimes with the use of cable protection materials impacting on Descriptors assessed under the MSFD (-1). However, with the application of good working practices, negative effects are expected to be temporary and there is not anticipated to be potential for significant effects in the medium to long-term (0).

Within the offshore component of the identified route corridors, there is the potential for short-term direct effects on water quality from the release of contaminated sediments/materials during cable construction, maintenance, or decommissioning phases; however, the dredge and spoil dumping ground is avoidable within the Cenos to Peterhead 1 identified route corridor, reducing the potential for impacts (-1). There are no shellfish waters, bathing waters, explosive munitions dumping grounds, Military Practice Areas or Military Danger Areas within the offshore identified route corridors.

Within the WFD coastal waterbodies present at landfall throughout the identified route corridors, aside from Aspen to Cedar, Beech to Aspen, Beech to Cedar, Sinclair to Scaraben, North Connect to Cenos and Beech to Beech MPI identified route corridors which are located entirely offshore, during cable construction, maintenance and decommissioning phases there is potential for short-term direct effects on water quality through the release of sediment associated with cable trenching or the release of chemicals associated with the construction, maintenance and decommissioning phases (-1). Similarly, onshore, during cable construction, decommissioning, and maintenance phases, there is a potential for short-term direct and indirect effects on

water quality through the release of sediment or alterations to local hydrological regimes where rivers or lakes are unavoidable within the identified route corridors (-1).

Aside from Aspen to Cedar, Beech to Aspen, Beech to Cedar, Sinclair to Scaraben, North Connect to Cenos and Beech to Beech MPI identified route corridors, which are located entirely offshore, National Flood Zones are present within the onshore identified route corridors and at landfall. Typically, these are unavoidable, and there is potential for short-term direct and indirect effects through potential for increased flood risk or alterations to local hydrological regimes during cable construction, maintenance, and decommissioning phases (-2).

Onshore Infrastructure:

There is potential for negative effects on water within the identified interface areas from the development of new infrastructure. During interface construction, maintenance, and decommissioning phases there is a potential for short-term direct and indirect effects on water quality through the release of sediment or alterations to local hydrological regimes to rivers and lakes, although typically these are avoidable, reducing the potential for impacts (-1). Within the WFD waterbodies present onshore within the interface areas, during interface construction, maintenance, and decommissioning phases, there is potential for short-term direct effects on water quality through the release of sediment associated with interface development or the release of chemicals associated with the construction, maintenance, and decommissioning phases (-1).

Air

Cabling:

There are no known Air Quality Management areas within the identified route corridors. There is potential for slight negative, direct, short-term temporary effects on local air quality due to dust generation and air emissions from vehicles and machinery in the vicinity of the works during the construction and decommissioning phases and during any cable maintenance activities (-1). There is also the potential for slight negative, short-term, temporary emissions from vessels due to maintenance activities during the operational phase. It is not expected that there will be any negative direct or indirect, medium or long-term effects on these sensitive receptors from air emissions / pollution during the construction, operational and decommissioning phases (0).

There are settlements within identified route corridors. There is potential for moderate negative, short-term effects on the local population through dust and traffic/machinery emissions, as well as noise emissions which may affect many receptors within these higher populated areas during the construction and decommissioning phases and during cable maintenance activities (-1). Populations in these areas may be of lower health status and may be of greater risk of health impacts such as those affecting the lungs due to existing health conditions in the areas of higher sensitivity (-1)

There is potential for slight positive, indirect effects on regional air quality in the medium to long-term from facilitation of new renewable energy infrastructure, supporting decarbonisation of the energy sector (+1).

Onshore Infrastructure:

There are major settlements within interface areas of the recommended design. Potential for a short-term, temporary increases in road traffic volumes on the public road network and within the construction areas generated by construction activities to result in adverse effects on local air quality, during pre-construction, installation, and decommissioning. Potential for intermittent/infrequent operational phase maintenance activities to temporarily increase traffic volumes and result in adverse effects in local air quality. Potential to impact local populations through a deterioration of local air quality via increased exposure to vehicle emissions. There is potential for slight negative, direct, short-term temporary effects on local air quality due to dust generation and air emissions from vehicles and machinery in the vicinity of the works during the construction and decommissioning phases and during any maintenance activities (-1).

There is potential for slight positive, indirect effects on regional air quality in the medium to long-term from facilitation of new renewable energy infrastructure, supporting decarbonisation of the energy sector (+1).

Climatic Factors

Cabling:

There are known locations of blue carbon habitat within the identified route corridors of the recommended design. There is unlikely to be potential for significant negative effects on blue carbon habitat within the identified route corridors during the construction, operational and decommissioning phases (0), as the cables can potentially avoid the areas of high blue carbon potential. There is potential for slight negative, short-term effects on sediment carbon storage, due to a localised release of CO2 from seabed disturbance during the construction and decommissioning phases (-1). There is potential for slight negative, short-term, temporary effects on localised Green House Gas (GHG) concentrations due to GHG emissions from vehicles and machinery in the vicinity of the works during the construction and decommissioning phases and during any cable maintenance activities (-1). There is also potential for the temporary loss of GHG sequestering material in the vicinity of the works during the construction and decommissioning phases and during any cable maintenance activities (-1).

There is potential for slight positive, medium to long-term effects during the operational phase, from facilitation of new renewable energy infrastructure, supporting decarbonisation of the energy sector, diversification of electricity supply and energy security, and meeting of energy objectives and climate change emission reduction targets (+2).

Onshore Infrastructure:

There are onshore carbon sinks within all interface areas of the recommended design. There are areas of peatland within the interface areas of Fetteresso, Peterhead 1 and Peterhead 2 / DCSS. There is potential for short-term release of CO2 due to ground disturbances on areas of carbon storage such as peatlands, bogs or salt marshes habitats, due to the activities required to facilitate the construction and decommissioning of the converter station (-1). There is potential for short-term direct and indirect GHG emissions to be generated by the construction process through the production of materials, transport of materials and onsite energy consumption. Potential for short-term, temporary emissions from vehicles and machinery during pre-construction, construction and decommissioning of the converter station.

There is potential for slight positive, medium to long-term effects during the operational phase, from facilitation of new renewable energy infrastructure, supporting decarbonisation of the energy sector, diversification of electricity supply and energy security, and meeting of energy objectives and climate change emission reduction targets (+2).

Material Assets

Cabling:

There is unavoidable offshore infrastructure encountered by the identified route corridors. In total, there are three submarine cable crossings, and 42 offshore gas/oil pipeline crossings within the identified route corridors. The majority of these cables and oil/gas pipelines are unavoidable, with five identified route corridors crossing submarine cables and seven crossing oil/gas pipelines. The greatest number of cable crossings (two) is by the identified route corridor from Cenos to Peterhead 1, whilst the greatest number of offshore pipeline crossings (22) is by North Connect to Cenos identified route corridor. There is potential for telecommunications and energy supplies of high importance within GB waters to be disrupted during the construction, operation, and decommissioning phases. There is potential for moderate negative, direct, short-term effects due to damage to these cables and pipelines, and subsequent disruption to telecommunications and energy supplies, during the construction and decommissioning phases (-2), as well as potential for slight negative medium to long-term direct effects in the operational phase during recurrent maintenance operations (-1). There is also potential for moderate negative indirect effects to telecommunications and energy supplies in the short-term during the construction and decommissioning phases, as access to these existing assets for maintenance may be reduced temporarily (-2), as well as for slight negative effects in the medium to long-term during the operational phase due to access issues during periods of maintenance (-1). Thus, given the high importance of the existing infrastructure, which cannot be avoided there is potential for moderate negative effects on this infrastructure in the short-term (-2) and slight negative effects in the medium, and long-term (-1), although good working practices may eliminate or minimise the potential for these effects to occur.

There are seven unavoidable onshore pipelines that are encountered by the identified route corridors. Two of the identified route corridors cross these pipelines within the vicinity of Peterhead 1 and Fetteresso. There are unavoidable overhead electrical transmission lines which are crossed by four identified route corridors in the HNDFUE (INTOG) recommended design. There is the potential for slight adverse, direct short-term, negative effects due to damage to the pipelines or overhead lines, and subsequent disruption to energy supplies and services, during the construction and decommissioning phases (-1), as well as potential for slight negative, medium to long-term (cable lifetime) direct effects in the operational phase during recurrent maintenance operations (-1). There is also the potential for slight negative indirect effects to energy supplies and services in the short-term during the construction and decommissioning phases, as access to these existing pipelines and cables for maintenance may be reduced temporarily (-1), as well as for slight negative effects in the medium to long-term during the operational phase due to access issues during periods of maintenance (-1). Furthermore, there is the potential for moderate negative, direct short-term effects during construction due to the potential requirement for permanent relocation or repositioning of existing overhead lines, services should return to normal once this has occurred. All potential negative effects on onshore energy infrastructure are, however, likely to be temporary and localised to the asset crossing locations. Directional drilling may also reduce or eliminate many of these issues onshore.

A number of roads will need to be crossed, with all four of the identified route corridors that extend onshore containing unavoidable roads. The Aspen to Fetteresso identified route corridor contains the longest onshore section, and the greatest number of road crossings. Two identified route corridors encounter unavoidable railway lines, Aspen to Fetteresso and Cedar to Branxton. As such, there is potential for slight adverse, direct, short-term negative effects due to the disruption of access to roads and railway lines due to road closures or road diversions, or restrictions/amendments to public transport routes during construction and decommissioning phases (-1). This may result in a temporary increase in travel time for road and public transport users. There is also potential for slight negative, direct short-term effects due to journeys being delayed by the potential increased vehicle traffic from construction machinery (-1), as well as short-term temporary road access restrictions, closures or slow-moving vehicle traffic to accommodate construction vehicles transporting abnormal loads (-1). There is the potential for slight negative, indirect short-term effects due to disruption from construction or decommissioning works or concerns regarding road safety for road users (motorised and non-motorised) with large vehicles or machinery (-1). All potential negative effects on transport infrastructure are, however, likely to be temporary and localised to the route corridor crossing locations. The use of directional drilling may also reduce or eliminate many of these issues onshore.

All identified route corridors which comprise the HNDFUE (INTOG) recommended design are within areas where shipping activity occurs. Five of the identified route corridors encounter areas of unavoidable high shipping density. This is generally encountered in the inshore areas, of the coast of Rattray Head, Peterhead, and Branxton. The identified route corridor from Scaraben to Peterhead 2 / DCSS crosses the largest area of high

shipping density. There is potential for significant, direct negative effects on shipping and navigation within the recommended design in the short-term due to displacement of vessels during the construction and decommissioning phases (-3), which can result in temporary disruption to vessel routing and timetables. There is potential for significant negative effects in the short-term during the construction and decommissioning phases due to the risk of collision and allision with vessels associated with cabling, which may result in injury or death and hazardous cargo or oil spillage (-3). There is potential for slight negative, medium and long-term effects during the operation phase due to the risk of collision or allision with slow-moving or stationary vessels and equipment during maintenance (-1). There is also potential for slight negative, medium and long-term effects during the operation phase due to the risk of entanglement of anchors with subsea cables or protective structures used over cables (-1). Furthermore, there is potential for significant negative effects within installation and decommissioning areas in the short-term construction and decommissioning phases, as the presence of installation vessels and equipment may adversely impact the efficiency of search and rescue operations (-3). It is, however, likely that all these potential effects can be mitigated by adherence to appropriate navigational safety planning and procedures.

There are relatively high-intensity fishing areas located within the identified route corridors, the majority of which are crossed within inshore areas off the coast of Branxton, St. Cyrus, and Peterhead. There is potential for moderate direct negative, short-term effects on commercial fisheries operations due to temporary displacement from traditional fishing grounds during the construction and decommissioning phases (-2), as well as potential for slight, medium and long-term negative effects due to displacement during maintenance within the operational phase (-1). Displacement of fishing activity could result in increased competition for alternate fishing grounds, with potential to adversely affect fish stocks and, by extension, landings, in nearby areas. There is potential for moderate negative direct effects due to an increased collision risk of fishing vessels with vessels associated with cable installation in the short-term during the construction and decommissioning phases (-2), and slight negative effects in the medium to long-term during recurrent maintenance activities in the operational phase (-1). There is also potential for slight negative effects on fishing activities within the identified route corridors in the operational phase, due to the risk of entanglement of fishing gear with cables or damage to fishing gear due to cable protection infrastructure where cables cannot be buried sufficiently, which may lead to avoidance of the area by fishing vessels (-1). There is potential for effects on commercial fish species and their key habitats within the identified route corridors. There is potential for moderate negative direct effects in the short-term construction (-2), and slight negative direct effects in the medium-to long-term operational phase due to the potential for a direct loss of supporting habitats, such as spawning and nursery grounds. There is potential for moderate indirect negative effects on the profitability of commercial fishing in the short- term (-2) and slight indirect negative effects in the medium and long-term (-1). This includes the potential for reduced quotas, increased resource competition for fishing, and reduced landings in both tonnage and economic value.

Four identified route corridors cross areas of unavoidable prime agricultural land. A significant portion of this prime agricultural land is in Aberdeenshire, crossed by the Aspen to Fetteresso identified route corridor. There is potential for direct, slight, short-term negative effects on agriculture due to the temporary loss of agricultural land and soils during pre-construction, construction and decommissioning processes (-1). There is also potential for short-term, direct, slight negative effects due to temporary restrictions in access to agricultural land with construction and decommissioning activities (-1). There is potential for short-term, direct damage to field drains due to construction and decommissioning activities (-1), as well as the potential for indirect, short-term secondary negative effects on agriculture during construction and decommissioning activities, including through pollution of water sources used for irrigation or for livestock or through the introduction of soil borne pests and diseases (-1).

Four of the identified route corridors intersect relatively small areas of either broadleaved woodland, conifer woodland, and mixed woodland, which may be utilised for commercial forestry, that may be difficult to avoid completely. There is potential for direct, slight negative effects on commercial forestry due to the loss of woodland within the onshore study corridor if felling of woodland and commercial forestry areas is required to facilitate cable installation in the short-term construction phase (-1). There is also potential for the direct, slight negative effects on commercial forestry in the medium and long-term due to the permanent loss of woodland within the onshore study corridor (-1). This could result in a reduction in income levels for this industry.

The potential for effects on tourism is considered indirectly within the topics of Landscape, Seascape and Visual Amenity (visibility of construction activity), Population and Human Health (recreational use), and Biodiversity, Flora, and Fauna (effects on wildlife). As discussed in the Landscape, Seascape and Visual Amenity Section, there is the potential for slight negative effects in the short-term on Landscape, Seascape and Visual Amenity, which may result in secondary adverse effects on tourism, as this may act as a deterrent to tourists. As discussed in Population and Human Health, there is a slight potential for negative effects on the population due to increased noise release in the short-term, as such tourism is unlikely to be impacted significantly by these potential effects, albeit temporary and localised. There is potential for slight negative, temporary direct and indirect effects on leisure and recreational marine users due to an increased collision risk or water quality effects, as well as access restrictions and displacement for marine and onshore recreational users during the construction (and decommissioning) phase, which may indirectly negatively affect tourism temporarily. Lastly, as discussed in Biodiversity, Flora and Fauna, there is potential for the construction phase to adversely affect wildlife, which may result in a secondary impact on tourism activities. Any impact on tourism will likely be temporary, localised and not significant.

The HNDFUE (INTOG) recommended design has the potential to connect approximately 4.5GW of offshore renewable energy generation to the GB grid. As such, there is potential for slight positive effects in the short-term (+1) and slight positive effects in the

medium to long-term, owing to the facilitation of new renewable energy infrastructure (+1) and the associated reduction in reliance of fossil fuel generation.

Onshore Infrastructure:

All of the potential areas where interface infrastructure may be located contain sections of overhead electrical transmission lines. Due to the presence of other environmental and technical constraints, space may be limited, and overhead lines may not be entirely avoidable, and a connection will also be required to this infrastructure. There is the potential for slight adverse, direct short-term, negative effects due to damage to the overhead lines, and subsequent disruption to energy supplies and services, due to the activities required to facilitate construction and decommissioning of the infrastructure during the construction and decommissioning phases (-1). There is potential for slight negative, medium to long-term (interface infrastructure lifetime) direct effects in the operational phase due to the recurrent maintenance activities required to facilitate the operation and maintenance (recurrent, short-term) (-1). There is also the potential for slight negative indirect effects to energy supplies and services in the short-term during the construction and decommissioning phases, as access to these existing overhead lines for maintenance may be reduced temporarily due to the activities required to facilitate construction and decommissioning of the infrastructure (-1), as well as for slight negative effects in the medium to long-term during the operational phase due to access issues during periods of maintenance (-1). Furthermore, there is the potential for moderate negative, direct short-term effects during construction due to the permanent relocation or repositioning of existing overhead lines, services should return to normal once this has occurred. All potential negative effects on onshore energy infrastructure are, however, likely to be temporary and localised to the location of new interface infrastructure.

All of the potential areas where interface infrastructure may be located contain a number of roads and although these roads can be avoided by the new interface infrastructure, vehicles associated with the construction and decommissioning phases may have to utilise these local roads to facilitate the construction and decommissioning of the interface infrastructure. As such, there is potential for slight adverse, indirect, short-term negative effects due to the disruption of access to roads due to activities required to facilitate the construction and decommissioning of the interface infrastructure, such as road closures or road diversions, or restrictions/amendments to public transport routes (-1). This may result in a temporary increase in travel time for road and public transport users. There is also potential for slight negative, indirect short-term effects due to journeys being delayed by the potential increased vehicle traffic from construction machinery (-1), as well as short-term temporary road access restrictions, closures or slow-moving vehicle traffic to accommodate construction vehicles transporting abnormal loads (-1). There is the potential for slight negative, indirect short-term effects due to disruption from construction or decommissioning works or concerns regarding road safety for road users (motorised and non-motorised) with large vehicles or machinery (-1). All potential

negative effects on transport infrastructure are, however, likely to be temporary and localised to the roads surrounding the construction and decommissioning works.

Three potential areas where interface infrastructure may be located (in the vicinity of Branxton, Peterhead 2 / DCSS and Peterhead 1) contain areas of prime agricultural land. A significant portion of this prime agricultural land is in East Lothian surrounding the Branxton interface point. Given the amount of required interface infrastructure within the recommended HNDFUE (INTOG) design and other HND recommendations, there is potential for direct, slight, short-term negative effects on agriculture through the temporary loss or disturbance of agricultural land and soils during pre-construction, construction and decommissioning phases (-1). This is due to land take requirements for construction compounds, haul roads and temporary access tracks during the construction and commissioning of the interface infrastructure. There is also potential for direct, slight, medium and long-term negative effects on agriculture due to the permanent loss or disturbance of agricultural land and soils during the operation period due to land take required for the operation of the converter station (-1). There is also potential for short-term, direct, slight negative effects due to temporary restrictions in access to agricultural land with construction and decommissioning activities (-1). There is potential for short-term, direct damage to field drains or the structure of agricultural land due to construction and decommissioning activities (-1), as well as the potential for indirect, short-term secondary negative effects on agriculture including through pollution of water sources used for irrigation or for livestock or through the introduction of soil borne pests and diseases (-1).

All of the potential areas where interface infrastructure may be located contain relatively small areas of either broadleaved woodland, conifer woodland, and mixed woodland, which may be utilised for commercial forestry. These may be difficult to avoid completely, thus there is potential for direct, slight negative effects on commercial forestry due to the loss or disturbance of woodland within the interface areas due to land take or felling requirements for construction compounds, haul roads and temporary access tracks during the construction and commissioning of the interface infrastructure (-1). There is also potential for the direct, slight negative effects on commercial forestry in the medium and long-term due to the permanent loss or disturbance of woodland within the interface area during the operation phase due to land take requirements for the operation of interface infrastructure. This could result in a reduction in income levels for this industry.

The potential for effects on tourism is considered indirectly within the topics of Landscape, Seascape and Visual Amenity (visibility of construction and operation/maintenance activity), Population and Human Health (recreational use), and Biodiversity, Flora, and Fauna (effects on wildlife). As discussed in the Landscape, Seascape and Visual Amenity Section, there is the potential for moderate negative effects in the short-term on Landscape, Seascape and Visual Amenity, which may result in secondary adverse effects on tourism, as this may act as a deterrent to tourists. As discussed in Population and Human Health, there is a slight potential for negative effects on the population due to increased noise release in the short-term, as such, tourism is unlikely to be impacted significantly by these potential effects, albeit

temporary and localised. There is also potential for temporary direct disturbance on the local population due to lighting, noise and vibration generated during the operation of the converter station and substations. There is potential for slight negative, temporary direct and indirect effects on access restrictions and displacement for onshore recreational users during the construction (and decommissioning) phase, which may indirectly negatively affect tourism temporarily, as well as direct permanent loss or disturbances to community land areas during the operation of the converter station and substations. Lastly, as discussed in Biodiversity, Flora and Fauna, there is potential for the construction, decommissioning and operation phases to adversely affect wildlife, which may result in a secondary impact on tourism activities. Any impact on tourism will likely be temporary, localised and not significant.

The HNDFUE (INTOG) recommended design has the potential to connect approximately 4.5GW of offshore renewable energy generation to the GB grid. As such, there is potential for slight positive effects in the short-term (+1) and slight positive effects in the medium to long-term, owing to the facilitation of new renewable energy infrastructure (+1) and the associated reduction in reliance of fossil fuel generation.

Cultural, Architectural and Archaeological Heritage

Cabling:

There are many (at least 483) marine archaeological/heritage assets located within the offshore section of the identified route corridors. These include 82 shipwrecks encountered by nine routes and 1,276 marine Trove Heritage Assets encountered by nine routes. The Cenos to Peterhead 1 identified route corridor contains the greatest number of marine heritage assets (152). There is potential to avoid all marine archaeological/heritage assets within the 5km-wide identified route corridors, avoiding the potential for direct effects. There is potential for indirect short-term moderate negative effects on these marine archaeological/heritage assets during the construction and decommissioning phases, due to indirect damage or disturbance to known and unknown features through alterations in the seabed morphology from suspended sediment levels and/or scour due to seabed preparation techniques and cable burial methods (-1).

Furthermore, there is potential for unknown marine and intertidal prehistoric landscapes, submerged archaeological artefacts, structures or wrecks to be discovered within the identified route corridors. There is potential for slight negative temporary to permanent effects, which may be due to direct damage or disturbance to unknown assets within the identified route corridors during surveys, works, cable laying or decommissioning activities (-1). There is also the potential for surveys and actions to contribute to archaeological knowledge and to inform subsequent decision-making.

There is also potential for slight negative indirect effects on known and unknown assets within the identified route corridors in the medium to long-term operational phase owing to the potential for scouring and exposure to occur around assets in the vicinity of cables and cable protection materials, leading to indirect damage or degradation, sediment deposition and further burial of assets in the long-term (-1) and potential for loss of, or damage to, assets during maintenance activities (-1). There may also be

potential for long-term positive effects on archaeological assets that are exposed, and that may be protected through burial with alterations in suspended sediment levels (+1).

In total, at least 1,398 terrestrial heritage assets are located within the onshore sections of the identified route corridors. These include four Garden and Designed Landscapes (within three route corridors), 41 Scheduled Monuments (within four route corridors), 1,123 Trove Heritage assets (within four route corridors, this dataset is only available for Scotland), 208 Listed Buildings (within four route corridors), four Conservation Areas (within three route corridors) and 18 Defence of Britain Sites (within three route corridors). The identified Aspen to Fetteresso route corridor contains the greatest number of terrestrial heritage assets (526).

There is potential for all known terrestrial heritage assets to be avoided within the identified route corridors, avoiding the potential for direct effects. However, there is potential for slight direct negative effects on unknown terrestrial heritage assets in the short-term due to the damage within the identified onshore route corridors during pre-construction surveys, construction works, cable laying or decommissioning activities (-1).

There is also potential for slight indirect negative effects on known and unknown terrestrial archaeological assets within the identified onshore route corridors, as well as assets within the immediate vicinity of the identified route corridor, .g., through sediment displacement or mud generation leading to burial of downstream sites, or hydrological regime alteration resulting in inundation or dewatering (-1) and from short-term, indirect temporary effects on the setting and cultural significance of designated and non-designated terrestrial heritage sites and archaeological assets, including coastal heritage assets (-1).

There is potential for slight, short-term, indirect temporary effects on the setting and cultural significance of designated and non-designated terrestrial heritage sites and archaeological assets, including coastal heritage assets, due to the presence of machinery and equipment involved in construction and decommissioning phases (-1). There is potential for slight indirect permanent effects in the medium and long-term on the setting and cultural significance of designated and non-designated terrestrial heritage sites and features, including coastal heritage assets due to alterations in the landscape or removal of areas for previous agricultural use, trees or landscape features associated with onshore heritage setting, if these are not reinstated to their previous state (-1).

At the project planning phase, any sites of archaeological potential should be identified and exclusion zones established around these, with site surveys or trial trenching conducted before any potentially damaging activities take place, to inform any appropriate mitigation. Within the marine environment modelling of hydrodynamic and sediment transport processes may be necessary to determine potential effects on surrounding archaeological features and determine any appropriate mitigation is required.

Onshore Infrastructure:

There are many (at least 818) terrestrial heritage assets located within the identified interface areas. These include 28 Scheduled Monuments (within five interface areas), 124 Listed Buildings (within seven interface areas), three Conservation Areas (within two interface areas), one Garden and Designed Landscapes (within the Branxton interface area), 650 terrestrial Trove Heritage assets (within seven interface areas) and 12 Defence of Britain Sites (within five interface areas). The identified Branxton interface area contains the greatest amount of terrestrial heritage assets (283). There is potential for all known terrestrial heritage assets to be avoided within the interface areas, avoiding the potential for direct effects. There is potential for slight direct negative effects on unknown buried terrestrial heritage assets in the short-term due to damage, partial or complete loss to unknown buried terrestrial archaeology assets, discovered in the converter station site or construction compounds, by site-based activities that involve groundbreaking and ground reduction, including foundations and the installation of services, and decommissioning activities (-1). There is also the potential for surveys and actions to contribute to archaeological knowledge and to inform subsequent decision-making. There is also potential for slight negative effects on known or unknown buried terrestrial archaeological assets within the interface areas through indirect damage to terrestrial archaeology assets or structures due to activities required to facilitate the construction or decommissioning of the interface infrastructure, e.g., through sediment displacement or mud generation leading to burial of downstream sites, or hydrological regime alteration resulting in inundation or dewatering (-1). Any damage to or loss of archaeological assets may affect the cultural significance of the assets.

Due to the number of new interface infrastructure required as part of the HNDFUE (INTOG) recommended design, there is potential for slight, short-term, indirect temporary effects on the setting and cultural significance of designated and non-designated terrestrial heritage sites and archaeological assets, including coastal heritage assets, due to the activities required to facilitate the construction and decommissioning of the interface infrastructure as a result of the presence of equipment and machinery, and temporary increases in air pollution, traffic, and noise and vibration (-1). There is also potential for slight indirect effects in the medium and long-term on the setting and cultural significance of designated and non-designated terrestrial heritage sites and features in the vicinity of new interface infrastructure, due to the physical presence of the interface infrastructure and any associated alterations in the landscape or removal of areas for previous agricultural use, trees or landscape features associated with onshore heritage setting, as well as to the activities required to facilitate the operation and maintenance of the converter station due to potential increases in air pollution, traffic, noise and vibration (-1).

At the project planning phase, any sites of archaeological potential should be identified and exclusion zones established around these, with site surveys or trial trenching conducted before any potentially damaging activities take place, to inform any appropriate mitigation.

Landscape, Seascape and Visual Amenity

Cabling:

The Cedar to Branxton identified route corridor crosses Marine Character Areas and identified route corridors making landfall in Scotland cross the Coastal Character Types of Rocky Coastline / Open Sea Views and Deposition Coastline, Open Views. Although these Marine Character and Coastal Character Areas are unavoidable, given the temporary nature of offshore cable laying, there is very limited potential for short-term, temporary effects on seascapes and visual amenity (0), as well as no anticipated effects on seascapes in the medium to long-term operation phase (0).

There are 12 National Landscape Character Areas encountered by the four identified route corridors that make landfall (Aspen to Fetteresso, Cedar to Branxton, Cenos to Peterhead 1 and Scaraben to Peterhead 2 / DCSS). Despite being unavoidable, there is also very limited potential for short-term, temporary negative landscape effects on these Landscape Character Areas within the identified route corridors (0), as well as no anticipated effects on these areas in the medium to long-term operation phase (0), given the temporary and relatively small-scale works involved with onshore cabling laying.

A short section of the Formartine and Buchan Way National Trail cannot be avoided and will need to be crossed by onshore cabling within the identified route corridor from Scaraben to Peterhead 2 / DCSS. As such, there is potential for slight direct localised negative effects on the walking trail in the short-term due to the localised activity of machinery, and the use of artificial lighting, during pre-construction, cable installation, and decommissioning and potential localised alterations to the surrounding landscape character types or loss of landscape elements (-1). Furthermore, there is potential for slight direct negative effects on this walking route in the long-term due to the localised removal of landscape elements such as trees, woodland areas, hedgerows, or agricultural land areas, if these are not reinstated following the completion of works (-1).

There are urban areas encountered by three of the identified route corridors (Aspen to Fetteresso, Cenos to Peterhead 1 and Scaraben to Peterhead 2 / DCSS), however there is potential to avoid these urban areas, and thus the potential for direct visual effects for a greater number of people. Areas of low population density are located within the onshore areas of all four identified route corridors. As such, there is potential for slight visual effects in the short to medium-term due to the localised activity of machinery, and the use of artificial lighting, during pre-construction, cable installation, and decommissioning (-1).

Areas of the highest landscape and seascape sensitivity should be avoided, where possible at the project planning phase, and a SLVIA should be undertaken which should inform project design and appropriate mitigation to minimise adverse effects.

Onshore Infrastructure:

There are eight National Landscape Character Areas encountered by the four interface areas. This includes Landscape Character Areas considered to be highly sensitive to new development at each interface area. These comprise the Landscape Character Areas of Beaches, Dunes and Links - Aberdeenshire (Landscape Character Type 12) (Peterhead 1 interface area), Coastal Agricultural Plain - Aberdeenshire (Landscape Character Type 17) (Peterhead 2 / DCSS interface area), Coastal Farmed Ridges and Hills – Aberdeenshire (Fetteresso interface area), and Coastal Farmland – Borders (Branxton interface area). The development of new substations or converter stations within these areas has greater potential for long-term negative effects on the landscape character, which should be taken into consideration at the project level. Given the amount of new infrastructure and sensitivity of the landscape in some areas, there is potential for moderate direct short-term, temporary negative landscape effects on the landscape elements within and overall landscape character within the interface areas during construction through the temporary or permanent loss of landscape elements to facilitate construction works including construction compounds and facilities, storage areas, the presence of plant, access routes, earthworks, Sustainable Drainage Systems (SuDS) and construction of emerging structures (-2). Furthermore, there is potential for moderate direct medium to long-term negative effects on landscape elements within and overall landscape character of National Landscape Character Areas due to the physical presence of the interface infrastructure and the permanent loss of landscape elements to facilitate the operational phase of the interface infrastructure (-2).

Although there is potential to avoid the short section of the Formartine and Buchan Way National Trail (partially located within the Peterhead 2 / DCSS interface area), there is the potential for slight indirect negative landscape and visual amenity effects on this trail in the short-term due to the visibility of activities required for the construction and decommissioning of the interface infrastructure and any subsequent removal of landscape elements (-1). There is also potential for slight indirect negative landscape and visual amenity effects in the medium to long-term due to the visibility of the interface infrastructure and activities required for facilitating the operation and maintenance of the interface infrastructure, as well as any subsequent removal of landscape elements (-2).

There are three urban areas partially within the Peterhead 1 and Peterhead 2 / DCSS interface areas; however, there is potential to avoid these urban areas with interface infrastructure, avoiding direct effects. Given the developed character of these urban areas, there is potential for slight indirect negative visual amenity effects in the short-term due to the potential visibility of activities in proximity to these areas, required for the construction and decommissioning of the interface infrastructure (-1). Development away from urban areas has the potential for long-term negative visual effects for the local population (-1). If new infrastructure is developed in proximity to high populated areas, there is greater potential for medium to long-term visual effects for a greater number of people due to the visibility of the interface infrastructure and activities required for facilitating the operation and maintenance of the interface infrastructure.

Areas of the highest landscape and seascape sensitivity should be avoided, where possible at the project planning phase, and a SLVIA should be undertaken, which should inform project design and appropriate mitigation to minimise adverse effects.

Potential for Cumulative / In-Combination Effects

Biodiversity, Flora and Fauna

There is potential for cumulative negative effects on protected features within the East of Gannet and Montrose Fields MPA from cabling within the identified route corridors from North Connect to Cenos and from Cenos to Peterhead 1.

There is potential for cumulative negative effects on protected features within the Southern Trench MPA from cabling within the identified route corridors from Cenos to Peterhead 1, Scaraben to Peterhead 2 / DCSS and various HND and HNDFUE identified route corridors.

There is potential for cumulative negative effects on the overall condition of Annex I reef due to direct or indirect damage to habitat from cabling within the identified route corridors, as well as from cabling within the HND and HNDFUE ScotWind identified route corridors.

In general, there is potential for cumulative negative effects on marine mammal species and seabirds where cabling activities take place within the same region, including effects associated with cabling within the identified route corridors for HND and HNDFUE.

There is potential for cumulative indirect negative effects on protected features within designated sites that are in the vicinity of new substations / converter stations for HND and HNDFUE INTOG at Peterhead 2 / DCSS, including the Hill of Longhaven SSSI and Rora Moss LNCS as well as areas of ancient woodland.

Population and Human Health

There is potential for cumulative negative effects on settlements and areas of highest deprivation in the Peterhead area from cabling between the identified route corridor from Cenos to Peterhead 1 and identified HNDFUE route corridor from SW_NE8 (Buchan) to Peterhead 1, where being in closer proximity to settlements is unavoidable.

There is potential for cumulative negative effects on settlements in the Peterhead 2 / DCSS area from cabling between the identified route corridor from Scaraben to Peterhead 2 / DCSS and the identified HNDFUE route corridors from SW_E2b (Muir Mhor) to Peterhead 2 / DCSS, SW_NE6 (Broadshore) to Peterhead 2 / DCSS, SW_NE7 (Marram) to Peterhead 2 / DCSS and SW_NE8 (Buchan) to Peterhead 1 and identified HND route corridor from SW_NE7 (Marram) to Peterhead 2 / DCSS.

There is potential for cumulative negative effects on areas of high intensity leisure boating in the Peterhead area from cabling between the HNDFUE (INTOG) identified route corridor from Cenos to Peterhead 1, the HND identified route corridor from SW_NE7 (Marram) to Peterhead 2 / DCSS and the HNDFUE (ScotWind) identified route corridors

from SW_E2b (Muir Mhor) to Peterhead 2 / DCSS and SW_NE7 (Marram) to Peterhead 2 / DCSS.

Geology, Soils and Land Use

There is the potential for cumulative impacts within the Southern Trench MPA from identified route corridors in INTOG, HND and HNDFUE ScotWind, on sediments and/or geomorphological processes.

Water

Potential for cumulative effects on flood risk with above identified route corridors on National Flood Zones.

Air

There is potential for cumulative negative effects on settlements and areas of highest deprivation in the Peterhead area from cabling within the identified route corridor from Cenos to Peterhead 1 and identified HNDFUE route corridor from SW_NE8 (Buchan) to Peterhead 1.

There is potential for cumulative negative effects on settlements in the Peterhead 2 / DCSS area from cabling within the identified route corridor from Scaraben to Peterhead 2 / DCSS and identified HNDFUE route corridors for SW_E2b (Muir Mhor) to Peterhead 2 / DCSS, SW_NE6 (Broadshore) to Peterhead 2 / DCSS, SW_NE7 (Marram) to Peterhead 2 / DCSS and SW_NE8 (Buchan) to Peterhead 1 and identified HND route corridor for SW_NE7 (Marram) to Peterhead 2 / DCSS, where being in closer proximity to settlements is unavoidable.

There is potential for cumulative negative effects on areas of relatively high intensity leisure boating in the Peterhead areas from cabling within the identified route corridor from Scaraben to Peterhead 2 / DCSS and identified HNDFUE route corridors from SW_E2b (Muir Mhor) to Peterhead 2 / DCSS, SW_NE6 (Broadshore) to Peterhead 2 / DCSS, SW_NE7 (Marram) to Peterhead 2 / DCSS and SW_NE8 (Buchan) to Peterhead 1 and identified HND route corridor from SW_NE7 (Marram) to Peterhead 2 / DCSS.

Climatic Factors

There is potential for cumulative negative effects on blue carbon habitats in the Peterhead area from cabling within the identified route corridor from Scaraben to Peterhead 2 / DCSS and identified HNDFUE route corridors from SW_NE6 (Broadshore) to Peterhead 2 / DCSS and SW_NE8 (Buchan) to Peterhead 1.

