

Hornsea Project Three
Offshore Wind Farm



Hornsea Project Three Offshore Wind Farm

Preliminary Environmental Information Report:
Chapter 6 – Commercial Fisheries

Date: July 2017

Hornsea 3
Offshore Wind Farm

DONG
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Environmental Impact Assessment
Preliminary Environmental Information Report

Volume 2
Chapter 6 – Commercial Fisheries

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Annex 6.1 Commercial Fisheries Technical Report

Glossary

Term	Definition
Beam trawlers	A method of bottom trawling with a net that is held open by a beam, which is generally a heavy steel tube supported by steel trawl heads at each end. Tickler chains or chain mats, attached between the beam and the ground rope of the net, are used to disturb fish and crustaceans that rise up and fall back into the attached net.
Bycatch	Catch which is retained and sold but is not the target species for the fishery.
CNPMEM	The French National Committee for Maritime Fisheries and Aquaculture, of which CRPMEM Nord, along with 13 other CRPMEMs are members.
Cooperative Maritime Etaploise (C.M.E.) Producer Organisation	A French producer organization representing 45% of French landings, representing 44 active vessels including their owners, skippers, crew and ancillary services.
CRPMEM Nord	One of 14 French regional committees for marine fisheries and marine farming which manages licensing of commercial fishing.
Danish Fisheries Directorate	Part of the Danish Ministry of Food, responsible for ensuring biologically, environmentally and socially sustainable Danish fisheries.
Danish Fishermen's Producer Organisation	A Danish producer organisation representing 95% of Danish vessels, equating to approximately 650 vessels including their owners, skippers, crew and ancillary services.
Demersal	Living on or near the seabed.
Demersal trawl	A fishing net used by towing the trawl along or close to the seabed.
Eastern Inshore Fisheries and Conservation Authority	A UK authority that license, regulate and plan commercial fisheries activities in the seas around England, with jurisdiction from 0 to 6 NM.
European Market Observatory for Fisheries and Aquaculture Products	An online database that enables direct monitoring of the weight, value and price of fishery and aquaculture products, from the first sale to retail stage, for EU countries, Norway and Iceland.
European Union Data Collection Framework	An EU framework for the collection and management of fisheries data.
Fish stock	Any natural population of fish, which is an isolated and self-perpetuating group of the same species.
Fishery	A group of vessel voyages which target the same species or use the same gear.
Fishing ground	An area of water or seabed targeted by fishing activity.
Fishing mortality	Mortality due to fishing; death or removal of fish from a population due to fishing.
Fleet	A physical group of vessels sharing similar characteristics (e.g. nationality).
Fly shooting	A fishing net consisting of a conical net with two long wings with a bag where the fish collect. Drag lines extend from the wings, and are long so they can surround an area. A seine boat drags the net in a circle around the fish, the motion of the drag lines herds the fish into the central net.
From Nord	A French non-cooperative producer organization, legally in the form of an association, representing 40% of all French quotas (on average across all species) and specifically 61% of sole <i>Solea solea</i> quota.

Term	Definition
Gear type	The method/equipment used for fishing.
German Federal Ministry for Food, Agriculture and Consumer Protection (BMELV)	A cabinet-level ministry of the Federal Republic of Germany responsible for German fisheries.
Gill net	Fishing net set vertically in the water so that fish swimming into it are entangled by the gills in its mesh.
ICES statistical rectangles	Defined areas, 1 degree longitude x 0.5 degree latitude equalling approximately 30 x 30 NM used for fisheries statistics.
Industrial fishery	Highly mechanised commercial fishing operations whose ultimate products are principally fishmeal and fish oil.
L'Institut Français de Recherche pour l'Exploitation de la Mer (IFREMER)	A French research institute for the exploitation of the sea.
Landings	Quantitative description of amount of fish returned to port for sale, in terms of value or weight.
Marine Management Organisation	A UK government department that license regulate and plan commercial fisheries activities in the seas around England, with jurisdiction from 0 to 12 NM.
Maximum sustainable yield	Maximum sustainable yield (MSY) is the largest yield (catch, in tonnes) that can be taken from a specific fish stock over an indefinite period under constant environmental conditions. Fishing at MSY levels should ensure the capacity of the stock to continue to produce this level in the long term.
Metier	A homogenous subdivision, either of a fishery by vessel type or a fleet by voyage type.
Minimum Landing Size	Is a technical measure that limits the size of fish or shellfish species that can be legally landed and sold. The MLS varies per species. With the implementation of the Landings Obligation, the existing MLS are changed into minimum conservation reference sizes (MCRS), but they will remain largely the same.
National Federation of Fishermen's Organisations	A UK organisation comprised of members from Producers' Organisations, fishermen's groups and individuals, representing fishermen in England, Wales, Northern Ireland and the Channel Islands.
Norwegian Directorate of Fisheries	A Norwegian government agency responsible for Norwegian fisheries.
Otter trawl	A net with large rectangular boards (otter boards) which are used to keep the mouth of the trawl net open. Otter boards are made of timber or steel and are positioned in such a way that the hydrodynamic forces, acting on them when the net is towed along the seabed, pushes them outwards and prevents the mouth of the net from closing.
Pelagic	Of or relating to the open sea.
Pelagic trawl	A net used to target fish species in the mid water column.
Rederscentrale	The only Belgian producer organization, an umbrella organization led by a Board of Directors, representing Belgian vessel owners and members.
Scallop dredge	A method to catch scallop using steel dredges with a leading bar fitted with a set of spring loaded, downward pointing teeth. Behind this toothed bar (sword), a matt of steel rings is fitted. A heavy net cover (back) is laced to the frame, sides and after end of the mat to form a bag.

Term	Definition
Shrimper	A vessel that predominantly targets shrimp.
Soak time	The duration of time that pots are left on the seabed in between hauls.
Spawning	The act of releasing or depositing eggs (fish).
Stock assessment	An assessment of the biological stock of a species and its status in relation to defined reference points for biomass and fishing mortality.
String	A series of static fishing gear (pots) joined together to form a single deployable linear line of pots.
Swedish Fishermen's Producer Organisation	Swedish producer organization, representing Swedish vessel owners and members.
The Crown Estate	An independent commercial business, created by Act of Parliament that owns the UK seabed out to 200 NM.
Total Allowable Catches	Total Allowable Catches (TACs) are catch limits, expressed in tonnes or numbers that are set for some commercial fish stocks.
Vessel Monitoring System	A system used in commercial fishing to allow environmental and fisheries regulatory organizations to monitor, minimally, the position, time at a position, and course and speed of fishing vessels.
VisNed	(Coöperatie Kottervisserij Nederland u.a.) a Dutch umbrella organisation of producer organisations, representing 75% of the Dutch Demersal Fishing interest.
Vivier	A fishing vessel, normally targeting crab, which has a tank on board allowing the catch to be stored live in water.
Wageningen Economic Research	A Dutch independent research institute, part of the Wageningen University & Research.
Year class	The individual animals of a single species of fish or shellfish that were born in any one-year.

Acronyms

Acronym	Description
AfL	Area for Lease
AIS	Automatic Identification System
BMELV	German Federal Ministry for Food, Agriculture and Consumer Protection
CEA	Cumulative Effects Assessment
cSAC	Candidate Special Area of Conservation
DCF	Data Collection Framework
DFPO	Danish Fishermen's Producer Organisation
EC	European Council
EEC	European Economic Community
EEFPO	The East of England Fish Producers Organisation
EEZ	Exclusive Economic Zone
EIA	Environmental Impact Assessment
EMF	Electromagnetic fields
EMS	European Marine Site
EU	European Union
EUMOFA	European Market Observatory for Fisheries and Aquaculture Products
FU	Functional Unit
ICES	International Council for the Exploration of the Sea
IFCA	Inshore Fisheries and Conservation Authorities
MCZ	Marine Conservation Zone
MMO	Marine Management Organisation
MPA	Marine Protected Area
MSAR	Monthly Shellfish Activity Returns
NFFO	National Federation of Fishermen's Organisations
rMCZ	Recommended Marine Conservation Zone
SAC	Special Area of Conservation
SPA	Special Protected Area
Spp.	Species
TAC	Total Allowable Catches

Acronym	Description
UK	United Kingdom
VMS	Vessel Monitoring System

Units

Unit	Description
€	Euro
£	Great British pounds
£/kg	Great British pounds per kilogram
hours	hours
kg	kilograms
km	kilometres
m	metres
mm	millimetres
nm	Nautical Mile

6. Commercial Fisheries

6.1 Introduction

6.1.1.1 This chapter of the Preliminary Environmental Information Report (PEIR) presents the findings to date of the Environmental Impact Assessment (EIA) for the potential impacts of the Hornsea Project Three offshore wind farm (hereafter referred to as Hornsea Three) on commercial fisheries. Specifically, this chapter considers the potential impact of Hornsea Three seaward of Mean High Water Springs (MHWS) during its construction, operation and maintenance, and decommissioning phases.

6.1.1.2 For the purpose of this chapter commercial fishing is defined as any form of fishing activity legally undertaken for taxable profit. Recreational fishing is addressed in chapter 10: Infrastructure and Other Users. Navigational aspects related to fishing vessels are assessed in chapter 7: Shipping and Navigation.

6.1.1.3 This chapter summarises information contained within a supporting technical report, which is included at volume 5, annex 6.1: Commercial Fisheries Technical Report.

6.2 Purpose of this chapter

6.2.1.1 The primary purpose of the Environmental Statement is to support the Development Consent Order (DCO) application for Hornsea Three under the Planning Act 2008 (the 2008 Act). This PEIR constitutes the Preliminary Environmental Information for Hornsea Three and sets out the findings of the EIA to date to support pre-application consultation activities required under the 2008 Act. The EIA will be finalised following completion of pre-application consultation and the Environmental Statement will accompany the application to the Secretary of State for Development Consent.

6.2.1.2 The PEIR will form the basis for Phase Two Consultation which will commence on 27 July and conclude on 20 September 2017. At this point, comments received on the PEIR will be reviewed and incorporated (where appropriate) into the Environmental Statement, which will be submitted in support of the application for Development Consent scheduled for the second quarter of 2018.

6.2.1.3 In particular, this PEIR chapter:

- Presents the existing environmental baseline established from desk studies, and consultation;
- Presents the potential environmental effects on commercial fisheries arising from Hornsea Three, based on the information gathered and the analysis and assessments undertaken to date;
- Identifies any assumptions and limitations encountered in compiling the environmental information; and
- Highlights any necessary monitoring and/or mitigation measures which could prevent, minimise, reduce or offset the possible environmental effects identified to date in the EIA process.

6.3 Study area

6.3.1.1 Hornsea Three is within the southwest portion of the International Council for the Exploration of the Sea (ICES) Division 4b (Central North Sea). Hornsea Three array area lies outside the 12 nautical miles (nm) territorial waters limit within the UK Exclusive Economic Zone (EEZ). For the purpose of recording fisheries landings, ICES Division 4b is divided into statistical rectangles, which are consistent across all Member States operating in the North Sea.

6.3.1.2 From a commercial fisheries perspective, the study areas are defined by the ICES statistical rectangles that Hornsea Three overlaps and is immediately adjacent to (Figure 6.1). The commercial fisheries study areas are defined as follows:

- Hornsea Three array area commercial fisheries study area: ICES rectangle 36F2;
- Hornsea Three offshore cable corridor commercial fisheries study area: ICES rectangles 36F2, 36F1, 35F1 and 34F1;
- Hornsea Three commercial fisheries study area: ICES rectangles 36F2, 36F1, 35F1 and 34F1; and
- Regional commercial fisheries study area: ICES rectangles: 37F0 to F3, 36F0 to F3, 35F0 to F3 and 34F0 to F3.

6.3.1.3 An admiralty chart covering the regional commercial fisheries study area is presented in Figure 6.2, together with relevant ICES Divisions.

6.3.1.4 Given the range of commercial fisheries stakeholders considered in this chapter, and the scale of geographic coverage of their activities, the commercial fisheries study area for the cumulative effects assessment (CEA) is defined as the North Sea (ICES Divisions 4a, 4b and 4c).

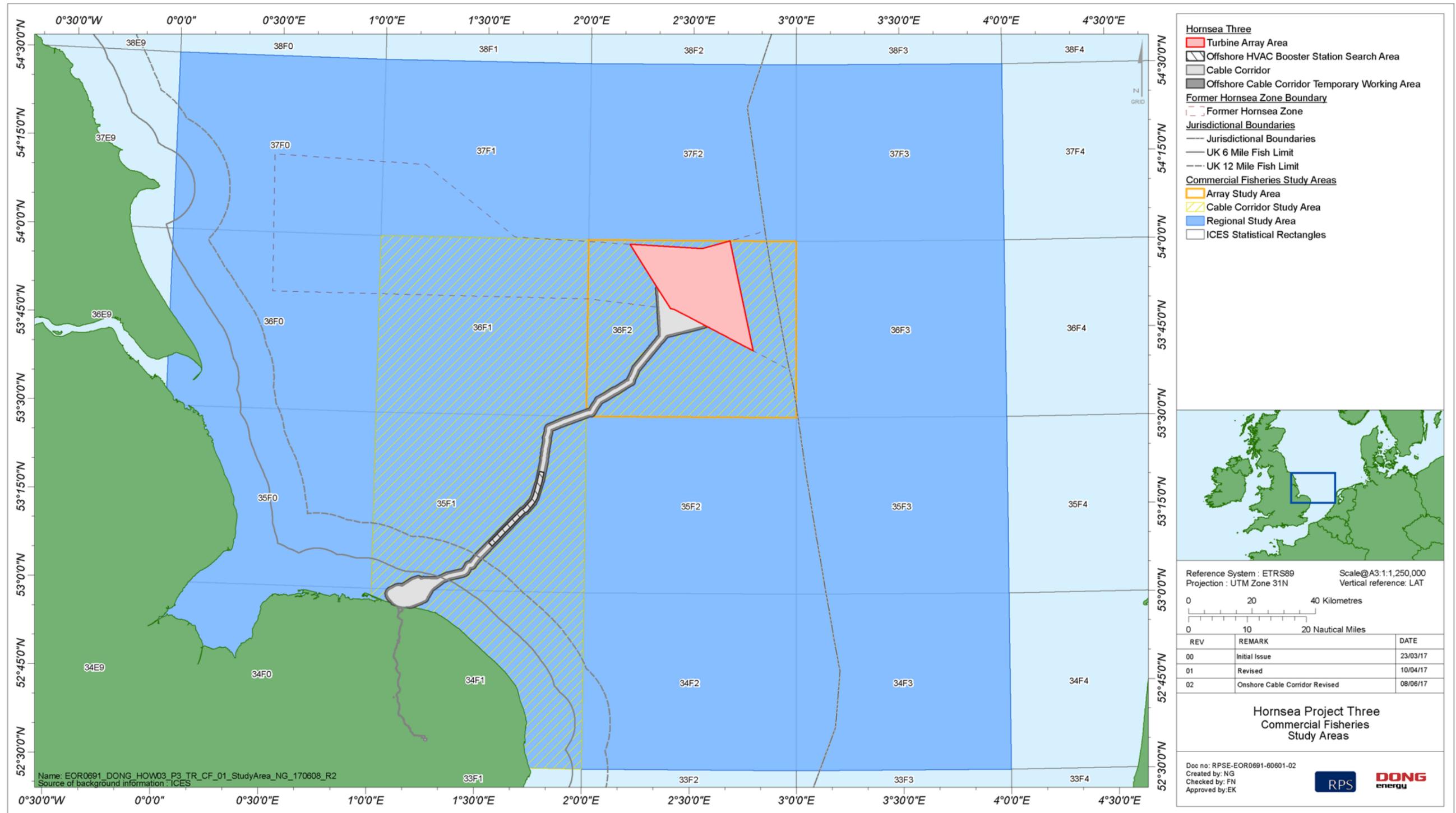


Figure 6.1: Commercial fisheries study areas for Hornsea Three.

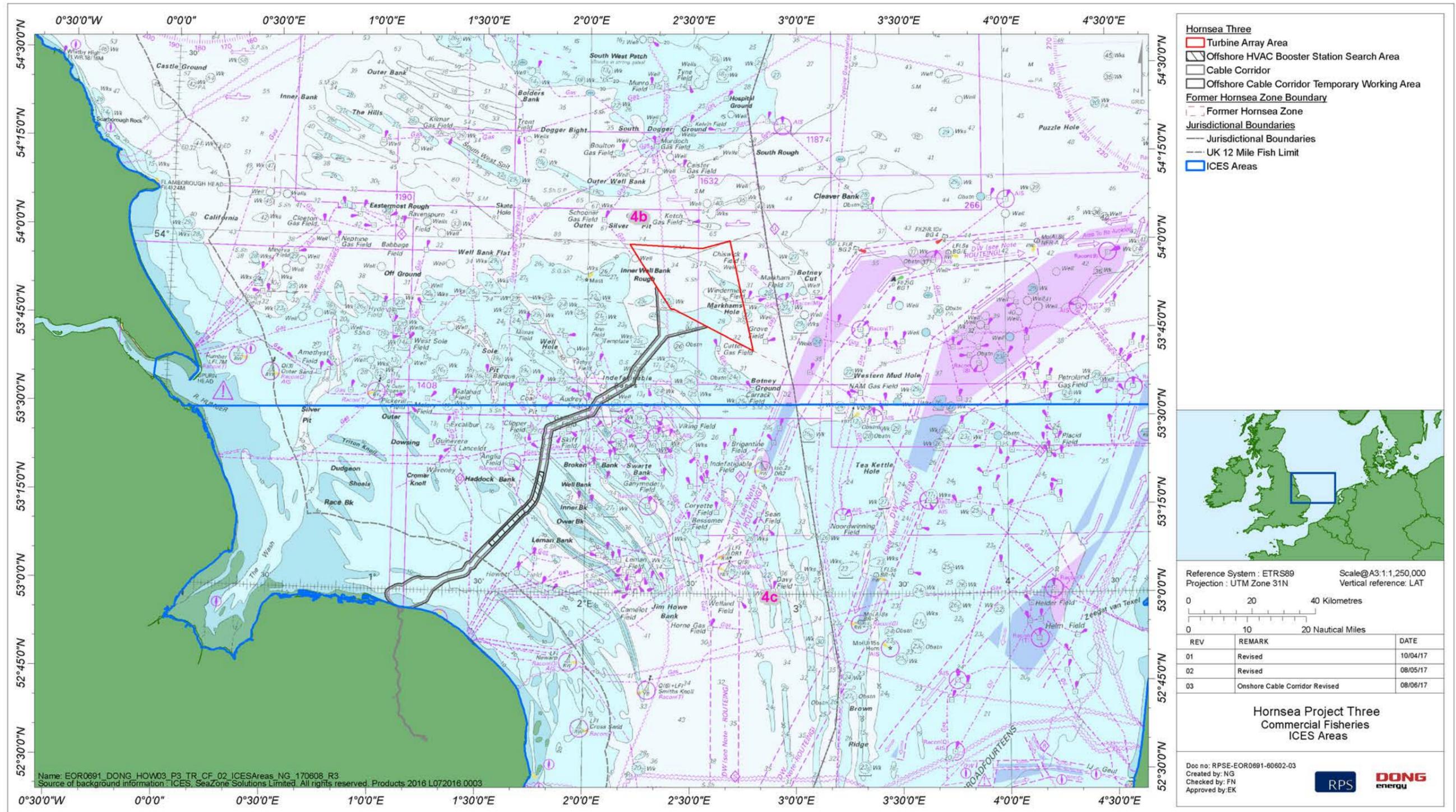


Figure 6.2: Admiralty chart indicating North Sea ICES Divisions.

6.4 Planning policy context

- 6.4.1.1 Planning policy on offshore renewable energy Nationally Significant Infrastructure Projects (NSIPs), specifically in relation to commercial fisheries, is contained in the Overarching National Policy Statement (NPS) for Energy (EN-1; DECC, 2011a) and the NPS for Renewable Energy Infrastructure (EN-3, DECC, 2011b).
- 6.4.1.2 NPS EN-3 includes guidance on what matters are to be considered in the assessment. These are summarised in Table 6.1 below.
- 6.4.1.3 Specifically the guidance provided within NPS EN-3 (DECC, 2011b) was considered, which highlights a number of factors relating to the determination of an application and in relation to mitigation. These are summarised in Table 6.2 below.

Table 6.1: Summary of NPS EN-3 provisions relevant to commercial fisheries.

Summary of NPS EN-3 provision	How and where considered in the PEIR
Consultation	
Early consultation should be undertaken with statutory advisors and with representatives of the fishing industry which could include discussions of impact assessment methodologies. Where any part of a proposal involves a grid connection to shore, appropriate inshore fisheries groups should also be consulted (paragraph 2.6.127 of NPS EN-3).	Engagement with the local and regional industry over the period September 2010 to present (see section 6.5).
Where a number of offshore wind farms have been proposed within an identified zone, it may be beneficial to undertake such consultation at a zonal, rather than a site-specific, level (paragraph 2.6.128 of NPS EN-3).	Consultation has been undertaken both at a zonal and at a project-specific, level (see section 6.5).
The assessment by the applicant should include detailed surveys of the effects on fish stocks of commercial interest and any potential reduction in such stocks, as well as any likely constraints on fishing activity within the project's boundaries (paragraph 2.6.129 of NPS EN-3).	Site-specific otter trawl and epibenthic beam trawl surveys were undertaken to inform fish and shellfish ecology; details of which are presented in Table 6.5. In addition, consultation with the fishing industry has identified key concerns as well as available data and potential impacts, which have all been considered in the assessment (see section 6.5).
Baseline data	
Robust baseline data should have been collected and studies conducted as part of the assessment (paragraph 2.6.129 of NPS EN-3).	In addition to recent official landings and surveillance data, extensive consultation with the industry and Eastern Inshore Fisheries and Conservation Authority (IFCA), in addition to data from published reports, have been used to establish baseline data (see section 6.6).

Summary of NPS EN-3 provision	How and where considered in the PEIR
Safety zones	
Where there is a possibility that safety zones will be sought around offshore infrastructure, potential effects should be included in the assessment on commercial fishing (paragraph 2.6.130 of NPS EN-3).	The need for safety zones has been considered by the navigational risk assessment (NRA) completed for Hornsea Three. The risk assessment results have been taken into account within the Commercial Fisheries assessment (see section 6.11). Consultation has also been undertaken with the Maritime and Coastguard Agency (MCA) (see chapter 7: Shipping and Navigation).
Where the precise extents of potential safety zones are unknown, a realistic worst case scenario should be assessed. Applicants should consult the MCA (paragraph 2.6.131 of NPS EN-3).	It is assumed there would be safety zones of 500 m around infrastructure under construction, decommissioning and major maintenance works; and 500 m safety zones around manned platforms during the operational period.
Fish stocks	
The assessment by the applicant should include detailed surveys of the effects on fish stocks of commercial interest and the potential reduction or increase in such stocks that will result from the presence of the wind farm development and of any safety zones (paragraph 2.6.131 of NPS EN-3).	The Hornsea Three assessment has considered the effects on commercial fish stocks (see section 6.11, and chapter 3: Fish and Shellfish Ecology).

Table 6.2: Summary of NPS EN-3 policy on decision making relevant to commercial fisheries.

Summary of NPS EN-3 policy on decision making (and mitigation)	How and where considered in the PEIR
<i>Commercial fisheries</i>	
The Secretary of State should be satisfied that the site selection process has been undertaken in a way that reasonably minimises adverse effects on fish stocks, including during peak spawning periods and the activity of fishing itself (paragraph 2.6.132 of NPS EN-3).	The effects arising from the proposed development have been and will be discussed with statutory bodies during pre and post application consultation. Hornsea Three, is, and will continue to, take steps to minimise the effects upon the fishing industry in the area through appropriate mitigation where required. Designed-in measures related to commercial fisheries and adopted as part of Hornsea Three are provided in section 6.10.
The Secretary of State should consider the extent to which the proposed development occupies any recognised important fishing grounds and whether the project would prevent or significantly impede protection of sustainable Commercial Fisheries or fishing activities (paragraph 2.6.132 of NPS EN-3).	The extent to which Hornsea Three impacts on recognised fishing grounds has been considered and consultation with fishing stakeholders in order to fully understand any potential impacts has been undertaken (see section 6.5). The results of the commercial fisheries assessment are presented in section 6.11 below.
The Secretary of State should be satisfied that the applicant has sought to design the proposal having consulted representatives of the fishing industry with the intention of minimising the loss of fishing opportunity taking into account effects on other marine interests (paragraph 2.6.133 of NPS EN-3).	
<i>Mitigation for commercial fisheries</i>	
Any mitigation proposals should result from the applicant having detailed consultation with relevant representatives of the fishing industry (paragraph 2.6.134 of NPS EN-3).	Consultation is integral to the assessment of impact on commercial fisheries for Hornsea Three. Hornsea Three consultation with UK and overseas stakeholders from the fishing community is on-going (see section 6.5).
Mitigation should be designed to enhance where reasonably possible any potential medium and long-term positive benefits to the fishing industry and Commercial fish stocks (paragraph 2.6.135 of NPS EN-3).	A range of mitigation measures are presented within section 6.10.

6.5 Consultation

6.5.1.1 A summary of the key issues raised during consultation specific to commercial fisheries is outlined below, together with how these issues have been considered in the production of this PEIR. A summary of consultation specific to commercial fisheries undertaken for Hornsea Project One and Hornsea Project Two, which are applicable to Hornsea Three, are also set out below.

6.5.2 Hornsea Project One and Hornsea Project Two consultation

6.5.2.1 Hornsea Three has similarities, both in terms of the nature of the development and its location, to Hornsea Project One and Hornsea Project Two. The matters relevant to Hornsea Three, which were raised by consultees during the pre-application and examination phases of Hornsea Project One and Hornsea Project Two on commercial fisheries, are set out in volume 4, annex 1.1: Hornsea Project One and Hornsea Project Two Consultation of Relevance to Hornsea Three..

6.5.3 Hornsea Three consultation

6.5.3.1 Table 6.3 below summarises the issues raised relevant to commercial fisheries, which have been identified during consultation activities undertaken to date. Table 6.3 also indicates either how these issues have been addressed within this PEIR or how the Applicant has had regard to them.

Table 6.3: Summary of key consultation issues raised during consultation activities undertaken for Hornsea Three relevant to commercial fisheries.

Date	Consultee and type of response	Issues raised	Response to issue raised and/or where considered in this chapter
08 February 2017	NFFO – consultation meeting	Effects related to floating turbines, their mooring systems and stability. Potential for co-existence given floating turbines. Uncertainty related to displacement.	The potential for co-existence is considered, however the mooring and anchor cables associated with floating turbine foundations would prevent active fishing; further details are presented within the maximum design scenarios in Table 6.7. The potential for displacement is acknowledged within the gear conflict impact assessment which is presented in section 6.11 below.
21 February 2017	Wells and District Fishermen's Association – consultation meeting	Details of the local potting fleet are provided relating to whelk, crab and lobster. Concern raised regarding landings statistics, noting that Monthly Shellfish Activity Returns (MSARs) are likely to be more accurate.	Details on the fishing patterns, gear configurations and grounds targeted in the vicinity of the Hornsea Three offshore cable corridor commercial fisheries study area have informed the baseline section 6.7 and volume 5, annex 6.1: Commercial Fisheries Technical Report. MSAR data is presented in volume 5, annex 6.1: Commercial Fisheries Technical Report.
21 February 2017	Norfolk Independent Fishermen's Association – consultation meeting	Concerns related to the offshore cable corridor during the construction phase are highlighted, including direct exclusion from grounds and displacement of effort.	The potential for a reduction in access to grounds, displacement from grounds and gear conflict are considered in section 6.11 below.
22 February 2017	North Norfolk Fishermen's Society – consultation meeting	Concerns related to the offshore cable corridor during the construction phase are highlighted. Notably construction methods and the potential that suspension of sediment and chalk plumes might affect crab resources. The potential cumulative impact of management measures related to the Cromer Shoal Chalk Bed Marine Conservation Zone (MCZ) was also noted.	A maximum design scenario for all phases of the development, including the construction phase, (see Table 6.7) has been used to inform the assessment of impacts from Hornsea Three. The potential impacts to the crab and other shellfish resource are considered in detail within chapter 3: Fish and Shellfish Ecology. This has informed the commercial fisheries EIA on the potential for displacement or disruption of commercially important fish and shellfish resources (section 6.11). The cumulative effect of Hornsea Three, alongside MCZs and SACs, as well as other projects, plans and activities in the southern North Sea, are considered within the CEA presented in section 6.13 below.
22 February 2017	Jonas Seafood – consultation meeting	Details provided on prices, markets and landings points for shellfish fisheries. Concerns related to construction activities affecting crab resources in the short-medium term.	The potential impacts to crab and other shellfish resources are considered in detail within chapter 3: Fish and Shellfish Ecology. This has informed the commercial fisheries EIA on the potential for displacement or disruption of commercially important fish and shellfish resources (section 6.11).
22 February 2017	Eastern Inshore Fisheries Conservation Authority– consultation meeting	Details discussed on information sources, including inshore fisheries maps and MSAR data. Interest in any effects on nursery and spawning grounds. Details discussed on the Wash and North Norfolk Coast SAC and Cromer Shoal Chalk Beds MCZ.	Details on the fishing patterns, gear configurations and grounds targeted in the vicinity of the Hornsea Three offshore cable corridor commercial fisheries study area have informed the baseline section 6.7 and volume 5, annex 6.1: Commercial Fisheries Technical Report. MSAR data is presented in volume 5, annex 6.1: Commercial Fisheries Technical Report. The potential impacts on nursery and spawning grounds are considered in detail within chapter 3: Fish and Shellfish Ecology. The cumulative effect of Hornsea Three, alongside MCZs and SACs, as well as other projects, plans and activities in the southern North Sea, are considered within the CEA presented in section 6.13 below.
23 February 2017	VisNed – consultation meeting and email correspondence.	Details discussed on fishing patterns of UK and Dutch vessels in the area. Concern raised over floating turbines and reduced access to the array area due to mooring and anchor cables.	Details on the fishing patterns, species mix, gear configurations and grounds targeted in the vicinity of the Hornsea Three array area commercial fisheries study area have informed the baseline section 6.7 and volume 5, annex 6.1: Commercial Fisheries Technical Report. The potential impact of Hornsea Three on access for commercial fisheries activities are considered in section 6.11.
16 February 2017	Rederscentrale - email correspondence.	Acknowledgement of project and request to be kept informed.	The Belgian fleet are characterised in the baseline assessment (section 6.7); the potential impacts of Hornsea Three during construction, operation, maintenance and decommissioning are assessed specifically for the Belgian fleet (section 6.11); as is the cumulative impact of Hornsea Three with other projects in North Sea (section 6.13).

Date	Consultee and type of response	Issues raised	Response to issue raised and/or where considered in this chapter
2 February 2017	CRPMEM Nord and Copeche - email correspondence.	Acknowledgement of project and request to be kept informed.	The French fleet are characterised in the baseline assessment (section 6.7); the potential impacts of Hornsea Three during construction, operation, maintenance and decommissioning are assessed specifically for the French fleet (section 6.11); as is the cumulative impact of Hornsea Three with other projects in North Sea (section 6.13).
30 March 2017	Norwegian Directorate of Fisheries - email correspondence.	Acknowledgement of project and request to be kept informed.	The Norwegian fleet are characterised in the baseline assessment (section 6.7); the potential impacts of Hornsea Three during construction, operation, maintenance and decommissioning are assessed specifically for the Norwegian fleet (section 6.11); as is the cumulative impact of Hornsea Three with other projects in North Sea (section 6.13).
16 June 2017	Danish Fishermen's Producer Organisation (DFPO) – email correspondence and consultation meeting	Details discussed on fishing patterns of Danish vessels in the area and wider North Sea. Concern raised over floating turbines and reduced access to the array area due to mooring and anchor cables, specifically across sandeel grounds that run from west to east across the northern half of the array area.	Details on the fishing patterns, species mix, gear configurations and grounds targeted in the vicinity of the Hornsea Three array area commercial fisheries study area have informed the baseline section 6.7 and volume 5, annex 6.1: Commercial Fisheries Technical Report. The potential impact of Hornsea Three on access for commercial fisheries activities are considered in section 6.11.
6 December 2016	PINS - Scoping Opinion	The Secretary of State agrees with the MMO in their consultation response that the potential impact of longer steaming distances to alternative fishing grounds during construction of the export cable should be scoped in to the impact assessment. The MMO has raised concerns that smaller, beach-launched vessels are likely to be limited in terms of where they can relocate their gear during the construction due to vessel limitations. The impact on such receptors could therefore be great, even where the period of time may be relatively short. The Secretary of State does not agree that this aspect can be scoped out.	The potential impact of longer steaming distances for fishing vessels during construction, operation and decommissioning of the Hornsea Three array area and offshore cable corridor have been scoped in to the impact assessment (section 6.11).
6 December 2016	PINS - Scoping Opinion	The Secretary of State agrees that in principle effects during operation and decommissioning can be scoped out. However the Applicant is first advised to consult with commercial fishermen, the Eastern Inshore Fisheries Conservation Authority (IFCA) and the MMO. It should be noted that commercial fishermen and the IFCA have not been consulted as part of the Secretary of State' Scoping Opinion.	The potential impacts have been scoped in (section 6.11). Commercial fisheries stakeholders, the MMO and Eastern IFCA have been consulted prior to submission of the PEIR.
6 December 2016	PINS - Scoping Opinion	Table 9.2 also proposes scoping out interference to fishing activity as a result of changes to shipping routes and construction vessel traffic leading to increased vessel traffic in fishing grounds for all phases of the development. The Secretary of State agrees that in principle these effects can be scoped out but as noted above, the Applicant should first consult with commercial fishermen, the Eastern IFCA and the MMO.	The potential impact of changes to shipping routes and construction vessel traffic leading to increased vessel traffic in fishing grounds during construction, operation and maintenance and decommissioning of the Hornsea Three array area have been scoped in to the impact assessment (section 6.11). Commercial fisheries stakeholders, the MMO and Eastern IFCA have been consulted prior to submission of the PEIR. "
6 December 2016	PINS - Scoping Opinion	"The Secretary of State welcomes the Applicant's intention to obtain further data in respect of the commercial fishing activity baseline, including obtaining landings data for non-UK vessels that has been landed at European ports from the relevant national governments, which will be presented in the ES."	The baseline section 6.7 and volume 5, annex 6.1: Commercial Fisheries Technical Report. present landings data for non-UK vessels landing into European ports.
6 December 2016	PINS - Scoping Opinion	The Applicant's attention is drawn to the comments of the MMO in respect of the commercial fishing ground (Botney Gut/Silver Pit) where <i>Nephrops norvegicus</i> are targeted using <i>Nephrops</i> otter trawls. The MMO identify that impacts on these fishing grounds will need to be assessed in the ES.	The baseline section 6.7 and volume 5, annex 6.1: Commercial Fisheries Technical Report. present landings data for <i>Nephrops</i> .

