

Non-Technical Summary

1 This document is the Non-Technical Summary (NTS) of the Environment Impact Assessment (EIA) for the proposed Near na Gaoithe offshore wind farm. It aims to provide a summary of the contents of the Environmental Statement (ES) undertaken by Mainstream Renewable Power as part of the consent application.

1.1 Mainstream Renewable Power

2 The developer of the project is Near na Gaoithe Offshore Wind Limited (NnGOWL), a wholly owned subsidiary of Mainstream Renewable Power (Mainstream). Mainstream was founded by Eddie O'Connor in 2008 to develop wind and solar energy schemes around the world. The company has a global development portfolio of over 15 GW, both onshore and offshore across four continents.

3 Mainstream is also developing the 4 gigawatt (GW) Hornsea Zone off the east coast of England with its joint venture partner Siemens Projects Ventures and investor, Dong Energy. In addition, Mainstream is also actively developing wind and solar plants onshore in the US, Canada, Chile and South Africa and is currently progressing the 1.2 GW Horizont offshore wind farm off the coast of Germany.

1.2 Project Overview

4 The proposed Near na Gaoithe Offshore Wind Farm (Near na Gaoithe) is located to the northeast of the Firth of Forth, 15.5 km directly east of Fife Ness (refer to Figure 1.1). The proposed wind farm will cover an area of approximately 105 km², comprising between 75 and 125 turbines, and have a maximum capacity of up to 450 megawatt (MW).

5 The offshore elements of the project will comprise the following main infrastructure:

- Offshore wind turbines, each with a rated output of between 3.6 MW and 7 MW;
- Turbine foundations will be either steel jacket structure or gravity base designs;
- One meteorological mast;
- One or two offshore collector stations;
- An estimated 140 km of inter-array subsea cables, connecting the turbines to the offshore substation; and
- Two 33 km export cables to shore.

6 The onshore aspects will include six onshore cables buried in either one or two parallel trenches, from the landing point at Thorntonloch beach to Crystal Rig II substation where the electricity will be fed into the National Grid. Additional onshore infrastructure will include a transition pit (where the offshore cables connect to the onshore cables) and a substation adjacent to the existing substation at Crystal Rig II. The onshore infrastructure application will be submitted under a separate process and is discussed in the onshore ES and associated planning application.

7 Construction of the offshore aspects is anticipated to commence in 2015 and continue into late 2016, with the wind farm being operational and exporting energy to the National Grid from mid to late 2016.

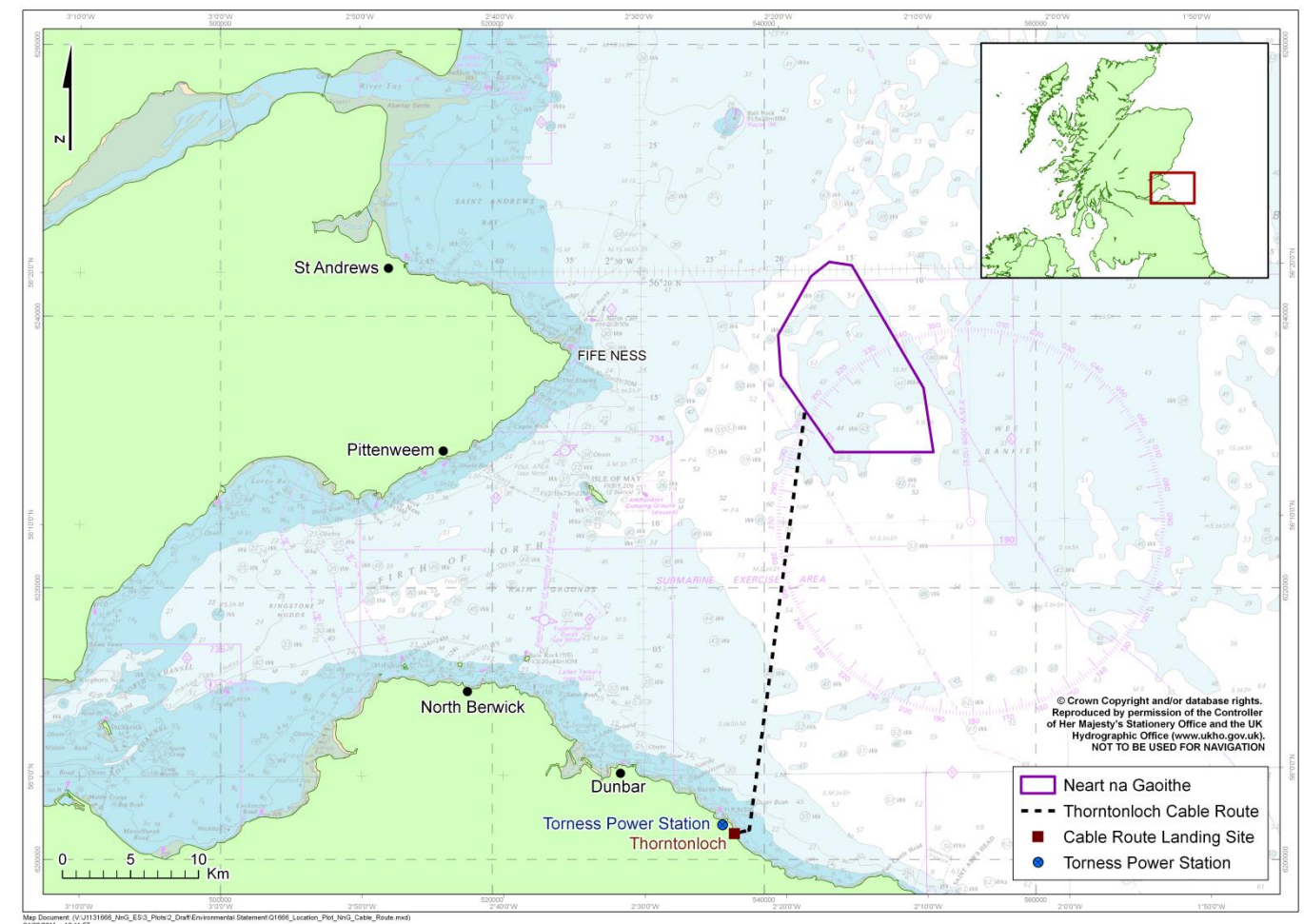


Figure 1.1: The proposed Near na Gaoithe offshore development and cable route

1.3 The Consenting Process

8 There are two important pieces of legislation governing the licensing of all offshore energy projects: The Electricity Act 1989 and the Marine (Scotland) Act 2010. The Electricity Act requires developers to apply for permission (consent) to construct and operate any energy generating development and the Marine (Scotland) Act gives Marine Scotland the powers to rule on these applications.

9 Marine Scotland is the competent authority in the decision making process and all applications made for all renewable energy developments of more than 1 MW within 12 nautical miles (NM) of the shore are submitted to Marine Scotland for consideration.

10 It is necessary to carry out an assessment of the potential impacts associated with the development of Near na Gaoithe before the consent application is considered. This requirement is defined in the Electricity Works (Environmental Impact Assessment) (Scotland) Regulations 2000 (as amended) and the Marine Works (Environmental Impact Assessment) Regulations 2007 (as amended). Both legislative instruments require the applicant to undertake an EIA of relevant electricity generating installations and marine projects respectively. The impacts and conclusions are described in an ES, which is submitted to Marine Scotland in support of the consent application.

11 In addition to the consenting requirements it is also necessary under the European Community Habitats and Birds Directives to consider whether the development could have an impact on protected areas which are considered to be in some way connected to the development area. This connectivity can be a physical overlap of geographic boundaries or can be an overlap whereby species that are qualifying features of a given protected site may use the

development area in some way. This assessment is separate from that required under the Environmental Impact Assessment Regulations and is known as a Habitats Regulation Appraisal (HRA).

12 This ES summarises the potential impacts arising as a direct result of the development and also sets out the information necessary to define the impacts at the HRA level.

1.4 The Assessment Process

13 EIA is a well-defined process which sets out how environmental impacts should be captured and considered throughout the project from the very early stages of discussion through to the construction stage. The emphasis is on identifying and preventing potential impact rather than mitigation and restitution once the impact has occurred.

14 As the impact assessment process begins at an early stage in the project, it is started before the final engineering design and construction methods are determined. In order to have something to assess, an upper and lower limit is set on the design – this is known as a Rochdale Envelope which permits a worst case scenario to be assessed. If the worst case scenario is assessed as not having a significant impact then all other development scenarios, as long as all individual parameters are within the Rochdale Envelope, can also be concluded to not have a significant impact.

15 The principle of the Rochdale Envelope permits the developer or applicant to provide alternative project engineering and construction parameters, of which one or a selection of the scenarios or parameters will ultimately be constructed.

16 It is important to understand the current environmental conditions so that any changes can be predicted against a baseline. Early in the assessment process through a combination of site surveys, consultation and desk based research an environmental baseline is developed for each of the receptors to be assessed. Once the existing conditions are understood it is possible to compare projected impacts against what would be expected to happen were the development not to be built. These changes are evaluated and those which are assessed to have a certain level of impact are mitigated by building procedures or changes to the infrastructure design or construction methods.

17 Depending on the receptor being assessed, the environmental assessment relies on modelling outputs, established literature and professional judgement to predict the extent of potential impacts.

1.5 Consultation and Engagement

18 Consultation and engagement with stakeholders is a critical aspect of the EIA process. Throughout the EIA process and during the continuing design for the proposed wind farm there has been extensive liaison with stakeholders and interested parties. This has included meeting with regulatory and special interest bodies on individual topics, such as commercial fisheries, as well as more widely through public exhibitions and events. Further public events are also planned throughout 2012 and will be advertised locally and on the project website (www.neartnagaoithe.com).