There is potential for cumulative negative effects on onshore carbon sinks, including peatlands in the Peterhead area from cabling within the identified route corridor from Scaraben to Peterhead 2 / DCSS and identified HNDFUE route corridors from SW_NE6 (Broadshore) to Peterhead 2 / DCSS and SW_NE8 (Buchan) to Peterhead 1.

Material Assets

Offshore Infrastructure

There is potential for cumulative negative effects on unavoidable offshore infrastructure (cables) from cabling within the identified route corridors Aspen to Beech and North Connect to Cenos; Beech to Cedar and North Connect to Cenos; Beech to Cedar and Cenos to Peterhead 1; Cedar to Aspen and Cenos to Peterhead 1; Aspen to Fetteresso and Cenos to Peterhead 1; and Beech to Cedar and Cedar to Aspen. If not carried out in a coordinated and well-planned manner, there is potential for such infrastructure to be impacted multiple times over a prolonged time span.

This includes the potential for intra-plan in-combination negative effects on unavoidable offshore infrastructure from cabling within SW_NE_3 to new Deer 2, SW_NE6 to Peterhead 2/DCSS and SW_NE8 to Peterhead 1 HNDFUE (Scotwind) identified route corridors and the Scaraben to Peterhead 2/DCSS HNDFUE (INTOG) identified route corridor; the SW_E2b to Peterhead 2 and SW_NE7 to Peterhead DCSS HND identified route corridors and Cenos to Peterhead 1 HNDFUE (INTOG) identified route corridor; the SW_E2b to Peterhead 2/DCSS HNDFUE (Scotwind) identified route corridor and the Aspen to Fetteresso HNDFUE (INTOG) identified route corridor; the SW_NE7 to Peterhead DCSS HND identified route corridor and Cenos to Peterhead 1 HNDFUE (INTOG) identified route corridor.

Onshore Infrastructure

There is no potential for cumulative negative effects on unavoidable onshore infrastructure (pipelines and/or overhead lines) from cabling within the identified route corridors or interface infrastructure within interface areas.

There is potential for intra-plan in-combination negative effects on unavoidable onshore infrastructure from cabling within the SW_NE7 to Peterhead DCSS HND identified route corridor and the Scaraben to Peterhead 2/DCSS HNDFUE (INTOG) identified route corridor; the SW_E1a to Hurlie HND identified route corridor and the Aspen to Fetteresso HNDFUE (INTOG) identified route corridor; the SW_E2b to Peterhead 2/DCSS, the SW_NE7 to Peterhead 2/DCSS, the SW_NE6 to Peterhead 2/DCSS and the SW_NE8 to Peterhead 1 HNDFUE (Scotwind) identified route corridors and the Scaraben to Peterhead 2/DCSS HNDFUE (INTOG) identified route corridor; the SW_NE8 to Peterhead 1 HNDFUE (Scotwind) identified route corridor and the Cenos to Peterhead 1 HNDFUE (INTOG) identified route corridor; the SW_E3 to Fiddes HNDFUE (Scotwind) identified route corridor and the Aspen to Fetteresso HNDFUE (INTOG) identified route corridor; the SW_E1a to Branxton HNDFUE (Scotwind) identified route corridor and the Cedar to Branxton HNDFUE (INTOG) identified route corridor. As well as potential for intra-plan in-combination negative effects on onshore infrastructure from cabling and interface infrastructure within the Peterhead 1, Peterhead 2/DCSS, Fetteresso and Branxton interface areas.

There is potential for subsequent disruption to the services provided by the onshore infrastructure due to multiple routes and being planned in similar or the same corridor, and cabling and interface infrastructure being planned within the same or similar interface area.

There is no potential for cumulative negative effects on unavoidable road and/or railways from cabling within the identified route corridors or interface infrastructure within interface areas.

There is potential for intra-plan in-combination negative effects on unavoidable onshore infrastructure from cabling within the SW_NE7 to Peterhead DCSS HND identified route corridor and the Scaraben to Peterhead 2/DCSS HNDFUE (INTOG) identified route corridor; the SW_E1a to Hurlie HND identified route corridor and the Aspen to Fetteresso HNDFUE (INTOG) identified route corridor; the SW_E2b to Peterhead 2/DCSS, the SW_NE7 to Peterhead 2/DCSS, the SW_NE6 to Peterhead 2/DCSS and the SW_NE8 to Peterhead 1 HNDFUE (Scotwind) identified route corridors and the Scaraben to Peterhead 2/DCSS HNDFUE (INTOG) identified route corridor; the SW_NE8 to Peterhead 1 HNDFUE (Scotwind) identified route corridor and the Cenos to Peterhead 1 HNDFUE (INTOG) identified route corridor; the SW_E3 to Fiddes HNDFUE (Scotwind) identified route corridor and the Aspen to Fetteresso HNDFUE (INTOG) identified route corridor; the SW_E1a to Branxton HNDFUE (Scotwind) identified route corridor and the Cedar to Branxton HNDFUE (INTOG) identified route corridor. As well as potential for intra-plan in-combination negative effects on onshore infrastructure from cabling and interface infrastructure within the Peterhead 1, Peterhead 2, Fetteresso and Branxton interface areas.

There is potential for subsequent disruption to the services provided by the transport infrastructure due to multiple routes and being planned in similar or the same corridor, and cabling and interface infrastructure being planned within the same or similar interface area.

Shipping and Navigation

There is potential for cumulative effects on shipping and navigation from cabling within the identified route corridors Aspen to Beech and North Connect to Cenos; Beech to Cedar and North Connect to Cenos; Beech to Cedar and Cenos to Peterhead 1; Cedar to Aspen and Cenos to Peterhead 1; Aspen to Fetteresso and Cenos to Peterhead 1; and Beech to Cedar and Cedar to Aspen. Cumulative effects include displacement of vessels, risk of collision and allision, risk of entanglement of anchors with subsea cables or protective structures used over cables and impacts on search and rescue, primarily due to multiple routes being planned in similar or the same corridor. If not carried out in a coordinated and well-planned manner, there is potential for shipping and navigation to be impacted multiple times over a prolonged time span.

This includes the potential for intra-plan in-combination negative effects on shipping and navigation from cabling within SW_NE_3 to new Deer 2, SW_NE6 to Peterhead 2/DCSS and SW_NE8 to Peterhead 1 HNDFUE (Scotwind) identified route corridors and the Scaraben to Peterhead 2/DCSS HNDFUE (INTOG) identified route corridor; the SW_E2b to Peterhead 2 and SW_NE7 to Peterhead DCSS HND identified route corridors and Cenos to Peterhead 1 HNDFUE (INTOG) identified route corridor; the SW_E2b to Peterhead 2/DCSS HNDFUE (Scotwind) identified route corridor and the Aspen to Fetteresso HNDFUE (INTOG) identified route corridor; the SW_E3 to Fiddes HNDFUE (Scotwind) identified route corridor and the Aspen to Fetteresso HNDFUE (INTOG)

identified route corridor; the SW_E1a to Branxton, SW_E1c_1 to Lincolnshire Connection Node, the SW_E1c_2 to Weston Marsh, SW_E2a_2 to Richborough HNDFUE (Scotwind) identified route corridors and the Cedar to Branxton HNDFUE (INTOG) identified route corridor; the SW_NE7 to Peterhead DCSS HND identified route corridor and Cenos to Peterhead 1 HNDFUE (INTOG) identified route corridor; the SW_E1a to Hurlie HND identified route corridor and the Aspen to Fetteresso HNDFUE (INTOG) identified route corridor; the PA_2 to Near Blyth, SW_E1a to Hawthorn Pit and SW_E1a to Lincolnshire Connection Node HND identified route corridors and the Cedar to Branxton HNDFUE (INTOG) identified route corridor.

Commercial Fisheries

There is potential for cumulative negative effects on commercial fisheries operations from cabling within the identified route corridors Aspen to Beech and North Connect to Cenos; Beech to Cedar and North Connect to Cenos; Beech to Cedar and Cenos to Peterhead 1; Cedar to Aspen and Cenos to Peterhead 1; Aspen to Fetteresso and Cenos to Peterhead 1; and Beech to Cedar and Cedar to Aspen. Potential cumulative effects are due to temporary displacement from traditional fishing grounds, increased collision risk of fishing vessels, risk of entanglement of fishing gear. If not carried out in a coordinated and well-planned manner, there is potential for commercial fisheries to be impacted multiple times over a prolonged time span. There is potential for negative cumulative effects on the profitability of commercial fishing. This includes the potential for reduced quotas, increased resource competition for fishing, and reduced landings in both tonnage and economic value.

There is potential for negative cumulative effects on commercial fish species and their key habitats within the identified route corridors stated above due to the potential for a direct loss of supporting habitats, such as spawning and nursery grounds, due to sediment mobilisation, effects due to EMFs from cables impact EMF sensitive species. These could have an indirect effect on fishing activity through an alteration of fishing stocks.

This includes the potential for intra-plan in-combination negative effects on commercial fisheries from cabling within SW_NE_3 to new Deer 2, SW_NE6 to Peterhead 2/DCSS and SW_NE8 to Peterhead 1 HNDFUE (Scotwind) identified route corridors and the Scaraben to Peterhead 2/DCSS HNDFUE (INTOG) identified route corridor; the SW_E2b to Peterhead 2 and SW_NE7 to Peterhead DCSS HND identified route corridors and Cenos to Peterhead 1 HNDFUE (INTOG) identified route corridor; the SW_E2b to Peterhead 2/DCSS HNDFUE (Scotwind) identified route corridor and the Aspen to Fetteresso HNDFUE (INTOG) identified route corridor; the SW_E3 to Fiddes HNDFUE (Scotwind) identified route corridor and the Aspen to Fetteresso HNDFUE (INTOG) identified route corridor; the SW_E1a to Branxton, SW_E1c_1 to Lincolnshire Connection Node, the SW_E1c_2 to Weston Marsh, SW_E2a_2 to Richborough HNDFUE (Scotwind) identified route corridors and the Cedar to Branxton HNDFUE (INTOG) identified route corridor; the SW_NE7 to Peterhead DCSS HND identified route corridor and Cenos to Peterhead HNDFUE (INTOG) identified route corridor; the SW_E1a to Hurlie HND identified route corridor and the Aspen to Fetteresso HNDFUE (INTOG) identified route corridor; the PA_2 to Near Blyth, SW_E1a to Hawthorn Pit and SW_E1a to Lincolnshire Connection Node

HND identified route corridors and the Cedar to Branxton HNDFUE (INTOG) identified route corridor.

Military

There is not considered to be potential for cumulative effects within the identified route corridors comprising the recommended HNDFUE (INTOG) design. There is no potential for intra-plan in-combination negative effects on military activities with the HND and HNDFUE (Scotwind) designs.

Agriculture

There is no potential for cumulative negative effects on agriculture from cabling within the identified route corridors or interface infrastructure within interface areas.

There is potential for intra-plan in-combination negative effects on agricultural from cabling within the SW_NE7 to Peterhead DCSS HND identified route corridor and the Scaraben to Peterhead 2/DCSS HNDFUE (INTOG) identified route corridor; the SW_E1a to Hurlie HND identified route corridor and the Aspen to Fetteresso HNDFUE (INTOG) identified route corridor; the SW_E2b to Peterhead 2/DCSS, the SW_NE7 to Peterhead 2/DCSS, the SW_NE6 to Peterhead 2/DCSS and the SW_NE8 to Peterhead 1 HNDFUE (Scotwind) identified route corridors and the Scaraben to Peterhead 2/DCSS HNDFUE (INTOG) identified route corridor; the SW_NE8 to Peterhead 1 HNDFUE (Scotwind) identified route corridor and the Cenos to Peterhead 1 HNDFUE (INTOG) identified route corridor; the SW_E3 to Fiddes HNDFUE (Scotwind) identified route corridor and the Aspen to Fetteresso HNDFUE (INTOG) identified route corridor; the SW_E1a to Branxton HNDFUE (Scotwind) identified route corridor and the Cedar to Branxton HNDFUE (INTOG) identified route corridor. As well as potential for intra-plan in-combination negative effects on agriculture from cabling and interface infrastructure within the Peterhead 1, Peterhead 2/DCSS, Fetteresso and Branxton interface areas.

In-combination effects may be due to an increased loss of agricultural land and soils, restrictions in access to agricultural land, direct damage to field drains, secondary effects on agriculture due to pollution of water sources being used for irrigation or as a livestock source and introduction of soil borne pests and diseases were to occur from construction process.

Commercial Forestry

There is no potential for cumulative negative effects on agriculture from cabling within the identified route corridors or interface infrastructure within interface areas.

There is potential for intra-plan in-combination negative effects on agricultural from cabling within the SW_NE7 to Peterhead DCSS HND identified route corridor and the Scaraben to Peterhead 2/DCSS HNDFUE (INTOG) identified route corridor; the SW_E1a to Hurlie HND identified route corridor and the Aspen to Fetteresso HNDFUE (INTOG) identified route corridor; the SW_E2b to Peterhead 2/DCSS, the SW_NE7 to Peterhead 2/DCSS, the SW_NE6 to Peterhead 2/DCSS and the SW_NE8 to Peterhead 1 HNDFUE (Scotwind) identified route corridors and the Scaraben to Peterhead 2/DCSS HNDFUE (INTOG) identified route corridor; the SW_NE8 to Peterhead 1 HNDFUE (Scotwind)

identified route corridor and the Cenos to Peterhead 1 HNDFUE (INTOG) identified route corridor; the SW_E3 to Fiddes HNDFUE (Scotwind) identified route corridor and the Aspen to Fetteresso HNDFUE (INTOG) identified route corridor; the SW_E1a to Branxton HNDFUE (Scotwind) identified route corridor and the Cedar to Branxton HNDFUE (INTOG) identified route corridor. As well as potential for intra-plan in-combination negative effects on agriculture from cabling and interface infrastructure within the Peterhead 1, Peterhead 2/DCSS, Fetteresso and Branxton interface areas.

Cultural Heritage

There is potential for cumulative negative indirect effects on marine archaeological/heritage assets during the construction and decommissioning phases, where assets are avoided but are in proximity to more than one route, due to indirect destruction, damage or disturbance to known and unknown features through alterations in the seabed morphology from suspended sediment levels and/or scour due to seabed preparation techniques and cable burial methods. Potential routes which may experience cumulative effects include Aspen to Beech and North Connect to Cenos; Beech to Cedar and North Connect to Cenos; Beech to Cedar and Cenos to Peterhead 1; Cedar to Aspen and Cenos to Peterhead 1; Aspen to Fetteresso and Cenos to Peterhead 1; and Beech to Cedar and Cedar to Aspen.

This could also include the potential for indirect effects in the medium to long-term operational phase owing to the potential for scouring and exposure to occur around features in the vicinity of cables and cable protection materials, leading to indirect damage or degradation, sediment deposition and further burial of features in proximity to more than one cable route.

This includes the potential for intra-plan in-combination negative effects on marine archaeological/heritage assets from construction/decommissioning within SW_NE_3 to new Deer 2, SW_NE6 to Peterhead 2/DCSS and SW_NE8 to Peterhead 1 HNDFUE (Scotwind) identified route corridors and the Scaraben to Peterhead 2/DCSS HNDFUE (INTOG) identified route corridor; the SW_E2b to Peterhead 2 and SW_NE7 to Peterhead DCSS HND identified route corridors and Cenos to Peterhead 1 HNDFUE (INTOG) identified route corridor; the SW_E2b to Peterhead 2/DCSS HNDFUE (Scotwind) identified route corridor and the Aspen to Fetteresso HNDFUE (INTOG) identified route corridor; the SW_E3 to Fiddes HNDFUE (Scotwind) identified route corridor and the Aspen to Fetteresso HNDFUE (INTOG) identified route corridor; the SW_E1a to Branxton, SW_E1c_1 to Lincolnshire Connection Node, the SW_E1c_2 to Weston Marsh, SW_E2a_2 to Richborough HNDFUE (Scotwind) identified route corridors and the Cedar to Branxton HNDFUE (INTOG) identified route corridor; the SW_NE7 to Peterhead DCSS HND identified route corridor and Cenos to Peterhead 1 HNDFUE (INTOG) identified route corridor; the SW_E1a to Hurlie HND identified route corridor and the Aspen to Fetteresso HNDFUE (INTOG) identified route corridor; the PA_2 to Near Blyth, SW_E1a to Hawthorn Pit and SW_E1a to Lincolnshire Connection Node HND identified route corridors and the Cedar to Branxton HNDFUE (INTOG) identified route corridor.

There is no potential for cumulative negative effects on unavoidable onshore infrastructure (pipelines and/or overhead lines) from cabling within the identified route corridors or interface infrastructure within interface areas.

There is no potential for cumulative negative indirect effects on terrestrial heritage assets through indirect damage, where assets are avoided but are in proximity to more than one route. There is no potential for cumulative effects on the setting of designated and non-designated terrestrial heritage sites and archaeological features, as well as coastal heritage assets. There is also no potential for cumulative negative long-term effects on the setting of heritage assets in these areas in the operational phase due to the presence of new interface infrastructure within the interface areas.

There is the potential for intra-plan in-combination negative effects on terrestrial and coastal heritage. Potential routes which may experience in-combination effects include SW_NE7 to Peterhead DCSS HND identified route corridor and the Scaraben to Peterhead 2/DCSS HNDFUE (INTOG) identified route corridor; the SW_E1a to Hurlie HND identified route corridor and the Aspen to Fetteresso HNDFUE (INTOG) identified route corridor; the SW_E2b to Peterhead 2/DCSS, the SW_NE7 to Peterhead 2/DCSS, the SW_NE6 to Peterhead 2/DCSS and the SW_NE8 to Peterhead 1 HNDFUE (Scotwind) identified route corridors and the Scaraben to Peterhead 2/DCSS HNDFUE (INTOG) identified route corridor; the SW_NE8 to Peterhead 1 HNDFUE (Scotwind) identified route corridor and the Cenos to Peterhead 1 HNDFUE (INTOG) identified route corridor; the SW_E3 to Fiddes HNDFUE (Scotwind) identified route corridor and the Aspen to Fetteresso HNDFUE (INTOG) identified route corridor; the SW_E1a to Branxton HNDFUE (Scotwind) identified route corridor and the Cedar to Branxton HNDFUE (INTOG) identified route corridor. As well as potential for intra-plan in-combination negative effects on terrestrial and coastal heritage from cabling and interface infrastructure within the Peterhead 1, Peterhead 2/DCSS, Fetteresso and Branxton interface areas.

Landscape, Seascape and Visual Amenity

There is potential for cumulative negative short-term landscape effects where identified route corridors or interface areas are within the same National Landscape Character Areas. The identified route corridors, which fall within the same National Landscape Character Area, include Cenos to Peterhead 1 and Scaraben to Peterhead 2/DCSS. If corridors are not spatially and temporally planned in a coordinated manner, there could be an increased area and timescale of impacts on these. There is potential for cumulative negative medium to long-term landscape effects where new infrastructure is required within interface areas for more than one identified route corridor, particularly where the Landscape Character types are recognised as sensitive to new development. Interface areas which may be impacted by cumulative effects in association with the interface infrastructure include Peterhead 1 and Peterhead 2/DCSS.

There is no potential for cumulative negative short-term visual effects on local populations where identified route corridors are in proximity within the HNDFUE (INTOG) Design.

There is potential for intra-plan in-combination negative landscape and visual effects from cabling within the SW_NE7 to Peterhead DCSS HND identified route corridor and the

Scaraben to Peterhead 2/DCSS HNDFUE (INTOG) identified route corridor; the SW_E1a to Hurlie HND identified route corridor and the Aspen to Fetteresso HNDFUE (INTOG) identified route corridor; the SW_E2b to Peterhead 2/DCSS, the SW_NE7 to Peterhead 2/DCSS, the SW_NE6 to Peterhead 2/DCSS and the SW_NE8 to Peterhead 1 HNDFUE (Scotwind) identified route corridors and the Scaraben to Peterhead 2/DCSS HNDFUE (INTOG) identified route corridor; the SW_NE8 to Peterhead 1 HNDFUE (Scotwind) identified route corridor and the Cenos to Peterhead 1 HNDFUE (INTOG) identified route corridor; the SW_E3 to Fiddes HNDFUE (Scotwind) identified route corridor and the Aspen to Fetteresso HNDFUE (INTOG) identified route corridor; the SW_E1a to Branxton HNDFUE (Scotwind) identified route corridor and the Cedar to Branxton HNDFUE (INTOG) identified route corridor. As well as potential for intra-plan in-combination negative effects on onshore infrastructure from cabling and interface infrastructure within the Peterhead 1, Peterhead 2/DCSS, Fetteresso and Branxton interface areas.

9.1.5 HND Implementation Plan Recommended Design

The HND Implementation Plan Recommended Design Study Area is shown in Figure 50.

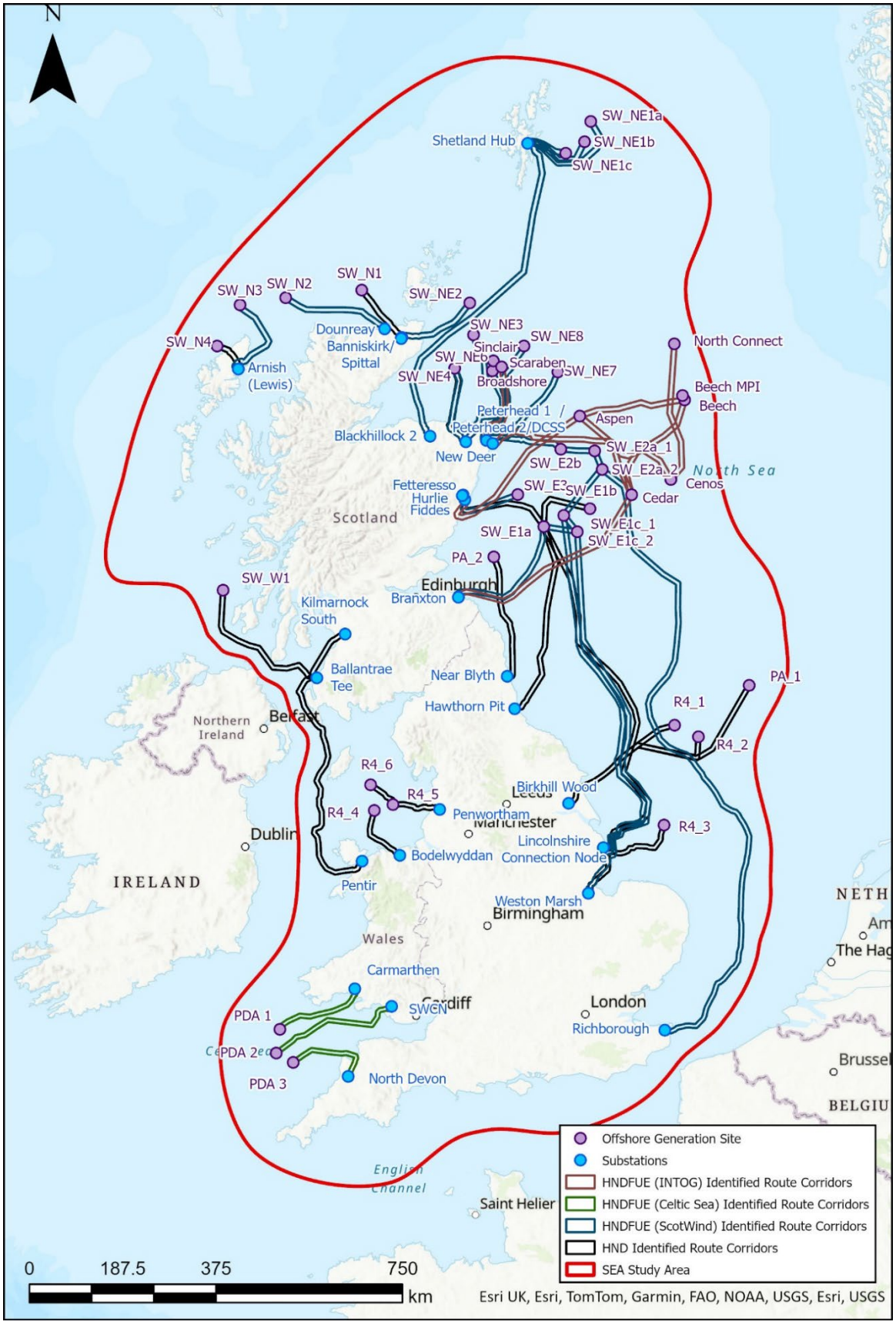
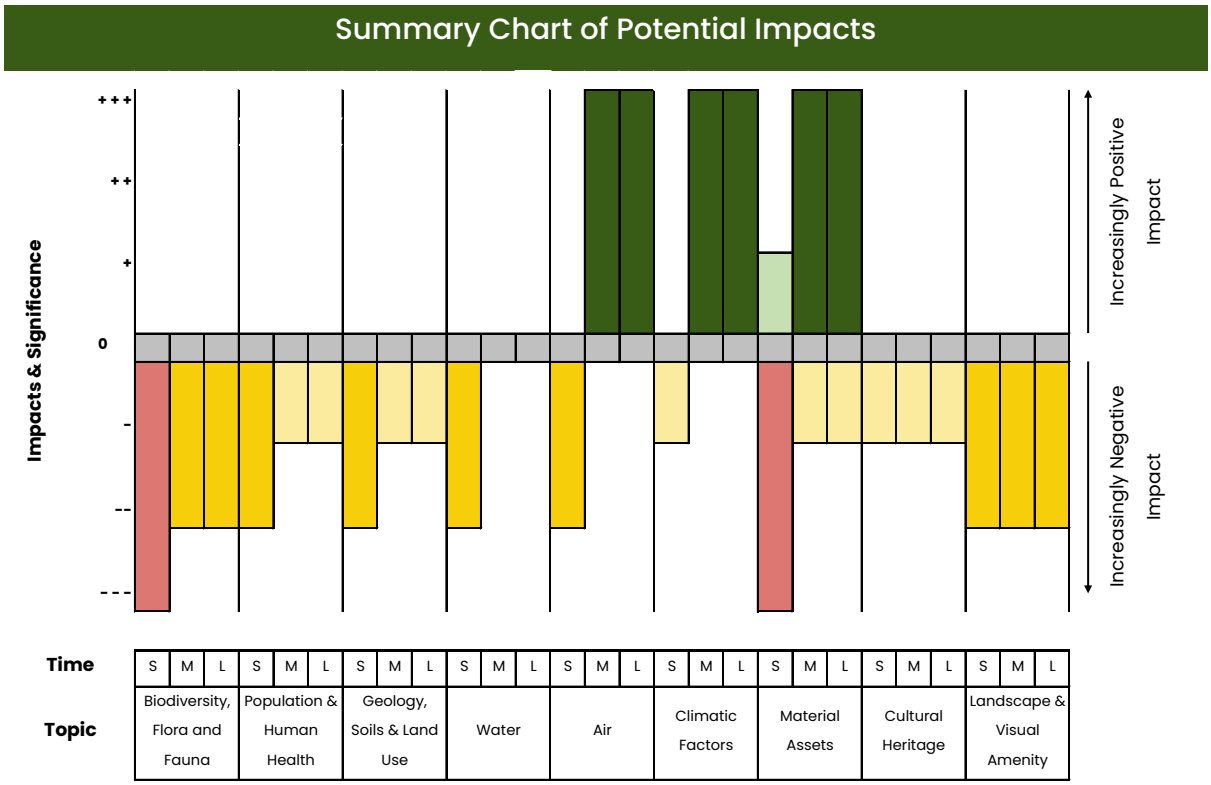


Figure 50: HND Implementation Plan Recommended Design Study Area

Environmental Assessment			
Environmental Assessment	Short-term	Medium-term	Long-term
Biodiversity, Flora and Fauna (BFF)	-3	-2	-2
Population and Human Health (PHH)	-2	-1	-1
Geology, Soils and Land Use (GSL)	-2	-1	-1
Water (W)	-2	0	0
Air (A)	-2	+3	+3
Climatic Factors (CF)	-1	+3	+3
Material Assets and Infrastructure (MA)	-3 / +1	-1 / +3	-1 / +3
Cultural, Architectural and Archaeological Heritage (CH)	-1	-1	-1
Landscape / Seascape and Visual Amenity (L)	-2	-2	-2

Table 38: HND Implementation Plan Recommended Design summary scoring table



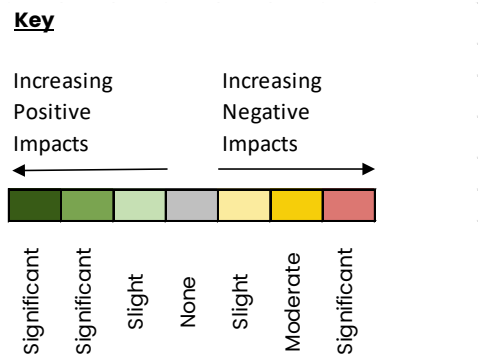


Figure 51: HND Implementation Plan Recommended Design summary scoring chart

Discussion of Potential Effects

Biodiversity, Flora and Fauna

There are designated sites that are not possible to avoid within the identified route corridors. This includes the North Anglesey Marine SAC, Afon Gwyrfai a Llyn Cwellyn SAC, Dogger Bank SAC, Southern North Sea SAC, Inner Dowsing, Race Bank and North Ridge SAC, Berwickshire and North Northumberland Coast SAC, River Thurso SAC, Garron Point SAC, Durham Coast SAC, Inner Hebrides and the Minches SAC, Sandwich Bay SAC, Bristol Channel Approaches SAC, and Carmarthen Bay and Estuaries SAC; the Liverpool Bay SPA, Greater Wash SPA, Northumberland Marine SPA, Lewis Peatlands SPA /Ramsar site, Thanet Coast and Sandwich Bay SPA/Ramsar, Outer Firth of Forth and St Andrews Bay Complex SPA, Greater Wash SPA, East Mainland Coast, Shetland SPA, Moray Firth SPA, North Caithness Cliffs SPA, Carmarthen Bay SPA, and Buchan Ness to Collieston SPA; the Nature Conservation MPAs, Clyde Sea Sill, Southern Trench, North-East Lewis, and East of Gannet and Montrose Fields; the Fylde MCZ, Berwick to St Mary's MCZ, Coquet to St Marys MCZ, and Holderness Inshore MCZ; and the Afon Gwyrfai a Llyn Cwellyn SSSI, Garron Point SSSI, Durham Coast SSSI, Sandside Bay SSSI, Rosehearty to Fraserburgh Coast SSSI, Loch of Strathbeg SSSI, Sandwich Bay to Hacklinge Marshes SSSI, Barns Ness Coast SSSI, Spey Bay SSSI, Pembrey Coast SSSI, Mermaid's Pool to Rowden Gut SSSI, St Cyrus and Kinnaber Links SSSI, and Bullers of Buchan Coast SSSI. If not mitigated there is potential for direct and indirect, short to medium-term, temporary negative effects within these sites during the construction and decommissioning phases and during cable maintenance activities. This could include direct and indirect damage to habitats, and damage to, disturbance and displacement of species, as well as damage to supporting habitats and displacement of prey species (-3).

There are sensitive habitats within the identified route corridors that are unavoidable, including Annex I reef and sandbank habitats, NRW key habitats identified as sensitive to cabling, and ancient woodland. There is potential for direct and indirect, negative effects during construction and decommissioning and cable maintenance activities; direct effects have the potential to be long-term or permanent (-2).

There is potential for direct and indirect, short to medium-term, temporary negative effects within other areas of sensitivity such as NNRs, LNRs, LNCSs, IBAs, RSPB sites, and

areas of importance for fish that are unavoidable. There is also potential for short-term, temporary disturbance to and displacement of seabirds, and other birds within the identified cable routes and to marine mammals during the construction and decommissioning phases and during cable maintenance activities. In general, there is also potential for direct and indirect negative effects from disturbance or damage to local habitats and species outside of designated sites during the construction and decommissioning phases and during any cable maintenance activities (-1).

For the development of onshore infrastructure such as substations and converter stations it should be possible to avoid designated and sensitive sites for Biodiversity, Flora and Fauna that are present within the wider interface areas, avoiding the potential for direct negative effects within these areas. The potential for indirect negative effects within these areas should be considered at the project stage. There is potential for a localised long-term loss of flora and fauna in the footprint of new infrastructure and for temporary short to medium-term loss or damage within the wider working areas (-1).

The HRA assessed the potential for negative effects on SACs and SPAs within the identified route corridors and potential onshore development areas and a relevant zone of influence as follows:

- Potential for temporary physical disturbance of subtidal and/or intertidal habitats.
- Potential for permanent loss of seabed or intertidal habitats.
- Potential for temporary disturbance as a result of increased suspended sediment concentrations and sediment deposition.
- Potential for adverse effects on site integrity via changes in water quality.
- Potential for adverse effects on site integrity via effects of the introduction of INNS on benthic habitats and species.
- Potential for adverse effects on site integrity via EMF impacts.
- Potential for adverse effects on site integrity due to subsea cable thermal emissions.
- Potential for adverse effects on site integrity due to impacts on marine mammals and fish from underwater sound.
- Potential for adverse effects on site integrity due to barriers to migration.
- Potential for adverse effects on site integrity due to changes in prey availability.
- Potential for adverse effects on site integrity due to collision risk with vessels.
- Potential for airborne sound and visual disturbance to marine mammals and seabirds.

- Potential for adverse effects on site integrity due to noise and visual impacts to birds from landfall / onshore works.
- Potential for adverse effects on site integrity due to risk of bird strike from onshore overhead line.
- Potential for a temporary or permanent loss or removal of terrestrial habitats.
- Potential for impacts on terrestrial functionally linked habitats.
- Potential for impacts via maintenance activities and cable repair.

The HRA set out mitigation measures required to avoid adverse effects on these sites via these impact pathways, including through micro routing.

Three routes were further considered through the derogation process for the potential for permanent loss of seabed or intertidal habitats, as the generation sites are within the Dogger Bank SAC, with a need for several cable crossings. These were PA_1 to Birkhill Wood Alternative, R4_1 to Birkhill Wood and R4_2 to Birkhill Wood.

The identified route corridor SW_N4 to Arnish was further considered through the derogation process due to the potential for direct habitat loss or indirect loss via hydrological changes within the Lewis Peatlands SPA/Ramsar.

The MCZ assessed the potential for negative effects on MCZs, HPMAs and Nature Conservation MPAs within the identified route corridors and a relevant zone of influence as follows:

- Potential for temporary physical disturbance - subtidal benthic habitats and species.
- Potential for permanent loss - subtidal benthic habitats and species.
- Potential for the introduction of INNS - subtidal benthic habitats and species.
- Potential for changes in prey availability.
- Potential collision risk – marine mammals.
- Potential for thermal emissions - subtidal benthic habitats and species.
- Potential for EMF - subtidal benthic habitats and species, marine mammals, fish, and invertebrates.
- Potential for airborne sound and visual disturbance – marine mammals and birds.
- Potential for underwater sound – marine mammals, fish, and shellfish.
- Potential for increased suspended sediment concentrations - subtidal benthic habitats and species, marine mammals, fish, and invertebrates.
- Potential impacts on water quality - subtidal benthic habitats and species, marine mammals, fish, and invertebrates.

- Potential barriers to migration – migratory fish.

The MCZ Stage 1 set out mitigation measures to avoid adverse effects on these sites via these impact pathways. Eight routes were further considered at the MCZ Stage 2 (derogation). Where it cannot be concluded at Stage 1 that there is no significant risk of the act (in this case the draft Plan) hindering the achievement of the conservation objectives stated for the MCZ, the authority must be satisfied that:

- There are no other means of proceeding (OMP).
- The act's benefit to the public clearly outweighs the risk of damage to the environment; and
- Measures of equivalent environmental benefit will be undertaken or arranged, compensating for the damage the act is likely to have on an MCZ.

The Stage 2 MCZ report identified OMP for all eight identified route corridors that it considered to be reasonably feasible, given the level of design detail at plan-level.

Population and Human Health

There are settlements within the identified route corridors, however these can be avoided. These settlements include Abbotsham/Bideford, Bac, Banff, Bideford, Benington, Beverly, Bethel, Beeford, Bodelwyddan, Boddam, Bontnewydd, Boston, Blackpool, Blyth, Burgh Le Marsh, Butterwick, Caernarfon, Chapel Saint Leonards, Cliffsend, Cottingham, Cuminestown, Dawdon, Dounreay, Easington Lane, Fishtoft, Fraserburgh, Friskney, Groeslon, Halkirk, Hogsthorpe, Holsworthy St Cyrus, Keith, Kidwelly, Kilmarnock, Kirton, Leake Commonside, Leven, Llanddulas, Llanrug, Llangynwyd, Longside, Maesteg, Margam, Mintlaw, Murton, Old Leake, Pembrey, Peterhead, Peterhead, Pyle, Ramsgate St Lawrence, Sandilands, Seaham, Skegness, South Hetton, Stonehaven, St Annes, St Asaph, Stornoway, Sutterton, Symington, Trimsaran, Troon, Tunga, Waunfawr, Wainfleet All Saints, Warton/Kirkham, Whitehills, Woodmansey and Wrangle. There are areas of relatively higher population density at Blackpool and Hull. There are areas of relatively moderate population density at Ciffsend, Ramsgate and Baglan Bay. There are areas of highest perceived deprivation in Abergele, Ashton Bank, Blackpool, Blyth, Boddam, Crimond, Dalton-le-Dale, East Putford, Eastington Colliery, Fraserburgh, Gwynedd, Haswell, Llangynwyd, Mabelthorpe, Margam, Pembrey, Peterhead, Pontyates, Pyworthy, Pyle, Ramsgate, Seaham, Shortlees, Skegness, South Hetton, Sutcombe and West Putford. Generally, there is the potential for slight negative, short-term effects on the local population from cable laying, such as noise, lighting, visual and disturbance during the construction and decommissioning phases and during cable maintenance activities (-1) and potential for moderate negative, short-term effects on the local population within these higher populated areas (-2). There is not expected to be any direct, medium, or long-term, disturbance of local populations due to noise or disturbance effects during the operational phases (0).