Date	Consultee and type of response	Issues raised	Response to issue raised and/or where considered in this chapter
6 December 2016	PINS - Scoping Opinion	The Secretary of State also welcomes the Applicant's intention to obtain information on the fishing activity of vessels in areas closer to shore within the offshore ECR corridor search area through consultation, particularly for those which are less than 10m in length, as this information is not captured by the Vessel Monitoring System (VMS) and surveillance datasets. The Applicant's attention is directed to the comments of the MMO in their consultation response (see Appendix 3), which include information on commercial fishing vessel vessels under 10m within the area. The MMO also provide information on important crab, lobster and whelk fisheries in the inshore area of the offshore ECR corridor and information on the North Norfolk fishing fleet. The Applicant's attention is drawn to the comments of the MMO at paragraph 6.5 of their consultation response which confirms that the fishing distribution of the North Norfolk fleet will not be captured by a VMS, as most, if not all vessels are under 12m in length and do not have a VMS installed (VMS is a requirement on vessels 12m+ since 2013).	Details on the fishing patterns, gear configurations and grounds targeted in the vicinity of the Hornsea Three offshore cable corridor commercial fisheries study area by North Norfolk fleets have been collated during industry consultation which have informed the baseline section 6.7 and volume 5, annex 6.1: Commercial Fisheries Technical Report. MSAR data is presented in volume 5, annex 6.1: Commercial Fisheries Technical Report.
6 December 2016	PINS - Scoping Opinion	The Applicant's attention is drawn to the comments of the MMO at Appendix 3, in respect of the need to consider the potential limitations of official landing statistics for fleet vessels less than 10m in length, as buyers and sellers notes are not produced. The MMO also identify that many of the vessels will have limited ability to relocate their pots during surveys and cable laying works. The Secretary of State advises that the Applicant consider these limitations in their impact assessment.	Limitations of data have been considered within section 6.6. It is noted that in some instances landings by vessels under 10 m are not captured within buyers and sellers notes, due to the quantities being landed and/or fishermen selling directly to the public from their own local outlets. Other sources of data have been explored for the under 10 m fleet, including MSAR data.
6 December 2016	PINS - Scoping Opinion	Figure 9.5 is noted to contain a number of different shades of pink/purple to identify gear types. The Secretary of State finds these difficult to interpret on the figure. The Applicant is requested to provide clear figures and legends/keys to figures within the ES.	The legend for the aerial surveillance has been updated and is presented in volume 5, annex 6.1: Commercial Fisheries Technical Report.
6 December 2016	PINS - Scoping Opinion	The Secretary of State is content with the potential impacts scoped in to the assessment, as per Table 9.1, with the provision that the Applicant include the data sources and potential receptors identified in comments above. The Applicant should also consider whether the data collection (e.g. the type and nature of current fisheries in the area, including the vessel data) for decommissioning impacts will need to be updated prior to decommissioning. At present the decommissioning data is stated to be the same sources and dates as for construction and operation.	It is agreed that the data to inform decommissioning impacts will require updating prior to decommissioning.
6 December 2016	PINS - Scoping Opinion	The Secretary of State advises that the Applicant consult with the Eastern IFCA and the fishing industry. As noted by the MMO, consultation with these bodies is important to establish the distribution of potting effort throughout the region and in relation to the offshore ECR corridor. The Secretary of State supports the MMO's recommendation to use an Offshore Fisheries Liaison Officer, a Company Fisheries Liaison Officer, and an Onshore Fishing Industry Representative to communicate with the fishing industry, as outline in the Fishing Liaison with Offshore Wind and Wet Renewables Group (FLOWW) Best Practice Guidance for Offshore Renewables Developments: Recommendations for Fisheries Liaison (Jan 2014). The Secretary of State notes and welcomes the Applicant's intention to include such liaison officers and offices as part of the measures to be adopted.	Commercial fisheries stakeholders, the MMO and Eastern IFCA have been consulted prior to submission of the PEIR. A company Fisheries Liaison Officer has been appointed within DONG Energy. Regular ongoing updates have been and continue to be disseminated to the fishing industry via Notice to Mariners (NIMs), and Offshore Fishing Industry Representatives have been mobilised aboard survey vessels. Significant avenues have been explored to find a suitable Onshore Fishing Industry Representative for inshore fisheries. However, such a role has not yet been appointed. This has somewhat been due to the clear distinction between inshore fleets in terms of the vessels used (in particular beach launched and port based) and areas targeted, together with the fact that inshore representation is well defined across distinct fishing industry groups. Work remains ongoing with the fishing industry to identify an Onshore Fishing Industry Representative. Hornsea Three will continue to follow industry best practice and engage on issues such as this.
6 December 2016	PINS - Scoping Opinion	The Applicant's attention is drawn to the comments of Norfolk County Council in respect of cumulative impacts and the need to consider offshore wind farms in the East Anglia Zone (Round 3) as well as those other projects off the Norfolk coast consented under previous licensing rounds; together with consented, proposed and operational wind farms, including the proposed Norfolk Vanguard and the Boreas wind farms.	The cumulative impact of Hornsea Three with other projects in North Sea is presented in section 6.13, including wind farms in the East Anglia Zone.
25 November 2016	MMO - Scoping Opinion	Commonly fished areas are around Markham's Hole and Silver Pit. The wind farm array is adjacent to a commercial fishing ground (Botney Gut/Silver Pit) where <i>Nephrops norvegicus</i> are targeted using Nephrops otter trawls. This will need to be given consideration in the EIA.	The <i>Nephrops</i> fleet are characterised as part of the UK demersal trawling fleet in the baseline assessment (section 6.7); the potential impacts of Hornsea Three during construction, operation, maintenance and decommissioning are assessed specifically for the UK demersal trawl fleet (section 6.11); as is the cumulative impact of Hornsea Three with other projects in North Sea (section 6.13).

Date	Consultee and type of response	Issues raised	Response to issue raised and/or where considered in this chapter
25 November 2016	MMO - Scoping Opinion	There are approximately 20 beach-launched commercial fishing vessels under 10m working from Hornsea, Withernsea and Easington on the Holderness Coast. The main activity of these vessels is inshore potting for brown crab (<i>Cancer pagurus</i>) and lobster (<i>Homarus gammarus</i>). Fishing vessels from The Wash working out of King's Lynn and Boston target cockles (<i>Cerastoderma edule</i>) and brown shrimp (<i>Crangon crangon</i>) and although most are over 12m, they also typically work inshore.	The baseline section 6.7 and volume 5, annex 6.1: Commercial Fisheries Technical Report present landings data for the inshore UK fleets.
25 November 2016	MMO - Scoping Opinion	"The inshore area of the proposed ECR corridor forms part of an important crab, lobster and whelk (<i>Buccinum undatum</i>) fishery. These species are targeted using baited pots which are left on the seabed to fish for up to several days. In recent years the landings of whelks have increased such that it now forms an important fishery, with peak catches occurring during the winter months. Conversely, peak catches for crab and lobster occur during spring-autumn, though catches occur all year around for all three species."	
25 November 2016	MMO - Scoping Opinion	The North Norfolk fishing fleet operate out of ports from The Wash estuary around the North Norfolk coast to beyond Lowestoft. The area extending offshore from Wells- Next-The-Sea to Cromer represents the most important area for this fishery. The majority of the fleet is made up of under 10m vessels, with many of those being beach launch vessels which are only able to fish on the inshore grounds. It is important to note that the fishing distribution of this fleet will not be captured by a Vessel Monitoring System (VMS) as most, if not all vessels, are under 12m in length and therefore do not have VMS installed (VMS has been required on vessels 12m+ since 2013).	The baseline section 6.7 and volume 5, annex 6.1: Commercial Fisheries Technical Report present landings data for the inshore UK fleets.
25 November 2016	MMO - Scoping Opinion	In addition, the potential limitations of official landings statistics for <10m fleet should be carefully considered as buyers and sellers notes are not produced. Many of the vessels will have limited ability to relocate their pots during surveys and cable laying works, due to heavily fished grounds in adjacent areas and the size of their vessels limiting the range they can travel.	Limitations of data have been considered within section 6.6. It is noted that in some instances landings by vessels under 10 m are not captured within buyers and sellers notes, due to the quantities being landed and/or fishermen selling directly to the public from their own local outlets. Other sources of data have been explored for the under 10 m fleet, including MSAR data.
25 November 2016	MMO - Scoping Opinion	The presence of vessels on site has the potential to create disruption to the commercial fishing activity. Some vessels may face longer steaming distances to alternative fishing grounds and more fishing pressure will be applied in areas outside of the exclusion zones. The impacts on commercial fishing activity can be reduced if the timings of works are well communicated with industry.	The designed in measures adopted as part of Hornsea Three, including communication with the industry, are presented in Table 6.11.
25 November 2016	MMO - Scoping Opinion	It is important the Eastern Inshore Fisheries and Conservation Authority (IFCA) and the fishing industry are consulted to establish the distribution of potting effort throughout the region and in relation to the proposed cable corridor in particular. The MMO recommends the continued use of an Offshore Fisheries Liaison officer, a Company Fisheries Liaison Office and an Onshore Fishing Industry Representative to communicate with the fishing industry as outlined in FLOWW Best Practice Guidance (2014).	The Eastern IFCA and North Norfolk fishing industry have been consulted, as detailed in this table and consultations remain on-going with these parties.
25 November 2016	Natural England - Scoping Opinion	We agree with the scoping in of impacts on commercial fisheries and the undertaking to liaise with fishing fleets as part of the project.	No action.
28 November 2016	Norfolk County Council - Scoping Opinion	County Council welcomes reference for need to assess potential cumulative impacts on commercial fishing interests a (Reference in paragraph 9.1.21). This should include those projects in the East Anglia Zone (Round 3), projects off the Norfolk coast consented under previous licencing Rounds and other operational, consented and proposed windfarms including Vanguard and the Boreas Windfarms. Commercial fishing contributes to the coastal economy of Norfolk and as such the impacts of this proposal alongside those already in operation, consented or planned needs to be carefully considered.	The cumulative impact of Hornsea Three with other projects in North Sea is presented in section 6.13.

6.6 Methodology to inform the baseline

6.6.1 Desktop study

6.6.1.1 Information on commercial fisheries within the commercial fisheries regional study area was collected through a detailed desktop review of existing studies and datasets. These are summarised at Table 6.4 below.

6.6.1.2 In addition, consultation with UK inshore and offshore fisheries and European offshore fisheries has been pertinent in both ground-truthing the above data sources and understanding temporal and spatial patterns of fishing activity.

Landing statistics

6.6.1.3 Landings data for all species are collected via the EU logbooks scheme and recorded by ICES statistical rectangle and stored in the EU Data Collection Framework (DCF) database, accessible through the EU Joint Research Committee. Landings data have been collated for all EU Member States for all ICES statistical rectangles that overlap the regional commercial fisheries study area, as shown in Figure 6.1.

6.6.1.4 Landing statistics were collated across five year (2011 to 2015) and ten year periods (2006 to 2015) to ensure reflection of long-term trends. Landing statistics include all landings by that country's nationally registered vessels into all ports. The following parameters were examined: year; season (quarter); gear type; ICES rectangle; species; effort (hours fished); and live weight (tonnes).

6.6.1.5 The EU DCF database does not provide first sales value or prices. The European Market Observatory for Fisheries and Aquaculture Products (EUMOFA) database was therefore assessed to provide first sale prices per country, species and year (i.e. an average price per year for each species and country from the EUMOFA database was correlated with the annual species landings per country in the EU DCF database in order to gain first sales values).

6.6.1.6 The EU DCF and EUMOFA databases included landings by UK, Belgian, Danish, Dutch, French, German and Swedish registered vessels. No landings statistics were obtained for Norwegian vessels, which are not included within the EU databases.

6.6.1.7 In addition to the EU DCF database, landing statistics for UK registered vessels were obtained from the Marine Management Organisation (MMO) with the following parameters: year; month; gear type; ICES rectangle; species; live weight (tonnes) and first sales value (£).

6.6.1.8 In addition, for the North Norfolk potting vessels, Monthly Shellfish Activity Returns data were analysed and are presented in volume 5, annex 6.1: Commercial Fisheries Technical Report.

Table 6.4: Summary of key desktop reports and datasets.

Title	Source	Year	Author
Landings statistics for Belgian, Danish, Dutch, French, German, Swedish and UK registered vessels for: landing year; quarter; ICES rectangle; vessel length; gear type; species and landed weight (tonnes).	European Union Data Collection Framework	2003 to 2015	N/A
Price data for species landed by Belgian, Danish, Dutch, French, German and Swedish registered vessels for: landing year; species; price (€/per kg)	European Market Observatory for Fisheries and Aquaculture Products	2011 to 2015	N/A
Landing statistics data for UK registered vessels with data query attributes for: landing year; landing month; vessel length category; country code; ICES rectangle; vessel/gear type; port of landing; species; live weight (tonnes); and value.	Marine Management Organisation	2011 to 2015	N/A
Vessel Monitoring System data for UK registered vessels with attributes for time fishing and value of catch at a resolution of 200th of an ICES rectangle amalgamated for all mobile vessels and all static vessels.	Marine Management Organisation	2011 to 2015	N/A
Surveillance data with data query attributes for: sighting date; ICES rectangle; ICES sub square; latitude; longitude; vessel/gear type; activity; nationality; course; speed; and number of sightings.	Marine Management Organisation	2011 to 2015	N/A
Monthly Shellfish Activity Returns data for: UK vessels landing shellfish species caught within EIFCA jurisdiction.	Eastern Inshore Fisheries and Conservation Authority	2006 to 2015	N/A
Vessel Monitoring System data for Belgian, Danish, Dutch, French, German, and Norwegian registered vessels with attributes for time fishing at a resolution of 1/200th of an ICES rectangle amalgamated for all mobile vessels. 2010 represents the latest data set available for this information.	Marine Management Organisation	2010	N/A
Commercial fishing activity density mapping across the former Hornsea Zone for beam trawl and demersal otter trawl.	The Crown Estate	1985 to 2010	N/A
Vessel Monitoring System data for Dutch registered vessels with data attributes presented graphically for: year; gear type; effort in hours fishing to a resolution of 1/200th ICES rectangle	Wageningen Economic Research	2011 to 2015	N/A
Mapping of effort (hours fishing) for demersal and combined demersal/pelagic otter trawling (French data provided in response to the consultation on The Crown Estate Round 3 UK offshore wind proposal). 2008 represents the latest data set available for this information.	French National Committee for Maritime Fisheries and Aquaculture (CNPMM)	2008	N/A
Maps of key sandeel grounds based on vessel tracking plots from Danish registered vessels.	Danish Fishermen's Association and DTU Aqua	1985 to 2010	N/A

Vessel Monitoring System data

- 6.6.1.9 All EU fishing vessels (i.e. fishing vessels flying the flag of an EU Member State), and third party fishing vessels operating in EU waters, that are ≥ 12 m in length, are required to have a VMS on board. This reports the vessels' position to fisheries management authorities, in the case of EU fishing vessels, every two hours. Since 1 January 2012, this obligation has applied to vessels that are ≥ 12 m in length (before 1 January 2012 it applied to vessels ≥ 15 m in length, see Council Regulation (EC) No 1224/2009). However, the MMO does not yet include VMS data for vessels between 12 to 14.9 m within its datasets; therefore all MMO VMS data (2011 to 2015) presented within this chapter and volume 5, annex 6.1: Commercial Fisheries Technical Report includes vessels that are ≥ 15 m in length.
- 6.6.1.10 A vessel's range varies due to weather conditions and skipper preferences as well as technical aspects such as power, but it is generally the case that vessels < 12 m in length fish within 20 nm offshore. Vessels ≥ 12 m in length can and do fish further afield, but in recent years many skippers have altered fishing patterns to favour fishing grounds closer to home ports due to increased fuel prices and time at sea restrictions (vessels being permitted a specific number of days at sea). This has particularly affected vessels operating mobile gears with high fuel demands, such as beam trawlers.
- 6.6.1.11 Although figures mapping VMS data may appear to show inshore areas as having lower (or no) fishing activity compared within offshore areas, this is not the case because VMS data do not include vessels typically operating in inshore area (i.e. typically vessels < 15 m in length). This is particularly important when assessing the activity across the offshore cable route corridor. Consultation has been key throughout the EIA process to determine extent and distribution of activity by the < 15 m fleet.
- 6.6.1.12 The MMO collate VMS data for UK registered vessels by aggregating the number of position plots by general gear type (mobile or static) in a grid of sub-rectangles approximately 5.3 nm² (i.e. at a resolution of 200th of an ICES rectangle). This has been integrated with landings values, thereby providing both effort (hours fished) and value (£) of each sub-rectangle for mobile and static gears. These data have been analysed across a five-year period from 2011 to 2015.
- 6.6.1.13 The MMO also provide effort (hours fished) for other Member States based on VMS recorded within the UK EEZ including, Belgian, Dutch, Danish, German, Swedish, and Norwegian registered vessels. These data are available for 2010.

Surveillance data

- 6.6.1.14 The UK has seven fisheries patrol vessels and four surveillance aircraft. Patrols are undertaken by IFCAs, Royal Navy Fisheries Patrol Vessels and patrol aircraft. UK surveillance aircraft are used to construct an on-going picture of fishing activity within the UK EEZ and to make effective use of patrol vessel activity by coordinated use of surveillance data. These data cannot be considered to give an accurate picture of the actual level of activity and have a number of limitations, as outlined in section 6.7.4. However, surveillance data include fishing vessels of all lengths, thereby allowing complete fleet coverage. In addition, individual gear types are identified, which can be cross-referenced with VMS data to identify fleet activity.

6.6.2 Site specific surveys

- 6.6.2.1 In order to inform the EIA, site-specific surveys were undertaken, as agreed with the statutory consultees. A summary of the surveys undertaken to date is outlined in Table 6.5 below.

6.6.3 Guidance

- 6.6.3.1 The EIA for Commercial Fisheries was undertaken in accordance with the following guidance documents:
- Best Practice Guidance for Fishing Industry Financial and Economic Impact Assessments (UKFEN, 2013);
 - Fisheries Liaison with Offshore Wind and Wet Renewables group (FLOWW) Recommendations For Fisheries Liaison: Best Practice guidance for offshore renewable developers (BERR, 2008 and FLOWW, 2014);
 - FLOWW Best Practice Guidance for Offshore Renewables Developments: Recommendations for Fisheries Disruption Settlements and Community Funds (FLOWW, 2015);
 - Options and opportunities for marine fisheries mitigation associated with wind farms (Blyth-Skyrme, 2010a); and
 - Developing guidance on fisheries CIA for wind farm developers (Blyth-Skyrme, 2010b).

Table 6.5: Summary of site-specific survey data.

Title	Extent of survey	Overview of survey	Survey contractor	Year	Reference to further information
Commercial Fisheries Scouting Surveys for Hornsea Project Three	A number of scouting surveys undertaken along the inshore section of the Hornsea Three offshore cable corridor.	Identify potting areas and any other relevant static gear areas along the Hornsea Three offshore cable corridor from shore to approximately 20 nm.	Brown and May Marine	2016 and 2017	N/A
Seasonal otter trawl sampling	41 trawls undertaken across the former Hornsea Zone with a 4 km buffer to the north and south. Twelve of these trawls were undertaken within or in the immediate vicinity to the Hornsea Three array area (see chapter 3 Fish and Shellfish Ecology).	Seasonal otter trawl surveys undertaken in spring and autumn 2011 within the Hornsea Three fish and shellfish study area. The vessel used to conduct these surveys was a commercial fishing vessel fitted with a high-opening 5 m otter trawl and 40 mm cod-end allowing for both demersal and semi-pelagic species to be caught. A total of 41 trawls, of 30 minute duration, were completed (see chapter 3 Fish and Shellfish Ecology).	EMU	2011	Volume 5, annex 3.1: Fish and Shellfish Ecology Technical Report
Epibenthic beam trawl sampling	102 beam trawl samples were collected across the former Hornsea Zone to support the zonal characterisation and baseline characterisations for Hornsea Projects One and Two. Nine of these were undertaken within the Hornsea Three array area (see chapter 3 Fish and Shellfish Ecology).	Epibenthic beam trawl surveys between 2010 and 2012 within the Hornsea Three fish and shellfish study area. The beam trawls, each lasting 10 minutes, were carried out using a standard Cefas 2 m 'Jennings' beam trawl fitted with a 5 mm cod-end.	EMU	2010 and 2012	Volume 5, annex 3.1: Fish and Shellfish Ecology Technical Report Volume 5, annex 2.1: Benthic Ecology Technical Report
Proposed epibenthic beam trawl sampling of Hornsea Three offshore cable corridor	Five epibenthic beam trawls to be undertaken across the Hornsea Three offshore cable corridor (see chapter 3 Fish and Shellfish Ecology).	During the Evidence Plan process (see chapter 3 Fish and Shellfish Ecology) it was agreed that further beam trawl samples would be collected to characterise the Hornsea Three offshore cable corridor. DE proposed a further five locations to be sampled along the offshore cable corridor during 2017 as part of the benthic ecology survey of the offshore cable corridor. Due to the timing of this survey, these data are not included within the PEIR (i.e. this report), but will be incorporated into the fish and shellfish technical report to be submitted as part of the DCO application.	To be confirmed	2017	Volume 5, annex 3.1: Fish and Shellfish Ecology Technical Report
Hornsea Three array area marine traffic survey (summer)	Hornsea Three array area shipping and navigation study area	AIS, visual and Radar vessel survey determining existing shipping activity within and in the vicinity of the Hornsea Three array area in accordance with MGN 543.	Anatec	2016	Volume 5, annex 7.1: Hornsea Three Array Area, Offshore Cable Corridor and Offshore HVAC Booster Station Search Area Navigational Risk Assessment
Hornsea Three offshore HVAC booster station search area marine traffic survey (summer)	Hornsea Three offshore HVAC booster station search area shipping and navigation study area	AIS, visual and Radar vessel survey determining existing shipping activity within and in the vicinity of the Hornsea Three offshore HVAC booster station search area in accordance with MGN 543.	Anatec	2016	Volume 5, annex 7.1: Hornsea Three Array Area, Offshore Cable Corridor and Offshore HVAC Booster Station Search Area Navigational Risk Assessment
Hornsea Three array area marine traffic survey (winter)	Hornsea Three array area	AIS, visual and Radar vessel survey determining existing shipping activity within and in the vicinity of the Hornsea Three array area in accordance with MGN 543.	Anatec	2016	Volume 5, annex 7.1: Hornsea Three Array Area, Offshore Cable Corridor and Offshore HVAC Booster Station Search Area Navigational Risk Assessment
Hornsea Three offshore HVAC booster station search area marine traffic survey (winter)	Hornsea Three offshore HVAC booster station search area shipping and navigation study area	AIS, visual and Radar vessel survey determining existing shipping activity within and in the vicinity of the Hornsea Three offshore HVAC booster station search area in accordance with MGN 543.	Anatec	2016	Volume 5, annex 7.1: Hornsea Three Array Area, Offshore Cable Corridor and Offshore HVAC Booster Station Search Area Navigational Risk Assessment

6.7 Baseline environment

6.7.1 Total landings and activity across Hornsea Three

6.7.1.1 Hornsea Three (including array area and offshore cable corridor) overlaps with ICES rectangles 34F1, 35F1, 36F1 and 36F2, which form the Hornsea Three commercial fisheries study area. For context, the aerial overlap of Hornsea Three equates to 7% of the Hornsea Three commercial fisheries study area. Specifically, the Hornsea Three array area overlaps with 19% of 36F2 and the Hornsea Three offshore cable corridor overlaps with 2% of the total area covered by 34F1, 35F1, 36F1 and 36F2.

6.7.1.2 The average annual landings across the regional commercial fisheries study area (Figure 6.3) show the highest quantity of catch (tonnes) to be taken from ICES rectangles 37F0 to F3 and 35F3. The highest quantity of catch (tonnes) is taken by Danish registered vessels, followed by Dutch registered vessels, and UK registered vessels with smaller amounts by French, German, Swedish and Belgian vessels (negligible amounts are landed by Irish and Isle of Man registered vessels). Norwegian landing statistics are not available, but this fleet is understood to only sporadically target the regional commercial fisheries study area. Within the regional commercial fisheries study area, 37F0 is the most important ICES rectangle to the French and German registered vessels, with significantly smaller amounts taken from other ICES rectangles in this regional commercial fisheries study area.

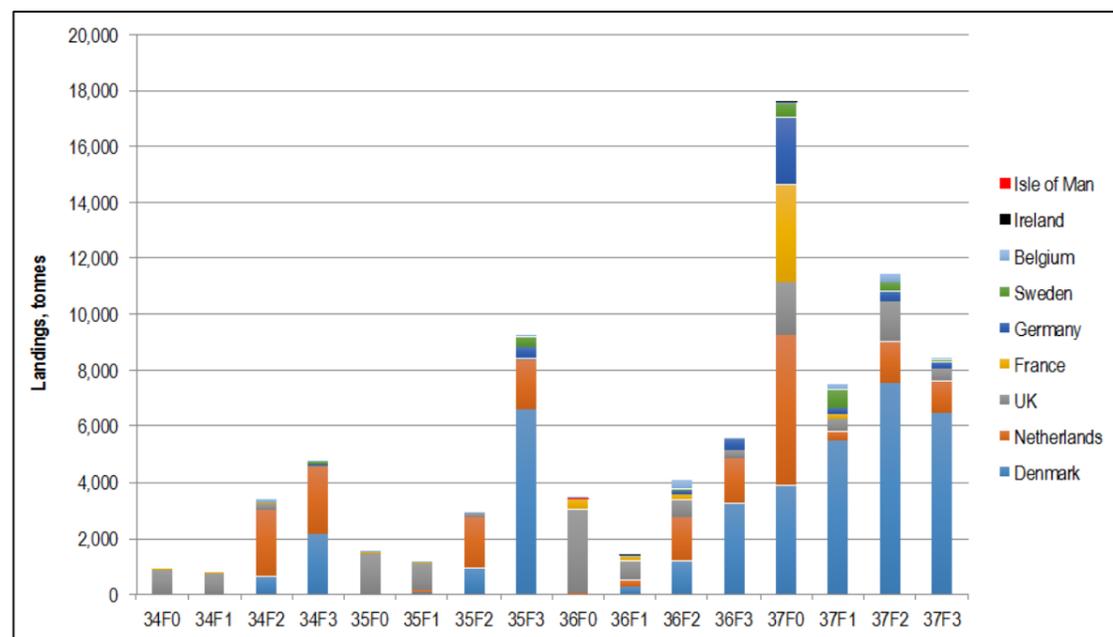


Figure 6.3: Average annual landed weight, tonnes, of all species landed by all EU member states from the regional commercial fisheries study area indicating ICES rectangles and vessel registered country (based on five-years' data from 2011 to 2015) (data source: EU DCF database, 2017).

6.7.1.3 Focusing into the Hornsea Three commercial fisheries study area (ICES rectangles 34F1, 35F1, 36F1 and 36F2), Figure 6.3 shows that landings by weight from 34F1, 35F1 and 36F1 are dominated by UK registered vessels, which is to be expected given the more inshore location of these F1 ICES rectangles; while landings weight from 36F2 is split across Danish, Dutch, UK, Belgian and to a smaller extent French and German vessels.

6.7.1.4 Landings from the Hornsea Three commercial fisheries study area had an average annual value of €10.4 million for all EU member states (based on five-years' data from 2011 to 2015; EU DCF database, 2017; EU MOFA, 2017). The proportion of value by ICES rectangle and species is shown in Figure 6.4.

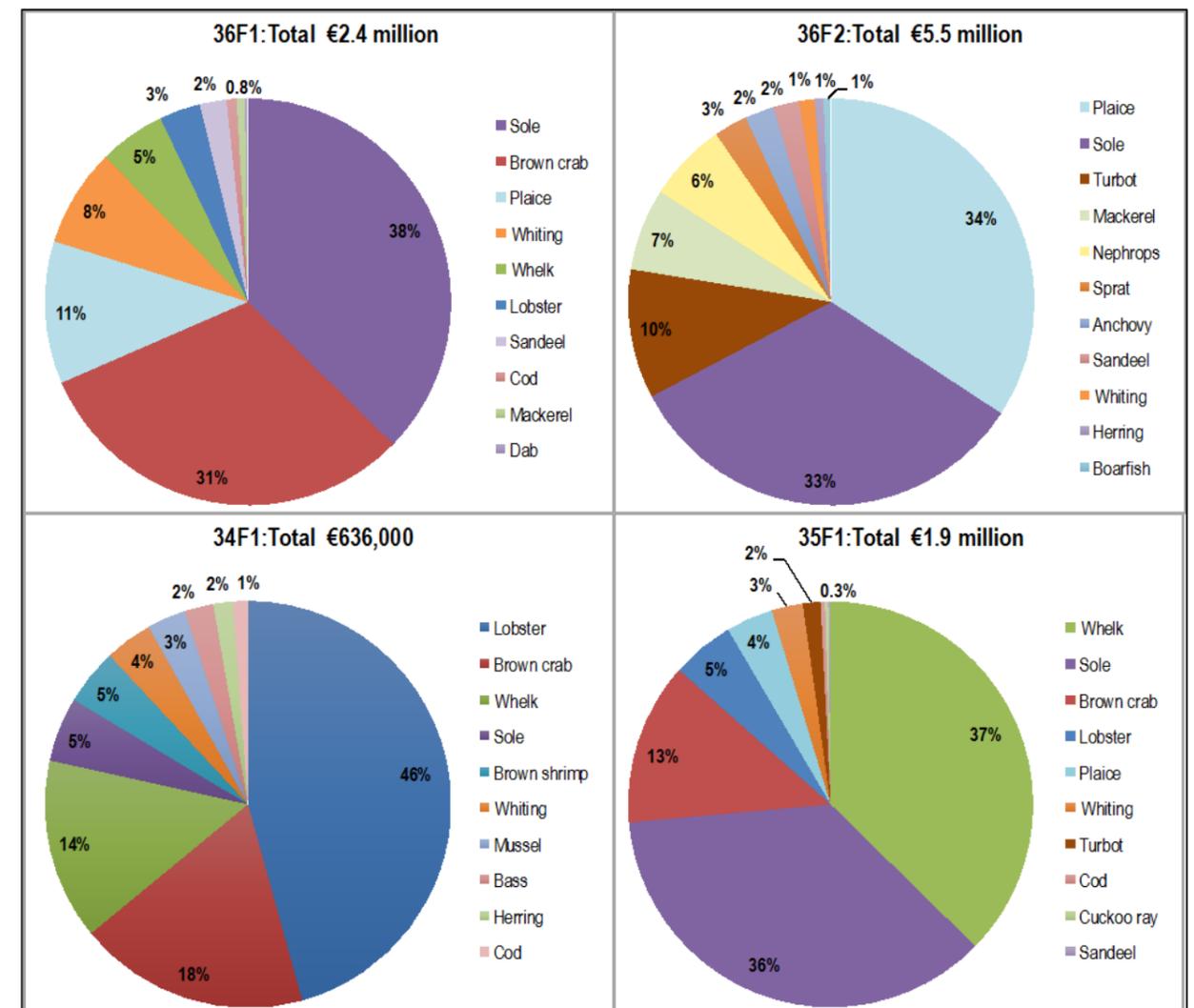


Figure 6.4: Average annual proportion of landings value by species and ICES rectangle for all EU member states combined (based on five-years' data from 2011 to 2015) (data source: EU DCF database, 2017; EU MOFA, 2017).

6.7.1.5 Plaice *Pleuronectes platessa* and sole *Solea solea* dominate the landings in 36F2, accounting for 67% of the annual value. Sole and plaice remain important for 36F1 and 35F1 (at 42% and 41% of the value respectively); but shellfish landings become increasingly dominant for these inshore ICES rectangles, with significant landings of brown crab *Cancer pagurus* from 36F1 (31% of value), whelk *Buccinum undatum* from 35F1 (37% of value), and lobster *Homarus gammarus* from 34F1 (46% of value). Together, lobster, brown crab and whelk account for 78% of the value from 34F1.

6.7.1.6 Surveillance data for UK and non-UK vessels of all sizes (which are presented in volume 5, annex 6.1: Commercial Fisheries Technical Report) indicate that the predominant gear types across the regional commercial fisheries study area include demersal otter trawlers and beam trawlers in the offshore areas (outside 12 nm) and potters/whelkers and shrimpers within inshore areas (inside 12 nm); clusters of other gears are also noted in a few locations including scallop dredgers.

6.7.1.7 Mapping undertaken as part of The Crown Estate UK Fishing Information Project (UKFIM) for beam trawling (Figure 6.7) indicates high to medium density of beam trawling activity throughout the Hornsea Three array area. Significant hotspots of activity are illustrated to occur in the south-east, central and north-west portions of the array area. Mapping for demersal otter trawling activity (which is presented in volume 5, annex 6.1: Commercial Fisheries Technical Report) indicates localised activity within distinct grounds within the array area, across the Outer Silver Pit and Markhams Hole (which are illustrated in Figure 6.2).

6.7.2 Commercial fishing fleets operating across Hornsea Three

Hornsea Three array area

All EU member states vessels

6.7.2.1 The Hornsea Three array area commercial fisheries study area (ICES rectangle 36F2) is dominated by landings of sole and plaice targeted principally by the Dutch fleet, as well as UK, Belgian and German registered vessels (Figure 6.5). Other flatfish and roundfish species are taken in association with the sole and plaice targeted fishery including: turbot *Scophthalmus maximus*, cod *Gadus morhua*, brill *Scophthalmus rhombus*, whiting *Merlangius merlangus*, dab *Platichthys flesus* and lemon sole *Microstomus kitt*.

6.7.2.2 The average annual value of the sole, plaice and mixed demersal fishery from 36F2 is €4.4 million for all EU member states. Peaks in sole and plaice landings are noted in 2013 and 2014, with a significant drop in 2015 (Figure 6.6). This is understood to be linked to changes in Total Allowable Catches (TACs) and quotas, with an increase in plaice TAC in 2015 resulting in fishermen targeting this species with more effort in grounds north of Hornsea Three (namely the Dogger Bank) (further details on this and TACs is provided in volume 5, annex 6.1: Commercial Fisheries Technical Report). Beam trawlers target sole and plaice.