1.6 Other Offshore Wind Farms

19 In the Firth of Forth area, there are two wind farms proposed within territorial waters (12 NM), and a zone for potential developments beyond 12 NM. The Crown Estate (TCE) encouraged collaboration between offshore wind developers to “address the issues arising as a result of the cumulative and combined benefits and effects in the most efficient and effective manner.” To achieve this, the Forth and Tay Offshore Wind Energy Developers Group (FTOWDG), originally chaired by TCE as an independent adjudicator, was established. Mainstream and Repsol Nuevas Energías, the developers of the two Scottish territorial waters (STW) sites, Neart na Gaoithe and Inch Cape, and Seagreen, the Firth of Forth Round 3 Zone 2 developer are collaborating in data collection, survey methodology and consultation on the following aspects:

- Hydrodynamic processes and geomorphology;
- Benthic ecology;
- Ornithology;
- Marine mammals;
- Natural fishery resources;

- Shipping and navigation;
- Commercial fisheries; and
- Seascape, landscape and visual character.

1.7 Physical Environment

1.7.1 Geology and Water Quality

1.7.1.1 Existing Environmental Conditions

20 Within the offshore site, the water depth is between 40 m and 58 m Lowest Astronomical Tide (LAT), with the deeper water in the west of the site. The seabed consists of a series of mounds, each approximately 1 km across and up to 6 m high. The sediments mainly comprise muddy sand, fine to very fine sand and gravelly sand (refer to Figure 1.2). These are underlain by Quaternary sediments, which reach up to 73 m thick in two palaeochannels that cross the site. The bedrock beneath this consists of Carboniferous limestones in the east and sandstones in the west. Along the cable route, the sediment is mainly muddy sand, but this is interrupted by a series of igneous dykes about 10 km offshore. The seabed then transitions to bedrock at the coast, consisting of Carboniferous limestone. The Scottish coast is divided into a series of cells which classify sections of coastline, and can be used for coastal management. The cable route falls within Subcell 1a.

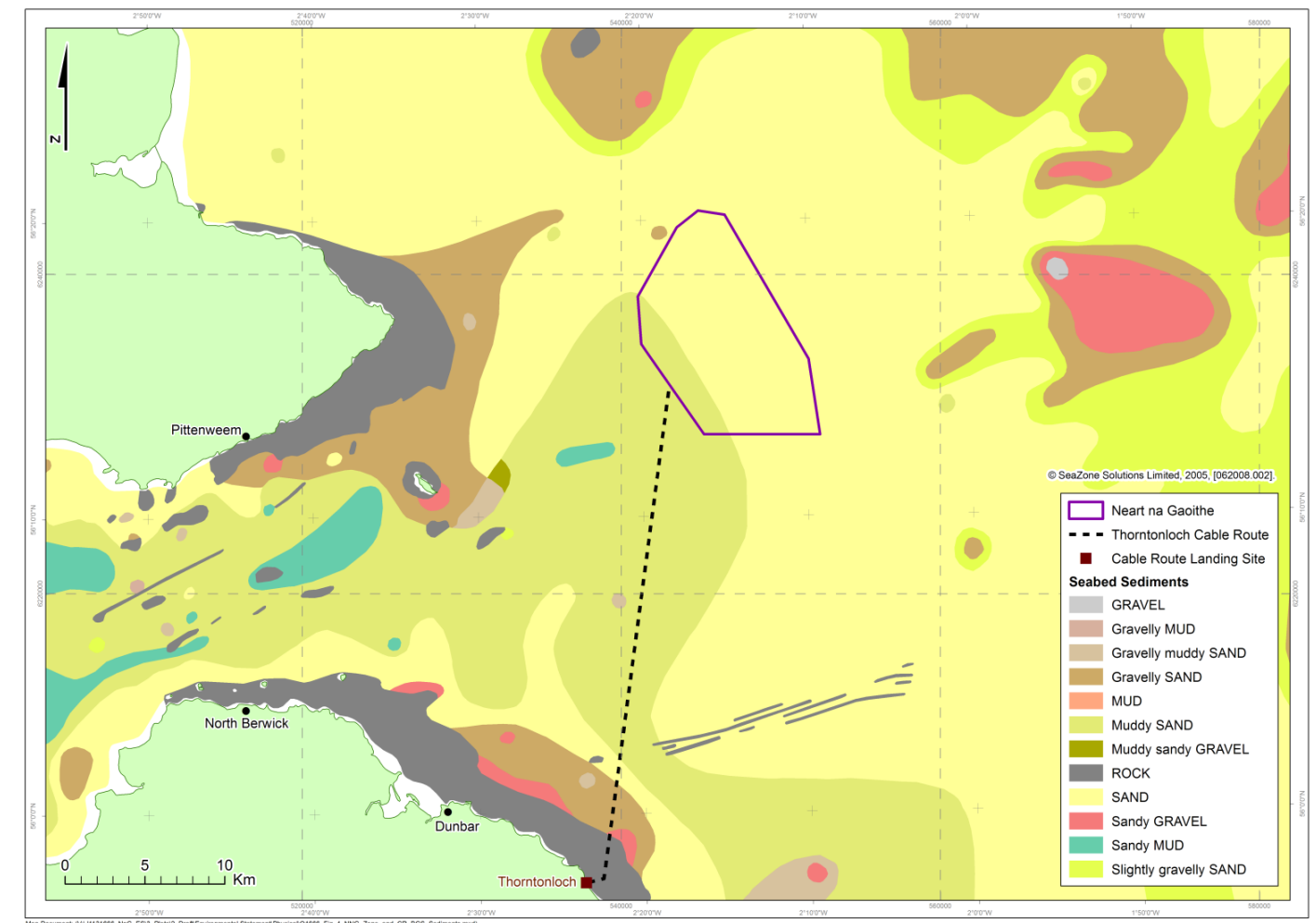


Figure 1.2: Seabed sediments

21 The offshore site is over 20 km from any registered disposal sites, and observed suspended sediment concentrations (SSC) are low (10 mg/l). Various sediment contaminants were measured and most were below the recognised standards for potential impacts. However, there were slightly elevated values of arsenic in the south of the offshore

site, and cadmium along the cable route. These may therefore cause occasional biological effects. The cable route landfall is within designated bathing water at Thorntonloch. In 2011, this achieved 'excellent' status. There are also designated shellfish waters to the west of the offshore site: Fife Ness to Elie.

1.7.1.2 Potential Impacts

- 22 The geology, sediments and bathymetry will not be changed by the proposed development, so the assessment concentrated on potential impacts on the coastline, sandbanks and water quality. The modelling within the physical processes study showed that the offshore site infrastructure and works would not cause any effects that reached the coastline, and therefore impacts on the coastline itself are not predicted. The cable, however, directly affects the coastline where it comes ashore. The preferred method of installation is directional drilling. This would involve installing a duct beneath the intertidal area, in to which the cable will be laid. There would be no impacts on the coastline associated with this. If the cable cannot be installed by directional drilling, it may be trenched across the intertidal area or laid on the surface with suitable protection, depending on the depth of sediment. This may cause local changes in the hydrodynamics and sediment concentrations of short duration. The impact is therefore considered to be of minor significance.
- 23 There are no sandbanks near the offshore works and therefore no predicted impacts.
- 24 In terms of water quality, the potential disturbance to contaminated sediments was assessed to be not significant as the existing levels of contaminants are low (the elevated values of arsenic being explained by naturally occurring arsenic in the local geology). There is the potential for accidental discharge of chemicals which, if it occurred, would be of major significance, but this is reduced to moderate significance as it is extremely unlikely to occur. By employing suitable management plans to reduce the likelihood of spillage further, and having proven procedures for dealing with such spills, the impact is further reduced to minor significance.
- 25 Along the cable route, the installation would increase suspended sediment concentrations (SSC), potentially affecting water quality. However, given the dynamic nature of the area, the change is considered small, and the overall impact of minor significance.
- 26 Overall, the only recommended mitigation is to produce Site Environmental Management Plans (SEMP) and Pollution Control and Spillage Response Plans prior to construction works. No significant cumulative or in-combination impacts are predicted.

1.7.2 Physical Processes

1.7.2.1 Existing Environmental Conditions

- 27 The physical processes study focused on changes to currents, water levels, waves and sediment transport, none of which are sensitive receptors, and therefore the only impact assessed was how these changes affected the sediment regime at the coast. However, a summary of the changes is given here, as they directly affect other sensitive receptors discussed later, such as benthic ecology and maritime archaeology.
- 28 The hydrodynamic conditions are relatively uniform across the site, with a mean spring tidal range of 4.6 m. Current speeds reach approximately 0.6 m/s on the flooding mean spring tide, and 0.4 m/s on the flooding mean neap tide. The flood tide is stronger than the ebb tide. The 50-year return storm surge current is of comparable strength, at about 0.6 m/s. The waves are most frequently from a north-northeast direction, with significant wave heights up to 6 m, and wave periods between 2 and 9 seconds. The 50th percentile for significant wave heights (i.e., the wave height exceeded for 50% of the time) is 1.2 to 1.4 m. The 99th percentile (i.e., the wave height exceeded for 1% of the time) is 5.2 to 5.4 m. The absence of bedforms across the offshore site and along the cable route suggests little sediment transport and a relatively stable seabed, classed as 'slightly mobile'.