Urban areas and settlements can be avoided within the potential interface areas. Generally, there is the potential for temporary direct disturbance to local populations due to lighting, noise and vibration generated during pre-construction, and construction from construction activities and vehicle movements (-1). There is also the

potential for temporary, direct disturbance to local populations due to lighting, noise and vibration generated during the operation of the substations / converter stations (-1). There is also the potential for impacts on the health of construction workers and future site users through exposure to hazardous contaminants during pre-construction, construction, and decommissioning. There is potential for health effects due to the emission of dust from demolition, earthworks, construction and track out during pre-construction, construction and decommissioning, operation and maintenance (-1), and this could cumulatively affect areas of higher perceived deprivation within some interface areas.

The bathing waters within the identified route corridors include Abergele (Pensarn), Anderby, Blackpool South, Chapel St Leonards, Fraserburgh (Tiger Hill), Inverboyndie, Kinmel Bay (Sandy Cove), Moggs Eye, Morfa Dinlle, Pembrey, Peterhead (Lido), Prestwick, Ramsgate Sands, Ramsgate Western Undercliffe, Sandwich Bay, Skipsea, St Annes, St Annes North and Troon (South Beach), Sutton-on-Sea, Thorntonloch, Westward Ho! and Whitesands. There is potential for short-term, indirect, negative effects such as noise, disturbance and water quality impacts to these areas during the construction and decommissioning phases and during cable maintenance activities (-1). The potential for negative direct or indirect effects on these users in the medium to long-term during the operational phase is considered to be negligible (0).

There are marinas within the identified route corridors, including Banff Harbour Marina, Comhairlie nan Eilean Siar, Peterhead Bay Marina, Port of Ramsgate, Portgordon Harbour, Royal Harbour Marina Ramsgate, Sandhaven & Pitullie Harbour, Seaham Bay Marina, Stornoway Marina and Whitehills Marina. There are several areas of recreational boating located along the coastline within some of the identified route corridors. There are areas of high intensity recreational boating activity inshore around Swansea Bay, Gwynedd, Isle of Man, within the North Channel, within Firth of Clyde, offshore of Kintyre, Stornoway, Shetland, within Moray Firth, Peterhead, Newcastle and Richborough. There is potential for slight negative, temporary, direct and indirect, negative effects on leisure and recreational marine users due to an increased collision risk, access restrictions and displacement, or water quality effects, during the construction and decommissioning phases and during cable maintenance activities (-1).

There are onshore recreation sites within the identified route corridors. There is potential for short-term, slight negative, temporary disruption to these recreational areas during construction and decommissioning works (-1). Within interface areas there is potential for temporary loss or disturbances to community land areas within the site footprint and wider working area during the construction process, and potential for direct permanent loss or disturbances to community land areas during the operation of the converter station (-1).

Geology, Soils and Land Use

There are designated sites for geological/geomorphological features within the identified route corridors that are not possible to avoid. These include the Berwick to St. Mary's MCZ, Flyde MCZ, Southern Trench MPA, Inner Dowsing, Race Bank and North Ridge MPA and SAC, Clyde Sea Sill MPA, North-east Lewis MPA, and the Pobie Bank Reef SAC.

The Thanet Coast MCZ, Goodwin Sands MCZ, Firth of Forth Banks Complex MPA, the Flow Country WHS, and the Shetland Geopark are also within the identified route corridors, however, these are likely to be avoidable. There is potential for short-term direct, moderate negative effects within these sites through loss of or damage to features during cabling installation, cable protection laying and decommissioning with cable removal (-2), with potential for slight negative (-1) permanent effects in the long-term if there is damage to protected features that cannot recover. There is also potential for short to long-term, slight, indirect negative effects through alterations to local sediment regimes impacting geomorphological features within these sites (-1).

Further areas which are protected for geology/geomorphology include areas of Annex I habitats of sandbanks and reefs, which are unavoidable within some of the identified route corridors as well as the following unavoidable SSSIs that include geological or geomorphological features; Durham Coast SSSI, Garron Point SSSI, Bamburgh Dunes SSSI, Northumberland Shore SSSI, Aber Taf/Taf Estuary SSSI, St Cyrus and Kinnaber Links SSSI, Loch of Strathbeg SSSI, Bullers of Buchan Coast SSSI, Rosehearty to Fraserburgh Coast SSSI, Sandwich Bay to Hacklinge Marsh SSSI, Barns Ness Coast SSSI, and the Spey Bay SSSI. The laying of offshore cabling and cable protection works has the potential for short to long-term, direct effects on Annex I habitats and protected features within these SSSIs (typically located at landfall), which cannot be avoided through loss of or damage to features in the footprint of works (-2), and for slight, indirect negative effects through alterations to local sediment regimes impacting these features (-1).

There are areas of potential contamination present within the identified route corridors, including dredge and spoil dumping grounds and the Beaufort's Dyke munitions dumping ground. There is the potential for short-term direct, negative effects on sediment and water quality from the release of contaminated sediments/materials or UXOs during cable construction, maintenance or decommissioning phases; however, within the recommended design all dredge and spoil dumping grounds and munitions dumping grounds are avoidable, reducing the potential for negative effects (-1). There are several military danger and practices areas present within the identified offshore route corridors which are unavoidable, namely: the Campbeltown Military Danger Area, Moray Firth South Military Danger Area, Druridge Bay Military Danger Area, Staxton Military Danger Area, Cape Wrath Military Danger Area, the Castlemartin Military Practice Area, Manorbier Military Practice Area, Pendine Military Practice Area, and the Pembrey Military Practice Area. There is potential for the release of explosives, chemicals, and/or other contaminants during cable installation, maintenance, or decommissioning phases, with the potential for short-term, direct, negative effects on soils and secondary effects on water quality (-2). The use of mitigation measures such as pre-construction surveys can help to identify potential sources of seabed contamination, and the potential impacts minimised through avoidance of these areas for development.

Within the onshore component of the identified route corridors and interface areas of the recommended design, geological designations for SSSIs are avoidable, as is the Shetland Geopark, there should be no potential for direct negative effects within these

areas. The potential for indirect negative effects on these sites should be considered at the project stage (-1).

Within the identified onshore route corridors there is potential for short to long-term direct negative effects on peatlands that are unavoidable; this may lead to the loss or degradation of the peatland habitat, with secondary indirect medium-term effects on carbon sequestration within these habitats if these do not re-establish quickly (-2). However, generally these habitats are avoidable, reducing the potential for effects (-1). There are areas of very good and good quality agricultural land that are crossed by the onshore areas of identified route corridors and interface areas that cannot be avoided. There is potential for short-term direct loss of soil in the footprint of cabling works and interface working areas, and the potential for direct effects on land use in the long-term if the former land use is not re-established (-2/-1). Areas of shallow soils and exposed rock are also present with the potential for short-term, direct, negative effects through the loss of soils in these areas and long-term, direct, negative effects through the permanent loss of geological material in these areas during cable installation and decommissioning phases (-2), however these are generally avoidable, reducing the potential for effects (-1).

Landfills are also present within the identified onshore route corridors and interface areas of the recommended designs, with the potential for short-term, direct, negative effects from the release of contaminants during cable laying, maintenance and decommissioning phases, which may negatively affect the surrounding soil and sediment quality with indirect, negative effects on overall water quality; however, as these landfill areas are avoidable, which reduces and potentially eliminates the potential for effects (0).

Water

The identified route corridors of the recommended designs are located within either the Celtic Seas or Greater North Seas sub-region for the Marine Strategy Framework Directive, where good environmental status has not been achieved for all Descriptors due to a variety of pressures from commercial fisheries, non-native species, climate change within the Celtic Seas, demersal fish species composition, and declines in breeding bird populations within the Greater North Sea. There is the potential for indirect effects from the release of sediment or chemicals used during cable installation, decommissioning and maintenance phases, or through alterations to sediment regimes with the use of cable protection materials impacting on Descriptors assessed under the MSFD (-1). However, with the application of good working practices, negative effects are expected to be temporary and there is not anticipated to be potential for significant effects in the medium to long-term (0).

Several coastal waterbodies and river waterbodies are within the identified route corridors and interface areas, as well as lakes. There is limited scope to avoid rivers for some identified route corridors, while coastal waterbodies cannot be avoided. For the coastal and river waterbodies, typically those located in Scotland are of good or high WFD ecological status, whilst those within England and Wales are typically of moderate ecological status. Generally, during cable and interface construction, maintenance, and

decommissioning phases, there is the potential for short-term direct effects on water quality through the release of sediment associated with cable trenching or the release of chemicals associated with the construction, maintenance, and decommissioning phases (-2). Similarly, onshore, during cable and interface construction, decommissioning, and maintenance phases, there is a potential for short-term direct and indirect effects on water quality through the release of sediment or alterations to local hydrological regimes, given the limited scope to avoid rivers within many of the identified route corridors (-2).

Several bathing waters and shellfish waters are within the identified route corridors, mainly located off the north-west coast of Wales, around Scotland, and the east coast of England; however, these are generally avoidable. There is potential for short-term indirect effects on bathing water and shellfish water quality during the installation, maintenance, or decommissioning phases of cables from the release of sediment or chemicals (-1).

There are National Flood Zones present within some identified route corridors and interface areas, which are typically unavoidable. There is potential for short to medium-term direct and indirect effects through a potential for increased flood risk or alterations to local hydrological regimes during cable construction, maintenance, and decommissioning phases (-2).

There are areas of potential contamination present within the identified route corridors including dredge and spoil dumping grounds and the Beaufort's Dyke munitions disposal ground. There is the potential for short-term direct, negative effects on water quality from the release of contaminated sediments/materials or UXOs during cable construction, maintenance, or decommissioning phases; however, within the recommended design, all dredge and spoil dumping grounds and munitions dumping grounds are avoidable, reducing the potential for negative effects (-1). There are several military danger and practice areas present within the identified route corridors which are unavoidable: the Campbeltown Military Danger Area, Moray Firth South Military Danger Area, Druridge Bay Military Danger Area, Staxton Military Danger Area, Cape Wrath Military Danger Area, the Castlemartin Military Practice Area, Manorbier Military Practice Area, Pendine Military Practice Area, and the Pembrey Military Practice Area. There is potential for the release of explosives, chemicals, and/or other contaminants during cable installation, maintenance, or decommissioning phases, with the potential for short-term, direct, negative effects on water quality (-2). The use of good working practices such as pre-construction surveys regarding the presence and clearance of UXOs, can minimise the potential for effects (-1).

Air

There are three Air Quality Management Areas, located at South Ribble, Thanet and Neath Port Talbot AQMA Taibach/Margam. There is potential for slight negative, direct, short-term temporary effects on local air quality due to dust generation and air emissions from vehicles and machinery in the vicinity of the works during the construction and decommissioning phases and during any cable maintenance activities (-1). There is also the potential for slight negative, short-term, temporary

emissions from vessels due to maintenance activities during the operational phase. It is not expected that there will be any negative direct or indirect, medium or long-term effects on sensitive receptors from air emissions / pollution during the construction, operational and decommissioning phases (0).

There are settlements within identified route corridors and interface areas, however these can be avoided. These settlements include Abbotsham/Bideford, Bac, Banff, Bideford, Benington, Beverly, Bethel, Beeford, Bodelwyddan, Boddam, Bontnewydd, Boston, Blackpool, Blyth, Burgh Le Marsh, Butterwick, Caernarfon, Chapel Saint Leonards, Cliffsend, Cottingham, Cuminestown, Dawdon, Dounreay, Easington Lane, Fishtoft, Fraserburgh, Friskney, Groeslon, Halkirk, Hogsthorpe, Holsworthy St Cyrus, Keith, Kidwelly, Kilmarnock, Kirton, Leake Commonside, Leven, Llanddulas, Llanrug, Llangynwyd, Longside, Maesteg, Margam, Mintlaw, Murton, Old Leake, Pembrey, Peterhead, Peterhead, Pyle, Ramsgate St Lawrence, Sandilands, Seaham, Skegness, South Hetton, Stonehaven, St Annes, St Asaph, Stornoway, Sutterton, Symington, Trimsaran, Troon, Tunga, Waunfawr, Wainfleet All Saints, Warton/Kirkham, Whitehills, Woodmansey and Wrangle.

There are areas of relatively higher population density at Blackpool and Hull. There are areas of relatively moderate population density at Ciffsend, Ramsgate and Baglan Bay. There is potential for moderate negative, short-term effects on the local population through dust and traffic/machinery emissions, as well as noise emissions, which may affect many receptors within these higher populated areas during the construction and decommissioning phases and during cable maintenance activities (-2). There are areas of highest perceived deprivation in Abergele, Ashton Bank, Blackpool, Blyth, Boddam, Crimond, Dalton-le-Dale, East Putford, Eastington Colliery, Fraserburgh, Gwynedd, Haswell, Llangynwyd, Mabelthorpe, Margam, Pembrey, Peterhead, Pontyates, Pyworthy, Pyle, Ramsgate, Seaham, Shortlees, Skegness, South Hetton, Sutcombe and West Putford. Populations in these areas may be of lower health status and may be of greater risk of health impacts, such as those affecting the lungs due to existing health conditions in the areas of higher sensitivity (-1).

There is potential for significant positive, indirect effects on regional air quality in the medium to long-term from facilitation of new renewable energy infrastructure, supporting decarbonisation of the energy sector (+3).

Climatic Factors

There are known locations of blue carbon habitat within the identified route corridors. There is unlikely to be potential for significant negative effects on blue carbon habitat within these areas during the construction, operational and decommissioning phases (0), as the project level micro-siting of these routes can avoid the areas of higher blue carbon potential. Generally, there is potential for slight negative, short-term effects on sediment carbon storage, due to a localised release of CO2 from seabed disturbance during the construction and decommissioning phases (-1).

There is potential for slight negative, short-term, temporary effects on localised GHG concentrations due to emissions from vehicles and machinery in the vicinity of the works during the construction and decommissioning phases and during any maintenance activities (-1). There is also potential for the temporary loss of GHG

sequestering material in the vicinity of the works during the construction and decommissioning phases and during any maintenance activities (-1).

There is potential for significant positive, medium to long-term effects during the operational phase, from facilitation of new renewable energy infrastructure, supporting decarbonisation of the energy sector, diversification of electricity supply and energy security, and meeting of energy objectives and climate change emission reduction targets (+3).

Material Assets

There is offshore infrastructure within the identified route corridors of the recommended designs that are not possible to avoid. These include submarine cable connection crossings, offshore gas/oil pipeline crossings and the Endurance CO2 Storage Facility pipeline. There is potential for telecommunications and energy supplies of high importance within GB waters to be disrupted during the construction, operation, and decommissioning phases. There is potential for significant negative, direct, short-term effects due to damage to these cables, and subsequent disruption to telecommunications and energy supplies, during the construction and decommissioning phases (-3), as well as potential for slight negative medium to long-term (cable lifetime) direct effects in the operational phase during recurrent maintenance operations (-1). There is also potential for significant negative indirect effects to telecommunications and energy supplies in the short-term during the construction and decommissioning phases, as access to these existing cables for maintenance may be reduced temporarily (-3), as well as for slight negative effects in the medium to long-term during the operational phase due to access issues during periods of maintenance (-1). Thus, given the high importance of the existing infrastructure, which cannot be avoided within the recommended designs, there is potential for significant negative effects on this infrastructure in the short, medium, and long-term, although good working practices may eliminate or minimise the potential for these effects to occur.

There is onshore infrastructure within the identified route corridors and interface areas of the recommended designs that are not possible to avoid. These include onshore pipelines and overhead lines. There is the potential for direct, short-term, moderate negative effects due to damage to the pipelines or overhead lines, and subsequent disruption to energy supplies and services, during the construction and decommissioning phases of both cables and interface infrastructure (-2), as well as potential for slight negative, medium to long-term (cable and interface infrastructure lifetime) direct effects in the operational phase due to the recurrent maintenance activities required to facilitate the operation and maintenance (recurrent, short-term) (-1). There is also the potential for slight negative indirect effects to energy supplies and services in the short-term during the construction and decommissioning phases, as access to these existing pipelines and cables for maintenance may be reduced temporarily (-1), as well as for slight negative effects in the medium to long-term during the operational phase due to access issues during periods of maintenance (-1). Furthermore, there is the potential for moderate negative, direct short-term effects during construction due to the potential requirement for permanent relocation or

repositioning of existing overhead lines; services should return to normal once this has occurred. All potential negative effects on onshore energy infrastructure are, however, likely to be temporary and localised to the asset crossing locations. The use of engineering techniques, such as directional drilling, may also reduce or eliminate many of these issues.

There are several roads and railways located within onshore sections of the identified route corridors of the recommended designs, which are unavoidable. Although roads can be avoided by interface infrastructure, vehicles associated with the construction and decommissioning phases will have to utilise these local roads to facilitate the construction and decommissioning of the interface infrastructure. There is potential for direct, short-term moderate negative effects due to the disruption of access to roads and railway lines due to road closures or road diversions, or restrictions/amendments to public transport routes during construction and decommissioning phases (-2). This may result in a temporary increase in travel time for road and public transport users. There is also potential for moderate negative, direct short-term effects due to journeys being delayed by the potential increased vehicle traffic from construction machinery (-2), as well as short-term temporary road access restrictions, closures or slow-moving vehicle traffic to accommodate construction vehicles transporting abnormal loads (-2). There is the potential for slight negative, indirect short-term effects due to disruption from construction or decommissioning works or concerns regarding road safety for road users (motorised and non-motorised) with large vehicles or machinery (-1). All potential negative effects on transport infrastructure are, however, likely to be temporary and localised to the route crossing locations. The use of engineering techniques, such as directional drilling, may also reduce or eliminate many of these issues.

Areas of high shipping density are located within the offshore sections of identified route corridors of the recommended designs, which are unavoidable. There are ship routing measures such as Traffic Separation Schemes (at Botney Ground, at Strait of Dover and adjacent waters), precautionary areas and deep-water routes. There is potential for significant negative effects in the short-term during the construction and decommissioning phases due to the risk of collision and allision with vessels associated with cabling, which may result in injury or death and hazardous cargo or oil spillage (-3). There is potential for slight negative, medium and long-term effects during the operational phase due to the risk of collision or allision with slow-moving or stationary vessels and equipment during maintenance (-1). There is also potential for slight negative, medium and long-term effects during the operational phase due to the risk of entanglement of anchors with subsea cables or protective structures used over cables (-1). Furthermore, there is potential for significant negative effects within installation and decommissioning areas in the short-term construction and decommissioning phases, as the presence of installation vessels and equipment may adversely impact the efficiency of search and rescue operations (-3). It is, however, likely that all these potential effects can be mitigated by adherence to appropriate navigational safety planning and procedures.

There are areas of relatively high intensity fishing within the offshore sections identified route corridors of the recommended designs, which are unavoidable. There is potential for moderate direct negative, short-term effects on commercial fisheries operations due to temporary displacement from traditional fishing grounds during the construction and decommissioning phases (-2), as well as potential for slight, medium and long-term negative effects due to displacement during maintenance within the operational phase (-1). Displacement of fishing activity could result in increased competition for alternate fishing grounds, with potential to adversely affect fish stocks and, by extension, landings, in nearby areas. There is potential for moderate negative direct effects due to an increased collision risk of fishing vessels with vessels associated with cable installation in the short-term during the construction and decommissioning phases (-2), and slight negative effects in the medium to long-term during recurrent maintenance activities in the operational phase (-1). There is also potential for slight negative effects on fishing activities in the operational phase, due to the risk of entanglement of fishing gear with cables, or damage to fishing gear due to cable protection infrastructure where cables cannot be buried sufficiently, which may lead to avoidance of the area by fishing vessels (-1). There is potential for effects on commercial fish species and their key habitats within the identified route corridors of the recommended designs. There is potential for moderate negative direct effects in the short-term construction (-2), and slight negative direct effects in the medium-to long-term operational phase due to the potential for a direct loss of supporting habitats, such as spawning and nursery grounds. There is potential for moderate indirect negative effects on the profitability of commercial fishing in the short- term (-2) and slight indirect negative effects in the medium and long-term (-1). This includes the potential for reduced quotas, increased resource competition for fishing, and reduced landings in both tonnage and economic value.

There are several military danger and practice areas within the offshore areas of identified route corridors which are unavoidable, namely: the Campbelltown Military Danger Area, Moray Firth South Military Danger Area, Druridge Bay Military Danger Area, Staxton Military Danger Area, Cape Wrath Military Danger Area, the Castlemartin Military Practice Area, Manorbier Military Practice Area, Pendine Military Practice Area, and the Pembrey Military Practice Area. There is potential for moderate negative effects on military activities, including temporary (short-term) disruption of military exercises and activities within these military danger areas during pre-construction and decommissioning (-2) phases. There is also the risk of encountering UXOs in these military danger areas.

There are unavoidable areas of prime agricultural land within onshore sections of the identified route corridors. Given the amount of required interface infrastructure associated with the recommended designs, there may be limited scope to avoid all prime agricultural land within interface areas. There is potential for direct, short-term negative effects on agriculture due to the temporary loss of agricultural land and soils during pre-construction, construction and decommissioning processes within the identified route corridors (-1) and within interface areas due to land take requirements for construction compounds, haul roads and temporary access tracks during the construction and commissioning of the interface infrastructure (-2). There is potential

for direct, slight, medium and long-term negative effects on agriculture due to the permanent loss of agricultural land and soils within identified route corridors, if this is unable to be reinstated following completion of construction or decommissioning works (-1). There is potential for direct, moderate, medium and long-term negative effects on agriculture due to the permanent loss or disturbance of agricultural land and soils during the operational period due to land take required for the permanent works, substations and converter stations (-2). There is also potential for short-term, direct, slight negative effects due to temporary restrictions in access to agricultural land due to construction and decommissioning activities (-1). There is potential for short-term, direct damage to field drains due to construction and decommissioning activities (-1), as well as the potential for indirect, short-term secondary negative effects on agriculture during construction and decommissioning activities, including through pollution of water sources used for irrigation or for livestock or through the introduction of soil borne pests and diseases (-1).

There are unavoidable areas of either broadleaved woodland, conifer woodland, and mixed woodland, which may be utilised for commercial forestry within the identified route corridors of the recommended designs. There may be limited scope to avoid all woodland areas within the interface areas, given the large areas required for interface infrastructure associated with the recommended designs. There is potential for direct, slight negative effects on commercial forestry due to the loss of woodland within the onshore study corridors, if felling of woodland and commercial forestry areas is required to facilitate cable installation in the short-term construction phase and due to land take or felling requirements for construction compounds, haul roads and temporary access tracks during the construction and decommissioning of the interface infrastructure (-1). There is also potential for the direct, slight negative effects on commercial forestry in the medium and long-term due to the permanent loss of woodland within the footprint of onshore cables, and due to the permanent loss or disturbance of woodland within the interface areas during the operational phase due to land take requirements for the operation of interface infrastructure. This could result in a reduction in income levels for this industry (-1).

The potential for effects on tourism is considered indirectly within the topics of Landscape, Seascape and Visual Amenity (visibility of construction activity and operation/maintenance activity), Population and Human Health (recreational use), and Biodiversity, Flora, and Fauna (effects on wildlife). As discussed in the Landscape, Seascape and Visual Amenity Section, there is the potential for negative effects on Landscape, Seascape and Visual Amenity, which may result in secondary negative effects on tourism, as this may act as a deterrent to tourists. As discussed in Population and Human Health, there is potential for negative effects on recreational activities, albeit temporary and localised. Lastly, as discussed in Biodiversity, Flora and Fauna, there is potential for the construction phase to adversely affect wildlife, which may result in a secondary impact on tourism activities. Any impact on tourism will likely be temporary, localised and not significant.

The recommended design has the potential to connect 77.8GW of renewable energy generation to the GB grid. As such, there is potential for slight positive effects in the

short-term (+1) and significant positive effects in the medium to long-term, owing to the facilitation of new renewable energy infrastructure (+3) and the associated reduction in reliance on fossil fuel generation.

Cultural, Architectural and Archaeological Heritage

There are a significant number of marine heritage assets located within the offshore areas of identified route corridors of the recommended designs, including shipwrecks and marine Trove Heritage Assets. There is potential to avoid all marine archaeological/heritage assets within the 5km-wide identified route corridors, avoiding the potential for direct effects. There is potential for indirect short-term slight negative effects on these marine archaeological/heritage assets during the construction and decommissioning phases, due to indirect damage or disturbance to known and unknown features through alterations in the seabed morphology from suspended sediment levels and/or scour due to seabed preparation techniques and cable burial methods (-1).

Furthermore, there is potential for unknown marine and intertidal prehistoric landscapes, submerged archaeological artefacts, structures or wrecks to be discovered within the identified route corridors. There is potential for slight negative temporary to permanent effects, which may be due to direct damage or disturbance to unknown features within the identified route corridors during surveys, works, cable laying or decommissioning activities (-1).

There is also potential for slight negative indirect effects on known and unknown features within the identified route corridors in the medium to long-term operational phase owing to the potential for scouring and exposure to occur around features in the vicinity of cables and cable protection materials, leading to indirect damage or degradation, sediment deposition and further burial of features in the long-term (-1) and potential for loss of, or damage to, features during maintenance activities (-1). There may also be potential for long-term positive effects on archaeological features that are exposed, and that may be protected through burial with alterations in suspended sediment levels (+1).

There are terrestrial heritage assets located within the onshore sections of the identified route corridors and interface areas. These include Parks and Gardens/Garden and Designed Landscapes, Scheduled Monuments, Trove Heritage assets, Listed Buildings, Conservation Areas, battlefields, a UNESCO WHS and Defence of Britain Sites. There is potential for all known terrestrial heritage assets to be avoided within the identified route corridors and interface areas, avoiding the potential for direct effects. However, there is potential for slight direct negative effects on unknown buried terrestrial heritage assets in the short-term due to potential damage within the identified onshore route corridors during pre-construction surveys, construction works, cable laying or decommissioning activities (-1). There is also potential for slight indirect negative effects on known and unknown terrestrial archaeological assets within the onshore areas of identified route corridors and interface areas e.g., through sediment displacement or mud generation leading to burial of downstream sites, or hydrological regime alteration resulting in inundation or dewatering (-1) and from short-term,

indirect temporary effects on the setting and cultural significance of designated and non-designated terrestrial heritage sites and archaeological assets, including coastal heritage assets (-1).

Due to the large area required for new interface infrastructure as part of the recommended design, there is potential for moderate, short-term, indirect temporary effects on the setting of, and cultural significance of, designated and non-designated terrestrial heritage sites and archaeological assets due to the activities required to facilitate the construction and decommissioning of the converter / substations, due to the presence of equipment and machinery, and temporary increases in air pollution, traffic, and noise and vibration (-2). There is also potential for indirect long-term moderate negative effects on the setting of, and cultural significance of, designated and non-designated terrestrial heritage sites and features due to the physical presence of the interface infrastructure and any associated alterations in the landscape or removal of areas for previous agricultural use, trees or landscape features associated with onshore heritage setting, as well as to the activities required to facilitate the operation and maintenance of the converter station due to potential increases in air pollution, traffic, noise and vibration (-2).

At the project planning phase, any sites of archaeological potential should be identified and exclusion zones established around these, with site surveys or trial trenching conducted before any potentially damaging activities take place, to inform any appropriate mitigation. Within the marine environment, modelling of hydrodynamic and sediment transport processes may be necessary to determine potential effects on surrounding archaeological features and determine any appropriate mitigation required.

Landscape, Seascape and Visual Amenity

The identified route corridors of the recommended designs cross English and Welsh Marine Character Areas, as well as Scottish Coastal Character Types. Although these areas are unavoidable, given the temporary nature of offshore cable laying, there is limited potential for short-term, temporary effects on seascapes and visual amenity (0), as well as no anticipated effects on seascapes in the medium to long-term operation phase (0).

There are also National Landscape Character Areas crossed by the identified route corridors. Despite being unavoidable, there is also limited potential for short-term, temporary negative landscape effects on the National Landscape Character Areas within the identified route corridors (0), as well as no anticipated effects on these areas in the medium to long-term operational phase (0), given the temporary and relatively small-scale works involved with onshore cabling laying. There are sensitive National Landscape Areas (AONBs) located within the vicinity of interface areas. Given the amount of new infrastructure and sensitivity of the landscape, there is potential for moderate direct short-term, temporary negative landscape effects on the landscape elements within and overall landscape character of national landscape areas within the identified route corridors during construction through the temporary or permanent loss of landscape elements to facilitate construction works including construction

compounds and facilities, storage areas, the presence of plant, access routes, earthworks, Sustainable Drainage Systems (SuDS) and construction of emerging structures (-2). Furthermore, there is potential for moderate direct medium to long-term negative effects on landscape elements within and overall landscape character of National Landscape Character Areas due to the physical presence of the interface infrastructure and the permanent loss of landscape elements to facilitate the operational phase of the interface infrastructure, particularly for those landscape character types that are recognised as highly sensitive to new development (-2).

There are short sections of National Trails, heritage coasts and a National Landscape located within identified route corridors. As such, there is potential for moderate direct localised negative effects on the walking trails in the short-term due to localised construction plant activity, and the use of artificial lighting, during pre-construction, cable installation, and decommissioning and potential localised alterations to the surrounding landscape character types or loss of landscape elements (-2). Furthermore, there is potential for moderate direct negative effects on these walking routes in the long-term due to the localised removal of landscape elements such as trees, woodland areas, hedgerows, or agricultural land areas, if these are not reinstated following the completion of works (-2).

There are also Country Parks, a WHS, and Heritage Coasts situated within the identified route corridors. There is potential to avoid these with onshore cabling and interface infrastructure, avoiding the potential for direct effects. However, there may be potential for slight indirect negative landscape and visual amenity effects of these sites in the short to medium-term due to the localised activity of machinery, and the use of artificial lighting, during pre-construction, cable installation, and decommissioning (-1). There are also National Trails, a WHS and Country Parks located within the interface areas. There is potential to avoid these with interface infrastructure, avoiding the potential for direct effects. However, given the amount of interface infrastructure required, there is the potential for moderate indirect negative landscape and visual amenity effects of these sites in the short-term due to the visibility of activities required for the construction and decommissioning of the interface infrastructure and any subsequent removal of landscape elements (-2). There is also potential for moderate indirect negative landscape and visual amenity effects of these sites in the medium to long-term due to the visibility of the interface infrastructure and activities required for facilitating the operation and maintenance of the interface infrastructure, as well as any subsequent removal of landscape elements (-2).

There are unavoidable urban areas and areas of moderate population density within the vicinity of the identified route corridors and interface areas. As such, there is potential for moderate visual effects in the short to medium-term due to localised construction plant activity, and the use of artificial lighting, during pre-construction, cable installation, and decommissioning (-2). Additionally, within the remaining route corridors, there is potential for slight visual effects in the short to medium-term during the construction and decommissioning phases (-1). There are also avoidable urban areas for interface infrastructure, avoiding the potential for direct effects. Given the developed character of these urban areas, there is potential for slight indirect negative

visual amenity effects in the short-term due to the visibility of activities required for the construction and decommissioning of the interface infrastructure (-1). There is also potential for slight indirect negative visual amenity effects of these urban areas in the medium to long-term due to the visibility of the interface infrastructure to a greater number of people and activities required for facilitating the operation and maintenance of the interface infrastructure (-1).

Areas of the highest landscape and seascape sensitivity should be avoided, where possible at the project planning phase, and a SLVIA should be undertaken, which should inform project design and appropriate mitigation to minimise adverse effects.

9.2 Cumulative / In-Combination Effects

9.2.1 Existing and planned infrastructure

The assessment of Recommended Designs of the draft HND Implementation Plan has included a consideration of the potential for cumulative and in-combination effects on SEA topics. This included the potential for cumulative negative effects on existing sites, infrastructure and other sensitivities, as well as the potential for in-combination effects of cabling and onshore infrastructure associated with implementation of the draft Plan. All existing and planned substantial projects have been taken into consideration within the HND appraisal process and avoided as far as possible. Where avoidance is not possible this has been considered in the SEA appraisal for Material Assets. This includes offshore renewable energy developments and major infrastructure.

There is potential for in-combination or cumulative effects of development associated with the draft Plan and offshore renewable energy developments. This includes the development of offshore wind projects that are directly facilitated by the Recommended Design of the draft Plan, which will be located at the starting point of identified route corridors. In-combination with the offshore wind farms that will generate the power to be connected by the identified route corridors, there is potential for cumulative, temporary construction-phase effects on biodiversity, including the potential for injury, disturbance and displacement of marine mammals and fish, disturbance and displacement of seabirds, and damage to benthic habitats, including habitats of importance for fish. There is also the potential for cumulative loss or damage, or loss of access to, marine cultural heritage assets, and for cumulative effects on material assets including damage to/crossings required for existing infrastructure, and cumulative loss of access to fishing grounds for commercial fisheries.

For offshore wind farms that will be facilitated by the draft Plan, the consenting application will consider the project in its entirety i.e., the array infrastructure as well as associated cabling to connect to the grid onshore. At this strategic plan level, although route corridors have been identified, there are no confirmed designs or methodologies for

each of the cable routes. Relevant projects should be considered and assessed further for the potential for cumulative and in-combination effects at the project level.

Generally, for Biodiversity, Flora and Fauna, there is potential for cumulative and in-combination negative effects within designated sites that are not possible to avoid within more than one identified route corridor, including SACs, SPAs, MCZs, Nature Conservation MPAs and SSSIs. There is also potential for cumulative and in-combination negative effects on areas of recognised importance for flora and fauna such as IBAs, RSPB sites and nature reserves, where these are unavoidable by more than one identified cable route, and potential for cumulative and in-combination negative effects on sensitive and/or protected habitats and species, including Annex I reefs and sandbanks, key sensitive habitats, fish spawning and nursery areas, and areas of importance for birds. If not carried out concurrently within the same area, there is potential for such sensitive areas to be negatively impacted multiple times over a prolonged period of time. There is also potential for cumulative disturbance and/or damage to local habitats and species along all cable routes, interface areas where new infrastructure is required, and working areas in the vicinity. There is potential for cumulative short-term effects on Geology, Soils and Land Use through soil/sediment loss during construction or alteration of sediment pathways, where multiple cable routes are planned within similar route corridors, and a potential cumulative risk of contamination where military areas are unavoidable by multiple routes. There is also potential for cumulative negative effects from the concentration of multiple routes on sensitive and/or protected geomorphological features, including Annex I reefs and sandbanks.

For Material Assets, there is potential for cumulative negative effects on unavoidable offshore infrastructure (cables and pipelines) and onshore infrastructure (pipelines, overhead lines, roads and railway lines) where multiple routes are planned in the same or similar route corridors. This includes interaction between offshore cables that are part of the Recommended Design of the draft Plan. If not planned in a coordinated manner, there is potential for existing infrastructure to be impacted multiple times over a prolonged period, and for increased disruption for services associated with roads and railways. Where multiple cable routes are planned within the same or similar corridor there is potential for cumulative negative effects on shipping and navigation, including displacement of vessels, risk of collision and allision, risk of entanglement of anchors with subsea cables or protective structures used over cables. There is potential for cumulative effects on commercial fisheries due to temporary displacement from traditional fishing grounds, increased collision risk of fishing vessels, and risk of entanglement of fishing gear. There is potential for localised effects from long-term cabling to have cumulative effects on fish stocks and access to fishing grounds, particularly in areas that already have a concentration of existing infrastructure. This includes habitat disturbance / loss, generation of EMF, increased or prolonged noise and vibration disturbance, or the potential for cumulative displacement of certain sensitive fish species where benthic habitat is altered due to cable protection requirements. There is potential for cumulative negative effects on military activities where multiple cable routes are planned within the same or similar corridor, such as disruption of military exercises and activities, and the time span of potential impacts will be increased if construction does not take place in a coordinated and well-planned manner. For the onshore section of cable routes, there is

potential for cumulative negative effects on agriculture, particularly where multiple routes are planned in the same or similar corridors, including repeated loss of agricultural land and soils, and restrictions in access to agricultural land. Cumulatively, the Recommended Design has the potential for significant positive long-term effects on Material Assets, by facilitating the greatest possible development of renewable energy infrastructure.

