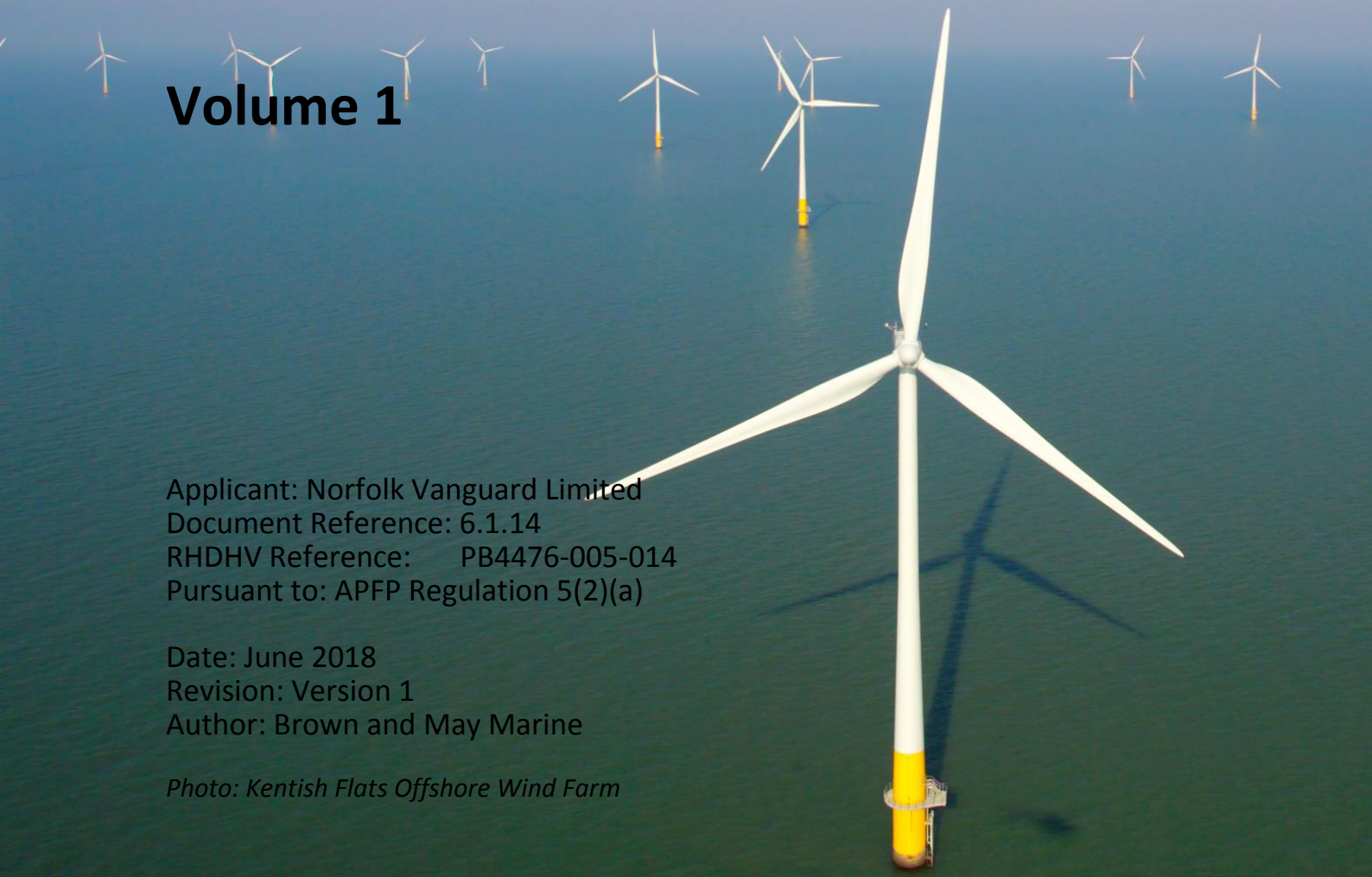
Norfolk Vanguard Offshore Wind Farm

Chapter 14

Commercial Fisheries

Environmental Statement

Volume 1



Applicant: Norfolk Vanguard Limited
Document Reference: 6.1.14
RHDHV Reference: PB4476-005-014
Pursuant to: APFP Regulation 5(2)(a)

Date: June 2018
Revision: Version 1
Author: Brown and May Marine

Photo: Kentish Flats Offshore Wind Farm

Environmental Impact Assessment
Environmental Statement

Document Reference: PB4476-004-014

June 2018

For and on behalf of Norfolk Vanguard Limited

Approved by: Ruari Lean, Rebecca Sherwood

Signed: [redacted]

Date: 8th June 2018

Date	Issue No.	Remarks / Reason for Issue	Author	Checked	Approved
22/03/2018	01	First draft for Norfolk Vanguard Limited review	JK	FB/JM	FB/JM
30/04/2018	02	Second Draft for Norfolk Vanguard Limited review	JK/SX	SJA	SJA
29/05/2018	01F	Final for ES Submission	SX/FB	SJA	SJA

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Glossary

ALARP	As Low As Reasonably Practicable
BMM	Brown and May Marine Limited
BWEA	British Wind Energy Association
Cefas	Centre for Environment, Fisheries and Aquaculture Science
CFP	Common Fisheries Policy
COLREGS	International Regulations for Preventing Collisions at Sea
CPA	Coastal Protection Act
CRPMEM	Comité Régional des Pêches Maritimes et des Elevages Marins
cSAC	Candidate Special Area of Conservation
DCO	Development Consent Order
DECC	Department of Energy and Climate Change
DEFRA	Department for Environment, Food and Rural Affairs
DTI	Department of Trade and Industry
EC	European Commission
EEZ	Exclusive Economic Zone
EIFCA	Eastern Inshore Fisheries Conservation Authority
EIA	Environmental Impact Assessment
ES	Environmental Statement
EU	European Union
EUCFP	European Union Common Fisheries Policy
ESFJC	Eastern Sea Fisheries Joint Committee
FEPA	Food and Environmental Protection Act
FIN	Fisheries Information Network
FLO	Fisheries Liaison Officer
FLOWW	Fishing Liaison with Offshore Wind and Wet Renewables Group
FQA	Fixed Quota Allocation
HHW SAC	Haisborough Hammond and Winterton Special Area of Conservation
ICES	International Council for the Exploration of the Seas
IFCA	Inshore Fisheries and Conservation Authority
IFREMER	L'Institut Français de Recherche pour l'Exploitation de la Mer
IMARES	Institute for Marine Resources and Ecosystem Studies
ILVO	Institute for Agricultural and Fisheries Research
JNCC	Joint Nature Conservation Committee
LEI	Landbouw Econmisch Instituut
MCEU	Marine Consents and Environment Unit
MCA	Maritime Coastguard Agency
MCZ	Marine Conservation Zone
MMO	Marine Management Organisation
MPA	Marine Protected Area
MSY	Maximum Sustainable Yield
NCMPA	Nature Conservation Marine Protected Area
NFFO	National Fishermen's Federation Organisation
NNFS	North Norfolk Fishermen's Society
NPS	National Policy Statement
NtM	Notice to Mariners
PO	Producer Organisation
PEIR	Preliminary Environmental Impact Report
TAC	Total Allowable Catch
SAC	Special Area of Conservation
SCI	Site of Community Importance

SPA	Special Protection Area
UKFEN	UK Fisheries Economic Network
UKHO	UK Hydrographic Office
VCU	Vessel Capacity Unit
VisNED	Dutch Fisherman's Federation
VMS	Vessel Monitoring System

Terminology

Array cables	Cables which link the wind turbines and the offshore electrical platform.
Beam trawl – Sum Wing	A trawl that is towed along the seabed where the net is held open by an aero foil shaped bar that is skimming just off the seabed.
Demersal fish	Fish living on or near the seabed
Fly shooter fishing	Nets are set using long thin lines, while the boat is moving. The long lines are used to startle the fish so that they are scooped up into the nets. This method is used to catch high value bottom (Demersal) fish
Gill netting	Monofilament nylon nets that are set on the seabed and left to fish. Each end is anchored and the net is held to the seabed by a weighted footrope and held up by a floating line. The size of mesh and length of soak time is specific to the species of fish being targeted.
ICES Rectangle	An area of approximately 900nm^2, aligned to 30' latitude by 1° longitude.
Interconnector cables	Buried offshore cables which link the offshore electrical platforms
Landfall	Where the offshore cables come ashore at Happisburgh South.
NV East	Norfolk Vanguard comprises two distinct areas, Norfolk Vanguard West (NV West) and Norfolk Vanguard East (NV East) ("the Offshore Wind Farm (OWF) sites")
NV West	Norfolk Vanguard comprises two distinct areas, Norfolk Vanguard West (NV West) and Norfolk Vanguard East (NV East) ("the Offshore Wind Farm (OWF) sites")
Offshore cable corridor	The corridor of seabed from the Norfolk Vanguard OWF sites to the landfall site within which the offshore export cables will be located.
Offshore electrical platform	A fixed structure located within the wind farm area, containing electrical equipment to aggregate the power from the wind turbines and convert it into a more suitable form for export to shore.
Offshore export cables	The cables which bring electricity from the offshore electrical platform to the landfall.
Offshore project area	The overall area of Norfolk Vanguard East, Norfolk Vanguard West and the offshore cable corridor.
Otter trawling	Nets which have otter boards fastened to the sides. When in motion under water, the boards pull away from each other resulting in the net opening up in a horizontal direction. Benthic fisheries as well as pelagic fisheries can apply this technique.
Pair Trawling	A trawl towed by two boats, either on the seabed or in mid water, held open by the distance apart of the two vessels. As the mouth of the net is kept open by the lateral pull of the individual vessels, otter boards are not required.
Pelagic fish	Fish living in the mid water

Pulse Wing Trawling (Dutch fleet only)	Advanced adaptation of conventional beam trawling where the tickler chains and chain mat of the beam trawl are removed and replaced with trailing electrodes.
Rod and line fishing	A flexible pole with a line and reel.
Safety zone	A marine zone outlined for the purposes of safety around a possibly hazardous installation or works / construction area under the Energy Act 2004.
Scallop dredger	A rigid structure with a chain mail collecting bag, towed on the seabed in order to collect a targeted edible bottom-dwelling species such as scallops.
Scour protection	Protective materials to avoid sediment being eroded away from the base of the foundations as a result of the flow of water.
Seine fishing	A method of fishing that employs a Seine or dragnet. The net hangs vertically in the water with the bottom edge held down by weights and the top edge buoyed by floats.
The Applicant	Norfolk Vanguard Limited.
The Offshore Wind Farm (OWF) sites	The two distinct offshore wind farm areas, Norfolk Vanguard East and Norfolk Vanguard West.
The project	Norfolk Vanguard Offshore Wind Farm, including the onshore and offshore infrastructure.
Vessel Monitoring System	A satellite-based monitoring system which at regular intervals provides data to the fisheries authorities (such as the MMO) on the location, course and speed of vessels.

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14 COMMERCIAL FISHERIES

14.1 Introduction

1. This chapter has been prepared by Brown and May Marine Limited (BMM) and describes the current commercial fisheries in relation to the proposed Norfolk Vanguard development ("the project"), followed by an assessment of the potential impacts on commercial fisheries. The areas of the project relevant to this assessment are the Offshore Wind Farm (OWF) sites (Norfolk Vanguard East (NV East) and Norfolk Vanguard West (NV West)), and the offshore cable corridor. Collectively these project components are referred to as 'the offshore project area'.

2. Appendix 14.1 Commercial Fisheries Technical Report provides further detail on the baseline environment. Full details on data and information sources and fisheries controls and legislation referenced within this document are provided in Appendix 14.1 (Annex 1 and 2).

3. For the purpose of this chapter only commercial fishing activity is considered and is defined as the activity by licensed fishing vessels undertaken for the legitimate capture and sale of finfish and shellfish. The chapter focuses specifically on those fleets which are active in the vicinity of Norfolk Vanguard. These include the local inshore fleet and larger vessels which operate further offshore and have homeports in the UK and elsewhere in Europe. Potential impacts on fish and shellfish populations, including commercially exploited species and non-commercial species, are assessed in Chapter 11 Fish and Shellfish Ecology.

4. There is no single data source or recognised model for establishing commercial fisheries baselines within small, discrete sea areas such as offshore wind farms. The description of the baseline has therefore been derived using data and information from a number of sources. In addition to analysis of fisheries statistical datasets, additional emphasis has been placed on undertaking direct consultation with the relevant national fishermen's federations, local associations and skippers whose fishing grounds are located within the vicinity of the Norfolk Vanguard.

14.2 Legislation, Guidance and Policy

5. The assessment of potential impacts on commercial fisheries as a result of the project has been undertaken with specific reference to the relevant National Policy Statement (NPS):

   - Overarching NPS for Energy (EN-1) (Department of Energy and Climate Change (DECC) 2011a); and
   - NPS for Renewable Energy Infrastructure (EN3) (DECC, July 2011).

6. The specific NPS assessment guidance for commercial fisheries is summarised in Table 14.1 below.

Table 14.1 National Policy Statement assessment guidance

NPS Guidance	NPS Reference	Where addressed in the Chapter
The construction and operation of offshore windfarms can have both positive and negative effects on fish and shellfish stocks.	EN-3 section 2.6.122	The potential impacts of the project on fish and shellfish species in relation to commercial fisheries are discussed in Section 14.7. A further detailed assessment can be found in Chapter 11 Fish and Shellfish Ecology.
Whilst the footprint of the offshore windfarm and any associated infrastructure may be a hindrance to certain types of commercial fishing activity such as trawling and longlining, other fishing activities may be able to take place within operational windfarms without unduly disrupting or compromising navigational safety. Consequently, the establishment of a windfarm can increase the potential for some fishing activities, such as potting, where this would not compromise any safety zone in place. The Planning Inspectorate should consider adverse or beneficial impacts on different types of commercial fishing on a case by case basis.	EN-3 section 2.6.123	The potential impacts of the project alone and cumulatively with other projects are described in Section 14.7 and Section 14.8, respectively, including analysis of the disruption and impact to the commercial fishing industry by fishing method.
In some circumstances, transboundary issues may be a consideration as fishermen from other countries may fish in waters within which offshore windfarms are sited.	EN-3 section 2.6.124	Consideration has been given to the potential impacts of the project on both UK and non-UK fleets (Sections 14.7 and 14.8).
Early consultation should be undertaken with statutory advisors and with representatives of the fishing industry which could include discussion of impact assessment methodologies. Where any part of the proposal involves a grid connection to shore, appropriate inshore fisheries groups should be consulted.	EN-3 section 2.6.127	Section 14.3 describes stakeholder consultation which has been undertaken to inform this chapter. This includes consultation with local (inshore) fleets amongst other stakeholders (Table 14.4).
Where a number of offshore windfarms have been proposed within an identified zone, it may be beneficial to undertake such consultation at a zonal, rather than a site specific, level.	EN-3 section 2.6.128	Section 14.3 describes stakeholder consultation which has been undertaken to inform this chapter.
The assessment by the applicant should include 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 boundaries. Robust baseline data should have been collected and studies conducted as part of the assessment.	EN-3 section 2.6.129	A detailed assessment of the impacts of the project on fish and shellfish receptors is provided in Chapter 11 Fish and Shellfish Ecology. This takes account of the results of surveys carried out in the area. The likely constraints on fishing associated with the project are considered in the assessment presented in Section 14.7 and Section 14.8.

NPS Guidance	NPS Reference	Where addressed in the Chapter
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.	EN-3 section 2.6.130	Consideration has been given in the assessment presented in Section 14.7 to the implication of the implementation of safety zones.
Where the precise extents of potential safety zones are unknown, a realistic worst case scenario should be assessed. Applicants should consult the MCA. Exclusion of certain types of fishing may make an area more productive for other types of fishing. The assessment by the applicant should include 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 windfarm development and of any safety zones.	EN-3 section 2.6.131	Consideration has been given to the implementation of safety zones for definition of the worst case scenario (Table 14.16) and assessment of potential impacts on commercial fisheries (Section 14.7). Consideration is given in this assessment to the potential impacts of the project on commercially exploited fish and shellfish populations (Section 14.7). A detailed assessment of the impacts of the project on fish and shellfish species, including those of commercial importance, is provided in Chapter 11 Fish and Shellfish Ecology.

7. In addition to the NPS guidance, the following guidance documents have been used to inform the assessment of potential impacts on commercial fisheries:

- Centre for Environment, Fisheries and Aquaculture Science (Cefas) (2012) Guidelines for data acquisition to support marine environmental assessments of offshore renewable energy projects. Contract report: ME5403, May 2012;
- Marine Licensing requirements (replacing Section 5 Part II of the Food and Environment Protection Act (FEPA) 1985 and Section 34 of the Coast Protection Act (CPA) 1949);
- Cefas, Marine Consents and Environment Unit (MCEU), Department for Environment, Food and Rural Affairs (DEFRA) and Department of Trade and Industry (DTI) (2004) Offshore Wind Farms - Guidance note for Environmental Impact Assessment In respect of FEPA and CPA requirements, Version 2;
- RenewableUK (2013) Cumulative impact assessment guidelines, guiding principles for cumulative impacts assessments in offshore wind farms;
- Sea Fish Industry Authority and UK Fisheries Economic Network (UKFEN) (2012) Best practise guidance for fishing industry financial and economic impact assessments;

- Blyth-Skyrme, R.E. (2010) Options and opportunities for marine fisheries mitigation associated with wind farms. Final report for Collaborative Offshore Wind Research into the Environment contract FISHMITIG09. COWRIE Ltd, London;
- FLOWW Best Practice Guidance for Offshore Renewables Developments. Recommendations for Fisheries Liaison. FLOWW (Fishing Liaison with Offshore Wind and Wet Renewables Group) (2014);
- FLOWW Best Practice Guidance for Offshore Renewables Developments: Recommendations for Fisheries Disruption Settlements and Community Funds. FLOWW (Fishing Liaison with Offshore Wind and Wet Renewables Group) (2015;
- UK Oil and Gas (2015) Fisheries Liaison Guidelines - Issue 6; and
- International Cable Protection Committee (2009) Fishing and Submarine Cables - Working Together.

14.3 Consultation

8. Consultation is a key part of the Development Consent Order (DCO) application process. To date, consultation regarding commercial fisheries has been conducted through the Scoping Report (Royal HaskoningDHV, 2016) and Preliminary Environmental Information Report (PEIR) (Norfolk Vanguard Limited, 2017). Full details of the project consultation process are presented within Chapter 7 Technical Consultation.

9. Following the release of the Scoping Report and PEIR to consultees, including statutory and non-statutory organisations and fishers, a number of responses have been received. Responses relevant to commercial fisheries are outlined in Table 14.2 and Table 14.3, along with information on how these have been addressed within this chapter.

10. In addition to formal consultation as part of the Scoping and PEIR consultation process, extensive direct consultation has been carried out with relevant fisheries stakeholders to inform this chapter. A list of consultees, along with dates of meetings, is provided in Table 14.4. The key concerns and issues raised by consultees are outlined below:

    - Concerns in relation to the location of the export cable in respect of local inshore fishing grounds;
    - Concerns over the potential for displacement from local fishing grounds to occur and the level of dependence on the area of the offshore cable corridor of some local fishermen;
    - Concerns on the location of the offshore cable corridor in respect of the Haisborough Hammond and Winterton Special Area of Conservation (SAC) and

on the potential for the implementation of management measures in the SAC to result in fishing closures;

- Concern (by Rederscentrale) that the area of the project may constitute important grounds to some Belgian vessels;
- Preference for cables to be buried rather than protected;
- Concerns (by VisNed) in relation to Dutch vessels resuming fishing activity within the OWF sites if spacing between turbines is less than one 1km; and
- Concerns (by the National Federation of Fishermen's Organisation (NFFO)) in respect of potential for displacement, turbine layouts, burial of array cables and ensuring minimal cross over of cables.