1.7.2.2 Potential Impacts

- 29 The assessment incorporated observations from a metocean survey, including current speed and direction, wave parameters, meteorological parameters and water samples. These were used to calibrate and validate a regional physical processes model which simulated the currents, waves and sediment transport within the offshore site and wider area to the coastline. The model was then used to predict changes due to the construction work and presence of the wind farm structures.

- 30 Using the model, the changes to the water levels, currents, and waves during construction are predicted to be negligible. While the installation of the cable will increase local sediment concentrations, the nature of the sediment means that it will be in suspension for a short duration, quickly becoming part of the background sediment movement, and therefore, again, the effect is considered negligible. Nearshore, if the preferred method of installation, directional drilling, is used, there will be no impact on the sediment regime. If trenching is required, there will be a local increase in sediment concentrations, but the sediment will rapidly become part of the background sediment regime, so the effect is considered to be low, causing no impact on the coastline.
- 31 During operation, the changes due to the 'blockage' effect of the foundations are predicted to be less than 1 mm in water level, which is considered negligible. The changes to current speed are between +0.02 m/s and -0.04 m/s within the wind farm, which is considered to be a low magnitude of change. Changes in the far-field (i.e., towards the coast) are considered negligible. Changes to significant wave height are predicted up to 0.04 m (less than 3%) within 10 km of the offshore site, and therefore are considered to be low in the near-field and negligible in the far-field. The changes in current speed and waves result in changes to bed shear stress which affects the SSC: higher bed shear stress results in more sediment entrainment. The predicted changes increase the sediment mobilisation within the offshore site from 15% of the time to 18% of the time. This may result in the formation of minor bedforms, such as ripples. However, these are limited to within the offshore site. Overall, the seabed would still be considered 'slightly mobile' and therefore the changes are considered to be negligible.

1.7.3 Air Quality

1.7.3.1 Existing Environmental Conditions

- 32 Baseline emissions of nitrogen oxides (NO_x), sulphur oxides (SO₂) and carbon dioxide (CO₂) were modelled and found to be relatively low, with total annual emissions of 7.33, 2.60 and 340.38 tonnes for nitrous oxides (NO_x), sulphur dioxide (SO₂), and carbon dioxide (CO₂) respectively.
- 33 Data from the nearby RAF Leuchars weather station show that the predominant wind direction is westerly (vector of 279°); this direction is away from the local coast. UK Met Office data for the Firth of Forth show that conditions of fog (less than 1 km visibility) have occurred 1.1% of the time and visibility of over 10 km occurred 88.8% of the time between 1981 and 2010.

1.7.3.2 Potential Impacts

- 34 Emissions from construction, maintenance and decommissioning vessels could impact marine species and humans at the local level, as well as habitats and species at the regional and global level (through acid deposition and climate change). The largest emissions produced by the NnG development will occur during construction, but these are predicted to be insignificant. Neart na Gaoithe is predicted to have a net positive effect on regional and global air quality. In particular the wind farm will result in a reduction in CO₂ emissions by generating energy that would have otherwise been produced from traditional fossil fuel sources.
- 35 Operational turbines have the potential to increase sea fog under certain conditions. However, given the low occurrence of foggy conditions recorded in the Firth of Forth, the potential increase in fog is considered to be an insignificant impact.
- 36 The cumulative effects of Neart na Gaoithe and other nearby wind farms are likely to have a positive effect once operational. The cumulative impacts with other emission producing activities are being considered and managed through international agreements, and as such are considered to be beyond the scope of this study.

1.8 Biological Environment

1.8.1 Nature Conservation

- 37 There are several species and habitats of nature conservation importance in the area surrounding the proposed project, including sites designated as important for their importance under national and international legislative measures. These include sites in the marine environment and the coasts surrounding the proposed project site.
- 38 The most important sites for nature conservation are those designated under European legislation. These are Special Areas of Conservation (SACs) for sites of importance for species such as marine mammals and migratory fish, as well as habitat features such as reef habitats, and Special Protection Areas (SPAs) for sites of importance for bird species, including seabirds. Additional sites are designated for their national or local importance for coastal habitats and species and there are developing measures to identify future protected areas in the marine environment.
- 39 Within the Forth and Tay region there are several SACs including the Isle of May SAC and the River Tay estuary SAC, as well as further afield such as in the Moray Firth. Most SACs in the region are designated for marine mammal or migratory fish species, including harbour and common seal, Atlantic salmon and bottlenose dolphin (in the Moray Firth). The SPAs in the region are designated for a wide range of seabirds and represent key areas for foraging, breeding and over-wintering for species including gannet, guillemot, terns and other seabird species.
- 40 There are no sites designated for nature conservation importance that overlap with the proposed Neart na Gaoithe site or offshore cable route (refer to Figure 1.3). Nevertheless, there is the potential for the site to have an impact on nature conservation sites by affecting species from these sites, namely birds, migratory fish and marine mammals. An assessment has been made of the connectivity between the project and these sites. This information will allow Marine Scotland, as the competent authority to undertake a Habitats Regulation Appraisal (HRA) including an Appropriate Assessment (AA). The ES presents information on the likely impact on key protected species from sites to enable the regulatory authority to assess these impacts against the relevant nature conservation legislation.

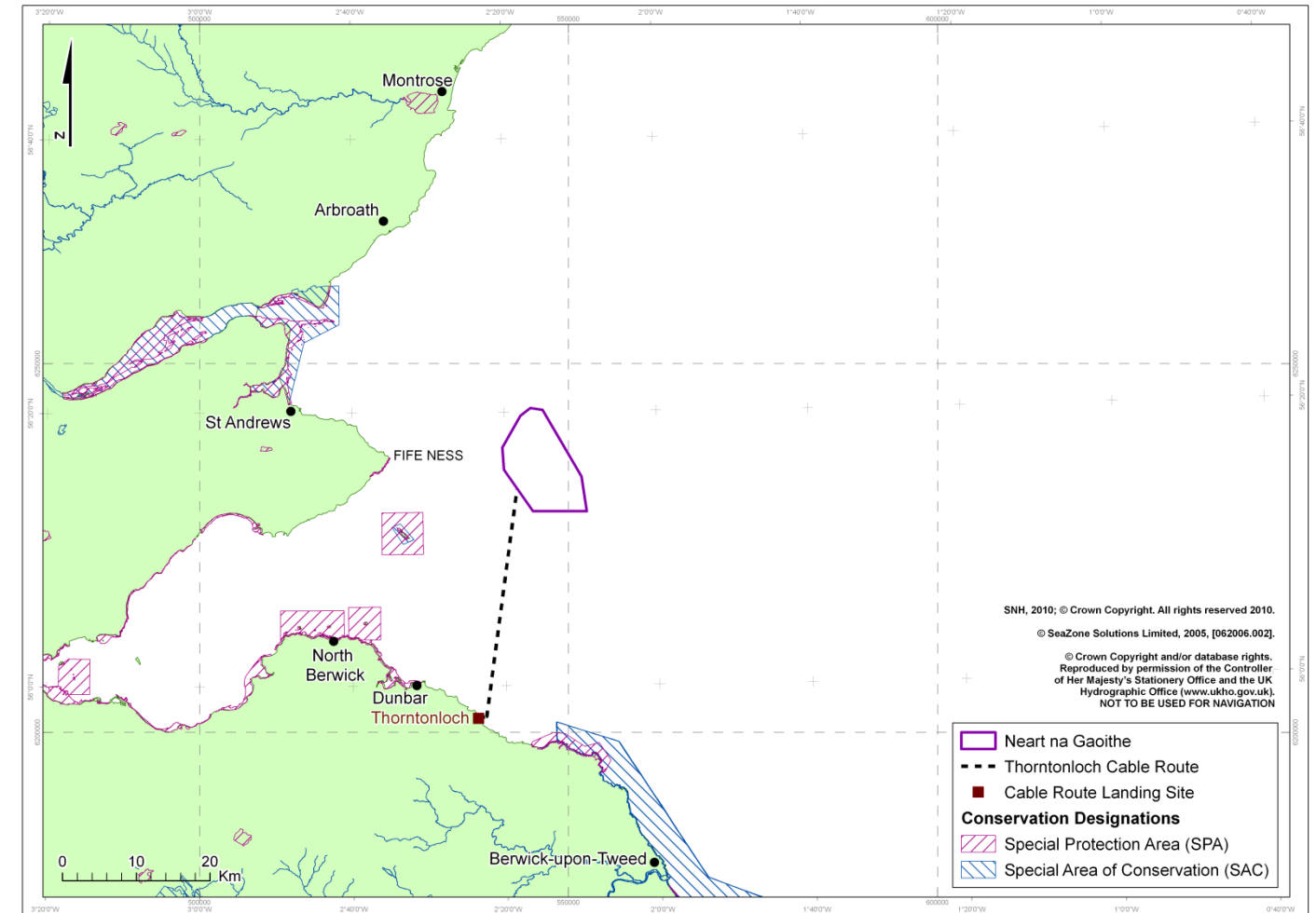


Figure 1.3: SAC and SPA in the vicinity of Neart na Gaoithe

1.8.2 Ornithology

1.8.2.1 Existing Environmental Conditions

- 41 Boat-based surveys were undertaken over a period of two years to determine the numbers and distribution of birds present in the study area. A total of 32 days of surveys were made in Year 1 (November 2009 to October 2010), with 28 days of surveys in Year 2 (November 2011 to October 2012).
- 42 A total of 29 seabird species were identified on surveys in the Neart na Gaoithe study area in Year 1. In Year 2, 26 seabird species were recorded.
- 43 The three most abundant species recorded during the surveys were gannet, puffin and guillemot. Together these three species accounted for 62.3% of all birds recorded in the offshore site in Year 1, and 77.1% of all birds recorded in the offshore site in Year 2. All three species were recorded in all months.
- 44 The height at which birds were flying was estimated during the surveys. Overall, 94.4% of all flying birds were recorded flying below the wind turbine rotor swept zone. For species such as fulmar, sooty shearwater, Manx shearwater, guillemot, razorbill and puffin, nearly all birds were recorded flying below the wind turbine rotor swept zone. For other species such as gannets and gulls, a greater proportion of birds were recorded flying higher, within the wind turbine rotor swept zone.
- 45 Thirteen species of seabird were considered to be key species and were assessed in greater detail on account of the high numbers present at certain times of year, the likely high connectivity to Special Protection Areas (SPAs) (nine species), and their sensitivity to potential effects. These key species were: fulmar, sooty shearwater, gannet, little gull, lesser-blacked gull, herring gull, great black-backed gull, kittiwake, Arctic tern, guillemot, razorbill, puffin and

little auk. All other species occurred only sporadically and in low or very low numbers and for this reason they were considered in less detail.