There is potential for cumulative negative, short-term effects on water quality, particularly where multiple cable routes are planned within the same or similar corridor, including the release of sediment associated with cable trenching or the release of chemicals associated with the construction, maintenance, and decommissioning phases of offshore cables. There is potential for cumulative negative, short-term effects on water quality through the release of sediment, or alterations to local hydrological regimes for onshore cabling and construction of substations or converter stations. Where multiple cable routes are planned within the same or similar corridor there is potential for cumulative negative effects on Population and Human Health, due to short-term disturbance of local populations during construction; however, major settlements and urban areas have been avoided by the Recommended Design. There is also potential for cumulative short-term negative effects on Air and Climatic Factors due to localised construction-related emissions and localised CO_2 release from seabed sediments. Cumulatively, the Recommended Design has the potential for significant, long-term positive effects on Air and Climatic Factors by leading decarbonisation of the energy sector.

Although many cultural heritage features are present within identified route corridors, owing to the scale of these features and the width of the study corridors, they should be possible to avoid and therefore avoiding the potential for direct negative effects. Where multiple cable routes are planned within the same or similar corridor, there is greater potential for indirect negative effects such as damage or disturbance of known features and loss of long-term access to heritage assets. The Recommended Design has aimed to avoid locating interface areas in areas of landscape or cultural heritage sensitivity. Where designated or sensitive areas are present within interface areas, they can be avoided, avoiding the potential for long-term negative effects during the operational phase of new substations or converter stations. Where multiple cable routes end at the same or a similar interface area there may be less potential for infrastructure to be screened from sensitive areas, unless coordinated.

Generally, where multiple routes are planned within the same or similar areas, the temporal nature of potential negative effects can be minimised if developments are coordinated, whereas there is greater potential for sensitive areas to be impacted multiple times over a prolonged period if developments do not take place in a coordinated and well-planned manner.

9.2.1.1 Offshore and Landfall Areas

In addition to the general recognition of potential for cumulative and in-combination effects, there are identified areas where independent projects associated with implementation of the draft HND Implementation Plan could interact with each other and/or with other known planned infrastructure at construction stage and/or in the long-term operational stage. Where there is greater potential for in-combination or cumulative negative effects identified at this strategic stage, due to potential routing bottlenecks, and

avoidance of designations and other environmental sensitivities, these areas would need to be taken into consideration at the detailed project planning and design stage.

Figure 52 demonstrates offshore areas where several identified cable route corridors interact with environmental sensitivities and where there is likely to be greater potential for cumulative negative effects on SEA topics.

East of Shetland

Four identified route corridors that are part of the Recommended Design of the draft HND Implementation Plan connect offshore wind generation sites to Shetland Hub. There is potential for short to medium-term, cumulative negative effects on Biodiversity, Flora and Fauna in this area. This includes the potential for direct cumulative negative effects on designated birds within the East Mainland Coast, Shetland SPA, which cannot be avoided by all cable routes to Shetland Hub. This also includes the potential for direct cumulative negative effects on Annex I reef, and grey seal high-density areas, which are unavoidable by cable routes, and the potential for indirect cumulative negative effects on the designated and/or sensitive areas of Pobie Bank Reef SAC, Noss SSSI and Noss IBA, which are all avoidable but in proximity to all cable routes, and Noss SPA, which is unavoidable by one cable route and in proximity to others.

There is potential for short-term, cumulative negative effects on Material Assets within this area. This includes the potential for direct cumulative negative effects on an offshore gas pipeline that would need to be crossed by three cable routes to Shetland Hub. There is also potential for cumulative short-term temporary disturbance and/or displacement within areas of relatively high-density shipping and fishing within this area and potential for cumulative effects on fish spawning and nursery areas. The potential for cumulative negative effects within this area also includes short-term effects on Population and Human Health, owing to areas used for recreational boating within all cable routes.

Offshore and landfall at Peterhead / Fraserburgh

Several identified cable route corridors accumulate within this area, connecting offshore wind generation sites to Peterhead and New Deer. This includes the HND route corridors of SW_NE7 (Marram) to Peterhead 2 / DCSS, the HNDFUE Scotwind route corridors of SW_NE6 (Broadshore) to Peterhead 2 / DCSS, SW_NE7 (Marram) to Peterhead 2 / DCSS, SW_NE8 (Buchan) to Peterhead 1, and SW_E2b (Muir Mhor) to Peterhead 2 / DCSS, and the HNDFUE INTOG route corridors of Cenos to Peterhead 1 and Scaraben to Peterhead 2 / DCSS. There is also potential for other offshore transmission reinforcements proposing landfall approaches to the Scottish coastline in the area, and there are cables and pipelines within the area that would need to be crossed. There is potential for cumulative short to medium-term negative effects on Biodiversity, Flora and Fauna in this area. This includes the potential for direct cumulative negative effects within the Southern Trench MPA, which is unavoidable for cable routes into Peterhead and New Deer; however, the trench itself and known locations of sensitive habitats can be avoided by all cable routes. There is greater potential for cumulative negative effects, including direct and indirect effects on benthic habitats during construction, should cable laying occur in succession. This has the potential to extend the potential for construction-phase impacts over a longer time period.

There is potential for short-term cumulative negative effects on Material Assets within this area. This includes the potential for direct cumulative negative effects on existing cables and pipelines, including the Fulmar to Saint Fergus Pipeline (crossed by four cable routes into Peterhead), the Beryl to Saint Fergus Pipeline and Miller to Saint Fergus Pipeline (crossed by two cable routes into Peterhead), the designated cable area for Buchan Deep Demo site (crossed by four cable routes into Peterhead) and the CNS Fibre Optic cable / Forties to Cruden Bay Pipeline (crossed by two cable routes into Peterhead and the identified HNDFUE INTOG cable route to Fetteresso). There is also potential for cumulative short-term temporary disturbance and/or displacement within fish spawning and nursery areas and areas of relatively moderate to high-intensity fishing and high-density shipping within this area. Owing to the potential concentration of cables proposed through the HND Implementation Plan and other planned infrastructure, such other offshore transmission reinforcements, if offshore cable routes are not coordinated between developers/operators, available seabed corridor capacity could be reduced, causing route congestion and increased risk of crossings, delays, and abandonment of preferred alignments and even projects. Therefore, to minimise the potential environmental and navigational adverse effects, cable routing and protection strategies should be coordinated between developers, transmission owners/operators and other seabed users, including active consideration of shared cable protection and joint corridor-management arrangements. This would reduce the seabed disturbance, minimise repeated installation and maintenance works, limit the footprint of rock protection, and reduce the likely requirement for crossings.

East of Scotland to East of England

Several identified cable route corridors of the HND Implementation Plan accumulate within this area. This includes the HND route corridors of SW_E1a (Morven) to Lincolnshire Connection Node; and the HNDFUE Scotwind route corridors of SW_E1c_1 (Ossian) to Lincolnshire Connection Node and SW_E1c_2 (Ossian) to Weston Marsh. There is also potential for other offshore transmission reinforcements to propose similar routes through this area.

There is potential for cumulative short-term temporary negative effects on harbour porpoise within the Southern North Sea SAC, which cannot be avoided by cable routes into Birkhill Wood, Lincolnshire Connection Node, Weston Marsh and Near Richborough. There is also potential for cumulative negative effects on designated sandbank habitat within the Dogger Bank SAC, which is unavoidable for several cable routes as the offshore generation site lies within the designated area. This includes the potential for cumulative negative effects, including potential intermittent direct risks as well as disturbance and displacement of designated harbour porpoise during pre-construction, maintenance during operation and decommissioning, and direct and indirect effects on benthic habitats, should cable laying occur in succession. This would extend the potential for construction-phase impacts over a longer time period. The requirement for cable rock protection should be minimised where benthic habitats of recognised importance are present. Several cable route corridors pass between the North East of Farnes Deep HPMA and the Swallow Sand MCZ; with a gap of over 25km between these designated sites there should be sufficient space to accommodate this cabling, without encroaching on the MCZ

boundaries, provided these routes and other planned subsea cables that may pass through the same area, are planned and developed in a coordinated manner.

There is potential for short-term cumulative negative effects on Material Assets within this area. This includes the potential for direct cumulative negative effects on existing offshore infrastructure, including the Dogger Bank A, B and C cables, the Teeside B (Sofia) Transmission Asset cable, the Hornsea Project 4 (HOW04) OFTO cable, Uk Germany 6, Tata North Europe, Pangea North UK/DMK, and four other unnamed cables that are crossed by all cable routes to south England; the CATS Gas Pipeline, Ekofisk to Teeside, Speipner to Easington (Langeled) pipelines that are crossed by several cable routes, and the Endurance CO2 Storage Facility Pipeline, crossed by routes into Birkhill Wood, Lincolnshire Connection Node and Weston Marsh. There is also potential for cumulative short-term temporary disturbance and/or displacement within areas of relatively high-density shipping within this area, and within the Staxton and Druridge Bay Military Areas by cable routes to the south of England. Potential effects on these Military Areas can also be considered as short-term negative effects on Geology, Soils and Land Use and Water, owing to the potential for contaminated sediments to be disturbed within these areas. There is also potential for cumulative effects on fish spawning and nursery areas. Owing to the potential concentration of cables proposed through the HND Implementation Plan and other planned infrastructure, such other offshore transmission reinforcements, if offshore cable routes are not coordinated between developers/operators, available seabed corridor capacity could be reduced, causing route congestion and increased risk of crossings, delays, and abandonment of preferred alignments and even projects. Therefore, to minimise the potential environmental and navigational adverse effects, cable routing and protection strategies should be coordinated between developers, transmission owners/operators and other seabed users, including active consideration of shared cable protection and joint corridor-management arrangements. This would reduce the seabed disturbance, minimise repeated installation and maintenance works, limit the footprint of rock protection, and reduce the likely requirement for crossings.

Offshore and landfall at Lincolnshire Connection Node / Weston Marsh

Several identified cable route corridors of the HND Implementation Plan accumulate within this area. This includes the HND route corridors of SW_E1a (Morven) to Lincolnshire Connection Node and R4_3 (Outer Dowsing) to Weston Marsh; and the HNDFUE Scotwind route corridors of SW_E1c_1 (Ossian) to Lincolnshire Connection Node and SW_E1c_2 (Ossian) to Weston Marsh. There is also potential for other offshore transmission reinforcements to propose approach to the English coastline to make landfall in this area, and there are cable and pipelines within the area that would need to be crossed. To approach the coastline in this area, the cable routes SW_E1a (Morven) to Lincolnshire Connection Node, SW_E1c_1 (Ossian) to Lincolnshire Connection Node and SW_E1c_2 (Ossian) to Weston Marsh, proposed as part of the HND Implementation Plan, as well as other planned cables, will need to pass through a gap of approximately 14.5km between the Holderness Offshore MCZ and the Outer Dowsing existing offshore wind lease area. The potential cable routes identified at this strategic plan stage are 5km in width. Cable separation distances will more likely be at least 100m, so technically, there should be sufficient space to accommodate the cabling, without encroaching on the MCZ boundaries, provided these are planned and developed in a coordinated manner.

There is potential for cumulative short-term temporary negative effects on designated birds within the Greater Wash SPA, which cannot be avoided by cable routes into Lincolnshire Connection Node, and Weston Marsh. There is also potential for cumulative negative effects on the Feature of Conservation Interest tide swept channels, which needs to be crossed by cable routes into these areas. There is greater potential for cumulative negative effects, including potential intermittent direct risks as well as disturbance and displacement of designated bird species during pre-construction, maintenance during operation and decommissioning, and direct and indirect effects on benthic habitats, should cabling occur in succession. This has the potential to extend the potential for construction-phase impacts over a longer time period.

There is potential for short-term cumulative negative effects on Material Assets within this area. This includes the potential for direct cumulative negative effects on existing offshore infrastructure, including the Hornsea 1 OFTO cable, Hornsea Project 2 OFTO cable, and Triton Knoll Transmission Asset, crossed by several cable routes; the Outer Dowsing Transmission Asset Cable, crossed by cable routes into Weston Marsh and four pipelines, crossed by several cable routes. There is also potential for cumulative short-term temporary disturbance and/or displacement within areas of relatively high-density shipping within this area, and within the Donna Nook Military Areas by cable routes to Lincolnshire Connection Node. There is also potential for cumulative effects on fish spawning and nursery areas. The requirement for many cable crossings has the potential for long-term negative effects on fishing activity owing to the greater potential for obstructions to fishing gear. Owing to the potential bottleneck of cables proposed through the HND Implementation Plan and other planned infrastructure, such other offshore transmission reinforcements, if offshore cable routes are not coordinated between developers/operators, available seabed corridor capacity could be reduced, causing route congestion and increased risk of crossings, delays, and abandonment of preferred alignments and even projects. Therefore, to minimise the potential environmental and navigational adverse effects, cable routing and protection strategies should be coordinated between developers, transmission owners/operators and other seabed users, including active consideration of shared cable protection and joint corridor-management arrangements. This would reduce the seabed disturbance, minimise repeated installation and maintenance works, limit the footprint of rock protection, and reduce the likely requirement for crossings.

Celtic SeaThe three cable route corridors of PDA1 to Carmarthen, PDA2 to South Wales Connection Node and PDA3 to North Devon are in close proximity within this area. There are also existing cables within this area, some of which would need to be crossed, and proposed offshore transmission reinforcements.

There is potential for cumulative short-term temporary negative effects on harbour porpoise within the Bristol Channel Approaches SAC, which cannot be avoided and would need to be crossed by each of the three HND Implementation Plan cable routes as well as potential offshore transmission reinforcements. There is also potential for cumulative negative effects on the Feature of Conservation Interest tide swept channels, which needs to be crossed by identified cable routes to the South West Connection Node and North Devon. This includes the potential for cumulative negative effects, including potential

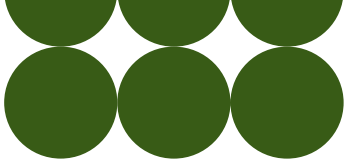
intermittent direct risks as well as disturbance and displacement of designated harbour porpoise during pre-construction, maintenance during operation and decommissioning, and direct and indirect effects on benthic habitats, should cabling occur in succession. This would extend the potential for construction-phase impacts over a longer time period. The requirement for cable rock protection should be minimised where benthic habitats of recognised importance are present.

There is potential for short-term cumulative negative effects on Material Assets within this area. This includes the potential for direct cumulative negative effects on existing offshore infrastructure, including the UK- Ireland 2 Crossing cable, crossed by all identified cable routes, and the Solas and Tata Atlantic North, crossed by cables routes to South West Connection Node and Carmarthen. There is also potential for cumulative effects on fish spawning and nursery areas and potential for cumulative short-term temporary disturbance and/or displacement within areas of relatively moderate to high-intensity fishing activity within this area, while the requirement for many cable crossings has the potential for long-term negative effects on fishing activity owing to the potential for obstructions to fishing gear. To minimise the potential environmental and navigational adverse effects, cable routing and protection strategies should be coordinated between developers, transmission owners/operators and other seabed users, including active consideration of shared cable protection and joint corridor-management arrangements. This would reduce the seabed disturbance, minimise repeated installation and maintenance works, limit the footprint of rock protection, and reduce the likely requirement for crossings.

Offshore and landfall at Kent

The identified cable HNDFUE Scotwind route corridors from SW_E2a_2 (Campion) to Richborough proposes to make landfall in Sandwich Bay at Ebbsfleet, an area which is spatially constrained, and has existing cables present at landfall. There is also offshore transmission reinforcements proposed in this area. Approaching landfall at this location there is a gap between the Thanet Coast MCZ and the Goodwin Sands MCZ of approximately 3km, while the Sandwich Bay SAC and the Thanet Coast and Sandwich Bay SPA stretch across the coastline at landfall. The potential cable route identified at this strategic plan stage is 5km in width, with one trench anticipated to be required, with a separation distance required of at least 100m between any trenches required by other cable routes. Technically, there should be sufficient space to accommodate the Plan cabling and proposed offshore transmission reinforcements, should it propose to take this route, without encroaching on the MCZ boundaries, provided these are planned and developed in a coordinated manner.

There is potential for cumulative short-term temporary negative effects on designated birds within the Thanet Coast and Sandwich Bay SPA, should the proposed offshore transmission reinforcements also make landfall in this area, including potential intermittent direct risks as well as disturbance and displacement of designated bird species during pre-construction, maintenance during operation and decommissioning, and direct and indirect effects on benthic habitats, should cabling occur in succession. This would extend the potential for construction-phase impacts over a longer time period. There is also potential for cumulative negative effects within the Sandwich Bay SAC,



should the other proposed offshore transmission reinforcements also make landfall in this area, if not coordinated and mitigated, including direct and indirect damage to designated dune habitats.

There is also potential for cumulative effects on fish spawning and nursery areas and potential for cumulative short-term temporary disturbance and/or displacement within areas of relatively moderate to high-intensity fishing activity on the offshore approach to this area.

To minimise the potential environmental and navigational adverse effects, cable routing and protection strategies should be coordinated between developers, transmission owners/operators and other seabed users, including active consideration of shared cable protection and joint corridor-management arrangements. This would reduce the seabed disturbance, minimise repeated installation and maintenance works, limit the footprint of rock protection, and reduce the likely requirement for crossings approaching and making landfall in this area. This coordination would also ensure that any proposed cable routes between the MCZs of Thanet Coast and Goodwin Sands would avoid the potential for encroaching on the site boundaries and limit the potential for indirect negative effects on these sites.

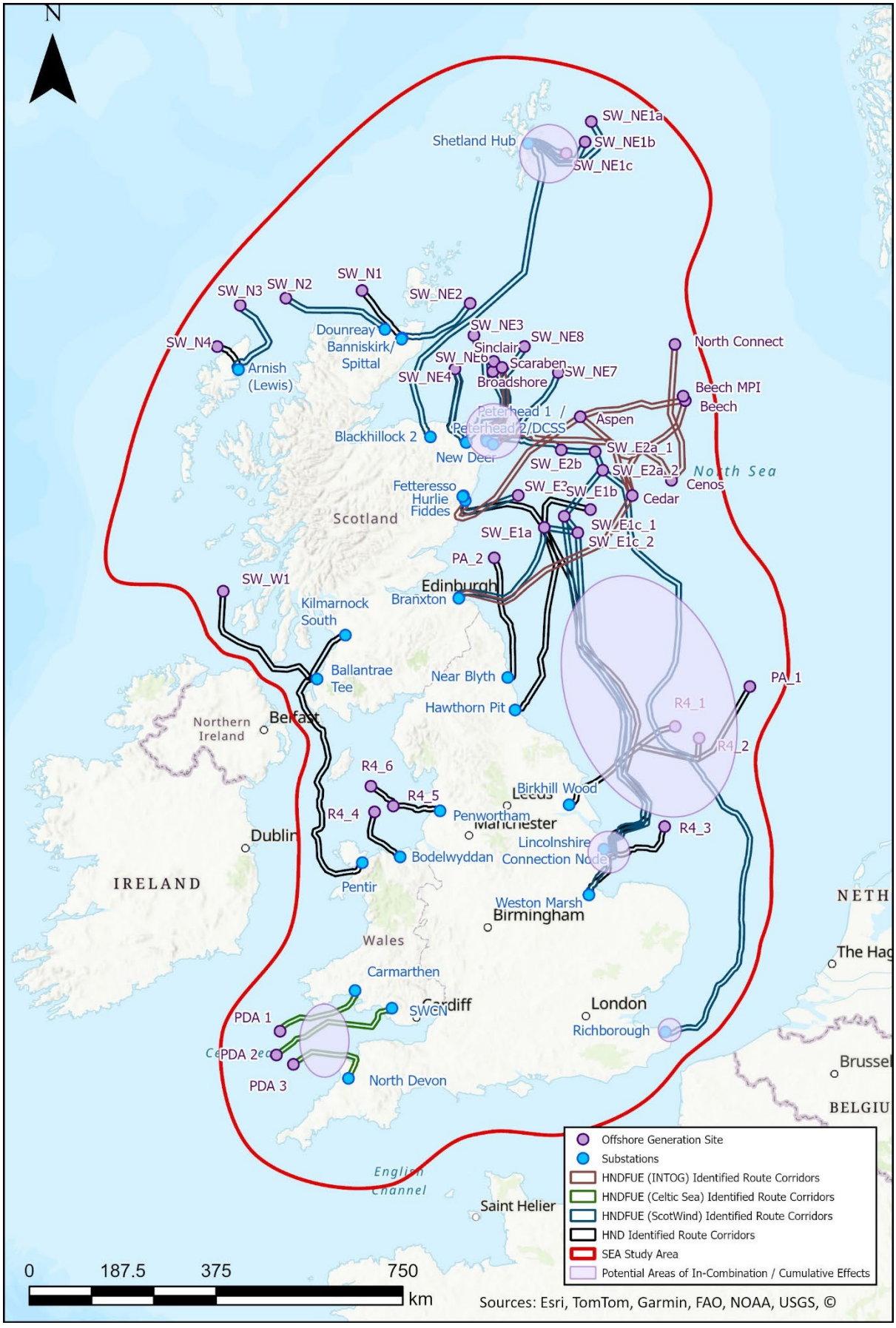
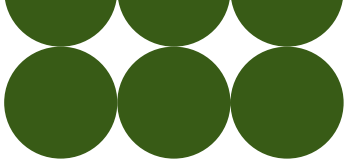


Figure 52: Potential areas of cumulative / in-combination effects



9.2.1.2 Onshore Interface Areas

There are areas onshore where several identified route corridors of the Recommended Design for the draft Plan terminate, with planned connection to the onshore grid at the same location or within proximity to each other. As there is a need to develop onshore infrastructure, including substations or converter stations at some of these interface areas, there is a greater potential for cumulative negative environmental effects where infrastructure is required by additional routes e.g., areas that have multiple reinforcement requirements and several TO and developer infrastructure requirements, such as at Arnish, Spittal, Peterhead, Peterhead 2 / DCSS, Shetland, Hurlie/Fetteresso, New Deer, Weston Marsh and Lincolnshire Connection Node. These areas and detailed discussion of potential cumulative effects are provided in Appendix F.2.

There is potential for cumulative and in-combination effects in relation to interface infrastructure requirements for the recommended HND Implementation Plan developments within interface areas where more than one identified route corridor is recommended.

In relation to Biodiversity, Flora and Fauna, there is potential for increased direct or indirect loss, damage or disturbance to habitats and species outside of designated sites in the short to long-term, as well as the potential for increased indirect effects on designated sites that are avoidable but are within the wider interface areas. For HNDFUE Scotwind, there is potential for cumulative indirect negative effects on protected features within designated sites that are in the vicinity of new substations/converter stations for HND and HNDFUE Scotwind at Arnish, Spittal, Peterhead 2/DCSS, New Deer, Lincolnshire Connection Node, and Weston Marsh, and for HNDFUE INTOG, designated sites that are in the vicinity of new substations/converter stations for HND and HNDFUE INTOG at Peterhead 2 / DCSS, as well as areas of ancient woodland. The potential for cumulative effects includes indirect effects on habitats and disturbance of species, which should be further considered at the project stage, with recommended mitigation through coordination and timing of activities.

In relation to Population and Human Health, there is potential for cumulative effects on local populations, including disturbance, where identified route corridors are in proximity and where being in closer proximity to urban areas cannot be avoided. For HND, this could include the potential for effects on the local population within identified route corridors to Birkhill Wood and Penwortham. For HNDFUE Scotwind, there is potential for cumulative negative effects on the local population/human health in the Lincolnshire Connection Node and Weston Marsh areas in combination with HND requirements. For HNDFUE INTOG, the potential for cumulative effects within the Peterhead 1 and Peterhead 2/DCSS areas is recognised in combination with HNDFUE Scotwind requirements.

For Geology, Soils and Land use, there is potential for a short-term cumulative disturbance/loss of the soil resource across identified route corridors and where interface infrastructure is required. For HND identified route corridors, this could include the potential for effects from soil exposure/loss and associated soil erosion/sedimentation, disturbance/loss of peatlands from construction within the Penwortham and Birkhill Wood interface areas. For HNDFUE Scotwind, there is potential for cumulative effects within the New Deer, Lincolnshire Connection Node, Banniskirk/Spittal and Arnish interface areas.

For Water, there is potential for cumulative effects on water bodies, including sedimentation and water quality impacts, where substations/converter stations could affect the same waterbodies. For HNDFUE Scotwind, there is potential for cumulative effects within the Shetland Hub interface area and associated waterbodies, with three developments proposed to connect to this interface area, and within the New Deer, Lincolnshire Connection Node, Banniskirk/Spittal and Arnish interface areas in combination with HND requirements.

Regarding Material Assets, there is potential for cumulative effects, including damage or disruption, to existing infrastructure that is unavoidable within interface areas. If not carried out in a coordinated and well-planned manner, there is potential for such infrastructure to be impacted multiple times over a prolonged time span. For HND, this could include the interface areas of Penwortham and Birkhill Wood. For HNDFUE Scotwind, this could include the Peterhead 1 and Peterhead 2/DCSS, and the New Deer and New Deer 2 interface areas, as well as the potential for cumulative effects from interface infrastructure within the Arnish, Banniskirk, New Deer, New Deer 2, Peterhead 1, Peterhead 2/DCSS, Fiddes, Lincolnshire Connection Node and Weston Marsh interface areas in combination with HND requirements. For HNDFUE INTOG, this could include the potential for cumulative effects within the interface areas of Peterhead 1, Peterhead 2/DCSS, Fetteresso and Branxton in combination with HND/HNDFUE Scotwind requirements. There is potential for cumulative effects of disruption on roads/railway lines including for HND interface areas of Ballantrae, Pentwortham and Birkhill Wood; for HNDFUE Scotwind interface areas of Shetland Hub, Peterhead 1, Peterhead 2/DCSS, New Deer and New Deer 2, as well as Arnish, Banniskirk, New Deer, New Deer 2, Peterhead 1, Peterhead 2/DCSS, Fiddes, Lincolnshire Connection Node and Weston Marsh interface areas in combination with HND requirements.

There is potential for cumulative effects on agricultural lands from developments within interface areas, which could include short-term damage, access restrictions or long-term loss of land use. This could include the HND interface areas of Penwortham and Birkhill Wood; HNDFUE Scotwind interface areas of Peterhead 1, Peterhead 2/DCSS, New Deer and New Deer 2, as well as New Deer, New Deer 2, Peterhead 1, Peterhead 2/DCSS, Fiddes, Lincolnshire Connection Node and Weston Marsh interface areas in combination with HND requirements. For HNDFUE INTOG, the potential for cumulative effects is also recognised for agricultural lands within the interface areas of Peterhead 1, Peterhead 2/DCSS, Fetteresso and Branxton in combination with HND/HNDFUE Scotwind requirements. If not carried out in a coordinated and well-planned manner, there is potential for agriculture to be impacted multiple times over a prolonged time span. There is also the potential for cumulative effects on commercial forestry, including the HND interface areas of Ballantrae, Penwortham and Birkhill Wood; HNDFUE Scotwind interface areas of Peterhead 1, Peterhead 2/DCSS, New Deer and New Deer 2, as well as Banniskirk, New Deer, New Deer 2, Peterhead 1, Peterhead 2/DCSS and Fiddes in combination with HND requirements. For HNDFUE INTOG, the potential for cumulative effects is also recognised for commercial forestry areas within the interface areas of Peterhead 1, Peterhead 2/DCSS, Fetteresso and Branxton in combination with HND/HNDFUE Scotwind requirements.

For Cultural Heritage, there is potential for cumulative effects on known heritage assets within interface areas, where assets are avoidable but in proximity to more than one route, including long-term cumulative effects on the setting of heritage assets from the presence of new substations/converter stations. For HND, this could include the interface areas of Birkhill Wood, Ballantrae and Penwortham; for HNDFUE Scotwind, this could include the Shetland Hub, New Deer, New Deer 2, Peterhead 2/DCSS and Peterhead 1 interface areas, as well as the Arnish, Banniskirk, New Deer, New Deer 2, Peterhead 1, Peterhead 2/DCSS, Fiddes, Lincolnshire Connection Node and Weston Marsh in combination with HND requirements. For HNDFUE INTOG, this could include the interface areas of Peterhead 1, Peterhead 2/DCSS, Fetteresso and Branxton in combination with HND/HNDFUE Scotwind requirements.

In relation to Landscape, Seascape and Visual Amenity, there is potential for cumulative negative medium to long-term landscape effects where new infrastructure is required within interface areas for more than one identified route corridor, particularly where the Landscape Character types are recognised as sensitive to new development. For HND, interface areas that may be impacted by cumulative effects in association with the interface infrastructure include Birkhill Wood, Ballantrae and Pentwortham; for HNDFUE Scotwind this could include the interface areas of New Deer, New Deer 2, Peterhead 1, Peterhead 2/DCSS, Lincolnshire Connection Node and Weston Marsh, as well as the Arnish, Spittal, New Deer, New Deer 2, Peterhead 1, Peterhead 2/DCSS, Fiddes, Lincolnshire Connection Node and Weston Marsh in combination with HND requirements. For HNDFUE INTOG, this could include the interface areas of Peterhead 1, Peterhead 2/DCSS, Fetteresso and Branxton in combination with HND/HNDFUE Scotwind requirements.

Where several routes are proposed to interface areas, and/or other infrastructure plans to terminate in these areas, to minimise the potential environmental adverse effects, it is recommended that cable routing and infrastructure development is coordinated between developers, transmission owners/operators and other users.

9.2.2 Other Plans and Programmes

This section considered the potential for cumulative / in-combination effects on SEA topics between the Recommended Design of the draft HND Implementation Plan and other plans or programmes.

Table 39 lists plans and programmes that have been considered for cumulative / in-combination effects with the draft HND Implementation Plan. Marine plans and spatial plans have been considered where identified route corridors that are part of the Recommended Design of the draft Plan interact with these areas.

At this strategic plan level there is insufficient detail to fully assess cumulative and in-combination effects with other strategic-level plans as, although route corridors have been identified, there are no confirmed designs or methodologies for each of the cable routes. Relevant Plans should be considered and assessed further for the potential for cumulative and in-combination effects at the project level, as relevant.

Plans and Programmes considered for cumulative / in-combination effects

Plan	Type	Description	HND Implementation Plan Areas	Potential for cumulative / in-combination effects
Scottish Sectoral Marine Plan for Offshore Wind Energy 2025	Marine Plan	This plan aims to identify sustainable options and provide a strategic framework for the future development of offshore wind energy in Scotland.	Identified route corridors that are part of the Recommended Design for HND1, HNDFUE ScotWind and HNDFUE INTOG in Scottish waters	The HND Implementation Plan has aimed to align with the aims of this plan by identifying the most appropriate space for connection of energy infrastructure at a strategic level.
English Marine Plans (North East, East, South East, South, South West and North West Plans)	Marine Plan	These plans set out a policy framework to inform decision making regarding activities taking place in the marine environment. Together they create a complete and integrated marine planning framework for England to manage the marine environment is used, developed, protected and enhanced	North West Plan - Identified route corridors that are part of the Recommended Design for HND1 South West Plan – Identified route corridors that are part of the Recommended Design for Celtic Sea North East Plan - Identified route corridors that are part of the Recommended Design for HND1 and HNDFUE ScotWind East Plan – Identified route corridors that are part of the Recommended Design for HND1 and HNDFUE ScotWind. This plan is currently being reviewed and updated. South East Plan – Identified route corridors that are part of the Recommended Design for HNDFUE ScotWind	The HND Implementation Plan has aimed to align with the aims of these plans by identifying the most appropriate space for energy infrastructure at a strategic level. There is greater potential for cumulative effects across SEA topics as the marine area becomes busier, therefore consideration of the right thing in the right place is important. Other activities and users of the English marine area are considered and assessed as part of the SEA assessment through consideration of a broad range of indicators and consideration of sensitivities.

Plan	Type	Description	HND Implementation Plan Areas	Potential for cumulative / in-combination effects
			South Plan - Identified route corridors that are part of the Recommended Design for HNDFUE ScotWind	
Strategic Spatial Energy Plan (SSEP)	Spatial Plan	This is a GB-wide plan that will map potential zonal locations, quantities and types of electricity and hydrogen generation and storage over time. The environmental assessments for this plan, comprising SEA, HRA and MCZ, will cover onshore and offshore generation (spatial zones).	All identified route corridors that are part of the Recommended Design for the draft Plan	The SSEP is an overarching plan to the HND Implementation and the driver to the consideration of offshore coordination. The SSEP and HND Implementation Plan will be in alignment and no cumulative / in-combiantion effects are expected.
Welsh National Marine Plan	Marine Plan	This is a marine plan for the inshore and offshore Welsh marine plan regions. It supports the sustainable development of the Welsh marine area.	Identified route corridors that are part of the Recommended Design for HND1 and HNDFUE Celtic Sea in Welsh waters	The HND Implementation Plan has aimed to align with the aims of this plan by identifying the most appropriate space for energy infrastructure at a strategic level. There is greater potential for cumulative effects across SEA topics as the marine area becomes busier, therefore consideration of the right thing in the right place is important. Other activities and users of the Welsh marine area are considered and assessed as part of the SEA assessment through consideration of a broad range of indicators and

Plan	Type	Description	HND Implementation Plan Areas	Potential for cumulative / in-combination effects
				consideration of sensitivities.
National Marine Plan for Scotland	Marine Plan	This plan aims to provide a strategic framework for managing all developments, activities and interests in or affecting Scotland's marine area (territorial and offshore waters).	Identified route corridors that are part of the Recommended Design for HND1, HNDFUE ScotWind and HNDFUE INTOG in Scottish waters	The HND Implementation Plan has aimed to align with the aims of this plan by identifying the most appropriate space for energy infrastructure at a strategic level. There is greater potential for cumulative effects across SEA topics as the marine area becomes busier, therefore consideration of the right thing in the right place is important. Other activities and users of the Scottish marine area are considered and assessed as part of the SEA assessment through consideration of a broad range of indicators and consideration of sensitivities.
National Planning Framework 4	Spatial Plan	This is the national spatial strategy for Scotland. It sets out the spatial principles, regional priorities, national developments and national planning policy.	Identified route corridors that are part of the Recommended Design for HND1, HNDFUE ScotWind and HNDFUE INTOG in Scottish waters	The HND Implementation Plan has aimed to align with the aims of this plan, including areas of support for renewable energy generation and transmission infrastructure. Other activities and users of the Scottish land area are considered and assessed as part of the SEA assessment through consideration of a broad range of indicators and consideration of sensitivities.

Plan	Type	Description	HND Implementation Plan Areas	Potential for cumulative / in-combination effects
Joint Fisheries Statement and Fisheries Management Plans	Management Plan	Set out policies that aim to achieve the objectives for fisheries as established in Section 2 of the Fisheries Act 2020. Lists Fisheries Management Plans to be delivered over the lifetime of the Statement.	All identified route corridors that are part of the Recommended Design for the draft Plan	The Joint Fisheries Statement and Fisheries Management Plans to be published aim to deliver more sustainable fisheries and consideration of the environment. Whilst fishing activity has the potential for cumulative environmental effects with the development of offshore cabling, greater environmental consideration within fisheries objectives and mininimisation of potential environmental effects through the SEA, HRA and recommendations of HND Implementation Plan will reduce the potential for cumulative effects.
Local Authority Local Plans	Spatial Plan	Establish the future plans relating to the type and scale of development within the plan area.	All identified route corridors that are part of the Recommended Design for the draft Plan	Local area plans were considered as part of the onshore routing and options development, in consideration of available space for new infrastructure. The potential for cumulative or in-combination effects will need to be considered at the project level, when details of designs or methodologies for each of the cable routes are known and when temporal planning of the proposed developments is further clarified.

Plan	Type	Description	HND Implementation Plan Areas	Potential for cumulative / in-combination effects
Shoreline Management Plans		Set out a planned approach to managing flood and coastal erosion risk along the coast.	All identified route corridors that are part of the Recommended Design for the draft Plan	The potential for cumulative or in-combination effects will need to be considered at the project level, when details of designs or methodologies for each of the cable routes are known.

Table 39: Plans considered for cumulative / in-combination effects

10. Mitigation and Monitoring

10.1 Mitigation

10.2 Monitoring



10.1 Mitigation

Mitigation measures have been recommended where potential negative effects on environmental topic areas have been identified from implementation of the draft HND Implementation Plan. At a Plan level, the main degree of mitigation has been to avoid sensitive features as far as possible to minimise impacts through the use of BRAG ranking. Project level assessment should fully consider the issues highlighted in the assessments, including the potential issues highlighted for cumulative / in-combination effects. At the project level, the further actions of reduce and mitigate must be used, with these recommended mitigation measures aiming to prevent, reduce and, as fully as possible, offset any significant adverse effects on the environment due to implementation of the draft HND Implementation Plan. The mitigation measures that have been put forward in the draft HND Implementation Plan and SEA processes will be included within the draft HND Implementation Plan and will be undertaken in the course of its adoption, pending the outcome of public consultation. Mitigation measures detailed at this strategic Plan level should be considered at the individual project level, depending upon the specific sensitivities, receptors and pathways impacted by development, which will be informed by project level assessments. The implementation of any such mitigation measures must be appropriate and feasible to the specific project.