Table 14.2 Consultee responses to Scoping Opinion

Consultee	Date of consultation Document	Responses received	Norfolk Vanguard Limited Response
Secretary of State/Planning Inspectorate	November 2016 Scoping Opinion Response	The Secretary of State welcomes the proposed consultation with local fisheries organisations, as well as the appointment of a Fisheries Liaison Officer (FLO) as part of the pre-application process. The continuation of the FLO appointment into the construction and operational phase should be considered.	As outlined in Section 14.7.1, and in line with FLOWW guidelines, the appointment of the Fisheries Liaison Officer (FLO) will continue over the construction and operational phase.
Secretary of State/Planning Inspectorate	November 2016 Scoping Opinion Response	The loss or restricted access to traditional fishing grounds may have subsequent effects on alternative grounds such as those which are fished by smaller vessels. Impacts on alternative fishing grounds should fully be assessed within the ES.	An assessment of the potential loss or restricted access to traditional fishing grounds and potential for subsequent displacement has been carried out for all fleets active in the study area (Section 14.7).
Secretary of State/Planning Inspectorate	November 2016 Scoping Opinion Response	The ES should identify whether safety zones will be sought around the offshore infrastructure and, if so, the potential effects of these should be considered within the assessment. If the precise extents are unknown, a realistic worst case scenario should be assessed and the Secretary of State would require the DCO to be limited as such.	Consideration has been given to the implementation of safety zones for definition of the worst case scenario (Table 14.16) and for assessment of potential impacts on commercial fisheries (Section 14.7).
Norfolk County Council	November 2016 Scoping Opinion Response	The scoping report specifically refers to the need to take into account the potential cumulative impacts of other wind farm developments within the former East Anglia Zone (page 150 para 583). Whilst supporting this principle, it is felt that the Environmental Impact Assessment (EIA) should take into account the	The assessment of cumulative impacts (Section 14.8) takes account of consented and proposed offshore wind farm projects in the former East Anglia Zone and the wider area, including both UK and non-UK projects and takes account of all relevant fleets, including local fleets.

Consultee	Date of consultation Document	Responses received	Norfolk Vanguard Limited Response
		wider cumulative impacts arising from other operational, consented and proposed wind farms off the Norfolk Coast (i.e. taking into account wind farms consented under earlier consenting rounds/ licencing regimes). Commercial fishing contributes to the coastal economy in Norfolk and as such the impacts of this proposal alongside those already in operation, consented or planned needs to be carefully considered.	As outlined in Section 14.8, operational projects are considered to be part of the existing environment and therefore have not been included in the cumulative assessment.
Norfolk County Council	November 2016 Scoping Opinion Response	The EIA/PIER should consider the potential impact of the offshore scheme, including any underwater cable routes and other ancillary development on Norfolk's commercial fishing interests. The EIA will need to consider the wider cumulative impacts taking into account existing operational windfarms: those under construction: those consented and those in planning. The EIA should set out appropriate mitigation, and where necessary indicate what compensation, will be given to those commercial fishing interests in Norfolk adversely impacted by the operation of the wind farm and/or ancillary development. In addition, the EIA should provide an indication of the likely impact on the local fishing industry particularly when other proposals are taken into account.	Consideration has been given in this chapter to all relevant offshore infrastructure associated with the project for assessment of potential impacts on commercial fisheries, including offshore cables (Table 14.16). Proposed and consented wind farms in the former East Anglia Zone and the wider area (both UK and non-UK projects) have been included for assessment of cumulative impacts for all fisheries receptors, including local fleets (Section 14.8). Operational wind farms are considered part of the existing environment and have therefore not been included in the cumulative assessment. A number of embedded mitigation measures have been incorporated as part of the design of the project. Those of relevance to commercial fisheries are described in Section 14.7.1. Where appropriate, additional mitigation measures have been identified (Section 14.7.4.2.3). These will be implemented taking an evidence based approach in line with FLOWW guidance (Section 14.7.4).
Marine Management Organisation	November 2016 Scoping Opinion	The following information source may provide useful information to help support the ES. The Eastern Sea Fisheries Joint Committee Fisheries Mapping Project Charts, compiled in 2010 may provide some useful fishing boundary information for inshore fishing activities. The data is available	Information provided in the ESFJC charts has been used to inform this chapter (Figure 14.41).

Consultee	Date of consultation Document	Responses received	Norfolk Vanguard Limited Response
		from www.easternifca.gov.uk/about/fisheries/fisheries-mapping-project	
Marine Management Organisation	November 2016 Scoping Opinion	Early engagement with the fishing industry (both local, national and internationally) and those involved in nearby aggregate dredging is recommended. In particular, the formation of a commercial fisheries working group would be advantageous.	Extensive consultation has been carried out to date with the fishing industry, including local, national and international stakeholders (Table 14.4). Consultation with the fishing industry is ongoing and will continue post consent.

Table 14.3 Consultee responses to PEIR

Consultee	Date / Document	Comment	Response / Where addressed in the ES
Eastern IFCA	October 2017 Consultation on PEIR	Vattenfall should note that Eastern IFCA are seeking small-scale fishing closures (via a byelaw) to protect sensitive features within the inshore section (within six nautical miles of the shore) of the SCI. These closures are yet to be finalised, but any works in this area will need to proactively take into consideration up-to-date closures and the latest available information on the location of sensitive species and habitats. Eastern IFCA will ensure that any changes to existing fishery closures are duly publicised.	Noted.
Eastern IFCA	October 2017 Consultation on PEIR	The East Marine Plans support sustainably-developed offshore wind energy generation projects. There are many of such projects in the southern North Sea, including Dudgeon, Sheringham Shoal, Scroby Sands, Race Bank, Triton Knoll, Lynn & Inner Dowsing, Lincs, and East Anglia offshore windfarms as well as other projects and plans. While Eastern IFCA appreciates that the cumulative impacts of Norfolk Vanguard with Norfolk Boreas and East Anglia THREE offshore wind farms have been comprehensively assessed within this PEIR, Eastern IFCA would encourage further	The assessment of cumulative impacts (Section 14.8) takes account of consented and proposed offshore wind farm projects in the former East Anglia Zone and the wider area, including both UK and non-UK projects. Operational offshore wind farm projects are considered to form part of the existing environment and therefore have not been included in the cumulative assessment. In addition to offshore wind farms, a range of other projects/activities have also been given consideration for assessment of cumulative impacts, including aggregate dredging areas (Section 14.8).

Consultee	Date / Document	Comment	Response / Where addressed in the ES
		assessment on an ongoing basis of the cumulative impacts of all Southern North Sea wind farm activity, as well as other activities including aggregate extraction activities. The impacts of these projects on the marine environment and fisheries should be assessed in-combination, highlighting any potential cumulative effects associated with the licence application and guiding decision-making and plan implementation in a stepwise approach.	
Eastern IFCA	October 2017 Consultation on PEIR	Where conclusions have been drawn within the PEIR that the project could have cumulative impacts with other plans/projects, these should be mitigated for wherever possible. This includes mitigation of the cumulative impacts on offshore ornithology, marine mammals and commercial fisheries.	The cumulative effects of the project in conjunction with other projects and activities are assessed in Section 14.8. The cumulative assessment carried out did not identify significant cumulative impacts on fisheries receptors. Specific mitigation in respect of cumulative impacts, additional to those proposed in the assessment of the project alone, have therefore not been proposed. Cumulative impacts on seabirds are discussed in Chapter 13 Offshore Ornithology. Cumulative impacts on marine mammals are discussed in Chapter 12 Marine Mammals.
Eastern IFCA	October 2017 Consultation on PEIR	The PEIR documentation states "export cables would be buried where possible, with typical target depths of between 1m and 3m". However, it states where cables cannot be buried due to cable crossings or where they become unburied over time due to mobile sediments alternative methods of protection may be required. Alternative protection methods could include rock placement, concrete mattressing, use of grout or sand bags, frond mattressing, and/or the use of uradact or similar shells. These alternative methods are not in keeping with the East Marine	Norfolk Vanguard is committed to bury offshore cables, where feasible, further reducing the need for cable protection. An Outline Scour Protection and Cable Protection Plan (Document reference 8.16) is provided with the Norfolk Vanguard DCO Application. A cable burial risk assessment will be undertaken post-consent, in consultation with stakeholders. The exact method for cable crossings will be subject to crossing agreements; however, the worst case scenario for cable protection is described in Section 14.7.3.

Consultee	Date / Document	Comment	Response / Where addressed in the ES
		Plans. Every effort should be made to maximise the length of cables that are buried and maintain burial over time. Using cable armouring instead of cable burial increases the likelihood of adverse environmental and fishery impacts. It is anticipated that 60km of export cable will become unburied during the life of the project. If not buried, the presence of the export cable can result in snagging of fishing gear. This poses a significant safety implication particularly for small vessels operating in the area, could result in semi-permanent exclusion of fishing activities from the area, and is therefore a concern for Eastern IFCA.	Post-lay and burial inspection surveys will be undertaken. In addition to burial status, these will identify the presence of construction related seabed obstacles and, where appropriate and practicable, rectification works would be undertaken.
Eastern IFCA	October 2017 Consultation on PEIR	The proposed works must strive to avoid displacement of other legitimate uses of the sea, including recreational and commercial fishing. The section of the cable corridor and surrounding areas that are within the Eastern IFCA district lie in important fishing grounds, particularly for crab, lobster and whelk potting. There are also small-scale netting and trawling fisheries in this area, targeting a range of species including herring and occasionally shrimps. Although the level of fishing effort occurring inshore is much smaller than that applied by larger (predominantly Dutch) offshore fishing vessels, displacement (for example during construction or maintenance works, or because of cable exposure) can have disproportionately large effects on inshore fisheries, which are characterised by small vessels operating within a short range from launch sites.	The potential loss or restricted access to traditional fishing grounds has been considered for assessment within this chapter (Section 14.7 and Section 14.8) Similarly, potential issues associated with displacement of fishing into other areas have also be given consideration within the assessment presented in this chapter for all commercial fisheries receptors, including local fleets (Section 14.7 and Section 14.8).
Eastern IFCA	October 2017 Consultation on PEIR	Eastern IFCA supports the proposed use of local Fisheries Liaison Officer, the Kingfisher Information Service and Notice	Noted. As described in Section 14.7.1 Notice to Mariners (NtMs), Kingfisher notifications and other

Consultee	Date / Document	Comment	Response / Where addressed in the ES
		to Mariners to minimise disruption to fishers; this communication is extremely important and should be carried out on a continuous basis and well in advance of scheduled works and closures during every phase of the development.	notices as required, will be issued to fishermen in an efficient and timely manner.
Eastern IFCA	October 2017 Consultation on PEIR	Appropriate liaison with fishers should ensure there are no conflicts with static gear within the area and no displacement of fishing activity into other areas during the construction phase, despite these being deemed effects of low magnitude.	Appropriate liaison with the fishing industry will be maintained throughout the construction and operation phase, and recommendations for effective fisheries liaison adhered to as endorsed by FLOWW Best Practice Guidance for Offshore Renewables Developments (2014) (Section 14.7.1).
Eastern IFCA	October 2017 Consultation on PEIR	Eastern IFCA is continually seeking to improve how we respond to consultations, both in terms of efficiency and meaningful content. Therefore, if any of the points raised in this response is reflected in the licence outcome, we would appreciate if you could inform us.	Noted.
French Transboundary (Ministry for the Environment, France)	October 2017 Consultation on PEIR	There is a clear impact on professional sea fishing, especially for Dutch and Belgium fishers. Even though, the impact on French professional fishers is very limited, we have to take into account the potential impact of the movement of foreign ships in the French fishing area. This concern is due to the rising presence of windfarm projects in the North Sea.	Consideration has been given to the potential impacts of the project on all fishing fleets active in areas relevant to Norfolk Vanguard, including the French fleet (Section 14.6.5). The potential impact of loss of fishing grounds and subsequent potential for displacement has been assessed for the project alone and cumulatively with other projects (Section 14.7.4.7 and Section 14.8).
French Transboundary (Ministry for the Environment, France)	October 2017 Consultation on PEIR	A public enquiry has been organised from November 6 2016 to December 16 2016 from the city of Bray-Dunes (Department du Nord) to the city of Etaples (Department du Pas-de-Calais). The purpose of this consultation was to understand and to provide an analysis of the potential impacts	Noted.

Consultee	Date / Document	Comment	Response / Where addressed in the ES
		of the windfarm projects about: marine environment, activities in relation to sea fishing and marine navigation. Following the public consultation the commission of inquiry has considered that the environmental impact on French coasts and marine environment remain low in view of the distance between British windfarm projects and French coasts.	
French Transboundary (Ministry for the Environment, France)	October 2017 Consultation on PEIR	In regard to the location of the project the potential environmental impact could be very limited due to the distance between the Norfolk Vanguard project and the French coastline. However considering the potential impact of the rising presence of windfarm projects this new project will have to take account of the cumulative impacts generated by all the activities in the affected area (potential impacts in terms of pollution produced over time by heavy metals). Specific measures will have to be taken to preserve the environmental sphere. It seems helpful to provide a global study about the environment impacts of the windfarm projects who have already been allowed. This research could help to understand the global assessment of the windfarm projects in the North Sea.	Noted. Consideration has been given in this assessment to the potential for the project to result in cumulative impacts on commercial fisheries in conjunction with other projects, both in UK and non-UK waters (Section 14.8.). The undertaking of a global study on the environmental impacts of windfarm projects already operational is outside of the scope of this ES. Where relevant, however, lessons learned and knowledge from the experience of operational projects has been taken account of in this chapter (Section 14.7).
Ministry of Infrastructure and Water Management Netherlands	October 2017 Consultation on PEIR	I am happy to note that you comply with the arrangements for East Anglia as commented by Rijkswaterstaat (distance between shipping route and wind park) with reference in Appendix 15.1 section 17.3.2 to the IMO advice.	Noted.
Marine Management Organisation	October 2017 Consultation on PEIR	It is described that the windfarm could be built in either one, two or three stages spanning a	Since the submission of the PEIR, the project construction programme has been refined and

Consultee	Date / Document	Comment	Response / Where addressed in the ES
		considerable time. Consideration needs to be given as to how the Development Consent Order (DCO) is to be structured to ensure interim monitoring between stages is conducted which takes into consideration any changes either in designation, conservation statuses, fishing practices, navigational issues or benthic habitat changes.	now only considers a single or two phase approach for construction. This would result in a maximum construction period of up to 4 years. An In Principle Monitoring Plan has been submitted as part of the DCO application which outlines proposed monitoring as required.
Marine Management Organisation	October 2017 Consultation on PEIR	The MMO notes that a burial depth of between 1 and 3m is assessed as the expected burial depth where possible. A cable burial risk assessment is proposed preconstruction to assess cable burial issues. The MMO considers cable burial risk assessment as an ongoing process which also needs to be conducted post construction in real time situations especially if cable exposures occur during the operational phase to fully understand and mitigate risks to other sea users. The MMO would like to see that concept addressed within the PEIR. Based on issues already experienced, the MMO would require further information of how risks are to be communicated to fishermen and other sea users. The risk assessment would also need to include details of varying levels of mitigation required to address different levels of risk situations.	An Outline Scour Protection and Cable Protection Plan (Document reference 8.16) is provided with the Norfolk Vanguard DCO Application. A cable burial risk assessment will be undertaken post consent, in consultation with stakeholders. The exact method for cable crossings will be subject to crossing agreements; however the worst case scenario for cable protection is described in Chapter 10. As described in Section 14.7.1, once cables are installed into the seabed, post-lay and burial inspection surveys will be undertaken. In addition to burial status, these will identify the presence of construction related seabed obstacles and where appropriate and practicable, rectification works would be undertaken. Potential risks will be communicated to fishermen through appropriate channels (i.e. NtMs, Kingfisher bulleting) following the procedures identified in the Fisheries Liaison and Co-existence Plan (as required under DCO Schedules 9 and 10 14.(1)(d)(v) and Schedules 11 and 12 9.(1)(d)(v)) which will be produced for the project post consent.
Marine Management Organisation	October 2017 Consultation on PEIR	The MMO would welcome more information on how the trawl-ability of the seabed after the construction of the windfarm is	An Outline Scour Protection and Cable Protection Plan (Document reference 8.16) is provided with the Norfolk Vanguard DCO

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		going to be assessed and how this is to be communicated to the fishing industry.	Application. A cable burial risk assessment will be undertaken post consent, in consultation with stakeholders. The exact method for cable crossings will be subject to crossing agreements; however, the worst case scenario for cable protection is described in Chapter 10. In the event that cables become unburied during the operational phase it is anticipated that this would be communicated to the fishing industry through the use of a dedicated FLO and appropriate channels such as KISORCA, Kingfisher, etc. Further detail will be captured at a later stage within the Fisheries Liaison and Co-existence Plan (as required under DCO Schedules 9 and 10 14.(1)(d)(v) and Schedules 11 and 12 9.(1)(d)(v)).
Marine Management Organisation	October 2017 Consultation on PEIR	If during construction, any unused cables are to be cut and clumped at the point of intersection with the windfarm cables, this will have to be licensed to ensure that the location of the clumped cables is known and communicated as a potential navigational risk to other sea users.	As outlined in Section 14.7.1, appropriate communication channels will be established to ensure that fishermen are aware of works being undertaken and of the presence of any items which may accentuate risk.
Marine Management Organisation	October 2017 Consultation on PEIR	The MMO notes that Vattenfall has stated cable protection to be kept to a minimum which is to be welcomed. However, contingency for unexpected exposures/unburied cables should be built into the assessments.	An Outline Scour Protection and Cable Protection Plan (Document reference 8.16) is provided with the Norfolk Vanguard DCO Application. A cable burial risk assessment will be undertaken post consent, in consultation with stakeholders. The exact method for cable crossings will be subject to crossing agreements; however, the worst case scenario for cable protection is described in Chapter 10. As described in Section 14.7.1, once cables are installed into the seabed, post-lay and burial inspection surveys will be undertaken. In addition to burial

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			status, these will identify the presence of construction related seabed obstacles and, where appropriate and practicable, rectification works would be undertaken. In addition, potential risks associated with unexpected exposures/unburied cables will be communicated to fishermen through appropriate channels.
Marine Management Organisation	October 2017 Consultation on PEIR	Brown crab, lobster, common whelk and shrimp are the most important commercial shellfish species within the area, with the majority of potting effort being concentrated in inshore waters in the vicinity of the proposed cable corridor. Most vessels targeting these species will likely be small (<10m) beach-launch boats, and as such, are likely to be more vulnerable to displacement resulting from the works than larger vessels. The MMO notes that this has been recognised and addressed within the PEIR.	Noted.
Marine Management Organisation	October 2017 Consultation on PEIR	Effort by the under 12m fleet is often underestimated as they aren't required to carry VMS and may be missed by overflight surveys. With this in mind, the consultation with local fishers and representatives of the fishing industry is vital to ensure the activity of fishers is captured. Such consultation results should be included in the EIA to support the assessment.	Extensive consultation has been carried out with the fishing industry to help inform this assessment, including consultation with local fleets (Table 14.4). Consultation with local fishers and representatives will be ongoing throughout the lifetime of the project and in accordance with the Fisheries Liaison and Co-Existence Plan (as required under DCO Schedules 9 and 10 14.(1)(d)(v) and Schedules 11 and 12 9.(1)(d)(v)).
Marine Management Organisation	October 2017 Consultation on PEIR	The PEIR has identified that the construction phase of the cable corridor is likely to result in a moderate adverse impact upon the <15 fleet through temporary loss of access to fishing grounds during installation of the offshore cable corridor. It is suggested that mutually acceptable procedures will be put in place for the relocation of	If gear relocation is required during construction, this will be discussed with local fisheries stakeholders and their representatives. Norfolk Vanguard Limited would seek to reach evidence based commercial agreements with affected fisheries stakeholders, where justified, in line with FLOWW Guidelines.