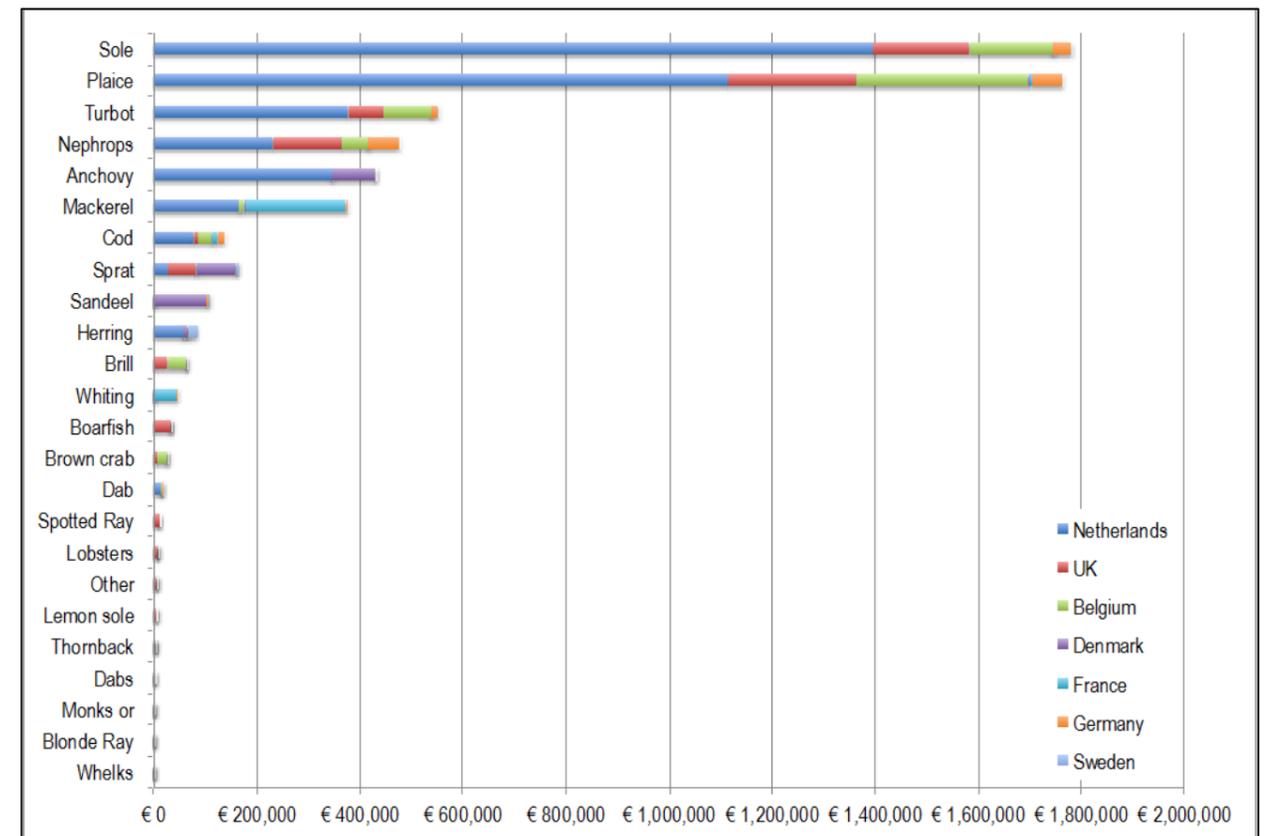


Figure 6.5: Average annual value landed from ICES rectangle 36F2 by all EU member states indicating species and vessel registered country (based on five-years' data from 2011 to 2015) (data sources: EU DCF database, 2017; EU MOFA, 2017).

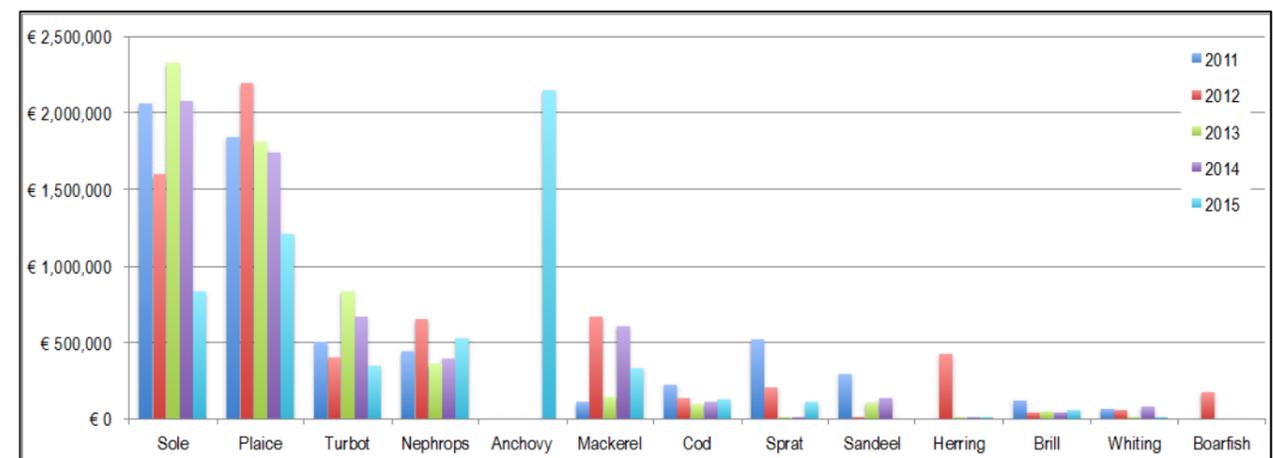


Figure 6.6: Annual value landed from ICES rectangle 36F2 by all EU member states indicating species from 2011 to 2015 (data sources: EU DCF database, 2017; EU MOFA, 2017).

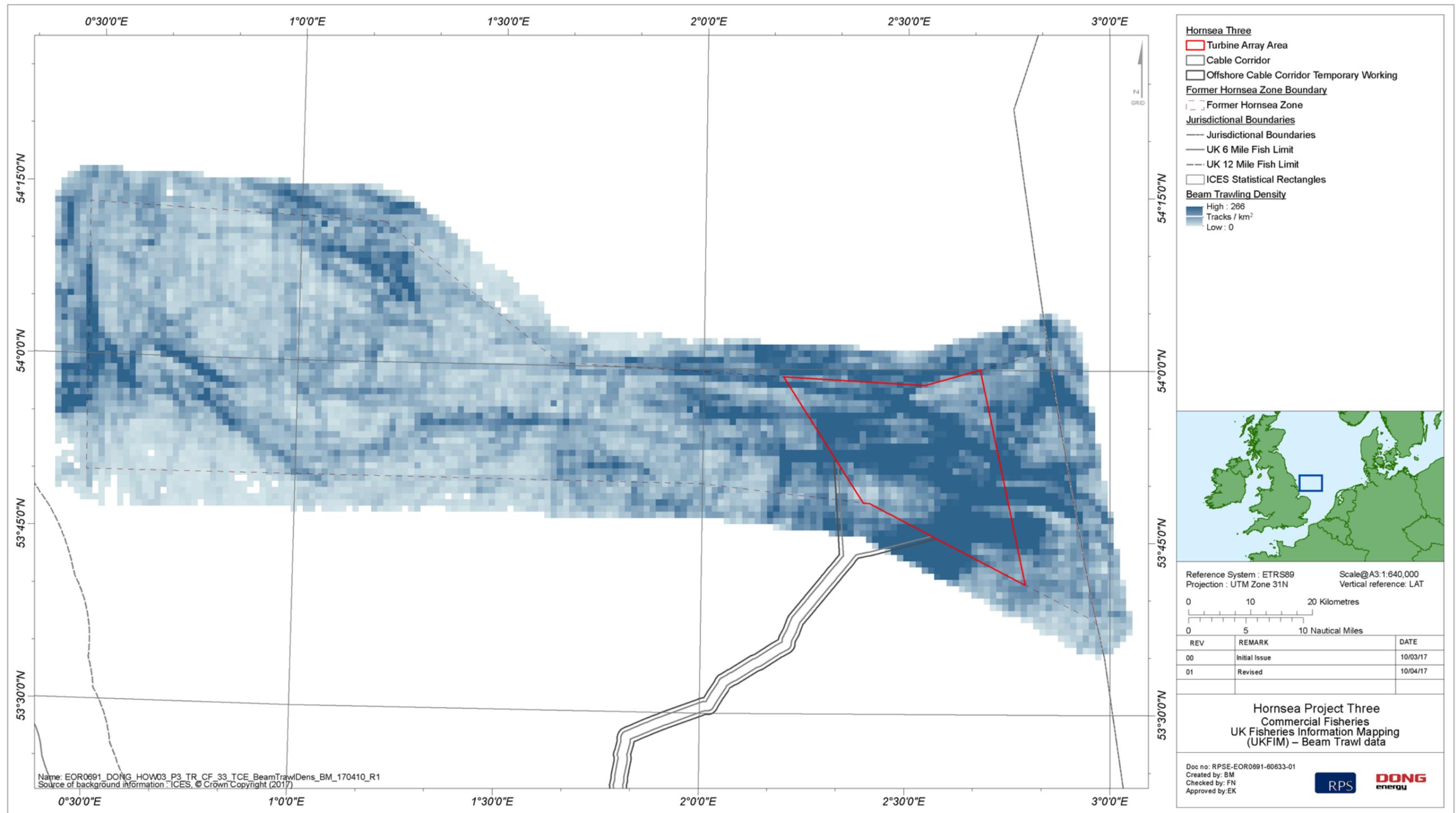


Figure 6.7: The Crown Estate UK Fisheries Information Project (UKFIM) beam trawl density mapping across Hornsea Three array area and the former Hornsea Zone.

6.7.2.3 *Nephrops norvegicus* (hereby referred to as *Nephrops*) are landed by Dutch, UK, Belgian and German demersal otter trawlers, with an average annual value of €480,000 from 36F2. Landings of *Nephrops* from 36F2 have remained fairly consistent across the five-year period from 2011 to 2015.

6.7.2.4 More sporadic landings of pelagic species are noted for anchovy *Engraulis encrasicolus* (by Dutch and Danish fleets), sprat *Sprattus sprattus* (by UK and Danish fleets), mackerel *Scomber scombrus* (by Dutch and French fleets), herring *Clupea harengus* (by Dutch fleet) and boarfish *Capros aper* (by UK fleet) (Figure 6.5 and Figure 6.6).

6.7.2.5 The Danish fleet has landed relatively small quantities of sandeel *Ammodytes* spp. from 36F2 across 2011 to 2015, although higher quantities are noted from 2006 to 2010. This is discussed further in the following sections, which provide summaries of landings for each country (based on vessel registration).

UK registered vessels

6.7.2.6 A number of associations and organisations represent UK commercial fisheries stakeholders that currently operate across the Hornsea Three array area commercial fisheries study area (36F2), including the Eastern England Fish Producers Organisation (EEFPO), the Anglo-Dutch Fish PO, the Anglo-Dutch Fishermen's Association, the Lowestoft Fish PO and the National Federation of Fishermen's Organisations (NFFO). These organisations represent UK registered; UK owned vessels and UK registered, Dutch owned vessels.

6.7.2.7 On average, the UK annual landings from 36F2 have a first sale value of £672,000 (based on five-years data from 2011 to 2015). The fisheries predominately targeted are plaice, sole and mixed demersal species by beam trawlers, and *Nephrops* and mixed demersal species by demersal otter trawlers. Landings of sprat are noted in 2011 (which were taken in November, by Northern Irish vessel(s)) and boarfish in 2012 (also taken in November, by Scottish vessel(s)). The vessels targeting these pelagic schooling fish species are not expected to typically or routinely target the Hornsea Three array area, and this is supported by the sporadic nature of these landings.

6.7.2.8 The Outer Silver Pit is an area of seabed routinely fished by UK demersal otter trawlers targeting *Nephrops* and mixed demersal species. It is located immediately north of the Hornsea Three array area (Figure 6.2), and overlaps across the northern portion of the array area.

6.7.2.9 Another significant fishing ground is Markhams Hole, which is located in the centre of the Hornsea Three array area, running south east to the eastern edge of the array and beyond (Figure 6.2), Markhams Hole is routinely fished by demersal otter trawlers targeting *Nephrops* and beam trawlers targeting sole and plaice. Figure 6.7 provides evidence for the extent of activity within Markhams Hole, in the central and south-east portions of the array area.

6.7.2.10 Trends in landings by the UK fleet targeting sole and plaice have fluctuated significantly across the five-year period from 2011 to 2015 (Figure 6.8). Landings of plaice and sole were lower than average in 2012; and landings of sole were lower in 2014 and 2015.

6.7.2.11 Fisheries management restrictions (including days at sea and quotas) and operating costs (fuel prices/gear technology) can impact fishing patterns on a yearly basis resulting in vessels choosing to fish grounds that target a different fishery (or species mix) or grounds that are closer to home ports.

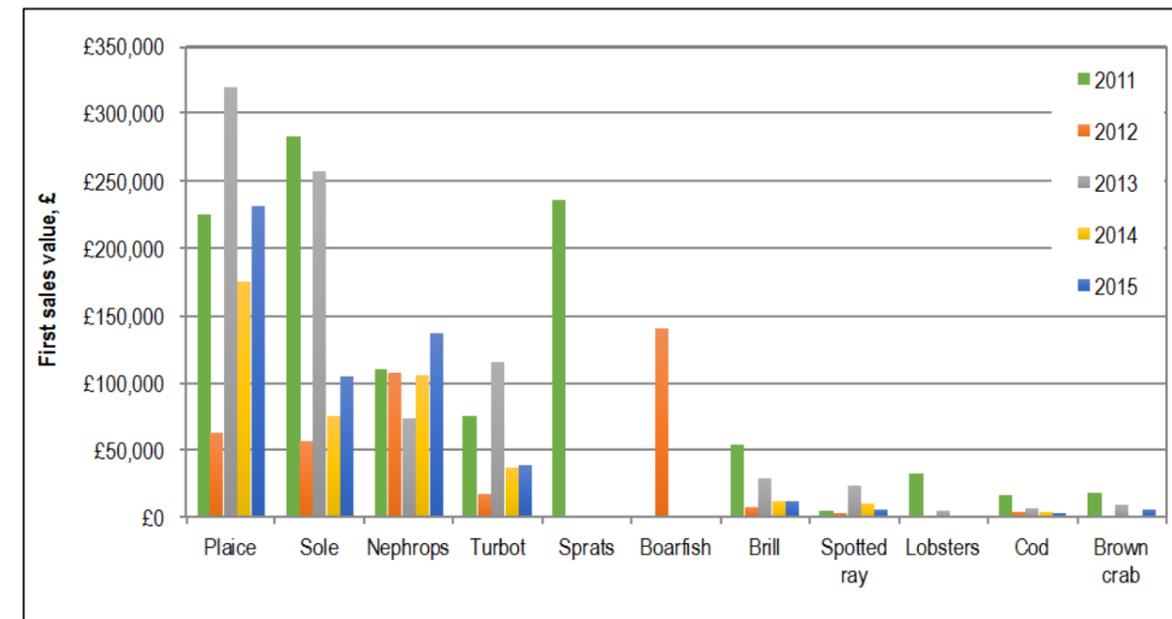


Figure 6.8: First sale value of species landed by UK registered vessels from ICES rectangle 36F2 from 2011 to 2015 (Data source: MMO, 2017).

6.7.2.12 VMS data for UK vessels deploying mobile gear (including beam trawlers, demersal otter trawlers and pelagic trawlers etc.) indicating the value of catches in 2015 is presented in Figure 6.9. VMS mapping for effort (hours fished) and value is presented in full for 2011 to 2015 in volume 5, annex 6.1: Commercial Fisheries Technical Report.

6.7.2.13 The resolution of UK VMS data allows the true value of landings and effort (hours fished) specifically from the Hornsea Three array area to be calculated for UK vessels. This is presented in Table 6.6 for UK vessels deploying mobile gear. No landings or effort is recorded for UK vessels deploying passive gear within the Hornsea Three array area.

6.7.2.14 On average, the first sale value of fish landed by UK vessels from the Hornsea Three array area is worth £278,000 per annum (based on five-years from 2011 to 2015). Peak landings were recorded in 2013 when a value of £766,000 was landed from the array area; this is reflected in the peak in plaice and sole landings seen in Figure 6.8 for 36F2.

6.7.2.15 On average, 19,000 hours of fishing occurs per annum within the Hornsea Three array area (based on five-years from 2011 to 2015), with a peak of approximately 29,000 hours in 2013.

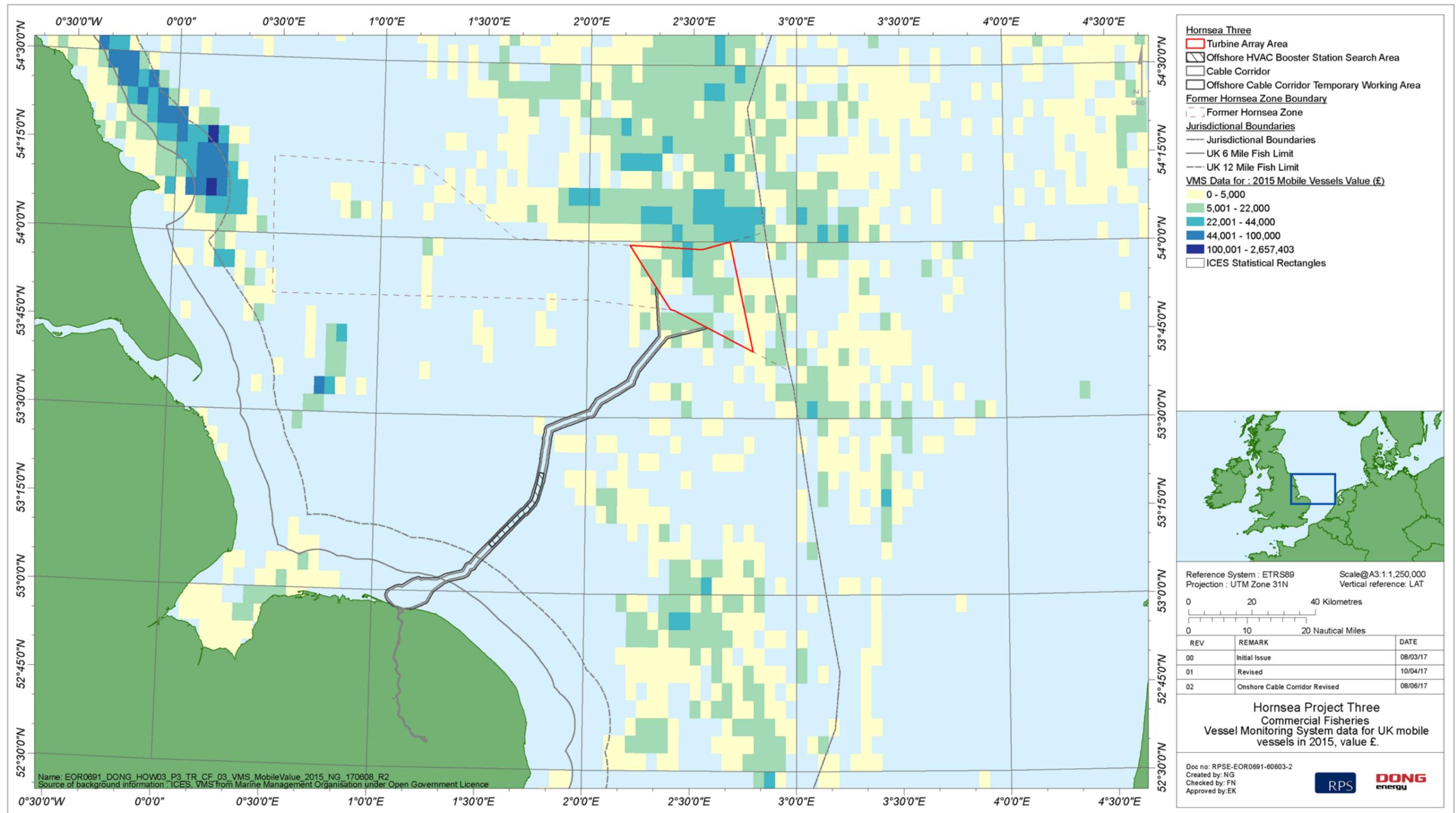


Figure 6.9: Vessel Monitoring System data for UK mobile vessels (≥ 15 m) actively fishing within regional commercial fisheries study area in 2015 indicating value of catch.

Table 6.6: Hours and value of catch landed from Hornsea Three array area by UK vessels using mobile gear based on VMS data, 2011 to 2015 (Source: MMO, 2017).

Year	Mobile hours fished	Mobile value
2011	19,363.93	£229,866
2012	14,479.08	£124,418
2013	29,169.12	£766,285
2014	11,658.41	£81,823
2015	20,075.42	£187,627
Average	18,949.19	£278,004

6.7.2.16 Consultation with the local Norfolk and Bridlington UK potting fleets indicates that vessels are unlikely to operate within the Hornsea Three array area. This is corroborated with VMS data for ≥ 15 m passive vessels and surveillance data for UK potters (see volume 5, annex 6.1: Commercial Fisheries Technical Report), which show no activity for potters within the array area.

6.7.2.17 UK scallop dredgers are not recorded as being active within the Hornsea Three array area, but target areas to the west and inshore of the former Hornsea Zone.

Dutch registered vessels

6.7.2.18 Dutch vessels fish within the Hornsea Three array area targeting sole and plaice together with mixed demersal species of turbot, *Nephrops* and cod, with an average annual first sale value of €3.2 million (based on five-years data from 2011 to 2015), with peaks of €3.9 million in both 2013 and 2014. The Dutch fleet predominately use pulse trawl (an adaptation of beam trawl), or fly shooting, which is becoming increasingly popular due to the lower fuel consumption. Vessels are greater than 25 m in length.

6.7.2.19 Sole and plaice are the key target species, followed by turbot. Landings dropped significantly from 2014 to 2015 (Figure 6.13) due to changing fishing patterns, as discussed for UK vessels. A sporadic landing of anchovy was noted in 2015, but anchovies are not expected to be routinely targeted in the Hornsea Three array area.

6.7.2.20 VMS data collated by Wageningen Economic Research for Dutch vessels indicating value of catch (see volume 5, annex 6.1: Commercial Fisheries Technical Report), show that the Hornsea Three array area is an important fishing ground within ICES rectangle 36F2.

6.7.2.21 In total, Dutch vessels spent approximately 120 days annually fishing within the array area (based on five-years data from 2011-2015). Approximately 40% of the landings from 36F2 were taken from within the Hornsea Three array area, with an average annual value of €1 million specifically from the Hornsea Three array area.

6.7.2.22 A progression from beam trawl gear (including traditional beam trawl and pulse trawl) to fly shooting is noted from 2011 to 2015, which is corroborated by consultation with the industry (see Appendix C for further data analysis and Appendix D for meeting minutes). The Hornsea Three array area is considered to be a productive and valuable fishing ground for the Dutch fleet (Oostenbrugge and Hamon, 2017).

6.7.2.23 Other gears including pelagic trawls and gill nets were rarely noted to be operated in the area.

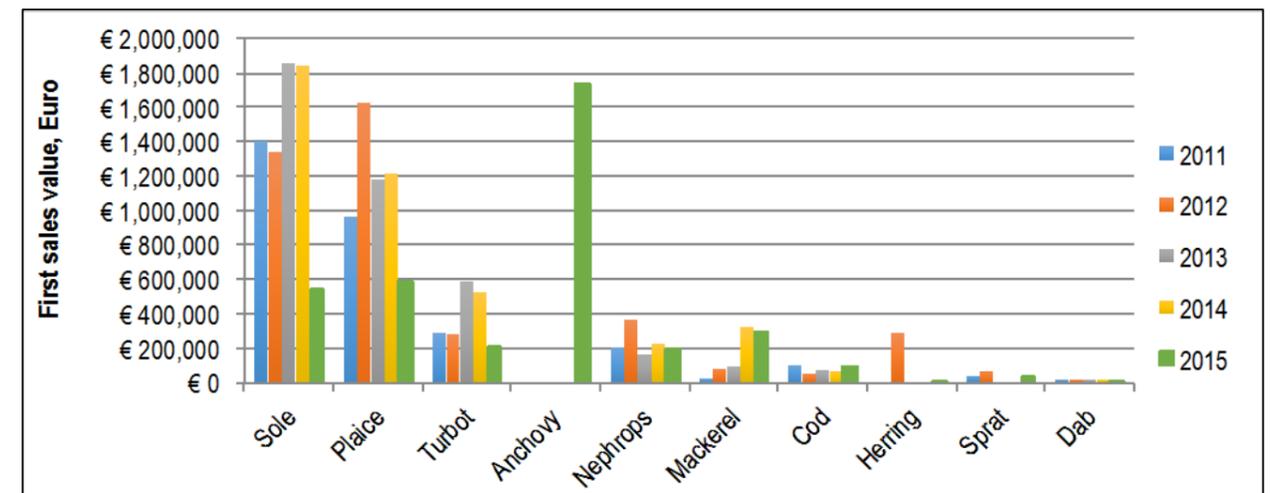


Figure 6.10: First sale value of species landed by Dutch registered vessels from ICES rectangle 36F2 from 2011 to 2015 (Data sources: EU DCF, 2017; EU MOFA, 2017).

French registered vessels

6.7.2.24 French registered vessels target mackerel in a mid-water trawl fishery and whiting in a demersal otter trawl fishery from ICES rectangle 36F2. Landings fluctuate, with an average first sales value of €250,000 per annum (ranging from €614,000 in 2012 to €33,000 in 2015).

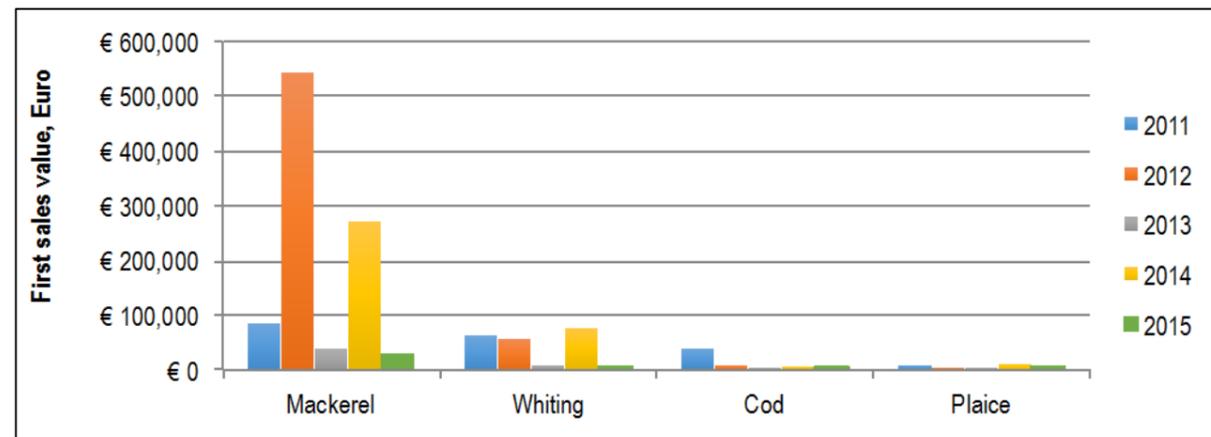


Figure 6.11: First sale value of species landed by French registered vessels from ICES rectangle 36F2 from 2011 to 2015 (Data sources: EU DCF, 2017; EU MOFA, 2017).

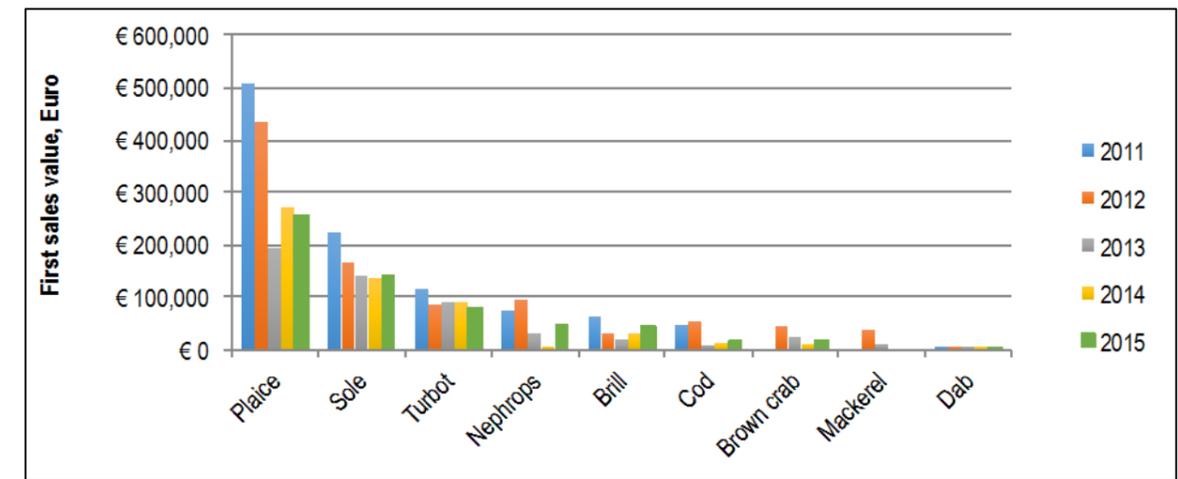


Figure 6.12: First sale value of species landed by Belgian registered vessels from ICES rectangle 36F2 from 2011 to 2015 (Data sources: EU DCF, 2017; EU MOFA, 2017).

6.7.2.25 The limited VMS data available for French vessels shows activity within the former Hornsea Zone to be focused across the Hornsea Three array area. A 2008 report calculated the average dependence of French demersal trawlers and combined demersal/pelagic trawlers on the former Hornsea Zone to be 2.3% (CNPMM, 2009), based upon the proportion of total fishing effort by these vessels that fished within the former Hornsea Zone.

Belgian registered vessels

6.7.2.26 Belgian beam trawl and demersal otter trawl vessels operate within the Hornsea Three array area commercial fisheries study area (36F2) targeting plaice, sole, turbot, Nephrops, brill and cod (Figure 6.12), with an average first sale value of €733,000 per annum (ranging from €1 million in 2011 to €518,000 in 2013).

6.7.2.27 VMS data for the Belgian fleet (see volume 5, annex 6.1: Commercial Fisheries Technical Report) indicate that the majority of effort within 36F2 is located within the Hornsea Three array area.

Danish registered vessels

6.7.2.28 Danish registered vessels principally target sandeel across the former Hornsea Zone, as well as herring and sprat that are also occasionally targeted by Danish vessels using pelagic trawl gear.

6.7.2.29 There are three distinct sandeel grounds in the former Hornsea Zone that could be targeted by the Danish trawling fleet, which includes up to 25 to 30 Danish trawl vessels (using demersal otter trawl and semi-pelagic otter trawl gear). A significant sandeel ground is located within the Hornsea Three array area, running horizontally from the west to east of the array boundary, in the northern half of the array area (Figure 6.15).

6.7.2.30 The sandeel fishing season runs from 1 April to 31 July each year. At the start of the season, sandeel fishermen will sample different grounds and then fish where the catch rates are highest. This means they may focus on one area, or move about, dependent on catch rates. The majority of effort by vessels targeting sandeel has been focused on other North Sea sandeel grounds (namely Dogger Bank) for the past ten years. Sandeel grounds are highly dependant on habitats and upwelling dynamics that support food source. Grounds are therefore distinct and the opportunity to fish for sandeel is defined to specific grounds that do not change over time. Over the past ten-years the productive nature of the grounds across the Dogger Bank has resulted in Danish effort being focused to these grounds throughout the relatively short seasonal fishery. However, it is expected that the grounds within Hornsea Three array area will be more productive again, depending upon sandeel recruitment patterns, and thereby targeted in the future.

6.7.2.31 Over the past five years (2011 to 2015) the average annual first sales value of sandeel landed from 36F2 has been €103,000 (Figure 6.13).

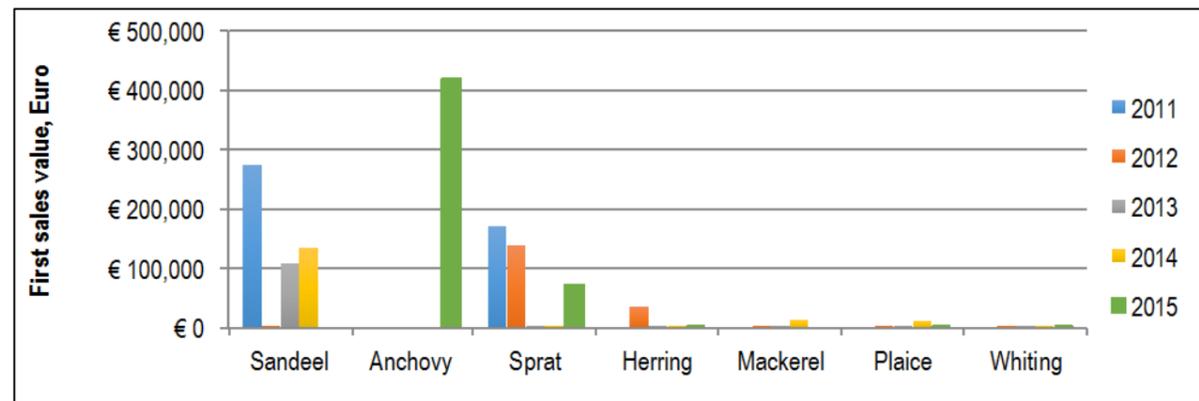


Figure 6.13: First sale value of species landed by Danish registered vessels from ICES rectangle 36F2 from 2011 to 2015 (Data sources: EU DCF, 2017; EU MOFA, 2017).

German registered vessels

6.7.2.32 German registered vessels principally target *Nephrops*, plaice and mixed demersal species using demersal otter trawl gear, with an average first sale value of €188,000 per annum (ranging from €300,000 in 2011 to €88,000 in 2014). Higher values of sole were landed in 2011, but have been low from 2012 onwards (Figure 6.14).

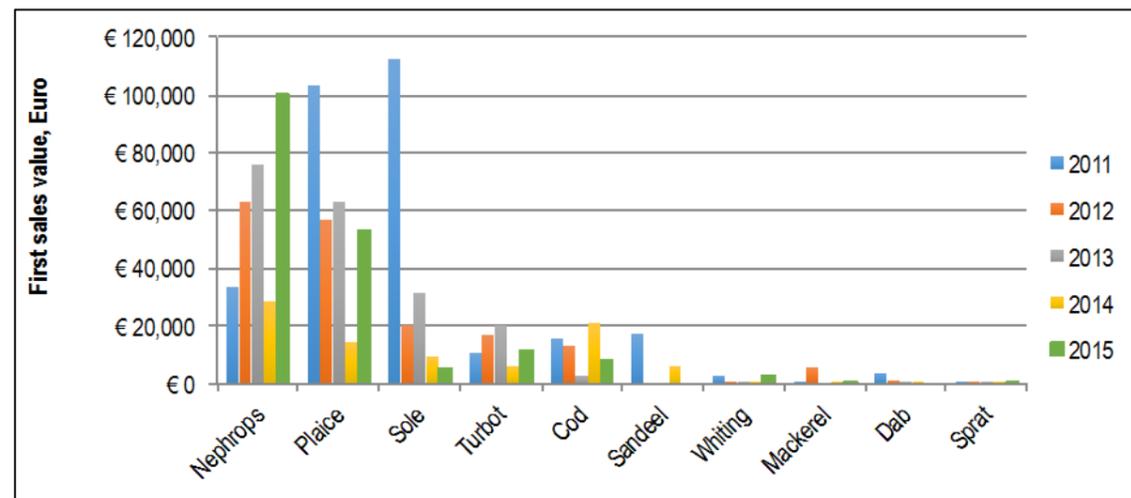


Figure 6.14: First sale value of species landed by German registered vessels from ICES rectangle 36F2 from 2011 to 2015 (Data sources: EU DCF, 2017; EU MOFA, 2017).