10.1.1 General Mitigation

The iterative development of the draft HND Implementation Plan and SEA, involving the mapping and modelling of constraints, including environmental constraints, and review and refinement in consultation with key stakeholders, has helped to focus the plan through the identification of lower constrained areas that can avoid the areas of highest environmental risk. This has included the application of the mitigation hierarchy with regard to Biodiversity, Flora and Fauna of avoid, minimise, restore and compensate which should be adhered to at the individual project level. All potential impacts should aim to be avoided where possible, if this cannot occur, appropriate and specific mitigation measures must be implemented relevant to the potential impacts, which should underpin restoration aims alongside any biodiversity net gains. If there are remaining impacts which cannot be avoided or mitigated against, compensation measures may be required by SNCBs, with strategic consideration as to the most appropriate type and location of any appropriate compensation. aligned with wider species and habitat conversation strategies. Such compensatory measures may be variable in their nature and should be picked appropriately according to the specific species and habitats impacted, but may include the creation of new habitats, nesting locations, wider habitat restoration efforts, efforts to remove existing marine pollution, predator management, or supplementary feeding. The measures should be designed to focus on the ecological features as well as geological / geomorphological features with an aim to restoration to an equivalent or greater level of ecological function (Parker et al., 2025a). Consideration should be given to the potential for the effects of climate upon identified impacts (e.g., alterations to cable exposure through changing wave and sediment regimes which may lead to indirect

impacts on seabed habitats and/or species, and water quality) and how this should be considered within implemented mitigation measures.

The principal SEA mitigation recommendation is that the predicted negative effects on the environment, identified in this report, should be considered further during the next stage of planning, refinement, and design for projects, when the specifics of the development infrastructure options and cabling routes can be optimised through detailed feasibility studies and design in order to limit identified impacts on sensitive receptors.

Existing marine infrastructure should be avoided, where possible, or planned to minimise the number of cable crossings and rock deposits required for cable and pipeline crossings, particularly within MPAs.

Areas have been identified in Section 9.2.1, where independent projects associated with implementation of the draft HND Implementation Plan could interact with each other and/or with other known planned infrastructure at construction stage and/or in the long-term operational stage, and where there is the greater potential for in-combination or cumulative negative effects to be considered at this strategic stage owing to a concentration of cables and potential bottlenecks, and avoidance of designations and other environmental sensitivities, and which would need to be taken into consideration at the detailed project planning and design stage. To minimise the potential environmental and navigational adverse effects, including minimisation of the cumulative footprint and disturbance, cable routing and protection strategies should be coordinated between developers, transmission owners/operators and other seabed users, including active consideration of shared cable protection and joint corridor-management arrangements.

At the project planning stage, further environmental studies based on the more detailed designs and construction methodologies should be undertaken as appropriate. These studies may involve, but are not limited to, marine and terrestrial ecology surveys, marine and terrestrial mammal surveys, ornithological and bat surveys, fish surveys, seascape, landscape and visual impact assessments, MCZ assessments, WFD assessments, geotechnical investigations and heritage surveys. Further Appropriate Assessment, to meet the requirements of the Habitats Directive, for the detailed designs and construction methodologies will be required at the project level, where potential impacts have been identified in this SEA and accompanying HRA Report for the draft HND Implementation Plan. Reference should be given to Parker et al. (2025a) with regards to the specific standards and processes to be undertaken for the collection of data for offshore developments. Data gathering for baseline characterisation will consist of a desk-based study using existing dataset gathering to assess population abundance and density for marine mammals and birds and provide information on benthic habitats, followed by site-specific surveys of which the survey type, timing and equipment used should be informed by any previous data gathering to ensure full data coverage and consultations on data evidence gaps in combination with statutory nature conservation bodies (SNCBs)/other relevant groups. Datasets of relevance for marine mammals should include, but not be limited to, SCANS IV surveys, the Marine Mammal Management Units, and previous surveys (see The Joint Cetacean Data Programme) in the relevant areas. Recently inclusion of digital aerial surveys for marine mammals and birds as well as underwater imagery for fish and benthic surveys as this provides a permanent record of

observations. Further details in specific survey methods, sampling approach, design and appropriate variables of interest and best practice for baseline characterisation surveys are provided in Parker et al. (2025b). Where suitable, non-UK populations should be included in assessments where there has been an assessment determined of sufficient connectivity, information should be presented both with and without this additional non-UK populations (Parker et al., 2025c). Best practice recommended by Natural England and JNCC includes submitting all survey data to the Marine Data Exchange.

Before any works are carried out, detailed method statements and management plans (construction and environmental) should be prepared, detailing timing of works, information on the specific mitigation measures to be employed for each works area, and mechanisms for ensuring compliance with environmental legislation and statutory consents. At the project level, this should include considerations on any new emerging technologies and the most up-to-date guidance, including the Reducing marine noise Policy Paper (DEFRA, 2025b) and the Marine environment: unexploded ordnance Joint Position Statement Policy Paper (UK GOV, 2025).

Contractors should be required to prepare Construction Environmental Management Plans (CEMPs), which would include a requirement for related plans to be prepared, as appropriate, for project implementation, such as Erosion and Sediment Control, Invasive Species Management, Emergency Response, Traffic and Safety Management, Dust and Noise Minimisation, and Stakeholder Communication Plans. It should also be noted that large parts of England are affected by water scarcity issues and the potential for construction works to impact on water availability and potential for over-abstraction to impact on habitat conditions, water availability and timing of construction works should be considered at the project level such as using water resource management plans to determine where water resources are constrained. Works should only be carried out once the method statements have been agreed with competent authorities. Construction method statements should be agreed prior to the commencement of licenced activities under a Marine Licence.

In line with the mitigation hierarchy, designated sites should be avoided in the first instance. If this is not possible then all efforts should be made to avoid features within the sites as a priority. Following that, mitigation measures should be used to reduce the impacts on designated features as much as possible. Further mitigation of impacts can be realised where burial is achievable and likely to remain buried throughout the lifetime of the cable and crossings are minimised. Given predicted climate change and potential acceleration of this, there should be careful consideration of future physical environmental conditions when considering cable burial requirements, particularly in areas with mobile seabed features. Projects may be subject to further Appropriate Assessment where potential impacts have been identified in this SEA and accompanying HRA Report. Where there may be unavoidable impacts on protected habitats and/or species the necessary derogation licences should be applied for prior to seeking planning permission or approval for a project. Consultation should also be undertaken with appropriate SNCBs as well as following government guidance and information such as that published by JNCC, Natural England and MD-LOT, this can include information relating specifically to designate sites as published under JNCC Advice on Operations

Guidance (JNCC, 2018) which details relevant site plans and any specific conservation advice. This provides information for various marine activities and provides a sensitivity score for the protected features for each activity and pressure combination. If an activity is not listed which is suitable to represent the proposed development, contact should be made with JNCC for further advice following project level assessment. JNCC have developed a Pressures-Activities Database (PAD) for UK inshore and offshore waters which has assessed the evidence base for 112 marine-based human activities and their associated pressure impacts based on OSPAR. This should be consulted in associated with any designated site information to consider potential pressure activities and impacts arising from development at the project level (JNCC, No Date).

Marine construction work generally has the greatest potential for negative impacts during spawning/breeding and early nursery periods for aquatic and marine protected species. Mitigation should be determined following an assessment of the potential impacts of a project, and mitigation may include avoidance or modification of work during sensitive periods. Consultation should be undertaken with the appropriate authorities in this regard.

Monitoring of project-level mitigation measures may differ between industries and projects and should be undertaken as agreed with the relevant regulators and SNCBs to ensure effectiveness. Where possible, and in consultation with the relevant regulators and SNCBs, monitoring plans should be flexible in design to consider new technologies as well as focus on acting with strategic level monitoring for collaboration purposes of any data collection and sharing best practice information (Parker et al., 2025d).

All works and planning of works should be undertaken with regard to all relevant legislation, licensing and consent requirements, and recommended best practice guidelines. An ecological clerk of works should be appointed for environmental management of each development, and where specific sensitive species may be impacted, an appropriate expert should also be appointed.

Biodiversity restoration and enhancement opportunities should be factored into the implementation of development projects, wherever possible. At a project-level, Biodiversity Net Gain (BNG) and marine restoration opportunities in advance of Marine Net Gain (MNG) being implemented should be considered where possible, the degree of net gain will depend on the specific area and its associated impacted habitats and species. Following cable installation and associated in-filling, it is likely that a degree of habitat restoration will occur naturally, potential BNG or marine restoration should aim to enhance and maximise this restoration.

The timing of construction and maintenance works should be planned to avoid any potential for negative cumulative impacts or inter-relationships with other schemes, plans or projects, yet look to optimise any potential positive cumulative impacts or inter-relationships. Activities should be coordinated temporally, where possible, where these may affect sensitive receptors e.g., coordinated planning of noisy activities such as UXO or seismic surveys to ensure that noise thresholds for SACs designated for Harbour porpoise are not exceeded.

The UK Government aims to reduce marine noise under pledges and commitments made in the Marine Strategy Regulations 2010 and the UK Marine Strategy (DEFRA, 2025a). Given

the large numbers of UXO present in the marine environment following both World Wars, there is potential for marine developments to encounter these, previously clearance of UXO has occurred using high order detonation. However, emerging technologies have allowed for low noise order clearance through deflagration which will burn the UXO explosive material, this has been outlined in the Joint Position Statement from the UK Government, devolved governments and relevant statutory bodies of the Marine Environment: unexploded ordnance clearance (UK GOV, 2025). This will reduce any resulting blast and reduces associated impacts from high order clearance such as seabed damage and injury/disturbance on marine species new methods. High order clearance methods should be used as a last resort for situations where low noise order clearance has failed, or where expert opinion is that the UXO is not a suitable candidate for all known low order technologies due to degradation of the UXO and/or prohibitive environmental conditions, in line with the Joint Position Statement of the Marine environment: unexploded ordnance clearance (UK GOV, 2025).

Mitigation should consider both marine mammals as outlined in JNCC guidelines for minimising the risk of injury to marine mammals from unexploded ordnance (UXO) clearance in the marine environment (JNCC, 2025) list a series of mitigation measures that should be considered as a minimum where there is potential for explosive clearance as well as benthic habitats. Considerations for mitigation regarding areas near designated sites should be on a case-by-case basis with consultations with appropriate regulators and SNCBs. Elsewhere, standard mitigation measures should be used as outlined in JNCC (2025) guidelines on minimising the risk to marine mammals from UXO, such as mitigation zones, which should be determined as the full extent within which auditory injury may occur or within a 1km radius, whichever is larger. UXO clearance should take place during daylight, employ at least two Marine Mammal Observers and a pre-clearance visual search of the area must be undertaken at least 1 hour prior to the clearance. Where applicable PAM (Passive Acoustic Monitoring) and ADD (Acoustic Deterrent Devices) may be used with regard to the use of Effective Deterrence Ranges (EDRs) for particular species to help inform disturbance distances. Marine mammal detection will require a delay to clearance for suitable times to allow the marine mammals to leave the area and visual monitoring should continue during clearance and for at least 15 minutes after clearance to determine any potential impacts to marine life such as injury or death. Further research is required for the potential for chemical contamination following UXO clearance from low order clearance methods of deflagration due to the potential for leakage of explosive materials which are not fully burned or from the release of chemicals during the burn process, therefore recovery of any potential seafloor debris should be considered best practice to mitigate the risk.

10.1.2 Mitigation by Environmental Effect

Table 40 provides environmental effect specific mitigation measures that should be considered at the project stage development of the Recommended Designs from the draft HND Implementation Plan to minimise the potential for any negative effects on the wider environment. These mitigation measures should be considered and adopted, where relevant, through the next stages of more detailed design/feasibility and project level study.

SEA Mitigation Measures

SEA Topic	Potential Impact	Proposed Mitigation
Biodiversity, Flora and Fauna	**Offshore Cabling**	
	Impacts on designated sites	Mitigation during the project planning phase to avoid designated areas for development. Screening for Likely Significant Effects where European Sites may be affected, with appropriate assessment undertaken where Likely Significant Effects are identified. All potential projects must ensure compliance with the requirements of the Habitats Regulations and Offshore Habitats Regulations (further mitigation is given in Table 41 for European Sites). It is recommended that MCZ assessments should also be undertaken at the project-level where applicable. If designated sites cannot be avoided, suitable mitigation steps should be chosen.
	Direct damage to benthic habitats and species from preparation of cable routes. Including potential for damage to shellfish or supporting fish species habitats.	Mitigation during the project planning phase through the avoidance of areas of benthic ecological importance, particularly areas where protected habitats and species are present. Where possible, the original sediment/habitats should be reinstated to facilitate natural restoration and habitat recolonisation as well as promote BNG and voluntary marine restoration opportunities in advance of Marine Net Gain or Marine Net Benefit (in Wales) being implemented. Consideration should be given at the project level to mitigation that reduces impacts within periods of vulnerable life stages such as annual migrations or known spawning periods.
	Direct loss of benthic habitats and sedentary species in footprints of hard cable protection. Including potential for long-term loss of shellfish habitats and supporting fish species habitats e.g., spawning, foraging and nursery grounds, or damage to supporting habitats for other marine species. Indirect loss of benthic habitat through scour around cable protection during operation.	Project planning mitigation should aim for cable installation in areas where non-sensitive habitats or species are present. Determining the use of compensatory measures should follow the mitigation hierarchy to reduce and mitigate prior to consideration of compensation. Such measures may include micrositing, placement of rock protection utilising a fallpipe (for more accurate placement), utilising backfill material that is similar to the existing substrate, techniques that improve burial success, design slope of berm to facilitate migration etc. Where appropriate, project mitigation measures may consider the creation of compensatory habitats for areas that are lost e.g., within inter-tidal areas, or the use of habitat enhancement such as developing population aggregation and refuge habitat areas, within the project planning phase.

SEA Topic	Potential Impact	Proposed Mitigation
		Additional data sources should be consulted, as appropriate to the project area e.g., for the Celtic sea area, outputs from the PELTIC surveys conducted by Cefas and spawning and nursery grounds as reported by Campanella & van der Kooij 2021. During project planning, the volume of rock used for cable armouring should be planned as the minimum required (based on the worst-case scenario) to ensure appropriate cable protection, whilst minimising habitat loss. This should also be a consideration at decommissioning. Where installation may be within a site where byelaws for fisheries are in place prohibiting bottom towed gear, rock protection may not be required. All potential projects must ensure compliance with the requirements of the Habitats Regulations and Offshore Habitats Regulations, and the Marine and Coastal Access Act 2009. The appropriate statutory nature conservation body should be consulted where supporting habitats of designated species could be adversely affected (damage, destruction or obstruction to habitats required for shelter or protection of species protected by Schedule 5 of the Wildlife and Countryside Act 1981 (as amended) is an offence; where impact cannot be avoided or mitigated, a licence may be required for operations).
	Indirect loss or damage to sensitive habitats and species in the vicinity of cable routes e.g., due to release of sediments (including contaminated sediments). Including potential for short-term indirect damage or smothering of shellfish habitats or fish spawning grounds, or alteration of foraging or social behaviours due to turbidity.	As above, project planning mitigation should aim for installation in areas where non-sensitive habitats or species are present. Areas of known potential contamination should be avoided. Risks to habitats and species should be avoided or minimised through project design and adoption of appropriate mitigation measures, such as careful route selection and use of suitable installation techniques. Mitigation during the project planning phase to avoid (or implement timing restrictions for) areas that may generate increased levels of suspended sediment (or use less disruptive cable installation methods e.g., plough installation) that coincide with areas of fish spawning grounds or sensitive species. Mitigation during the project planning phase could include suitable modelling of hydrodynamic and sediment transport processes. Information on sediment transport pathways will require further detail at the project level to assess potential effects and determine suitable mitigation to minimise effects within construction areas.

SEA Topic	Potential Impact	Proposed Mitigation
		Consideration should be given at the project level to mitigation that reduces impacts within periods of vulnerable life stages such as annual migrations or known spawning periods. All such measures will be captured in project specific implementation plans – such as Construction Environmental Management Plans (CEMPs), and subject to regulatory compliance. Where cable routes are proposed in proximity, coordination of cable routing, and protection is recommended between developers/operators to reduce the potential for cumulative effects.
	Effects of colonisation of hard cable protection material: potential for long-term community alterations. Direct loss of benthic habitats and species if colonised cable protection material is removed at decommissioning.	Mitigation during the project planning phase should consider how potential alterations in community structure may impact wider ecosystem functioning and communities. Ecological survey work to inform project planning, and appropriate communication with environmental consultees. Measures to mitigate this impact may include utilising similar substrate to the surrounding area and adopting Invasive Non Native Species (INNS) biosecurity best practice. Mitigation measures during the project planning phase should consider the decommissioning activities that will be used, and whether removal of cable protection material or cables themselves is required or could result in additional habitat loss (that from pre-construction and decommissioning periods). This will require a consideration of the lifecycles of materials used and the overall potential for degradation/release of toxic compounds.
	Introduction of non-native/invasive species.	At the project planning phase, pre- and post-construction surveys for invasive/non-native species should be undertaken in areas of known risk and, if found to be present, an Invasive Species Management Plan should be prepared and a Code of Good Practice, which outlines controls and/or removal measures to ensure that species are not spread during the project's construction or operation. Developers should be aware of the potential for offences in this regard under the Wildlife and Countryside Act 1981 (as amended). Introduction of non-native species from vessels during construction, operation, and decommissioning should be mitigated through adherence to the objectives of the IMO International Convention for the Control and

SEA Topic	Potential Impact	Proposed Mitigation
		Management of Ships' Ballast Water and Sediments, which requires all ships to use a Ballast Water Management Plan, have a Ballast Water Record Book, an International Ballast Water Management Certificate, and conduct a ballast water exchange at least 200nm from the coast and in a water depth of at least 200m. A Biosecurity Plan should be adopted for the construction, maintenance and decommissioning for vessels involved, with strict cleaning of equipment and machinery and strict management protocols to combat the spread of invasive species.
	Deoxygenation and introduction of microbial pathogens from construction vessels/associated activities	There is potential for deoxygenation to occur from the release of ballast water in construction vessels which have any been stagnated or else deliberately deoxygenated for treatment of any non-indigenous species which may lead to a temporary lowering of oxygen levels with impacts on species and habitats dependent on specific conditions. Untreated or insufficiently treated effluent discharges & run-off from terrestrial sources & vessels may also lead to deoxygenation. Microbial pathogens may potentially be released from ballast water or other discharges from construction processes which may have environmental implications and impact indigenous populations.
	Adverse effects on species due to EMF generation e.g., on benthic species, fish, marine mammals.	Risks currently associated with EMF generation for marine life are not considered to be significant at a population level, however, research has indicated that increased data is required for understanding anthropogenic EMF environmental standards. Accepted mitigation measures at the project planning phase include the configuration and orientation of cables to reduce the field strength of EMF generation. Cable burial to a depth of 1-3m may also be used to reduce EMF through increased separation distance from marine organisms, however the process of burial should be considered regarding any environmental effects. The need for further mitigation should be considered during project planning such as through identifying migratory routes and avoidance of placing EMF-generating cables within these areas, particularly for elasmobranch marine species to avoid potential barrier effects as the effects are uncertain and the degree of risk varies for species (Hermans et al., 2024). Where cable routes are proposed in proximity, coordination of cable routing, and protection is recommended between

SEA Topic	Potential Impact	Proposed Mitigation
		developer/operators to reduce the potential for cumulative effects.
	Adverse effects on habitats and species due to alteration of hydraulics, hydrodynamics or sediment dynamics around protective structures and surface laid elements of cables during operation.	Mitigation during the project planning phase to ensure appropriate modelling of hydraulic regimes is undertaken and anticipated effects are assessed in relation to the presence of sensitive habitats and species within development areas.
	Adverse effects on species due to noise impacts during pre-construction (e.g., geophysical surveys, UXO clearance), cable installation and decommissioning. Including injury, behavioural, physiological, disturbance or displacement effects on marine mammals, fish, and birds.	At the project planning phase, geophysical surveys should be appropriate to the project needs and planned as the least intrusive, taking into account appropriate mitigation for sensitive species. Where possible, surveys and operations should be timed to avoid sensitive periods. It is important during project planning phases to have spatial and temporal considerations of other relevant simultaneous construction activities to minimise impacts. The primary impact on marine mammals would be that of underwater sound, from geophysical surveys prior to cable burial and UXO clearance (where required). Project-level assessments should therefore consider the impacts from this, with noise modelling conducted to determine the range at which marine mammals could potentially experience auditory injury. A Marine Mammal Mitigation Plan (MMMP) may be required, on which JNCC should be consulted, including a commitment to adhering to the relevant JNCC Marine Mammal Mitigation guidelines. The use of trained Marine Mammal Observers before commencing noisy surveys is advisable with the use of Passive Acoustic Monitoring (PAM) if surveys are due to commence during hours of darkness or low visibility (JNCC, Natural England and Countryside Council for Wales. 2010). If marine mammals are observed, it is recommended that surveys do not commence for 20 minutes to allow mammal dispersal from the area via the MMOs and PAM system tracking the mammals. The duration of the pre-search and mitigation zone depends on the activity, and additional passive acoustic monitoring systems may complement MMOs. Avoidance of UXO should be prioritised over clearance. Whenever possible, UXO should be left in-situ, 'lift and

SEA Topic	Potential Impact	Proposed Mitigation
		shift' methodology used, or rendered harmless with disposal using low-noise methods that require the use of explosive material to effect clearance but in much smaller volumes compared to requirements high order detonation. All aim to render UXOs inert without resulting in a high order detonation. There should be clear justification whenever such methods are not used, and high order detonation is required. JNCC recommend that UXO clearance is applied for in separate marine licences rather than included in DCOs. Where PAM is used, the JNCC guidelines for the use of PAM (JNCC 2023) should be followed. Mitigation measures such as consideration and reduction of noise emissions from installation methods where feasible e.g., use of jetting measures of lower sound production compared to the use of plough systems for trenching which generate higher noise and careful planning to minimise the impact of the temporal and spatial overlap between marine mammals and construction activity. Mitigation during project planning phases for construction and decommissioning to ensure that the number of vessels and noise generation on a cumulative basis is necessary for each phase of construction. Ensure management of vessel presence considers the necessity of each specific noise/vibration generation and, where possible, use noise abatement measures to reduce the input of anthropogenic noise. Where there is the potential for cumulative short-term negative effects on harbour porpoise within designated sites, JNCC guidelines should be adhered to, and individual developers could liaise with other operators to coordinate noisy activities wherever possible and ensure daily noise thresholds are not breached. Developers should, where possible, avoid noisy operations during the seasonal period of greater harbour porpoise abundance in the relevant SACs, when noise disturbance management applies. Specific bird species can be disproportionally impacted by cabling works due to their sensitivities to displacement (NRW, 2025b). Project level assessment should consider the specific species and their foraging distances which may be impacted by development with suitable mitigation measures in place such as the timing of construction works to minimise impacts and use of up-to-date data to inform modelling process (Evans and Waggitt, 2023). Specific species may have certain

SEA Topic	Potential Impact	Proposed Mitigation
		distances applied regarding their sensitivity to the displacement which should be adhered to following project level assessment (JNCC, 2022). Consideration should be given at the project level to mitigation that reduces impacts within periods of vulnerable life stages such as annual migrations or known spawning periods
	Collision risks for marine mammals, fish and birds with vessels and machinery during pre-construction, installation, and decommissioning.	Mitigation in the project planning phase to consider key areas of use and migratory routes, including through appropriate surveys and consultation with key stakeholders and groups. Relevant seabird tracking data registered on Birdlife International Seabird Tracking Database, https://data.seabirdtracking.org should be considered. Monitoring for the presence of marine mammals may be required, as determined on a case-by-case basis. Further mitigation includes the enforcement of speed limits for installation, maintenance, and decommissioning vessels in areas of high marine mammal or fish species abundance. A vessel management plan may be required, including a commitment to slower speeds and following regular routes wherever possible. Mitigation with temporal activity planning with night-time considerations for construction and maintenance vessels, for vessels involved in cable laying activities when birds are more vulnerable to collisions.
	Short-term disturbance and displacement for species e.g., marine mammals, birds, due to presence of vessels and machinery, and use of artificial lighting in construction and decommissioning phases.	At the project planning phase, construction and decommissioning phases should be avoided in periods of the year known to be important for bird breeding or specific stress-related times of year e.g., during moults. Where possible the planning of developments should avoid the breeding season to minimise impacts on these areas and where this cannot be avoided, construction timing should be well planned and works duration, and invasive workings should be kept to a minimum in these areas. Monitoring during the project planning phase for mitigation to understand trends in site populations and displacement effects with developments. Mitigation during the project planning phase with considerations of the location and timing of works (e.g., daily/seasonal periods which may be important for certain species such as fish species moving to the surface during daily periods or seasonal breeding periods) to reduce impacts on migration and breeding. Where this

SEA Topic	Potential Impact	Proposed Mitigation
		cannot be avoided, construction timing should be well planned and works duration, and invasive workings should be kept to a minimum in these areas. Avoidance of installation during turtle migration periods and avoidance of turtle migration routes can also be used to reduce the risk of displacement. Mitigation measures for reducing impacts on birds, particularly migratory birds, from lighting used on vessels may be considered at the project stage, as relevant e.g., removal of steady state red lights for flashing lights or green down-lights to reduce upward light transmission or the use of radar-activated lighting to only switch on lighting whenever aircraft are near vessels involved in installation.
	Adverse effects on marine species due to the generation of heat by installed cables.	Mitigation at the project planning phase through cable burial to a suitable depth may help to prevent localised water column temperature fluctuations.
	Onshore Cabling	
	Impacts on designated sites.	Mitigation during the project planning phase to avoid designated areas for development. Screening for Appropriate Assessment where European Sites may be affected - all potential projects must ensure compliance with the requirements of the Habitats Regulations (further mitigation is given in Table 41 for European Sites). If designated sites cannot be avoided, suitable mitigation steps should be used.
	Direct loss of coastal habitats with pre-construction clearance and construction works for cabling landfall. Direct loss of, or damage to, terrestrial habitats along cable routes, including rare and sensitive habitats and potential for effects on species that depend on these habitats. Short-term habitat loss, damage, alteration or fragmentation.	Scoping of relevant specialist ecological surveys during the detailed planning stage and prior to any construction works. An Ecological Clerk of Works (ECoW) should be employed, as appropriate, during the construction phase. Development and implementation of a Construction Environmental Management Plan (CEMP). Avoidance of notable habitats through micro-siting and use of Horizontal Direction Drilling (HDD) technology. Restricted working areas should be imposed to ensure minimal disturbance to sensitive habitats and vegetation clearance should be kept to a minimum. Following construction, replanting, landscaping, natural revegetating and habitat enhancement should be undertaken in line with appropriate guidelines that aim to improve local biodiversity and wildlife. This is likely to provide for medium and long-term benefits to the biodiversity, flora and fauna near the working areas.

SEA Topic	Potential Impact	Proposed Mitigation
		Where possible, original sediment / soil should be reinstated to original levels to facilitate natural restoration and recolonisation of habitats.
	Introduction of soil-borne diseases or pests, or the introduction/spread of invasive, non-native species.	Cleaning of equipment and machinery along with strict management protocols to combat the spread of invasive species. Pre- and post-construction surveys for invasive species may be recommended in areas of known invasive species risk. If invasive species are found to be present, an Invasive Species Management Plan should be prepared to outline control and or removal measures to ensure such species are not spread during construction or operation of any future projects.
	Pollution of the terrestrial environment from construction materials or fuel/chemical spills. Pollution / siltation of watercourses during construction.	Development and implementation of a CEMP and related best practice pollution avoidance measures. Consultation with relevant stakeholders at the project planning stage. The planning of developments should aim to avoid known aquatic nursery or spawning grounds. Where these cannot be avoided, construction timing should be well planned with the works duration and any invasive workings should be kept to a minimum in these areas. Any works involving open cut crossings should be carried out during the period May to September to avoid interruption of salmonid spawning runs, spawning, incubation of eggs and the early developmental stages.
	Injury or mortality to mammals, reptiles, birds and bats during construction due to vehicle collision and the presence of open compounds, and direct loss of nests/young birds during vegetation clearance.	Scoping of relevant specialist ecological surveys during the detailed planning stage and prior to any construction works. A European Protected Species (EPS) licence will be required where works may impact these species, and agreement of any species protection planning with the relevant SNCBs. An ECoW should be employed, as appropriate, to during the construction phase. Development and implementation of a CEMP and Construction Traffic Management Plan (CTMP) during construction, which should include best practice guidance to avoid, minimise and mitigate effects on the environment during construction, and which should provide principles for the safe operation of construction vehicles. This will reduce the risk of injury and/or mortality during construction. Where applicable, prior to any vegetation clearance, an ecologist should be contracted to undertake a 'pre-vegetation clearance' survey for signs of nesting birds and important species. Should important species be

SEA Topic	Potential Impact	Proposed Mitigation
		found during surveys the sequential approach of avoid, reduce or mitigate should be adopted to prevent significant impacts. Restricted working areas should be imposed to ensure minimal disturbance to sensitive habitats and vegetation clearance should be kept to a minimum. Vegetation clearance involving nesting habitats should only occur outside the main breeding bird season from September to March.
	Disturbance and displacement to mammals, reptiles, birds and bats through lighting (and associated light spill), noise, vibration, pollution or vehicle movements during construction and decommissioning phases along onshore cable route and landfall sites. Potential for disturbance and displacement of fish and amphibians from noise and vibration (particularly from horizontal directional drilling (HDD) use) from works near to waterways.	As for potential impact of injury or mortality. For works involving significant vibration such as HDD, relevant stakeholders (such as fisheries boards) should be consulted prior to construction and suitable mitigation measures should be agreed prior to works being undertaken.
	Onshore Substations / Converter Stations	
	Impacts on designated sites.	As for onshore cabling.
	Direct loss of, or damage to, terrestrial habitats within the construction area, including rare and sensitive habitats and potential for effects on species that depend on these habitats. Short-term habitat loss, damage, alteration or fragmentation.	As for onshore cabling. The selection of onshore substation/converter station sites should be influenced by prioritising avoidance of important and sensitive habitats. Relevant targeted ecological surveys should be undertaken prior to construction and micro-siting as required to relocate works away from important or legally protected habitats and species features.

SEA Topic	Potential Impact	Proposed Mitigation
	Construction phase disturbance and displacement of mammals, birds and bats due to vehicle movements, light, noise and vibration. Disturbance of fish and amphibians if works in/near watercourses.	As for onshore cabling.
	Operational phase displacement of due to the presence of the infrastructure, and disturbance due to increased lighting, noise, and vibration pollution, which can arise from the operation and maintenance activities at the converter station / substation.	Development and implementation of a Lighting Management Plan (LMP), as required. A plan should be developed and implemented during operation of the substation/converter station which considers lighting regimes, noise and vibration pollution. This may include modelling of potential impacts and considerations made on how to minimise these effects during the design of the substation/converter station such as the use of vegetation plantation for screening of light pollution, subject to appropriate project level considerations of the local area. It may also include considerations on the undertaking of maintenance activities to minimise disturbance and displacement, which may include restrictions on the timing and duration of maintenance.
	Pollution of/physical change to watercourses and effects on aquatic species due to continued sedimentation from bare ground or accidental pollutant leaks during operation of the infrastructure.	As for onshore cabling. A plan should be developed and implemented during operation of the substation/converter station that details how fuels and other toxic substances should be handled and stored. An emergency procedure plan should be in place during operation that details the actions necessary in the event of a contamination incident.
	Introduction/spread of invasive, non-native species.	As for onshore cabling, cleaning of equipment and machinery along with strict management protocols to combat the spread of invasive species during operation and maintenance.
	Injury or mortality to mammals, reptiles, birds and bats during construction due to vehicle collision and the presence of open	As for onshore cabling.

SEA Topic	Potential Impact	Proposed Mitigation
	compounds, and direct loss of nests/young birds during vegetation clearance.	
Population and Human Health	**Offshore Cabling**	
	Short-term disturbance (noise and visual) to local populations and displacement of marine leisure and recreational users (e.g. recreational sailing, fishing, water sports and beach/coastal use) during construction, decommissioning and maintenance.	Mitigation during the project planning phase may include timing considerations e.g., construction and decommissioning noise occurring during daylight hours to avoid impacts on local population health, where local populations have potential to be affected. Regular communication with local communities is advisable to monitor complaints regarding noise and vibration emissions from construction works. To minimise impacts on recreational activity, suitable planning should occur during the project planning phase to avoid areas of key importance to mitigate against deterioration in leisure activity access. Suitable management during the project planning phase on the use of lighting during construction activities may be implemented, as relevant and required, to minimise potential impacts on nearby populations.
	Impacts on marine and coastal leisure and recreational users (collision risks with cable protection materials, particularly in shallow waters).	Any licensing and development of cabling should aim to ensure the minimisation of risks to other marine users and must be subjected to planning policy specific to such projects e.g., the UK Marine Policy Statement and Marine Plans for England, Scotland and Wales. See mitigation for 'Risk of entanglement of fishing gear and anchors along cable routes e.g., from cable protection armouring' under the Material Assets SEA topic. Suitable safety information should be communicated to the public through various communicative means.
	Onshore Cabling	
	Short-term access restrictions to coastal areas for marine and recreational users and local communities during construction. Direct disturbance and potential access restrictions to private properties. Temporary disturbance to/loss of	Establishment of effective communication with local communities such as through a Local Liaison Committee. Disturbances can be kept to a minimum with good working practices, planning and timing. Development and implementation of a CEMP which should include mitigation and monitoring measures and commitments, and which should detail standard best practice to reduce noise emissions during the construction phase.

SEA Topic	Potential Impact	Proposed Mitigation
	community land areas during construction and maintenance. Short-term disturbance (noise and visual, traffic, dust) to local populations during construction, decommissioning and maintenance/repairs.	Noise-producing activities such as excavation and piling should only take place during daylight hours and monitoring of these activities should be ongoing. Continued liaison with local communities is advised with regard to complaints concerning noise and vibration emissions resulting from construction works. Development of dust minimisation plans in advance of works. Dust suppression measures in place during construction, for example establishing appropriate speed limits over unmade surfaces and establishing wheel washing facilities on construction sites. Continued liaison with local communities is advised with regard to complaints concerning dust releases resulting from construction works. Development and implementation of a CTMP, which should detail traffic management planning to minimise road traffic impacts and access restrictions.
	Potential for major accidents (e.g. fires/explosions, chemical spills) during the construction or decommissioning processes.	Developments should be designed in accordance with industry good practice, and account for anticipated environmental conditions and receptors to minimise the potential for harm. Construction and operation should be managed through health and safety regulations, including the Construction (Design and Management) Regulations 2015 and the Health and Safety at Work etc. Act 1974. Development and implementation of a Pollution Incident Response Plan.
	Perceived risk of EMF generated by cables on human health.	Infrastructure should be designed to ensure it does not exceed the Government's adopted exposure limits and policies.
	Onshore Substations / Converter Stations	
	Exposure to hazardous contaminants during construction.	Developments should be designed in accordance with industry good practice, and account for anticipated environmental conditions and receptors to minimise the potential for harm. Construction and operation should be managed through health and safety regulations, including the Construction (Design and Management) Regulations 2015 and the Health and Safety at Work etc. Act 1974.