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		static gear which would be sufficient to reduce the impact to minor adverse significance. A description of the possible procedures should be included in the EIA and DCO. A plan for alternative mitigation should be included if fisheries are unwilling to relocate their gear or if gear relocations are not deemed feasible.	
Departmental Directorate of the Sea and Territories of Pas-de-Calais	October 2017 Consultation on PEIR	The area is not densely fished by French vessels. However, displacement of activity to grounds targeted by French vessels could increase competition and put the French fleet in a difficult position. This includes vessels based in Dunkerque as well. Cable burial could contribute to minimise potential effects on fishing activity as well as EMFs on sensitive species. Appropriate consultation with fishermen and their representatives is necessary. Aspects such as fishing in OWF should be thought through.	The potential for loss of grounds and restricted access to fishing grounds and associated displacement is considered within the assessment, for all fleets, including the French fleet (Section 14.7). Consultation was undertaken with the CRPMEM on 14th March 2017 (Table 14.4) to discuss issues in relation to French fishing activity and the project. As described in Section 14.7.1, Norfolk Vanguard Limited is committed to bury cables where possible. Impacts associated with EMFs on sensitive species are assessed in Chapter 11 Fish and Shellfish Ecology Consultation with the fishing industry will be on-going through-out all stages of the project. The potential for fishing to resume within the operational OWF sites has been given consideration within the impact assessment (Section 14.7).
Prefecture Maritime Manche Mer du Nord	October 2017 Consultation on PEIR	It would be useful to examine in great detail real impacts on French marine activities, specifically commercial fisheries and displacement of activity on grounds targeted by the French.	The potential for loss of grounds and restricted access to fishing grounds and associated displacement has been given consideration within the assessment for all the fleets of concern, including the French fleet (Section 14.7).
Prefecture Maritime	October 2017 Consultation on	It is likely that there will be an increase in marine traffic and	The potential for loss of grounds and restricted access to fishing

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Manche Mer du Nord	PEIR	interference with fishing activity and navigation. It would be useful to identify and quantify real impacts of displacement of fishing activity triggered by the increase in density of marine traffic in the area of the Norfolk Vanguard OWF.	grounds and associated displacement has been given consideration within the assessment, for all fleets, including the French fleet (Section 14.7). Similarly, the potential for interference with fishing activity as a result of an increase in vessel transits has also been given consideration within the assessment (Section 14.7). Potential impacts of the project on shipping and navigation are described in detail in Chapter 15 Shipping and Navigation.
Prefecture Maritime Manche Mer du Nord	October 2017 Consultation on PEIR	As a consequence, for consistency and coexistence purposes and given the information provided to the Prefecture Maritime and its attributions in terms of marine safety and marine planning, we are deeply interested in being kept informed of further consultation undertaken on this project.	Consultation with French Maritime Authorities will be ongoing through-out all stages of the project.
National Federation of Fishermen's Organisations	October 2017 Consultation on PEIR	The NFFO noted at 5th April 2017 consultation meeting that we would like to see an approach to the impact assessment that it should consider that the assessment should explicitly assess the level of compatibility in the operation of fishing activities within the immediate footprint and vicinity of the project before going on assess wider impact significance taking account of available access to alternative fishing grounds. The NFFO also noted that this is important when considering the east inshore and offshore marine plan policy aimed at maximising coexistence (policy GOV 2) so that mitigation is aimed directly at addressing this policy and mitigation responses are not just cast as a broader consideration according to the ability of vessels to access	The potential for loss or restricted access to fishing grounds has been recognised in the impact assessment for all relevant fleets, including consideration on whether fishing may be able to resume within the operational wind farm (Section 14.7). The significance of potential impacts is assessed based on the sensitivity of the fleet and the magnitude of the effect in line with standard EIA procedures (Section 14.7). Considerations relating to the spatial scale of the impact form part of the identification of impact magnitude levels (Section 14.7). It should be noted that a Fisheries Liaison and Co-existence Plan (as required under DCO Schedules 9 and 10 14.(1)(d)(v) and Schedules 11 and 12 9.(1)(d)(v)) will be produced for the project post consent. In addition, a number of embedded mitigation measures have been

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		alternative grounds.	included as part of the project design to help minimise impacts and facilitate co-existence with fishing activities. (Section 14.7.1.). Furthermore, whilst the assessment has been carried out on a fleet by fleet basis, where relevant the specific sensitivities of certain vessels have been recognised (i.e. local inshore vessels that may need to relocate gear during cable installation). In these instances, it has been proposed that evidence based mitigation, as specified in FLOWW Guidelines be applied.
National Federation of Fishermen's Organisations	October 2017 Consultation on PEIR	Aside from being able to distinguish between issues related to coexistence and wider fisheries impact, the methodology assesses the spatial adaptability of fishing vessels (sensitivity) and proportion of landings derived from the footprint of the project (magnitude). These are invariably directly related to one another and are therefore not that insightful when presenting the results. A separation of analysis into direct compatibility of activity with the project followed by assessing the wider significance would be a more instructive approach for EIA and project planning purposes.	The potential for activity to resume within the OWF sites once operational is discussed in Section 14.7.5.7). The sensitivity of the receptor is based on its operational range, versatility of the method used and availability of grounds. The assessment of magnitude takes account of the level of activity of a given fleet in the area relevant to the project, in the context of the distribution of their overall activity. In addition, it considers the extent of the area affected as well as the duration of the impact (Section 14.7).
National Federation of Fishermen's Organisations	October 2017 Consultation on PEIR	No details or evidence is provided to substantiate the view that fishing vessels can fish within operational wind farms relative to worst case scenario – e.g. what type of fishing where and has it returned to similar levels that existed before the project.	There are examples of operational wind farms where fishing activities have resumed without risks to safety during the operational phase, including potting inside Barrow and Thanet and trawling inside Kentish Flats. Given concerns raised during consultation in respect of minimum spacing and the use of floating foundations both from the NFFO and Dutch consultees, a conservative approach has been taken to the assessment of loss or restricted access to fishing grounds during operation and it has been assumed that towed gear skippers

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			may elect not to operate their gears within the OWF sites (Section14.7.5.2).
National Federation of Fishermen's Organisations	October 2017 Consultation on PEIR	The NFFO doubt that the conditions related to observations of fishing activities within wind farms will be comparable to the worst case scenario that is assessed here. Spacings of 616m between turbines represent a dense layout relative to the majority of windfarms that have been subject to planning application in the UK. Moreover, the worst case scenario includes provision for the deployment of floating wind structures with anchor cables that will present a sub-surface hazard to fishing activities. According to the Project Description Chapter (Ch 5) these could be angled at 30°. This would translate into cables spreading out to cover up to 65m (assuming anchor line of 20m). This would result in an overall theoretical distance of 468m to fish between. Assuming a 50m safety buffer is added to this then the total fishable space would be reduced to 368m. Under these circumstances we consider that it is extremely unlikely that any forms of towed gear fishing activity would attempt to operate within the project array area.	Under the updated project design, the worst case turbine spacing is 680m (9MW turbine option). Given concerns raised during consultation in respect of minimum spacing and the use of floating foundations both from the NFFO and Dutch consultees, a conservative approach has been taken to the assessment of loss or restricted access to fishing grounds during operation and it has been assumed that towed gear skippers may elect not to operate their gears within the OWF (Section14.7.5.2). In this context it should be noted that for other recent offshore wind farm projects it has been agreed that fishing activity can continue within the site during operation. The Statement of Common Ground (SOCG) for the East Anglia Three Application records: “Dutch fishermen have stated that they would be able to fish within the East Anglia THREE windfarm in safe conditions. It is also recorded that VisNed/NFFO consider that it is unlikely that fishing will be able to take place to the same degree as in an open sea area and that fishing within the operational windfarm would likely require modifications to existing operating patterns due to the presence of infrastructure”. The turbine spacing referenced in the EA THREE SOCG was “unobstructed rows of 675m (in-row) and 900m (between row)”.
National Federation of Fishermen's Organisations	October 2017 Consultation on PEIR	A fuller assessment could consider the manoeuvrability of fishing vessels with typical towed gears to consider this in a more comprehensive way, but as it stands we consider the inferred conclusions on fishing compatibility to be false and the assessment should be further	Given concerns raised during consultation in respect of minimum spacing and the use of floating foundations both from the NFFO and Dutch consultees, a conservative approach has been taken to the assessment of loss or restricted access to fishing grounds during operation and it has been

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		elaborated to reflect the reality of the worst case scenario	assumed that towed gear skippers may elect not to operate their gears within the OWF sites (Section 14.7.5.2). In this context it should be noted that for other recent offshore wind farm projects it has been agreed that fishing activity can continue within the site during operation. The Statement of Common Ground (SOCG) for the East Anglia Three Application records: "Dutch fishermen have stated that they would be able to fish within the East Anglia THREE windfarm in safe conditions. It is also recorded that VisNed/NFFO consider that it is unlikely that fishing will be able to take place to the same degree as in an open sea area and that fishing within the operational windfarm would likely require modifications to existing operating patterns due to the presence of infrastructure". The turbine spacing referenced in the EA THREE SOCG was "unobstructed rows of 675m (in-row) and 900m (between row)".
National Federation of Fishermen's Organisations	October 2017 Consultation on PEIR	The commercial fisheries Chapter notes that an assessment of safety impact is not best considered via an environmental assessment approach, but should be assessed according to safety risk (Ch 14, para 196, p55). We agree with that view. However, the fisheries assessment considers that risks would only present themselves in incidences of infringements to safety zones (para 199, p56). This is incorrect as it does not recognise the risk of snagging on cables, dropped objects or cable protection. Chapter 14 refers to the navigational impact assessment in chapter 15, but as chapter 15 indicates, the assessment only considers navigational impacts (i.e. fishing vessels in transit), not those specifically related to	The assessment of safety risks for fishing vessels provided in this chapter (Section 14.7.4 and Section 14.7.5) and takes account of risks to vessels associated with snagging, dropped objects and issues associated with cable protection, as well as manoeuvrability issues.

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		fishing such as reduced manoeuvrability and gear snagging risks. Ch 15, para 182 states "that certain foundation types will have an impact on levels of active fishing due to the snagging risk associated with mooring lines. This is considered further within Chapter 14 Commercial Fisheries." This risk, nor risks to snagging on cables or dropped objects is assessed in either Chapter 14 or 15. We consider that these risks should be assessed accordingly taking account of the manoeuvrability of vessels when fishing and the relative position of deployed gears.	
National Federation of Fishermen's Organisations	October 2017 Consultation on PEIR	We note that not all MPAs and MPA proposals have been considered in the commercial fisheries assessment.	Proposals for fishing restrictions within local SACs have been noted, however, it is understood that these are a current recommendation proposed for adoption and have yet to be finalised or implemented. MPA/SACs considered in the cumulative assessment can be found in Table 14.29.
National Federation of Fishermen's Organisations	October 2017 Consultation on PEIR	It is not clear, or perhaps we have not seen what provisions are expected for potential exposures to cables and related remediation works. These do not appear to be factored into a worst case scenario, but in our view are a significant risk. Nor does there appear to be contingency planning proposed for such occurrences. The Galloper windfarm, for instance, has recently identified 8 such occurrences along its export cable.	Galloper is still in construction and any non-buried sections of the cables have been rectified by the contractor prior to sign off. Consideration has been given in the assessment of safety risks for fishing vessels during the operational phase to potential risks associated with exposed cables. (Section 14.7.4 and Section 14.7.5). An Outline Scour Protection and Cable Protection Plan (Document reference 8.16) is provided with the Norfolk Vanguard DCO Application. A cable burial risk assessment will be undertaken post consent, in consultation with stakeholders. The exact method for cable crossings will be subject to crossing agreements; however, the worst case scenario for cable protection is described in Chapter 10.

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			As described in Section 14.7.1, once cables are installed into the seabed, post-lay and burial inspection surveys will be undertaken. In addition to burial status, these will identify the presence of construction related seabed obstacles and, where appropriate and practicable, rectification works would be undertaken.
National Federation of Fishermen's Organisations	October 2017 Consultation on PEIR	The commercial fisheries chapter details some measures that would assist in mitigating fisheries impacts – e.g. cable burial to 3m (1m is referred to in the fish ecology chapter Ch 11 – this should be clarified), NTMs, appointment of fisheries liaison officer. We do not consider that actions by the fishing fleet to adapt to the proposal represent mitigation as detailed in the Commercial fisheries Chapter. We note that safety zones under the Electricity Act 2004 are not permissible for cables outside of safety zones defined renewable energy installations.	As outlined in Section 14.7.1, cables will be buried where possible to at least a depth of 1m and protected where cable burial is not feasible. The description of safety zones now includes the term "advisory" in respect of cables to address this point.
National Federation of Fishermen's Organisations	October 2017 Consultation on PEIR	For OWF array and export cables the NFFO would like to apply adherence to FLOWW best practice guidelines.	Vattenfall Wind Power Ltd (the parent company of Norfolk Vanguard Limited) are part of the FLOWW Committee and would therefore consider adherence to these guidelines as standard.
National Federation of Fishermen's Organisations	October 2017 Consultation on PEIR	Consult with fisheries stakeholders on the production of cable burial plans/ cable burial risk assessment and monitoring plans.	Ongoing consultation with fisheries stakeholders will be undertaken, including sharing of project specific information as it becomes available (Section 14.7.).
National Federation of Fishermen's Organisations	October 2017 Consultation on PEIR	Where significant risk is identified with bottom towed fishing gears and cables consider this in proposing any protection and contingency remedial works	Noted.

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National Federation of Fishermen's Organisations	October 2017 Consultation on PEIR	Use of post installation trawl surveys to verify clear seabed	An Outline Scour Protection and Cable Protection Plan (Document reference 8.16) is provided with the Norfolk Vanguard DCO Application. A cable burial risk assessment will be undertaken post consent, in consultation with stakeholders. The exact method for cable crossings will be subject to crossing agreements; however, the worst case scenario for cable protection is described in Chapter 10. Post-lay and burial inspection surveys will be undertaken after the cables are installed into the seabed as outlined in Section 14.7.1 to assess the seabed status. In addition to burial status, these will identify the presence of construction related seabed obstacles and, where appropriate and practicable, rectification works would be undertaken. In the event that cables become unburied during the operational phase it is anticipated that this would be resolved through the methods described and communicated to the fishing industry through the use of a dedicated FLO and appropriate channels such KISORCA and Kingfisher. Further detail is expected to be captured at a later stage within the Fisheries Liaison and Co-existence Plan (as required under DCO Schedules 9 and 10 14.(1)(d)(v) and Schedules 11 and 12 9.(1)(d)(v)) In light of the above it is not anticipated that post - installation trawl surveys would be necessary.
National Federation of Fishermen's Organisations	October 2017 Consultation on PEIR	Communicate the results of post installation surveys to fisheries stakeholders.	Ongoing consultation with fisheries stakeholders will be undertaken, including sharing of project specific information as it becomes available (Section 14.7).
National Federation of Fishermen's Organisations	October 2017 Consultation on PEIR	Use of Kingfisher to provide hazard information and alert of emergent hazards (in addition to works and cable crossings and cable protection) e.g. risk of de-	Noted. See section 14.7.1.

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		burial of cables and cable exposures.	
National Federation of Fishermen's Organisations	October 2017 Consultation on PEIR	Protect emergent hazards such as exposed cables through appropriate means (e.g. guard vessel deployment) prior to remediation works being completed.	Noted. Circumstances under which guard vessels could be used will be described within the Fisheries Liaison and Co-existence Plan (as required under DCO Schedules 9 and 10 14.(1)(d)(v) and Schedules 11 and 12 9.(1)(d)(v)).
National Federation of Fishermen's Organisations	October 2017 Consultation on PEIR	The NFFO takes the view that there should be no in-situ seabed hazards left in place following decommissioning and any infrastructure that remains buried in the seabed following an adequate assessment of the options should be subject to an ongoing monitoring regime with retained liability to address any emergent hazards.	It is expected the DCO will state that the seabed should be returned to a similar state as prior to construction.
National Federation of Fishermen's Organisations	October 2017 Consultation on PEIR	Preparation of a fisheries liaison and coexistence plan prepared in consultation with fisheries stakeholders that may detail provisions identified above as well as other operational management arrangements such as provisions for gear clearance and disruption settlements, navigation corridors and protocols, gear snagging protocols and processes for attributable claims, and retrieval of displaced static gears from safety zones. The NFFO suggests this is prepared at an early stage so that certainty and assurance can be provided to fishing communities and workable approaches to resolving issues can be established. It is expected, however, that it will form a working document that is periodically updated to reflect changing circumstances or the emergence of issues that have not been previously accounted for.	A Fisheries Liaison and Co-existence Plan (as required under DCO Schedules 9 and 10 14.(1)(d)(v) and Schedules 11 and 12 9.(1)(d)(v)) will be produced for the project post-consent in consultation with stakeholders. Where there has been demonstrable impact on individual vessels any agreements will be based on evidence and track record – in accordance with FLOWW guidance.
National Federation of Fishermen's	October 2017 Consultation on PEIR	The NFFO encourage the use of funding arrangements like the West of Morecombe Fisheries	Noted.