1.8.2.2 Potential Impacts

- 46 Possible impacts on birds arising from the proposed development include collision with turbines, displacement (or habitat loss - the potential for the wind farm to reduce or prevent birds, including flying birds, from using the offshore site) and barrier effects, where birds avoid flying through the proposed development and have to fly further to go around it.
- 47 Collision risk modelling was conducted for the 13 key species to determine if there would be any significant effects arising from birds colliding with turbines. Collision impacts are predicted for little gull, which was ranked as being of minor to moderate significance depending on avoidance rate used and Great Black-Backed Gull, which was ranked as being of minor to moderate significance depending on avoidance rate used.
- 48 Impacts from displacement on razorbills after the breeding season were ranked as being of minor significance, with no significant impacts from displacement for the other 12 key species.
- 49 Impacts from barrier effects on razorbills in the breeding season were ranked as being of moderate significance, with no significant impacts from barrier effects for the other 12 key species.
- 50 Impacts from collision, displacement and barrier effects for the remaining species were ranked as not significant.
- 51 Cumulative impacts have been assessed, in particular considering the adjacent offshore wind farm developments in the Firth of Forth. The results from the cumulative collision risk modelling identified potentially significant cumulative collision impacts for gannet and kittiwake. In addition, potentially significant cumulative displacement impacts were identified for gannet and razorbill in the breeding season.

1.8.3 Marine Mammals

1.8.3.1 Existing Environmental Conditions

- 52 Boat-based surveys were undertaken over a period of two years to determine the number and distribution of marine mammals present in the study area. A total of 32 days of surveys were made in Year 1 (November 2009 to October 2010), with 28 days of surveys in Year 2 (November 2011 to October 2012).
- 53 In addition to the visual surveys undertaken from boats, acoustic surveys were undertaken between October 2009 and October 2010. These surveys detect underwater vocalisations of harbour porpoise and dolphins.
- 54 Data from aerial surveys in 2009 and 2010 have also been used in informing the assessment.
- 55 The results from the surveys identified four species of marine mammal in Year 1 (harbour porpoise, minke whale, grey seal and harbour seal) and a further two species (white-beaked dolphin and killer whale) were recorded during the second year.
- 56 The most abundant species recorded was harbour porpoise with a total of 172 individuals recorded, of which 15 were in the offshore site. They were recorded regularly throughout the year. The second most frequently recorded marine mammal was grey seal with 90 individuals. The majority of grey seal sightings were in the spring and autumn periods. Of the 90 grey seals recorded, eight were seen in the development area. All other species were recorded relatively infrequently with less than 25 records of white-beaked dolphin, harbour seal and minke whale and only a single sighting of a killer whale. There were no records of bottlenose dolphins.
- 57 The results from the baseline surveys indicate that the proposed development area does not have high numbers or densities of marine mammals.

1.8.3.2 Potential Impacts

- 58 There is potential for noise arising from the construction, operation and decommissioning of the proposed development to cause either behavioural responses to, or displacement of, marine mammals in the area of affect. During construction, the noise could potentially cause damage to hearing, either permanently or temporarily, specifically from the installation of the turbine bases by piling. There are also possible physical impacts to marine mammals from either collisions with vessels or interaction with ducted propellers.

- 59 Noise modelling of piling operations has provided an indication of the level the effects, and the possible impacts on the marine mammals present in the area. The results from the modelling indicate that for all species recorded the risk of any individual receiving levels of noise that could cause permanent hearing damage is very low. The number of individuals that could have temporary changes in their ability to hear is greater but still relatively low. Temporary changes in hearing ability are expected to be of a short duration, usually less than 12 hours and therefore not likely to cause a significant impact.
- 60 For the majority of species present the impacts from displacement are predicted to be not significant as the number of individuals affected will be relatively low and those that are affected can relocate to other areas. However, the displacement impacts arising from piling activities during the construction period on seal populations are recognised to be moderately significant for harbour seal and of minor significance for grey seals, due to the proportion of the population potentially displaced.
- 61 Impacts from noise arising during other construction activities or operational noise are not considered to cause a significant effect. Impacts from collisions with vessels or from interaction with ducted propellers are thought to be low.
- 62 Cumulative impacts have been assessed, in particular considering the adjacent offshore wind farm developments in the Firth of Forth. The results from the cumulative noise modelling identify a potential wider scale impact, including displacement of marine mammals, particularly bottlenose dolphin, harbour seal and grey seal.
- 63 Possible measures to mitigate against potential impacts, particularly the impacts of noise on marine mammals, have been considered and will be developed more fully as the project progresses. Mitigation measures under consideration include foundation type, reduced energy input for piling, soft start-up, use of barriers such as bubble curtains or piling sleeves, use of marine mammal observers, passive acoustic monitoring and acoustic deterrents.

1.8.4 Benthic Ecology

1.8.4.1 Existing Environmental Conditions

- 64 The benthic (seabed) environment was characterised following a review of published information and a site survey, carried out in 2009. This survey examined sediment types, took dropdown video footage and sampled representative species so that the benthic environment and habitats in the proposed site could be classified according to the established marine habitat classification system developed by the Joint Nature Conservation Committee (JNCC).
- 65 The offshore site is similar to much of the surrounding southern North Sea region and is generally characterised by a muddy and muddy sand group of biotopes, which are characterised by fine mud and burrowing species such as crabs and Nephrops (known as Norway lobster, langoustine or prawns). There are areas of similar sediment types characterised by invertebrates such as seapens, brittlestars, polychaete worms and bivalve molluscs. There are also areas of mixed coarse sediment in small assemblages with species such as brittlestars, and the colonial soft coral dead man's fingers.
- 66 The export cable route is also characterised by similar muddy habitats, with similar species found. Further inshore there are areas of cobbles, pebbles and gravels, with species such as lobsters and keel worms present. In the intertidal zone on Thorntonloch beach there is a range of habitats including exposed rock, cobbles and shingle and sand.
- 67 Some of these habitats and representative species, such as burrowed mud, are considered to be of nature conservation importance, however the site does not overlap with any areas currently designated as protected for this or any other benthic habitat features.