Swedish registered vessels

6.7.2.33 Swedish registered vessels landed an average first sale value of €27,000 per annum from 36F2, related to sporadic landings of sprat and herring. Swedish vessels are understood to target sandeel grounds throughout the North Sea and to occasionally target the regional commercial fisheries study area. Swedish vessels targeting sandeel are not known to have fished within Hornsea Three array area over the past five years, based on the location of sandeel grounds inferred from the Danish activity and VMS data provided by the MMO (see volume 5, annex 6.1: Commercial Fisheries Technical Report).

Norwegian registered vessels

6.7.2.34 Norwegian registered vessels are understood to sporadically fish within the Hornsea Three array area targeting pelagic species. No landings data has been made available to corroborate the scale of this effort, but it is expected to be low. Norwegian landing statistics are not included within EU databases analysed, and data requests to Norwegian fisheries departments have not yet been forthcoming.

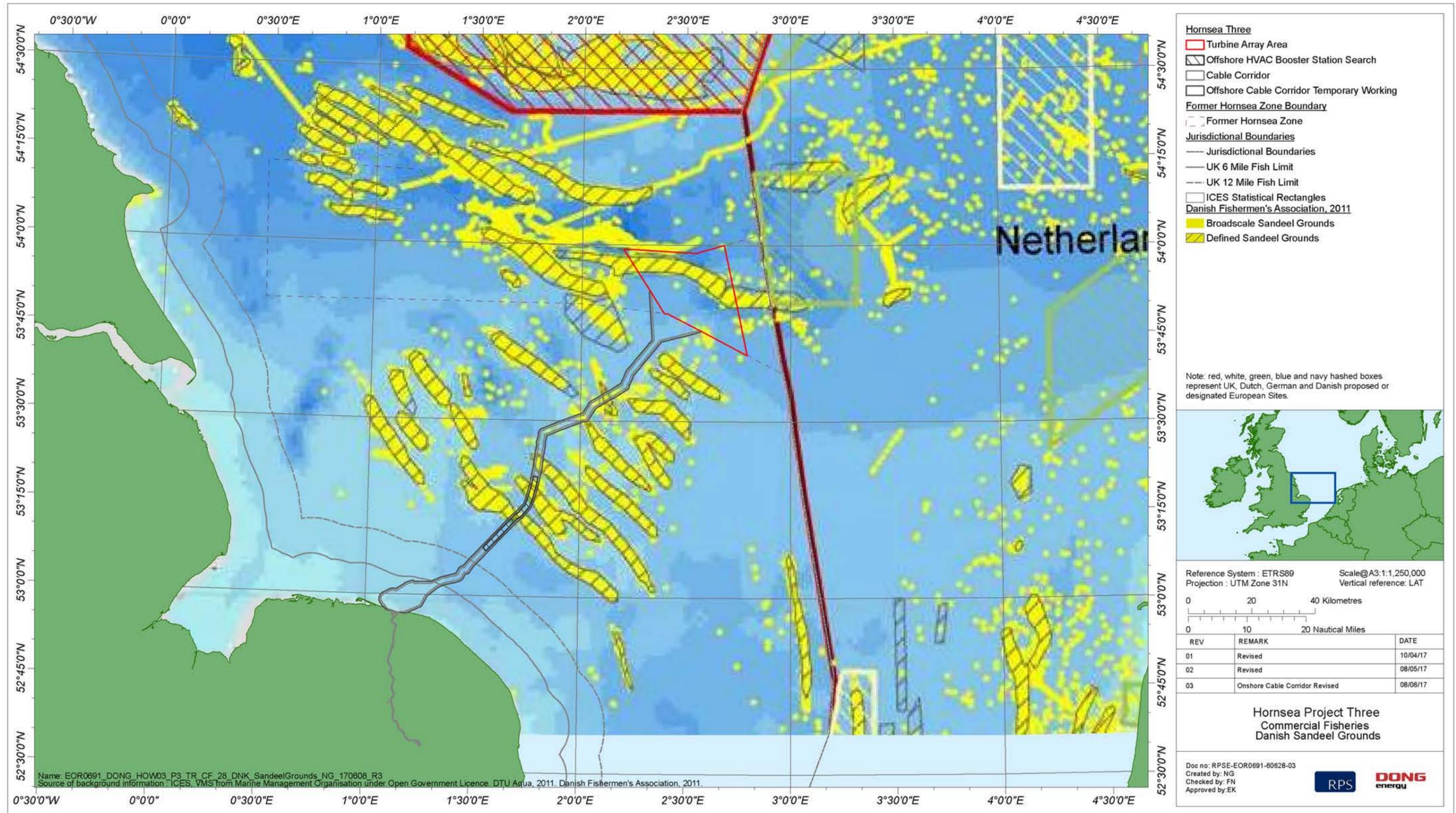


Figure 6.15: Map of key sandeel fishing grounds (yellow) for Danish fleet based on Vessel Monitoring System data.

Hornsea Three offshore cable corridor

All EU member state vessels

6.7.2.35 The Hornsea Three offshore cable corridor commercial fisheries study area is the same as that described for Hornsea Three (i.e. ICES rectangles 34F1, 35F1, 36F1 and 36F2) in section 6.7.1. The proportion of landings from 36F2 and 34F1, 35F1 and 36F1 is illustrated by country in Figure 6.16.

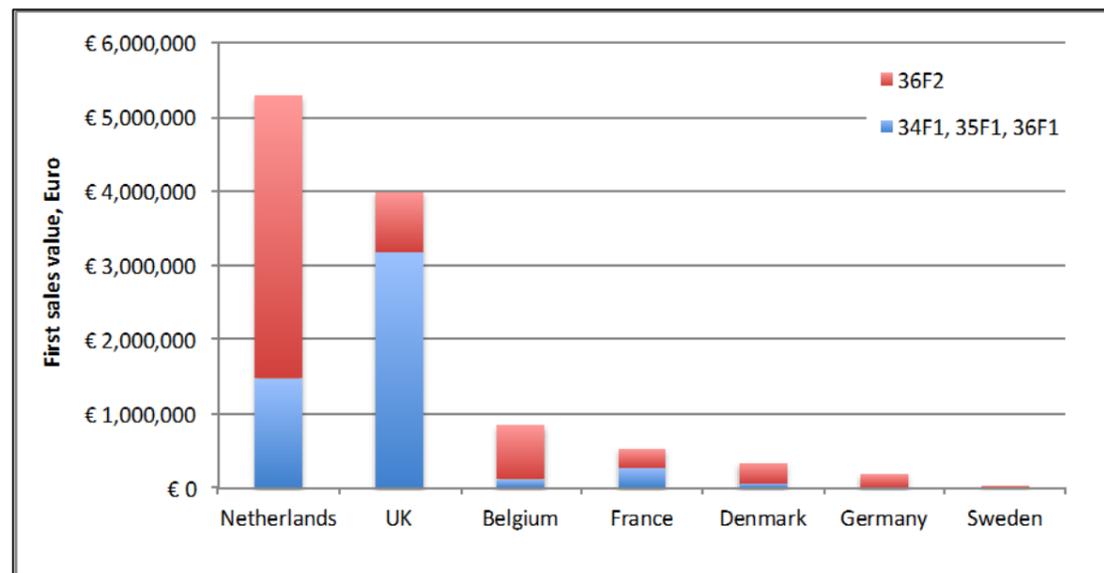


Figure 6.16: Average annual first sales value of landings by EU member states by ICES rectangle (based on five-years' data from 2011 to 2015) (data sources: EU DCF database, 2017; EU MOFA, 2017).

6.7.2.36 The sections below focus on landings from ICES rectangles 34F1, 35F1 and 36F1, as 36F2 has been characterised in detail in the previous section.

UK registered vessels

6.7.2.37 UK registered vessels are responsible for the large majority of landings from 34F1, 35F1 and 36F1, which is to be expected given the proximity to UK coastline. The average annual first sales value of UK landings from 34F1, 35F1 and 36F1 is £2.5 million (approximately €3.2 million).

6.7.2.38 It is important to note that the Hornsea Three offshore cable corridor overlaps with a very small portion of the south-east corner of ICES rectangle 36F1. Significant crab and lobster grounds are known to exist within 36F1, targeted by the Bridlington fleet, but these are located in the northern and western halves of 36F1 and do not coincide with the small area of cable corridor that overlaps this ICES rectangle. Data from 36F1 has not been scoped out of the baseline characterisation to ensure a comprehensive assessment that allows all potential impacts to be assessed (e.g. displacement). Further data on 36F1 is provided in volume 5, annex 6.1: Commercial Fisheries Technical Report.

6.7.2.39 UK landings from 34F1 and 35F1 are dominated by whelk, lobster and brown crab (Figure 6.17), with an average annual first sales value of £1.5 million.

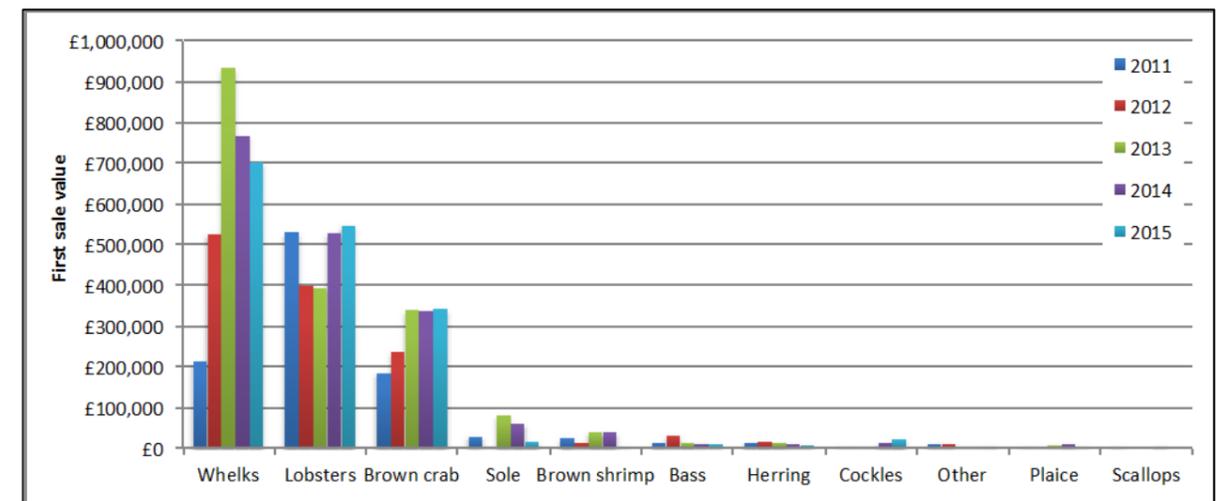


Figure 6.17: First sale value of species landed by UK registered vessels from ICES rectangle 34F1 and 35F1 from 2011 to 2015 (Data sources: MMO, 2017).

6.7.2.40 Further characterisation of the North Norfolk potting fleet, together with analysis of MSAR data is provided in volume 5, annex 6.1: Commercial Fisheries Technical Report.

Other EU member states and Norwegian registered vessels

6.7.2.41 As indicated in Figure 6.16, other EU nationalities have relatively low levels of landings from ICES rectangles 34F1 and 35F1, with the exception of the Netherlands.

6.7.2.42 The average annual first sales value of Dutch landings from 34F1 and 35F1 is €570,000. Sole dominate the landings and are predominately taken from 35F1 (Figure 6.18), with small amounts of plaice and turbot also taken. The Dutch sole landings have significantly dropped from €747,000 in 2011 to €232,000 in 2015.

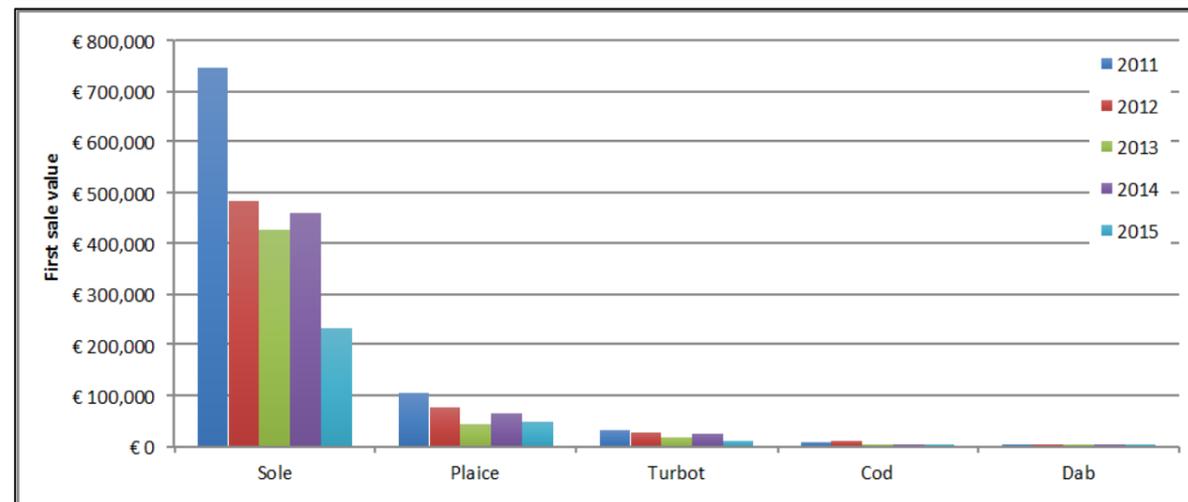


Figure 6.18: First sale value of species landed by Dutch registered vessels from ICES rectangle 34F1 and 35F1 from 2011 to 2015 (Data sources: EU DCF, 2017; EU MOFA, 2017).

6.7.2.43 As shown in Figure 6.15 the offshore cable corridor overlaps five defined sandeel grounds, including three within the offshore HVAC booster station search area. For four of these defined sandeel grounds, it is important to note that the overlap occurs at the outermost ends of the grounds. Landing statistics for 35F1 and 36F2 indicate that sandeels have not been targeted in this area from 2011 to 2015. However, as described in paragraph 6.7.2.30, it is expected that the grounds within Hornsea Three offshore cable corridor will be targeted in the future, depending upon sandeel recruitment patterns.

6.7.3 Future baseline scenario

6.7.3.1 Commercial fisheries patterns change and fluctuate based on a range of natural and management controlled factors. This includes the following:

- Stock abundance: fluctuation in the biomass of individual species stocks in response to status of the stock, recruitment, natural disturbances (e.g. due to storms, sea temperature etc.), changes in fishing pressure etc.;
- Fisheries management: including changes in TACs leading to the relocation of effort, and/or an overall increase/decrease of effort;
- Environmental management: including the potential restriction of certain fisheries within protected areas;
- Improved efficiency and gear technology: with fishing fleets constantly evolving to reduce operational costs e.g. by moving from beam trawl to pulse trawl;

- Sustainability: with seafood buyers more frequently requesting certification of the sustainability of fish and shellfish products, such as the Marine Stewardship Council certification, industry is adapting to improve fisheries management and wider environmental impacts; and
- Markets: commercial fishing fleets respond to market prices by focusing effort on higher value target species when prices are high and markets in demand.

6.7.3.2 The variations and trends in commercial fisheries activity is an important aspect of the baseline assessment, and forms the principle reason for assessing five years of baseline data. In some cases, fisheries stakeholders request a longer period to be considered in the baseline to ensure long-term trends inform the assessment (e.g. Dutch and Danish fleets, see volume 5, annex 6.1: Commercial Fisheries Technical Report). Therefore, for commercial fisheries, the future baseline scenario is expected to be reflected within the current baseline assessment undertaken.

6.7.4 Data limitations

6.7.4.1 Limitations of landings data include the spatial size of ICES rectangles (e.g. the surface-area of the Hornsea Three array area is 19% of the surface area of ICES rectangle 36F2). This can misrepresent actual activity across Hornsea Three and care is therefore required when interpreting these data. A further limitation of landings data is the potential under-reporting of landings associated with potting vessels, which may occur as a result of estimating catches (as opposed to accurate weighing) and not reporting catches that fall below the acceptable limit as defined within the UK Registration of Buyers and Sellers (i.e. when purchases of first sale fish direct from a fishing vessel are wholly for private consumption, and less than 30 kg is bought per day).

6.7.4.2 Lack of Norwegian landing statistics, as they are not included within EU databases, is also recognised as a data limitation.

6.7.4.3 Limitations of VMS data are primarily focused on the coverage being limited to vessels ≥ 15 m (noting that while vessels ≥ 12 m require VMS, data is not available for under 15 m vessels). It is important to be aware that where mapped VMS data may appear to show inshore areas as having lower (or no) fishing activity compared within offshore areas, this is not the case because VMS data do not include vessels typically operating in inshore area (i.e. which typically comprises of vessels < 15 m in length). This is particularly important when assessing the activity across the offshore cable corridor. Consultation has been key throughout the EIA process to determine extent and distribution of activity by the < 15 m fleet.

6.7.4.4 Limitations of surveillance data are primarily focused on the frequency and aerial coverage of patrols. UK surveillance aircraft are used to construct an on-going picture of fishing activity within the UK EEZ and to make effective use of patrol vessel activity by coordinated use of surveillance data. These data cannot be considered to give a complete picture of the actual level of activity and have a number of limitations, including the following key aspects:

- Patrol effort by IFCAs, Royal Navy Fisheries Patrol Vessels and patrol aircraft are optimised for enforcement purposes and not collection of sightings data. Areas with fewer fisheries enforcement issues are therefore likely to be visited less often and result in lower data confidence;
- Surveillance data are only indicative of areas where fishing activities occur, as there is no continuous monitoring of activities;
- Surveillance data present a snapshot of activity in an area and it cannot be assumed that if no vessels have been sighted then no fishing takes place; and
- Vessels fishing at night would likely remain undetected.

6.7.4.5 Data limitations were managed by ensuring accurate interpretation of the data and clear understanding of its scope (i.e. VMS data provided by MMO includes vessels ≥ 15 m in length, omitting those from 12 m to < 15 m). Consultation was fundamental in understanding the validity of data, enabling appropriate interpretation and ground-truthing of data, particularly for the UK potting fleet. This also allowed specific requests to be accommodated (e.g. assessing ten-year trends for Dutch and Danish fleets to ensure a more accurate reflection of historic fishing patterns).

6.7.4.6 As data form only part of the evidence base, the limitations identified are not considered to significantly affect the certainty or reliability of the impact assessments in section 6.11.

6.8 Key parameters for assessment

6.8.1 Maximum design scenario

6.8.1.1 The maximum design scenarios identified in Table 6.7 have been selected as those having the potential to result in the greatest effect on an identified receptor or receptor group. These scenarios have been selected from the details provided in the project description (volume 1, chapter 3: Project Description). Effects of greater adverse significance are not predicted to arise should any other development scenario, based on details within the project Design Envelope (e.g. different turbine layout), to that assessed here be taken forward in the final design scheme.

6.8.1.2 The commercial fisheries impact assessment of reduced access to fishing grounds will be used to inform chapter 3: Fish and Shellfish Ecology. Both chapter 3: Fish and Shellfish Ecology and chapter 7: Shipping and Navigation have been used to inform the commercial fisheries EIA.

6.8.2 Impacts scoped out of the assessment

6.8.2.1 On the basis of the baseline environment and the project description outlined in volume 1, chapter 3: Project Description, no impacts are scoped out of the assessment for commercial fisheries.

Table 6.7: Maximum design scenario considered for the assessment of potential impacts on commercial fisheries.

Potential impact	Maximum design scenario	Justification
<p><i>Construction phase</i></p> <p>Hornsea Three array area construction activities and physical presence of constructed wind farm infrastructure leading to reduction in access to, or exclusion from established fishing grounds.</p>	<p>Construction duration: lasting up to 11 years over three phases, the maximum indicative gap between the same component of Hornsea Three in different phases would be four years and this would assume that two phases were built out sequentially either before, or after, the gap to the third.</p> <p>Construction of up to 342 turbines utilising the entire Agreement for Lease (AfL) area of 696 km² (see volume 1, chapter 3: Project Description).</p> <p>Minimum spacing between turbines of 1,000 m.</p> <p>Construction of floating turbine foundations each with up to 12 mooring cables and anchors of up to 1,000 m radius per mooring cable.</p> <p>Construction of up to 19 offshore platforms within the Hornsea Three array area including:</p> <ul style="list-style-type: none"> • Up to 12 offshore HVAC collector substations with box gravity base foundations and with topsides footprints of 8,100 m². • Up to four offshore HVDC substations with foundations pontoon gravity base-Type I. • Up to three offshore accommodation platforms each of dimensions 60 x 60 m (3,600 m² topsides footprint) with suction caisson jackets foundations including scour protection. <p>Construction of array and interconnector cables including:</p> <ul style="list-style-type: none"> • Array cables of up to 850 km length and a 10 m width of seabed affected by installation within the Hornsea Three array area (total seabed footprint of 8.5 km²), with up to 595,000 m² cable protection based on the installation of cable protection for up to 10% of the 850 km of array cables (i.e. 85 km of array cables with cable protection and 7 m wide cable protection footprint) • Array cable/pipe crossings with an area of up to 33,600 m² post-lay rock berm. • Interconnector cables of up to 225 km in length, with up to 157,500 m² cable protection based on the installation of cable protection for up to 10% of the 225 km of substation interconnector cables (i.e. 22.5 km and 7 m wide cable protection footprint). • Interconnector cable/pipe crossings with an area of up to 5,600 m² post-lay rock berm. • Typically the array and interconnector cables will be buried between 1 and 2 m below the seabed surface. A Cable Burial Risk Assessment will inform the actual cable burial depth which will depend upon ground conditions. This assessment will be undertaken post-consent. • Sandwave clearance activities across an area of 179,594 m². <p>All of the above infrastructure utilising the entire AfL area of 696 km².</p> <p>Advisory safety distances as follows:</p> <ul style="list-style-type: none"> • 500 m safety zones around infrastructure under construction; • 50 m safety zones around incomplete structures at which construction activity may be temporarily paused (and therefore the 500 m safety zone has lapsed); and • 1,000 m advisory safety distances around vessels undertaking construction activities. <p>Exclusion scenario: three phased exclusion within Hornsea Three array area equating to the total AfL of 696 km² plus advisory distances around construction works.</p>	<p>The three-phase construction scenario has a maximum gap of four years during the construction period of 11 years, resulting in the longest time of construction activity (compared to the two-phase construction scenario which has an assumed maximum gap of six years).</p> <p>Floating turbine foundations represent the largest area of topsides, seabed and volume of water column that would prevent fishing activity during construction due to the mooring radius.</p> <p>The HVDC scenario results in more infrastructure within the array area (compared to the HVAC scenario).</p> <p>Offshore HVAC collector substations with box gravity base foundations represent the largest area of seabed.</p> <p>Offshore HVDC substation foundations pontoon gravity base - Type I represent the largest area of seabed.</p> <p>Three accommodation platforms represent the largest topsides footprint.</p> <p>Array and interconnector cables assumptions represent largest area of remedial cable protection and rock berms associated with crossings.</p>

Potential impact	Maximum design scenario	Justification
Hornsea Three offshore export cable corridor construction activities leading to reduction in access to, or exclusion from, established fishing grounds.	<p>Construction duration for offshore export cables and four above surface offshore HVAC booster stations: 36 months over a period of 11 years, built in three phases with a maximum gap of 4 years split between each phase (e.g. 12 months installation (phase 1), 6 year gap, 12 months installation (phase 2), 12 months installation (phase 3)).</p> <p>Construction of up to six offshore export cables, each up to 173 km in length, located within a total corridor width of up to 1,000 m, with up to 10,380,000 m² seabed disturbance and 726,600 m² cable protection area based on the installation of cable protection for up to 10% of the 1,038 km of export cable. Assumes up to 7 m width of cable protection per cable and 10 m width seabed disturbance associated with each export cable. Up to 37 cable/pipe crossings within the cable corridor, with up to 103,600 m² cable/pipe crossing post-lay berm area.</p> <p>Typically, the export cables will be buried between 1 and 2 m below the seabed surface. A Cable Burial Risk Assessment will inform the actual cable burial depth which will depend upon ground conditions. This assessment will be undertaken post-consent.</p> <p>Construction of four offshore above surface HVAC booster stations with box gravity base foundations.</p> <p>Sandwave clearance activities across an area of 735,220 m² (with disposal within the offshore cable corridor temporary working area).</p> <p>Advisory safety distances as follows:</p> <ul style="list-style-type: none"> • 500 m safety zones around infrastructure under construction; • 50 m safety zones around incomplete structures at which construction activity may be temporarily paused (and therefore the 500 m safety zone has lapsed); and • 1,000 m advisory safety distances around vessels undertaking construction activities. <p>Exclusion scenario: 1,000 m advisory safety distance around vessel construction activities along the Hornsea Three offshore export cable corridor (i.e. a roaming 3.1 km² exclusion along the 173 km cable route corridor).</p>	<p>The three-phase construction represents the longest time period over which the 36 months of construction activities will occur (compared to the one or two-phase construction).</p> <p>The assessment assumes fishing activity would be prevented from the Hornsea Three offshore cable route corridor within advisory safety distances around construction vessels, with a maximum duration of 3.5 years over a period of 8 years. The assessment assumes fishing will resume during the 4-year gap between construction phases 2 and 3.</p> <p>HVAC transmission option represents the greatest number of infrastructure in the Hornsea Three offshore cable corridor (compared with HVDC transmission option).</p> <p>Four offshore above surface HVAC booster stations with box gravity base foundations represent the largest area (topsides) (compared to six subsurface HVAC booster stations with pile foundations).</p>
Displacement from Hornsea Three array area leading to gear conflict and increased fishing pressure on adjacent grounds.	As per maximum design scenario for " <i>Hornsea Three array area construction activities and physical presence of wind farm infrastructure leading to reduction in access to, or exclusion from established fishing grounds</i> ".	As per construction description for " <i>Hornsea Three array area construction activities and physical presence of wind farm infrastructure leading to reduction in access to, or exclusion from established fishing grounds</i> ".
Displacement from the offshore export cable corridor leading to gear conflict and increased fishing pressure on adjacent grounds.	As per maximum design scenario for " <i>Hornsea Three offshore cable corridor construction activities leading to reduction in access to, or exclusion from established fishing grounds</i> ".	As per construction description for " <i>Hornsea Three offshore cable corridor construction activities leading to reduction in access to, or exclusion from established fishing grounds</i> ".
Hornsea Three array area and offshore export cable corridor construction activities leading to displacement or disruption of commercially important fish and shellfish resources.	The maximum design scenarios for impacts on fish and shellfish species during the construction activities are presented in chapter 3: Fish and Shellfish Ecology	The scenarios presented in chapter 3: Fish and Shellfish Ecology provide for the greatest disturbance to fish and shellfish species and therefore the greatest knock on effect to Commercial Fisheries.
Hornsea Three array area and offshore export cable construction activities leading to additional steaming to alternative fishing grounds for vessels that would otherwise be fishing within the array and export cable areas.	As per maximum design scenario for " <i>Hornsea Three array area construction activities and physical presence of wind farm infrastructure leading to reduction in access to, or exclusion from established fishing grounds</i> " and " <i>Hornsea Three offshore cable corridor construction activities leading to reduction in access to, or exclusion from established fishing grounds</i> ".	As per construction description for " <i>Hornsea Three array area construction activities and physical presence of wind farm infrastructure leading to reduction in access to, or exclusion from established fishing grounds</i> " and " <i>Hornsea Three offshore cable corridor construction activities leading to reduction in access to, or exclusion from established fishing grounds</i> ".
Increased vessel traffic within fishing grounds as a result of changes to shipping routes and construction vessel traffic from Hornsea Three array area and Hornsea Three offshore cable corridor leading to interference with fishing activity.	<p>As per maximum design scenario for "<i>Hornsea Three array area construction activities and physical presence of wind farm infrastructure leading to reduction in access to, or exclusion from established fishing grounds</i>" with the exception of gravity base foundations for the turbines (as opposed to floating turbine foundations).</p> <p>Vessel movements from a range of vessels including (but not limited to) jack-up barge, tugs, small and large cable laying vessels, heavy lift vessels, drilling vessels, crew transport, diver vessels, dredging vessels and guard vessels.</p> <p>Maximum of 11,026 vessel return trips over the construction phase.</p>	<p>The maximum number of turbines and associated infrastructure will lead to the highest level of construction activities and therefore highest level of construction vessel movements.</p> <p>The construction of gravity base foundations have the highest support, dredging and tug vessel movements related to the self-installing concept compared with other foundation designs.</p>

Potential impact	Maximum design scenario	Justification
<i>Operation phase</i>		
<p>Physical presence of Hornsea Three array area infrastructure leading to reduction in access to, or exclusion from established fishing grounds.</p>	<p>25 year design life.</p> <p>Physical presence of up to 342 turbines, utilising the entire AfL area of 696 km² (see volume 1, chapter 3: Project Description).</p> <p>Minimum spacing between turbines of 1,000 m.</p> <p>Floating turbine foundations each with up to 12 mooring cables and anchors of up to 1,000 m radius per mooring cable.</p> <p>Up to 19 offshore platforms within the Hornsea Three array area to include:</p> <ul style="list-style-type: none"> Physical presence of up to 12 offshore HVAC collector substations with box gravity base foundations and with topsides footprint of 8,100 m²; Physical presence of up to four offshore HVDC substations with foundations pontoon gravity base-Type I; and Physical presence of up to three offshore accommodation platforms each of dimensions 60 x 60 m (3,600 m² topsides footprint) with suction caisson jackets foundations including scour protection. <p>Array and interconnector cables including:</p> <ul style="list-style-type: none"> Array cables of up to 850 km length, with up to 595,000 m² cable protection based on the presence of cable protection for up to 10% of the up to 850 km of array cables (i.e. 85 km and 7 m wide cable protection footprint); Array cable/pipe crossings with an area of up to 33,600 m² post-lay rock berm; Interconnector cables of up to 225 km in length, with up to 157,500 m² cable protection area based on the presence of cable protection for up to 10% of the 225 km of substation interconnector cables (i.e. 22.5 km and 7 m wide cable protection footprint); Interconnector cable/pipe crossings with an area of up to 5,600 m² post-lay rock berm; Typically the array and interconnector cables will be buried between 1 and 2 m below the seabed surface. A Cable Burial Risk Assessment will inform the actual cable burial depth which will depend upon ground conditions. This assessment will be undertaken post-consent; and Preventive maintenance of subsea cables including routine inspections to ensure adequate burial and integrity of the cable and cable protection system (i.e. on average two visits per year for the first three years are anticipated, moving to annually thereafter), plus maintenance works to rebury/replace and carry out repair works as required. <p>All of the above infrastructure utilising the entire AfL area of 696 km².</p> <p>Advisory safety distances as follows:</p> <ul style="list-style-type: none"> 500 m safety zones around manned platforms; 500 m safety zones around infrastructure undergoing major maintenance; and 1,000 m advisory safety distances around vessels undertaking major maintenance activities. 	<p>The assessment assumes that the mooring and anchor systems of 342 turbines prevent all commercial fisheries from actively fishing within the entire AfL area throughout the entire duration of design life.</p>
<p>Physical presence of offshore export cable and infrastructure within the Hornsea Three offshore cable corridor leading to reduction in access to, or exclusion from established fishing grounds.</p>	<p>Physical presence of export cables up to 173 km in length, located in a corridor of up to 850 m width, with up to 726,600 m² cable protection area based on the presence of cable protection for up to 10% of the 1,038 km of export cable. Assumes up to six cables, and up to 7 m width of cable protection per cable.</p> <p>Typically the export cables will be buried between 1 and 2 m below the seabed surface. A Cable Burial Risk Assessment will inform the actual cable burial depth which will depend upon ground conditions. This assessment will be undertaken post-consent.</p> <p>Physical presence of four above surface offshore HVAC booster stations with box gravity base foundations with length and width = 100 m (10,000 m² topsides footprint).</p> <p>Potential for operational-phase safety zones of 500 m around infrastructure undergoing major maintenance (equating to 100 m length + 500 m radius, 1.13 km² per substation, sub-total = 4.52 km²).</p> <p>Total affected seabed area = 726,600 m² (from export cable protection) and 4.52 km² (safety zones around substations).</p> <p>Advisory safety distances as follows:</p> <ul style="list-style-type: none"> 500 m safety zones around infrastructure undergoing major maintenance; and 1,000 m advisory safety distances around vessels undertaking major maintenance activities (i.e. roaming 3.1 km² exclusion along the 1,038 km of offshore export cable). 	<p>Assessment assumes that fishing will resume along the export cable, with the exception of areas of cable protection and safety zones around infrastructure undergoing major maintenance.</p>

Potential impact	Maximum design scenario	Justification
Displacement from Hornsea Three array area and offshore export cable leading to gear conflict and increased fishing pressure on adjacent grounds.	As per maximum design scenario for "Physical presence of Hornsea Three array area infrastructure leading to reduction in access to, or exclusion from established fishing grounds" and "Physical presence of offshore export cable and infrastructure leading to reduction in access to, or exclusion from established fishing grounds".	As per operation description for "Physical presence of Hornsea Three array area infrastructure leading to reduction in access to, or exclusion from established fishing grounds" and "Physical presence of offshore export cable and infrastructure leading to reduction in access to, or exclusion from established fishing grounds".
Physical presence of Hornsea Three array area leading to gear snagging.	As per maximum design scenario for "Physical presence of Hornsea Three array area infrastructure leading to reduction in access to, or exclusion from established fishing grounds".	Assessment assumes that fishing might resume within areas of the array area and thereby floating turbines and associated mooring and anchor cables represent the highest level of risk for snagging.
Physical presence of the offshore export cable and infrastructure within the Hornsea Three offshore cable corridor leading to gear snagging.	As per maximum design scenario for "Physical presence of offshore export cable and infrastructure leading to reduction in access to, or exclusion from established fishing grounds".	As per operation description for "Physical presence of offshore export cable and infrastructure leading to reduction in access to, or exclusion from established fishing grounds".
Electromagnetic fields, habitat alteration, noise and other ecological impacts due to operational and maintenance activities leading to displacement or disruption of commercially important fish and shellfish resources.	The maximum design scenario for impacts on fish and shellfish species during the operational phase are presented in chapter 3: Fish and Shellfish Ecology	The scenarios presented in chapter 3: Fish and Shellfish Ecology provide for the greatest disturbance to fish and shellfish species and therefore the greatest knock on effect to Commercial Fisheries.
Physical presence of Hornsea Three array, interconnector and offshore export cable leading to additional steaming to alternative fishing grounds for vessels that would otherwise be fishing within the array and export cable areas.	As per maximum design scenario for "Physical presence of Hornsea Three array area infrastructure leading to reduction in access to, or exclusion from established fishing grounds" and "Physical presence of offshore export cable and infrastructure leading to reduction in access to, or exclusion from established fishing grounds".	As per operation description for "Physical presence of Hornsea Three array area infrastructure leading to reduction in access to, or exclusion from established fishing grounds" and "Physical presence of offshore export cable and infrastructure leading to reduction in access to, or exclusion from established fishing grounds". Assessment assumes fishing will not resume within the Hornsea Three array and that vessels will not transit through the array, leading to the greatest potential for longer steaming distances to alternative grounds.
Increased vessel traffic within fishing grounds as a result of changes to shipping routes and maintenance vessel traffic from Hornsea Three array area and offshore cable corridor infrastructure leading to interference with fishing activity.	As per maximum design scenario for "Physical presence of Hornsea Three array area infrastructure leading to reduction in access to, or exclusion from established fishing grounds" and "Physical presence of offshore export cable and infrastructure leading to reduction in access to, or exclusion from established fishing grounds". 2,832 vessel movements per year throughout operation and maintenance.	As per operation description for "Physical presence of Hornsea Three array area infrastructure leading to reduction in access to, or exclusion from established fishing grounds" and "Physical presence of offshore export cable and infrastructure leading to reduction in access to, or exclusion from established fishing grounds". Assessment assumes the highest level of maintenance activities and therefore highest level of vessel movements