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Organisations		Fund as a mechanism to support fishing industry stakeholders affected by the project and provisioning of work opportunities (e.g. guard vessels or surveys for example) available to affected fisheries stakeholders as far as practically possible.	
National Federation of Fishermen's Organisations	October 2017 Consultation on PEIR	The NFFO encourage that support is made to fund the adoption of the Fish Safe device by fishing vessels operating in the area – see http://www.fishsafe.eu/en/fishsafe-unit.aspx. This technology, which combined with other safety elements above, provides automated means of integrating safety information into the navigational systems on fishing vessels that in turn provide a real-time warning of safety hazards in the wheel house. This will greatly promote safe working regime around the vicinity of the project and minimise the likelihood of incidents occurring in an area where there exists high levels of fishing activity.	Noted.
National Federation of Fishermen's Organisations	October 2017 Consultation on PEIR	The NFFO encourage the development of a windfarm industry wide scheme to assess and address non-attributable claims for gear damages or losses.	Noted. Norfolk Vanguard will implement evidence based gear loss claim process in line with FLOWW guidelines
Paul Lines (fisherman)	October 2017 Consultation on PEIR	Mr Lines has requested a survey is undertaken to look into the value of the fishing activity in the study area, specifically the "south end"	The assessment presented in this chapter has been informed by various sources of data and information including value derived from landings and VMS data (Appendix 14.1) Where mitigation is required an evidence based approach in line with FLOWW guidance will be taken (Section 14.7.1).
Paul Lines (fisherman)	October 2017 Consultation on PEIR	Mr Lines is concerned about the cables impacting elasmobranchs	The potential impact of EMFs associated with the project on sensitive fish species, including elasmobranchs, has been assessed in detail in Chapter 11 Fish and Shellfish Ecology. Significant

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			impacts in this respect have not been identified (impacts assessed as of minor adverse significance for elasmobranchs).
Paul Lines (fisherman)	October 2017 Consultation on PEIR	Mr Lines has asked that socio-economic aspects are explored from any potential damage to benthic community and biodiversity	The potential impacts of the project on benthic habitats are assessed in Chapter 10 Benthic and Intertidal Ecology. The assessment carried out did not identify significant impacts (i.e. above minor adverse significance) on benthic communities.
Paul Lines (fisherman)	October 2017 Consultation on PEIR	Mr Lines has requested that "a system is put in place where fishermen can converse to the developer without having to speak to [an] appointed liaison [officer] who is financed by the developer"	Consultation with the fishing industry will be ongoing. As outlined in Section 14.7.1, an FLO will be appointed during the construction and operation phase of the project and FLOWW guidance in respect of fisheries liaison adhered to.
Paul Lines (fisherman)	October 2017 Consultation on PEIR	Mr Lines has requested "all vessel carry a fisherman as liaison [that] is local to the area"	Consultation with the fishing industry will be ongoing. In line with FLOWW guidance an FLO will be appointed. Where appropriate, suitably experienced Offshore Fisheries Liaison Officers (OFLOs) may also be used
Paul Lines (fisherman)	October 2017 Consultation on PEIR	Mr Lines has asked that a clear transit route is established to and from all area of operations and is communicated daily	Detailed transit routes are at this stage unknown. These will be defined post-consent in line with standard practice.
Paul Lines (fisherman)	October 2017 Consultation on PEIR	An understanding of cost of gear is established before commencement of work	Norfolk Vanguard will implement an evidence based gear loss claim process in line with FLOWW guidelines. A gear loss protocol will be included within the Fisheries Liaison and Co-existence Plan (as required under DCO Schedules 9 and 10 14.(1)(d)(v) and Schedules 11 and 12 9.(1)(d)(v)).
Natural England	October 2017 Consultation on PEIR	Natural England do not necessarily agree that only impacts assessed as significant resulting from the construction and operation will have the potential to contribute to cumulative effects. A range of smaller impacts over a long period of time could eventually become a significant impact.	All the potential impacts on commercial fisheries assessed for the project alone have been taken account of in the cumulative assessment (Section 14.8). Exceptions to this are safety issues and risks associated with seabed obstacles as it is understood that the same obligations will apply to other projects and therefore there is no potential pathway for a

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			cumulative impact.
Natural England	October 2017 Consultation on PEIR	Further explanation needs to be provided as to why quantitative assessment cannot be undertaken.	Surveillance sightings data provide a qualitative indication of the distribution of fishing activity by method and nationality and do not provide information on the intensity of fishing (i.e. level of effort or value) to allow a quantitative assessment.
Natural England	October 2017 Consultation on PEIR	We question the last sentence of this point stating that the electric pulse is mild and that minimum disturbance occurs. Evidence presented in peer reviewed literature has shown that large gadoid fishes which come close to pulse trawls can suffer from haemorrhages and muscular contractions which cause breakages of the spine. Furthermore, any organism that comes into contact with the trawl is effectively electrocuted, this cannot described as minimum disturbance.	Noted. This has been amended in the text.
Natural England	October 2018 Consultation on PEIR	Agree with the proposal to bury the cables – not only does it reduce the risk to fishermen but also reduces the effects of EMF upon sensitive fish species. However, additional cable (rock) protection should only be a last resort where burial is not possible. It would pose a risk to trawling fishing vessels and also could have negative environmental effects – especially in soft sediment dominated area.	As previously mentioned, Norfolk Vanguard Limited are committed to bury the cables where feasible, therefore reducing the need for cable protection. Potential safety issues for fishing vessels associated with cable protection have been taken account of in this chapter and are assessed in Section 14.7.5.5. Potential impacts associated with EMFs on sensitive fish species are considered within Chapter 11 Fish and Shellfish Ecology.
Natural England	October 2018 Consultation on PEIR	Looking at the evidence presented within this chapter, the proposed offshore site for Vanguard is located in some key areas for Dutch trawlers. This is particularly true in parts of NV west and the offshore cable corridor, where fishing intensity is high and worth a lot of money. Although displacement impacts have been categorised as negligible / minor significance from an environmental point of view it could potentially be	The Dutch fleet has a wide operational range and availability of equally productive grounds in the context of the area occupied by the OWF sites. In addition, a voluntary agreement is currently in place to avoid fishing in certain areas off the east coast of England. This includes a section of NV West. On this basis significant impacts on this fleet have not been identified in respect of loss or restricted access to fishing grounds and

Consultee	Date / Document	Comment	Response / Where addressed in the ES
		worse. The transferral of this fishing effort into other areas may potentially expose protected species and sites to additional pressure. This is particularly true if fisherman are displaced from areas that are the most efficient to fish, they may have to fish more intensively to maintain catch rates or profitability against increased costs such as fuel. Fishermen as a result may take more risks and flout previously agreed management practices to maximise these returns. Overall, despite the wind farm potentially acting as a de facto MPA and reducing fishing pressure in the project area it could have the opposite effect and increase intensity in other areas. This needs to be assessed further despite only a small area, yet a productive one, being potentially lost	potential for associated displacement. Assessments of the potential impact of the project on benthic ecology and on fish and shellfish ecology are provided in Chapter 10 Benthic and Intertidal Ecology and Chapter 11 Fish and Shellfish Ecology, respectively.
Natural England	October 2018 Consultation on PEIR	The Commercial Fisheries technical report provides a good overview of the commercial fisheries occurring around the project boundaries. The majority of UK fishermen are concentrated around the inshore areas, mainly using static gear such as pots and creels, targeting shellfish species. Further offshore, foreign vessels, mainly Dutch, French and Belgium trawlers, target benthic and demersal species such as Plaice, Sole and Cod. This offshore fishery represents quite a large operation. The proposed offshore area for the windfarm represents a heavily fished area, which when construction and operation is occurring may displace fishermen to other areas that are not as regularly fished – see comments above. The UK fishermen that utilise static gear may suffer some	Noted.

Consultee	Date / Document	Comment	Response / Where addressed in the ES
		disturbance from inshore works. However we do not believe that it would be significant.	
Andy Williamson	October 2018 Consultation on PEIR	Being a local fisherman from sea Palling Andy works static gear (crab and lobster pots) through the proposed cable routes which is going to "destroy" his livelihood so at this present time Andy is not happy with the project.	Consultation has been undertaken with Mr Williamson (Table 14.4) and his grounds have been identified and the data used to inform this chapter.
Charles Lines	October 2018 Consultation on PEIR	Charles fishes with his father in the area of the cables. He is concerned the disturbance generated by "digging up" the seabed will greatly affect my livelihood. Charles asks for assurance that the cables won't "come to destroy the crabs, lobsters and whelks" before buying a new fishing vessel.	The potential disturbance to fish and shellfish species associated with construction of the project, including that associated with cable installation activities, are addressed in Chapter 11 Fish and Shellfish Ecology. It should be noted that the assessment carried out did not identify any impacts exceeding minor adverse significance in this respect.
Steve Wightman	October 2018 Consultation on PEIR	Writing on behalf of the fishing business, based in Lowestoft - Steve fishes in the area of the proposed wind farm and cable route throughout the year. Steve has "grave concerns" about the future viability of fishing this area post construction of Vanguard because of the proximity of the turbines. Steve uses long lining and netting, which "takes up a lot of sea area". During operations fishing between the turbines will be hazardous and restrictive. Steve has requested to be fully involved in discussions on layout and arrangement of the turbines to find the best solution to these concerns. Steve mentioned a feasibility fishing survey within the East Anglia One windfarm site, "the outcome of which will have bearing on Vanguard and other windfarms".	The majority of activity by the local static gear fleet occurs within the 12nm limit and therefore in areas relevant to the offshore cable corridor Consideration has however also been given to the potential for some local vessels to occasionally extend their activity to areas as far offshore as the OWF (Section 14.7.5.2.3). The limitations of different fishing methods, including long lining and netting in terms of their potential to resume activity in the OWF sites have been given consideration in the impact assessment (Section 14.7.5.2).

Table 14.4 Summary of fisheries stakeholder consultation

Consultees	Role / Organisation	Consultation date
Ady Woods	Area Officer - Eastern IFCA	31/05/2016
Richard Clarke	Sea Palling Fishermen's Association	31/05/2016
Richard Clarke, Paul Lines, Andy Williamson	Sea Palling Fishermen, Great Yarmouth Fisherman	06/06/2016
Gavin Whatling	Sea Palling Fisherman	08/06/2016
Nicola Gaff	North Norfolk Fishermen's Society (NNFS)	10/06/2016
Billy Gaff, Andy Williamson, John Davies, Gavin Whatling	NNFS	13/06/2016
Stephen Sheales	Caister Fisherman	15/06/2016
Mark Wright	Sea Palling Fisherman	17/06/2016
Billy Gaff, Andy Williamson, John Davies	NNFS	05/07/2016
Stephen Sheales	Caister Fisherman	12/07/2016
Billy Gaff	NNFS	12/07/2016
Paul Lines	Great Yarmouth fishermen	12/07/2016
Richard Clarke	Sea Palling Fishermen	18/07/2016
Billy Gaff	NNFS	11/08/2016
Paul Tyack	MMO – Lowestoft	19/10/2016
Julian Gregory, Judith Stoutt	Eastern IFCA	21/10/2016
Sander Meyens, Jasmine Vlieninick, Jolien Goossens	Rederscentrale, Vlaanderen	29/11/2016
Henrik Lund	Danmarks Fisheriforening PO	30/11/2016
Harald Ostensjo	Fiskbat	30/11/2016
Pim Visser	VisNED	14/02/2017 11/04/2018 26/04/2018
Espen Jacobsen	Fiskbat	07/03/2017
Antony Viera, Olivier Lepretre	CRPMEM- Pas de Calais	14/03/2017
John Knights	Lowestoft	31/03/2017
Dale Rodmell, Alan Piggott	NFFO	05/04/2017
David Raas	VisNED	19/04/2017
John Knights, Steve Wightman, Terry Wightman, Ronnie Richards, Paul Mears, Paul Klyne, Ove Jinkerson.	Lowestoft Fishermen	16/05/2017
Secretary	Deutchser Fisherei Vernband	23/05/2017
Paul Williams	Caister Fisherman	06/06/2017
Jeffrey Melton	Lowestoft Beam Trawl Skipper	15/06/2017
Richard Clatterham	Caister inshore Fishermen's Association	22/06/2017
Dean Ellis	Happisburgh Fisherman	11/08/2017

14.4 Assessment Methodology

14.4.1 Impact Assessment Methodology

11. The potential impacts of Norfolk Vanguard on commercial fisheries receptors taken forward for assessment are as specified in the Cefas and MCEU (2004) guidelines for offshore wind developments:

- Implications for fisheries during the construction phase;
- Implications for fisheries during the operation phase;
- Adverse impact on commercially targeted fish and shellfish populations;
- Adverse impact on recreationally targeted fish populations;
- Complete loss or restricted access to traditional fishing grounds;
- Safety issues for fishing vessels;
- Increased steaming times to fishing grounds;
- Obstacles on the seabed post construction; and
- Interference with fishing activities.

12. In addition to the above, the following potential impact has also been considered for assessment:

- Displacement of fishing activity into other areas.

13. Assessment of the above impacts has been applied separately to the construction, operational and decommissioning phases of development.

14. Cumulative impacts relevant to commercial fishing arising from other marine developments are discussed in section 14.8.

14.4.1.1 Significance criteria

14.4.1.2 Sensitivity

15. The definition of the different sensitivity levels used to inform the assessment on commercial fisheries are presented in Table 14.5.

Table 14.5 Definitions of Sensitivity Levels for Commercial Fisheries Receptors

Sensitivity	Definition
High	Limited operational range and ability to deploy only one gear type. High dependence upon a single fishing ground.
Medium	Moderate extent of operational range and / or ability to deploy an alternative gear type. Dependence upon a limited number of fishing grounds.

Sensitivity	Definition
Low	Extensive operational range and / or ability to deploy a number of gear types, or modify gears. Ability to fish a number of fishing grounds.
Negligible	Extensive operational range and very high method versatility in terms of gear types. Vessels are able to exploit a large number of fishing grounds.

14.4.1.3 Magnitude

16. The criteria used to define magnitude of a potential impact on commercial fisheries are provided in Table 14.6.

17. The magnitude of an effect is considered for each predicted impact on an individual fleet basis and is defined taking account of the spatial and temporal extent of the impact. This is considered in the context of the relative level of importance to each fleet of the area affected by the potential impact (i.e. the level of fishing in the area with reference to the extent of alternative grounds that the fleet is able to exploit).

18. With respect to the duration of potential impacts, those which relate to construction are considered to be short to medium term, with the overall offshore construction programme for Norfolk Vanguard anticipated to be between 2 and 4 years (see section 14.7.3). Impacts associated with operation are longer term, throughout the anticipated 30 year design life of Norfolk Vanguard.

Table 14.6 Definitions of Magnitude for Commercial Fisheries Receptors

Magnitude	Definition
High	The area affected by the impact sustains high levels of activity by the fleet and covers a large or moderate extent of its grounds; and/or The effect is permanent.
Medium	The area affected by the impact sustains moderate/high levels of activity by the fleet and covers a small/moderate extent of its grounds; and/or The effect is long term.
Low	The area affected by the impact sustains low/moderate levels of activity by the fleet and covers a small extent of its grounds; and/or The effect is short to medium term.
Negligible	The area affected by the impact sustains low/ negligible activity by the fleet and covers a small/negligible extent of its grounds; and/or The effect is short term.

14.4.1.4 Impact Significance

19. Table 14.17 applies the significance criteria to the assessment of an impact, taking into account the magnitude of effect and sensitivity of the receptor. On this basis potential impacts are assessed as of negligible, minor, moderate of major

significance. Those impacts which are of moderate or major significance are considered significant in Environmental Impact Assessment (EIA) terms.

20. It should be noted that the application of significance criteria to this assessment, whilst guided by the significance criteria matrix (Table 14.17), is largely qualitative and based on professional judgement.

Table 14.7 Impact significance matrix

		Negative Magnitude				Beneficial Magnitude			
		High	Medium	Low	Negligible	Negligible	Low	Medium	High
Sensitivity	High	*Major*	*Major*	*Moderate*	*Minor*	*Minor*	*Moderate*	*Major*	*Major*
	Medium	*Major*	*Moderate*	*Minor*	*Minor*	*Minor*	*Minor*	*Moderate*	*Major*
	Low	*Moderate*	*Minor*	*Minor*	*Negligible*	*Negligible*	*Minor*	*Minor*	*Moderate*
	Negligible	*Minor*	*Negligible*	*Negligible*	*Negligible*	*Negligible*	*Negligible*	*Negligible*	*Minor*

Table 14.8 Impact significance definitions

Impact Significance	Definition
Major	Very large or large change in receptor condition, either adverse or beneficial, which is likely to be an important consideration at a regional or district level because it contributes to achieving national, regional or local objectives, or, could result in exceedance of statutory objectives and / or breaches of legislation.
Moderate	Intermediate change in receptor condition, which is likely to be an important consideration at a local level.
Minor	Small change in receptor condition, which may be raised as a local issue but is unlikely to be important in the decision making process.
Negligible	No discernible change in receptor condition.

14.4.1.5 Health and safety risks

21. Where Norfolk Vanguard poses a potential health and safety risk to fishing vessels and crews, the significance criteria outlined previously are not considered adequate. In these instances, impacts are assessed in terms of potential risks in line with the parameters used in Chapter 15 Shipping and Navigation (Table 14.9).

22. Following this approach, risks which are defined to be within acceptable limits are not considered significant in EIA terms whilst risks deemed to be outside acceptable limits are considered to be significant in terms of the EIA regulations.

Table 14.9 Risk Matrix Description

Risk Region	Risk	Description
	Broadly Acceptable	Risk as low as reasonably practicable (ALARP) with no additional mitigation or monitoring required above embedded mitigations. Includes impacts that have no perceptible effect (effect would not be noticeable to receptors).
	Tolerable (with or without mitigation)	Risk acceptable but may require additional mitigation measures and monitoring in place to control and reduce to ALARP.
	Unacceptable	Significant risk mitigation or design modification required to reduce to ALARP.

14.4.2 Cumulative Impact Assessment

23. The projects / activities which have been screened for assessment of cumulative impacts take account of the wide operational range of some of the fleets and therefore include projects located within the North Sea and the English Channel.

14.4.3 Transboundary Impacts

24. The impact assessment provided within this chapter also takes account of the potential impacts of Norfolk Vanguard on international fleets which are known to operate in the study area. As a result, the assessment of potential transboundary impacts is integrated within the impact assessment carried out throughout this chapter.

14.5 Scope

14.5.1 Study Area

25. The study area for the assessment of commercial fishery activities in Norfolk Vanguard is shown in Figure 14.1. The development is located in ICES Division IVc (Southern North Sea). Fisheries data are recorded, collated and analysed by ICES rectangles within each division. ICES rectangles are the smallest available units for collation of fisheries data and have therefore been used to define the study area for the project as follows:

- ICES rectangle 34F1 which encompasses the inshore section of the offshore cable corridor;
- ICES rectangle 34F2 which encompasses most of NV West, the western section of NV East and part of the offshore cable corridor; and
- ICES rectangle 34F3 which encompasses the eastern section of NV East.

26. A small area of the northern section of NV West is located outside the ICES rectangles mentioned above (in ICES rectangle 35F2). Due to the small proportion of this rectangle occupied by NV West, baseline information in respect of commercial fisheries has not been analysed at ICES rectangle level for this rectangle.

14.5.2 Data and Information Sources

27. The key datasets used to characterise the baseline and assess the potential impacts of Norfolk Vanguard on commercial fisheries receptors are summarised in Table 14.10. A detailed description of the data and information sources used is provided in Appendix 14.1.

Table 14.10 Key datasets used to inform this chapter

Data	Year	Coverage	Confidence	Notes
UK MMO Fisheries Statistics	2007 to 2016	UK vessels landing into UK and European ports. Non-UK vessels landing into UK ports.	High	Landings data provided by value (£).
UK MMO Surveillance Sightings	2011 to 2015[1]	Sightings of vessels by gear type (all nationalities) recorded in UK waters on weekly surveillance fly overs during daylight hours.	Medium to high	May underestimate total extent of fishing activity due to flyover frequency and timing.
UK MMO Satellite Tracking (VMS) Data	2012 to 2016	Aggregated VMS pings recorded in 0.05° by 0.05° grids from UK vessels only in European waters.	High	VMS provided by value (£) and effort (hours)
Belgian ILVO fisheries statistics (landings value and effort data)	2010 to 2014	All over-10m Belgian vessels recorded as actively fishing, irrespective of location.	High	Landings data provided by value (€).
Belgian ILVO VMS Data	2010 to 2014	VMS data combined with logbook data by Belgian vessels. The data has been filtered by speed.	High	VMS is provided by value (€), effort (days at sea) and by gear type
Netherlands, IMARES and LEI VMS and integrated Landings data.	2012 to 2016	VMS data combined with logbook data by Dutch vessels in the North Sea. A grid is defined based on 1/16th of an ICES rectangle. The data is filtered by speed.	High	VMS is provided by value (€), effort (days at sea) and gear type.