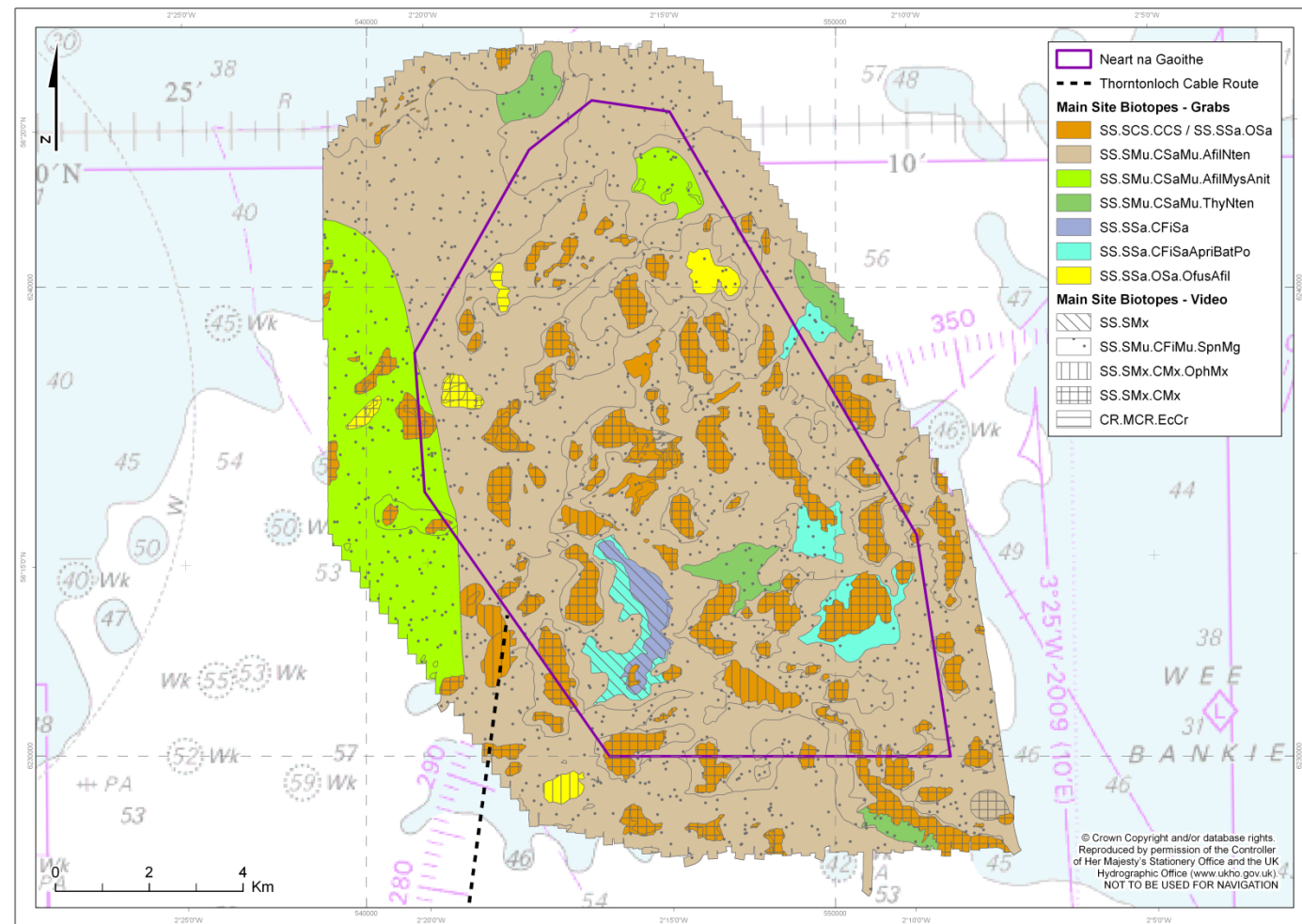


Figure 1.4: Biotope map of Neart na Gaoithe

1.8.4.2 Potential Impacts

68 The potential impacts on the benthic ecological environment were assessed following approaches outlined in published guidance. This includes consideration of the sensitivity or vulnerability of benthic habitats and species to environmental change.

69 Information on the predicted level of environmental change from the proposed project was obtained from details on the parameters of the proposed wind farm and the hydrodynamic modelling exercise undertaken (as described above).

70 There are a number of potential impacts that could arise from the construction, operation and decommissioning of Neart na Gaoithe. These include direct impacts, which occur at the same time or place as the action, and indirect impacts, which could affect species through pathways such as changes in wider environmental conditions.

71 All impacts are predicted to be of a minor significance, given the tolerance and recoverability of the benthic habitats and species found in the site. Additionally the habitats and species in the site are well represented in the wider region and are not considered to be rare or unique examples of benthic environments.

72 The cumulative changes, considering the other two planned wind farms in the region, increase the overall impact. However, given the wider area covered by each project, the percentage of habitat affected is assessed to be very small.

73 The potential direct impacts are:

- Habitat loss and disturbance (e.g., change in nature of the seabed; displacement of reproductive faunal and floral populations and prey/food items) from construction of the wind farm through placement of installation vessels and turbine foundations. This has been assessed to be of minor significance, as the majority of species

and habitats characterised in the site that could be impacted have some tolerance to such change and can recover. Additionally the wider region represents large areas of similar habitat;

- Increase in SSC and associated turbidity (e.g., implications for filter feeders, visual predators), subsequent sediment settlement and siltation or scour of benthic communities and potential implications for survival and reproductive success. This has been assessed to be of minor significance, as the predicted SSC levels from the hydrodynamic modelling are not particularly high and largely not discernible above existing background levels or levels tolerated by the benthic environment in the site; and
- Electromagnetic fields and heating from operating subsea cables on invertebrates and their different life cycle stages. Changes in electromagnetic field are not detectable more than a metre or so from the source and as such the impact has been assessed as being of minor significance. However, there is some uncertainty associated with this impact as there is a lack of scientific data on benthic species' responses.

74 The potential indirect impacts include:

- Changes in hydrodynamics and nutrient transport (e.g., structures could affect water flow and this may be critical to marine organisms since it influences larval recruitment, sedimentation rates, the availability of food and oxygen and the removal of waste). This has also been assessed as being of minor significance given the extremely low predicted change in hydrodynamics from the modelling exercise; and
- Introduction of artificial substrate and alien species (e.g., increase of habitat heterogeneity and biodiversity of sessile organisms and potential to provide entry points and stepping-stones for alien rocky shore species brought in as larvae by ballast water, or indigenous species not naturally resident in the area, but facilitated by the presence of artificial substrate). This impact was also assessed as being of minor significance given the benthic habitats' existing heterogeneity in the site and nearby examples of colonisation of new substrata (Torness artificial reef) showing no fundamental change in species composition.

1.8.5 Fish and Shellfish Ecology

1.8.5.1 Existing Environmental Conditions

75 As described above, the proposed site is characterised by a marine environment that occurs widely in the North Sea region. Therefore fish and shellfish species and populations that are supported by such habitats are also expected to be characteristic of the surrounding region.

76 Information on the species on site was obtained from a combination of the site-specific survey and a detailed review of existing literature and data. The benthic ecology survey provided information on the fish and shellfish habitat types found on site, and experimental trawls were also conducted during the survey period.

77 The region is characterised by the following types of species:

- Pelagic fish (those that inhabit the water column) such as herring, sprat and mackerel;
- Demersal fish (bottom feeders than live on or near the seabed) such as cod, haddock, monkfish, flatfish species and sandeel;
- Elasmobranchs (sharks, skates and rays), such dogfish, tope and thornback ray;
- Migratory fish (those that are known to migrate through the area and who spend only part of their life cycle in the marine environment) such as salmon, sea trout, eel and lamprey species; and
- Shellfish species, including crabs, lobsters, Nephrops scallops and squid.

78 These species are found across the region inhabiting the muddy sand and gravel habitats in the region, and migrating from the freshwater locations such as the River Teith, Tay and South Esk (areas which are designated as being of nature conservation importance due to their migratory fish populations). The species may have connectivity with the proposed site through distribution of their feeding, spawning or nursery grounds.

79 Several of the fish and shellfish species found to characterise the region are of commercial importance locally and regionally, such as Nephrops and squid, and many are also of conservation importance due to their rarity or sensitivity, such as sandeel, spiny dogfish and salmon.

1.8.5.2 Potential Impacts

- 80 The potential impacts on fish species were assessed through a detailed characterisation of the Neart na Gaoithe area and surrounding region. This included reviewing information on whether certain fish species are more prevalent than others or more sensitive to potential environmental change.
- 81 Information on the predicted level of changes was obtained from hydrodynamic modelling (as described above) and from the underwater noise modelling. Of the impacts predicted, the majority, with the exception of noise impacts on herring which has been assessed as being of moderate significance, are assessed as being of minor significance.
- 82 Suspended sediment from activities such as dredging could affect fish and shellfish species directly, by reducing visibility and acting as a barrier to movement or predation. The sediment deposition could then result in clogging of feeding apparatus or gills, changes to habitats or impacts on fish eggs and larvae. The hydrodynamic modelling results predict changes in SSC to be localised and as a result, the impact has been assessed to be of minor significance.
- 83 The installation of offshore structures is also predicted to result in the loss of some habitat and introduction of new harder habitats from the underwater turbine towers and foundations. Given the area of habitat loss and estimated new substrate, this has also been assessed as being of minor significance given the amount of habitat available elsewhere.
- 84 Many fish species are sensitive to noise and the installation of the wind farm could result in physical or behavioural changes in hearing sensitive species such as herring. Underwater noise modelling predicts that for most hearing specialist or sensitive species, impacts are not of a high level. However, an impact of moderate significance is predicted for herring due to the species' inherent sensitivity to noise and the possible overlap of spawning areas with areas affected by the underwater noise.
- 85 Underwater cabling emits an electromagnetic field and some fish species are sensitive to this and could be affected by cabling. Electromagnetic fields are weak beyond 1 m from the source and as a result of this, the impact has been assessed as being of minor significance.

1.9 Human Environment

1.9.1 Commercial Fisheries

1.9.1.1 Existing Environmental Conditions

- 86 The principal fishing activities in the region are:
- Bottom otter trawls targeting Nephrops;
 - Boat dredges targeting scallops; and
 - Creels targeting crustaceans such as crab and lobster.
- 87 To a lesser degree, squid is seasonally targeted, primarily by reconfigured bottom otter trawls.
- 88 Consultation with fishermen suggested that important fishing grounds are generally outside of the proposed offshore site, except for squid, for which grounds have been identified throughout the Forth and Tay areas.
- 89 The offshore export cable route passes through areas of regional importance for Nephrops, squid and crustaceans. Vessels targeting this area are predominantly located within the Anstruther and Eyemouth Fishery Districts. The proposed cable landfall is located within the jurisdiction of the Forth Salmon Board District (FSBD). Fishing activity here is principally rod-and-line.
- 90 Pittenweem is the principal fishing port in the area, followed by Dunbar and Eyemouth. Other ports that receive fewer catch landings are Crail, Methil and Leven, Anstruther, St Andrews, and West Wemyss.

1.9.1.2 Potential Impacts

- 91 Extensive consultation was undertaken with stakeholders and a number of published reports and guidance documents were used in completing this study.
- 92 Impacts to commercial fisheries may include:
- Loss or restricted access to fishing grounds;
 - Increased steaming times to fishing grounds;
 - Fouling of static gear or changes to towing patterns; and
 - Displacement of fishing vessels into other areas.
- 93 These impacts would be caused by the presence of vessels and machinery during construction and may affect fishing vessels operating in the vicinity of the wind farm or cable route. During the operation and maintenance of the wind farm, these impacts will be caused by the presence of turbines, infrastructure and fishing vessels.
- 94 Proposed mitigation includes the development of a working group and ensuring sufficient cable burial; if these are put in place, the impacts are assessed as being of minor significance. The cumulative effects of the construction of multiple wind farms in the region causing restricted access to fishing grounds and the displacement of fishing vessels is thought to result in a moderate impact to commercial fishing activities.