Potential impact	Maximum design scenario	Justification
<i>Decommissioning phase</i>		
<p>Hornsea Three array area decommissioning activities leading to reduction in access to, or exclusion from, potential and/or established fishing grounds.</p>	<p>Decommissioning duration: lasting up to 11 years over three phases, the maximum indicative gap between the same component of Hornsea Three in different phases would be four years and this would assume that two phases were built out sequentially either before, or after, the gap to the third.</p> <p>Decommissioning of up to 342 turbines and 19 substations platforms, positioned based on Layout A i.e., turbines arranged with a dense border, which has a wavy edge along the border of the array area, with the remaining turbines within the array positioned in one line of orientation, utilising the entire AfL area of 696 km².</p> <p>Minimum spacing between turbines of 1,000 m.</p> <p>Decommissioning of floating turbine foundations each with up to 12 mooring cables and anchors of up to 1,000 m radius per mooring cable.</p> <p>Decommissioning of up to 19 substations within the array area including:</p> <ul style="list-style-type: none"> • Up to 12 offshore HVAC collector substations with Box GBS foundations and with topsides footprint of 8,100 m²; • Up to four offshore HVDC substations with foundations Pontoon GBS-Type I; and • Up to three offshore accommodation platforms each of dimensions 60 x 60 m (3,600 m² topsides footprint) with suction caisson jackets foundations including scour protection. <p>Decommissioning of array and interconnector cables including removal of:</p> <ul style="list-style-type: none"> • Array cables of up to 850 km length and a 10 m width of seabed affected by possible decommissioning options within the array site, with up to 595,000 m² cable protection area based on installation of cable protection for 10% of the up to 850 km of array cables (i.e., 85 km and 7 m wide cable protection footprint); • Array cable/pipe crossings with an area of up to 33,600 m² post-lay rock berm; • In-project substation interconnector cables of up to 225 km in length, with up to 157,500 m² cable protection area based on the installation of cable protection for 10% of the up to 225 km of substation interconnector cables (i.e., 22.5 km and 7 m wide cable protection footprint). This includes all cable links between HVAC or HVDC substations and offshore accommodation platforms; • In-project substation interconnector cable/pipe crossings with an area of up to 5,600 m² post-lay rock berm; and • Minimum burial depth of array and interconnector cables unknown and subject to burial assessment. <p>All of the above infrastructure utilising the entire AfL area of 696 km².</p> <p>Advisory safety distances as follows:</p> <ul style="list-style-type: none"> • 500 m safety zones around infrastructure under decommissioning; • 50 m safety zones around incomplete structures at which decommissioning activity may be temporarily paused (and therefore the 500 m safety zone has lapsed); and • 1,000 m advisory safety distances around vessels undertaking decommissioning activities. <p>Exclusion scenario: three phased exclusion within Hornsea Three array area equating to the total AfL of 696 km² plus 1,000 m advisory distance around decommissioning works.</p>	<p>The three-phase decommissioning scenario has a maximum gap of four years during the decommissioning period of 11 years, resulting in the longest time of decommissioning activity (compared to the two-phase construction scenario which has a gap of six years).</p> <p>Floating turbine foundations represent the largest area of topsides, seabed and volume of water column that would exclude fishing activity during decommissioning due to the mooring radius.</p> <p>The HVDC scenario results in more infrastructure to be decommissioned within the array area (compared to the HVAC scenario).</p> <p>Offshore HVAC collector substations with Box GBS foundations represent the largest area of seabed.</p> <p>Offshore HVDC substation foundations Pontoon GBS-Type I represent the largest area of seabed.</p> <p>Three accommodation platforms represent the largest topsides footprint.</p> <p>Array and interconnector cables represent largest area of cable protection and post-lay rock berm.</p>
<p>Offshore export cable decommissioning activities within the Hornsea Three offshore cable corridor leading to reduction in access to, or exclusion from, potential and/or established fishing grounds.</p>	<p>Decommissioning duration for offshore cable and four above surface booster stations: 3.5 years over a period of 8 years, decommissioned in three phases with 0.5 to 4 year gaps between phases.</p> <p>Decommissioning of up to six offshore cables, each up to 173 km in length, with a corridor width of up to 1,000 m, with up to 10,380,000 m² seabed disturbance and 726,600 m² cable protection area based on the decommissioning of cable protection for 10% of the up to 1,038 km of export cable. Assumes up to 7 m width of cable protection per cable and 10 m width seabed disturbance associated with each export cable. Up to 37 cable/pipe crossings within the cable corridor, with up to 103,600 m² cable/pipe crossing post-lay berm area.</p> <p>Decommissioning of four offshore above surface HVAC booster stations with Box GBS foundations.</p> <p>Exclusion scenario: up to 173 km² plus a 1 km radius advisory distance around decommissioning operations along the cable route, centred on the decommissioning vessel (i.e., a roaming 3.1 km² exclusion along the 173 km cable route corridor).</p>	<p>The three-phase decommissioning represents the longest duration of decommissioning activities with the lowest period of gaps between phases (compared to the two phased decommissioning).</p> <p>The assessment assumes exclusion from the offshore cable route corridor and advisory distances around decommissioning activities for a maximum duration of 3.5 years over a period of 8 years. The assessment assumes fishing will resume, to the extent possible, during the 4-year gap between decommissioning phases 2 and 3.</p> <p>Four offshore above surface HVAC booster stations with Box GBS foundations represent the largest area (topside) (compared to six subsurface HVAC booster stations with pile foundations).</p>

Potential impact	Maximum design scenario	Justification
Displacement from Hornsea Three array area leading to gear conflict and increased fishing pressure on adjacent grounds.	As per maximum design scenario for "Hornsea Three array area decommissioning activities leading to reduction in access to, or exclusion from, potential and/or established fishing grounds".	As per decommissioning description for "Hornsea Three array area decommissioning activities leading to reduction in access to, or exclusion from, potential and/or established fishing grounds".
Displacement from the Hornsea Three offshore cable corridor leading to gear conflict and increased fishing pressure on adjacent grounds.	As per maximum design scenario for "Offshore export cable decommissioning activities leading to reduction in access to, or exclusion from, potential and/or established fishing grounds".	As per decommissioning description for "Offshore export cable decommissioning activities leading to reduction in access to, or exclusion from, potential and/or established fishing grounds".
Decommissioning activities leading to displacement or disruption of commercially important fish and shellfish resources.	The maximum design scenario for impacts on fish and shellfish species during the operational phase are presented in chapter 3: Fish and Shellfish Ecology	The scenarios presented in chapter 3: Fish and Shellfish Ecology provide for the greatest disturbance to fish and shellfish species and therefore the greatest knock on effect to Commercial Fisheries.
Decommissioning activities leading to longer steaming distances to alternative fishing grounds.	As per maximum design scenario for "Hornsea Three array area decommissioning activities leading to reduction in access to, or exclusion from, potential and/or established fishing grounds" and "Offshore export cable decommissioning activities leading to reduction in access to, or exclusion from, potential and/or established fishing grounds".	As per decommissioning description for "Hornsea Three array area decommissioning activities leading to reduction in access to, or exclusion from, potential and/or established fishing grounds" and "Offshore export cable decommissioning activities leading to reduction in access to, or exclusion from, potential and/or established fishing grounds".
Increased vessel traffic, including Hornsea Three array area related and changes in shipping routes, leading to interference with fishing activity	As per maximum design scenario for "Hornsea Three array area decommissioning activities leading to reduction in access to, or exclusion from, potential and/or established fishing grounds".	As per decommissioning description for "Hornsea Three array area decommissioning activities leading to reduction in access to, or exclusion from, potential and/or established fishing grounds".
Physical presence of cable and scour protection leading to gear snagging.	As per maximum design scenario for "Hornsea Three array area decommissioning activities leading to reduction in access to, or exclusion from, potential and/or established fishing grounds" and "Offshore export cable decommissioning activities leading to reduction in access to, or exclusion from, potential and/or established fishing grounds". Cable protection and scour protection to be left in situ following decommissioning.	As per decommissioning description for "Hornsea Three array area decommissioning activities leading to reduction in access to, or exclusion from, potential and/or established fishing grounds" and "Offshore export cable decommissioning activities leading to reduction in access to, or exclusion from, potential and/or established fishing grounds".

6.9 Impact assessment criteria

6.9.1.1 The criteria for determining the significance of effects is a two-stage process that involves defining the sensitivity of the receptors and the magnitude of the potential impacts. This section describes the criteria applied in this chapter to assign values to the sensitivity of receptors and the magnitude of potential impacts. The terms used to define sensitivity and magnitude are based on those used in the DMRB methodology, which is described in further detail in volume 1, chapter 5: Environmental Impact Assessment Methodology.

6.9.1.2 The criteria for defining sensitivity in this chapter are outlined in Table 6.8 below.

Table 6.8: Definition of terms relating to the sensitivity of the receptor.

Sensitivity	DMRB definition	Definition used in this chapter
Very High	Very high importance and rarity, international scale and very limited potential for substitution	Receptor is highly vulnerable to impacts that may arise from the project and recoverability is long term or not possible. No alternative fishing grounds are available.
High	High importance and rarity, national scale and limited potential for substitution	Receptor is generally vulnerable to impacts that may arise from the project and recoverability is slow and/or costly. Low levels of alternative fishing grounds are available and/or fishing fleet has low operational range.
Medium	High or medium importance and rarity, regional scale, limited potential for substitution	Receptor is somewhat vulnerable to impacts that may arise from the project and has moderate levels of recoverability. Moderate levels of alternative fishing grounds are available and/or fishing fleet has moderate operational range.
Low (or lower)	Low or medium importance and rarity, local scale	Receptor is not generally vulnerable to impacts that may arise from the project and/or has high recoverability. High levels of alternative fishing grounds are available and/or fishing fleet has large to extensive operational range; fishing fleet is adaptive and resilient to change.
Negligible	Very low importance and rarity, local scale	Receptor is not vulnerable to impacts that may arise from the project and/or has high recoverability. Extensive alternative fishing grounds available and/or fishing fleet is highly adaptive and resilient to change.

6.9.1.3 The criteria for defining magnitude in this chapter are outlined in Table 6.9 below.

Table 6.9: Definition of terms relating to the magnitude of an impact.

Magnitude of impact	DMRB definition	Definition used in this chapter
Major	Loss of resource and/or quality and integrity of resource; severe damage to key characteristics, features or elements (Adverse)	Total loss of resource and total loss of ability to carry on fishing activities. Impact is of extended physical extent and/or of long-term duration (e.g., approximately 25 years duration). (Adverse)
	Large scale or major improvement or resource quality; extensive restoration or enhancement; major improvement of attribute quality (Beneficial)	Large scale or major improvement of resource quality; extensive restoration or enhancement of habitats supporting commercial fisheries resources (Beneficial)
Moderate	Loss of resource, but not adversely affecting integrity of resource; partial loss of/damage to key characteristics, features or elements (Adverse)	Partial loss of resource and partial loss of ability to carry on fishing activities. Impact is of moderate physical extent and/or of medium term duration (e.g., less than 12 years). (Adverse)
	Benefit to, or addition of, key characteristics, features or elements; improvement of attribute quality (Beneficial)	Moderate improvement of resource quality; moderate restoration or enhancement of habitats supporting commercial fisheries resources (Beneficial)
Minor	Some measurable change in attributes, quality or vulnerability, minor loss or, or alteration to, one (maybe more) key characteristics, features or elements (Adverse)	Minor shift away from baseline, leading to a reduction in level of activity that may be undertaken. Impact is of limited physical extent and/or of short-term duration (e.g., less than 5 years). (Adverse)
	Minor benefit to, or addition of, one (maybe more) key characteristics, features or elements; some beneficial impact on attribute or a reduced risk of negative impact occurring (Beneficial)	Minor benefit to or minor improvement of resource quality; minor restoration or enhancement of habitats supporting commercial fisheries resources (Beneficial)
Negligible	Very minor loss or detrimental alteration to one or more characteristics, features or elements (Adverse)	Very slight change from baseline condition. Physical extent of impact is negligible and/or of very short-term duration (e.g., less than 2 years). (Adverse)
	Very minor benefit to, or positive addition of one or more characteristics, features or elements (Beneficial)	Very minor benefit to or very minor improvement of resource quality; very minor restoration or enhancement of habitats supporting commercial fisheries resources (Beneficial)
No change	No loss or alteration or characteristics, features or elements; no observable impact in either direction	No change from baseline conditions.

6.9.1.4 In assessing the magnitude of the impact the value and vulnerability of the receptor, i.e. the fishing fleet under assessment, together with the reversibility of the impact are also considered. Due to the range in scale, value (in terms of both landings and income/profit) and operational practises, within the commercial fishing fleets assessed, specific economic criteria were not set for defining value within the categories of high, medium or low. Instead, these classifications were based on judgement informed from the baseline characterisation and consultation with the industry.

- 6.9.1.5 The significance of the effect upon commercial fisheries is determined by correlating the magnitude of the impact and the sensitivity of the receptor. The particular method employed for this assessment is presented in Table 6.10. Where a range of significance of effect is presented in Table 6.10, the final assessment for each effect is based upon expert judgement.
- 6.9.1.6 For the purposes of this assessment, any effects with a significance level of minor or less have been concluded to be not significant in terms of the EIA Regulations.

Table 6.10: Matrix used for the assessment of the significance of the effect.

		Magnitude of impact				
		No change	Negligible	Minor	Moderate	Major
Sensitivity	Negligible	Negligible	Negligible	Negligible or minor	Negligible or minor	Minor
	Low	Negligible	Negligible or minor	Negligible or minor	Minor	Minor or moderate
	Medium	Negligible	Negligible or minor	Minor	Moderate	Moderate or major
	High	Negligible	Minor	Minor or moderate	Moderate or major	Major or substantial
	Very high	Negligible	Minor	Moderate or major	Major or substantial	Substantial

6.10 Measures adopted as part of Hornsea Three

- 6.10.1.1 As part of the project design process, a number of designed-in measures have been proposed to reduce the potential for impacts on commercial fisheries (see Table 6.11). These measures are considered standard industry practice for this type of development and have therefore been considered in the assessment presented in section 6.11 below. Assessment of sensitivity, magnitude and therefore significance includes implementation of these measures.

Table 6.11: Designed-in measures adopted as part of Hornsea Three.

Measures adopted as part of Hornsea Three	Justification
Advance warning and accurate location details of phased construction operations and associated advisory distances.	Ensure sufficient notice for either gear removal and/or avoidance of construction areas.
On-going liaison with all fishing fleets (including regular Notice to Mariners).	Ensure appropriate and proactive communication.
Appropriate marine coordination to ensure risks associated with construction vessels are minimised.	Ensure navigational safety.

Measures adopted as part of Hornsea Three	Justification
Use of guard vessels, where appropriate.	Protect construction activities, provide assistance and communicate information to passing vessels.
Regular Notice to Mariners used to request mariners maintain an advisory safe distance (up to 1,000 m) from construction vessels and its attendant anchor spread and/or anchor handling tugs.	Ensure navigational safety.
Ensure that partially constructed turbines are marked correctly with temporary Aids to Navigation.	Ensure navigational safety.
Extensive promulgation of information to ensure vessels do not pass in close proximity to construction activities by taking them into consideration during their passage planning.	Ensure navigational safety.
A post construction survey to detect any construction debris and subsequent removal where necessary and/or possible.	To determine and remove presence of any construction related debris materials.
Application for and use of the following safety zones: <ul style="list-style-type: none"> 500 m safety zones around infrastructure under construction or decommissioning activities or undergoing major maintenance; 50 m safety zones around incomplete structures at which construction/decommissioning activity may be temporarily paused (and therefore the 500 m safety zone has lapsed) 500 m safety zones around manned platforms during operational phase. 	Ensure navigational safety.
1000 m advisory safety distances around vessels undertaking under construction or decommissioning activities or undertaking major maintenance activities.	Ensure navigational safety.
Advance warning and accurate location details of maintenance operations and associated advisory safety zones.	Ensure sufficient notice for either gear removal and/or avoidance of maintenance area.
Adequate navigational markers including lighting, as directed by Trinity House Lighthouse Service (THLS).	Ensure navigational safety.
Notification of all offshore and seabed structures (locations of cables to be disseminated via Kingfisher Information Service - Cable Awareness (KISCA) Charts).	Minimise risk of gear snagging.
Early communication of any incidents to the fishing sector.	Ensure navigational safety.
Location of cable protection provided via Notice to Mariners.	Minimise risk of gear snagging.
Prepare a fisheries co-existence and liaison plan	Ensure opportunities to fish are maintained where possible.
Prepare a Decommissioning Programme.	Ensure that any in situ hazards to fishing activities are identified and either removed or marked on charts.

6.11 Assessment of significance

6.11.1 Construction phase

6.11.1.1 The impacts of the offshore construction of Hornsea Three have been assessed on commercial fisheries. The environmental impacts arising from the construction of Hornsea Three are listed in Table 6.7 above along with the maximum design scenario against which each construction phase impact has been assessed.

6.11.1.2 A description of the potential effect on commercial fisheries receptors caused by each identified impact is given below.

Hornsea Three array area construction activities and physical presence of constructed wind farm infrastructure leading to reduction in access to, or exclusion from established fishing grounds.

6.11.1.3 During construction of the Hornsea Three array area (specifically the maximum design scenario of floating foundations) and associated infrastructure and cabling, commercial fisheries will be progressively prevented from fishing within the three phases of construction, equating to a total of up to 696 km² (plus 1 km advisory distance around construction works) across an 11 year period built in three phases, with a maximum indicative gap between the same component of Hornsea Three in different phases of four years, assuming that two phases were built out sequentially either before, or after, the gap to the third (e.g. first phase piling, two year gap, second phase piling, two year gap, third phase piling).

Magnitude of impact

6.11.1.4 This impact will lead to a progressive loss of access to fishing grounds and the fish resources within these grounds for a range of fishing opportunities during the 11 year construction phase, which will directly affect fleets over a medium-term duration. The impact is predicted to be continuous with progressive exclusion from the three phases of construction i.e., the phased construction results in partial loss of grounds over the 11 year period; for example, two-thirds of the array area will be accessible while the first phase of construction is undertaken. The impact is of relevance to international fishing fleets and is described below on a fleet-by-fleet basis.

6.11.1.5 UK demersal trawlers, including otter trawl, beam trawl, pulse trawl and fly shooting (including UK registered/Dutch owned vessels): The Hornsea Three array area overlaps with sole, plaice and *Nephrops* grounds that are routinely targeted by UK demersal trawling vessels. An average annual first sales value of £278,004 landings is taken specifically within Hornsea Three array area by UK vessels.

6.11.1.6 Dutch demersal trawlers, including otter trawl, beam trawl, pulse trawl and fly shooting: The Hornsea Three array area overlaps with sole, plaice and *Nephrops* grounds that are routinely targeted by Dutch demersal trawling vessels. An average annual first sales value of €1 million landings is taken specifically within Hornsea Three array area by Dutch vessels.

6.11.1.7 Belgian demersal trawlers, including otter trawl and beam trawl: The Hornsea Three array area overlaps with sole and plaice grounds that are routinely targeted by Belgian demersal trawling vessels. An average annual first sales value of €300,500 landings is estimated to be taken specifically within the Hornsea Three array area by Belgian vessels (based on the assumption that 41% of effort from within 36F2 to be attributable to Hornsea Three array area).

6.11.1.8 German and French demersal otter trawlers: landing statistics and VMS data indicate that grounds within Hornsea Three array area are occasional targeted, with an estimated annual first sales value of €77,000 for German vessels and €24,600 for French vessels taken specifically within the Hornsea Three array area.

6.11.1.9 Danish sandeel industrial otter trawlers: industry mapping of sandeel grounds within the North Sea indicate a substantial ground located within the Hornsea Three array area (Figure 6.15). However, landing statistics indicate that the Hornsea Three array area study area (36F2) has not been heavily targeted for sandeel for the past five years in comparison to the regional commercial fisheries study area and the wider North Sea. It is understood that effort has been recently focused on the Dogger Bank. The sandeel fishery is highly dependent on recruitment on a year-to-year basis; it is noted that a zero TAC was in place for 2015 due to low stock abundance (ICES, 2015). Sandeel grounds are well established and understood throughout the North Sea and it is reasonable to assume that the sandeel grounds overlapping the Hornsea Three array area could be productive in the future including within the 11-year construction period.

6.11.1.10 Danish, UK, French, Swedish and Norwegian vessels deploying pelagic gear, including pelagic (mid-water) otter trawl and purse seine: Hornsea Three array area is understood to be sporadically targeted for pelagic species including: mackerel, herring, sprat, anchovy and boarfish. Highly mobile pelagic species, that move in shoals and are not associated with specific seabed habitats, are assumed to be available to catch across large areas i.e., if a shoal of herring cannot be caught within Hornsea Three array area, this shoal is expected to move to an area where they can be caught. Thereby, while the access to the water column within the array area may be effected; the opportunity to catch pelagic fish is not lost.

6.11.1.11 UK potters: potting vessels are understood not to operate within Hornsea Three array area, which is supported by landing statistics, VMS data and by virtue of the mobile effort across the array area (which makes co-existence of these gear types challenging).

6.11.1.12 All other EU and Norwegian fleets: VMS and/or landing statistics indicate negligible levels of effort and landings by any other fleets not included above.

6.11.1.13 The impact is predicted to be of regional spatial extent, medium term duration, continuous and reversible. It is predicted that the impact will affect the receptors directly. The magnitude is therefore, considered to be **moderate** for UK, Dutch and Belgian demersal trawlers; **minor** for German and French demersal trawlers; **moderate** for Danish industrial demersal trawlers; **minor** for UK, Danish, Norwegian, Swedish and French pelagic trawlers; **negligible** for UK potters and **negligible** for all other fleets.

Sensitivity of the receptor

6.11.1.14 The EU and Norwegian mobile vessels targeting Hornsea are typically > 25 m in length and operate across large areas over the North Sea. Given adequate notification it is expected that these vessels will be in a position to avoid construction areas. All mobile fleets are considered to have a large operational range.

6.11.1.15 The UK, Dutch and Belgian demersal trawling fleets are considered to have moderate levels of alternative fishing grounds; while the French, German and Swedish demersal trawling fleets are considered to have moderate-high levels of alternative grounds, based on their lower dependence on the Hornsea Three array area. The UK, Dutch and Belgian demersal trawling fleets are deemed to be of medium vulnerability, high recoverability and medium value. The sensitivity of the receptor is therefore, considered to be **medium**. The French, German and Swedish demersal trawling fleets are deemed to be of low vulnerability, high recoverability and low value. The sensitivity of the receptor is therefore, considered to be **low**.

6.11.1.16 The Danish sandeel industrial otter trawlers are considered to have substantial alternative fishing grounds and be resilient and adaptable to change (e.g. given large fluctuations in TACs). The Danish sandeel industrial otter trawlers are deemed to be of low vulnerability, high recoverability and low value. The sensitivity of the receptor is therefore, considered to be **low**.

6.11.1.17 All pelagic gear fleets are considered to have an extensive operational range, be highly adaptive and resilient to change. The Danish, UK, French, Swedish and Norwegian fleets deploying pelagic gear are deemed to be of low vulnerability, high recoverability and low value. The sensitivity of the receptor is therefore, considered to be **low**.

6.11.1.18 The UK potting fleet are typically < 15 m in length and operate across more distinct areas of ground, typically 0 to 6 nm from shore, but also extending from 6 nm. The UK potting fleet are deemed to be of low vulnerability, medium recoverability and low value. The sensitivity of the receptor is therefore, considered to be **low**.

6.11.1.19 All other EU and Norwegian fleets are deemed to be of low vulnerability, high recoverability and low value. The sensitivity of the receptor is therefore, considered to be **low**.

Significance of the effect

6.11.1.20 UK, Dutch and Belgian demersal trawling fleets: overall, it is predicted that the sensitivity of the receptor is considered to be **medium** and the magnitude is deemed to be **moderate**. The effect will, therefore, be of **moderate** adverse significance, which is significant in EIA terms.

6.11.1.21 French, German and Swedish demersal trawling fleets: overall, it is predicted that the sensitivity of the receptor is considered to be **low** and the magnitude is deemed to be **minor**. The effect will, therefore, be of **minor** adverse significance, which is not significant in EIA terms.

6.11.1.22 The Danish sandeel industrial otter trawling fleet: overall, it is predicted that the sensitivity of the receptor is considered to be **low** and the magnitude is deemed to be **moderate**. The effect will, therefore, be of **minor** adverse significance, which is not significant in EIA terms.

6.11.1.23 Danish, UK, French, Swedish and Norwegian fleets deploying pelagic gear: overall, it is predicted that the sensitivity of the receptor is considered to be **low** and the magnitude is deemed to be **minor**. The effect will, therefore, be of **minor** adverse significance, which is not significant in EIA terms.

6.11.1.24 UK potting fleet: overall, it is predicted that the sensitivity of the receptor is considered to be **low** and the magnitude is deemed to be **negligible**. The effect will, therefore, be of **minor** adverse significance, which is not significant in EIA terms.

6.11.1.25 All other EU and Norwegian fleets: overall, it is predicted that the sensitivity of the receptor is considered to be **low** and the magnitude is deemed to be **negligible**. The effect will, therefore, be of **negligible** adverse significance, which is not significant in EIA terms.

Further mitigation

6.11.1.26 Floating turbine technology is currently at an early stage of development. The assessment for the reduction in access to, or exclusion from established fishing grounds considers a certain type of floating turbine concept to present the maximum design scenario. There are a range of floating foundations as well as other technologies (such as monopiles and jacket foundations) which will be considered for Hornsea Three. If such alternative technologies were to be used (those foundations that are more 'tried and tested' by the offshore wind industry or alternative floating foundation concepts that had a reduced seabed/water column footprint) or if the spatial extent of deployment of the floating foundation design considered in this assessment was reduced, then it is considered likely that this impact would be reduced because fishing is expected to continue within the Hornsea Three array area once the project is operational.

Hornsea Three offshore cable corridor construction activities leading to reduction in access to, or exclusion from established fishing grounds.

6.11.1.27 Fishing activity will be locally and temporarily excluded at the location of construction owing to the presence of construction vessels, construction operations and the need to observe The Convention on the International Regulations for Preventing Collisions at Sea, 1972 (COLREGS).

6.11.1.28 The construction scenario assumes 36 months of construction over a period of 11 years, built in three phases. An advisory safety distance up to 1 km radius around cable installation vessels active along the cable route, is recommended i.e., a roaming 3.1 km² area along the 173 km cable route corridor.

Magnitude of impact

6.11.1.29 This impact will lead to a loss of access to fishing grounds and the fish resources within these grounds for a range of fishing opportunities during the construction activities, which will directly affect fleets over a short-term duration. The impact is predicted to be intermittent with potential resumption of activities between phases of construction. The impact is of relevance to international fishing fleets and is described below on a fleet-by-fleet basis.

6.11.1.30 UK potters: Consultation with North Norfolk fishermen's associations and societies, and the Eastern IFCA indicates the Hornsea Three offshore cable corridor overlaps with fishing ground routinely targeted by potting vessels targeting brown crab and lobster using creels and whelk using pots. Consultation indicates that beach launched vessels tend to target areas from 0 to 3 nm, while harbour based vessels predominately target areas from 3 to 6 nm and further offshore. During the construction process vessels with pots set along the offshore cable corridor will be required to move these pots and cease fishing activities at particular construction locations. Sufficient notice, together with the support of a guard vessel where appropriate, will be provided to facilitate this process.

6.11.1.31 UK and Dutch demersal trawlers, including otter trawl, beam trawl, pulse trawl and fly shooting: VMS and landing statistics indicate low levels of activity by mobile vessels along the offshore cable corridor, with the exception of the funnel shaped area where the offshore cable corridor meets the array area. This area is routinely fished with an effort proportional to that seen within the array area.

6.11.1.32 UK beam trawlers targeting shrimp: the Wash is a nationally significant area for the UK brown shrimp fishery, however activity is predominately within ICES rectangles 34F0 and 35F0 (which the offshore cable corridor does not overlap). Brown shrimp landings from 34F1 have an average annual value of £22,000, with minimal landings from 35F1 and none from 36F1 and 36F2. A notable reduction in landings was seen in 2015 when only £650 were landed from 34F1, this is linked to Eastern IFCA management of closed areas to protect designated sites within their jurisdiction.

6.11.1.33 German and French demersal otter trawlers: VMS and landing statistics indicate that grounds within Hornsea Three offshore cable corridor are very occasional fished.

6.11.1.34 Danish sandeel industrial otter trawlers: industry mapping of sandeel grounds within the North Sea indicate an overlap across the offshore cable corridor with four distinct grounds that run in a north west to south east orientation (Figure 6.15). As per the description in paragraph 6.11.1.9, sandeel landings have been low over the last five-year period, but could be productive in the future and within the 11-year construction period.

6.11.1.35 Danish, UK, French, Swedish and Norwegian vessels deploying pelagic gear, including pelagic (mid-water) otter trawl and purse seine: landing statistics indicate minimal landings of pelagic species from ICES rectangles 34F1, 35F1 and 36F1 (that overlap Hornsea Three offshore cable corridor). As described in paragraph 6.11.1.10, 36F2 is understood to be sporadically targeted for pelagic species including: mackerel, herring, sprat, anchovy and boarfish.

6.11.1.36 All other EU and Norwegian fleets: VMS and landing statistics indicate negligible levels of effort and landings by any other fleets not included above.

6.11.1.37 The impact is predicted to be of regional spatial extent, short term duration, intermittent and reversible. It is predicted that the impact will affect the receptors directly. The magnitude is therefore, considered to be **minor** for UK, Dutch and Belgian demersal trawlers; **minor** for German and French demersal trawlers; **minor** for Danish industrial demersal trawlers; **negligible** for UK, Danish, Norwegian, Swedish and French pelagic trawlers; **moderate** for UK potters and **negligible** for all other fleets.

Sensitivity of the receptor

6.11.1.38 The EU and Norwegian mobile vessels targeting Hornsea are typically > 25 m in length and operate across large areas over the North Sea. Given adequate notification it is expected that these vessels will be in a position to avoid construction areas. All mobile fleets are considered to have a large operational range.

6.11.1.39 The UK, Dutch, Belgian, French, German and Swedish demersal trawling fleets are considered to have moderate-high levels of alternative grounds, based on their lower dependence on the Hornsea Three offshore cable corridor. The UK, Dutch, Belgian French, German and Swedish demersal trawling fleets are deemed to be of low vulnerability, high recoverability and low value. The sensitivity of the receptor is therefore, considered to be **low**.

6.11.1.40 The Danish sandeel industrial otter trawlers are considered to have substantial alternative fishing grounds and be resilient and adaptable to change (e.g. given large fluctuations in TACs). The Danish sandeel industrial otter trawlers are deemed to be of low vulnerability, high recoverability and low value. The sensitivity of the receptor is therefore, considered to be **low**.

6.11.1.41 All pelagic gear fleets are considered to have an extensive operational range, be highly adaptive and resilient to change. The Danish, UK, French, Swedish and Norwegian fleets deploying pelagic gear are deemed to be of low vulnerability, high recoverability and low value. The sensitivity of the receptor is therefore, considered to be **low**.

6.11.1.42 The UK potting fleet are typically < 15 m in length and operate across more distinct areas of ground, typically 0 to 6 nm from shore, but also extending from 6 nm. The UK potting fleet are deemed to be of medium vulnerability, medium recoverability and medium value. The sensitivity of the receptor is therefore, considered to be **medium**.

6.11.1.43 The UK beam trawl fleet targeting brown shrimp are typically < 18 m in length and operate across more distinct areas of ground, typically 0 to 6 nm from shore, and predominately in ICES rectangles 34F0 and 35F0, but sometimes extending into 34F1. The UK beam trawl fleet targeting brown shrimp are deemed to be of medium vulnerability, medium recoverability and low value. The sensitivity of the receptor is therefore, considered to be **medium**.

6.11.1.44 All other EU and Norwegian fleets are deemed to be of low vulnerability, high recoverability and low value. The sensitivity of the receptor is therefore, considered to be **low**.

Significance of the effect

6.11.1.45 UK, Dutch, Belgian, French, German and Swedish demersal trawling fleets: overall, it is predicted that the sensitivity of the receptor is considered to be **low** and the magnitude is deemed to be **minor**. The effect will, therefore, be of **minor** adverse significance, which is not significant in EIA terms.

6.11.1.46 Danish sandeel industrial otter trawling fleet: overall, it is predicted that the sensitivity of the receptor is considered to be **low** and the magnitude is deemed to be **minor**. The effect will, therefore, be of **minor** adverse significance, which is not significant in EIA terms.

6.11.1.47 Danish, UK, French, Swedish and Norwegian fleets deploying pelagic gear: overall, it is predicted that the sensitivity of the receptor is considered to be **low** and the magnitude is deemed to be **negligible**. The effect will, therefore, be of **negligible** adverse significance, which is not significant in EIA terms.

6.11.1.48 UK potting fleet: overall, it is predicted that the sensitivity of the receptor is considered to be **medium** and the magnitude is deemed to be **moderate**. The effect will, therefore, be of **moderate** adverse significance, which is significant in EIA terms.

6.11.1.49 UK beam trawling fleet targeting brown shrimp: overall, it is predicted that the sensitivity of the receptor is considered to be **medium** and the magnitude is deemed to be **minor**. The effect will, therefore, be of **minor** adverse significance, which is not significant in EIA terms.

6.11.1.50 All other EU and Norwegian fleets: overall, it is predicted that the sensitivity of the receptor is considered to be **low** and the magnitude is deemed to be **negligible**. The effect will, therefore, be of **negligible** adverse significance, which is not significant in EIA terms.

Further mitigation

6.11.1.51 UK potting fleet: with respect to any justifiable disturbance payment, the procedures as outlined in the FLOWW guidance documents (2014 and 2015), will be followed wherever possible. The residual effect will, therefore, be of **minor** adverse significance, which is not significant in EIA terms.

Displacement from Hornsea Three array area leading to gear conflict and increased fishing pressure on adjacent grounds.

6.11.1.52 Phased exclusion from fishing grounds during construction of Hornsea Three array area may lead to temporary increases in fishing effort in other areas that may already be exploited thereby leading to gear conflict.

Magnitude of impact

6.11.1.53 The impact is predicted to be of regional spatial extent, medium-term duration, intermittent and with medium reversibility. It is predicted that the impact will affect the receptor directly. The impact is of relevance to international fishing fleets as described below.