[1] Given the limitations of the MMO 2016 surveillance sightings dataset (no sightings recorded in the study area for that year) surveillance sightings data have been analysed only up to 2015 (see Appendix 14.1 for further detail).

Data	Year	Coverage	Confidence	Notes
Netherlands IMARES Fisheries statistics (landings value and effort data)	2012 to 2016	Dutch vessel landings into European ports	High	Fisheries statistics (landings values and effort) available from 2012 to 2016 for method only.
Danish, Ministeriet for Fødevarer, Landbrug og Fiskeri VMS Data	2011 to 2015	VMS data for all UK waters by Danish vessels that can be split into gear categories. The data is filtered by speed.	High	VMS is provided by effort (days) and by gear type.
French L'Institut Français de Recherche pour l'Exploitation de la Mer (IFREMER) VMS Effort data	2014	VMS charts provided for the Central (IVb) and Southern North Sea (IVc).	High	VMS provided by effort (days)
Comité Régional des Pêches Maritimes et des Elevages Marins (CRPMEM) Nord-Pas-de-Calais Picardie VMS Effort Data	2009	VMS charts provided for the Nord-Pas-de-Calais Picardie fleet based on speed filtered VMS data and sales registered at French fish auctions.	Medium to High	Based on consultation with 89% of the fleet.
German Federal Office for Agriculture and Food VMS data	2007 to 2012	VMS provided by vessel density in the North Sea.	Medium	VMS provided by density.

28. In addition to information derived from analysis of the datasets outlined in Table 14.10, extensive information has been collected through direct consultation with fisheries stakeholders (Table 14.4) and has been used to inform the baseline characterisation and impact assessment. This included information on fishing patterns, operating practices, vessel and gear specifications as well as key concerns in relation to the project (Appendix 14.1).

14.5.3 Assumptions and Limitations

29. Characterisation of the existing environment has been undertaken using the data sources listed above. These data sources, including their sensitivities and limitations, are described in further detail in Appendix 14.1.

14.6 Existing Environment

14.6.1 General Overview

30. MMO surveillance sightings (2011-2015) in the study area are shown in Figure 14.2 and Figure 14.3. It should be noted that surveillance sightings do not accurately

describe actual levels of fishing activity, but give a general indication of the relative distribution of activity by nationality and method.

31. The number and proportion of the total observations by nationality in ICES rectangles 34F1, 34F2 and 34F3 are detailed in Table 14.11, Table 14.12 and Table 14.13, respectively.

32. In inshore rectangle 34F1, where the inshore section of the offshore cable corridor is located, the majority of sightings (89%) are of the local UK fleet and for the most part concentrated within the 6nm limit (Table 14.11 and Figure 14.2). 62% of UK sightings in this rectangle are of potters/whelkers. French vessels, principally trawlers, make up 9% of observations in 34F1. As the French fleet do not have historic rights to fish inside the UK's 12nm limit it is understood that these vessels are in transit to grounds further north. Whilst the Belgian fleet have historic fishing rights to operate between the UK's 6 - 12nm limit, a limited number of sightings by these vessels have been recorded within this area in rectangle 34F1 (Table 14.11, Figure 14.2 and Figure 14.3).

33. In ICES rectangle 34F2, where the majority of the area occupied by the OWF sites is located, Dutch beam trawlers account for 70% of sightings. 14% of sightings are Belgian vessels, comprising almost entirely of beam trawls. The UK fleet accounts for 8% of the sightings in this rectangle across a range of gear types (Table 14.12, Figure 14.2. and Figure 14.3).

34. In ICES rectangle 34F3, where the eastern edge of NV East is located, Dutch beam trawlers account for the majority of sightings (75%). Vessels from the UK, Belgium, France, Denmark and Germany comprise the remaining 11% of observations in this rectangle (Table 14.13 , Figure 14.2. and Figure 14.3).

35. A summary of the distribution, type and level of fishing activity is given in the following sections for the fleets active in the study area. These include the following fleets:

- Dutch;
- Belgium;
- UK;
- French;
- Danish; and
- German.

36. Further detailed information on fishing practices by all the relevant fleets is provided in the Commercial Fisheries Technical Report (Appendix 14.1).

Table 14.11 Surveillance sightings (2011-2015) in ICES rectangle 34F1 by nationality and method

Nationality	Method	% of total Sightings in 34F1
United Kingdom	Potter/Whelker	62.4
	Beam Trawler	6.8
	Trawler (All)	5.6
	Gill Netter	2.9
	Scallop Dredger (French/Newhaven)	2.5
	Unknown	2.0
	Long Liner	1.4
	Stern trawler	1.1
	Demersal Side Trawler	0.9
	Other Dredges (Including Mussel)	0.9
	Shrimper	0.9
	Pair Trawler (All)	0.5
	Rod and Line	0.5
	Stern Trawler (Pelagic/Demersal)	0.5
	Demersal Stern Trawler	0.2
	United Kingdom % Of Total Sightings (All Gears)	87.8
France	Trawler (All)	7.9
	Stern Trawler (Pelagic/Demersal)	0.9
	Pelagic Stern Trawler	0.2
	France % Of Total Sightings (All Gears)	9.0
Belgium	Beam Trawler	2.9
	Belgium % Of Total Sightings (All Gears)	2.9
Netherlands	Beam Trawler	0.2
	Netherlands % Of Total Sightings (All Gears)	0.2

Table 14.12 Surveillance sightings (2011-2015) in ICES rectangle 34F2 by nationality and method

Nationality	Method	% of total Sightings in 34F2
United Kingdom	Long Liner	1.6
	Potter/Whelker	1.6
	Beam Trawler	1.5
	Gill Netter	1.4
	Trawler (All)	1.3
	Bottom Seiner (Anchor/Danish/Fly/Scots)	0.1
	Demersal Stern Trawler	0.1
	Unknown	0.1
	UK % Of Total Sightings (All Gears)	7.9
France	Trawler (All)	1.8
	Stern Trawler (Pelagic/Demersal)	0.6
	Demersal Stern Trawler	0.2
	Beam Trawler	0.1
	France % Of Total Sightings (All Gears)	2.7

Nationality	Method	% of total Sightings in 34F2
Belgium	Beam Trawler	13.6
	Trawler (All)	0.2
	Stern Trawler (Pelagic/Demersal)	0.1
	Belgium % Of Total Sightings (All Gears)	13.8
Denmark	Trawler (All)	0.8
	Beam Trawler	0.2
	Pair Trawler (All)	0.2
	Gill Netter	0.1
	Stern Trawler	0.1
	Denmark % Of Total Sightings (All Gears)	1.5
Germany	Beam Trawler	0.6
	Trawler (All)	0.2
	Pair Trawler (All)	0.1
	Demersal Stern Trawler	0.0
	Germany % Of Total Sightings (All Gears)	1.0
Netherlands	Beam Trawler	70.0
	Trawler (All)	2.1
	Pair Trawler (All)	0.5
	Unknown	0.2
	Bottom Seiner (Anchor/Danish/Fly/Scots)	0.1
	Netherlands % Of Total Sightings (All Gears)	73.0

Table 14.13 Surveillance sightings (2011-2015) in ICES rectangle 34F3 by nationality and method

Nationality	Method	% of total Sightings in 34F3
United Kingdom	Beam Trawler	1.7
	Gill Netter	1.7
	United Kingdom % Of Total Sightings (All Gears)	3.3
France	Trawler (All)	0.8
	Gill Netter	0.4
	Pelagic Stern Trawler	0.4
	Stern Trawler (Pelagic/Demersal)	0.4
	France % Of Total Sightings (All Gears)	2.1
Belgium	Trawler (All)	0.8
	Beam Trawler	0.4
	Side Trawler (Pelagic/Demersal)	0.4
	Stern Trawler (Pelagic/Demersal)	0.4
	Belgium % Of Total Sightings (All Gears)	2.1
Denmark	Gill Netter	1.2
	Beam Trawler	0.4
	Stern Trawler (Pelagic/Demersal)	0.4
	Denmark % Of Total Sightings (All Gears)	2.1

Nationality	Method	% of total Sightings in 34F3
Germany	Beam Trawler	1.2
	Gill Netter	0.4
	Germany % Of Total Sightings (All Gears)	1.7
Netherlands	Beam Trawler	74.8
	Trawler (All)	9.5
	Bottom Seiner (Anchor/Danish/Fly/Scots)	1.2
	Stern Trawler (Pelagic/Demersal)	0.8
	Demersal Stern Trawler	0.4
	Gill Netter	0.4
	Pair Trawler (All)	0.4
	Potter/Whelker	0.4
	Purse Seiner	0.4
	Unknown	0.4
	Netherlands % Of Total Sightings (All Gears)	88.8

14.6.2 Dutch Fishing Activity

14.6.2.1 Overview

37. The Netherlands operates the largest fleet of fishing vessels in the Southern North Sea. The majority of Dutch vessels undertake beam trawling, mainly pulse wing trawling, with a significantly lower number deploying seine nets. Due to the absence of any historic rights, Dutch vessels can only target grounds outside of the UK's 12nm limit.

14.6.2.2 Beam Trawling

38. Analysis of VMS data for the Dutch beam trawl fleet indicates that their activity for the most part concentrates in the Southern North Sea and to a lesser extent, in some parts of the Central North Sea. The greatest intensity of beam trawling activity occurs along the coasts of the Netherlands and Belgium with moderate to high fishing activity extending into the OWF sites and wider surrounding areas. Comparatively lower activity levels are recorded in the offshore section of the offshore cable corridor and in the wider area north of the OWF sites (Figure 14.4 and Figure 14.5)

39. Beam trawling targets flatfish species, predominantly sole and plaice. Other species are also caught but to a lesser extent.

40. Grounds in areas relevant to Norfolk Vanguard are predominately fished by vessels from Texel, Stellendam and Ouischild. From consultation it is understood that at present, up to fifty-seven Dutch beam trawlers fish the former East Anglia Zone in which Norfolk Vanguard is located (Appendix 14.1).

41. Most of the vessels fishing in the study area are of the large size category of beam trawler, of 40-43m in length, and deploy pulse wing trawl gear.

42. It should be noted that the EU voted to prohibit electronic pulse fishing on 16th January 2018 as part of the overhaul of EU fishing regulations. This was subsequently negotiated by the European Parliament, European Commission, the UK (NFFO) and the Netherlands (VisNed). It was agreed that from 15th February 2018, a voluntary Interim Spatial Separation Agreement would come into force between Dutch pulse fishermen and the English East Coast inshore fishermen, whereby Dutch fishermen would avoid using pulse methods in three designated areas (area 1 - Ramsgate/Thames; area 2 - Welland Area, Lowestoft; area 3 - East Lowestoft area, Lowestoft) (Figure 14.6)

43. In recent consultation, VisNed expressed the opinion that the Netherlands would be successful in their negotiations with the EU and that within two years pulse wing fishing by the Dutch fleet would be able to resume as it occurred prior to 16th January 2018 (Pers Comms: P. Visser, 11/04/2018). It is however as yet not known how the UK government will address the issue of pulse wing fishing in respect of "Brexit".

14.6.2.3 Seine Netting

44. There are a limited number of Dutch vessels targeting demersal and pelagic species using seine nets.

45. Dutch seine netting occurs at significantly lower levels within the offshore project area in comparison to beam trawling. The highest concentration of activity by Dutch seine netters occurs within the English Channel (Figure 14.7 and Figure 14.8).

46. Seine nets make a small contribution to landings in rectangles 34F2 and 34F3, where NV East and NV West are located. However, this is significantly less than landings by beam trawlers (Figure 14.9).

14.6.2.4 Other Methods

47. Midwater trawling by the Dutch occurs at only very low levels in the vicinity of Norfolk Vanguard (Figure 14.10 and Figure 14.11). From consultation with VisNed (Pers. Comm: P. Visser, 11/04/2018) it is understood that pelagic vessels do not fish in the area of the project to any significant extent. Furthermore, the majority of the full time Dutch pelagic vessels are of a size, typically 90-142m in length, and operate gears of dimensions which would make it unviable to operate in the area where the project is located.

36. Fishing activity by demersal otter trawls (Figure 14.12 and Figure 14.13) and nets (Figure 14.14 and Figure 14.15) occurs at minimal levels in areas relevant to Norfolk

Vanguard. Other methods such as purse seines (Figure 14.16 and Figure 14.17), traps (Figure 14.18 and Figure 14.19) and dredges (Figure 14.20 and Figure 14.21), show no activity within the study area.

14.6.3 Belgian Fishing Activity

14.6.3.1 Overview

48. The Belgian fleet focuses its fishing activity in areas to the southwest of Norfolk Vanguard. The fleet comprises a total of approximately 65 vessels, the majority of which are beam trawlers classed as Eurokotters and which operate from Ostend. A significantly lower number of vessels deploy demersal otter trawls. A very limited number of vessels utilise seine nets.

49. The Belgian fleet have historic fishing rights between the UK's 6 and 12nm limit and are therefore allowed to fish in the section of the offshore cable corridor which falls within those limits.

14.6.3.2 Beam Trawling

50. Belgian beam trawlers operate in the southern section of NV West and across the central part of the offshore cable corridor. However, the majority of activity is recorded to the south of the project. Only very low levels of activity occur in NV East (Figure 14.22 and Figure 14.23).

51. The vast majority of landings from the ICES rectangles in which the offshore export cable and the majority of the OWF sites are located (34F1 and 34F2), derive from beam trawling with the small remainder being from seine netting (Figure 14.24 and Figure 14.25).

14.6.3.3 Demersal Otter Trawling

52. Demersal otter trawling by Belgian vessels occurs at substantially lower levels than beam trawling and for the most part activity is focused on specific grounds in the Central North Sea and further south off the Essex coast (Figure 14.26 and Figure 14.27).

14.6.3.4 Seine Netting

53. Belgian seine netting occurs at a low level and is only occasionally recorded in areas relevant to Norfolk Vanguard (Figure 14.28 and Figure 14.29).

14.6.4 UK Fishing Activity

14.6.4.1 Overview

54. The principal locations for local UK vessels operating in areas relevant to Norfolk Vanguard are beach launches at Sea Palling, Caister, Cromer, and the ports of Lowestoft and Great Yarmouth.

55. Local vessels operating from these key locations primarily fish grounds within the UK's 12nm limit and mostly within the 6nm limit, due to their small size and associated limited operational range and in order to reduce the risk of potential conflicts with trawl gears. A number of the vessels are multi-purpose with the ability to switch between gears on a seasonal basis. The main method employed along the East Anglian coastline is potting for lobster, edible crabs and whelks.

56. Further offshore, beyond the 12nm limit, fishing activity by UK vessels is comparatively low. Of this activity, beam trawling represents the main UK fishing method.

14.6.4.2 Demersal Trawling

57. Demersal trawling occurs throughout the vicinity of Norfolk Vanguard including areas within NV East and NV West (Figure 14.30 and Figure 14.31). Separate analysis of VMS data for beam trawls only (Figure 14.32) suggests that the majority of demersal trawling activity in areas relevant to Norfolk Vanguard is undertaken by this method, with otter trawling accounting for very low levels of activity (Figure 14.33, Figure 14.34 and Figure 14.35).

58. In line with this, analysis of MMO landings data from ICES rectangles 34F2 and 34F3, where the majority of NV East and NV West are located, indicates that landings are almost exclusively from beam trawlers (Figure 14.36). It should be noted that the majority of landings from these rectangles are into Dutch ports, and it is understood that most of these are from UK flagged but Dutch owned vessels (Appendix 14.1).

59. The principal species targeted by beam trawlers in this area is Dover sole and to a lesser extent plaice, turbot and brill (Figure 14.37).

60. There are no landings recorded by the over 15m otter trawl fleet in any areas relevant to Norfolk Vanguard (Figure 14.33, Figure 14.34 and Figure 14.35).

14.6.4.3 Static Gears

61. The UK under 10m fleet, which undertakes potting, longlining and netting, targets local fishing grounds within the inshore section of the offshore cable corridor, mostly within 6nm (Figure 14.3, Figure 14.38, Figure 14.39, Figure 14.40, Figure 14.41). Analysis of landings data indicates that static gears account for a significant proportion of landings in inshore rectangle 34F1, where the inshore section of the offshore cable corridor is located (Figure 14.36). In contrast to larger UK beam trawlers focusing on grounds further offshore, these smaller vessels have reduced capability to endure adverse weather and lack the capacity to exploit more extensive commercial fishing grounds (Appendix 14.1).

62. Lobsters, edible crab and whelk are the main species targeted by under 10m inshore vessels (Figure 14.37). The principal gear types employed are pots (both parlour and whelk pots) (Appendix 14.1).

63. Further offshore, longlining and to a lesser extent netting, are undertaken on a seasonal basis and when weather conditions allow. A number of vessels that longline out of Lowestoft are known to fish large areas off the Norfolk and Suffolk coasts (Appendix 14.1).

14.6.5 French Fishing Activity

14.6.5.1 Overview

64. Low levels of activity are identified for French vessels within the OWF sites and the offshore cable corridor.

65. The principal methods deployed by French vessels in areas relevant to Norfolk Vanguard are bottom trawls and to a lesser extent pelagic trawls.

66. The majority of French vessels are the larger class of demersal otter trawlers (>18m in length) and operate predominantly from the port of Boulogne and to a lesser extent Dieppe (Appendix 14.1).

14.6.5.2 Demersal Otter Trawling and Pelagic Trawling

67. French activity by demersal otter trawls and pelagic nets occurs at relatively low levels in the offshore section of the offshore cable route and within the OWF sites. Fishing activity by these fleets, is primarily focused on grounds to the south of Norfolk Vanguard (Figure 14.42, Figure 14.43, Figure 14.44 and Figure 14.45).

68. Bottom otter trawls target demersal fish species (Dover sole, red mullet, cuttlefish, whiting and plaice) and cephalopods (cuttlefish), while pelagic trawls target species such as herring, mackerel, horse mackerel and sardine (Appendix 14.1).

14.6.6 Danish Fishing Activity

14.6.6.1 Overview

69. The Danish offshore fleet consists mainly of industrial sandeel trawlers, demersal trawlers, midwater trawlers and seine netters. However, demersal trawling and seine netting is focused on fishing grounds north of the project area and does not occur in the area where Norfolk Vanguard is situated (Appendix 14.1).

14.6.6.2 Sandeel Trawling and Pelagic Trawlers

70. Danish sandeel trawling is undertaken by specifically designed industrial trawlers of up to 40m in length as well as occasionally by 65-80m pelagic trawlers whose

principal fishing activity is the capture of higher value pelagic species, namely mackerel, herring and horse mackerel.

71. Activity by the industrial sandeel fleet is mainly concentrated in areas such as the Dogger Bank (Central North Sea) and Norwegian coast (Northern North Sea). Although not restricted to these areas, activity is considerably lower in the Southern North Sea, including the offshore project area (Figure 14.46).

72. Whilst sandeel fishing grounds are known to occur in the areas relevant to NV East, the Danish Fishermen Federation confirmed (Pers. Comm: H. Lund, 22/12/2016) that activity in these areas has been at very low levels in recent years.

73. Similarly, activity by midwater trawlers in areas relevant to Norfolk Vanguard is also limited, with the highest levels of activity recorded to the west of the Danish coast (Figure 14.47).

14.6.7 German Fishing Activity

74. Surveillance sightings illustrate sporadic sightings of German vessels, the majority of which are recorded in amongst the areas of concentrated activity by Dutch vessels (Figure 14.2).