1.9.2 Shipping and Navigation

1.9.2.1 Existing Environmental Conditions

- 95 A shipping survey conducted in 2010 found that between 16 and 17 vessels per day pass within 10 NM of Neart na Gaoithe, with an average of 2 per day passing through the wind farm. A busy shipping route lies to the south of the wind farm, intersecting the cable route. This is mainly used by tankers and cargo vessels heading in/out of the Firth of Forth. Navigational features include a general practice and submarine exercise area that overlies the wind farm and cable route, and the Forth Ports Ltd authority area which is 8.4 NM west of the wind farm.
- 96 The wind farm is north and east of areas of high fishing vessel activity and approximately 4 NM west of recreational racing and sailing areas. Some recreational craft may be seen during summer daylight hours on a route that passes through the wind farm; and also two similar routes intersect the cable route.
- 97 Two maritime accidents were reported within the wind farm area from 2001 to 2010, one involving an accident to person in 2010 and the second machinery failure in 2001. The majority of incidents that the Royal National Lifeboat Institute (RNLI) respond to occur off Fife Ness and Isle of May, and no RNLI incidents were recorded within the wind farm boundary from 2001 to 2010. The closest search and rescue helicopter base is 51 NM to the south-southeast of the wind farm, at Boulmer (although operations will cease here in 2015 following government restructure) and RNLI lifeboats will respond to incidents in the area from Anstruther, Dunbar or Arbroath bases.
- 98 Future potential developments that are likely to cause changes to current shipping activity include: three biomass plants at Rosyth, Grangemouth and Dundee; the re-opening of the Port of Kirkcaldy; a new international container terminal at Rosyth; re-development of the Port of Leith; and the re-development of Torry Quay.

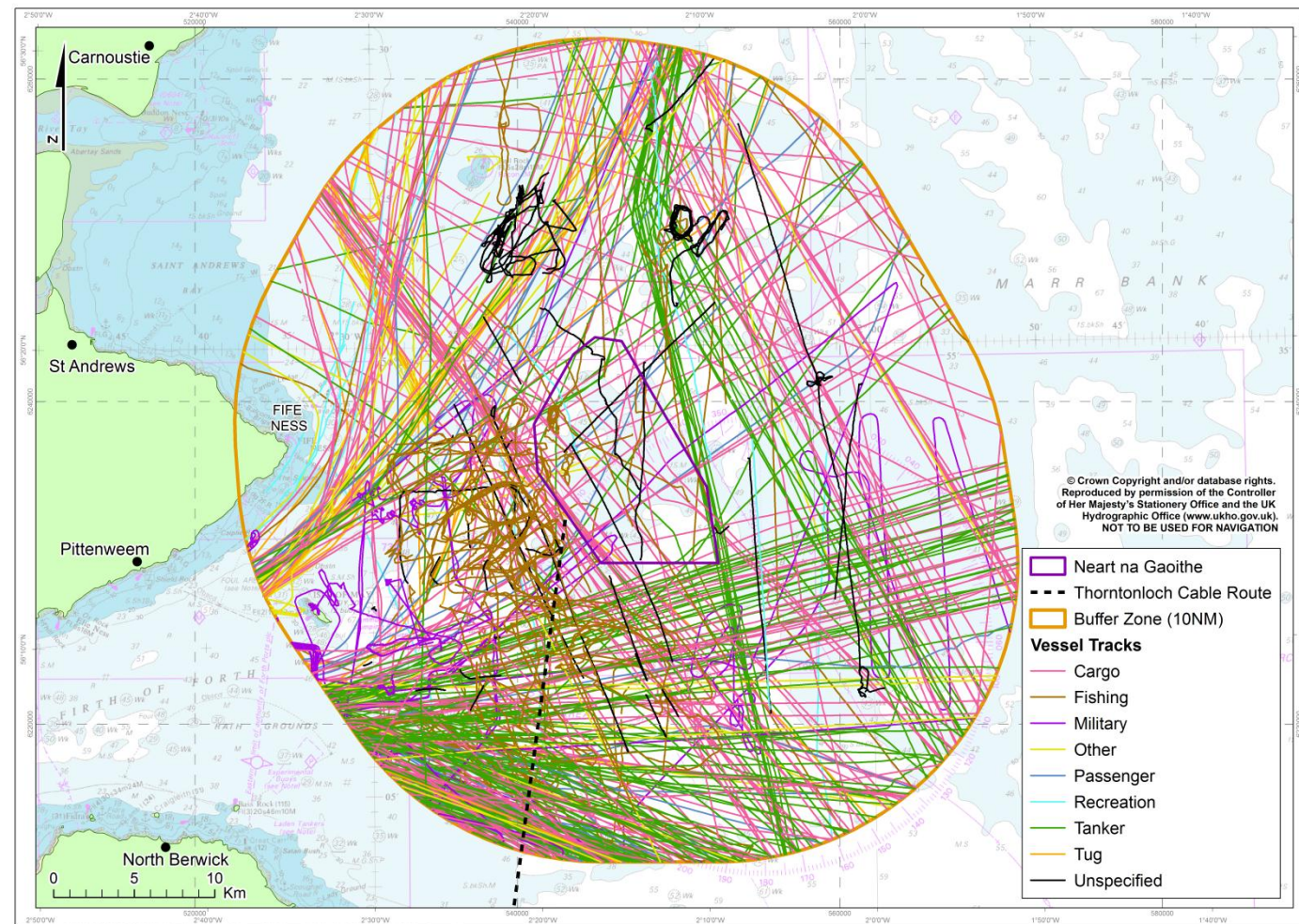


Figure 1.5: Vessel AIS data

1.9.2.2 Potential Impacts

- 99 A desk study was undertaken to review shipping, recreation, aggregates and fishing data as well as UK Hydrographic Office charts. Baseline shipping activity was assessed using Automatic Identification System (AIS) and radar track data.
- 100 Impacts to shipping and navigation may arise from the wind farm structures leading to a loss of navigable sea room and deviations around structures, which may lead to increased collision risk (vessel to vessel and vessel to structure).
- 101 The impact to commercial shipping, fishing vessels and recreational routeing are considered to be small, as there is sufficient sea room for vessels to make the deviation around construction activities or the operating wind farm (or individual turbines for smaller vessels in good sea conditions).
- 102 As the cable will be buried, there is limited risk of vessels grounding on the cable, gear snagging, or the electromagnetic field affecting navigation equipment.
- 103 The cumulative effects of multiple wind farms could increase the number of vessels deviating east of Neart na Gaoithe, ‘squeezing’ vessels into narrower sea areas and denser routes. Overall, mariners will be aware of the development, through consultation and liaison, and will be able to plan their journeys based on available sea room and shipping data. Best practice procedures, such as adequate lighting of the wind farm and correct chart markings, should limit the impact of increased collision risk.

1.9.3 Military and Aviation

1.9.3.1 Existing Environmental Conditions

- 104 The following primary surveillance radars are considered in this study: air traffic control radars; military air defence radars; precision approach radars; En-route radars; vessel traffic services radars; and meteorological radars.
- 105 The only Ministry of Defence (MOD) radar identified in the line of sight of Neart na Gaoithe is the Watchman air traffic control radar at RAF Leuchars, approximately 18.5 NM from the proposed wind farm. No civil air traffic control radars are identified to be in line of site of the wind farm. All other types of radar do not have coverage of the turbines or the turbines fall outside the safeguarding zones that show where wind farms are likely to have an impact.
- 106 A number of telecommunications systems are used in the region, these include marine navigation aids; global navigation systems; global maritime distress safety systems; telephony systems; and television and public radio broadcasts. No line of site links are present in the region.
- 107 Neart na Gaoithe does not overlap with any obstacle limitation surfaces or military low-flying areas, but it does partly intersect a military Practise and Exercise Area where the principal activity is firing practice (Area X5641).

1.9.3.2 Potential Impacts

- 108 Extensive consultation was undertaken with stakeholders and a number of published reports and guidance documents were used in completing this study.
- 109 The impacts on radar and telecommunications systems arise due to the physical presence of turbines, mainly as a result of reflections causing interference, or by the blockage of signals (shadowing).
- 110 Neart na Gaoithe has been identified as having a potential impact on the primary surveillance radar at RAF Leuchars (the Watchman air traffic control radar). This will apply to all offshore wind farms proposed for the Firth of Forth and Tay area. As the majority of the proposed wind farms are in line of site of the radar at RAF Leuchars it is implicit that the more wind farms that are proposed or built, the greater the impact on the provision of air traffic control radar services.
- 111 The impact can be mitigated by changing airspace by designating area over the wind farm as a Transponder Mandatory Zone, which would require aircraft to be equipped with transponders, or by installing infill radar to supplement coverage. Following this mitigation, the impacts to military and aviation activities are considered to be minor.
- 112 Impacts to telecommunications may arise due to interference/shadowing, reflections from turbines or obstruction of signals. All impacts to telecommunications are considered to be of minor significance due to the transitory nature of the vessels or the unlikelihood and lack of current use in the area.
- 113 Feedback from the MOD indicates the impact of restrictions on activities carried out in the military Practise and Exercise Area would be low.