6.11.1.54 VMS and surveillance data indicate that there are numerous areas surrounding Hornsea Three array area that are targeted by the same gear types used within Hornsea Three array area (including beam trawl, pulse trawl, demersal otter trawl and fly shooting). Notably a distinct *Nephrops* and mixed demersal fishing ground extends from within the northern border of the Hornsea Three array area to 20 km north of the array area. Whether or not displaced vessels are likely to disperse into these areas depends on the normal fishing patterns of the fleets targeting the area.

6.11.1.55 The UK and Dutch VMS data show the vast areas targeted by the demersal trawl, beam trawl, pulse trawl and fly shooting fleets, as do the maps of Danish sandeel grounds throughout the North Sea. The beam trawlers, demersal, semi-pelagic and pelagic otter trawlers from all nationalities that operate within the regional commercial fisheries study area, fish throughout the North Sea across a range of established fishing grounds.

6.11.1.56 Conflict over diminished grounds is also likely to be of concern to the UK potting vessels, if displaced vessels operating mobile gear explore grounds traditionally fished by potters. Displacement of mobile gear may therefore increase the risk of interaction with potting grounds and gear. However, potting activity is most prominent in inshore areas (within 12 nm), with little effort in waters adjacent to the array.

6.11.1.57 The magnitude of potential increased conflict over alternative fishing grounds during the construction process is considered to be **minor** for all demersal trawling fishing fleets and UK potting vessels, and **negligible** for fleets deploying pelagic gear.

Sensitivity of the receptor

- 6.11.1.58 All mobile commercial fisheries fleets operating within the Hornsea Three array area are considered to have high availability of alternative fishing grounds (including current focus of effort), and an operational range that is not limited to the Hornsea Three array area. All mobile fleets are deemed to be of low vulnerability, high recoverability and medium value. The sensitivity of all mobile fleets is therefore, considered to be **low**.
- 6.11.1.59 The UK potting fleet operates across large areas inshore from Hornsea Three array area and across the offshore cable corridor. This form of static fishing gear is considered to be of high vulnerability to gear conflict interactions since it is left unattended on the seabed. It is expected that any displacement from mobile vessels may lead to exploring other fishing grounds outside the Hornsea Three array area, which includes areas currently targeted by potters. The UK potting fleet are deemed to be of high vulnerability, medium recoverability and medium value. The sensitivity of the UK potting fleet is therefore, considered to be **medium**.

Significance of the effect

- 6.11.1.60 All mobile fleets deploying demersal trawl gear: overall, it is predicted that the sensitivity of the receptor is considered to be **low** and the magnitude is deemed to be **minor**. The effect will, therefore, be of **minor** adverse significance, which is not significant in EIA terms.
- 6.11.1.61 All mobile fleets deploying pelagic gear: overall, it is predicted that the sensitivity of the receptor is considered to be **low** and the magnitude is deemed to be **negligible**. The effect will, therefore, be of **negligible** adverse significance, which is not significant in EIA terms.
- 6.11.1.62 UK potting fleet: overall, it is predicted that the sensitivity of the receptor is considered to be **medium** and the magnitude is deemed to be **minor**. The effect of mobile gears being displaced into potting ground will, therefore, be of **minor** adverse significance to UK potters, which is significant in EIA terms.

Displacement from the offshore export cable corridor leading to gear conflict and increased fishing pressure on adjacent grounds.

- 6.11.1.63 Exclusion from fishing grounds during construction of the offshore cable corridor may lead to temporary increases in fishing effort in other areas that may already be exploited thereby leading to gear conflict.

Magnitude of impact

- 6.11.1.64 The impact is predicted to be of regional spatial extent, medium-term duration, intermittent and with medium reversibility. It is predicted that the impact will affect the receptor directly. The impact is of relevance to international fishing fleets as described below.

- 6.11.1.65 UK potters: The vessels deploying creels and pots across the offshore cable corridor will be required to temporarily relocate gear to other grounds during the construction process. The density of creels and pots varies significantly along the length of the export cable, increasing from low at the array area to high in inshore waters, within 1.5 – 3nm from shore. Vessels deploy between approximately 300 and 3,500 pots. However, it is not likely that all fleets (or creels/pots from one vessel) will overlap the offshore cable corridor given that a number of fleets of pots and a range of grounds are targeted at any given time. Vessels deploying pots in the North Norfolk area tend to leave their pots on the ground (i.e. do not bring pots back to shore in between fishing trips, with the exception of carrying out gear maintenance on specific pots/stings).

- 6.11.1.66 Therefore, when considering the impact of potters being displaced into grounds already targeted by potters two scenarios are feasible:

- Alternative fishing grounds are available to relocate gear, in which case gear conflict and displacement effects will be low;
- Alternative fishing grounds are not available as adjacent areas are already being fished by potters, in which case the gear already on the ground limits the level of displacement. While there remains potential for gear conflicts and increased fishing pressure to arise, appropriately mitigated exclusion impacts will limit this (see paragraph 6.11.1.51).

- 6.11.1.67 On balance, the displacement effect to UK potters targeting the offshore export cable corridor is considered to have a lower magnitude of impact than the exclusion impact causing the displacement. Taking all of these aspects into consideration, the magnitude of the displacement impact is assessed to be **minor** for UK potters.

- 6.11.1.68 For all mobile fleets deploying demersal trawl gear, due to the lower level of activity across the offshore cable corridor, together with the range of alternative grounds, the magnitude is considered to be **minor**.

- 6.11.1.69 For all mobile fleets deploying pelagic trawl gear, the magnitude is considered to be **negligible**.

Sensitivity of the receptor

- 6.11.1.70 The sensitivity is as assessed in paragraphs 6.11.1.58 and 6.11.1.59.

Significance of the effect

- 6.11.1.71 All mobile fleets deploying demersal trawl gear: overall, it is predicted that the sensitivity of the receptor is considered to be **low** and the magnitude is deemed to be **minor**. The effect will, therefore, be of **minor** adverse significance, which is not significant in EIA terms.

- 6.11.1.72 All mobile fleets deploying pelagic gear: overall, it is predicted that the sensitivity of the receptor is considered to be **low** and the magnitude is deemed to be **negligible**. The effect will, therefore, be of **negligible** adverse significance, which is not significant in EIA terms.

6.11.1.73 UK potting fleet: overall, it is predicted that the sensitivity of the receptor is considered to be **medium** and the magnitude is deemed to be **minor**. The effect will, therefore, be of **minor** adverse significance, which is significant in EIA terms.

Hornsea Three array area and offshore export cable corridor construction activities leading to displacement or disruption of commercially important fish and shellfish resources.

6.11.1.74 Temporary displacement due to noise and disruption of habitats during construction activities may decrease or displace commercially important fish and shellfish populations from the area. This section assesses the potential temporary knock-on impact for the owners of fishing vessels, where commercially important stocks may be disturbed or displaced to a point where normal fishing practices would be affected.

Magnitude of impact

6.11.1.75 Detailed assessments of the following potential construction impacts have been undertaken in chapter 3: Fish and Shellfish Ecology for key commercial species (including brown crab, lobster, *Nephrops*, sandeel and 'other' fish and finfish species such as sole, plaice and whiting):

- Temporary habitat loss/disturbance from construction operations including foundation installation and cable laying operations;
- Increased suspended sediment concentrations as a result of foundation installation, cable installation and seabed preparation resulting in potential effects on fish and shellfish receptors;
- Sediment deposition as a result of foundation installation, cable installation and seabed preparation resulting in potential effects on fish and shellfish receptors; and
- Underwater noise as a result of foundation installation (i.e., piling) and other construction activities (e.g. cable installation) resulting in potential effects on fish and shellfish receptors.

6.11.1.76 With respect to the magnitude of this impact on commercial fisheries, the overall significance of the effect on fish and shellfish species is considered (i.e. both the magnitude and sensitivity of fish and shellfish species are considered to assess the magnitude on commercial fishing fleets). For instance, where an effect of negligible significance is assessed for a species, a **negligible** magnitude is assessed for commercial fishing; where an effect of minor adverse significance is assessed for a species, a **minor** magnitude is assessed for commercial fishing, and so on.

6.11.1.77 Details of the fish and shellfish ecology assessment are summarised in Table 6.12 justifications for this assessment will not be repeated in this chapter. Evidence, modelling and justifications for these assessments are provided in chapter 3: Fish and Shellfish Ecology.

6.11.1.78 The impact is predicted to be of regional spatial extent, of relevance to international fishing fleets, and of medium-term duration. It is predicted that the impact will affect the receptor directly through loss of resources. The magnitude is therefore considered to be **minor** for all species and all potential impacts.

Table 6.12: Significance of effects of construction impacts on fish and shellfish ecology.

Potential impact	Species	Significance of effect
Habitat loss/ disturbance	Brown crab and lobster	Minor
	Sandeel and herring	Minor
	All other fish and shellfish species	Minor
Increased suspended sediment concentrations	Brown crab and lobster	Minor
	<i>Nephrops</i>	Minor
	Brown shrimp	Minor
Sediment deposition	All other fish and shellfish species	Minor
	Brown crab and lobster	Minor
	<i>Nephrops</i>	Minor
	Brown shrimp	Minor
Release of sediment contaminants	All other fish and shellfish species	Minor
	All species	To be confirmed in the Environmental Statement
	Shellfish	Negligible
	Demersal finfish	Negligible
Underwater noise	Pelagic finfish	Negligible

Sensitivity of the receptor

6.11.1.79 Exposure to the impact is likely and commercial fleets targeting key species will be affected, including sole, plaice, sandeel, *Nephrops*, brown crab, lobster, whelk and brown shrimp.

6.11.1.80 Due to the locality of the impact on brown crab and lobster, the sensitivity of the UK potting fleet is considered to be **medium**. This is based on the potential for grounds beyond the immediate construction activities to be affected by increased suspended sediment and sediment deposition, impacting the wider potting fleet.

6.11.1.81 Suspended sediment concentration modelling related to installation of the export cable is presented within chapter 3: Fish and Shellfish Ecology, which states that *"finer material will be advected away from the release location by the prevailing tidal current. High initial concentrations (similar to sands and gravels) are to be expected but will be subject to rapid dispersion, both laterally and vertically, to near-background levels (tens of mg/l) within hundreds to a few thousands of metres of the point of release"*. Brown shrimp are primarily targeted in the Wash, and also along the North Norfolk coast adjacent to the Wash. Brown shrimp fishing grounds are understood not to overlap with the offshore export cable. Based on these fishing locations, and the rate of dispersion predicted by modelling, it is expected that elevated suspended sediment concentrations and sediment deposition will not impact brown shrimp grounds and therefore the sensitivity of beam trawlers targeting this species is considered to be **low**.

6.11.1.82 Due to the importance of the *Nephrops* grounds located within the northern border of Hornsea Three array area and extending north, the sensitivity of UK demersal otter trawlers targeting *Nephrops* is considered to be **medium**.

6.11.1.83 Due to the range of alternative areas targeted and the distribution of key commercial species throughout the central and southern North Sea the sensitivity of all other fleets is considered to be **low**.

Significance of the effect

6.11.1.84 Danish sandeel industrial otter trawling fleet: overall, it is predicted that the sensitivity of the receptor is considered to be **low** and the magnitude is deemed to be **minor**. The effect will, therefore, be of **minor** adverse significance, which is not significant in EIA terms.

6.11.1.85 All mobile demersal otter trawling fleets targeting *Nephrops*: overall, it is predicted that the sensitivity of the receptor is considered to be **medium** and the magnitude is deemed to be **minor**. The effect will, therefore, be of **minor** adverse significance, which is not significant in EIA terms.

6.11.1.86 All other mobile fleets deploying demersal trawl gear: overall, it is predicted that the sensitivity of the receptor is considered to be **low** and the magnitude is deemed to be **minor**. The effect will, therefore, be of **minor** adverse significance, which is not significant in EIA terms.

6.11.1.87 All mobile fleets deploying pelagic gear: overall, it is predicted that the sensitivity of the receptor is considered to be **low** and the magnitude is deemed to be **minor**. The effect will, therefore, be of **minor** adverse significance, which is not significant in EIA terms.

6.11.1.88 UK potting fleet: overall, it is predicted that the sensitivity of the receptor is considered to be **medium** and the magnitude is deemed to be **minor**. The effect will, therefore, be of **minor** adverse significance, which is significant in EIA terms.

Hornsea Three array area and offshore export cable construction activities leading to additional steaming to alternative fishing grounds for vessels that would otherwise be fishing within the array and export cable areas.

6.11.1.89 A detailed Navigational Risk Assessment has been undertaken within chapter 7: Shipping and Navigation, which includes full consideration of commercial fishing vessels while transiting (e.g. from a collision and allision perspective). This assessment focuses on the potential impact of longer steaming distances to alternative fishing grounds while construction processes are ongoing.

Magnitude of impact

6.11.1.90 The impact is predicted to be of regional spatial extent, of relevance to international fishing fleets, and of medium-term duration. It is predicted that the impact will affect the receptor directly.

6.11.1.91 The construction programme for the Hornsea Three array area and the offshore export cable corridor will be communicated through Notice to Mariners and Kingfisher Bulletins with ample warning provided. A shipping corridor will be maintained (immediately west of Hornsea Three array area) to allow steaming to grounds north of Hornsea Three (namely to Dogger Bank). Although, it should be noted that commercial fisheries will not be restricted to these lanes. In addition, construction works will only necessitate minor deviations for fishing vessels transiting along the offshore cable route during the construction phase. Localised impacts are anticipated but will be limited to the immediate area of construction activity and associated construction vessels. The magnitude is therefore, considered to be **minor** for all fishing fleets.

Sensitivity of the receptor

6.11.1.92 The mobile fleets targeting the Hornsea Three array area and the offshore cable corridor are typically > 25 m, operating across large areas of the North Sea. Given adequate notification it is expected that these vessels will be in a position to avoid construction areas with no or minimal impact upon steaming times.

6.11.1.93 The potting fleet targeting the Hornsea Three offshore export cable corridor operate across a range of grounds to haul and re-set different fleets of creels/pots on a daily basis. Their normal operating range is expected to extend well beyond the roaming advisory safety distance of 500 m radius that will be requested around large cable installation vessels. Given adequate notification it is expected that these vessels will be in a position to avoid construction areas with no or minimal impact upon steaming times.

6.11.1.94 All commercial fisheries fleets are considered to have high availability of alternative fishing grounds (including the grounds where fishing effort is currently focused throughout the North Sea area), and an operational range that is not limited to the Hornsea Three area. The sensitivity of the receptor is therefore, considered to be **low**.

Significance of the effect

6.11.1.95 All commercial fishing fleets: overall, it is predicted that the sensitivity of the receptor is considered to be **low** and the magnitude is deemed to be **minor**. The effect will, therefore, be of **minor** adverse significance, which is not significant in EIA terms.

Increased vessel traffic within fishing grounds as a result of changes to shipping routes and transiting construction vessel traffic from Hornsea Three array area and Hornsea Three offshore cable corridor leading to interference with fishing activity.

6.11.1.96 This assessment focuses on the potential impact of Hornsea Three related vessel traffic and changes to shipping patterns as a result of navigational channels leading to interference with fishing activity (i.e. reduced access) during construction.

Magnitude of impact

6.11.1.97 Vessel movements (i.e. construction vessels transiting to and from areas undergoing construction works) related to the construction of Hornsea Three, the offshore export cable and all associated infrastructure will add to the existing level of shipping activity in the area (see chapter 7: Shipping and Navigation for a full assessment of additional vessel movements).

6.11.1.98 Based on the extent of fishing currently within the proposed navigation corridor to the west of Hornsea Three array area (based on baseline characterisation from 2011 to 2015) a **moderate** magnitude of impact is considered for UK, Dutch and Belgian demersal trawlers and Danish sandeel industrial trawlers.

6.11.1.99 The magnitude for fleets deploying pelagic gear is considered **negligible**; and for all other fishing fleets is considered **minor** due to low levels of activity within the navigation corridor.

Sensitivity of the receptor

6.11.1.100 Construction traffic is likely to constrain most potting activity across established construction supply routes due to the vulnerability of the marker buoys to the propellers of passing construction vessels. The sensitivity of potting is therefore considered to be **medium**.

6.11.1.101 All other fleets are expected to be in a position to avoid the Hornsea Three area during construction and the sensitivity of all other fleets is considered to be **low** or **negligible**.

Significance of the effect

6.11.1.102 UK, Dutch and Belgian demersal trawling fleets: overall, it is predicted that the sensitivity of the receptor is considered to be **low** and the magnitude is deemed to be **moderate**. The effect will, therefore, be of **minor** adverse significance, which is not significant in EIA terms.

6.11.1.103 Danish sandeel industrial otter trawling fleet: overall, it is predicted that the sensitivity of the receptor is considered to be **low** and the magnitude is deemed to be **moderate**. The effect will, therefore, be of **minor** adverse significance, which is not significant in EIA terms.

6.11.1.104 All fleets deploying pelagic gear: overall, it is predicted that the sensitivity of the receptor is considered to be **negligible** and the magnitude is deemed to be **negligible**. The effect will, therefore, be of **negligible** adverse significance, which is not significant in EIA terms.

6.11.1.105 UK potting fleet: overall, it is predicted that the sensitivity of the receptor is considered to be **medium** and the magnitude is deemed to be **minor**. The effect will, therefore, be of **minor** adverse significance, which is not significant in EIA terms.

6.11.1.106 All other mobile fleets: overall, it is predicted that the sensitivity of the receptor is considered to be **negligible** and the magnitude is deemed to be **minor**. The effect will, therefore, be of **negligible** adverse significance, which is not significant in EIA terms.

6.11.2 Operational and maintenance phase

6.11.2.1 The impacts of the offshore operation and maintenance of Hornsea Three have been assessed on commercial fisheries. The environmental impacts arising from the operation and maintenance of Hornsea Three are listed in Table 6.7 along with the maximum design scenario against which each operation and maintenance phase impact has been assessed.

6.11.2.2 A description of the potential effect on commercial fisheries receptors caused by each identified impact is given below.

Physical presence of Hornsea Three array area infrastructure leading to reduction in access to, or exclusion from established fishing grounds.

6.11.2.3 The assessment assumes that the mooring and anchor systems of 342 turbines with floating foundations prevent all commercial fisheries from actively fishing within the entire AfL area throughout the entire duration of design life.

Magnitude of impact

6.11.2.4 This impact will lead to a loss of access to fishing grounds and the fish resources within these grounds for a range of fishing opportunities during the 25 year operational and maintenance phase, which will directly affect fleets over a long-term duration. The impact is predicted to be continuous with low reversibility and is of relevance to international fishing fleets.

6.11.2.5 Evidence on the value and importance of the Hornsea Three array area to commercial fishing fleets is the same as that presented for construction in paragraphs 6.11.1.5 to 6.11.1.12.

6.11.2.6 Total loss of access to fishing grounds from the entire array AfL throughout the entire duration of design life results in the magnitude of impact to be considered **major** for UK, Dutch and Belgian demersal trawlers; **major** for German and French demersal trawlers; **major** for Danish industrial demersal trawlers; **minor** for UK, Danish, Norwegian, Swedish and French pelagic trawlers; **negligible** for UK potters and **negligible** for all other fleets.

Sensitivity of the receptor

6.11.2.7 The sensitivity of the commercial fisheries receptors is the same as that presented for construction in paragraphs 6.11.1.15 to 6.11.1.19, summarised as **medium** for UK, Dutch and Belgian demersal trawlers (including otter trawl, beam trawl, pulse trawl and fly shooters), **medium** for UK potters and **low** for all other fleets.

Significance of the effect

6.11.2.8 UK, Dutch and Belgian demersal trawling fleets: overall, it is predicted that the sensitivity of the receptor is considered to be **medium** and the magnitude is deemed to be **major**. The effect will, therefore, be of **moderate** adverse significance, which is significant in EIA terms.

6.11.2.9 French, German and Swedish demersal trawling fleets: overall, it is predicted that the sensitivity of the receptor is considered to be **low** and the magnitude is deemed to be **major**. The effect will, therefore, be of **minor** adverse significance, which is not significant in EIA terms.

6.11.2.10 The Danish sandeel industrial otter trawling fleet: overall, it is predicted that the sensitivity of the receptor is considered to be **low** and the magnitude is deemed to be **major**. The effect will, therefore, be of **minor** adverse significance, which is not significant in EIA terms.

6.11.2.11 Danish, UK, French, Swedish and Norwegian fleets deploying pelagic gear: overall, it is predicted that the sensitivity of the receptor is considered to be **low** and the magnitude is deemed to be **minor**. The effect will, therefore, be of **minor** adverse significance, which is not significant in EIA terms.

6.11.2.12 UK potting fleet: overall, it is predicted that the sensitivity of the receptor is considered to be **medium** and the magnitude is deemed to be **negligible**. The effect will, therefore, be of **minor** adverse significance, which is not significant in EIA terms.

6.11.2.13 All other EU and Norwegian fleets: overall, it is predicted that the sensitivity of the receptor is considered to be **low** and the magnitude is deemed to be **negligible**. The effect will, therefore, be of **negligible** adverse significance, which is not significant in EIA terms.

Further mitigation

6.11.2.14 Floating turbine technology is currently at an early stage of development. The assessment for the reduction in access to, or exclusion from established fishing grounds considers a certain type of floating turbine concept to present the maximum design scenario. There are a range of floating foundations as well as other technologies (such as monopiles and jacket foundations) which will be considered for Hornsea Three. If such alternative technologies were to be used (those foundations that are more 'tried and tested' by the offshore wind industry or alternative floating foundation concepts that had a reduced seabed/water column footprint) or if the spatial extent of deployment of the floating foundation design considered in this assessment was reduced, then it is considered likely that this impact would be reduced because fishing is expected to continue within the Hornsea Three array area once the project is operational.

Physical presence of offshore export cable and infrastructure leading to reduction in access to, or exclusion from established fishing grounds.

6.11.2.15 Temporary 500 m safety zones, that may be established around the HVAC booster stations if major works are required, and advisory safety distances requested around vessels engaged in export cable repair works, could limit fishing opportunities within localised areas.

Magnitude of impact

6.11.2.16 The assessment assumes that fishing will resume within the vicinity of the export cables. Minimum burial depth of the offshore cable is unknown and subject to burial assessment, but it is assumed that where areas of cable protection are not necessary, the cable will be buried to a depth that allows demersal trawling gear to operate.

6.11.2.17 Notices to Mariners will be issued in advance of any maintenance works. Potting vessels may be required to temporarily relocate pots during maintenance works, although such works are likely to be infrequent.

6.11.2.18 The impact is predicted to be of local spatial extent and of short-term duration for the HVAC booster stations and short-term duration for maintenance works that may be required along the offshore export cables. It is predicted that the impact will affect the receptor directly. Given that fishing can resume across the majority of the offshore cable corridor, the magnitude is considered to be **minor** for all fishing fleets.

Sensitivity of the receptor

6.11.2.19 The UK potting fleet are typically < 15 m in length and operate across more distinct areas of ground, typically 0 to 6 nm from shore, but also extending from 6 nm. The UK potting fleet are deemed to be of medium vulnerability, medium recoverability and medium value. The sensitivity of the receptor is therefore, considered to be **medium**.

6.11.2.20 All mobile commercial fisheries fleets are considered to have high availability of alternative fishing grounds (including current focus of effort), and an operational range that is not limited to the offshore cable corridor. All commercial fisheries fleets deploying mobile gear are deemed to be of low vulnerability, high recoverability and medium to low value. The sensitivity of the receptor is therefore, considered to be **low**.

Significance of the effect

6.11.2.21 UK potting fleet: overall, it is predicted that the sensitivity of the receptor is considered to be **medium** and the magnitude is deemed to be **minor**. The effect will, therefore, be of **minor** adverse significance, which is not significant in EIA terms.

6.11.2.22 All other EU and Norwegian fleets: overall, it is predicted that the sensitivity of the receptor is considered to be **low** and the magnitude is deemed to be **minor**. The effect will, therefore, be of **minor** adverse significance, which is not significant in EIA terms.

Displacement from Hornsea Three array area and offshore export cable leading to gear conflict and increased fishing pressure on adjacent grounds.

6.11.2.23 Exclusion from a fishing grounds during operation and maintenance of Hornsea Three may lead to increases in fishing effort in other areas that may already be exploited thereby leading to gear conflict.

Magnitude of impact

6.11.2.24 The magnitude of impact of displacement during the operational and maintenance phase is expected to be the same or similar to that during construction for all commercial fishing fleets deploying mobile demersal or pelagic gear (see paragraphs 6.11.1.53 to 6.11.1.57 and 6.11.1.64 to 6.11.1.69), summarised as **minor** for all demersal trawlers and **negligible** for vessels deploying pelagic gear.

6.11.2.25 Given that potting can resume across the offshore export cable corridor, the magnitude for UK potters is considered to be **minor**.

Sensitivity of the receptor

6.11.2.26 The sensitivity of the commercial fisheries receptors is the same as that presented for construction in paragraphs 6.11.1.58 to 6.11.1.59, summarised as **low** for all fleets deploying mobile gear and **medium** for UK potters.

Significance of the effect

6.11.2.27 All mobile fleets deploying demersal trawl gear: overall, it is predicted that the sensitivity of the receptor is considered to be **low** and the magnitude is deemed to be **minor**. The effect will, therefore, be of **minor** adverse significance, which is not significant in EIA terms.

6.11.2.28 All mobile fleets deploying pelagic gear: overall, it is predicted that the sensitivity of the receptor is considered to be **low** and the magnitude is deemed to be **negligible**. The effect will, therefore, be of **negligible** adverse significance, which is not significant in EIA terms.

6.11.2.29 UK potting fleet: overall, it is predicted that the sensitivity of the receptor is considered to be **medium** and the magnitude is deemed to be **minor**. The effect will, therefore, be of **minor** adverse significance, which is not significant in EIA terms.

Physical presence of Hornsea Three array area leading to gear snagging.

6.11.2.30 The mooring and anchor systems of turbines with floating foundations, together with any structures on the seabed represent potential snagging points for fishing gear and could lead to damage to, or loss of, fishing gear. However, the assessment assumes that fishing would be prevented from within areas of the array area due to the mooring systems that can include up to 12 cables of up to 1 km diameter. The safety aspects including potential loss of life as a result of snagging risk are assessed within chapter 7: Shipping and Navigation.

Magnitude of impact

6.11.2.31 In the instance that snagging does occur, the developer would work to the protocols laid out within the guidance by the FLOWW group and 'Recommendations For Fisheries Liaison: Best Practice' guidance for offshore renewable developers, in particular section 9: Dealing with claims for loss or damage of gear (FLOWW, 2006 and 2014; BERR, 2008).

6.11.2.32 For all demersal trawling fleets (including otter trawl, beam trawl, pulse trawl and fly shooting), the risk of gear snagging includes moorings and anchor systems on the seabed, as well as mooring cable networks within the water column. As such, the risk of snagging exists when towing gear on the seabed, and also when deploying and hauling gear.

6.11.2.33 Snagging poses a risk to fishing equipment and in extreme cases may potentially lead to capsizing of vessel and crew fatalities, as well as damage to subsea infrastructure. Three phases of interaction are possible: initial impact of gear and subsea infrastructure; pullover of gear across subsea infrastructure; and snagging or hooking of gear on the subsea infrastructure. The snagging or hooking phase is the most hazardous to the vessel and crew due to the possibility of capsizing. In addition to snagging and hooking (of fishing gear with infrastructure/cables/anchors on the seabed), the presence of the mooring cables within the water column may lead to a risk of gear entanglement (of fishing gear with cables in the water column).

6.11.2.34 It is considered likely that fishermen would operate appropriately given the higher risk associated with mooring and anchor systems of floating turbines; and are highly likely to avoid the array area entirely. For this reason, the magnitude of gear snagging is considered to be **minor**.

6.11.2.35 The UK potting fleet has minimal effort within the array area and therefore the magnitude to this fleet is considered **negligible**.

Sensitivity of the receptor

6.11.2.36 Due to the nature and operation of mobile trawling gear (i.e., it is actively towed and demersal gear directly penetrates the seabed with near continuous contact) there is increased vulnerability to this impact and the sensitivity is therefore considered to be **medium** for demersal and pelagic fleets.

6.11.2.37 UK potters show a low vulnerability as the gear is placed, not towed and is less likely to penetrate the seabed. The sensitivity of UK potters is considered to be **low**.

Significance of the effect

6.11.2.38 All mobile fleets deploying pelagic and demersal gear: overall, it is predicted that the sensitivity of the receptor is considered to be **medium** and the magnitude is deemed to be **minor**. The effect will, therefore, be of **minor** adverse significance, which is significant in EIA terms.

6.11.2.39 UK potting fleet: overall, it is predicted that the sensitivity of the receptor is considered to be **low** and the magnitude is deemed to be **negligible**. The effect will, therefore, be of **negligible** adverse significance, which is not significant in EIA terms.

Further mitigation

6.11.2.40 Floating turbine technology is currently at an early stage of development. The assessment for the array area leading to snagging considers a certain type of floating turbine concept to present the maximum design scenario. There are a range of floating foundations as well as other technologies (such as monopiles and jacket foundations) which will be considered for Hornsea Three. If such alternative technologies were to be used (those foundations that are more 'tried and tested' by the offshore wind industry or alternative floating foundation concepts that had a reduced seabed/water column footprint) or if the spatial extent of deployment of the floating foundation design considered in this assessment was reduced, then it is considered likely that this impact would be reduced because fishing is expected to continue within the Hornsea Three array area once the project is operational.

Physical presence of the offshore export cable and associated infrastructure leading to gear snagging.

Magnitude of impact

6.11.2.41 Based on the measures that will be implemented as part of the project and the commitment to follow standard protocols should snagging occur, the magnitude is considered to be **negligible** for fleets deploying pelagic gear and **minor** for all other fishing fleets.

Sensitivity of the receptor

6.11.2.42 Due to the nature and operation of mobile demersal trawling gear (i.e., it is actively towed and directly penetrates with near continuous contact with the seabed) there is high vulnerability to this impact and the sensitivity is therefore considered to be **medium**.

6.11.2.43 Fleets deploying pelagic gear have a low vulnerability, as the gear does not normally touch the seabed, as fishing takes place in the water column. The sensitivity of pelagic fleets is considered to be **low**.

6.11.2.44 UK potters show a low vulnerability as the gear is placed, not towed and is less likely to penetrate the seabed. The sensitivity of UK potters is considered to be **low**.

Significance of the effect

6.11.2.45 All mobile fleets deploying demersal gear: overall, it is predicted that the sensitivity of the receptor is considered to be **medium** and the magnitude is deemed to be **minor**. The effect will, therefore, be of **minor** adverse significance, which is significant in EIA terms.

6.11.2.46 All mobile fleets deploying pelagic gear: overall, it is predicted that the sensitivity of the receptor is considered to be **low** and the magnitude is deemed to be **negligible**. The effect will, therefore, be of **negligible** adverse significance, which is significant in EIA terms.

6.11.2.47 UK potting fleet: overall, it is predicted that the sensitivity of the receptor is considered to be **low** and the magnitude is deemed to be **minor**. The effect will, therefore, be of **minor** adverse significance, which is not significant in EIA terms.

Electromagnetic fields, habitat alteration, noise and other ecological impacts due to operational and maintenance activities leading to displacement or disruption of commercially important fish and shellfish resources.

6.11.2.48 Displacement or disturbance of commercially important fish and shellfish resources may occur during the operational phase due to a range of impacts brought on by the physical presence and operation of the project, including long-term habitat alterations and potential EMF effects.

6.11.2.49 Long-term changes to benthic habitat due to rock protection at certain locations along the offshore cable route corridor, cables within the Hornsea Three array area and turbine foundations may affect spawning and nursery grounds, most notably for demersal spawners.

6.11.2.50 Other ecological effects, such as the creation of artificial habitat and the potential for the Hornsea Three array area to act as a refuge for commercially important fish and shellfish species, are considered within the assessment carried out in chapter 3: Fish and Shellfish Ecology.

Magnitude of impact

- 6.11.2.51 A detailed assessment of EMF interactions with fish and shellfish is presented within chapter 3: Fish and Shellfish Ecology.
- 6.11.2.52 As described in chapter 3: Fish and Shellfish Ecology, EMF during operation would be mitigated by use of armoured cable for array, platform inter-connector, accommodation platform inter-connector and export cables buried at a sufficient depth to reduce the potential impact of EMF on fish and shellfish.
- 6.11.2.53 With the exception of elasmobranchs, no experiments have highlighted significant concerns and the magnitude of impact of EMFs is generally considered to be **low** for most marine organisms (Switzer and Meggitt, 2010; Polagye, *et al.*, 2011). Evidence from post construction surveys of Round 1 wind farms (Kentish Flats, Lynn and Inner Dowsing, Burbo Bank and Barrow) show no significant effects to fish populations as a result of EMF.
- 6.11.2.54 Elasmobranchs do not form a targeted fishery in this area, and are not taken in significant quantities as retained species by the fleets in operation across the offshore cable or Hornsea Three array area boundaries.
- 6.11.2.55 Another industry concern raised was the potential for an increase in ray abundance due to attraction to EMF leading to increased predation on juvenile crab and lobster. Chapter 3: Fish and Shellfish Ecology reviews research into responses of some ray individuals, which suggest greater searching effort when cables are switched on, although responses were not predictable and did not always occur (Gill *et al.*, 2009).
- 6.11.2.56 The permanent habitat loss due to the installation of foundations, scour protection and cable protection leads to the loss of seabed habitats during the operation of Hornsea Three array area will result in a reduction of potential spawning habitat available to a number of commercial species including, sole, plaice, sandeel, mackerel and cod. The breakdown of potential habitat lost per species is presented in chapter 3: Fish and Shellfish Ecology, together with a full assessment of this impact.
- 6.11.2.57 The magnitude of disruption or displacement of commercially important species during operation is considered to be **minor**.

Sensitivity of the receptor

- 6.11.2.58 For UK potters the sensitivity is considered to be **medium**, based on their reliance on grounds across the offshore cable corridor. The sensitivity of all other fleets to the displacement of resources is considered **low**, based on the range of alternative areas available and the distribution of key commercial species throughout the central and southern North Sea.

Significance of the effect

- 6.11.2.59 All mobile fleets: overall, it is predicted that the sensitivity of the receptor is considered to be **low** and the magnitude is deemed to be **negligible**. The effect will, therefore, be of **negligible** adverse significance, which is not significant in EIA terms.
- 6.11.2.60 UK potting fleet: overall, it is predicted that the sensitivity of the receptor is considered to be **medium** and the magnitude is deemed to be **minor**. The effect will, therefore, be of **minor** adverse significance, which is not significant in EIA terms.

Physical presence of Hornsea Three array and offshore export cable leading to additional steaming to alternative fishing grounds for vessels that would otherwise be fishing within the array and export cable areas.

- 6.11.2.61 A detailed Navigational Risk Assessment has been undertaken within chapter 7: Shipping and Navigation, which includes full consideration of commercial fishing vessels while transiting (e.g. from a collision and allision perspective). This assessment focuses on the potential impact of longer steaming distances to alternative fishing grounds during operation and maintenance.