75. As noted in Appendix 14.1, a number of requests to the German Federal Office for Agriculture and Food for up to date VMS, catch and effort data have been made, however these have not been forthcoming.

76. As shown by the currently available VMS data (2007-2012) (Figure 14.48), it appears that negligible activity by German registered fishing vessels occurs within the offshore project area, with effort being mainly concentrated in the Dutch and Danish sectors of the Central North Sea.

77. From consultation with VisNed (Pers. Comms: P. Visser, 26/04/2018), it is understood that a significant proportion of the German fishing fleet and particularly the beam trawling fleet, whilst being on the German register of fishing vessels, fishing German licences and quotas, is actually Dutch owned and operated.

14.6.8 Anticipated Trends in Baseline Conditions

78. Frequently imposed changes to quota and effort allocation, fishing areas and gear restrictions make predicting future patterns of fishing activity difficult. Furthermore, significant changes to the Common Fisheries Policy (CFP), which are applied to all fleets in addition to the potential effects of “Brexit”, are likely to have significant impacts on commercial fishing within the North Sea.

79. For foreign fishing fleets, "Brexit" may have a significant impact on quotas and accessibility to UK waters, as full fisheries independence within the UK's exclusive economic zone has been postulated. At present, the final outcome in terms of foreign fleet's access within UK territorial limits is therefore difficult to predict. Whilst as stated above, full independence has been suggested, it is however possible that to a large extent the current patterns of access and effort and catch controls may largely remain as they are at present following the end of the "Brexit" transition phase.

14.7 Potential Impacts

80. This section describes the assessment of the potential impacts on commercial fishing activities as a result of the construction, operation and decommissioning of Norfolk Vanguard. The impacts taken forward for assessment are based on the relevant guidance as outlined in section 14.4.1. The opinions of regulators and stakeholders identified from scoping and PEIR responses and direct consultation (see section 14.2) have also been considered within the assessment.

14.7.1 Embedded Mitigation Specific to Commercial Fisheries

81. A number of mitigation measures have been incorporated as part of the project design process in order to minimise the potential impacts of Norfolk Vanguard on various receptors. Those that are relevant to commercial fisheries are outlined below.

82. Following PEIR, Norfolk Vanguard Limited has reduced the maximum number of turbines from 257 to 200, while maintaining the maximum generating capacity of up to 1,800MW by committing to using larger 9MW to 20MW turbines. Additionally, this results in an increase in the minimum spacing between turbines from 616m to 680m.

83. The overall indicative window within which the construction phase will take place has been reduced to approximately four years with two construction phases currently proposed (instead of three) within this window. This will result in a reduction of the overall period of disturbance to commercial fishing associated with construction activities.

84. Norfolk Vanguard Limited has committed to using an HVDC solution in order to reduce the number of export cables and volume of cable protection. This results in the following mitigating features:

- There will be two cable trenches instead of six for Norfolk Vanguard (and the same for Norfolk Boreas, considered in the CIA);

- The volume of sediment arising from pre-sweeping and cable installation works is reduced;
- The area of disturbance for pre-sweeping and cable installation is reduced;
- The space required for cable installation is reduced, increasing the space available within the cable corridor for micrositing;
- The potential requirement for cable protection in the unlikely event that cables cannot be buried is reduced; and
- The number of export cables required to cross existing cables and pipelines and the associated cable protection is reduced

85. Norfolk Vanguard Limited is committed to burying offshore export cables where possible, therefore reducing the need for surface cable protection. A detailed export cable installation study (CWind 2017 unpublished[2]) was commissioned by Norfolk Vanguard Limited which confirmed that cable burial is expected to be possible throughout the offshore cable corridor, with the exception of cable and pipeline crossing locations. In order to provide a conservative and future-proof impact assessment, a contingency estimate has however been included in the assessment, in the event that there may be isolated sections where cable burial is not possible (see Table 14.16).

86. In addition to the above, Norfolk Vanguard Limited is committed to minimise potential impacts on commercial fisheries and facilitate co-existence through the following:

- Timely and efficient Notice to Mariners (NtMs), Kingfisher notifications and other navigational warnings (of the position and nature of works including offshore cable corridor crossings) would be issued to the fishing community.
- Appropriate liaison would be undertaken with all relevant fishing interests in line with the fisheries liaison and co-existence plan (DCO Schedules 9 and 10 14.(1)(d)(v) and Schedules 11 and 12 9.(1)(d)(v)) to ensure that they are fully informed of development planning, construction and maintenance activities and any items which may accentuate risk such as UXOs, unburied cables, cut and weighted cables, etc.
- A Fisheries Liaison Officer (FLO) would be appointed over the construction and operational phase of the project and FLOWW Guidance (2014; 2015) adhered to.
- Development of a Fisheries Liaison and Co-existence Plan post consent;
- The UK Hydrographic Office (UKHO) would be informed of both the progress and the completion of Norfolk Vanguard.

[2] CWind (2017). Norfolk Vanguard Offshore Windfarm Export Cable Installation Study

- Information on the location of areas of cable protection would be communicated to the fishing industry to prevent damage to and from fishing gear, thus ensuring the safety of vessels operating in the area.
- The turbine layout would be arranged in in accordance with the recommendations for layout contained in MGN543, to assist vessel transit through the OWF sites.
- All contractors undertaking site works would be contractually obliged, and monitored by client representatives, to ensure compliance with standard offshore policies. These policies would prohibit the discarding of objects or materials overboard and require rapid recovery of any accidentally dropped objects.
- An Outline Scour Protection and Cable Protection Management Plan (document reference 8.16) is provided with the Norfolk Vanguard DCO Application. A cable burial risk assessment will be undertaken post consent, in consultation with stakeholders; and
- Post-lay and burial inspection surveys will be undertaken. In addition to burial status, these will identify the presence of construction related seabed obstacles and, where appropriate and practicable rectification works would be undertaken.

14.7.2 Monitoring

87. An Offshore In Principle Monitoring Plan (document reference 8.12) has been submitted with the DCO application. Of specific relevance to commercial fisheries is the monitoring of cables. An Outline Scour Protection and Cable Protection Plan (document reference 8.16) has been submitted with the DCO application (as required under conditions 14.(1) (e) (DCO schedules 9 and 10) and 9.(1) (e) (DCO Schedules 11 and 12) of the Deemed Marine Licences (DMLs).

14.7.3 Worst Case

88. The offshore project area consists of:

- The offshore cable corridor with landfall at Happisburgh South;
- Norfolk Vanguard West (NV West); and
- Norfolk Vanguard East (NV East).

89. The detailed design of Norfolk Vanguard (including numbers of wind turbines, layout configuration, requirement for scour protection etc.) will not be determined until after the DCO has been determined. Therefore, realistic worst case scenarios have been defined for each of the potential impacts of Norfolk Vanguard on commercial

fisheries and are outlined in Table 14.16. These have been identified based on the information on project design provided in Chapter 5 Project Description.

14.7.3.1 Foundations

90. Within Norfolk Vanguard, several different sizes of wind turbine are being considered in the range of 9MW and 20MW. In order to achieve the maximum 1,800MW installed capacity, there would be between 90 (20MW) and 200 (9MW) wind turbines.

91. In addition, up to two offshore electrical platforms, two accommodation platforms, two meteorological masts, two LiDAR platforms and two wave buoys, plus offshore cables are considered as part of the worst-case scenario.

92. A range of foundation options are currently being considered, these include:

- Wind turbines - jacket, gravity base structure (GBS), suction caisson, monopile and tension leg floating platforms;
- Offshore electrical platform – GBS, monopile, pin-pile or suction caisson;
- Accommodation platforms – monopile, pin-pile or suction caisson;
- Met masts - GBS, monopile or pin-pile; and
- Lidar - floating with anchors or monopile.

93. The use of 9MW turbines is considered to represent the worst case scenario in respect of commercial fishing as this would result in the maximum number of structures (200 turbines) and associated safety zones and the minimum spacing between turbines (680m).

94. The worst case scenario of turbine foundations takes account of the design option that would result in the greatest potential interaction risks with fishing gears. This would be a result of the installation of 200 x 9MW tension leg floating platforms with up to 12 anchor lines (angle of mooring being up to 30 degrees and diameter of a floating structure of 45m).

14.7.3.2 Layout

95. The layout of the wind turbines will be defined post consent but will be based on the following maxima:

- Up to 1800MW in NV East, 0MW in NV West; or
- 0MW in NV East, up to 1800MW in NV West.

96. Any other potential layouts that are considered up to a maximum of 1800MW (e.g. 1,200MW in NV West and 600MW in NV East, 600MW in NV West and 1,200MW in NV East or 900MW in NV West and 900MW in NV East) lie within the envelope of these scenarios.

14.7.3.3 Phasing

97. Norfolk Vanguard Limited is currently considering constructing the project in one of the following phase options.

- A single phase of up to 1800MW; or
- Two phases of up to a combined 1800MW capacity.

98. Phasing is only applicable to the assessment of construction and decommissioning impacts and not the assessment of impacts during the O&M phase. The infrastructure would be the same for each phasing scenario.

14.7.3.4 Programme

99. The full construction window is expected to be up to four years for the full 1800MW capacity. Table 14.14 and Table 14.15 provide indicative construction programmes for the single phase and two phase options, respectively.

100. In summary, the overall indicative duration of construction works under each phase approach would be as follows:

- Single Phase Approach: offshore construction works taking place for up to approximately two years (23 months) and export cable installation occurring over six months within this period.
- Two Phase Approach: Offshore construction works taking place in two phases of 12 month duration each over a 4 year overall offshore construction works window. Export cable installation occurring over 2 phases (3 months each) during the 4 year overall offshore construction works window.

101. For the purposes of this assessment it is considered that the two phase approach constitutes the worst case scenario as this would result in the overall longest construction programme (up to four years compared to two years under the single phase approach) and therefore on the longest potential disturbance to normal fishing activities.

Table 14.14 Indicative Norfolk Vanguard construction programme – single phase

Indicative Programme	Approximate duration	2024				2025				2026				2027				2028			
		Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4
Foundation installation	20 months																				
Array & interconnector cable installation	19 months																				
Export cable installation	6 months																				
Wind turbine installation	20 months																				
Total construction works	23 months																				

Table 14.15 Indicative Norfolk Vanguard construction programme – two phase

Indicative Programme	Approximate duration	2024				2025				2026				2027				2028			
		Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4
Foundation installation	2 x 8 months																				
Array & interconnector cable installation	2 x 7 months																				
Export cable installation	2 x 3 months																				
Wind turbine installation	2 x 8 months																				
Total construction works	2 x 12 months																				

Table 14.16 Worst Case Assumptions

Impact	Key design Parameters forming the realistic worst case scenario	Rationale
Construction		
Impact 1: Adverse impacts on commercially exploited fish and shellfish populations	See Chapter 11 Fish and Shellfish Ecology	
Impact 2: Temporary loss or restricted access to traditional grounds	Temporary 500m safety zones around construction works and 50m safety zones around installed or partially installed infrastructure leading to a theoretical worst case under which fishing activities would be excluded from NV East and NV West and a 500m buffer around each site. Temporary 500m safety zones around cable laying vessels and 500m advisory safety zones along exposed sections of cables (i.e. cables awaiting burial or protection) leading to a theoretical worst case under which all fishing activities would be excluded from the export cable corridor. Offshore construction works taking place in two phases of 12 month duration each, over a 4 year overall indicative offshore construction works window. Export cable installation occurring over 2 phases (3 months each) during the 4 year overall indicative offshore construction works window.	This represents the maximum duration and extent of fishing exclusion throughout the construction phase and hence the greatest potential to restrict access to fishing grounds.

Impact 3: Safety issues for fishing vessels	**Safety risks as a result of potential interactions between fishing vessels, gear and cables:**
	• Maximum length of cables:
	  ○ Array cables: 600km
	  ○ Interconnector cables: 150km
	  ○ Export cables: 400km (4 cables (2xDC pairs)
	  ○ Cables would be buried to at least 1m where possible and protected where burial is not feasible (i.e. due to hard ground or at crossings);
	• Maximum extent of cables requiring protection measures:
	Array cables:
	  ○ Up to 60km of cable protection may be required in the unlikely event that array cables cannot be buried (based on 10% of the length) resulting in a footprint of 300,000m^2 (based on protection width of 5m).
		This would result in the maximum potential for safety risks for fishing vessels as a result of potential interactions between fishing gear and cables and infrastructure

Impact	Key design Parameters forming the realistic worst case scenario	Rationale
	○ Array cable protection at turbines 100m cable length x 5m width x 200 turbines = 100,000m2 ○ Array cable crossings protection 10 crossings x 100m x 10m = 10,000m^2 <u>Interconnector cable protection</u>: ○ Interconnector cable protection approaching platforms 100m cable length x 5m width x 2 platforms = 1,000m^2 ○ Surface laid interconnector cable protection 5m width x 15,000m (10% of the length) = 75,000m^2 ○ Interconnector cable crossings protection crossings – captured within export cable/array cable crossing total <u>Export cables</u> ○ Crossings: A total of eleven crossings (nine cables and two pipelines) are required for each cable pair (i.e. up to 22 crossings in total) resulting in a total footprint of 22,000m^2 (based on a width of 10m and length of 100m of cable protection per crossing). ○ Nearshore (within 10m depth contour): Cable protection may be required at each of the landfall HDD exit points. This would entail one mattress (6m length x 3m width x 0.3m height) plus rock dumping (5m length x 5m width x 0.5m height) at each exit point (up to two cable pairs) resulting in a footprint of 36m^2 ○ Unburied cables: In the unlikely event that cable burial is not possible due to hard substrate being encountered, up to 10km per cable pair outside the SAC and 4km inside the SAC per cable pair (28km in total) could require additional protection resulting in a footprint of 140,000m^2 (based on protection width of 5m). **Safety risks as a result of potential Interactions between fishing vessels and gear and project infrastructure:** Manoeuvrability and snagging risk issues associated with the presence of installed and partially installed infrastructure as a result of the installation of: • 200x 9MW turbines on tension leg platforms with up to 12 anchor lines (angle of mooring up to 30 degrees and 45m diameter of floating structure). • Two offshore electrical platforms;	

Impact	Key design Parameters forming the realistic worst case scenario	Rationale
	• Two accommodation platforms; • Two met masts; and • Two Lidar. Safety risks in relation to seabed obstacles are addressed separately under Construction Impact 5. Safety issues for fishing vessels associated with the potential for collision with construction vessels and allision with infrastructure within the Norfolk Vanguard are described and assessed in Chapter 15 Shipping and Navigation. Similarly, safety issues associated with marine radar interference and potential increased emergency response are also described and assessed in Chapter 15 Shipping and Navigation.	
Impact 4: Increased steaming times to fishing grounds	Maximum number of 500m safety zones around construction works and 50m safety zones around installed or partially installed infrastructure within NV East and NV West at any given over the four year overall construction window (two phase approach). 500m safety zones around export cable lay vessels over the two 3 month phases for export cable installation within the 4 year indicative overall offshore construction works window (two phase approach).	Represents the maximum potential disruption to established steaming routes.
Impact 5: Obstacles on the seabed	Offshore works such as construction anchoring, jack up legs or cable trenching can produce seabed obstructions which can represent a potential fastening risk and damage to fishing gears. Potential for objects to be dropped on the seabed during construction related activities.	The presence of seabed obstacles may result in potentially unacceptable safety risks to fishing vessels
Impact 6: Interference with fishing activities	Construction vessels operating over the indicative offshore construction works window of up to 4 years with construction works occurring over 2 phases of 12 month each. Maximum number of vessel movements: 1,180 return trips to local port over the construction phase. Assumes construction vessel transit routes overlap with mobile and static gear fishing grounds.	The maximum number of vessels transits and the maximum duration of the construction programme would result in the greatest potential for conflict/interaction between construction vessels and fishing vessels and gear.

Impact	Key design Parameters forming the realistic worst case scenario	Rationale
Impact 7: Displacement of fishing activity into other areas	As for the impact of 'Temporary loss or restricted access to traditional fishing grounds'	The worst case represents the maximum duration and extent of fishing exclusion throughout the construction phase and hence the greatest potential to displace fishing activity into other areas.
Operation		
Impact 1: Adverse impacts on commercially exploited fish and shellfish populations	See Chapter 11: Fish and Shellfish Ecology	

Impact 2: Complete loss or restricted access to traditional fishing grounds	Maximum area lost/maximum restriction in access to fishing as a result of the following:
	• 200x9MW turbines on tension leg platforms with up to 12 anchor lines (angle of mooring up to 30 degrees and 45m diameter of floating structure);
	• Two offshore electrical platforms;
	• Two accommodation platforms;
	• Two LIDAR;
	• Safety zones of 500m around major operation and maintenance activities and 50m safety zones around installed infrastructure;
	• Minimum spacing between turbines: 680m;
	• Maximum length of cables:
	  ○ Array cables: 600km
	  ○ Interconnector cables: 150km
	  ○ Export cables: 400km (4 cables (2xDC pairs)
	• Cables will be buried to a minimum depth of 1m where possible and protected where burial is not feasible (i.e. due to hard ground or at crossings); and
	• Maximum area of cables requiring protection:
	  <u>Array cables:</u>
	  ○ Up to 60km of cable protection may be required in the unlikely event that array cables cannot be buried (based on 10% of the length) resulting in a
		Represents the maximum loss of fishing grounds throughout Norfolk Vanguard.