1.9.4 Maritime Archaeology and Cultural Heritage

1.9.4.1 Existing Environmental Conditions

- 114 Maritime archaeology and cultural heritage encompasses everything from recent shipwrecks to vast submerged landscapes. Due to the potentially unique nature of any archaeological find it is important to characterise those artefacts which are known to be in the area and also to understand the potential for new artefacts to be discovered.
- 115 A desk based study and archaeological assessment of geophysical and geotechnical survey data was carried out to identify potential cultural heritage assets that may be affected and to establish their current condition. This work also provided information upon which to base the assessment of archaeological potential.
- 116 The desk based assessment reviewed existing maritime records to identify potential wrecks in the offshore site or with the cable corridor and compared the locations with magnetic anomalies picked up in the geophysical survey of the site.
- 117 There are nine recorded or charted wrecks and obstructions from the Seazone dataset located within the offshore site and one live wreck within the cable route corridor (refer to Figure 1.2). Eight of these lie within the inner study

area and one within the 1 km site buffer zone. Of these, seven are 'Live' (i.e., they have been accurately located by survey) and two are considered 'Dead' (repeat surveys have failed to locate the wreck and its co-ordinates are considered to be unreliable).

- 118 The geophysical survey also identified objects which were considered to be of anthropogenic origin, i.e., which are not natural features. These were identified and given a high, medium or low potential which indicated the potential value or interest associated with the object. Anomalies considered to be of medium or high potential were investigated further.
- 119 Eight anomalies of high archaeological potential and seven of medium archaeological potential were identified across the proposed offshore site through the archaeological review of sidescan sonar data (refer to Figure 2). All eight anomalies of high archaeological potential are located within the wind farm footprint and correspond with six known 'Live' wreck sites recorded in the SeaZone/UKHO records.

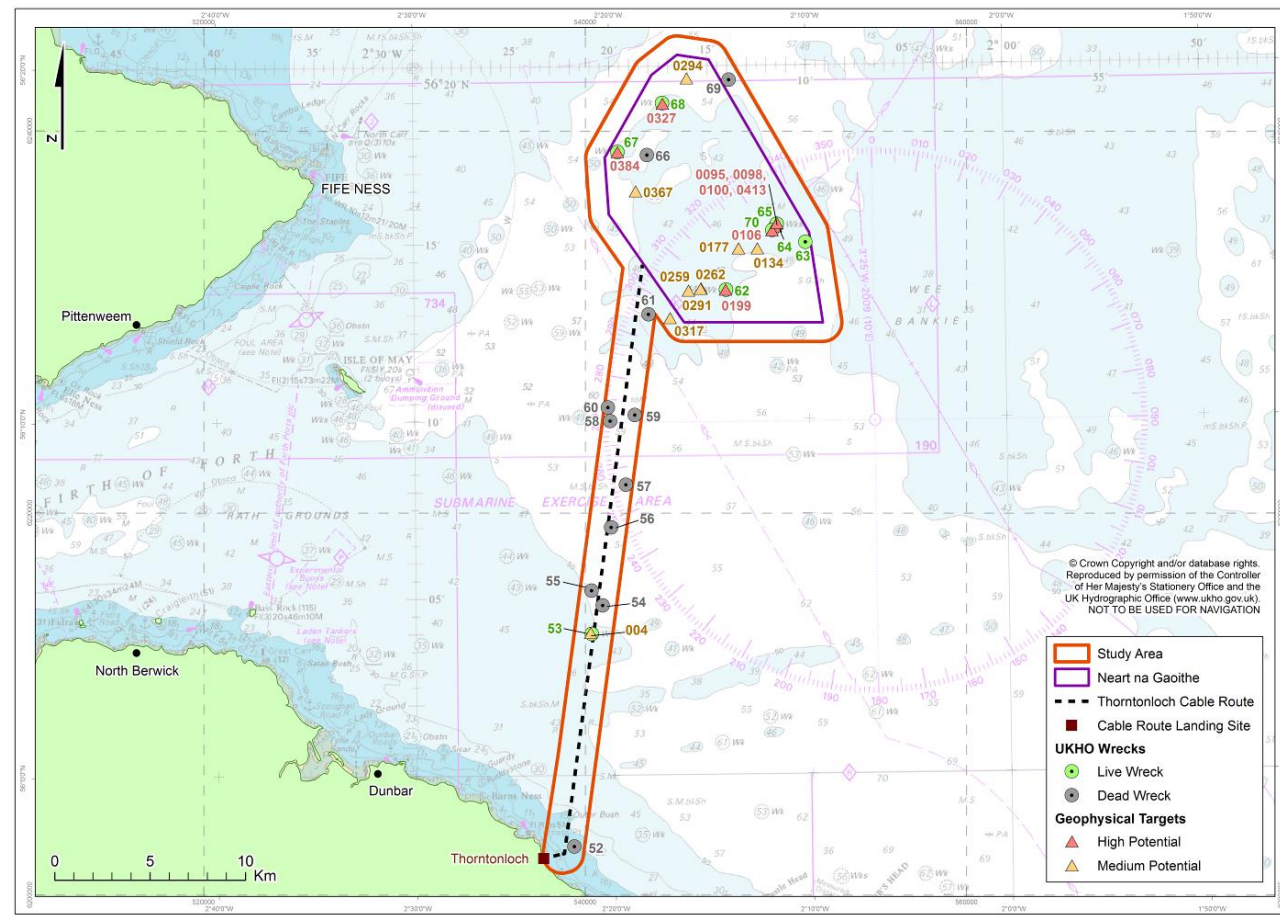


Figure 1.6: Live and dead wrecks on the offshore site and cable route

- 120 Wrecks 64, 65 and 70 are the remains of two military submarines designated as Protected Places under the Protection of Military Remains Act 1986 in the study area. These are the K-class submarines, K4 and K17, which sank in 1918 (refer to Figure 3).
- 121 Exclusion zones will be maintained around the known wreck sites and a Written Scheme of Investigation (WSI) and Protocol for Archaeological Discoveries (PAD) will be developed for any unexpected archaeological discoveries. Any proposed mitigation measures are subject to approval by Historic Scotland.

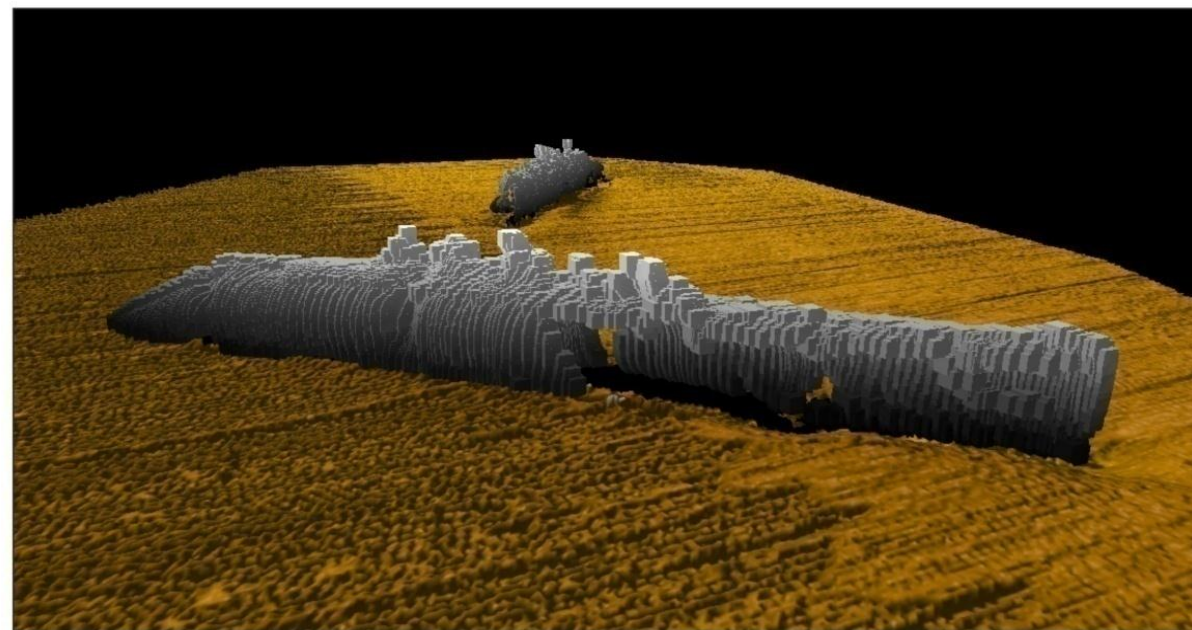
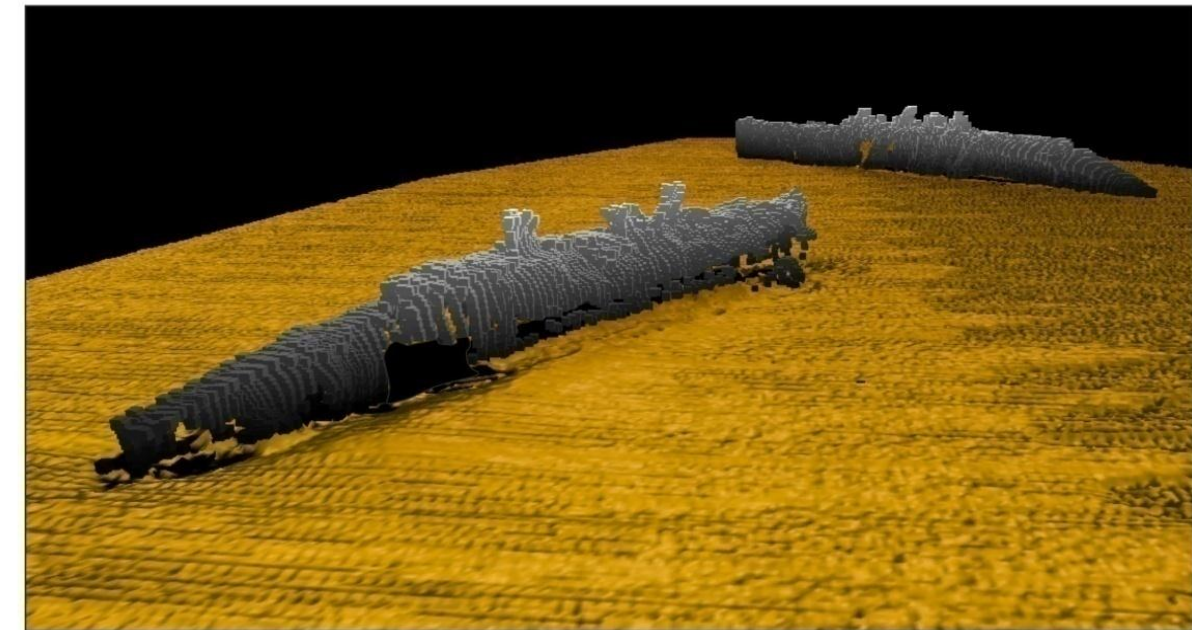