SEA Topic	Potential Impact	Proposed Mitigation
		Development and implementation of a Pollution Incident Response Plan should hazardous contaminants be released.
	Disturbance (noise, dust, light), to the local population during construction.	See mitigation for onshore cabling. Suitable management during the project planning phase on the use of lighting is required to minimise potential impacts on nearby populations.
	Disturbance (lighting, noise, vibration) during operation and maintenance of the substation/converter station.	Development and implementation of a Lighting Management Plan (LMP), as required. A plan should be developed and implemented during operation of the substation/converter station which considers lighting regimes, noise and vibration pollution. This may include modelling of potential impacts and considerations made on how to minimise these effects during the design of the substation/converter station such as the use of vegetation plantation for screening of light pollution, subject to appropriate project level considerations of the local area. It may also include considerations on the undertaking of maintenance activities to minimise disturbance and displacement, which may include restrictions on the timing and duration of maintenance.
	Demographic and socio-cultural changes due to construction workers and to workers during operation (e.g. access to housing, services).	Demographic and socio-cultural changes should be assessed as part of a socio-economic impact appraisal within EIAs for future developments projects associated with the draft HND Implementation Plan.
	Disturbance and temporary (construction phase) or permanent (presence of the station) land-take to private properties or loss of community land areas. Displacement or access restriction for recreational/leisure users during operation.	See mitigation for onshore cabling. To minimise impacts on recreational and leisure activity, suitable planning should occur during the project planning phase to avoid areas of key importance to mitigate against deterioration in leisure activity access.
	Offshore Cabling	
	Damage (direct or indirect) to designated	Mitigation during the project planning phase with the conduction of geophysical and geotechnical surveys to

SEA Topic	Potential Impact	Proposed Mitigation
Geology, Soils and Land Use	geological/geomorphological features within designated sites (WHSs, UNESCO Geoparks, MCZs, SSSIs), and other features of importance, during cable installation or decommissioning.	identify areas of key geological/geomorphological interest, with avoidance of these areas during development. Avoidance of rocky outcrops for installation is advisable for reducing potential impacts on geology and geomorphological features. Consultation with SNCBs where potential effects on designated features are identified during project planning.
	Loss of seabed sediments and change in morphology during installation and decommissioning. Alteration of sediment transport due to cable presence.	Modelling of hydrodynamic and sediment transport processes during the project planning phase. Information on sediment transport pathways will require further detail at the project level to assess potential effects and determine any appropriate mitigation. Minimise the dispersal of sediment e.g., through the use of bubble curtains. Decommissioning methods should be used that aim to minimise the amount of sediment generated.
	Seabed contamination during construction and operation.	During project planning, pre-construction surveys should be conducted to identify potential sources of seabed contamination, with avoidance of these areas for development. Project phase mitigation should also assess the degree of disturbance occurring on the seabed and, if appropriate, additional contaminant and water quality monitoring may be implemented. Materials used in construction e.g., drilling wastes generated and particulate discharges, should aim to be of low toxicity to ensure lower contamination risk. Compliance with legislation and regulations regarding litter and marine pollution, in accordance with the objectives of the Marine Strategy Regulations 2010 and Marine Plans for England, Scotland and Wales.
	Heat generation by cables during operation which may affect sediments.	Infrastructure should be designed such that it prevents the generation of heat that could significantly impact on soils/sediments, this may include certain design considerations on the materials used or through cable burial.
	Onshore Cabling	
	Damage (direct or indirect) to designated geological/geomorphological features within	See mitigation for offshore cabling.

SEA Topic	Potential Impact	Proposed Mitigation
	designated sites, and other features of importance, during cable installation or decommissioning.	
	Riverbed contamination during construction and maintenance (e.g., through fuel, chemical spills).	Pollution prevention guidance notes (PPGs) should be consulted, which provide detailed guidance and appropriate mitigation measures to avoid or reduce the impact on the water environment. Develop, implement and enforce a Water Pollution Prevention and Environmental Emergency Response Plan for all work sites. This should include good site practices as described in the Good Practice Guidance notes proposed by SEPA. All protective coatings used should be suitable for use in the aquatic environment and used in accordance with best environmental practice. Storage facilities would contain and prevent the release of fuels, oils and chemicals associated with plant, refuelling and construction equipment into the environment. Emergency and spill response equipment should be kept on hand during construction.
	Loss of soils during construction and increased susceptibility to erosion. Effects on soil quality, e.g. through compaction. Temporary loss of land uses e.g., agricultural lands, woodlands, forestry. Potential for permanent loss if not reinstated.	Good site management practices and construction management plans, and consultation with the competent and statutory authorities prior to any works should enable all impacts to be kept to a minimum over a short timescale. Development and implementation of a CEMP and adoption of Construction Best Practice. Restricted working areas should be imposed to ensure minimal disturbance to sensitive soils and land uses and vegetation clearance should be kept to a minimum. Land within the working area should be reinstated as near as practical to its former condition.
	Contamination due to interaction with contaminated lands, ground gas or UXO, or due to spillages during construction.	Identification of historically contaminated areas and sites and careful route planning during the design stage to avoid these sites where possible, to prevent further contamination. Good management, planning and working practices to minimise contamination of nearby soils and land uses if works crossing historically contaminated sites or hazardous soils cannot be avoided.

SEA Topic	Potential Impact	Proposed Mitigation
		Good working practices may include installation of wheel wash and plant washing facilities. Strict management and regulation of construction activities. Sampling and analysis of sites prior to construction works in potentially hazardous areas, to establish potential risk.
	Onshore Substations / Converter Stations	
	Short to long-term disturbance of features designated for onshore geological or geomorphological importance/interest.	See mitigation for offshore cabling.
	Short to long-term impacts on mineral resources. Potential for sterilisation of mineral resource due to development at surface.	Project planning and mitigation should aim to avoid potential disruption of future mineral resources. During the pre-construction and construction phase suitable technical and expert analysis should be used to determine if any mineral resources are uncovered.
	Temporary or permanent loss of land use in the substation/converter station area e.g., agricultural land and soils due to land take, forestry or woodland due to felling, commercial land, private properties and housing due to land take, community land/recreational resource. Reduced access to lands during construction or operation (e.g., agricultural lands, commercial lands, forestry, woodlands, community lands).	Good spatial planning to minimise the potential for such impacts. Good site management practices and construction management plans, and consultation with the competent and statutory authorities prior to any works should enable all impacts to be kept to a minimum over a short timescale. Development and implementation of a CEMP and adoption of Construction Best Practice. Restricted working areas should be imposed to ensure minimal disturbance to sensitive land uses and vegetation clearance should be kept to a minimum.
	Temporary or permanent loss of soils, compaction or physical	Good spatial planning to minimise the potential for such impacts. Good site management practices and construction management plans, and consultation with

SEA Topic	Potential Impact	Proposed Mitigation
	damage to peat or carbon rich soils, and increased risk of erosion.	the competent and statutory authorities prior to any works should enable all impacts to be kept to a minimum over a short timescale. Development and implementation of a CEMP and adoption of Construction Best Practice. Restricted working areas should be imposed to ensure minimal disturbance to sensitive soils and vegetation clearance should be kept to a minimum.
	Contamination due to interaction with contaminated lands, ground gas or UXO, or due to spillages during construction.	As described for onshore cabling. Compliance with all relevant safety standards. Best practice should be followed in the storage, use and disposal of oils and chemicals to avoid impacts on soils and groundwater during operation resulting from spills or leaks.
Water	**Offshore Cabling**	
	Effects on water quality due to sediment mobilisation and disturbance during cable installation and decommissioning.	Avoidance of areas of known potential contamination during project planning. Mitigation at the project level with sediment testing and water quality monitoring if required through construction and decommissioning phases to manage potential effects. Consultations should take place with environmental bodies on the construction methodology and appropriate timing of works to provide the least potential for sediment mobilisation to waterbodies. A WFD Compliance Assessment should be carried out should a development interact with a WFD waterbody.
	Effects on water quality due to construction discharges or accidental contaminant release from machinery or vessels during construction and maintenance.	At the project planning phase, mitigation against water quality impacts from construction-based discharges by using materials of low toxicity; coatings/treatments must be suitable for the marine environment. Mitigation against accidental contamination from vessels as described under Material Assets - Shipping and Navigation. The use of Shipboard Oil Pollution Emergency Planning (SOPEP) plans should be considered as mitigation within the project planning phase, as well as pollution and environmental emergency response plans. Preparation and adherence to a Pollution Prevention and Control Plan during construction, maintenance, and decommissioning activities. A Litter Pollution Prevention strategy should be designed for all stages of development to prevent marine pollution, in accordance with the objectives of the Marine Strategy

SEA Topic	Potential Impact	Proposed Mitigation
		Regulations 2010 and Marine Plans for England, Scotland and Wales.
	Effects on water quality during cable operation due to leakage of insulation fluids or anti-fouling components.	At the project planning phase, mitigation to ensure that any fluids or anti-fouling components (chemicals currently used in the cable industry are similar to those from the oil and gas industry which are controlled via the Offshore Chemical Notification Scheme reflecting the OSPAR Harmonised Mandatory Control Scheme) - chemicals used are typically within closed systems, minimising the risk of discharges.
	Onshore Cabling	
	Effects on surface water quality due to sediment mobilisation and disturbance during cable installation, maintenance and decommissioning.	Construction good practices should be adhered to (e.g. adherence to Construction Industry Research and Information Association (CIRIA) guidance and Guidelines for Pollution Prevention). Good management and planning to keep water quality disturbance to a minimum. Precautions should be put into place to avoid or minimise the generation and release of sediments into any watercourses. Any potential water quality issues from construction should be contained and treated to ensure no damage to natural waterbodies. Construction will have to be planned appropriately, using Best Available Techniques / Technology (BAT) at all times, to ensure water quality issues are kept to a minimum, with no significant adverse effects. Develop, implement and enforce an Erosion and Sedimentation Control Plan (ESCP) where risks are identified to downstream European sites. Sediment sampling may be recommended in the vicinity of where any sediment will be disturbed laying or burying the cable at landfall. A WFD Compliance Assessment should be carried out should a development interact with a WFD waterbody.
	Effects on surface water quality due to construction discharges or accidental contaminant release from machinery during construction and maintenance.	Construction good practices should be adhered to (e.g. adherence to Construction Industry Research and Information Association (CIRIA) guidance and Guidelines for Pollution Prevention), which provide detailed guidance and appropriate mitigation measures to avoid or reduce the impact on the water environment. Develop, implement and enforce a Water Pollution Prevention and Environmental Emergency Response Plan for all work sites. This should include good site practices

SEA Topic	Potential Impact	Proposed Mitigation
		as described in the Good Practice Guidance notes proposed by SEPA. All protective coatings used should be suitable for use in the aquatic environment and used in accordance with best environmental practice. Storage facilities would contain and prevent the release of fuels, oils and chemicals associated with plant, refuelling and construction equipment into the environment. Emergency and spill response equipment should be kept on hand during construction.
	Temporary or permanent physical alterations to waterbodies or effects on water quantity.	Development and implementation of a CEMP. Works within or alongside waterbodies should be designed to ensure no significant detrimental impacts on flow conveyance. Any works that could affect the quality or quantity of surface waters, groundwater aquifers or groundwater dependent systems should be considered through the development and implementation of a surface water and groundwater monitoring plan. Trenchless techniques, such as HDD should be the preferred crossing method for any WFD waterbodies or sensitive waterbodies such as salmonid rivers, shellfish waters or bathing waters where technically feasible.
	Effects on groundwater quantity or quality due to mobilisation of existing areas of contamination or accidental release of pollutants during construction and maintenance, or due to chemical leaks and concrete leaching during operation.	Development and implementation of a CEMP including a groundwater management plan, and adherence to construction good practice for the avoidance of pollution.
	Effects on surface and groundwater available for abstraction for public, private water supply, and agricultural use due to changes in catchment flows.	At the project planning stage, cable routes should aim to avoid known water supply source points and infrastructure. If this is not possible, a protection plan should be developed and implemented.

SEA Topic	Potential Impact	Proposed Mitigation
	Short or long-term effects on recreational activities dependent on waterbodies due to changes in water quality or quantity.	See mitigation for impacts on water quality or quantity.
	Short or long-term elevated risk of increased fluvial and pluvial flooding due to alterations in the degree of impervious surfaces. Potential for contamination associated with flood events.	Developments to be subject to detailed Flood Risk Assessment at the detailed planning stage, where risk has been identified. Avoid flood extents where possible or provide design considerations that are both resilient to the potential flood risk and provides no transfer of flood risk once developed. Critical infrastructure should not be placed in floodplains where it may be impacted, or where it may be inaccessible during flood events.
	Onshore Substations / Converter Stations	
	Effects on surface water quality due to sediment mobilisation and disturbance during installation, maintenance and decommissioning.	Construction good practices should be adhered to (e.g. adherence to Construction Industry Research and Information Association (CIRIA) guidance and Guidelines for Pollution Prevention). Good management and planning to keep water quality disturbance to a minimum. Precautions should be put into place to avoid or minimise the generation and release of sediments into any watercourses. Any potential water quality issues from construction should be contained and treated to ensure no damage to natural waterbodies. Construction will have to be planned appropriately, using Best Available Techniques / Technology (BAT) at all times, to ensure water quality issues are kept to a minimum, with no significant adverse effects. Develop, implement and enforce an Erosion and Sedimentation Control Plan (ESCP) where risks are identified to downstream European sites. A WFD Compliance Assessment should be carried out should a development interact with a WFD waterbody.
	Effects on surface water quality due to construction discharges or accidental contaminant release from machinery during	Construction good practices should be adhered to (e.g. adherence to Construction Industry Research and Information Association (CIRIA) guidance and Guidelines for Pollution Prevention), which provide detailed guidance and appropriate mitigation measures to avoid or reduce the impact on the water environment.

SEA Topic	Potential Impact	Proposed Mitigation
	construction and maintenance.	Develop, implement and enforce a Water Pollution Prevention and Environmental Emergency Response Plan for all work sites. This should include good site practices as described in the Good Practice Guidance notes proposed by SEPA. All protective coatings used should be suitable for use in the aquatic environment and used in accordance with best environmental practice. Storage facilities would contain and prevent the release of fuels, oils and chemicals associated with plant, refuelling and construction equipment into the environment. Emergency and spill response equipment should be kept on hand during construction.
	Effects on groundwater quantity or quality due to mobilisation of existing areas of contamination or accidental release of pollutants during construction and maintenance, or due to chemical leaks and concrete leaching during operation.	Development and implementation of a CEMP including a groundwater management plan, and adherence to construction good practice for the avoidance of pollution.
	Effects on catchment flow pathways and water quantity in surface waters and groundwaters due to activities required to facilitate construction (e.g., diversions, abstraction).	Works within or alongside waterbodies should be designed to ensure no significant detrimental impacts on flow conveyance. Any works that could affect the quality or quantity of surface waters, groundwater aquifers or groundwater dependent systems should be considered through the development and implementation of a surface water and groundwater monitoring plan. Modelling of catchment flow pathways should be considered during station planning and design to minimise the potential for effects.
	Short or long-term elevated risk of increased fluvial and pluvial flooding due to alterations in the degree of impervious surfaces. Potential for contamination	Developments to be subject to detailed Flood Risk Assessment at the detailed planning stage, where risk has been identified. Avoid flood extents where possible or provide design considerations that are both resilient to the potential flood risk and provides no transfer of flood risk once developed. Critical infrastructure should not be placed in floodplains where it may be impacted, or where it may be inaccessible during flood events.

SEA Topic	Potential Impact	Proposed Mitigation
	associated with flood events.	
	Effects on resource or quality of waters used for drinking water, including protected groundwater abstraction areas.	At the project planning stage, substation/converter station development areas should aim to avoid known water supply source points and infrastructure. If this is not possible, a protection plan should be developed and implemented.
Air	**Offshore Cabling**	
	Temporary increase in air emissions from vessels and machinery during cable installation, maintenance, and decommissioning.	At the project phase, emissions of air pollutants should be minimised through adherence with the requirements of the Merchant Shipping (Prevention of Air Pollution from Ships) Regulations 2008[10], and amendments of The Merchant Shipping (Prevention of Air Pollution from Ships and Motor Fuel (Composition and Content) (Amendment) Regulations 2014 and the Merchant Shipping (Prevention of Air Pollution from Ships) (Amendment) Regulations 2021[11]. Further mitigation at project level should include limiting the idling of vessels or construction machinery when not required or in use to minimise emissions to air.
	Onshore Cabling	
	Temporary increase in dust generation and air emissions and reductions in local air quality machinery during cable installation, maintenance, and decommissioning.	Development and implementation of a CEMP, including development of a dust minimisation plan. Dust suppression measures in place during construction to include regular dampening down of stock piles, establishing appropriate speed limits over unmade surfaces and establishing wheel washing facilities on construction sites. Avoid the use of diesel or petrol-powered generators and use mains electricity or battery powered equipment where practicable. Limiting the idling of construction machinery when not required or in use to minimise emissions to air.
	Onshore Substations / Converter Stations	

[10] The Regulations implemented 19 regulations and a technical code on the control of emissions of Nitrogen Oxides applicable to ships over 400 gross tonnages as well as fixed and floating platforms and drilling rigs - these vessels must be fitted with an exhaust gas cleaning system and use fuel oil with a sulphur content less than 1.5% m/m.

[11] The 2021 amendment implemented several air quality measures to control sulphur and nitrogen oxide emissions.

SEA Topic	Potential Impact	Proposed Mitigation
	Temporary increase in dust generation and air emissions and reductions in local air quality from machinery during construction, maintenance, and decommissioning of the substation/converter station.	As described for onshore cabling.
Climatic Factors	**Offshore Cabling**	
	Temporary increase in GHG emissions from vessels and machinery during cable installation, maintenance, and decommissioning.	At the project phase, GHG emissions from vessels should be minimised through adherence to Regulations from the Merchant Shipping (Prevention of Air Pollution from Ships) (Amendment) Regulations 2021. Further mitigation at project level should include limiting the idling of vessels or construction machinery when not required or in use to minimise GHG emissions.
	Seabed disturbance or loss and release of CO_2 during construction and decommissioning, particularly relating to 'blue carbon' habitats.	During the project planning phase, areas that have the potential for high carbon sequestration or as blue carbon hotspots should be considered and development within these areas should be avoided to ensure minimal disturbance e.g., through surveys and ecosystem mapping of sediment potential, and consultation with statutory nature conservation bodies or other relevant stakeholders regarding the location of areas of known importance such as 'blue carbon' habitats. Where avoidance is not possible, overlap should be minimised and environmental significance fully considered.
	Potential for the landfall locations of cables to be affected by climate change influenced coastal change.	Considerations on projected climate change scenarios should be accounted for during project planning phases for suitable locations of landfall points of cables and locations of associated coastal infrastructure to avoid potential impacts on these from flooding, sea-level rise or storm damage. Associated infrastructure and landfall areas should also be chosen through modelling of potential scenarios, to ensure that they do not increase the risk of flooding or coastal damage elsewhere.
	Onshore Cabling	
	Temporary increase in GHG emissions from vehicles and machinery during cable installation,	Plan construction scheduling to minimise vehicle trips. Limit idling of heavy equipment unless needed for the safe operation of the equipment.

SEA Topic	Potential Impact	Proposed Mitigation
	maintenance, and decommissioning.	
	Temporary loss of GHG sequestering vegetation / short-term release of CO_2 due to ground disturbances if the construction or decommissioning phase impacts areas of carbon storage such as peatland, woodland or saltmarsh habitats.	Good planning and timing of works to minimise construction footprint impacts. Following construction, replanting, landscaping, and natural revegetating, should be undertaken in line with appropriate guidelines that aim to improve local GHG sequestering vegetation cover.
	Short-term generation of GHG emissions during waste removal, transport and disposal processes for onshore infrastructure and materials.	A lifecycle approach should be taken to the assessment of GHG emissions at the project stage to capture the potential for both direct and indirect emissions. GHG emissions from construction activities should be considered for a whole life carbon assessment in line with IEMA guidance (IEMA, 2022). Development and implementation of a CEMP, which should include best practice management of material resources and waste streams.
	Potential for the coastal areas to be affected by climate change influenced coastal change.	Individual developments to be subject to detailed Flood Risk Assessment at the detailed planning stage, where risk has been identified, including for climate change scenarios. Avoid climate change flood extents where possible or provide infrastructure that is both resilient to the potential flood risk and provides no transfer of flood risk once developed. Cables and associated critical infrastructure should not be placed in floodplains where it may be impacted, or where it may be inaccessible during flood events.
	Onshore Substations / Converter Stations	
	Short-term GHG emissions through the production of materials, transport of materials and onsite energy consumption during construction as well as emissions from vehicles and machinery during construction,	As described for onshore cabling. At the project planning stage, infrastructure should consider the Publicly Available Specification (PAS) 2080:2023 specification of infrastructure and buildings carbon management (BSI, 2023).

SEA Topic	Potential Impact	Proposed Mitigation
	maintenance and decommissioning. Short-term generation of GHG emissions during waste removal, transport and disposal processes for onshore infrastructure and materials.	
	Temporary loss of GHG sequestering vegetation / short-term release of CO_2 due to ground disturbances if the construction or decommissioning phase impacts areas of carbon storage such as peatland, woodland or saltmarsh habitats. Long-term reduction in carbon storage/sequestration due to loss/disturbance of peat soil, or permanent loss of carbon sequestering habitats.	As described for onshore cabling. During the project planning phase, areas that have the potential for high carbon sequestration should be considered and development within these areas should be avoided to ensure minimal disturbance.
	Potential for climate change impacts (e.g., extreme high temperatures, storms, drought, heavy rainfall and flooding) to affect construction and operation.	As described for onshore cabling.
Material Assets	**Offshore Cabling**	
	Existing Infrastructure: Cables and Pipelines	
	Damage to existing cables or pipelines during installation and operation, with potential to impact telecommunications or	At the project planning phase, the location of pre-existing cable and pipeline routes should be considered. Safety zones (e.g., 500m avoidance areas) are typically used for activities of the offshore oil and gas sector to ensure the safety of subsea structures and installations. Safety zones can be used for pre-existing cables and pipelines and

SEA Topic	Potential Impact	Proposed Mitigation
	release hazardous substances. Reduced access to existing cables or pipelines during installation and operation.	could be used to avoid disruption within these zones. Where existing cables and pipelines must be crossed, safety zones may not be applicable and communications with the owners of the existing cables and pipelines should be made. During project planning and through the installation process, there should be communication with the owners of existing cables and pipelines that could potentially be affected to ensure that the construction process does not impact on access requirements to this infrastructure and a crossing agreement should be finalised.
	Other Users: Commercial Fisheries and Aquaculture	
	Short-term displacement from fishing grounds during installation and decommissioning activities.	Mitigation during the project planning phase should consider avoidance of disturbances during key fishing seasons, in consultation with the industry. Good site management practices and construction management plans and consultation with the competent and statutory authorities prior to any works should enable all impacts to be kept to a minimum over a short timescale.
	Increased collision risk with vessels during construction and maintenance.	For avoidance of vessel collision and allision risk see mitigation under Shipping and Navigation. Standard mitigation methods to reduce collision risks include extensive notifications of works occurring, use of safety zones, if appropriate, and ensuring the maintenance of access to ports and harbours for fishing vessels. Provisions should be made by the offshore developers for seabed maps showing accurate and precise locations of any hazards and potential alterations on seabed depths. Construction and maintenance vessels should use suitable lighting to ensure that they are visible during night-time and in poor weather conditions to reduce the risk of collisions.
	Risk of entanglement of fishing gear and anchors along cable routes e.g., from cable protection armouring.	Mitigation from the UK Hydrographic Office Mariners Handbook should be adhered to, which advises vessels not to anchor or trawl for fish within 0.25nm of a subsea cable or within discretionary Cable Protection Zones (CPZ), requires suitable and accurate updating and accurate marking of marine maps to inform the location of such features by developers. Cables should be buried, where possible, in areas of importance for commercial fisheries. If this is not possible,

SEA Topic	Potential Impact	Proposed Mitigation
		consideration of alternative protection that is of lower risk to fisheries could be considered. Where cable routes are proposed in proximity, coordination of cable routing, and protection is recommended between developers/operators to reduce the potential for cumulative effects.
	Impacts of spoil, construction or decommissioning debris on the seabed.	Ensure minimal construction spoil or decommissioning debris is left to prevent impacts on fishing activities, such as the use of bottom trawler-based equipment or through affecting underkeel clearance. All feasible removal of such material should take place and be incorporated into the construction and decommissioning programmes.
	Direct and indirect impacts on commercial fish and shellfish species.	Mitigation as set out under the Biodiversity, Flora and Fauna; Geology, Soils and Land Use; and Water topics. Mitigation during project planning should consider avoidance of disturbances during key fishing seasons, in consultation with the industry e.g., the period of mussel seed settlement (February-April; September) and the salmon migration period (May-July). Where cable routes are proposed in proximity, coordination of cable routing, and protection is recommended between developers/operators to reduce the potential for cumulative effects.
	Other Users: Shipping and Navigation	
	Collision and allision risk with vessels during installation, operation and decommissioning, with potential for spillage of oil or hazardous cargo.	The integrated HND/HNDFUE and SEA development and constraints assessment has aimed to identify and avoid important navigational routes. At the project planning stage, mitigation should include the development of a navigational risk assessment, which surveys vessels within the vicinity of the proposed development and takes into consideration Marine Guidance Note (MGN) 654 (MCA, 2021), MGN 372 Amendment 1 (MCA, 2022), and the Methodology for Assessing the Marine Safety Navigational Safety and Emergency Response Risks of Offshore Renewable Energy Installations (MCA, 2023). Standard mitigation methods that should be considered during project planning include extensive notification of works occurring. A minimisation of the number of vessels present should also be employed, and guard vessels should be deployed within construction areas. Safety zones are typically 500m for vessels involved during installation, maintenance and decommissioning under

SEA Topic	Potential Impact	Proposed Mitigation
		The Electricity (Offshore Generating Stations) (Safety Zones) (Application Procedures and Control of Access) Regulations 2007 (as amended). Mitigation measures also include the guidance on vessel visibility based on MGN 654, IALA lighting G1162 (IALA, 2021), Trinity House guidance (Trinity House, 2016), and marking recommendations and vessel compliance with the Convention on the International Regulations for Preventing Collisions at SEA (COLREGs) to reduce collision and allision risks. The use of Shipboard Oil Pollution Emergency Planning (SOPEP) plans should be considered as mitigation within the project planning phase, as well as pollution and environmental emergency response plans.
	Temporary displacement from construction areas due to safety exclusion zones. Restrictions on port and harbour access.	As above, the integrated HND/HNDFUE and SEA development and constraints assessment has aimed to identify and avoid important navigational routes. Any licensing and development of offshore cabling should aim to ensure the minimisation of risks to other marine users, including shipping activity and freedom of navigation, and must be subjected to planning policy specific to such projects e.g., the UK Marine Policy Statement and Marine Plans for England, Scotland and Wales. Proposed developments should mitigate against alteration of the ease and safety of navigation in port approaches. Mitigation in the project planning phase should ensure that developments do not constrain entrances to harbours/ports that are typically high vessel activity areas. There should be regular communications with port authorities and issuing of the appropriate notifications during installation, maintenance, and decommissioning periods.
	Effects on search and rescue operations within installation/decommissioning areas.	Mitigation during the project planning phase with discussion and regular communication with groups involved with search and rescue, and provision of detailed maps and information on development areas. Preliminary assessment of the potential impacts of the offshore development on search and rescue should be considered as per Marine Guidance Note 654[6] and the Methodology for Assessing the Marine Safety Navigational Safety and Emergency Response Risks of Offshore Renewable Energy Installations (MCA, 2023), to seek formal consent for marine works.

SEA Topic	Potential Impact	Proposed Mitigation
	Risk of entanglement of anchors along cable routes e.g., from cable protection armouring.	Mitigation from the UK Hydrographic Office Mariners Handbook should be adhered to, which advises vessels not to anchor within 0.25nm of a subsea cable or within discretionary Cable Protection Zones (CPZ), requires suitable and accurate updating and accurate marking of marine maps to inform the location of such features by developers.
	Other Users: Military Activities	
	Risk of UXO presence in cable routes during construction.	Areas of known live military firing or munitions disposal should be avoided during the next stage of consideration, prior to project development, At the project stage, mitigation should follow appropriate procedures for the management/removal of UXO e.g., Crown Estates 2006 (TCE, 2006) (Dealing with munitions in marine aggregates), DEFRA 2025, Reducing Marine Noise (DEFRA, 2025b), UK Government 2025, Marine environment: unexploded ordnance clearance: Joint Position Statement (UK Government, 2025).
	Temporary disruption of military exercises and activities during construction and decommissioning phases.	During the project planning phase, mitigation must aim to avoid jeopardising national security unless the impacts are appropriately mitigated or deemed acceptable in consultation with the MoD.
	Other Users: Disposal Areas	
	Disturbance of previously disposed materials during construction/decommissioning.	Mitigation during project planning phase to identify areas that were previously used for disposal, or sampling of sites prior to construction works in potentially hazardous areas, to establish potential risk e.g., pre-construction surveys and consultations with key stakeholders/companies to identify disposal areas.
	Disruption of vessel access to disposal sites during construction and decommissioning activities.	Mitigation during the project planning phase to identify key transit and navigational routes for vessels accessing disposal areas with consultation undertaken to avoid disrupting routes to the usage of safety exclusion zones to allow navigation/transit to areas to occur safely.
	Other Users: Mineral Resources and Aggregate Extraction	
	Disruption of vessel access to sites during construction and decommissioning activities.	Mitigation during the project planning phase to identify key transit and navigational routes for vessels accessing extraction sites with consultation undertaken to avoid disrupting routes to the usage of safety exclusion zones to allow navigation/transit to areas to occur safely.

SEA Topic	Potential Impact	Proposed Mitigation
	Loss of access to future mineral resources due to cable presence during the operational lifecycle.	Project planning and mitigation should aim to avoid potential disruption of future aggregate supplies. During the pre-construction and construction phase suitable technical and expert analysis should be used within GB waters to determine if any aggregate resources are uncovered.
	Other Users: Tourism	
	Temporary impacts on coastal tourism activities with the generation of noise and visual impacts and potential release of contaminants during construction/decommissioning phases. Temporary impacts with the loss of access to coastal areas during construction/decommissioning phases.	Mitigation during the project planning phase to avoid coinciding with the most disruptive periods of construction/decommissioning with high seasonality periods for tourism. Mitigation as set out under Population and Human Health topic for potential impacts on local populations and leisure and recreation, including disturbance and collision risk. Mitigation as set out under Water topic for potential pollution impacts to waterbodies. Mitigation as set out under Landscape, Seascape and Visual Amenity topic for potential visual impacts.
	Onshore Cabling	
	Existing Infrastructure: Cables and Pipelines	
	Damage to cables or pipelines during installation and operation, with potential to impact telecommunications or release hazardous substances. Reduced access to existing cables or pipelines during installation and operation.	Constraints should be identified and described in as much detail as possible during the early stages of a project, so that awareness of them and their potential impact can be managed. Incorporation of potential impacts and risks associated with other planned developments at the detailed planning stage. Consultation with other asset owners to establish the best possible working arrangements with the least disturbance. During project planning and through the installation process, there should be communication with the owners of existing cables and pipelines that could potentially be affected to ensure that the construction process does not impact on access requirements to this infrastructure.
	Other Users: Commercial Onshore Fisheries	
	Reduced access to commercial fisheries during construction,	Development of good site management practices, traffic and construction management plans and consultation with the competent and statutory authorities prior to any works should enable all impacts to be kept to a minimum

SEA Topic	Potential Impact	Proposed Mitigation
	maintenance and decommissioning.	over a short timescale. Minimise the frequency and duration of road closures. Adoption of Construction Best Practices.
	Water quality/quantity impacts on commercial fish species during construction, maintenance and decommissioning.	Mitigation as set out under Water topic for potential quality/quantity impacts on waterbodies.
	Other Users: Commercial Forestry	
	Temporary or permanent loss of woodland within onshore cable corridor.	Good site management practices and construction management plans and consultation with the competent and statutory authorities prior to any works should enable all impacts to be kept to a minimum over a short timescale. Adoption of Construction Best Practice. Consultation with landowners and / or tenants to identify speciality lands that may require protection during construction. Consultation with landowners to develop compensation for lost crop value caused by construction works. Land within the working area should be reinstated as near as is practical to its former condition.
	Other Users: Military Activities	
	Risk of UXO presence in cable routes during construction.	Areas of known live military firing or munitions disposal should be avoided during the next stage of consideration, prior to project development, At the project stage, mitigation should follow appropriate procedures for the management/removal of UXO e.g., Crown Estates 2006 (TCE, 2006) (Dealing with munitions in marine aggregates), DEFRA 2025, Reducing Marine Noise (DEFRA, 2025b), UK Government 2025, Marine environment: unexploded ordnance clearance: Joint Position Statement (UK Government, 2025).
	Temporary disruption of military exercises and activities during construction and decommissioning phases.	During the project planning phase, mitigation must aim to avoid jeopardising national security unless the impacts are appropriately mitigated or deemed acceptable in consultation with the MoD.
	Other Users: Disposal Areas	

SEA Topic	Potential Impact	Proposed Mitigation
	Disruption of access to disposal sites during construction and decommissioning activities.	Project planning and mitigation should aim to avoid potential disruption of access to disposal sites.
	Other Users: Mineral Resources and Aggregate Extraction	
	Loss of access to future mineral resources due to cable presence during the operational lifecycle.	Project planning and mitigation should aim to avoid potential disruption of future aggregate supplies. During the pre-construction and construction phase suitable technical and expert analysis should be used to determine if any aggregate resources are uncovered.
	Other Users: Tourism	
	Temporary impacts on coastal and onshore tourism activities with the generation of noise and visual impacts and potential release of contaminants during construction/decommissioning phases. Temporary impacts with the loss of access to areas during construction/decommissioning phases.	Mitigation during the project planning phase to avoid coinciding with the most disruptive periods of construction/decommissioning with high seasonality periods for tourism. Mitigation as set out under Population and Human Health topic for potential impacts on local populations and leisure and recreation, including disturbance and collision risk. Mitigation as set out under Water topic for potential pollution impacts to waterbodies. Mitigation as set out under Landscape, Seascape and Visual Amenity topic for potential visual impacts.
	Other Users: Road Network Users	
	Effects on the road network during construction and decommissioning (e.g., increased traffic, delays, impacts on public transport, road closures).	Development of good site management practices, traffic and construction management plans and consultation with the competent and statutory authorities prior to any works should enable all impacts to be kept to a minimum over a short timescale. Minimise the frequency and duration of road closures. Adoption of Construction Best Practice.
	Other Users: Agriculture	
	Temporary loss of, or damage to, agricultural lands during construction, maintenance and decommissioning (e.g.	Good site management practices and construction management plans and consultation with the competent and statutory authorities prior to any works should enable all impacts to be kept to a minimum over a short timescale. Adoption of Construction Best Practice. Consultation with landowners and / or tenants to identify

SEA Topic	Potential Impact	Proposed Mitigation
	direct impacts, impacts on field drains, impacts on waters used for livestock). Permanent loss of agricultural lands if these are not reinstated post-construction. Temporary impacts with the loss of access to agricultural lands during construction/decommissioning phases.	speciality agricultural crops or lands that may require protection during construction. Consultation with landowners to develop compensation for lost crop value caused by construction works. Land within the working area should be reinstated as near as practical to its former condition.
	Onshore Substations / Converter Stations	
	Existing Infrastructure: Cables and Pipelines	
	Damage to cables or pipelines during installation and operation, with potential to impact telecommunications or release hazardous substances. Reduced access to existing cables or pipelines during installation and operation.	Constraints should be identified and described in as much detail as possible during the early stages of a project, so that awareness of them and their potential impact can be managed. Incorporation of potential impacts and risks associated with other planned developments at the detailed planning stage. Consultation with other asset owners to establish the best possible working arrangements with the least disturbance. During project planning and through the installation process, there should be communication with the owners of existing cables and pipelines that could potentially be affected to ensure that the construction process does not impact on access requirements to this infrastructure.
	Other Users: Agriculture	
	Long-term to permanent loss of agricultural lands due to land take within the substation/converter station footprint.	Good spatial planning to minimise the potential for such impacts. Consultation with landowners to develop compensation for loss of assets, such as agricultural land, caused by development of new infrastructure. Good site management practices and construction management plans, and consultation with the competent and statutory authorities prior to any works should enable all impacts to be kept to a minimum over a short timescale. Adoption of Construction Best Practice.
	Temporary loss of, or damage to, agricultural lands during	Good site management practices and construction management plans and consultation with the competent and statutory authorities prior to any works should

SEA Topic	Potential Impact	Proposed Mitigation
	construction, maintenance and decommissioning (e.g. direct impacts, impacts on field drains, impacts on waters used for livestock). Temporary impacts with the loss of access to agricultural lands during construction/decommissioning phases.	enable all impacts to be kept to a minimum over a short timescale. Adoption of Construction Best Practice. Consultation with landowners and / or tenants to identify speciality agricultural crops or lands that may require protection during construction. Consultation with landowners to develop compensation for lost crop value caused by construction works. Land within the working area should be reinstated as near as is practical to its former condition.
	Other Users: Commercial Forestry	
	Long-term to permanent loss of forestry lands due to land take or felling within the substation/converter station footprint.	Good site management practices and construction management plans and consultation with the competent and statutory authorities prior to any works should enable all impacts to be kept to a minimum over a short timescale. Adoption of Construction Best Practice. Consultation with landowners to develop compensation for lost forestry value caused by construction works.
	Temporary loss of, or damage to, forestry lands during construction, maintenance and decommissioning (e.g., access roads, construction compounds, felling).	As above. Consultation with landowners and / or tenants to identify speciality agricultural crops or forestry lands that may require protection during construction. Land within the working area should be reinstated as near as practical to its former condition.
	Other Users: Mineral Extraction	
	Direct or indirect damage to mineral resources during construction. Loss of access to future mineral resources due to substation/converter station presence during the operational lifecycle.	Project planning and mitigation should aim to avoid known mineral resources. Project planning and mitigation should aim to avoid potential disruption of future mineral resources. During the pre-construction and construction phase suitable technical and expert analysis should be used to determine if any mineral resources are uncovered.
	Other Users: Aviation	
	Short-term disturbance to flight and aviation	Large-scale construction machinery may impact on radio and radar communications through the blocking of

SEA Topic	Potential Impact	Proposed Mitigation
	ground-based radio/radar or penetration of aviation safeguarded/protected surfaces during construction.	signals or lead to the false identifications of aircraft structures. Considerations on the locations of developments should be undertaken in line with consultations with the competent and statutory authorities prior to any works commencing to minimise the potential for impacts.
	Long-term disturbance to flight and aviation ground-based radio/radar or penetration of aviation safeguarded/protected surfaces due to the presence of the substation/converter station.	Inappropriate siting of large-cale buildings may impact on radio and radar communications through the blocking of signals or lead to the false identifications of aircraft structures. Considerations on the locations of developments should be undertaken in line with consultations with the competent and statutory authorities prior to the construction of the substation/converter station commencing to minimise the potential for impacts.
	Other Users: Road Network Users	
	Effects on the road network during construction and decommissioning (e.g., increased traffic, delays, impacts on public transport, road closures).	Development of good site management practices, traffic and construction management plans and consultation with the competent and statutory authorities prior to any works commencing should enable all impacts to be kept to a minimum over a short timescale. Minimise the frequency and duration of road closures. Adoption of Construction Best Practice.
	Other Users: Military Activities	
	Risk of UXO presence during construction.	Areas of known live military firing or munitions disposal should be avoided during the next stage of consideration, prior to project development, At the project stage, mitigation should follow appropriate procedures for the management/removal of UXO e.g., Crown Estates 2006 (TCE, 2006) (Dealing with munitions in marine aggregates), DEFRA 2025, Reducing Marine Noise (DEFRA, 2025b), UK Government 2025, Marine environment: unexploded ordnance clearance: Joint Position Statement (UK Government, 2025).
	Temporary disruption of military exercises and activities during construction and decommissioning phases.	During the project planning phase, mitigation must aim to avoid jeopardising national security unless the impacts are appropriately mitigated or deemed acceptable in consultation with the MoD.