Impact	Key design Parameters forming the realistic worst case scenario	Rationale
	footprint of 300,000m^2 (based on protection width of 5m). ○ Array cable protection at turbines 100m cable length x 5m width x 200 turbines = 100,000m2 ○ Array cable crossings protection 10 crossings x 100m x 10m = 10,000m^2 <u>Interconnector cable protection</u>: ○ Interconnector cable protection approaching platforms 100m cable length x 5m width x 2 platforms = 1,000m^2 ○ Surface laid interconnector cable protection 5m width x 15,000m (10% of the length) = 75,000m^2 ○ Interconnector cable crossings protection crossings – captured within export cable/array cable crossing total <u>Export cables</u> ○ Crossings: A total of eleven crossings (nine cables and two pipelines) are required for each cable pair (i.e. up to 22 crossings in total) resulting in a total footprint of 22,000m^2 (based on a width of 10m and length of 100m of cable protection per crossing). ○ Nearshore (within 10m depth contour): Cable protection may be required at each of the landfall HDD exit points. This would entail one mattress (6m length x 3m width x 0.3m height) plus rock dumping (5m length x 5m width x 0.5m height) at each exit point (up to two cable pairs) resulting in a footprint of 36m^2 ○ Unburied cables: In the unlikely event that cable burial is not possible due to hard substrate being encountered, up to 10km per cable pair outside the SAC and 4km inside the SAC per cable pair (28km in total) could require additional protection resulting in a footprint of 140,000m^2 (based on protection width of 5m).	
Impact 3: Safety issues for fishing vessels	**Safety risks as a result of potential interactions between fishing vessels and gear and cables:** • Maximum length of cables (as in Impact 2 complete loss or restricted access to fishing grounds); • Cables will be buried to a minimum depth of 1m where possible and protected where burial is not feasible (i.e. due to hard ground or at crossings); • Maximum extent of cables requiring protection measures (as in Impact 2 complete	This would result in the maximum potential for safety risks for fishing vessels as a result of potential interactions between fishing gear and cables and project infrastructure

Impact	Key design Parameters forming the realistic worst case scenario	Rationale
	loss or restricted access to fishing grounds): • One export cable repair per year with 300m sections removed and replaced; • Reburial of up to 20km length per export cable pair over the life of the project; • Two array cable repairs per year (array cables estimated to be approximately 6km in length; • Reburial of up to 25% of array cable (estimated once every 5 years); and • One interconnector repair per year. **Safety risks as a result of potential Interactions between fishing vessels and gear and project infrastructure:** Manoeuvrability and snagging risk issues associated with the presence of installed infrastructure (as per in Impact 3 Safety issues for fishing vessels in the construction phase). Safety risks in relation to seabed obstacles are addressed separately under Operation Impact 5. Safety issues for fishing vessels associated with the potential for collision with construction vessels and allision with infrastructure within the Norfolk Vanguard are described and assessed in Chapter 15 Shipping and Navigation. Similarly, safety issues associated with marine radar interference and potential increased emergency response are also described and assessed in Chapter 15 Shipping and Navigation.	
Impact 4: Increased steaming times	• 200 wind turbines with a minimum in row and inter row spacing of 680m (9MW turbines); • Two offshore electrical platforms; • Two accommodation platforms; • Two meteorological masts; and • Two 2 LiDAR stations.	Results in the maximum potential disruption to established steaming routes.
Impact 5: Obstacles on the seabed	Presence of obstacles on the seabed that may represent a fastening/safety risk to fishing vessels	Presence of obstacles on the seabed with potential to result in unacceptable risks to fishing vessels

Impact	Key design Parameters forming the realistic worst case scenario	Rationale
Impact 6: Interference with fishing activities	Up to 440 round trips to site from local ports per year. Assumes transit routes cross mobile and static gear fishing grounds.	The maximum number of vessel transits during operation and decommissioning results in the greatest potential for conflict between operation and maintenance vessels and fishing gear.
Decommissioning		
In the absence of detailed methodologies and schedules, decommissioning works and associated implications for commercial fisheries are considered analogous with those assessed for the construction phase. Decommissioning is likely to include removal of all of the wind turbine components and part of the foundations (those above seabed level). Some or all of the array cables, interconnector cables, and offshore export cables may be removed. Scour and cable protection would likely be left *in situ.*		
Cumulative		
Impact 1: Adverse impacts on commercially exploited fish and shellfish populations	See Chapter 11: Fish and Shellfish Ecology	
Impact 2: Complete loss or restricted access to fishing grounds	Full development of other marine developments in the region, including those detailed in Table.	The worst-case scenario has the potential to result in the maximum restriction of resumption of normal fishing.
Impact 3: Safety issues for fishing vessels	It is assumed that developers and operators of other infrastructure will adhere to the required standards so that fishing vessel safety is not compromised by a cumulative effect in respect of fishing vessel safety.	
Impact 4: Increased steaming times	Full development of other marine developments (please see Table 14.31).	This has the potential to result in maximum disruption to established steaming routes.

Impact	Key design Parameters forming the realistic worst case scenario	Rationale
Impact 5: Obstacles on the seabed	It is assumed that the same obligations will apply in respect of objects on the seabed and as such there is no potential for cumulative effects to occur in relation to seabed debris.	
Impact 6: Interference with fishing vessels	Full development of other marine developments as outlined previously.	Highest potential to result in conflict with fishing vessels or gears.
Impact 7: Displacement of fishing activity into other areas	Full development of other marine developments as outlined previously	Greatest potential to restrict the continuation of normal fishing activities within the region.

14.7.4 Potential Impacts during Construction

14.7.4.1 Impact 1: Adverse impacts on commercially exploited fish and shellfish populations

102. There is the potential for the construction phase of Norfolk Vanguard to have adverse impacts on commercially exploited fish and shellfish. This could in turn indirectly affect the productivity of the fisheries that target them. The potential impacts of the project on fish and shellfish species, including those of commercial importance, are assessed in Chapter 11 Fish and Shellfish Ecology and are not expected to exceed minor adverse significance. Consequently, any impacts associated with this on the commercial fisheries that target them are also not expected to exceed **minor adverse** significance**.**

14.7.4.2 Impact 2: Temporary loss or restricted access to traditional fishing grounds

103. Restricted access or loss of traditional fishing grounds during the construction phase will effectively be a consequence of the requirement to implement temporary safety zones around:

- Construction activities;
- Partially installed infrastructure; and
- Vulnerable sections of cables.

104. The theoretical worst case scenario associated with construction activities at NV East and NV West would be for commercial fishing activity to be excluded from both OWF sites and a 500m buffer around their perimeters for the duration of the overall offshore construction works window (approximately four years under the two phase approach) (see Table 14.16). However, it should be noted that exclusion around construction works would actually only occur over two years (two construction phases of 12 months each) within the indicative overall four year construction programme. In addition, in practice, safety zones would only be placed around foundations and installations that are under construction. Therefore, the total area from which fishing may be excluded will change depending on the level of works being carried out and the level of infrastructure installed or partially installed at a given time.

105. With regards to the export cable corridor, the theoretical worst case would be the implementation of a 500m advisory safety zone along the entire offshore cable corridor for an indicative duration of approximately 6 months (2 installation phases of 3 months each over the four year overall construction programme window). Further details on safety zones are described in the Safety Zone Statement submitted as part of the DCO application (document reference 7.2).

106. In practice, the actual area of exclusion associated with export cable installation, would depend on the installation methods used. For example, simultaneous lay and burial techniques, as used on many previous wind farm projects, would be expected to shorten the period of exclusion.

107. The following assessment of temporary loss or restricted access to traditional fishing grounds is discussed below on a fleet by fleet basis. Due to data limitations, it is beyond the scope of this assessment to assess the impacts on individual vessels. It is however recognised that the level and distribution of fishing activity and dependence on fishing grounds within the offshore project area will vary between individual vessels within the same fleets.

14.7.4.2.1 Dutch Fishing Vessels

Beam trawlers

108. The majority of Dutch beam trawlers active in areas relevant to Norfolk Vanguard are the larger class of vessel of up to 43m in length with main engines main engines of up to 2,000hp.

109. Until recently, Dutch beam trawlers typically deployed traditional beam trawls comprising nets attached to steel cylindrical beams supported off the seabed by shoes at each end. This gear type involves the use of a series of heavy tickler chains and chain mats resulting in total fully rigged trawl weights in air of up to 7.5 tonnes. As discussed in Appendix 14.1, in the past ten years, there has been an almost wholesale conversion to pulse wing electric fishing within the Dutch beam trawling fleet, the primary driver being the reduction in fuel consumption associated with pulse wing trawling. The use of this gear is currently permitted over a wide area of the North Sea, including ICES Division IVc and IVb to the south of 55 degrees N.

110. By virtue of their size and engine power, Dutch beam trawlers have wide operational ranges and fishing opportunities, as well as the ability to operate in weather conditions which would prevent other fishing vessels operating. With these considerations in mind, their sensitivity to loss of fishing grounds is considered to be low.

111. Analysis of VMS data for this fleet (Figure14.4 and Figure 14.5) indicates that the greatest intensity of beam trawling activity occurs along the coasts of the Netherlands and Belgium with moderate to high fishing activity extending into the OWF sites, the offshore section of the offshore cable corridor but also in the wider area. Comparatively lower activity levels are recorded towards the northern section of the Southern North Sea and into the Central North Sea (Figure14.4 and Figure 14.5). With this in mind but recognising the small area that Norfolk Vanguard

represents in the context of the extent of the grounds available to Dutch beam trawlers and the temporary nature of the construction phase (indicative 4 year overall construction programme with two offshore construction phases of 12 month each), the magnitude of the effect is assessed as low**.**

112. In this context it should be noted that voluntary no fishing zones for Dutch pulse wing trawlers have been agreed between Dutch pulse fishermen and the English East Coast inshore fishermen in areas relevant to Norfolk Vanguard, including a zone which overlaps into NV West (Figure 14.6). With these implemented, the temporary loss of grounds associated with construction at the OWF sites would therefore only apply to NV East and the section of NV West which is not included in the voluntary agreement.

113. Based on the low magnitude of the effect and the low receptor sensitivity, the impact of temporary loss or restricted access to fishing grounds for the Dutch beam trawl fleet during the construction phase is assessed to be of **minor adverse** significance**.**

Seine netting

114. As discussed in Section 14.6.2.3, a limited number of Dutch vessels operate seine nets. The majority of these vessels are over 24m in length and have wide operational ranges, with their fishing opportunities extending over a large area from the north of Denmark, south to the English Channel and Western Approaches. Considering their operational ranges and availability of grounds, they are considered receptors of low sensitivity to loss or restricted access to fishing grounds.

115. Analysis of VMS data indicates that Dutch seine netting occurs at relatively low levels in the OWF sites with comparatively higher effort and values recorded in other areas, particularly in the English Channel. Considering this together with the relatively small area that Norfolk Vanguard represents in the context of the extent of fishing grounds available to the fleet and the temporary nature of the construction phase, the magnitude of the effect is considered to be low.

116. Taking the low sensitivity of the receptor and low magnitude of the effect, the impact is assessed to be of **minor adverse** significance**.**

Other Dutch fishing methods

117. As discussed in Appendix 14.1, analysis of VMS data indicates no activity or minimal activity in areas relevant to Norfolk Vanguard for Dutch demersal (otter) trawls, mid-water trawls, purse seines, nets, traps and dredges (Figure 14.10 to Figure 14.21). Therefore, the magnitude of the effect of loss of grounds would be negligible.

118. The sensitivity of these methods ranges from low in the case of demersal (otter) trawls and mid water trawls (both with wide operational ranges) to medium in the case of vessels deploying nets, purse seines, traps and dredges all of which are generally more restricted in terms of fishing area (Figure 14.10 to Figure 14.21).

119. Taking the above into account the impact of loss or restricted access to fishing grounds on these fleets is considered to be of **negligible** to **minor adverse** significance.

120. Table 14.17 summaries the potential impact to Dutch vessels of temporary loss or restricted access to traditional fishing grounds associated with the construction phase.

Table 14.17 Impact significance of temporary loss or restricted access to traditional fishing grounds for Dutch vessels during the construction phase

Receptor Group		Receptor sensitivity	Magnitude of Effect	Impact Significance
Dutch Beam Trawling		Low	Low	**Minor adverse**
Dutch Seine Netting		Low	Low	**Minor adverse**
Other Dutch Methods	Demersal (otter) trawls and mid water trawls	Low	Negligible	**Negligible**
	Nets, purse seines, traps and dredges	Medium	Negligible	**Minor adverse**

14.7.4.2.2 Belgian fishing vessels

Beam trawling

121. The fishing grounds of Belgian beam trawlers cover substantial areas of the Southern North Sea, and English Channel and parts of the Central North Sea. Given their wide operational range and fishing opportunities their sensitivity to loss of fishing grounds is considered to be low.

122. Whilst some Belgian beam trawling activity has been observed in the general area of the project, the area of higher concentrations of activity by this fleet is located to the south of the OWF sites, extending through the Dover Strait and into the English Channel (Figure 14.22 and Figure 14.23). Considering this together with the small area that Norfolk Vanguard represents in the context of the extent of grounds available to this fleet and the temporary nature of any loss of grounds during the construction phase, the magnitude of the effect is assessed as low.

123. Taking the low sensitivity of the receptor in combination with the low magnitude of the effect, the impact of temporary loss or restricted access to fishing grounds for the Belgian beam trawl fleet is assessed to be of **minor adverse** significance.

Demersal (otter) trawling

124. The operational range and associated fishing opportunities of the Belgian demersal (otter) trawl fleet is similar to that described above for beam trawlers. On this basis they are also considered of low sensitivity to temporary loss of restricted access to fishing grounds.

125. Analysis of VMS data (Figure 14.26 and Figure 14.27) for this fleet indicates that the offshore project area sustains negligible levels of activity by this category of vessels, with activity for the most concentrating south of the OWF sites and in discrete areas of the Central North Sea. Considering this together with the small area that Norfolk Vanguard represents in the context of the extent of grounds available to the fleet and the temporary nature of any loss of grounds during the construction phase, the magnitude of the effect is assessed as negligible.

126. The impact of loss or restricted access to fishing grounds for the Belgian demersal otter trawl fleet during construction is therefore considered to be of **negligible** significance**.**

Seine netting

127. The fishing grounds of Belgian seine netters cover substantial areas of the Southern North Sea, and English Channel and parts of the Central North Sea. Given their wide operational range and fishing opportunities their sensitivity to loss of fishing grounds is considered to be low.

128. Analysis of VMS data (Figure 14.26 and Figure 14.27) for this fleet indicates that the offshore project area sustains negligible levels of activity by this category of vessels, with activity for the most concentrating in the English Channel. Considering this together with the small area that Norfolk Vanguard represents in the context of the extent of grounds available to the fleet and the temporary nature of any loss of grounds during the construction phase, the magnitude of the effect is assessed as negligible.

129. The impact of loss or restricted access to fishing grounds for the Belgian seine net fleet during construction is therefore considered to be of **negligible** significance**.**

130. Table 14.18 summaries the potential impact to Belgian vessels of temporary loss or restricted access to traditional fishing grounds associated with the construction phase.

Table 14.18 Impact significance of temporary loss or restricted access to traditional fishing grounds for Belgian vessels during the construction phase

Receptor Group	Receptor sensitivity	Magnitude of Effect	Impact Significance
Belgian Beam Trawling	Low	Low	**Minor adverse**
Belgian Demersal Otter Trawling	Low	Negligible	**Negligible**
Belgian Seine Nets	Low	Negligible	**Negligible**

14.7.4.2.3 UK fishing vessels

Beam trawling

131. As discussed in Appendix 14.1 and further supported by consultation with VisNed, the majority of fishing activity by beam trawlers in the vicinity of Norfolk Vanguard is by Anglo-Dutch vessels (UK registered but Dutch owned and operated). As such, these vessels are effectively Dutch beam trawlers and therefore have the same sensitivity as described above under the assessment for the Dutch fleet (paragraph 110), namely low**.**

132. Areas relevant to Norfolk Vanguard may occasionally also be fished by UK owned and operated beam trawl vessels. These vessels mainly operate out of south-west ports such as Brixham, Penzance and Newlyn and predominantly target grounds in the Celtic Sea, Western Approaches and English Channel. In view of their wide operational range and associated fishing opportunities, these vessels are also considered of low sensitivity to temporary loss or restricted access to fishing grounds.

133. Analysis of VMS data (Figure 14.32) for the UK registered beam trawlers suggests medium to low levels of activity by these vessels in the offshore project area with patches of activity throughout the Southern North Sea and into the English Channel and highest fishing intensity in the Central North Sea. Considering this together with the small area that Norfolk Vanguard represents in the context of the extent of grounds available to this fleet and the temporary nature of any loss of grounds during the construction phase, the magnitude of the effect is assessed as low. This is considered to be the case in respect of Anglo-Dutch vessels.

134. In the particular case of UK owned and operated beam trawlers, it is understood that only a limited number of these vessels may occasionally target sole off the coast of East Anglia on a seasonal basis and that this tends to be to the south of Norfolk Vanguard. Considering the comparatively low levels of activity by these vessels in areas relevant to the OWF sites, the magnitude of the effect is assessed as negligible.

135. Taking the above into account the impact of temporary loss or restricted access to fishing grounds during construction is considered to be of **minor adverse** significance

in the case of Anglo-Dutch beam trawlers and of **negligible** significance in the case of UK owned and operated beam trawlers.

Demersal otter trawling

136. Demersal otter trawls have wide operational ranges being able to target extensive grounds throughout the North Sea. They are therefore considered of low sensitivity in respect of temporary loss or restricted access to fishing grounds.

137. Analysis of VMS data (Figure 14.33., 14. 34 and 14.35) indicates that activity by UK demersal otter trawling, both single rigged and twin rigged, is either absent or at most at negligible levels in the offshore project area. Considering this together with the small area that Norfolk Vanguard represents in the context of the extent of grounds available to this fleet and the temporary nature of any loss of grounds during the construction phase, the magnitude of the effect is assessed as negligible.

138. Taking the above into account the impact of temporary loss or restricted access to fishing grounds during construction is considered to be of **negligible** significance.

Local inshore vessels

139. The local inshore fleet predominantly operates static fishing gears such as potting, netting and long lining.

140. The majority of the vessels involved are under 10m in length and have limited operational ranges compared to other fleets comprised of larger vessels. Whilst a number of the vessels have multipurpose capabilities, being able to deploy pots, nets and lines, in view of their limited operational ranges their sensitivity to loss of fishing grounds is considered to be medium

141. The available data and information obtained during consultation suggest that in areas relevant to Norfolk Vanguard, potting occurs within the 12nm limit with the majority of activity concentrated within 3nm off the coast, including the area of the offshore cable corridor (Figure 14.38). Potting is understood to also occur in inshore areas along the East Anglia Coast, to the north and south of the export cable corridor (Figure 14.41).

142. Netting and longlining also occurs mainly within inshore areas inside the 12nm limit, including areas relevant to the offshore cable corridor. Some vessels, however, are known to extend their activity to areas further offshore on an occasional basis.

143. Potential loss of fishing grounds to the UK local inshore fleet during construction would therefore for the most part be a result of export cable installation activities. Considering the relatively short them nature of export cable installation

(approximately 6 months (2x 3month phases)) and the localised area that would be affected, the magnitude of the effect is considered to be low.

144. Taking the medium sensitivity of the receptor and the low magnitude of the effect, the impact of temporary loss or restricted access to fishing grounds is considered to be of **minor adverse** significance.

145. It is however recognised that there may be occasions when certain vessels may need to relocate their gear as a result of cable installation activity. In these instances, evidence based mitigation, as specified in the FLOWW Guidelines will be applied. Table 14.19 summaries the potential impact to UK vessels of temporary loss or restricted access to fishing grounds associated with the construction phase.

Table 14.19 Impact significance of temporary loss or restricted access to traditional fishing grounds for UK vessels during the construction phase

Receptor Group	Receptor sensitivity	Magnitude of Effect	Impact Significance
UK Beam Trawling (Anglo-Dutch)	Low	Low	**Minor adverse**
UK Beam Trawling (South-west ports)	Low	Negligible	**Negligible**
UK Demersal Otter Trawling	Low	Negligible	**Negligible**
Local inshore vessels (static gear)	Medium	Low	**Minor adverse**

14.7.4.2.4 French fishing vessels

146. French demersal and pelagic trawlers target a variety of species and have wide operational ranges, exploiting grounds from the Central North Sea to the English Channel and on occasions to the Western approaches. Taking account of their wide operational range and fishing opportunities they are considered of low sensitivity to temporary loss or restricted access to fishing grounds.

147. From consultation and the data that has been made available (Appendix 14.1) it is understood that activity by French vessels within the offshore project area occurs at low levels, with their activity primarily focused on grounds to the south of Norfolk Vanguard (Figure 14.42, Figure 14.43, Figure 14.44 and Figure 14.45). Considering this together with the small area that Norfolk Vanguard represents in the context of the extent of grounds available to French vessels and the temporary nature of any loss of grounds during the construction phase, the magnitude of the effect is assessed as low.

148. Taking the above into account the impact of temporary loss or restricted access to fishing grounds during construction is considered to be of **minor adverse** significance**.**

149. Table 14.20 summaries the potential impact to French vessels of temporary loss or restricted access to fishing grounds associated with the construction phase.