Figure 1.7: Swath bathymetry image showing submarines

- 122 Impacts upon the setting of two cultural heritage assets have been identified: Isle of May Priory and Old Lighthouse (SM 838 and 887 respectively). In both cases these have been assessed as being of minor significance. No mitigation is proposed in relation to these and the impacts will cease upon decommissioning.

1.9.5 Ordnance

- 123 The offshore works area for the project is located in an area of the North Sea which is potentially at risk from ordnance due to military activity, especially from activity which occurred during WWII. Ordnance may be from practice ranges, torpedoes, or combat mines. In addition, the location of the area overlaps with current military firing ranges. Some wrecks in the area date from the WWI or WWII era and as such may contain unexploded ordnance (UXO).
- 124 The baseline identifies several potential sources of UXO that could exist within the Neart na Gaoithe offshore wind farm and along the export cable route. The site overlaps with several military practice areas, both historic and current, within which ordnance will have been used and could remain. Other risks exist from activities during WWI and WWII. These include wrecks containing ordnance as well as the possibility of bombs tipped by Luftwaffe pilots returning from missions in the area.
- 125 Due to the potential for ordnance within the vicinity of the site, a risk assessment will be carried out prior to construction and full seabed magnetometer scan, or other industry accepted method of UXO identification, may be undertaken prior to construction.

1.9.6 Seascape, Landscape and Visual Impact

- 126 The seascape, landscape and visual impact assessment examined the potential effects of the proposed development on onshore and offshore character, and on visual amenity, within a study area of 50 km radius from the development boundary. The assessment focused on the long term impact of the turbines during the operational phase but also considered the short term impact of the construction process. The assessment considered the sensitivity of the landscape or the viewer, and the magnitude of change predicted to occur. Two alternative layouts were considered, representing the maximum height of turbines, and the maximum density of development.
- 127 The seascape and landscape of the study area was considered in terms of its existing character, as represented by seascape and landscape character areas, and by nationally and locally protected landscapes. It was considered that impacts on the seascape and landscape caused by construction activities would be temporary and would only be significant at the cable landfall point. Depending on the construction method used, impacts at the landfall would be experienced for up to four months. Other construction activities would be longer term, but impacts will never be significantly greater than those arising from the operational phase.
- 128 The seascape assessment concluded that direct effects will be limited to an area of open sea, upwards of 15 km from shore. Significant indirect impacts, arising from the presence of the turbines in offshore views, are predicted to affect areas along the Fife coast and the Isle of May closest to the proposal, with an open outlook towards the turbines. In all other areas, the development would have no significant impacts on seascape and landscape character. No significant impacts were predicted on any protected landscapes.
- 129 The visual assessment considered the current conditions from specific viewpoints along the coast. Eighteen viewpoints were selected as they were representative of the coastline, had amenity value and/or were used by the public and also had views to the proposed wind farm location. Viewpoint locations were agreed during consultation. Using computer software, an image was generated for each viewpoint to indicate the nature of the view should the wind farm be constructed.
- 130 The assessment concluded that, during construction, the visual impact on the area immediately adjacent to the cable landing point would be major, but temporary. Consultation is ongoing, with the caravan park at Thorntonloch in particular, to discuss potential mitigation measures to reduce the impact.
- 131 Moderate impacts were predicted at six of the 18 viewpoints. A major-moderate impact was predicted at one viewpoint, Dunbar. Major impacts were predicted at three viewpoints: at the Isle of May, Fife Ness and Anstruther Easter. These represent the three closest viewpoints to the proposed development and would have clear uninterrupted views of the turbines, from where lighting is also likely to be visible at night. Operational activities including maintenance and boat movements, are not predicted to have significant additional effects.
- 132 The level of impact experienced by a viewer depends on their sensitivity and viewing opportunity, and the weather conditions at the time. Significant impacts are only likely to occur at open coastal locations.
- 133 Significant cumulative effects on the Fife coastal seascape, and on views from viewpoints in northeast Fife, are predicted to arise should the Neart na Gaoithe, Inch Cape and Firth of Forth Round 3 wind farms be constructed.

- 134 There is little mitigation which can be applied to offshore wind farms to minimise visual impact effects. The turbines will be painted in a pale grey colour. Screening with trees and planting is not possible, and the nature of the marine horizon means that the design of the wind farm has little impact on how it is perceived. The examination of two alternative layouts has concluded that the precise layout of the development, within the parameters defined in the Rochdale Envelope, is unlikely to vary the findings of the Seascape, Landscape and Visual Impact Assessment (SLVIA).

1.9.7 Other Users

1.9.7.1 Existing Environmental Conditions

- 135 Several activities occur in the region surrounding the offshore works for Neart na Gaoithe and have the potential to be affected by the development. In summary, these are:
 - Sailing activities, which take place within the Firth of Forth and Outer Forth and up to 30 km offshore;
 - Recreational watersports, including surfing, kitesurfing, windsurfing and kayaking or canoeing, which take place at the export cable landing point at Thorntonloch and other coastal locations such as Berwick, Fife, Dunbar, Pease Bay, St Abbs, and Arbroath and occasionally out to offshore locations such as Bell Rock (kayakers only);
 - Scuba diving activities, which occur mainly on wreck sites within the Firth of Forth and have been occasionally recorded at a wreck site in the offshore site; and
 - Recreational fishing activities, which take place along the coastline and around navigational features such as Bell Rock.
- 136 Several other activities, including mariculture and some airborne activities, also occur in the region, however these are considered not to be affected by the development and so have been scoped out of the impact assessment.
- 137 No surveys specific to other coastal and marine users have been undertaken. However, the outputs of the metocean survey, the navigational survey and ecology surveys have been considered.

1.9.7.2 Potential Impacts

- 138 Impacts to other users during construction include:
 - The exclusion from parts of the sea due to construction safety zones;
 - The increase in suspended sediment reducing visibility for scuba divers;
 - The presence of machinery causing changes to recreationally fished species;
 - Presence of cable burial machinery causing changes to hydrodynamics for surfers;
 - Changes to visual amenity;
 - Changes to recreational amenity, which comprises a number of different elements including noise and vibration, dust, and traffic movement; and
 - Loss of access to coastal users during beach works.
- 139 The impacts during construction are considered to be minor and short lived. Consultation and engagement will be undertaken with local stakeholders prior to construction commencing to minimise impacts where possible.
- 140 Impacts during operation include an increased navigation hazard for recreational vessels due to the presence of the wind turbines and a low probability of increased sight-seeing activity.
- 141 These impacts are considered to be small, as the changes will be minor or temporary. Also, most other users, such as sailors, surfers, windsurfers and kayakers, are considered to be flexible in their activity. Consultation and engagement will continue throughout the development of Neart na Gaoithe to ensure other marine users remain involved throughout.

1.9.8 Socioeconomics

- 142 The aim of the socioeconomic assessment was to assess the scale of economic benefit as a result of the Neart na Gaoithe development. The socioeconomic assessment considered both the anticipated economic and employment benefits across the study area of Fife, Angus and East Lothian and at the Scotland level.
- 143 The socioeconomic benefit was assessed using an economic model which considered the anticipated project expenditure and industry data in the installation and operational phases. The Neart na Gaoithe project has been assessed as having a positive socioeconomic effect both at the study area level but also across Scotland, in terms of job creation and overall project expenditure.
- 144 The estimated economic benefit over the course of the project lifetime within the study area is expected to be between £54 million and £440 million. For Scotland as a whole the benefit is anticipated to be in the range of £118 million and £570 million. The lower figure represents a cautious estimate of benefit while the higher figure represents the more optimistic benefit. The final scenario is likely to be approximately at the midpoint.
- 145 Employment is worked out in terms of job years rather than individual jobs. One job year is a representation of the length of the job rather than a single job, for example two full time jobs lasting for 6 months each would be equivalent to one job year. An estimate of job years generated in the study area is between 3,000 and 11,600 job years. When considering the benefits to Scotland as a whole the estimated number of job years is between 4,200 and 15,000 job years.
- 146 It is important to note that the socioeconomic assessment considered only the first 25 years of construction and operation and does not consider the potential for repowering after 25 years.