Magnitude of impact

- 6.11.2.62 The impact is predicted to be of regional spatial extent, of relevance to international fishing fleets, and of long-term duration. It is predicted that the impact will affect the receptor directly.
- 6.11.2.63 During the operation and maintenance phase, it is expected that fishing will resume across the offshore export cable and, as such, additional steaming will not be necessary. A shipping corridor will be maintained (immediately west of Hornsea Three array area) to allow steaming to grounds north of Hornsea Three (namely to Dogger Bank). Although, it should be noted that commercial fisheries will not be restricted to these lanes. The magnitude is therefore, considered to be **negligible** for all fishing fleets.

Sensitivity of the receptor

- 6.11.2.64 The sensitivity of commercial fishing fleets to this impact is expected to be the same or similar to that for construction (see paragraph 6.11.1.92 to 6.11.1.94) and is **low** for all fleets.

Significance of the effect

- 6.11.2.65 All commercial fishing fleets: overall, it is predicted that the sensitivity of the receptor is considered to be **low** and the magnitude is deemed to be **negligible**. The effect will, therefore, be **negligible**, which is not significant in EIA terms.

Increased vessel traffic within fishing grounds as a result of changes to shipping routes and maintenance vessel traffic from Hornsea Three array area and offshore export cable infrastructure leading to interference with fishing activity.

- 6.11.2.66 The effects of the operational and maintenance phase are expected to be the same or similar to the effects from construction. The significance of effect is therefore **negligible** adverse for pelagic fleets and **minor** adverse for all other commercial fishing fleets (see paragraph 6.11.1.96 to 6.11.1.106), which is not significant in EIA terms.

6.11.3 Decommissioning phase

- 6.11.3.1 The impacts of the offshore decommissioning of Hornsea Three have been assessed on commercial fisheries. The environmental effects arising from the decommissioning of Hornsea Three are listed in Table 6.7 along with the maximum design scenario against which each decommissioning phase impact has been assessed.

- 6.11.3.2 A description of the potential effect on commercial fisheries receptors caused by each identified impact is given below.

Hornsea Three array area decommissioning activities leading to reduction in access to, or exclusion from, potential and/or established fishing grounds.

- 6.11.3.3 The effects of decommissioning activities are expected to be the same or similar to the effects from construction. The significance of effect is therefore **moderate** for UK, Dutch and Belgian demersal trawl fleets, which is significant in EIA terms, and **minor** for all other commercial fishing fleets (see paragraph 6.11.1.3 to 6.11.1.25), which is not significant in EIA terms.

Further mitigation

- 6.11.3.4 Floating turbine technology is currently at an early stage of development. The assessment for the array area leading to snagging considers a certain type of floating turbine concept to present the maximum design scenario. There are a range of floating foundations as well as other technologies (such as monopiles and jacket foundations) which will be considered for Hornsea Three. If such alternative technologies were to be used (those foundations that are more 'tried and tested' by the offshore wind industry or alternative floating foundation concepts that had a reduced seabed/water column footprint) or if the spatial extent of deployment of the floating foundation design considered in this assessment was reduced, then it is considered likely that this impact would be reduced because fishing is expected to continue within the Hornsea Three array area once the project is operational.

Offshore export cable decommissioning activities leading to reduction in access to, or exclusion from, potential and/or established fishing grounds.

- 6.11.3.5 The effects of decommissioning activities are expected to be the same or similar to the effects from construction. The significance of effect is therefore **moderate** for the UK potting fleet, which is significant in EIA terms, and **negligible** for pelagic fleets and **minor** for all other commercial fishing fleets (see paragraph 6.11.1.27 to 6.11.1.50), which is not significant in EIA terms.

Further mitigation

- 6.11.3.6 UK potting fleet: with respect to any justifiable disturbance payment, the procedures as outlined in the FLOWW guidance documents (2014 and 2015), will be followed wherever possible. The residual effect will, therefore, be of **minor** adverse significance, which is not significant in EIA terms.

Displacement from Hornsea Three array area leading to gear conflict and increased fishing pressure on adjacent grounds.

- 6.11.3.7 The effects of decommissioning activities are expected to be the same or similar to the effects from construction. The significance of effect is therefore **minor** for the UK potting fleet, negligible for pelagic fleets and **minor** for all other commercial fishing fleets (see paragraph 6.11.1.52 to 6.11.1.62), which is significant in EIA terms.

Displacement from the offshore export cable leading to gear conflict and increased fishing pressure on adjacent grounds.

- 6.11.3.8 The effects of decommissioning activities are expected to be the same or similar to the effects from construction. The significance of effect is therefore **minor** for the UK potting fleet, which is significant in EIA terms, and **negligible** for pelagic fleets and **minor** for all other commercial fishing fleets (see paragraph 6.11.1.63 to 6.11.1.73), which is not significant in EIA terms.

Decommissioning activities leading to displacement or disruption of commercially important fish and shellfish resources.

- 6.11.3.9 The effects of decommissioning activities are expected to be the same or similar to the effects from construction. The significance of effect is **minor** for the UK potting fleet, which is significant in EIA terms, and **negligible** for pelagic fleets and **minor** for all other commercial fishing fleets (see paragraph 6.11.1.74 to 6.11.1.88), which is not significant in EIA terms.

Decommissioning activities leading to longer steaming distances to alternative fishing grounds.

- 6.11.3.10 The effects of the decommissioning phase are expected to be the same or similar to the effects from construction. The significance of effect is therefore **negligible** for pelagic fleets and **minor** adverse for all other commercial fishing fleets (see paragraph 6.11.1.89 to 6.11.1.95), which is not significant in EIA terms.

Increased vessel traffic, including Hornsea Three array area related and changes in shipping routes, leading to interference with fishing activity.

6.11.3.11 The effects of the operational and maintenance phase are expected to be the same or similar to the effects from construction. The significance of effect is therefore **negligible** adverse for pelagic fleets and **minor** adverse for all other commercial fishing fleets (see paragraph 6.11.1.96 to 6.11.1.106), which is not significant in EIA terms.

Physical presence of any infrastructure left in situ leading to gear snagging.

6.11.3.12 The effects of decommissioning activities are expected to be the same or similar to the effects from operation phase of the offshore cable corridor. The significance of effect is **negligible** adverse for pelagic fleets and **minor** adverse for all other commercial fishing fleets (see paragraph 6.11.2.41 to 6.11.2.47), which is not significant in EIA terms.

6.12 Cumulative Effect Assessment methodology

6.12.1 Screening of other projects and plans into the Cumulative Effect Assessment

6.12.1.1 The Cumulative Effect Assessment (CEA) takes into account the impact associated with Hornsea Three together with other projects and plans. The projects and plans selected as relevant to the CEA presented within this chapter are based upon the results of a screening exercise undertaken as part of the 'CEA long list' of projects (see annex 4.5: Cumulative Effects Screening Matrix and Location of Schemes). Each project on the CEA long list has been considered on a case-by-case basis for scoping in or out of this chapter's assessment based upon data confidence, effect-receptor pathways and the spatial/temporal scales involved.

6.12.1.2 In undertaking the CEA for Hornsea Three, it is important to bear in mind that other projects and plans under consideration will have differing potential for proceeding to an operational stage and hence a differing potential to ultimately contribute to a cumulative impact alongside Hornsea Three. For example, relevant projects and plans that are already under construction are likely to contribute to cumulative impact with Hornsea Three (providing effect or spatial pathways exist), whereas projects and plans not yet approved or not yet submitted are less certain to contribute to such an impact, as some may not achieve approval or may not ultimately be built due to other factors. For this reason, all relevant projects and plans considered cumulatively alongside Hornsea Three have been allocated into 'Tiers', reflecting their current stage within the planning and development process. This allows the CEA to present several future development scenarios, each with a differing potential for being ultimately built out. Appropriate weight may therefore be given to each Tier in the decision making process when considering the potential cumulative impact associated with Hornsea Three (e.g. it may be considered that greater weight can be placed on the Tier 1 assessment relative to Tier 2). An explanation of each tier is included below:

- Tier 1: Hornsea Three considered alongside other project/plans currently under construction and/or those consented but not yet implemented, and/or those submitted but not yet determined and/or those currently operational that were not operational when baseline data was collected, and/or those that are operational but have an on-going impact;
- Tier 2: All projects/plans considered in Tier 1, as well as those on relevant plans and programmes likely to come forward but that have not yet submitted an application for consent (the PINS programme of projects is the most relevant source of information). Specifically, this Tier includes all projects where the developer has submitted a Scoping Report; and
- Tier 3: All projects/plans considered in Tier 2, as well as those on relevant plans and programmes likely to come forward but that have not yet submitted an application for consent (the PINS programme of projects is the most relevant source of information). Specifically, this Tier includes all projects where the developer has advised PINS in writing that they intend to submit an application in the future but have not submitted a Scoping Report.

6.12.1.3 It is noted that Tier 1 includes projects, plans and activities that are operational, under construction, consented but not yet implemented and submitted but not yet determined. The certainty associated with other projects, plans and activities, in terms of the scale of the development and the likely impacts, increase as they progress from submitted applications to operational projects. In particular, offshore wind farms seek consent for a maximum design scenario and the as built offshore wind farm will be selected from the range of consented scenarios. In addition, the maximum design scenario quoted in the application (and the associated Environmental Statement) are often refined during the determination period of the application. For example, it is noted that the Applicant for Hornsea Project One has gained consent for an overall maximum number of turbines of 240, as opposed to 332 considered in the Environmental Statement. Similarly, Hornsea Project Two has gained consent for an overall maximum number of turbines of 300, as opposed to 360 considered in the Environmental Statement.

6.12.1.4 It should be noted that the CEA presented in this commercial fisheries chapter has been undertaken on the basis of information presented in the Environmental Statements for the other projects, plans and activities. The level of impact on commercial fisheries would likely be reduced from those presented here. In addition, Hornsea Three is currently considering how the different levels of certainty associated with projects in Tier 1 can be reflected in the CEA and an update, in terms to the approach to tiering, will be presented in the Environmental Statement.

6.12.1.5 The specific projects scoped into this CEA and the Tiers into which they have been allocated, are outlined in Table 6.13. The projects included as operational in this assessment have been commissioned since the baseline studies for this project were undertaken and as such were excluded from the baseline assessment. The projects included in Tiers 1, 2 and 3 are depicted graphically in Figure 6.19 to Figure 6.22.

Table 6.13: List of other projects and plans considered within the CEA.

Tier	Phase	Project/Plan	Distance from Hornsea Three array area	Distance from Hornsea Three offshore cable corridor	Details	Date of Construction (if applicable)	Overlap of construction phase with Hornsea Three construction phase	Overlap of operation phase with Hornsea Three operation phase
<i>Offshore wind farms</i>								
	Consented, or being Constructed or in Operation and Maintenance phase or being Decommissioned	Belgium: Norther, Rentel Area A, Seastar Denmark: Horns Rev 3, Vesterhavet Nord, Vesterhavet Syd Germany: Aiolos, Albatros, AreaC I, AreaC II, AreaC III, Austerngrund, Bight, Power I, Borkum Riffgrund 2, Demonstrationsprojekt Albatros 1, Deutsche, BuchtOffshore Wind Farm, Kaikas, Kaskasi II, MEG Offshore I (now Merkur Offshore Wind Farm), Noerdlicher Grund, Nordgeruende, OWP Delta Nordsee 1, OWP Delta Nordsee 2, OWP West, Petrel, PNE Atlantis I, Sandbank 24, Sandbank Extension, Trianel Windpark Borkum (Borkum West II) Phase 2 Netherlands: Borssele 1 and 2, Borssele 3 and 4, Leegwater - Turbine Demonstration Facility, Windpark Fryslan UK: Aberdeen Demo, Blyth Demo, Burbo Bank Extension, Dogger Bank Creyke Beck A, Dogger Bank Creyke Beck B, Dogger Bank Teesside A & B, Dudgeon, East Anglia ONE, East Anglia Three, Galloper, Hornsea Project One, Hornsea Project Two, Hywind Scotland Pilot Park, Inch Cape, Neart na Gaoithe, Race Bank, Rampion Wind Farm, SeaGreen Alpha, SeaGreen Bravo, Triton Knoll, Walney Extension.	14 – 448 km	17 to 472 km	Capacity up to 26 GW	-	Yes	Yes
<i>Oil and gas infrastructure</i>								
1	Construction/ Decommissioning	UK: Gas Field - Production Ceased: Aberdonia Gas Field, Artemis Gas Field, Beaufort Gas Field, Breach Gas Field, Camelot Central North East Gas Field, Camelot Central North Gas Field, Camelot Central South Gas Field, Dawn Gas Field, Deben Gas Field, Esmond Gas Field, Forbes Gas Field, Gordon Gas Field, Hawksley Gas Field, Orwell Gas Field, Tristan Gas Field, Tristan North West Gas Field, Watt Gas Field, Welland North West Gas Field, Welland South Gas Field. Gas Field – Under development: Cygnus Gas Field, Lemen South Gas Field, Viking A Gas Field. Netherlands: Gas Field - Production ceased: D15-A Gas Field, D15-A-104 Gas Field, Halfweg Gas Field, K05-G Gas Field, K05a-Es Gas Field, K06-N Gas Field, K06-T Gas Field, K12-C Gas Field, L07-H South-East Gas Field, L07-N Gas Field, L09-FC Gas Field, L10-S2 Gas Field, L10-S4 Gas Field, L11b-A Gas Field, L13-FB Gas Field, Logger Olie Field, P09-B Gas Field, P12-SW Gas Field, P15-10 Gas Field, P15-14 Gas Field, P15-15 Gas Field, P15-16 Gas Field Oil Field - Production ceased: Kotter Olie Field.	21 to 174 km	34 to 176 km	Gas and oil fields where production has ceased and decommissioning is therefore anticipated	-	Yes	Yes

Tier	Phase	Project/Plan	Distance from Hornsea Three array area	Distance from Hornsea Three offshore cable corridor	Details	Date of Construction (if applicable)	Overlap of construction phase with Hornsea Three construction phase	Overlap of operation phase with Hornsea Three operation phase
<i>Pipelines</i>								
	Construction/ Maintenance/ Decommissioning	Netherlands: Under construction: PL0219_PR K4-Z to K5-A, PL0219_UM K4-Z to K5-A UK: Precommission: PL2236 - MIMAS TO SATURN, PL2237 - SATURN TO MIMAS, PL2894 - KATY TO KELVIN GAS EXPORT PIPELINE, PL2895 - KELVIN TO KATY METHANOL PIPELINE, PL3086 - CYGNUS A TO CYGNUS B GAS PIPELINE, PL3088 - CYGNUS TO ETS GAS PIPELINE, PL3121 - JULIET TO PICKERILL A GAS PIPELINE, PLU3122 - JULIET TO PICKERILL A UMBILICAL	20 to 80 km	22 to 78 km	Under construction and pre-commission pipelines	-	Yes	Yes
<i>Marine designations and protected areas</i>								
	Designated	60 UK designated MCZs of total area 20,450 km ² 10 UK Sites of Community Importance (SCIs) with marine components, of total area 21,947 km ² 22 UK SACs with marine components, of total area 4,821 km ² 51 SPAs with marine components, of total area 6,803 km ²	12 km	0 km	Nature designated areas within the North Sea and English Channel	-	Yes	Yes
<i>Offshore wind farms</i>								
	Scoping submitted	UK: Norfolk Boreas, Kincardine Offshore Wind Farm, Methil Demonstration Project - 2B Energy, Seagreen Charlie, Seagreen Delta, Seagreen Echo, Seagreen Foxtrot, Seagreen Golf Belgium: Northwester 2	112 to 422 km	78 to 438 km	Capacity up to 5.3 GW	-	Yes	Yes
<i>Marine designations and protected areas</i>								
2	Recommended, potential or candidate designations	58 UK recommended MCZs of total area 18,394 km ² 1 English candidate SAC of total area 36,950 km ² 8 English potential SPAs of total area 5,771 km ²	0 km	0 km	Recommended, potential or candidate designations within the North Sea and English Channel	-	Yes	Yes
<i>Pipelines and/or interconnectors</i>								
	Scoping submitted	Viking Link Interconnector	13 km	18 km	High voltage (up to 500 kV) Direct Current (DC) electricity interconnector	-	Yes	Yes

Tier	Phase	Project/Plan	Distance from Hornsea Three array area	Distance from Hornsea Three offshore cable corridor	Details	Date of Construction (if applicable)	Overlap of construction phase with Hornsea Three construction phase	Overlap of operation phase with Hornsea Three operation phase	
<i>Offshore wind farms</i>									
3	Pre-scoping and/or pre-planning and unknown whether a scoping report has been submitted.	Denmark: Nissum Bredning France: Le Treport Germany: Borkum-Riffgrund West II, Concordia I, Concordia II, Diamant, Horizont I, Horizont II, Horizont III, Horizont IV, Meerwind West, Nautilus I, Nemo, Neptune III, Nord-Ost Passat I, Nord-Ost Passat II, Nord-Ost Passat III, PNE Atlantis II, PNE Atlantis III, Prowind I, Seagull, SeaStorm I, SeaStorm II, SeaWind III, SeaWind IV, Skua, Witte Bank Netherlands: Zeeuws Offshore Wind Project UK: East Anglia One North, East Anglia TWO, Norfolk Vanguard	94 to 461 km	91 to 485 km	Capacity up to 15 GW	-	Yes	Yes	
	<i>Oil and gas infrastructure</i>								
	Undeveloped discovery wells	Netherlands: Gas Discovery Well - Undeveloped: A15-A Gas Field, D15 Tourmaline Gas Field, F16-P Gas Field, K09c-B Gas Field, L05a-D Gas Field, L07-F Gas Field, L08-I Gas Field, L10-19 Gas Field, L11-7 Gas Field, L11-Gillian Gas Field, L12-FA Gas Field, L13-FI Gas Field, M01-A Gas Field, M10-FA Gas Field, M11-FA Gas Field, P11a-E Gas Field, P11b Van Ghent East Gas Field, P11b Witte de With Gas Field, Q07-FA Gas Field Oil Discovery Well - Undeveloped: F17-NE (Rembrandt) Olie Field, L05a-E Olie Field, P08-A Horizon-West Olie Field, Q01-Northwest Olie Field	34 to 169 km	60 to 185 km	Undeveloped discovery wells (production start expected within 5 years)	-	Yes	Yes	
<i>Pipelines</i>									
Proposed	Netherlands: Proposed: PL0221_HS D18-A to D15-FA-1, PL0221_PR D18-A to D15-FA-1 UK: Proposed: PLU3087 - CYGNUS A TO CYGNUS B UMBILICAL	10 to 65 km	45 to 70 km	Proposed pipelines	-	Yes	Yes		

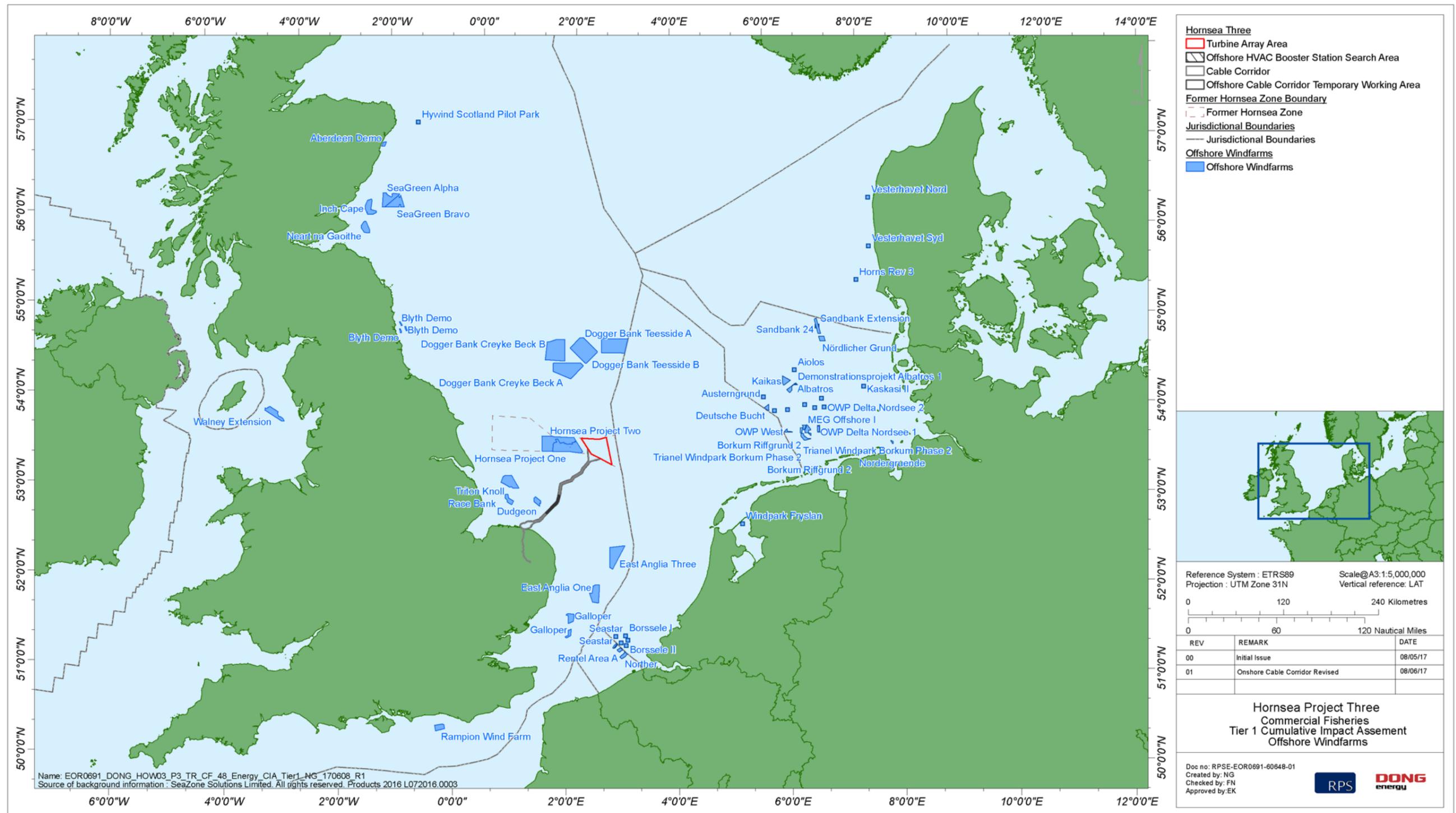


Figure 6.19: Offshore renewable energy projects included in the Tier 1 cumulative effects assessment.

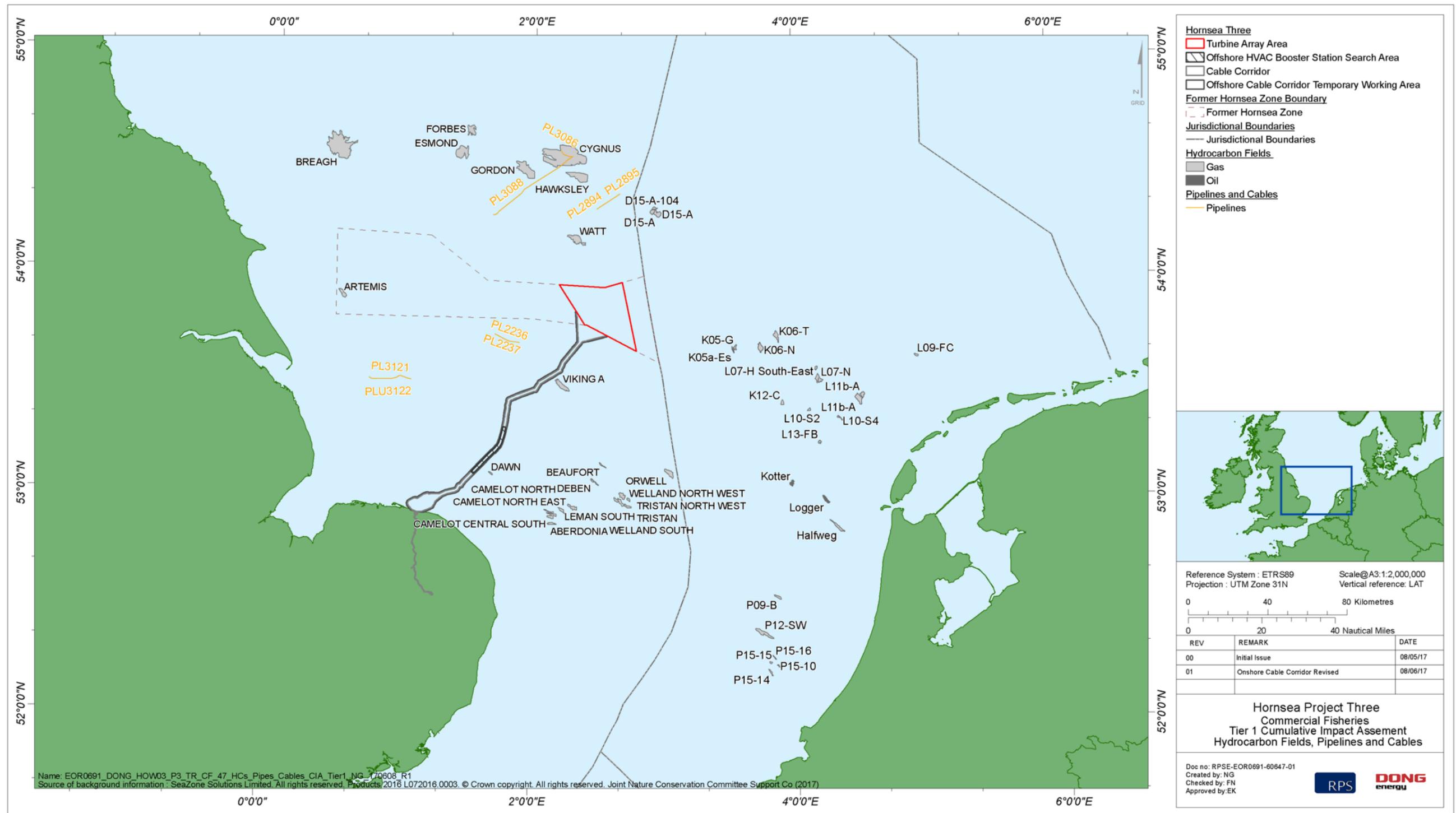


Figure 6.20: Oil and gas, cables and pipeline projects included in the Tier 1 cumulative effects assessment.

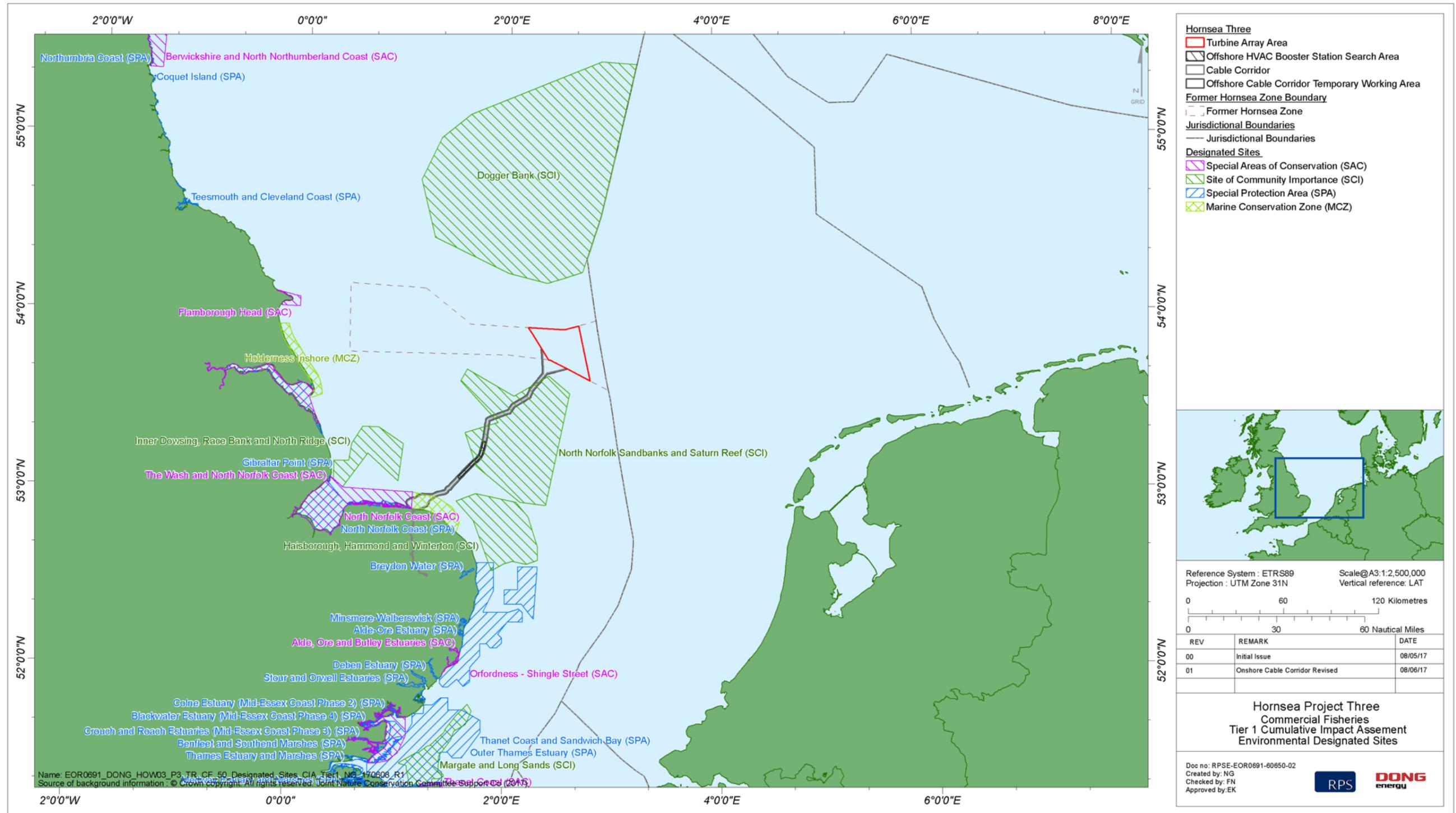


Figure 6.21: Marine designations included in the Tier 1 cumulative effects assessment.

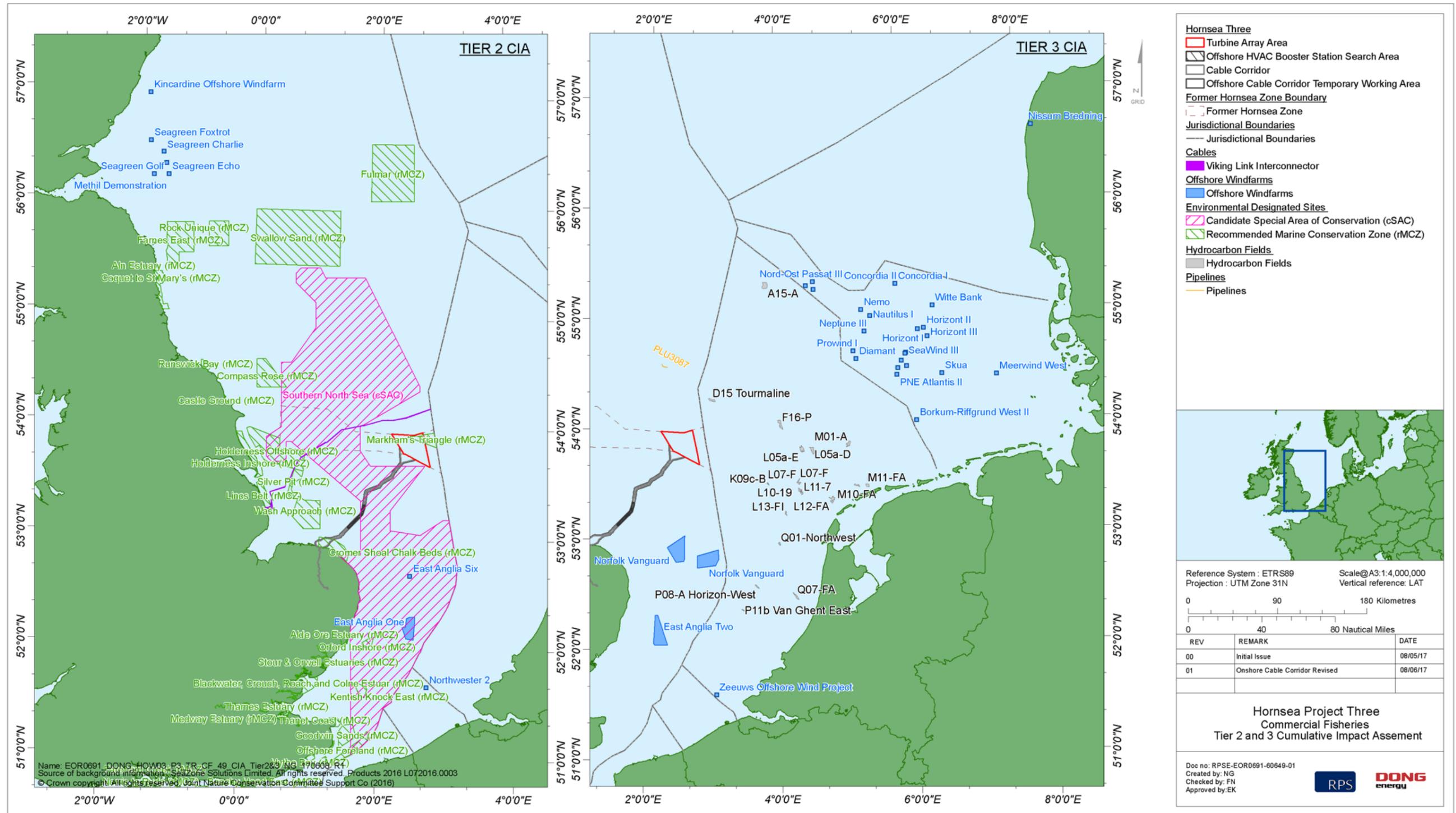


Figure 6.22: Projects included in the Tier 2 and Tier 3 cumulative effects assessments.

6.12.2 Maximum design scenario

6.12.2.1 The maximum design scenarios identified in Table 6.14 have been selected as those having the potential to result in the greatest effect on an identified receptor or receptor group. The cumulative impacts presented and assessed in this section have been selected from the details provided in the Hornsea Three project description (volume 1, chapter 3: Project Description), as well as the information available on other projects and plans, in order to inform a 'maximum design scenario'. Effects of greater adverse significance are not predicted to arise should any other development scenario, based on details within the project Design Envelope (e.g. different turbine size), to that assessed here be taken forward in the final design scheme.

6.13 Cumulative Effect Assessment

6.13.1.1 A description of the significance of cumulative effects upon commercial fisheries receptors arising from each identified impact is given below.

6.13.1.2 The CEA for commercial fisheries assesses cumulative effects for all fishing fleets considered within the EIA for Hornsea Three. The majority of the impacts identified within the EIA are taken forward for assessment at a cumulative level, with the exception of gear snagging and increased vessel traffic which are not considered to be cumulative effects, but specific to individual projects.