SEA Topic	Potential Impact	Proposed Mitigation
	Long-term disruption of military exercises and activities due to activities required to operate and maintain the substation/converter station.	
	Other Users: Tourism	
	Temporary impacts on coastal and onshore tourism activities with the generation of noise and visual impacts and potential release of contaminants during construction/decommissioning phases. Temporary impacts with the loss of access to areas during construction/decommissioning phases.	Mitigation during the project planning phase to avoid coinciding with the most disruptive periods of construction/decommissioning with high seasonality periods for tourism. Mitigation as set out under Population and Human Health topic for potential impacts on local populations and leisure and recreation, including disturbance and collision risk. Mitigation as set out under Water topic for potential pollution impacts to waterbodies. Mitigation as set out under Landscape, Seascape and Visual Amenity topic for potential visual impacts.
	Long-term effects on visitor numbers to the area due to the presence of the substation/converter station (e.g. access, effects on the landscape). Long-term to permanent impacts with the loss of access to areas due to activities required for operation and maintenance.	Mitigation during the project planning phase to avoid areas of high importance for tourism. Mitigation as set out under Landscape, Seascape and Visual Amenity topic for potential visual impacts during operation.
Cultural Heritage	**Offshore Cabling**	
	Archaeology and Wrecks	
	Loss of, or damage to wrecks or submerged archaeological artefacts during cable	At the construction, operation/maintenance and decommissioning stages, actions should be taken to safeguard known heritage assets, and to consider and mitigate against the potential to damage or disturb as yet

SEA Topic	Potential Impact	Proposed Mitigation
	installation, maintenance, and decommissioning. Indirect damage or degradation of archaeological sites or features due to sedimentation impacts during construction/decommissioning.	undiscovered heritage assets in the marine environment. For assets in England, baseline datasets to support projects can be found at Historic England' s Open Data Hub which includes National Heritage List for England (NHLE) data and the Historic Environment Records (HERs) provide access to comprehensive and dynamic resources relating to the archaeology and historic built environment of a defined geographic area and are regularly updated. The MDE Heritage Accelerator (MDEHA) project (https://historicengland.org.uk/advice/planning/infrastructure/renewable-energy/accelerating-clean-energy-offshore/), is also significantly increasing the amount of heritage information available to inform marine development. Mitigation during the project planning phase to identify sites of interest for archaeological potential and use exclusion zones around these areas. Mitigation may include relevant surveys before potentially damaging activities occur, with survey results informing further mitigation to ensure sensitive seabed surface or subsurface features are avoided. Use of geophysical surveys to identify previously unknown wreck locations within development areas and cable routes, with notification and submission of artefacts, potential archaeological and vessel remains to suitable authorities in line with the Protection of Wrecks Act (1973) (as amended in Scotland under the Marine (Scotland) Act 2010 replaced under a system of historic marine protected areas), within GB territorial waters within 12 miles of shore. Heritage assets may also be found beyond the 12 miles of the shore however these cannot be designated but require consideration. Adherence to Historic England, Royal Commission on the Ancient and Historical Monuments of Wales and Historic Environment Scotland with consultation to key stakeholders e.g., the Ancient Monuments and Archaeological Areas Act 1979. Consultation with qualified archaeologists during project planning phase for the suitable design and construction of developments with the requirement for statutory consents for works. A Written Scheme of Investigation (WSI) is a project specific, formal and live document which forms the agreement between archaeologists and the developer regarding detail on the archaeological method statements and ensure archaeological work occurs pre-

SEA Topic	Potential Impact	Proposed Mitigation
		and post-consent. This also includes recording information such as public archiving duties. Protocols for Archaeological Discoveries (PADs) are systems of monitoring for unexpected or incidental finds relating to the historic environment, these should be used at all stages of the development process where any archaeological information may be obtained (TCE, 2014). PADs include specific mitigation measures and protocols to be followed for the recovery and locating of discoveries. Within England and Wales, archaeological objects must be reported to the relevant local Finds Liaison Officer or if this is a wreck to the Receiver of Wreck within 14 days of recovery. Within Scotland, finds must be reported to Treasure Trove, Scotland. Mitigation during the project planning phase as part of general environmental assessments to undertake coastal process assessment to assess potential effects of construction/decommissioning on sediment dispersion and transport and modelling of these changes to determine potential effects on surrounding archaeological sites or features.
	Damage or degradation of archaeological sites or features with the potential for scouring and exposure to occur around cable protection.	As above, mitigation during the project planning phase to identify sites of interest for archaeological potential and use exclusion zones around these areas. Undertaking coastal process assessment to assess potential effects from installed cable protection on sediment dispersion and transport and modelling can help to identify potential impact areas on a wider basis.
	Coastal Heritage	
	Short-term effects on the setting of designated and non-designated coastal heritage sites due to the presence of vessels and machinery during construction and decommissioning phases.	Mitigation during the project planning phase with consideration of the impacts of settings on historical assets within the project-level assessment, and the management of cultural heritage through the development and application of a MARP (Marine Archaeology Reporting Plan). Consultation with qualified archaeologists/architects during project planning phase for the location of cable routes with the requirement for statutory consents for works.
	Onshore Cabling	
	Terrestrial Archaeology and Heritage	

SEA Topic	Potential Impact	Proposed Mitigation
	Loss of, or damage to archaeological artefacts during cable installation, maintenance, and decommissioning. Indirect damage or degradation of archaeological sites or features during construction and decommissioning (e.g., due to sedimentation impacts, vibration, changes to hydrology).	Where necessary a heritage impact assessment should be prepared in respect of any works to architectural or archaeological features in advance of any works being carried out to feed into detailed design. Consultation and agreement with Historic England, Royal Commission on the Ancient and Historical Monuments of Wales, Historic Environment Scotland in advance of any works taking place in respect of protected archaeological or architectural features. Construction supervision by qualified project archaeologists, combined with sensitive construction methods and restoration to minimise potential for damages, in potentially sensitive areas. Heritage features damaged could be restored / preserved. Statutory consents and notices may be required prior to works taking place. All new archaeological discoveries are reported in line with legislative requirements.
	Temporary effects on the setting of archaeological and heritage features or sites during cable construction, maintenance and decommissioning. Long-term effects on the setting of features or sites if landscape features are not re-established following construction.	Impacts could be kept to a minimum through sensitive design and planning. Planning and design advice from qualified archaeologists / architects. Statutory consents may be required prior to works.
	Onshore Substations / Converter Stations	
	Terrestrial Archaeology	
	Loss of, or damage to archaeological artefacts during construction, maintenance, and decommissioning. Indirect damage or degradation of archaeological sites or features during construction and	Where necessary a heritage impact assessment should be prepared in respect of any works to architectural or archaeological features in advance of any works being carried out to feed into detailed design. Consultation and agreement with Historic England, Royal Commission on the Ancient and Historical Monuments of Wales, Historic Environment Scotland in advance of any works taking place in respect of protected archaeological or architectural features. Construction supervision by qualified project archaeologists, combined with sensitive construction methods and restoration to minimise

SEA Topic	Potential Impact	Proposed Mitigation
	decommissioning (e.g., due to sedimentation impacts, vibration, changes to hydrology).	potential for damages, in potentially sensitive areas. Heritage features damaged could be restored / preserved. Statutory consents and notices may be required prior to works taking place. All new archaeological discoveries are reported in line with legislative requirements. Full assessment and modelling, where required, to determine potential for indirect impacts through alterations to hydrology or sediment regimes.
	Temporary effects on the setting of archaeological and heritage features or sites during construction, maintenance and decommissioning.	Where necessary a heritage impact assessment should be prepared in respect of any works to architectural or archaeological features in advance of any works being carried out to feed into detailed design. Consultation and agreement with Historic England, Royal Commission on the Ancient and Historical Monuments of Wales, Historic Environment Scotland, construction machinery should be kept to the minimum required to reduce the potential for effects on setting.
	Terrestrial Heritage	
	Loss of, or damage to heritage features during construction, maintenance, and decommissioning. Indirect damage or degradation of features during construction and decommissioning (e.g., due to sedimentation impacts, vibration, changes to hydrology).	Where necessary a heritage impact assessment should be prepared in respect of any works to architectural or archaeological features in advance of any works being carried out to feed into detailed design. Consultation and agreement with Historic England, Royal Commission on the Ancient and Historical Monuments of Wales, Historic Environment Scotland in advance of any works taking place in respect of protected archaeological or architectural features. Construction supervision by qualified project archaeologists, combined with sensitive construction methods and restoration to minimise potential for damages, in potentially sensitive areas. Heritage features damaged could be restored / preserved. Statutory consents and notices may be required prior to works taking place. All new archaeological discoveries are reported in line with legislative requirements. Full assessment and modelling where required to determine potential for indirect impacts through alterations to hydrology or sediment regimes.
	Temporary effects on the setting of heritage features or sites during construction,	Where necessary a heritage impact assessment should be prepared in respect of any works to architectural or archaeological features in advance of any works being carried out to feed into detailed design. Consultation and

SEA Topic	Potential Impact	Proposed Mitigation
	maintenance and decommissioning. Long-term effects on the setting of features or sites during operation of the substation/converter station.	agreement with Historic England, Royal Commission on the Ancient and Historical Monuments of Wales, Historic Environment Scotland, construction machinery should be kept to the minimum required to reduce the potential for effects on setting. Considerations on visual and setting impacts and need for screening to minimise impacts should be undertaken for the settings of features or sites, subject to appropriate project level considerations of the local area.
Landscape, Seascape and Visual Amenity	**Offshore Cabling**	
	Short-term effects on seascape and visual amenity from activity of vessels and machinery and the use of artificial lights during construction, maintenance and decommissioning phase of cabling.	Mitigation during planned construction, maintenance or decommissioning activities with ensuring that visual impacts are constrained around the development area, wherever possible, and do not spread into unnecessary areas. Limited mitigation measures are available beyond ensuring that the number of vessels/machinery and planned lighting is the minimum required and is carefully planned not to exceed requirements for activities to induce additional visual impacts.
	Onshore Cabling	
	Short-term effects on landscape from activity of vehicles and machinery and the use of artificial lights during construction, maintenance and decommissioning phase of cabling. Long-term effects on the landscape if features are not re-established following construction.	Impacts could be kept to a minimum through good site practice and planning (e.g., screened laydown areas and traffic management). Adoption of Construction Best Practice. Landscape and Visual Assessment of options at the detailed feasibility and detailed planning stages to minimise the potential for impacts and provide site specific mitigation measures, this may involve the use of screening to reduce the long-term impacts of development or ensuring the restoration of habitats to previous conditions following cable installation.
	Temporary effects on visual amenity and viewpoints during construction due to the presence of construction vehicles and machinery and loss of landscape elements.	Mitigation during planned construction, maintenance or decommissioning activities with ensuring that visual impacts are constrained around the development area, wherever possible, and do not spread into unnecessary areas. Limited mitigation measures are available beyond ensuring that the number of vessels/machinery and planned lighting is the minimum required and is carefully planned not to exceed requirements for activities to induce additional visual impacts.

SEA Topic	Potential Impact	Proposed Mitigation
	Onshore Substations / Converter Stations	
	Effects on landscape elements, including permanent loss in the footprint of the substation/converter station and temporary in the surrounding area (e.g., access routes).	Impacts could be kept to a minimum through sensitive design and planning (e.g., vegetative screening and landscape management planning). Landscape and visual assessment and advice during detailed design. Public consultation on draft designs. Landscape and Visual Assessment of options at the detailed feasibility and detailed planning stages to minimise the potential for impacts and provide site specific mitigation measures.
	Effects on landscape character, including temporary impacts during construction and long-term impacts due to the presence of the substation/converter station.	Landscape and Visual Assessment of options at the detailed feasibility and detailed planning stages to minimise the potential for impacts and provide site specific mitigation measures dependent upon the specific landscape characteristics of an area.
	Temporary effects on visual amenity and viewpoints during construction due to the presence of construction vehicles and machinery and loss of landscape elements. Potential for long-term effects on visual amenity and viewpoints due to the presence of the substation/converter station.	Areas of highest landscape and seascape sensitivity should be avoided, where possible, during the next stage of consideration, prior to project development. At the project planning phase, a Landscape and Visual Impact Assessment (LVIA) should be undertaken and should inform project design and appropriate mitigation.

Table 40: Proposed SEA Mitigation Measures

10.1.3 HRA Mitigation

Plan-Level Mitigation

The HRA report has identified that, given the uncertainties associated with the HND Implementation Plan, plan-level mitigation measures are required to ensure that there is no AEoSI. This includes the following measure identified as integral to the draft plan:

- The legal requirement for individual projects to undergo HRA. All future developments within the HND and HNDFUE corridors will be required to undergo an HRA and, wherever the possibility of a likely significant effect on a European site cannot be excluded, a project-level Appropriate Assessment will need to be completed.

The plan-level HRA is not a substitute for project-level HRAs, where these are required for individual projects; the HRA process will still be required in accordance with legislation. The HRA considered that this requirement for a project level Appropriate Assessment, where a possibility for a LSE is identified, is an important mitigation measure at plan-level to ensure that there is no AEoSI for designated sites once there is the required certainty about development location(s) and design.

For individual cable projects a range of mitigation measures can be applied to help reduce or offset ecological effects where needed and were identified in the HRA report and linked to particular European sites and route corridors on a precautionary basis. These are relatively standard mitigation approaches that have been effectively deployed in many development contexts including marine and terrestrial electricity cable construction, maintenance and decommissioning. While the measures can be identified in broad terms for the plan-level HRA, their precise requirement, and their details, will need to be developed for each individual project application HRA and will be linked to specific survey and other investigations. Of these measures, an overarching consideration, and the one that is also most intuitive, is that during the early stages in the design of any development, 'a primary consideration will be to try to avoid habitats within a European/Ramsar site and minimise exposure and risk'. Given that the route corridors are 5km wide, the HRA frequently identifies that there is potential for many impacts on European sites to be avoided entirely through either careful routing or careful location of the landfall. In many instances where the entire 5km corridor traverses a European site at landfall, use of trenchless techniques has been identified as a potential solution. However, this should be considered a mitigation method rather than an avoidance technique as trenchless techniques can still have impacts on the European sites that they pass beneath, depending on the sensitivities of the European site and construction details.

Therefore, while the range of project-level mitigation measures that are available is identified, they do not, by themselves, provide further certainty that any European/Ramsar site or features will not be affected. This is because they are not a formal requirement of the HND Implementation Plan, and they are too generic at this stage to be assured that there will be no adverse effects as a result of their application. However, coupled with consideration in the HRA of whether there is room within each route corridor to avoid particular European sites, the identified mitigation measures do give a strong indication as to whether the corridors identified in the HND Implementation Plan have sufficient flexibility that it is likely to be possible to deliver each route corridor at a project level without any adverse effect on the integrity of European sites.

For the pathway of direct benthic or intertidal habitat loss, the HRA identified several route corridors where there is a high likelihood that a reliance on the derogations in the HRA process (the tests of Imperative Reasons of Overriding Public Interest, No Alternatives and

Compensation) would be required at the project level. These are PA_1 to Birkhill Wood, R4_1 to Birkhill Wood, R4_2 to Birkhill Wood and SW_N4 to Arnish.

The HRA recommended that a suite of environmental design principles is developed following adoption of the HND Implementation Plan that would be implemented at individual project stage to further limit impacts to the environment. These could include, but not limited to:

- Minimise environmental impact
- Avoid European sites that are avoided in the HND Implementation Plan
- Avoid sensitive features that are avoided in the HND Implementation Plan
- Reduce cable lengths
- Reduce external cable protection
- Reduce cable crossings
- Location of offshore infrastructure outside of European sites/sensitive features
- Consideration of sediment processes (to include any additional impacts from external cable protection)
- Avoid sensitive periods for European site features
- Detailed mitigation measures at the project level can be set out within the design documents and alternatives assessment, but in particular in Registers of Environmental Actions and Commitments and Construction Environment Management Plans.

Project-Level Mitigation

The HRA report identified that any new project for a study corridor identified in the HND Implementation Plan would legally be required to undergo a project-level HRA where the possibility of an LSE on a European/Ramsar site cannot be excluded. The HRA report also identified that developers are not legally, spatially or technically bound by the route corridors identified in the HND Implementation Plan. However, all projects would be required to review baseline conditions and ensure that work does not lead to any AEoSI unless they can demonstrate to the satisfaction of the appropriate competent authority (permitting body) and appropriate authority (relevant Secretary of State or Administration) that the derogation tests completed by the HRA can be passed.

At plan level, many sites within the impact pathway screening distances (including those that overlap directly with the proposed cable corridors (e.g. Carmarthen Bay SAC)) were given an amber risk rating due to the fact that mitigation measures could be put in place to avoid adverse impacts on site integrity and features. However, at this stage it was not possible to completely rule out AEoSI that could occur at the project level (especially where there are uncertainties on route options and given that there will be site-based engineering constraints). Any technology or configuration change that materially alters

environmental pathways, including HVAC phasing that increases cable numbers, trenches and landfalls relative to HVDC assumptions, should be screened promptly through the Impact Assessment process and taken through proportionate HRA refresh where necessary.

The HRA report set out information to aid future project-level Appropriate Assessments. All future project-level down-the-line HRA work will need to be completed in the context of the latest scientific knowledge and evidence base (relating to the development of electricity cable routes) that is available at the time of the assessment. It will also need to be done to the satisfaction of the consenting body (as competent authority at the project stage), taking account of advice from statutory nature conservation bodies, and consultees where appropriate. The pursuance of project-level HRAs (with reference to the latest monitoring and scientific understanding) will be a legal requirement in all cases where likely significant effects cannot be excluded as will the application of project-level mitigation (where these are necessary to avoid adverse effects at project level). This work will provide assurances of no adverse effect from individual projects but will also improve understanding of the impacts from key pathways, with updated information fed back into the HRA process i.e. through subsequent applications. The information that will need to be supplied within the project-level HRAs includes:

- Updates on the location and status of new European designations.
- New information on interest feature sensitivities (in the context of the latest scientific understanding).
- Assessment of effects during survey, construction and operational phases of the project (including the in-combination effects with other plans or projects).
- Proposed mitigation measures.

The HRA report stated that it should also be recognised that it may be necessary, as part of the project-level HRAs, to revisit the screening process that was undertaken for the HND Implementation Plan. Depending upon the outcome of the project-level Appropriate Assessment there might be a need for mitigation measures to be implemented to ensure that there is no AEoSI. This process will also require project-level Derogations to be prepared for Development Consent Orders at project level.

Table 41 shows the range of project-level mitigation measures proposed in the HRA report.

HRA Mitigation Measures

Potential Impact	Proposed Mitigation
Offshore Cabling	
Temporary physical disturbance of subtidal and/or intertidal habitats	Raise the priority of environmental considerations to an equal footing with other, more-traditional considerations at this strategic level, such as avoiding designated sites, and the need to cross third-party infrastructure, as far as possible.

Potential Impact	Proposed Mitigation
	Detailed route development and micro-routing within the study corridor, following best practice guidance (JNCC & Natural England, 2022), and informed by pre-installation evaluation of site-specific survey data to avoid or minimise localised engineering and environmental constraints; including minimising the footprint as much as possible, and targeting seabed habitats that are known for quicker recovery times, where practicable. A vehicle management plan, which identifies sensitive habitats and adheres to best practice to avoid damage to these. For example, identifying vehicle routes, briefing staff on site sensitivities, and identifying pollution control measures. The specific locations where the cable will land have not been shown in detail. When the specific location has been decided sediment samples should be taken in the location of any potential sediment disturbance or cable burial. Survey is not mitigation but will inform any detailed measures in a Construction Environment Management Plan, Register of Environmental Actions and Commitments or similar. Consideration of the cable trenching method with the smallest Zone of Influence (ZoI). Consideration of the requirement and extent of for pre-lay grapnel runs and sand wave lowering.
Permanent loss of seabed of intertidal habitats	The following measures have the potential to avoid and/or reduce the permanent loss of seabed or intertidal habitats: Raise the priority of environmental considerations to an equal footing with other, more-traditional considerations at this strategic level, such as avoiding designated sites, and the need to cross third-party infrastructure, as far as possible. An assessment of the impacts of climate change on the exposure of the cable through a Cable Burial Risk Assessment. Ensuring that cables are buried to a sufficient depth would avoid cable exposure later and the potential need for cable protection. Consideration of the longevity of the cable protection and decommissioning intentions should be given at the design stage. For example whether long term impacts can be reduced though the use of removable materials (the following study reviewed cable protection options and their removability at end of life). Detailed route development and micro- routing within the study corridor, informed by pre-installation evaluation of site-specific survey data to avoid or minimise localised engineering and environmental constraints, including minimising the footprint as much as possible.

Potential Impact	Proposed Mitigation
	Nature-inclusive design measures; Where possible, cable protection materials could be selected to match the environment (e.g. when cables are installed in areas of cobbles or other natural rock features, rock of similar diameter and material as the receiving environment could be used as an alternative to artificial materials, such as concrete matressing). Mitigation would need to account for any changes in physical processes and sediment transport regimes as a result of rock armour / mattress placement on the seabed. Measures would be included in a Construction Environment Management Plan, Register of Environmental Actions and Commitments or similar.
Temporary disturbance as a result of increased suspended sediment concentrations and sediment deposition	The following measures have the potential to avoid and/or reduce the impact of SSC and sediment deposition on marine receptors. Measures would be included in a Construction Environment Management Plan, Register of Environmental Actions and Commitments or similar: Raise the priority of environmental considerations to an equal footing with other, more-traditional considerations at this strategic level, such as avoiding designated sites, and the need to cross third-party infrastructure, as far as possible. Detailed route development and micro-routing within the study corridor, informed by pre-installation evaluation of site-specific survey data to avoid or minimise localised engineering and environmental constraints, including minimising the footprint as much as possible. Consideration of the cable trenching method with the smallest (ZoI). Consideration of the requirement and extent of pre-lay grapnel runs and sand wave lowering.
Changes in water quality	The following measures have the potential to avoid and/or reduce the impact of changes in water quality. Measures would be included in a Construction Environment Management Plan, Register of Environmental Actions and Commitments or similar: Consideration of timings of works, especially in close proximity of natal rivers and breeding sites. CEMP including an Emergency Spill Response Plan and Waste Management Plan during the installation phase of each individual project to minimise releases. Appropriate HSE procedures (identified in the CEMP), with strict weather and personnel limits to reduce any risk of accidental spillage.

Potential Impact	Proposed Mitigation
	Response plans, including control measures and SOPEP in place and adhered to under MARPOL Annex I requirements for all vessels. Planned effluent dischargers compliant with MARPOL Annex IV 'Prevention of Pollution from Ships' standards. Drilling fluids selected from the OSPAR List of Substances/Preparations Used and Discharged Offshore (2021) which are Considered to Pose Little or No Risk to the Environment.
Introduction of INNS to subtidal benthic habitats and species	A number of industry best practice mitigations would lower the probability of INNS transmission to benthic habitats and thus reduce the risk of significantly affecting a European site whether in the marine, intertidal or terrestrial environment. Measures would be included in a Construction Environment Management Plan, Register of Environmental Actions and Commitments or similar: All project vessels should adhere to the International Maritime Organisation (IMO) Guidelines for the control and management of ship'' biofouling, and the International Convention for the Control and Management of Ships' Ballast Water and Sediments, to minimize the transfer of invasive aquatic species. Any material introduced into the marine environment, such as rock protection material, should be from a suitable source to ensure no INNS can be introduced. Ultimately, a biosecurity plan should be produced by the applicant for each project once a planning application is being devised, following the latest guidance on INNS from the Great Britain Non-Native Species Secretariat. This can be adopted across all cable route projects, at plan level, to reduce the overall risk of INNS introductions. With the adherence to these guidelines and measures, INNS introductions would be considered unlikely, with any impacts limited to individual cable route corridors. Thus, significantly reducing the likelihood of significantly adverse effects on a designated site.
EMF impacts	Raise the priority of environmental considerations to an equal footing with other, more-traditional considerations at this strategic level, such as avoiding designated sites, and the need to cross third-party infrastructure, as far as possible. Detailed route development and micro-routing within the study corridor, informed by pre-installation evaluation of site-specific survey data to avoid or minimise localised engineering and

Potential Impact	Proposed Mitigation
	environmental constraints, including minimising the footprint as much as possible. Consideration of the need for EMF modelling, to inform design. Consideration of the configuration of multiple cables. Consideration of the required depth of lowering to minimise EMF emissions.
Potential effects due to subsea cable thermal emissions	Raise the priority of environmental considerations to an equal footing with other, more-traditional considerations at this strategic level, such as avoiding designated sites, and the need to cross third-party infrastructure, as far as possible. Detailed route development and micro-routing within the study corridor, informed by pre-installation evaluation of site-specific survey data to avoid or minimise localise engineering and environmental constraints, including minimising the footprint as much as possible. Consideration of the need for thermal modelling, to inform design.
Impacts to marine mammals and fish from underwater sound	The following measures have the potential to avoid and/or reduce the impact of underwater sound on marine receptors. Measures would be included in a Construction Environment Management Plan, Register of Environmental Actions and Commitments or similar: Raise the priority of environmental considerations to an equal footing with other, more-traditional considerations at this strategic level, such as avoiding designated sites, and the need to cross third-party infrastructure, as far as possible. Consideration of the JNCC guidelines for minimising the risk of injury to marine mammals from geophysical surveys (JNCC, 2017). Refer to and draw upon the Defra Noise Policy package 2025, which aims to reduce the impact of noise on marine environments and marine life. Consideration of the need for underwater sound modelling, to inform design; and Consideration of the need for Marine Mammal Observation. As detailed in Natural England's best practice guidance (Parker *et al*., 2022) it is advised that a Marine Mammal Management Plan (MMMP) is submitted alongside Development Consent Order (DCO) applications; detailing the mitigation measures implemented as part of any project where marine mammals may be affected. As noted by the Marine Directorate in Scotland, European Protected Species (whales, dolphins and porpoise) and

Potential Impact	Proposed Mitigation
	basking sharks require a license for disturbance separate to the marine licensing process of the Marine Directorate.
Barriers to migration	The following measures have the potential to avoid and/or reduce the impact of barriers to migration on marine receptors. Measures would be included in a Construction Environment Management Plan, Register of Environmental Actions and Commitments or similar: Raise the priority of environmental considerations to an equal footing with other, more-traditional considerations at this strategic level, such as avoiding designated sites, and the need to cross third-party infrastructure, as far as possible. Detailed route development and micro-routing within the study corridor, informed by pre-installation evaluation of site-specific survey data to avoid or minimise localised engineering and environmental constraints, including minimising the footprint as much as possible. Consideration of the need for EMF modelling, to inform design. Consideration of the configuration of multiple cables (e.g. bundled). Consideration of the required depth of lowering to minimise EMF emissions. Consideration of potential migratory routes of diadromous fish (e.g. river mouths). The application of seasonal restrictions during construction can also avoid the impact entirely, should the migratory fish be qualifying features of a traversed designated site.
Changes in prey availability	The following measures have the potential to avoid and/or reduce the impact of changes in prey availability if implemented by the applicant at the time a planning consent is granted. Measures would be included in a Construction Environment Management Plan, Register of Environmental Actions and Commitments or similar: Habitat/prey mapping and consideration of timing to avoid key biological periods/locations to reduce impact on prey species. Use of certain construction methods to avoid or minimise impacts and disturbance such as use of trenchless methods like Horizontal Direct Drilling to traverse the intertidal environment, particularly habitats such as saltmarsh or reefs. Creation or enhancement of alternative freshwater or terrestrial habitat (if the foraging habitat in question lies outside the

Potential Impact	Proposed Mitigation
	boundary of a European site) to ensure no net loss in foraging resource. Raise the priority of environmental considerations to an equal footing with other, more-traditional considerations at this strategic level, such as avoiding designated sites, and the need to cross third-party infrastructure, as far as possible. Detailed route development and micro-routing within the study corridor, informed by pre-installation evaluation of site-specific survey data to avoid or minimise localised engineering and environmental constraints, including minimising the footprint as much as possible.
Collision risk with vessels	The following measures have the potential to avoid and/or reduce the risk of collision with vessels and marine mammals and should be deployed by applicants as necessary during construction of their schemes, in accordance with best practice; a more detailed approach would need to be devised for individual planning applications and Development Consent Orders. Measures would be included in a Construction Environment Management Plan, Register of Environmental Actions and Commitments or similar: Raise the priority of environmental considerations to an equal footing with other, more-traditional considerations at this strategic level, such as avoiding designated sites, and the need to cross third-party infrastructure, as far as possible. Project vessels to comply with the International Regulations for Preventing Collisions at Sea 1972. Development of a Vessel Management Plan at project-level to support compliance with the International Regulations for Preventing Collisions at Sea 1972, including specifying a maximum vessel speed for each vessel. Deploy marine mammal observers on vessels to help prevent collisions with marine animals. Consider the number of vessels required relative to the existing marine traffic. Reduce the speeds undertaken by vessels. Reduce the number and frequency of vessels transiting between port and the installation/ maintenance site.
Airborne sound and visual disturbance to marine mammals and seabirds	The following measures have the potential to avoid and/or reduce the impact of airborne sound and visual disturbance on marine receptors. Measures would be included in a Construction

Potential Impact	Proposed Mitigation
	Environment Management Plan, Register of Environmental Actions and Commitments or similar: Considering lighting and the spectrum of lighting on vessels operating at night during key foraging and migratory periods. Adjusting vessel transit speeds when some species are visible, particularly razorbill or guillemot. NatureScot have indicated this is particularly likely to be required for works occurring within the Outer Firth of Forth and St Andrews Bay Complex SPA if there is temporal overlap with the flightless moult period of razorbills and guillemots from mid-August to the end of October. Other seasonal restrictions, particularly on works within 2km of red throated diver and 2.5 km of common scoter. JNCC when consulted over an earlier version of the HRA report advised that works occurring within or around SPAs designated for common scoter and/or red-throated diver are carried out outside of their wintering period. This will vary slightly for each European site, and the list below is not comprehensive (it does not include Carmarthen Bay SPA, for example): • Greater Wash SPA – from September to April for both common scoter and red-throated diver. • Liverpool Bay SPA – from November to March for both common scoter and red-throated diver • Outer Firth of Forth and St Andrews Bay Complex SPA – from September to March for red-throated diver, from July to April for common scoter. • Outer Thames Estuary SPA – from October to May for red-throated diver. Should this not be possible then a vessel disturbance assessment should be carried out to inform further analysis. Raise the priority of environmental considerations to an equal footing with other, more-traditional considerations at this strategic level, such as avoiding designated sites, and the need to cross third-party infrastructure, as far as possible; Micro-routing to avoid seal haul outs overlapping with the ZoI; and Lighting on-board the vessels can be kept to the minimum level required to ensure safe operations and directed towards working areas.

Potential Impact	Proposed Mitigation
Noise and visual disturbance of birds from landfall/onshore works	Whether the impacts are likely to arise on birds (as detailed in Table 20 of the RIAA), or bats or otters, the approach to addressing potential adverse effects on integrity will be similar, although assessment thresholds will differ. Mitigation is likely to take three forms. Measures would be included in a Construction Environment Management Plan, Register of Environmental Actions and Commitments or similar: Physical avoidance – since the corridors are 5km wide this provides ample opportunity for most corridors to locate the actual construction swath (including any new substation or converter station) sufficiently far away from the site to avoid disturbance (e.g. at least 300m away for birds). Temporal avoidance – for some sites it may be possible to time the most disturbing works (e.g. HDD) to take place outside sensitive periods. This is likely to be more possible for birds and bats than for otter, as bats hibernate during the winter and many SPAs are designated for either non-breeding or breeding birds. For sites designated for non-breeding birds avoiding the most disturbing works between October to March may avoid any adverse effect on integrity. For sites designated for breeding birds the season will vary and will need to be confirmed on a case-by-case basis, but the core season is usually March to June. For sites designated for both breeding and non-breeding birds, temporal avoidance may not be possible. Mitigation – this essentially involves reducing the noise and visual disturbance experienced by the bird or other wildlife to a level that is not significantly disturbing. This could involve the use of a different construction method. It may also involve ensuring visual screens and noise barriers are installed between the relevant works and the SPA, and/or fitting features to noise-generating plant and lighting fixtures to reduce the noise or light generated. It should be noted, however, that depending on noise/light levels during construction and proximity to European sites it may not be possible to reduce noise and light levels to a sufficient degree to avoid significant disturbance. For example, British Standard guidance generally indicates that conventional noise fencing may only reduce noise levels by up to 10dB, while other types of mitigation (e.g. enclosing an HDD drive site in a housing) may achieve reductions of 20dB. In these circumstances physical or temporal avoidance may be the only solution.
Risk of bird strike from onshore overhead line	Mitigating birdstrike incidents with OHL is imperative to minimise adverse effects on the designated avian populations. Measures would be included in a Construction Environment Management Plan, Register of Environmental Actions and Commitments or similar.

Potential Impact	Proposed Mitigation
	If new OHL is going to be constructed, design modifications are essential for mitigation; incorporating avian-friendly features like bird flight diverters (which can include moving diverters and those which absorb light during the day and emit it at night for low visibility situations and nocturnal movements), perch deterrents, and insulator covers to reduce collision risks and discourage perching (Ferrer, 2020). Enhancing OHL visibility through markers and reflective materials is crucial to alert birds and diminish collision risks (NatureScot, 2016). Strategic undergrounding of cables, particularly in areas with high avian activity or ecologically sensitive habitats, eliminates collision risks altogether. Vegetation management could be implemented to control plant growth near OHL, reducing perching opportunities for birds. Installing raptor perch deterrents and bird flight diverters along OHL further discourages avian interactions (Slater & Smith, 2010). Site-specific impact assessments are important to identify areas with increased avian activity and tailor mitigation measures accordingly.
Temporary or permanent loss or removal of terrestrial and intertidal habitats	In general, when undertaking detailed design for the purposes of planning application and Development Consent Order landfalls should avoid European site boundaries and only occur within site boundaries if it can be shown that other options will not deliver the objectives of the project. If landfall will occur within a site, this and the corridor continuation within the European site, should be undertaken using trenchless techniques such as HDD, with the compounds and HDD pits located outside the site boundary and/or the intertidal zone. There would need to be a geotechnical investigation regarding the use of trenchless techniques to ensure that it can be installed without any risk of collapse of the surface substrate. If landfall will occur within a site, the surface permanent infrastructure should be located outside the site boundary unless it can be situated within 'site fabric'. It can be seen from Table 22 of the RIAA that one corridor is considered not to be able to avoid adverse effects on the integrity of a European site and will therefore require derogations based on available information. This is SW_N4_to_Arnish_(Lewis) which cannot avoid adverse effects on Lewis Peatlands SPA either due to direct habitat loss or indirect habitat loss through impacts on hydrology.
Terrestrial functionally linked habitat impacts	As relevant schemes are developed further for planning applications and Development Consent Orders, those identified as having potential AEoSI for otters (i.e. Corridors Ballantrae_to_Pentir, SW_N1_to_Spittal,

Potential Impact	Proposed Mitigation
	Shetland_to_Blackhillock, SW_E1c_2_to_Weston Marsh, SW_N2_to_Near_Dounreay, SW_N3_to_Arnish and PDA1_to_Llandyfaelog) and Corridor Ballantrae_to_Pentir for lesser horseshoe bat (*Rhinolophus hipposideros*) would need to undertake the following: For otters, surveys would be required for the planning application to identify their presence where suitable habitats to be affected. Where necessary to preserve such habitats, appropriate construction techniques (such as trenchless techniques for buried cables across significant watercourses) would need to be implemented. Where this was not possible or appropriate within the context of the scheme (such as with some ditches) then alternative habitat may need to be provided and steps taken to ensure no loss of connectivity for otters. For lesser horseshoe bats, any scheme will need to undertake bat surveys and, if lesser horseshoe bats are found, either preserve key habitats such as tree lines, roosts, and hedgerows or species-rich meadows (such as careful working practices, trenchless techniques and habitat restoration immediately following works) or offset impacts by enhancement of other areas or provision of replacement roosts (where roosts are directly affected). Where corridors are identified as lying within the ZoI for functionally-linked land impacts on SPA birds as set out in Natural England Impact Risk Zone guidance or other guidance such as that produced by NatureScot, the following procedures will need to be followed: Firstly, bird survey (typically two years) at the relevant time of year will be required of the affected area to confirm the bird use of the site. If the fields in question regularly support approximately 1% of the SPA population or above, they are classed as functionally-linked habitat. Note that this does not necessarily mean that fields supporting less than 1% of an SPA population are not functionally-linked land (e.g. for rare species such as golden plover, even land supporting less than 1% of the SPA population may be important) but the 1% threshold can provide a useful starting point. Where possible these fields should be avoided, particularly by permanent infrastructure. If it is not possible to avoid them it will be necessary to offset the loss through the creation/enhancement of alternative habitat to ensure no overall net loss of available resource.