6.13.2 Construction phase

6.13.2.1 The CEA for the construction phase is consistent with the operation and maintenance assessment below.

6.13.3 Operation and maintenance phase

Cumulative effects of reduction in access to, or exclusion from, potential and/or established fishing grounds.

Tier 1

Magnitude of impact

6.13.3.1 The magnitude of impact of gas and oil fields that have ceased production is considered to be **minor** to all fishing fleets based on the expected time-frame for decommissioning activities and the potential for fishing grounds to be gained based on the cessation of any related safety zones.

6.13.3.2 In relation to offshore wind farms, Dudgeon and Race Bank have the most potential to result in a cumulative impact for the North Norfolk UK potting fleet due to the location of these wind farms and the grounds targeted by the potting fleet, while all other wind farms are expected to have a **negligible** to **minor** magnitude of impact to this fleet.

Table 6.14: Maximum design scenario considered for the assessment of potential cumulative impacts on commercial fisheries.

Potential impact	Maximum design scenario	Justification
Construction phase		
Cumulative effects of reduction in access to, or exclusion from, potential and/or established fishing grounds.	Tier 1 <ul style="list-style-type: none"> 53 offshore wind farm developments of potential combined capacity of 26 GW within the following EEZs: UK: 20, Germany: 23, Netherlands: 4, Denmark:3, Belgium: 3 41 gas fields with ceased production (and therefore decommissioning activities expected) 3 gas fields under development 1 oil field with ceased production (and therefore decommissioning activities expected) 8 pipelines precommission in UK EEZ; 2 pipelines under construction In Netherlands EEZ 60 UK designated MCZs of total area 20,450 km² 10 UK SCIs with marine components, of total area 21,947 km² 22 UK SACs with marine components, of total area 4,821 km² 51 SPAs with marine components, of total area 6,803 km² Tier 2 <ul style="list-style-type: none"> 12 UK offshore wind farms of combined capacity of 5.3 GW 1 Belgium offshore wind farm 1 pipeline interconnector 58 UK recommended MCZs of total area 18,394 km² 1 English candidate SAC of total area 36,950 km² 8 English potential SPAs of total area 5,771 km² Tier 3 <ul style="list-style-type: none"> 30 offshore wind farm developments of potential combined capacity of 15 GW within the following EEZs: UK: 1, Germany: 25, Netherlands: 1, Denmark: 1, Belgium: 1, France: 1. 19 gas discovery wells (undeveloped with production expected within 5 years) 4 oil discovery wells (undeveloped with production expected within 5 years) 3 proposed pipelines including 2 in Netherlands EEZ and 1 in UK EEZ. 	Outcome of the CEA will be greatest when the greatest number of other schemes, present or planned, are considered.
Cumulative effects of displacement leading to gear conflict and increased fishing pressure on alternative grounds.		
Cumulative effects of longer steaming distances to alternative fishing grounds.		
Cumulative effects of changes in shipping routes, leading to interference with fishing activity.		
Operation phase		
As per construction	As per construction	As per construction
Decommissioning phase		
As per construction	As per construction	As per construction

- 6.13.3.3 Dudgeon is located 11 km and Race Bank is located 28 km from Hornsea Three offshore cable corridor. Environmental Statements confirm activity by North Norfolk potting fleets across the wind farm boundaries and offshore cable routes. However, the impacts are assessed as minor on account of the opportunity for co-existence of potting fisheries within the wind farms. The magnitude of the cumulative impact is therefore assessed as being **minor**.
- 6.13.3.4 In relation to all other fleets (including UK, Dutch, Danish, French, Belgian, Norwegian, Swedish and German demersal and/or pelagic otter trawlers, fly shooters and/or beam trawlers) the following wind farms have the most potential to result in a cumulative impact due to the location of the wind farms and the grounds targeted and/or operational range of the fishing fleets: (from south to north) Galloper, East Anglia One, Triton Knoll, Race Bank, Dudgeon, Hornsea Project One, Hornsea Project Two, Dogger Bank Creyke Beck A & B, Dogger Bank Teesside A & B. Based on the available evidence, including VMS data provided by the MMO, all other wind farms are expected to have a low to negligible magnitude of impact for these fleets.
- 6.13.3.5 Based on available Environmental Statements (DONG Energy, 2014; FOREWIND, 2013a; FOREWIND, 2013b; RWE npower renewables, 2003; ScottishPower Renewables and Vattenfall, 2012; SMartWind, 2013; SMartWind, 2015), it is understood that these offshore wind farms are considered to represent effects within a range of minor to moderate adverse significance to demersal trawl commercial fisheries and negligible to minor for pelagic fleets. This is due to fishing not being excluded within the operational wind farms, together with commitment to follow FLOWW guidance (2008 and 2014). As such a **minor** magnitude is assessed for these fleets.
- 6.13.3.6 The impact of the designated Cromer Shoal MCZ on the UK potting fleet has been considered. It is understood that the current level of effort by the potting fleet is unlikely to cause detrimental effects to the status of this MCZ. This does not eliminate the possibility of management measures being introduced in the future to limit effort to current levels. As such a **minor** magnitude is assessed for this fleet.
- 6.13.3.7 The impact is predicted to be of international spatial extent, medium to long-term duration, continuous and medium reversibility. It is predicted that the impact will affect the receptor directly. The magnitude, combined with the EIA for Hornsea Three is therefore, considered to be **moderate** for all demersal trawling fleets and **minor** for all pelagic trawling fleets and the UK potting fleet.

Sensitivity of receptor

- 6.13.3.8 UK, Dutch, Danish, French, German and Belgian demersal trawlers (including otter trawl, beam trawl, pulse trawl and fly shooting) are known to fish within areas overlapping Round 2 and 3 developments. It is noted that these fleets also operate across most of the North Sea ICES Divisions 4b and 4c. Overall these fleets are considered to be vulnerable to cumulative impacts of exclusion from developed areas as the opportunities and options for fishing current and future alternative grounds are reduced. Demersal fisheries fleets are deemed to be of medium vulnerability, medium recoverability and high value. The sensitivity of the receptor is therefore, considered to be **medium**.
- 6.13.3.9 The Danish and Norwegian pelagic trawlers target wide areas throughout the North Sea when fishing for pelagic, water-column dwelling species including herring and sprat, and are not known to specifically target the Hornsea Three area. Pelagic fisheries fleets are deemed to be of low vulnerability, high recoverability and high value. The sensitivity of the receptor is therefore, considered to be **low**.
- 6.13.3.10 The operating range of UK potters is more limited than the UK and European trawling fleets due to the size and power of the vessels. The UK potters may therefore be more sensitive to reduced access to Round 2 sites. The UK potting fleet is deemed to be of medium vulnerability, medium recoverability and medium value. The sensitivity of the receptor is therefore, considered to be **medium**.
- 6.13.3.11 All other commercial fisheries fleets are deemed to be of low vulnerability, high recoverability and medium value. The sensitivity of all other commercial fisheries receptors is therefore, considered to be **low**.

Significance of Effect

- 6.13.3.12 For all demersal trawlers, overall, it is predicted that the sensitivity of the receptor is considered to be **medium** and the magnitude is deemed to be **major**. The cumulative effect will, therefore, be of **moderate** adverse significance, which is significant in EIA terms.
- 6.13.3.13 For all pelagic trawlers, overall, it is predicted that the sensitivity of the receptor is considered to be **low** and the magnitude is deemed to be **minor**. The cumulative effect will, therefore, be of **minor** adverse significance, which is not significant in EIA terms.
- 6.13.3.14 For all potting vessels, overall, it is predicted that the sensitivity of the receptor is considered to be medium and the magnitude is deemed to be **minor**. The cumulative effect will, therefore, be of **minor** adverse significance, which is not significant in EIA terms.

Tier 2

Magnitude of impact

- 6.13.3.15 The additional 12 UK and 1 Belgium offshore wind farms are not expected to increase the magnitude of the cumulative impact assessed for Tier 1, based on the locations of these wind farms.

6.13.3.16 Two designations are of particular importance to commercial fisheries under the Tier 2 cumulative assessment: the recommended Markhams Triangle MCZ and the candidate Southern North Sea SAC.

6.13.3.17 Markhams Triangle rMCZ covers an area of 200 km², and overlaps with the Hornsea Three array area. The proposed features of the Markhams Triangle rMCZ relate to the broad-scale habitats of subtidal coarse sediment and subtidal sand (Green and Cooper, 2014).

6.13.3.18 The Southern North Sea cSAC is located 2 km from the Hornsea Three array area and overlaps the offshore export cable corridor; it covers an area of 36,951 km² and is the largest cSAC in UK and European waters. It is identified as an area of importance for harbour porpoise *Phocoena phocoena*, including key winter and summer habitat for this species (JNCC, 2017). The conservation objective is to avoid deterioration of the habitats of the harbour porpoise or significant disturbance to the harbour porpoise.

6.13.3.19 The objective for these proposed/recommended designations is to maintain the integrity of the sites and identified features. There is uncertainty as to whether management measures would be implemented in relation to commercial fisheries operating within these sites. Where management measures are required, it is Defra's policy that:

- Both regulatory and non-regulatory mechanisms should be investigated (e.g. voluntary agreements);
- Management measures with the least social and economic impact should be implemented where effective in meeting conservation objectives (e.g. gear adaptations or seasonal closures rather than area closures); and
- Management measures should be proportionate to the conservation objectives of the feature (e.g. permit schemes rather than area closures).

6.13.3.20 However, given the uncertainty of the scale of any management measure implemented to maintain the status of the rMCZ and cSAC, a **moderate** magnitude for demersal trawlers is assessed. This combined with the EIA for Hornsea Three is therefore, considered to be **major** for all demersal trawling fleets targeting flatfish and mixed demersal species.

6.13.3.21 The assessment for UK potters, pelagic gear and all other fleets is consistent with Tier 1.

Sensitivity of receptor

6.13.3.22 The sensitivity of receptors is consistent with the Tier 1 assessment for all fishing fleets.

Significance of Effect

6.13.3.23 For all demersal trawlers, overall, it is predicted that the sensitivity of the receptor is considered to be **medium** and the magnitude is deemed to be **major**. The cumulative effect will, therefore, be of **major** adverse significance, which is significant in EIA terms. This assessment takes account of a high degree of uncertainty.

6.13.3.24 For all pelagic trawlers, overall, it is predicted that the sensitivity of the receptor is considered to be **low** and the magnitude is deemed to be **minor**. The cumulative effect will, therefore, be of **minor** adverse significance, which is not significant in EIA terms.

6.13.3.25 For all potting vessels, overall, it is predicted that the sensitivity of the receptor is considered to be **medium** and the magnitude is deemed to be **minor**. The cumulative effect will, therefore, be of **minor** adverse significance, which is not significant in EIA terms.

Tier 3

6.13.3.26 The cumulative effect is consistent with the Tier 2 assessment for all fishing fleets. The significance of effect is therefore **major** adverse for demersal trawling fleets, which is significant in EIA terms and **minor** for all other fleets, which is not significant in EIA terms (see paragraph 6.13.3.23 to 6.13.3.25).

Cumulative effects of displacement leading to gear conflict and increased fishing pressure on alternative grounds.

Tier 1

Magnitude of impact

6.13.3.27 The effect of displacement leading to gear conflict and increased fishing pressure is directly correlated to the previous impact of reduced access to fishing grounds (i.e. if there is no reduction in access, then there will be no displacement). There is a **moderate** magnitude of impact for reduced access to fishing grounds and therefore displacement is expected. As such the magnitude of impact of displacement is assessed as **moderate** for all demersal trawling fleets; **minor** for pelagic fleets; **minor** for potting fleets and **minor** for all other commercial fisheries fleets.

Sensitivity of receptor

6.13.3.28 The sensitivity of the receptors is consistent with the assessment of reduced access to fishing grounds (see paragraphs 6.13.3.8 to 6.13.3.11). The sensitivity is therefore **medium** for demersal trawling fleets and potting fleets and **low** for pelagic and all other commercial fishing fleets.

Significance of Effect

6.13.3.29 For all demersal trawlers, overall, it is predicted that the sensitivity of the receptor is considered to be **medium** and the magnitude is deemed to be **moderate**. The cumulative effect will, therefore, be of **moderate** adverse significance, which is significant in EIA terms. This assessment takes account of a high degree of uncertainty.

6.13.3.30 For all pelagic trawlers, overall, it is predicted that the sensitivity of the receptor is considered to be **low** and the magnitude is deemed to be **minor**. The cumulative effect will, therefore, be of **minor** adverse significance, which is not significant in EIA terms.

6.13.3.31 For all potting vessels, overall, it is predicted that the sensitivity of the receptor is considered to be **medium** and the magnitude is deemed to be **minor**. The cumulative effect will, therefore, be of **minor** adverse significance, which is not significant in EIA terms.

Tier 2

Magnitude of impact

6.13.3.32 Following the logic for the Tier 1 assessment, the effect of displacement leading to gear conflict and increased fishing pressure is directly correlated to the previous Tier 2 impact of reduced access to fishing grounds (i.e. if there is no reduction in access, then there will be no displacement). There is a **major** magnitude of impact for reduced access to fishing grounds on account of two designations (rMCZ and cSAC), and therefore displacement is expected. As such the magnitude of impact of displacement is assessed as **major** for all demersal trawling fleets; **minor** for pelagic fleets; **minor** for potting fleets and **minor** for all other commercial fisheries fleets.

Sensitivity of receptor

6.13.3.33 The sensitivity of the receptors is consistent with the assessment of reduced access to fishing grounds (see paragraphs 6.13.3.8 to 6.13.3.11). The sensitivity is therefore **medium** for demersal trawling fleets and potting fleets and **low** for pelagic and all other commercial fishing fleets.

Significance of Effect

6.13.3.34 For all demersal trawlers, overall, it is predicted that the sensitivity of the receptor is considered to be **medium** and the magnitude is deemed to be **major**. The cumulative effect will, therefore, be of **major** adverse significance, which is significant in EIA terms. This assessment takes account of a high degree of uncertainty.

6.13.3.35 For all pelagic trawlers, overall, it is predicted that the sensitivity of the receptor is considered to be **low** and the magnitude is deemed to be **minor**. The cumulative effect will, therefore, be of **minor** adverse significance, which is not significant in EIA terms.

6.13.3.36 For all potting vessels, overall, it is predicted that the sensitivity of the receptor is considered to be **medium** and the magnitude is deemed to be **minor**. The cumulative effect will, therefore, be of **minor** adverse significance, which is not significant in EIA terms.

Tier 3

6.13.3.37 The cumulative effect is consistent with the Tier 2 assessment for all fishing fleets. The significance of effect is therefore **major** adverse for demersal trawling fleets, which is significant in EIA terms and **minor** for all other fleets, which is not significant in EIA terms (see paragraph 6.13.3.34 to 6.13.3.36).

Cumulative effects of longer steaming distances to alternative fishing grounds.

Tier 1

Magnitude of impact

6.13.3.38 A shipping corridor has been identified through the former Hornsea Zone which will aid navigational safety around and through the zone.

6.13.3.39 Based on the fact that vessels will not be prohibited from transiting through operational offshore wind farms, or designated areas, the magnitude of longer steaming distances is considered to be **minor** for all fishing fleets.

Sensitivity of receptor

6.13.3.40 All commercial fisheries fleets are considered to have high availability of alternative fishing grounds (including current focus of effort), and an operational range that is not limited to the proposed development areas. The sensitivity of the receptor is therefore, considered to be **low**.

Significance of Effect

6.13.3.41 Overall, it is predicted that the sensitivity of the receptor is considered to be **low** and the magnitude is deemed to be **minor**. The cumulative effect will, therefore, be of **minor** adverse significance, which is not significant in EIA terms.

Tier 2

6.13.3.42 The cumulative effect is consistent with the Tier 1 assessment for all fishing fleets, which is of **minor** adverse significance, which is not significant in EIA terms.

Tier 3

6.13.3.43 The cumulative effect is consistent with the Tier 1 assessment for all fishing fleets, which is of **minor** adverse significance, which is not significant in EIA terms.

Cumulative effects of changes in shipping routes, leading to interference with fishing activity.

Tier 1

6.13.3.44 A shipping corridor has been identified through the former Hornsea Zone which will aid navigational safety around and through the zone.

6.13.3.45 Based on the fact that vessels will not be prohibited from transiting through operational offshore wind farms, or designated areas, magnitude of changes in shipping routes, leading to interference with fishing activity is considered to be **low** for all fishing fleets.

Sensitivity of receptor

6.13.3.46 All commercial fisheries fleets are considered to have high availability of alternative fishing grounds (including current focus of effort), and an operational range that is not limited to proposed development areas. The sensitivity of the receptor is therefore, considered to be **low**.

Significance of Effect

6.13.3.47 Overall, it is predicted that the sensitivity of the receptor is considered to be low and the magnitude is deemed to be **minor**. The cumulative effect will, therefore, be of **minor** adverse significance, which is not significant in EIA terms.

Tier 2

6.13.3.48 The cumulative effect is consistent with the Tier 1 assessment for all fishing fleets, which is of **minor** adverse significance, which is not significant in EIA terms.

Tier 3

6.13.3.49 The cumulative effect is consistent with the Tier 1 assessment for all fishing fleets, which is of **minor** adverse significance, which is not significant in EIA terms.

6.13.4 Decommissioning phase

6.13.4.1 The CEA for the decommissioning phase is consistent with the operation and maintenance assessment.

6.14 Transboundary effects

6.14.1.1 Transboundary effects relate to impacts that may occur from an activity within one European Economic Area (EEA) state on the environment or interests of another.

6.14.1.2 A screening of transboundary impacts has been carried out and is presented in annex 5.5: Transboundary Impacts Screening Note. This screening exercise identified that there was potential for significant transboundary effects with regard to commercial fisheries from Hornsea Three upon the interests of other EEA States.

6.14.1.3 This commercial fisheries chapter has assessed the potential impacts incurred by non-UK registered vessels operating within UK waters. This includes the potential effects on Belgian, Danish, Dutch, French, German, Norwegian and Swedish commercial fishing fleets across all impact categories assessed, including exclusion from Hornsea Three and displacement effects. Transboundary impacts within UK waters have therefore been intrinsically considered throughout the commercial fisheries EIA process and are consistent to those presented in sections 6.11 and 6.12.

6.14.1.4 Transboundary impacts outside UK waters are limited to potential displacement of effort from Hornsea Three into non-UK EEZs, namely the Dutch EEZ. Based on the established fishing grounds targeted by the fleets under assessment it is not anticipated that displacement effects into the Dutch EEZ would be significant.

6.15 Inter-related effects

6.15.1.1 Inter-relationships are considered to be the impacts and associated effects of different aspects of the proposal on the same receptor. These are considered to be:

- Project lifetime effects: Assessment of the scope for effects that occur throughout more than one phase of the project (construction, operational and maintenance, and decommissioning), to interact to potentially create a more significant effect on a receptor than if just assessed in isolation in these three key project stages (e.g. displacement during construction and decommissioning activities and reduction in access to ground due to floating turbine mooring and cable systems during operation); and
- Receptor led effects: Assessment of the scope for all effects to interact, spatially and temporally, to create inter-related effects on a receptor. As an example, all effects on commercial fisheries, such as changes to fisheries resources, loss of ground, longer steaming times and displacement leading to gear conflict may interact to produce a different, or greater effect on this receptor than when the effects are considered in isolation. Receptor-led effects might be short term, temporary or transient effects, or incorporate longer term effects.

6.15.1.2 A description of the likely inter-related effects arising from Hornsea Three on commercial fishers is provided in chapter 11: Inter-Related Effects (Offshore).

6.16 Conclusion and summary

6.16.1.1 A summary of the potential environmental effects on Commercial Fisheries is provided in Table 6.15.

6.16.1.2 During construction the potential effects of reduced access and phased exclusion from Hornsea Three array area are of **moderate** adverse significance, which is significant in EIA terms, for UK, Dutch and Belgian demersal trawling fleets targeting flatfish, *Nephrops* and mixed demersal species; and of **minor** adverse significance for all other fleets.

6.16.1.3 During construction the potential effects of reduced access and phased exclusion from Hornsea Three offshore cable route are of **moderate** adverse significance, which is significant in EIA terms, for UK potters targeting brown crab, lobster and whelk; and of **minor** adverse significance for all other fleets.

- 6.16.1.4 During construction the potential effects of displacement leading to gear conflict and displacement or disruption of fish and shellfish resources are of **minor** adverse significance, which is not significant in EIA terms, for UK potters targeting brown crab, lobster and whelk; and also of **minor** adverse significance for all other fleets.
- 6.16.1.5 During the operational and maintenance phase of the Hornsea Three array area, the assessment assumes that the mooring and anchor systems of 342 turbines with floating foundations prevent all commercial fisheries from actively fishing within the entire AfL area throughout the entire duration of design life. The potential effects of exclusion from the Hornsea Three array area are of **moderate** adverse significance, which is significant in EIA terms, for UK, Dutch and Belgian demersal trawling fleets targeting flatfish, *Nephrops* and mixed demersal species; and of **minor** adverse significance for all other fleets.
- 6.16.1.6 The moderate effects related to reduction in access or exclusion from fishing grounds have been mitigated by committing to following, wherever possible, the procedures as outlined in the FLOWW guidance documents (2014 and 2015) with respect to any justifiable disturbance payment. As such, the residual effects are of **minor** adverse significance, which is not significant in EIA terms.
- 6.16.1.7 During the operational and maintenance phase the potential effects associated with the Hornsea Three array area leading to gear snagging are of **minor** adverse significance, which is not significant in EIA terms, for all demersal and pelagic trawling fleets due to the potential of gear entanglement with the mooring and anchoring systems associated with floating turbines including on the seabed and in the water column, and of **minor** adverse significance for UK potters. This assessment is based on the assumption that trawlers are highly unlikely to fish within the array area due to the presence of mooring systems.
- 6.16.1.8 All other potential effects during operational and maintenance phase are of **minor** or **negligible** adverse significance for all fleets.
- 6.16.1.9 Potential effects during decommissioning are consistent with the assessment for the construction phase.

6.17 Next Steps

- 6.17.1.1 The next steps in producing the Environmental Statement commercial fisheries chapter include further consultation with UK, European and international commercial fisheries stakeholders and further analysis of any additional information that may become available during those consultations.
- 6.17.1.2 Consultation will include feedback on this PEIR chapter, which will inform the development of the Environmental Statement.

Table 6.15: Summary of potential environment effects, mitigation and monitoring.

Description of impact	Measures adopted as part of the project	Magnitude of impact	Sensitivity of receptor	Significance of effect	Additional measures	Residual effect	Proposed monitoring
<i>Construction Phase</i>							
Hornsea Three array area construction activities and physical presence of wind farm infrastructure leading to reduction in access to, or exclusion from established fishing grounds.	Advance warning and accurate location details of construction operations and associated Safety Zones and advisory safety distances. On-going liaison with all fishing fleets (including regular Notice to Mariners).	UK, Dutch & Belgian demersal trawl ^a fleets: Moderate Danish sandeel fleet: Moderate UK potting fleet: Negligible All other fleets: Minor	UK, Dutch & Belgian demersal trawl fleets: Medium UK potting fleet: Low All other fleets: Low	UK, Dutch & Belgian demersal trawl fleets: Moderate (significant in EIA terms). All other fleets: Minor (not significant in EIA terms).	Alternative floating foundation concepts that have a reduced seabed/water column footprint)	N/A	None
Hornsea Three offshore cable corridor construction activities leading to reduction in access to, or exclusion from established fishing grounds.		UK, Dutch & Belgian demersal trawl fleets: Minor Danish sandeel fleet: Minor UK potting fleet: Moderate Pelagic fleet: Negligible All other fleets: Minor	UK potting fleet: Medium UK shrimp beam trawlers: Medium All other fleets: Low	UK potting fleet: Moderate (significant in EIA terms). Pelagic fleet: Negligible (not significant in EIA terms). All other fleets: Minor (not significant in EIA terms).	With respect to any justifiable disturbance payment, the procedures as outlined in the FLOWW guidance (2014 and 2015), will be followed wherever possible	UK potting fleet: Minor (not significant in EIA terms).	None
Displacement from Hornsea Three array area leading to gear conflict and increased fishing pressure on adjacent grounds.		UK potting fleet: Minor Pelagic fleet: Negligible All other fleets: Minor	UK potting fleet: Medium All other fleets: Low	UK potting fleet: Minor (not significant in EIA terms). Pelagic fleet: Negligible (not significant in EIA terms). All other fleets: Minor (not significant in EIA terms).	None proposed	N/A	None
Displacement from the offshore export cable corridor leading to gear conflict and increased fishing pressure on adjacent grounds.		UK potting fleet: Minor Pelagic fleet: Negligible All other fleets: Minor	UK potting fleet: Medium All other fleets: Low	UK potting fleet: Minor (not significant in EIA terms). Pelagic fleet: Negligible (not significant in EIA terms). All other fleets: Minor (not significant in EIA terms).	None proposed	N/A	None
Hornsea Three array area and offshore export cable corridor construction activities leading to displacement or disruption of commercially important fish and shellfish resources.	Mitigation detailed within chapter 3: Fish and Shellfish Ecology.	UK potting fleet: Minor Pelagic fleet: Negligible All other fleets: Minor	UK potting fleet: Medium All other fleets: Low	UK potting fleet: Minor (not significant in EIA terms). Pelagic fleet: Negligible (not significant in EIA terms). All other fleets: Minor (not significant in EIA terms).	None proposed	N/A	None
Hornsea Three array area and offshore export cable construction activities leading to additional steaming to alternative fishing grounds for vessels that would otherwise be fishing within the array and export cable areas.	Appropriate marine coordination to ensure construction vessels do not present an additional risk. Use of guard vessels, where appropriate.	Pelagic fleet: Negligible All other fleets: Minor	All other fleets: Low	Pelagic fleet: Negligible (not significant in EIA terms). All other fleets: Minor (not significant in EIA terms).	None proposed	N/A	None
Increased vessel traffic within fishing grounds as a result of changes to shipping routes and construction vessel traffic from Hornsea Three array area leading to interference with fishing activity.	Advance warning and accurate location details of construction operations and associated phased Safety Zones and advisory safety distances. On-going liaison with all fishing fleets (including regular Notice to Mariners).	UK, Dutch & Belgian demersal trawl fleets: Moderate Danish sandeel fleet: Moderate Pelagic fleet: Negligible All other fleets: Minor	UK potting fleet: Medium Pelagic fleet: Negligible All other fleets: Low	Pelagic fleet: Negligible (not significant in EIA terms). All other fleets: Minor (not significant in EIA terms).	None proposed	N/A	None

Description of impact	Measures adopted as part of the project	Magnitude of impact	Sensitivity of receptor	Significance of effect	Additional measures	Residual effect	Proposed monitoring
<i>Operation Phase</i>							
Physical presence of Hornsea Three array area infrastructure leading to reduction in access to, or exclusion from established fishing grounds.	Advance warning and accurate location details of maintenance operations and associated advisory safety zones. 500 m safety zones around manned platforms. 500 m safety zones around infrastructure undergoing major maintenance.	UK, Dutch & Belgian demersal trawl fleets: Major French, German, Swedish demersal trawl fleets: Major Danish sandeel fleet: Major UK potting fleet: Negligible All other fleets: Minor	UK, Dutch & Belgian demersal trawl fleets: Medium UK potting fleet: Medium All other fleets: Low	UK, Dutch & Belgian demersal trawl fleets: Moderate (significant in EIA terms). All other fleets: Minor (not significant in EIA terms).	Alternative floating foundation concepts that have a reduced seabed/water column footprint)	N/A	None
Physical presence of offshore export cable and infrastructure leading to reduction in access to, or exclusion from established fishing grounds.	1000 m advisory safety distances around vessels undertaking major maintenance activities.	All fleets: Minor	UK potting fleet: Medium All other fleets: Low	All fleets: Minor (not significant in EIA terms).	None proposed	N/A	None
Displacement from Hornsea Three array area and offshore export cable leading to gear conflict and increased fishing pressure on adjacent grounds.	On-going liaison with all fishing fleets (including regular Notice to Mariners).	Pelagic fleet: Negligible All other fleets: Minor	UK potting fleet: Medium All other fleets: Low	Pelagic fleet: Negligible (not significant in EIA terms). All other fleets: Minor (not significant in EIA terms).	None proposed	N/A	None
Physical presence of Hornsea Three array area leading to gear snagging.	Location of any cable protection will be provided via Notices to Mariners.	UK potting fleet: Negligible All other fleets: Minor	UK potting fleet: Low All other fleets: Medium	UK potting fleet: Negligible (not significant in EIA terms). All other fleets: Minor (not significant in EIA terms).	None proposed	N/A	None
Physical presence of the offshore export cable leading to gear snagging.	In the instance that snagging does occur, protocols are laid out within the guidance by FLOWW and 'Recommendations For Fisheries Liaison: Best Practice' guidance for offshore renewable developers, in particular Section 9: Dealing with claims for loss or damage of gear (BERR, 2008). 500 m safety zones around manned platforms. 500 m safety zones around infrastructure undergoing major maintenance. 1000 m advisory safety distances around vessels undertaking major maintenance activities.	Pelagic fleet: Negligible All other fleets: Minor	Demersal trawl fleets: Medium All other fleets: Low	Pelagic fleet: Negligible (not significant in EIA terms). All other fleets: Minor (not significant in EIA terms).	None proposed	N/A	None

Description of impact	Measures adopted as part of the project	Magnitude of impact	Sensitivity of receptor	Significance of effect	Additional measures	Residual effect	Proposed monitoring
Electromagnetic fields, habitat alteration, noise and other ecological impacts due to operational and maintenance activities leading to displacement or disruption of commercially important fish and shellfish resources.	Mitigation detailed within chapter 3: Fish and Shellfish Ecology.	UK potting fleet: Minor All other fleets: Negligible	UK potting fleet: Medium All other fleets: Low	UK potting fleet: Minor (not significant in EIA terms). All other fleets: Negligible (not significant in EIA terms).	None proposed	N/A	None
Physical presence of Hornsea Three array and offshore export cable leading to additional steaming to alternative fishing grounds for vessels that would otherwise be fishing within the array and export cable areas.	Adequate navigational markers including lighting, as directed by THLS. Notification of all offshore and seabed structures (locations of cables) to be disseminated via KIS-ORCA Charts. Early communication of any incidents to the fishing sector.	All fleets: Negligible	All fleets: Low	All fleets: Negligible (not significant in EIA terms).	None proposed	N/A	None
Increased vessel traffic within fishing grounds as a result of changes to shipping routes and maintenance vessel traffic from Hornsea Three array area and offshore export cable infrastructure leading to interference with fishing activity.	500 m safety zones around manned platforms. 500 m safety zones around infrastructure undergoing major maintenance. 1000 m advisory safety distances around vessels undertaking major maintenance activities.	UK, Dutch & Belgian demersal trawl fleets: Moderate Danish sandeel fleet: Moderate Pelagic fleet: Negligible All other fleets: Minor	UK potting fleet: Medium All other fleets: Low	Pelagic fleet: Negligible (not significant in EIA terms). All other fleets: Minor (not significant in EIA terms).	None proposed	N/A	None
Decommissioning Phase							
Hornsea Three array area decommissioning activities leading to reduction in access to, or exclusion from, potential and/or established fishing grounds.	As detailed within measures adopted during construction.	UK, Dutch & Belgian demersal trawl fleets: Moderate Danish sandeel fleet: Moderate UK potting fleet: Negligible All other fleets: Minor	UK, Dutch & Belgian demersal trawl fleets: Medium UK potting fleet: Medium All other fleets: Low	UK, Dutch & Belgian demersal trawl fleets: Moderate (significant in EIA terms). All other fleets: Minor (not significant in EIA terms).	Alternative floating foundation concepts that have a reduced seabed/water column footprint)	N/A	None
Offshore export cable decommissioning activities leading to reduction in access to, or exclusion from, potential and/or established fishing grounds.		UK, Dutch & Belgian demersal trawl fleets: Moderate Danish sandeel fleet: Moderate UK potting fleet: Moderate Pelagic fleet: Negligible All other fleets: Minor	UK potting fleet: Medium UK shrimp beam trawlers: Medium All other fleets: Low	UK potting fleet: Moderate (significant in EIA terms). Pelagic fleet: Negligible (not significant in EIA terms). All other fleets: Minor (not significant in EIA terms).	With respect to any justifiable disturbance payment, the procedures as outlined in the FLOWW guidance (2014 and 2015), will be followed wherever possible	UK potting fleet: Minor (not significant in EIA terms).	None
Displacement from Hornsea Three array area leading to gear conflict and increased fishing pressure on adjacent grounds.		UK potting fleet: Minor Pelagic fleet: Negligible All other fleets: Minor	UK potting fleet: Medium All other fleets: Low	UK potting fleet: Minor (not significant in EIA terms). Pelagic fleet: Negligible (not significant in EIA terms). All other fleets: Minor (not significant in EIA terms).	None proposed	N/A	None

Description of impact	Measures adopted as part of the project	Magnitude of impact	Sensitivity of receptor	Significance of effect	Additional measures	Residual effect	Proposed monitoring
Displacement from the offshore export cable leading to gear conflict and increased fishing pressure on adjacent grounds.		UK potting fleet: Minor Pelagic fleet: Negligible All other fleets: Minor	UK potting fleet: Medium All other fleets: Low	UK potting fleet: Minor (not significant in EIA terms). Pelagic fleet: Negligible (not significant in EIA terms) All other fleets: Minor (not significant in EIA terms).	None proposed	N/A	None
Decommissioning activities leading to displacement or disruption of commercially important fish and shellfish resources.		UK potting fleet: Minor Pelagic fleet: Negligible All other fleets: Minor	All fleets: Low	UK potting fleet: Minor (significant in EIA terms). Pelagic fleet: Negligible (not significant in EIA terms). All other fleets: Minor (not significant in EIA terms).	None proposed	N/A	None
Decommissioning activities leading to longer steaming distances to alternative fishing grounds.		Pelagic fleet: Negligible All other fleets: Minor	UK potting fleet: Medium All other fleets: Low	Pelagic fleet: Negligible (not significant in EIA terms). All other fleets: Minor (not significant in EIA terms).	None proposed	N/A	None
Increased vessel traffic, including Hornsea Three array area related and changes in shipping routes, leading to interference with fishing activity.		UK, Dutch & Belgian demersal trawl fleets: Moderate Danish sandeel fleet: Moderate Pelagic fleet: Negligible All other fleets: Minor	UK potting fleet: Medium All other fleets: Low	Pelagic fleet: Negligible (not significant in EIA terms). All other fleets: Minor (not significant in EIA terms).	None proposed	N/A	None
Physical presence of cable and scour protection leading to gear snagging.		Pelagic fleet: Negligible All other fleets: Minor	Demersal trawl fleets: Medium All other fleets: Low	Pelagic fleet: Negligible (not significant in EIA terms). All other fleets: Minor (not significant in EIA terms).	None proposed	N/A	None

a Demersal trawl includes demersal otter trawl, beam trawl, pulse trawl and fly shooting fleets targeting sole, plaice, *Nephrops* and mixed demersal fisheries.

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