Potential Impact	Proposed Mitigation
	Measures would be included in a Construction Environment Management Plan, Register of Environmental Actions and Commitments or similar.

Table 41: HRA Proposed Project-Level Mitigation Measures

10.1.4 MCZ Mitigation

Plan-Level Mitigation

The Stage 1 MCZ assessment determined the impact pathways that could affect MCZs, HPMAs and Nature Conservation MPAs, noting that, as the final cable designs and methodologies are not yet defined, there remains potential for many effects on MCZ protected features from cable installation, operation, and maintenance, and decommissioning to be reduced, or possibly avoided altogether through additional mitigation commitments embedded within each individual cable project design. The Stage 1 MCZ report set out specific mitigation measures, which should be considered on a case-by-case basis by each project, as appropriate, as these projects develop.

The potential impact pathways identified by the Stage 1 MCZ are as follows:

- Temporary physical disturbance – subtidal benthic habitats and species.
- Permanent loss – subtidal benthic habitats and species.
- Introduction of INNS – subtidal benthic habitats and species.
- Changes in prey availability.
- Collision risk – marine mammals.
- Thermal emissions – subtidal benthic habitats and species.
- EMF - subtidal benthic habitats and species, marine mammals, fish, and invertebrates.
- Airborne sound and visual disturbance – marine mammals and birds.
- Underwater sound – marine mammals, fish, and shellfish.
- Increased suspended sediment concentrations - subtidal benthic habitats and species, marine mammals, fish, and invertebrates.
- Water quality - subtidal benthic habitats and species, marine mammals, fish, and invertebrates.
- Barriers to migration – migratory fish.

Developments are expected to follow the Mitigation Hierarchy Framework, prioritising measures resulting in the least effect on protected features. Where cable route corridors run directly through an MCZ, the projects should consider reducing the width of the study corridor to avoid entering the MCZ or, where this cannot be reasonably achieved, consider

micro-siting the route corridor around sensitive and protected features within the MCZs. In the case of HPMAs, it is highly unlikely that consent will be given from regulators should a cable route or its ZoI for its associated pathways overlap a site's boundaries. Therefore, it is highly likely designs which avoid HPMA altogether, including the application of spatially appropriate impact buffer zones, will be required.

Table 42 shows the range of project-level mitigation measures proposed in the MCZ report.

MCZ Mitigation Measures

Potential Impact	Proposed Mitigation
Offshore Cabling	
Temporary physical disturbance - subtidal benthic habitats and species	The following measures have the potential to avoid and / or reduce the impact of temporary physical disturbance on marine receptors: Raise the priority of environmental considerations to an equal footing with other, more-traditional considerations at this strategic level. Detailed route development and micro-routing within the study corridor, following best practice guidance (JNCC & Natural England, 2022), and informed by pre-installation evaluation of site-specific survey data to avoid or minimise localised engineering and environmental constraints; including minimising the footprint as much as possible, and targeting seabed habitats that are known for quicker recovery times, where practicable. Consideration of the cable trenching method with the smallest Zone of Influence (ZoI). Consideration of the requirement and extent of for pre-lay grapnel runs and sand wave lowering.
Permanent loss - subtidal benthic habitats and species	Raise the priority of environmental considerations to an equal footing with other, more-traditional considerations at this strategic level. Detailed route development and micro-routeing within the study corridor, following best practice guidance (JNCC and Natural England, 2022), and informed by pre-installation evaluation of site-specific survey data to avoid or minimise localised engineering and environmental constraints, including minimising the footprint as much as possible. Where possible, cable protection materials could be selected to match the environment (e.g. when cables are installed in areas of cobbles or other natural rock features, rock of similar diameter and material as the receiving environment should be used could

Potential Impact	Proposed Mitigation
	be used as an alternative to materials such as concrete mattressing).
increased suspended sediment concentrations – subtidal benthic habitats and species, marine mammals, fish, and invertebrates	The following measures have the potential to avoid and/or reduce the impact of SSC and sediment deposition on marine receptors: Raise the priority of environmental considerations to an equal footing with other, more-traditional considerations at this strategic level. Detailed route development and micro-routing within the study corridor, following best practice guidance (JNCC and Natural England, 2022), and informed by pre-installation evaluation of site-specific survey data and physical processes modelling to avoid or minimise localised engineering and environmental constraints; including minimising the footprint as much as possible, and installation that avoids fine sediments where possible. Consideration of the cable trenching method with the smallest (ZoI). Consideration of the requirement and extent of pre-lay grapnel runs and sand wave lowering.
Water quality – subtidal benthic habitats and species, marine mammals, fish, and invertebrates	The following measures have the potential to avoid and/or reduce the impact of changes in water quality: CEMP including an Emergency Spill Response Plan and Waste Management Plan during the installation phase of each individual project to minimise releases. Appropriate HSE procedures (identified in the CEMP), with strict weather and personnel limits to reduce any risk of accidental spillage. Response plans, including control measures and SOPEP in place and adhered to under MARPOL Annex I requirements for all vessels. Drilling fluids selected from the OSPAR List of Substances/Preparations Used and Discharged Offshore (2021) which are Considered to Pose Little or No Risk to the Environment.
Introduction of INNS - subtidal benthic habitats and species	A number of industry best practice mitigations would lower the probability of INNS transmission to benthic habitats and thus reduce the risk of significantly affecting a habitats site: All project vessels should adhere to the International Maritime Organisation (IMO) Guidelines for the control and management of ship' biofouling, and the International Convention for the Control

Potential Impact	Proposed Mitigation
	and Management of Ships' Ballast Water and Sediments, to minimize the transfer of invasive aquatic species. Where possible, the number of locations where cable protection is required (i.e. the number of cable crossings) should be minimised. Any material introduced into the marine environment, such as rock protection material, should be from a suitable source to ensure no INNS can be introduced. Ultimately, it is considered industry best practice to produce a marine biosecurity plan / INNS management plan at project-level, following the latest guidance on INNS from the GB non-native species secretariat. This is increasingly becoming considered a requirement for offshore developments at project-level. With the adherence to these guidelines and measures, INNS introductions would be considered unlikely, with any impacts limited to individual cable route corridors. Thus, significantly reducing the likelihood of significantly adverse effects on a habitats site.
EMF – subtidal benthic habitats and species, marine mammals, and fish	The following measures have the potential to avoid and / or reduce the impact of EMF on marine receptors: Raise the priority of environmental considerations to an equal footing with other, more-traditional considerations at this strategic level. Detailed route development and micro-routing within the study corridor, following best practice guidance (JNCC and Natural England, 2022), and informed by pre-installation evaluation of site-specific survey data to avoid or minimise localised engineering and environmental constraints, including minimising the footprint as much as possible. Consideration of the need for EMF modelling, to inform design. Consideration of the configuration of multiple cables (e.g., bundled). Consideration of the required depth of lowering to minimise EMF emissions.
Underwater sound - marine mammals, fish and shellfish	The following measures have the potential to avoid and/or reduce the impact of underwater sound on marine receptors: Raise the priority of environmental considerations to an equal footing with other, more-traditional considerations at this strategic level.

Potential Impact	Proposed Mitigation
	Consideration of the best practice guidelines for minimising the risk of injury to marine mammals from geophysical surveys (JNCC, 2017). Consideration of the need for underwater sound modelling, to inform design; and Consideration of the need for Marine Mammal Observation. As detailed in Natural England's best practice guidance (Parker *et al.*, 2022) it is advised that a Marine Mammal Management Plan (MMMP) is submitted alongside Development Consent Order (DCO) applications; detailing the mitigation measures implemented as part of any project where marine mammals may be affected.
Barriers to migration – diadromous fish	The following measures have the potential to avoid and/or reduce the impact of EMF on marine receptors: Raise the priority of environmental considerations to an equal footing with other, more-traditional considerations at this strategic level. Detailed route development and micro-routing within the study corridor, informed by pre-installation evaluation of site-specific survey data to avoid or minimise localised engineering and environmental constraints, including minimising the footprint as much as possible. Consideration of the need for EMF modelling, to inform design. Consideration of the configuration of multiple cables (e.g. bundled). Consideration of the required depth of lowering to minimise EMF emissions. Consideration of potential migratory routes of diadromous fish (e.g. river mouths).
Changes in prey availability – birds and marine mammals	The following measures have the potential to avoid and/or reduce the impact of changes in prey availability: Raise the priority of environmental considerations to an equal footing with other, more-traditional considerations at this strategic level. Detailed route development and micro-routing within the study corridor, informed by pre-installation evaluation of site-specific survey data to avoid or minimise localised engineering and environmental constraints, including minimising the footprint as much as possible.

Potential Impact	Proposed Mitigation
	Consideration of habitat and / or prey mapping to inform mitigation needs and / or micro routing as appropriate. Consideration of timing to avoid key biological periods / locations to reduce impact on prey species as appropriate.
Collision risk – marine mammals	The following measures have the potential to avoid and/or reduce the risk of collision with vessels and marine mammals: Adherence to standard best practice, including but not limited to: • Design of study corridors which optimise the balance of environmental, technical, commercial, and financial considerations, such as avoiding designated sites, as far as possible. • Deploy marine mammal observers on vessels to help prevent collisions with marine animals. • Consider the number of vessels required relative to the existing marine traffic. • Project vessels to comply with the International Regulations for Preventing Collisions at Sea 1972. • Reduce the speeds undertaken by vessels. • Reduce the number and frequency of vessels transiting between port and the installation/ maintenance site.
Airborne sound and visual disturbance - marine mammals and birds	The following measures have the potential to avoid and/or reduce the impact of airborne sound and visual disturbance on marine receptors, and are considered standard best practice: Raise the priority of environmental considerations to an equal footing with other, more-traditional considerations at this strategic level. Implementing seasonal restrictions on certain installation, maintenance, and decommissioning activities, which avoid important breeding and wintering periods for certain bird species, and / or pupping and moulting periods for seal species. Micro-routing to avoid seal haul outs overlapping with the ZoI. Lighting on-board the vessels can be kept to the minimum level required to ensure safe operations and directed towards working areas.
Thermal emissions – subtidal benthic habitats and species	The following measures have the potential to avoid and / or reduce the impact of thermal emissions on marine receptors:

Potential Impact	Proposed Mitigation
	Raise the priority of environmental considerations to an equal footing with other, more-traditional considerations at this strategic level. Detailed route development and micro-routeing within the study corridor, following best practice guidance (JNCC and Natural England, 2022), and informed by pre-installation evaluation of site-specific survey data to avoid or minimise localised engineering and environmental constraints, including minimising the footprint as much as possible. Consideration of the need for thermal modelling, to inform design.

Table 42: MCZ Proposed Project-Level Mitigation Measures

10.2 Monitoring

The SEA Directive requires that the implementation of a Plan or Programme is monitored in order to identify, at an early stage, any unforeseen adverse effects and in order to undertake appropriate remedial action. The proposed monitoring programme in Table 43 is based on the Indicators and Targets established in the SEOs. SEA monitoring should be undertaken in conjunction with proposed reviews of the draft HND Implementation Plan, in advance of updates, to enable monitoring outcomes to influence the draft HND Implementation Plan development. Much of the environmental monitoring proposed can be collated from ongoing environmental monitoring and reviews undertaken by bodies such as statutory nature conservation bodies and the Office for National Statistics. The indicators and data proposed for the monitoring of draft HND Implementation Plan implementation are at a strategic level, to match the SEO objectives. The suggested data sources for monitoring of effects are mostly at a strategic level, are nationally consistent and are freely available.

Monitoring is also likely to be required as part of consenting conditions at the project level for cabling and associated infrastructure developments. Project level monitoring outcomes may influence future understanding of environmental interactions and can be considered during subsequent HND Implementation Plan updates or CSNP updates, if appropriate and relevant to the strategic-level indicators, to account for gaps in national level reporting cycles. It should also be noted that under the SEA process and with required survey campaigns that there should be opportunities to share new knowledge from collaborative approaches to expand knowledge and understanding into to inform future developments and aid decision-making processes.

SEA Monitoring

SEO	Indicator	Target	Proposed Data Source(s)
Biodiversity, Flora and Fauna Avoid damage to, and where possible enhance, biodiversity, flora and fauna. **Objective Description** Preserve, protect, maintain and, where possible, enhance biodiversity and ecosystems within GB marine and coastal areas, including internationally, nationally, and locally protected sites, habitats and species, and other known species of conservation concern.	• Conservation status of designated habitats and species within international and national designated sites (e.g., SACs, SPAs, Ramsar sites, MCZs, NCMPAs, SSSIs). • Status of protected and priority habitats and species (e.g., Annex habitats and species, priority habitats and species). • Areas of known importance for flora and fauna (e.g., fish spawning and nursery grounds, RSPB Reserves, NRW habitats sensitive to cabling).	• No negative change, or a positive change, in the conservation status of designated habitats and species within international, and national designated sites. • No negative change, or a positive change, in the status of protected or priority species and habitats outside designated sites. • Avoid areas of known importance for flora and fauna.	• Site condition monitoring and reporting for SACs, SPAs, Ramsar sites, MCZs, MPAs, NNRs, and SSSIs by Statutory Nature Conservation Bodies (SNCBs: Natural England and DEFRA, NatureScot, NRW). • SNCB, JNCC reporting of protected and priority species. • SNCB reporting of non-native and invasive species. • CEFAS or other published reviews of fish spawning and nursery grounds. • OSPAR review/further mapping of threatened or declining habitats and species. • Information from project-level studies, where appropriate and relevant to strategic-level indicators, to account for gaps in national level reporting cycles. • NESO monitoring of plan-level progression.

SEO	Indicator	Target	Proposed Data Source(s)
Population and Human Health Minimise disruption to the local population, and adverse effects on human health and wellbeing, while maximizing potential benefit to the population. **Objective Description** Avoid adverse effects on human health and safety and minimise disruption to the local population, and displacement of recreational and leisure use of the area, while supporting transition from fossil fuel use through delivery of a new secure renewable energy supply for the GB population, with potential employment and other benefit opportunities.	• Population centres in proximity to onshore routes. • Areas of higher deprivation in proximity to onshore routes. • Use of the area by recreational and leisure users (e.g., RYA areas, Bathing waters) and status of these areas, where applicable. • Potential to support new renewable energy supply for the GB population, with potential employment and other benefit opportunities.	• Delivery of cables and associated infrastructure with minimal adverse nuisance to communities, including in areas of higher deprivation. • Minimise the risk to, or displacement of, recreational and leisure users of the area. • No negative change, or a positive change, in the status of Bathing Waters. • Facilitation of renewable energy infrastructure that supports a transition away from fossil fuel use and maximises the potential benefits to the population.	• Office for National Statistics (ONS; England and Wales), National Records of Scotland census data. • Consumer Data Research Centre (CDRC) harmonised statistics on population deprivation. • ONS employment data. • RYA leisure density data (review of any changes). • Environment Agency (England), SEPA (Scotland), NRW (Wales) reporting of Bathing Water quality. • Information from project-level studies, where appropriate and relevant to strategic-level indicators, to account for gaps in national level reporting cycles. • NESO plan-level monitoring, including data on capacity of new renewable energy generation facilitated.
Geology, Soils and Land Use	• Site condition/status of protected	• No negative change, or a positive change, in	• Site condition monitoring and reporting for MCZs,

SEO	Indicator	Target	Proposed Data Source(s)
Minimise damage to the function and quality of the seabed, and avoid significant damage to, or loss of, sensitive onshore land and soils. **Objective Description** Preserve, protect, maintain and, where possible, enhance, sites designated for geological or geomorphological features, and minimize direct and indirect damage to the function and quality of the seabed and sensitive onshore land and soils.	geological/geomorphological features within designated sites (WHSs, MCZs/Historic MPAs, SSSIs, UNESCO Geoparks). • Interaction with known areas of potential contamination (e.g., MoD live firing areas, munition disposal areas, UXO, dumping grounds offshore). • Potential scale of loss or alteration to seabed geology and sediments. • Potential scale of loss of soil resource including high-quality agricultural lands.	the condition of protected geological/geomorphological features within designated sites. • Minimise potential interaction with areas of potentially contaminated sediments. • Minimise potential loss or alteration to seabed geology and sediments. • Minimise potential loss of sensitive land and soils including high-quality agricultural lands.	MPAs and SSSIs by SNCBs (Natural England and DEFRA, NatureScot, NRW). • DEFRA reporting for the Marine Strategy (e.g., Descriptor 6: sea floor integrity). • UK Centre for Ecology and Hydrology (UKCEH) CORINE data and review/update of UK Agricultural Land Classification and Land Quality Survey (Natural England), Land Capability for Agriculture (James Hutton Institute). • Information from project-level studies, where appropriate and relevant to strategic-level indicators, to account for gaps in national level reporting cycles. • NESO monitoring of plan-level progression.
Water Avoid impacts on the status or quality of waterbodies and avoid interaction with areas of flood risk. **Objective Description**	• Status of WFD waterbodies and protected areas (Bathing Waters, Shellfish Waters) interacting with offshore and onshore routes. • MS Environmental status of marine	• No negative change in the status of WFD waterbodies, and protected areas. • No negative change in the Environmental status of MS Descriptors. • Minimise potential interaction with	• Reporting of waterbody status in RBMPs by Environment Agency (England), SEPA (Scotland), NRW (Wales). • DEFRA reporting for the MS (e.g., Descriptor 5: human

SEO	Indicator	Target	Proposed Data Source(s)
Support the objectives of the WFD and MS by avoiding damage to or deterioration of water status, quality and resource and support the objectives of the Floods Directive by avoiding interactions with national flood zones.	area (e.g., Descriptor 5, 8, 9, 10, 11). • Interaction with known areas of potential contamination offshore (e.g., MoD live firing areas, munition disposal areas, UXO, dumping grounds). • Potential for impacts on water quality during construction. • Interaction with areas of known flood risk (national flood zones).	areas of potentially contaminated sediments. • Minimise the potential for impacts on water quality during construction. • Minimise potential interaction with areas of known flood risk.	induced eutrophication, Descriptor 8: concentration of contaminants within marine environment, Descriptor 9: concentrations of contaminants in fish and other seafood, Descriptor 10: marine litter, Descriptor 11: human introduced noise). • Flood risk management reporting by Environment Agency (England), SEPA (Scotland), NRW (Wales). • Information from project-level studies, where appropriate and relevant to strategic-level indicators, to account for gaps in national level reporting cycles. • NESO monitoring of plan-level progression.
Air Minimise risk to local air quality and contribute to improving national emissions.	• Sensitive receptors in proximity to routes (e.g., population centres onshore, areas of high recreational/leisure use offshore).	• Minimise the potential for negative effects on air quality from vessel emissions and onshore emissions. • Avoid interaction with areas of known	• Office for National Statistics (ONS; England and Wales), National Records of Scotland census data.

SEO	Indicator	Target	Proposed Data Source(s)
Objective Description Minimise risk to local air quality and contribute to improving regional pollutant emissions.	• Interaction with areas of known air quality issues onshore (e.g., Air Quality Management Areas) • Capacity to support new renewable energy connection, with potential effects on pollutant reduction.	air quality issues onshore. • Facilitation of renewable energy infrastructure that supports a transition away from fossil fuel use and maximises the potential for a reduction in air pollutant emissions.	• RYA leisure density data (review of any changes). • DEFRA and National Atmospheric Emissions Inventory air quality and emissions reporting. • Information from project-level studies, where appropriate and relevant to strategic-level indicators, to account for gaps in national level reporting cycles. • NESO monitoring of plan-level progression, including data on capacity of new renewable energy generation facilitated.
Climatic Factors Avoid impacts on carbon stocks and potential while contributing to a reduction in GHG emissions. **Objective Description** Minimise loss of carbon sequestering seabed and terrestrial carbon sinks while contributing to a reduction in GHG emissions from the	• Interaction with areas of known or potential blue carbon habitats. • Interaction with onshore habitats that are carbon sinks (peatlands, forests). • Capacity to support new renewable energy connection, with potential effects on GHG reduction.	• Minimise the potential for loss of known blue carbon habitat. • Minimise the potential for loss of onshore habitats that function as carbon sinks. • Facilitation of new renewable energy infrastructure that maximises the potential for a reduction of GHG emissions in line	• SNCB reporting / published information of Annex I habitats / areas of known or potential blue carbon habitat. • National Atmospheric Emissions Inventory GHG emissions reporting. • Information from project-level studies, where appropriate and relevant to

SEO	Indicator	Target	Proposed Data Source(s)
energy supply sector in line with national commitments.		with emission reduction targets.	strategic-level indicators, to account for gaps in national level reporting cycles. • NESO monitoring of plan-level progression, including data on capacity of new renewable energy generation facilitated.
Material Assets Minimise disruption to other assets and infrastructure while providing robust new renewable energy infrastructure. **Objective Description** Provide robust new renewable energy infrastructure while minimising disruption to other assets and infrastructure.	• Presence of offshore and onshore coastal infrastructure (e.g., cables, pipelines, roads, WWTWs). • Interaction with other users of the marine area (shipping, fisheries and Shellfish Waters, military, aviation, dredging sites). • Potential capacity of new renewable energy infrastructure facilitated.	• Minimise the potential for loss or damage to other marine, coastal, and onshore infrastructure. • Minimise the risk to, or displacement of, other users of the area (fisheries and aquaculture, shipping, military activities, aviation, dredging sites). • Facilitation of new renewable energy infrastructure that maximises the potential energy output in line with government targets to decarbonise the power system by 2030.	• NESO monitoring of plan-level progression, including data on capacity of new renewable energy generation facilitated. • Information from project-level studies, where appropriate and relevant to strategic-level indicators, to account for gaps in national level reporting cycles. • Shipping statistics and data (e.g., ports traffic, VMS density data – review of any changes). • Fisheries statistics and data (e.g., UK Sea fisheries annual statistics reporting, MMO fish landings reporting, and data (e.g., ports traffic, VMS density data –

SEO	Indicator	Target	Proposed Data Source(s)
			review of any changes)).
Cultural Heritage Protect, conserve, and enhance designated and non- designated heritage assets and their settings. **Objective Description** Protect international, national and local heritage designations, and non-designated heritage assets, and their settings.	• Interaction with known designated marine heritage features/sites (e.g., protected wrecks, Historic MPAs). • Interaction with known designated coastal archaeological or architectural heritage features (e.g., listed buildings, scheduled monuments). • Potential to contribute to archaeological knowledge through surveys and actions.	• Minimise the potential for effects on known designated marine heritage features/sites. • Minimise the potential for effects on known heritage features and their setting in development and operation of onshore infrastructure. • Potential for gaining new knowledge to inform subsequent decision-making.	• Information from project-level studies, where appropriate and relevant to strategic-level indicators, to account for gaps in national level reporting cycles, and condition of heritage assets directly impacted by proposals. • Marine Historic Environment Record (HER) and MDE Heritage Accelerator (MDEHA) project (https://historicengland.org.uk/advice/planning/infrastructure/renewable-energy/accelerating-clean-energy-offshore/), which is significantly increasing the amount of heritage information available to inform marine development. • Number of new assets discovered by proposed works. • NESO monitoring of plan-level progression.

SEO	Indicator	Target	Proposed Data Source(s)
Landscape and Visual Amenity Protect, and where possible enhance, the landscape and seascape character and visual amenity of the GB shoreline. **Objective Description** Protect and where possible enhance the landscape and seascape character and visual amenity of the GB shoreline.	• Potential for effects on visually sensitive designated areas (e.g., National Landscapes, WHSs). • Population centres in proximity to onshore routes.	• No long-term negative change, or a positive change, to areas designated for landscape. • Delivery of cabling and associated onshore infrastructure with minimal adverse visual effects to communities.	• Office for National Statistics (ONS; England and Wales), National Records of Scotland census data. • Reviews, updates or sensitivity assessments of NCAs in England (Natural England), NLCAs in Wales (NRW), and LCAs in Scotland (NatureScot). • Local Development Plan updates. • Information from project-level studies, where appropriate and relevant to strategic-level indicators, to account for gaps in national level reporting cycles. • NESO monitoring of plan-level progression.

Table 43: Proposed SEA Monitoring of the draft HND Implementation Plan

11. Summary and Conclusions



The SEA Environmental Report has identified the potential positive and negative effects on the wider environment of undertaking the Recommended Designs of the draft HND Implementation Plan, along with highlighting the potential cumulative or in-combination effects of developing within these areas. This report is designed to help support the future decision making in the implementation of the HND Implementation Plan, to ensure that NESO and future developers are fully aware of the environmental constraints and opportunities of potential cabling and interface infrastructure works, and to support the future sustainable development of projects that come from the draft HND Implementation Plan.

The draft HND Implementation Plan is being prepared by NESO to set out the recommendations of the four HND work strands, which together comprise the Holistic Network Design (HND) and Holistic Network Design Follow Up Exercise (HNDFUE) exercises. These work strands are HND, HNDFUE ScotWind, HNDFUE Celtic Sea, and HNDFUE INTOG. Together, these aim to provide a set of holistic network recommendations to facilitate the connection of future offshore wind energy in GB waters. The draft Plan provides offshore network design recommendations and sets the framework for the development of offshore cabling, associated onshore cabling, and developer converter / substations.

The Recommended Designs for HND, HNDFUE ScotWind, HNDFUE Celtic Sea and HNDFUE INTOG were determined by NESO on the basis of four Network design objectives 'Economic and efficient', 'Deliverability and operability', 'Environmental impact', and 'Local community impact'. As part of this early work, RPS undertook assessment of environmental and social constraints to offshore cabling (cabling from the proposed offshore wind farm site to the proposed interface point on the onshore grid) to inform the development of recommended network design options. At this stage, all technically feasible route corridors and grouped Options available to the draft Plan were appraised, considering technical, environmental, and community constraints and sensitivities, and the short-listing of potential route corridors and options was influenced by environmental and social factors.

For a total of 112 short-listed route corridors, 31 short-listed options, and 39 interface areas (which considered the wider area around the endpoint of route corridors where onshore infrastructure, including substations and/or converter stations would need to be developed), an SEA light assessment was then conducted. This was based on key indicators across the SEA topics of Biodiversity, Flora and Fauna; Population and Human Health; Geology, Soils and Land Use; Water; Air; Climatic Factors; Material Assets; Cultural, Architectural, and Archaeological Heritage; and Landscape, Seascape, and Visual Amenity, and included identification of the potential for effects on these indicators for these topics and the nature of these effects (e.g., significance and temporal nature).

The Recommended Designs for the four HND / HNDFUE work strands were considered and assessed in the order in which they were developed, and the recommended network design established, i.e., HND, HNDFUE ScotWind, HNDFUE Celtic Sea, HNDFUE INTOG, recognising that earlier work strands could have in-combination and/or cumulative effects with subsequent Recommended Designs for work strands that overlap in a geographic area, and a summary of the likely environmental effects of implementing all of the work strands of the draft Plan was also appraised. This SEA assessment considered

a wider range of available strategic level data within each Recommended Design study area across the SEA topics. These appraisals were informed by a high-level assessment of the potential effects on SEA topics from cabling and development of infrastructure within interface areas, which was established through a thorough literature review.

The assessment indicated the potential for significant negative effects on Biodiversity, Flora and Fauna from development of cabling within identified route corridors and onshore infrastructure within interface areas. This was due to the potential for direct, short-term, negative effects on features of designated sites that are unavoidable by cable routes, and indirect effects on designated sites within proximity to developments, noting that that identified route corridors aimed to avoid all designated sites, where this was possible. The potential for moderate negative effects on Biodiversity, Flora and Fauna was also indicated, owing to the significant amount of offshore and onshore cabling required, which could have longer-term negative effects on protected habitats such as reefs, where recovery may be difficult, as well as the significant amount of onshore interface infrastructure required, albeit with potential avoidance of sensitive areas.

The potential for significant, short-term temporary, negative effects was identified for Material Assets, primarily due to the significant amount of unavoidable infrastructure, including cables and pipelines, that would need to be crossed by cables within the Recommended Designs, as well as infrastructure that is unavoidable within interface areas, and the potential for damage and/or disruption to services, as well as interaction with busy shipping and fishing areas during construction and decommissioning.

For the SEA topics of Population and Human Health; Geology, Soils and Land Use; Water; Air; and Landscape, Seascape and Visual Amenity, the potential for moderate short-term negative effects was identified, owing to the significant quantity of cabling and onshore infrastructure associated with the draft Plan and the potential effects on sensitive areas or receptors. The potential for medium to long-term moderate negative effects on Landscape, Seascape and Visual Amenity was also identified, associated with the potential landscape and visual impacts from development of a significant amount of onshore infrastructure, particularly in areas of higher sensitivity. Best practice mitigation was outlined in the assessments for the avoidance or minimisation of identified negative effects.

The potential for positive effects was also identified by the assessment of Recommended Designs. The potential for significant medium to long-term positive effects on Material Assets was identified as implementation of the draft Plan has the potential to connect approximately 77.8GW of renewable energy generation to the GB grid, significantly reducing the associated reliance on fossil fuel generation. The potential for significant medium to long-term positive effects for Air and Climatic Factors was also recognised, as new renewable energy infrastructure will support decarbonisation of the energy sector, diversification of electricity supply and energy security, and meeting of energy objectives and climate change emission reduction targets. These positive impacts in turn will help to ensure that electricity supply is able to meet future demand, and that there is less reliance on fossil fuels into the future, resulting in better air quality and less GHG emissions.

Areas were identified where there is greater potential for in-combination or cumulative negative effects to be considered at this strategic stage owing to a concentration of existing and planned cables, and which would need to be taken into consideration at the detailed project planning and design stage. To minimise the potential environmental and navigational adverse effects, it is recommended that cable routing and protection strategies should be coordinated between developers, transmission owners/operators and other seabed users, including active consideration of shared cable protection and joint corridor-management arrangements.

Further environmental studies based on the more detailed designs and construction methodologies should be undertaken as appropriate and may include, for instance, surveys of various biotic groups, Landscape, Seascape, and Visual Impact Assessments, or heritage assessments, with any recommended avoidance or mitigation measures applied to ensure that there are no significant negative environmental effects during construction, operation, and decommissioning of the developments associated with the draft Plan.

The HRA Report for the draft Plan considered the potential for Likely Significant Effects, and subsequently Adverse Effects on Site Integrity of identified European sites, with regard to their Qualifying Interest Features and associated Conservation Objectives. In advance of considering mitigation measures, it could not be concluded that there will be no Adverse Effects on Integrity of Site (AEoSI) on any European sites for any corridors. This is because of the inherent uncertainties that exist about future developments and the potential in-combination effects. Given the inherent uncertainties associated with HND, HNDFUE, INTOG and Celtic Sea, plan-level mitigation measures it concluded that plan-level mitigation measures are required to ensure there is no AEoSI. In the majority of cases, it was concluded that the plan will not have an adverse effect on the integrity of any European sites alone or in combination with other plans or projects. This conclusion was partly due to the requirement for a down-the-line HRA for specific planning applications when the fullest level of detail on each scheme is available. It was also partly due to the conclusion that it would be possible for most new cable routes to either avoid or adequately mitigate adverse effects on the integrity of European sites. Finally, it was partly due to the fact that the plan is not legally, spatially or technically binding on developers and therefore does not force developers to utilise a corridor identified in the plan. The exceptions identified by the HRA were for cable routes PA_1 to Birkhill Wood, R4_1 to Birkhill Wood, R4_2 to Birkhill Wood, and SW_N4 to Arnish (Lewis). The HRA Derogation Report considered these routes further. It concluded that three of the study corridors (PA_1 to Birkhill Wood, R4_1 to Birkhill Wood and R4_2 to Birkhill Wood, all of which connect to wind farms located within Dogger Bank and thus require traversing Dogger Bank SAC) meet the test of 'no alternatives' and 'Imperative Reasons of Overriding Public Interest' as to why they should nonetheless proceed despite the harm they will cause to Dogger Bank SAC.

At the plan level it was concluded that study corridor SW_N4_to_Arnish_(Lewis) meets the test of 'no alternatives' and 'Imperative Reasons of Overriding Public Interest' as to why it should nonetheless proceed despite the harm it will cause to Lewis Peatlands SPA/Ramsar. It was also concluded that there is a high level of confidence it would be technically feasible for the developer to deliver suitable compensation for the adverse

effects on integrity. Therefore, it was concluded that the plan can proceed with these four study corridors included.

The Stage 1 MCZ assessment for the draft Plan identified a total of 36 study corridors as having the potential to undermine the conservation objectives of 33 MCZs. Of these study corridors, eight study corridors were identified as having the potential to hinder the conservation objectives of an English MCZ, Highly Protected Marine Area (HPMA), or Scottish Marine Protected Area (MPA). Study corridors and associated MCZs were identified that will likely require further consideration at the individual project level. These included impact pathways ranked as 'Amber', for which at this stage mitigation measures have been identified that may be sufficient to avoid hindering the MCZ conservation objectives. However, commitments could not be made at this stage, and the feasibility of these measures will need to be assessed at the project level. Additional, mitigation measures may be identified as required when further environmental and project design information are available. There is potential that with appropriate mitigation these study corridors could avoid the need for Stage 2 assessment, at project-level.

Other impact pathways were ranked as 'Red'. As such, the study corridors associated with these Study Corridors were further considered by a Stage 2 Assessment. This stage identified 'other means of proceeding' for all eight identified route corridors that it considered to be reasonably feasible, given the level of design detail at plan-level.

With the application of the precautionary principle, and professional judgment, these other means of proceeding were considered to significantly reduce the risk of hindering the conservation objectives of the associated MCZ / HPMA / NCMPAs. Therefore, it was concluded that all eight study corridors do not need to be considered further for the remaining conditions associated with Stage 2 Assessment at plan-level.

12. Next Steps



Consultations on the draft HND Implementation Plan, SEA Environmental Report, HRA Report and MCZ Report are anticipated to commence in November 2025 and run until January 2026. These documents will be made available for viewing digitally via the NESO website.

Following completion of the consultation period, all comments will be collated and the draft HND Implementation Plan, SEA Environmental Report, HRA Report and MCZ Report will be reviewed and revised as necessary. Provided there are no objections or comments that will significantly alter the draft HND Implementation Plan, the final version of the HND Implementation Plan can be drafted and adopted. This is anticipated to be in Q3 2026. Following release of the adopted HND Implementation Plan, an SEA Statement will be drafted to summarise the process undertaken and identify the manner by which environmental considerations and consultations were integrated into the final HND Implementation Plan.

Table 44 demonstrates the proposed upcoming time stages for the draft HND Implementation Plan, SEA, HRA and MCZ processes.

Milestones

HND Implementation Plan	Dates	SEA / HRA / MCZ
Development of the draft HND Implementation Plan	October 2024 – August 2025	Environmental Assessment. Writing of SEA Environmental Report, HRA Report and MCZ Assessment Report.
Public and statutory consultation on the draft HND Implementation Plan	November 2025 – January 2026	Statutory, Non-Statutory and Public Consultation on SEA Environmental Report, HRA Report and MCZ Assessment Report.
Release of Final HND Implementation Plan	Q3 2026	SEA Environmental Statement

Table 44: Draft Anticipated Milestones

The contact details for any information regarding the draft HND Implementation Plan or its environmental assessments is as follows:

By Email	box.enexternal@neso.energy
By Post	Faraday House, Warwick Technology Park, Gallows Hill, Warwick, CV34 6DA

13. References



Introduction

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