Table 14.20 Impact significance of temporary loss or restricted access to traditional fishing grounds for French vessels during the construction phase

Receptor Group	Receptor sensitivity	Magnitude of Effect	Impact Significance
French demersal and pelagic trawlers	Low	Low	**Minor adverse**

14.7.4.2.5 Danish fishing vessels

150. Danish sandeel trawling is undertaken by specifically designed industrial trawlers of up to 40 m in length as well as occasionally by 65-80m pelagic trawlers whose principal fishing activity is the capture of higher value pelagic species, namely mackerel, herring and horse mackerel.

151. Both fleets have wide operational ranges and fishing opportunities and therefore their sensitivity to loss of fishing grounds is considered to be low.

152. Danish industrial sandeel trawling occurs at relatively high levels over a substantial area of the Central North Sea with very low activity recorded by this fleet in recent years in the offshore project area (Figure 14.46). Similarly, activity by pelagic trawlers has also been very low in areas relevant to the offshore project area, with the highest activity by these vessels concentrating in the Central North Sea, particularly off the Danish coast. Considering this together with the small area that Norfolk Vanguard represents in the context of the extent of grounds available to the Danish industrial sandeel trawlers and pelagic trawlers and the temporary nature of the construction phase, the magnitude of the effect is assessed as negligible.

153. Taking the above into account the impact of temporary loss or restricted access to fishing grounds during construction is considered to be of **negligible** significance.

Table 14.21 Impact significance of temporary loss or restricted access to traditional fishing grounds for Danish vessels during the construction phase

Receptor Group	Receptor sensitivity	Magnitude of Effect	Impact Significance
Danish sandeel industrial trawling	Low	Negligible	**Negligible**
Danish pelagic trawlers	Low	Negligible	**Negligible**

14.7.4.2.6 German fishing vessels

154. It is understood that German fishing activity in the vicinity of the project is mainly by beam trawlers. The majority of these are German registered fishing German quotas but Dutch owned and operated. On this basis, the sensitivity identified for the Dutch beam trawl fleet is also considered to apply here, namely low.

155. Analysis of available VMS data for this fleet (Figure 14.48) suggests negligible levels of activity in areas relevant to Norfolk Vanguard, with activity concentrating for the most part in the Dutch and Danish Sector of the Central North Sea. Considering this together with the small area that Norfolk Vanguard represents in the context of the extent of grounds available to German vessels and the temporary nature of the construction phase, the magnitude of the effect is assessed as negligible.

156. Taking the above into account the impact of temporary loss or restricted access to fishing grounds during construction is considered to be of **negligible** significance.

157. Table 14.22 Impact significance of temporary loss or restricted access to traditional fishing grounds for Danish vessels during the construction phase.

Table 14.22 Impact significance of temporary loss or restricted access to traditional fishing grounds for German vessels during the construction phase

Receptor Group	Receptor sensitivity	Magnitude of Effect	Impact Significance
German fishing vessels	Low	Negligible	**Negligible**

14.7.4.3 Impact 3: Safety issues for fishing vessels

158. With regard to safety issues for fishing vessels, as outlined in Section 14.4.1, the use of the standard impact assessment matrix is not considered appropriate. Safety risks are therefore discussed in terms of being within or outside of acceptable limits in line with the approach adopted in Chapter 15 Shipping and Navigation.

159. An assessment specific to safety issues associated with fishing activity in terms of potential risk of gear snagging and the manoeuvrability of vessels is given below.

160. In terms of foundation types, as given in Table 14.15, the worst case scenario in relation to safety issues takes account of the installation of 200 x 9MW turbines on tension leg platforms with up to 12 anchor lines at angles of mooring up to 30 degrees and 45m diameter of floating structures. The progressive installation of these during the construction phase would result in an increasing potential for snagging and manoeuvrability risks on fishing vessels. In addition, snagging risks may arise during the construction phase as a result of sections of array, interconnector and export cables remaining exposed on the seabed for short periods of time whilst awaiting burial or remedial protection measures.

161. Safety zones will be in place around partially installed and installed infrastructure. In addition, in instances where sections of cable are exposed localised advisory safety zones over such vulnerable cables would be implemented to prevent fishing gear snagging and the consequential risks to both the cables and fishing vessels and their gears.

162. In order to minimise potential safety risks to fishing vessels, the required levels of information distribution would be undertaken through the channels of the Kingfisher Information System, Notices to Mariners, as well as direct liaison with fishermen and their representatives. The primary purpose of this would be to ensure amongst fishing vessel owners and crews the required level of awareness of potential construction related risks and the locations and periods of safety exclusion zones (Section 14.7.1). In addition, where appropriate, guard vessels and Offshore Fishing liaison Officers (OFLOs) would be employed.

163. In conclusion, the application of the liaison and information distribution discussed above with the required compliance by fishermen, safety issues for fishing vessels should be **within acceptable limits**.

164. A separate assessment of potential safety issues associated with seabed obstacles is provided in Section 14.7.4.5. Safety risks associated with potential for collisions with construction vessels and allision with project infrastructure are addressed in Chapter 15 Shipping and Navigation.

14.7.4.4 Impact 4: Increased steaming times to fishing grounds

165. The implementation of safety zones during the construction phase could, in theory, result in some short term increases in steaming distances and times, and therefore higher operational costs for fishing vessels.

166. In the case of the UK local inshore vessels, these vessels generally concentrate their activity within the 12nm limit, and therefore do not venture as far as the OWF sites. It is therefore expected that there will be few if any occasions when there would be a requirement to change existing steaming routes to avoid temporary safety zones. The sensitivity of these receptors is therefore considered to be **negligible.**

167. The locations of the main fishing ports relative to the majority of fishing grounds for the Dutch and Belgian fleets are such that their traditional steaming routes would not involve passages through areas covered by safety zones, giving a **negligible** sensitivity

168. Likewise, the majority of the fishing grounds of the UK trawlers and Danish and French fishing vessels, relative to the location of their base ports would generally not involve steaming routes that would pass through areas with safety zones, and therefore again the sensitivity of these receptors to the potential impact is considered to be **negligible.**

169. In terms of magnitude, the short duration of the imposition of safety zones and their small footprint confers a low magnitude.

170. Taking the above into account the impact of increased steaming times is considered to be of **negligible** significance for all the fleets.

171. In the context of this assessment it is important to note that as described in Chapter 15 Shipping and Navigation it is anticipated that commercial fishing vessels would be able to transit through the buoyed construction area.

14.7.4.5 Impact 5: Obstacles on the seabed

172. Obstacles on the seabed during construction could potentially cause damage to, or complete loss of, fishing gears. In addition, activities associated with construction works such as construction vessel anchoring, jack up legs or cable trenching could produce spoil or mounds onto which fishing gears could fasten.

173. Offshore policy (IMO, 1996) prohibits the discarding of objects or waste at sea. The reporting and recovery of any accidentally dropped object is also required.

174. An Outline Scour Protection and Cable Protection Plan (document reference 8.16) is provided with the Norfolk Vanguard DCO Application. A cable burial risk assessment will be undertaken post consent, in consultation with stakeholders.

175. Post-lay and burial inspection surveys will be undertaken after the cables are installed into the seabed as outlined in Section 14.7.1 to assess the seabed status. In addition to burial status, these will identify the presence of construction related seabed obstacles and, where appropriate and practicable, rectification works would be undertaken.

176. With the above procedures in place, safety issues to fishing vessels associated with obstacles on the seabed would should **within acceptable limits**.

14.7.4.6 Impact 6: Interference with fishing activities

177. During the construction phase there may be potential for transiting construction vessels to cause interference with fishing activities.

178. For the UK inshore fleet, the main potential cause of interference (conflict) would be the fouling of static gear surface marker lines by transiting construction vessels, particularly crew transfer vessels. At present, the surface markers used by local fishermen operating gears within the 12nm are not visible at all states of visibility, being unlit, without radar reflectors and often simply 5 litre plastic bottles, footballs or small spherical buoys or dhans.

179. Experience from the construction phases of other offshore wind farms has demonstrated that with the appropriate liaison enabling awareness of construction vessels crews of the locations of static gears, combined with fishermen's awareness of construction vessel transit routes, interference to static gear fishing can be

avoided. Considering this, the magnitude of the effect on the local static gear fleet is assessed to be low, giving an impact of **minor adverse** significance.

180. In the case of fleets operating towed gears, taking account of their mobility, the sensitivity to interference is considered to be low. Transiting construction vessels will fully comply as required under the International Regulations for Preventing Collisions at Sea (COLREGS). Such compliance would negate the requirement for fishing vessels engaged in fishing to alter course or pose any risk to fishing gears being towed. With the above in mind the magnitude of the impact in respect of fleets operating towed gear is considered to be negligible, resulting in and impact of **negligible** significance**.**

14.7.4.7 Impact 7: Displacement of fishing activity into other areas

181. During consultation, concerns were raised by a number of fishermen's representatives that any loss or restricted access to fishing grounds could result in increased competition on fishing on grounds in other areas.

182. In the case of static gears deployed by local vessels, there could be potential for displacement impacts to occur whereby vessels and gears that have to be temporarily removed from the offshore cable corridor are relocated into grounds where other static gear vessels operate. Due to the number of pots or nets that a relatively small area such as the offshore cable corridor can viably support, the number of static gear units capable of causing a displacement effect would be limited. Furthermore, as stated above in respect of loss of fishing area, appropriate procedures as specified by the FLOWW Guidelines would be implemented.

183. Concerns have also been raised during consultation on the issue of whether larger trawlers could be displaced into areas where static gears are deployed. As described in Section 14.6.4.3, the majority of the static gear vessels operate within the 12nm limit. Activity in the OWF sites is predominantly by Dutch and Anglo Dutch beam trawlers. By virtue of their main engine power and gear sizes these vessels are not permitted to fish within the UK's 12nm. In the case of Belgian beam trawlers, the larger class of these vessels are also prohibited from fishing within the UK's 12nm limit (although the small class with engines of less than 300hp and with relatively small beam trawls with a combined length of eight metres can fish between the 6 and 12nm limits due to historic fishing rights). Activity by Belgian beam trawlers is however significantly higher south of the OWF sites rather than in areas relevant to Norfolk Vanguard. Similarly, activity by the remaining fleets in the offshore project area is also relatively low.

184. In view of the limited operational range of local inshore vessels operating static gear, as for the assessment of temporary loss or restricted access to fishing grounds, their sensitivity to displacement is considered to be medium.

185. From the information provided above, it is apparent that there is limited potential for displacement to result in increased levels of competition between static gear vessels. Similarly, it is apparent that there is little potential for conflicts between towed and static gear vessels to occur. As such, the magnitude of the potential effect of displacement on the UK local inshore static gear fleet is considered to be negligible, resulting in an impact of **minor adverse** significance.

186. In addition to the above, it is recognised that there could also be potential for displacement of fishing vessels into other areas to result in competition for grounds between different fleets that operate towed gear.

187. For the most part these fleets have wide operational ranges relative to the potential loss of grounds associated with the construction phase of the project (Section 14.7.4.2) and therefore any increased competition between these vessels arising from displacement would be expected to be minimal. Whilst it is difficult to predict where fishing activity may be displaced to and how this may affect individual vessels, in all cases, the level of displacement would be a function of the temporary loss or restricted access to fishing grounds. It is therefore considered that the sensitivity of receptors, magnitude of effect and resulting impact significance in respect of displacement would, at worst, be as identified in relation to temporary loss or restricted access to fishing grounds for towed gear fleets. As summarised in Table 14.23 this would result in an impact of **negligible to minor adverse** significance depending on the towed gear fleet under consideration.

Table 14.23 Impact significance of displacement of fishing activity into other areas for towed gear fleets

Receptor Group		Receptor sensitivity	Magnitude of Effect	Impact Significance
Dutch Beam Trawling		Low	Low	**Minor adverse**
Dutch Seine Netting		Low	Low	**Minor adverse**
Other Dutch Methods	Demersal (otter) trawls and mid water trawls	Low	Negligible	**Negligible**
	Nets, purse seines, traps and dredges	Medium	Negligible	**Minor adverse**
Belgian Beam Trawling		Low	Low	**Minor adverse**
Belgian Demersal Otter Trawling		Low	Negligible	**Negligible**
Belgian Seine Nets		Low	Negligible	**Negligible**

Receptor Group	Receptor sensitivity	Magnitude of Effect	Impact Significance
UK Beam Trawling (Anglo-Dutch)	Low	Low	**Minor adverse**
UK Beam Trawling (South-west ports)	Low	Negligible	**Negligible**
UK Demersal Otter Trawling	Low	Negligible	**Negligible**
French demersal and pelagic trawlers	Low	Low	**Minor adverse**
Danish sandeel industrial trawling	Low	Negligible	**Negligible**
Danish pelagic trawlers	Low	Negligible	**Negligible**
German fishing vessels	Low	Negligible	**Negligible**

14.7.5 Potential Impacts during Operation

188. The impacts described below should be considered in the context of the design life of the Norfolk Vanguard. The impact assessment provided is based on the existing baseline but the potential for this to change over time (see Appendix 14.1) is recognised.

189. It should be noted that the same receptor sensitivities identified for the construction phase also apply for assessment of impacts during operation. Therefore, where relevant, reference is made to relevant sections within the impact assessment presented for the construction phase (Section 14.7.4).

14.7.5.1 Impact 1: Adverse impacts on commercially exploited fish and shellfish populations

190. There is the potential for the operational phase of Norfolk Vanguard to result in adverse impacts on commercially exploited fish and shellfish species. This could in turn indirectly affect the fisheries that target them. The potential impacts of the operation phase of the project on fish and shellfish species, including those of commercial importance, are assessed in Chapter 11 Fish and Shellfish Ecology. This identified, at worst, impacts of minor adverse significance on fish and shellfish species. Consequently, any resulting potential impacts on the fisheries that target them are also not expected to exceed **minor adverse** significance.

14.7.5.2 Impact 2: Complete loss or restricted access to traditional fishing grounds

191. Existing legislation does not prevent fishing from occurring within operational wind farm sites. In addition, as outlined in section 14.7.1. Norfolk Vanguard is committed to facilitate co-existence. It is therefore likely that fishing could resume within the OWF sites once the construction phase is completed.

192. The worst case scenario in respect of complete loss or restricted access to traditional fishing grounds (Table 14.16), considers the installation of 200 X 9MW turbines with

a minimum in row and inter row distances of 680m between wind turbines. It also takes account of the use of tension leg floating platforms with up to 12 anchor lines with an angle of mooring up to 30 degrees.

193. During consultation on the PEIR (Table 14.3), concerns were raised by UK fisheries representatives that any form of towed gear fishing within the OWF sites would not be attempted. This was based on the minimum spacing assessed under the PEIR (616m) and the additional constraints to fishing resulting from installation of floating turbines (particularly the additional extent of exclusion to fishing to avoid snagging risks due to the presence of anchor lines where these are not vertical). Similarly, during consultation with VisNed concerns were also raised in relation to the reduced potential for Dutch beam trawlers to resume activity within the operational OWF sites if the minimum spacing between turbines was under 1km.

194. It is noted that as described in Section 14.7.1, since the production of the PEIR, the project design envelope has been refined with the spacing between turbines increasing to a minimum of 680m.

195. In this context it is important to note that account has been taken of the potential absolute worst case minimum spacing between turbines of 680m for assessment, as at present the final turbine layout plan is unknown. As described in Chapter 5 Project Description, however, the realistic worst case compressed layout proposed would range between four to seven rotor diameters (680m and 1,190m) (in-row) and between four to 20 rotor diameters (680m and 3,400m) (inter-row).

196. Similarly, in terms of the worst case scenario associated with the use of floating foundations, it should be recognised that if used on a different turbine design option, the minimum spacing between turbines would increase to 920m. Fishing by towed gear methods could therefore be less constrained in terms of resuming activity within the operational OWF.

197. The Statement of Common Ground (SOCG) for the East Anglia Three Application records: “Dutch fishermen have stated that they would be able to fish within the East Anglia THREE windfarm in safe conditions. It is also recorded that VisNed/NFFO consider that it is unlikely that fishing will be able to take place to the same degree as in an open sea area and that fishing within the operational windfarm would likely require modifications to existing operating patterns due to the presence of infrastructure”. The turbine spacing referenced in the EA THREE SOCG was “unobstructed rows of 675m (in-row) and 900m (between row)”.

198. Taking a precautionary approach and recognising the concerns raised by stakeholders, however, for the purposes of this assessment in the first instance it has

been assumed that towed gear skippers may elect not to operate their gears within the OWF sites once they are operational.

199. In respect of potential loss of fishing grounds associated with the presence of array, interconnector and export cables, as outlined in Section 14.7.1, cables will be buried where possible to at least 1m depth and where burial is not possible (i.e. due to hard ground or at crossings) cables will be protected.

200. In addition, in line with standard practice in the North Sea offshore oil and gas industry, measures would be undertaken to ensure that where cable protection is required, the protection methods used are as far as practically possible, compatible with fishing activities.

201. It is therefore assumed that during the operational phase, the presence of cables, would not result in any material loss of fishing grounds and that fishing activity will be able to continue normally with the exception of any safety zones around maintenance works, where required.

202. As such the assessment of the impact of complete loss or restricted access to traditional fishing grounds during operation is focused on the OWF sites.

14.7.5.2.1 Dutch Fishing Vessels

Beam trawlers

203. As discussed above for temporary loss or restricted access to fishing grounds during the construction phase (Section 14.7.4.2.1), the sensitivity of Dutch beam trawlers is considered to be low.

204. Whilst the OWF sites are located in an area which sustains moderate to high levels of activity by this fleet, the area occupied by the OWF sites is small in the context of the extent of fishing grounds for this fleet. In addition, similarly productive grounds extend over a wide area (Figure 14.4, Figure 14.15). Also, as previously discussed, Dutch operators of pulse wing beam trawls have voluntarily agreed to stop fishing in various areas off the east coast of England, including an area that covers part of NV West (Figure 14.6). With this in mind but acknowledging the long term duration of the operation phase, the magnitude of the effect is considered to be medium.

205. Taking the above into account the impact of complete loss or restricted access to fishing grounds during operation is considered to be of **minor adverse** significance.

Seine netting

206. As previously discussed (Section 14.7.4.2.1), Dutch seine netters are considered to be receptors of low sensitivity.

207. Analysis of VMS data indicates that Dutch seine netting occurs at relatively low levels in the OWF sites with comparatively higher effort and values recorded in other areas, particularly in the English Channel. In addition, the area that Norfolk Vanguard represents in the context of the extent of fishing grounds available to this fleet is comparatively low (Figure 14.7 and Figure 14.8). With this in mind but recognising the long term nature of the operation phase, the magnitude of the effect is considered to be medium.

208. Taking the low sensitivity of the receptor and medium magnitude of the effect, the impact is assessed to be of **minor adverse** significance**.**

Other Dutch fishing methods.

209. As previously discussed (Section 14.7.4.2.1), analysis of VMS data indicates no activity or minimal activity in areas relevant to Norfolk Vanguard for Dutch demersal (otter) trawls, mid-water trawls, purse seines, nets, traps and dredges. Therefore the magnitude of the effect of loss of grounds to these fleets would be negligible.

210. The sensitivity of these methods ranges from low in the case of demersal (otter) trawls and mid water trawls (both with wide operational ranges) to medium in the case of vessels deploying nets, purse seines, traps and dredges all of which are generally more restricted in terms of fishing area (Figure 14.10 to Figure 14.21).

211. Taking the above into account the impact of loss or restricted access to fishing grounds on these fleets is considered to be of **negligible** to **minor adverse** significance.

212. Table 14.24 summaries the potential impact to Dutch vessels of complete loss or restricted access to traditional fishing grounds associated with the operation phase.

Table 14.24 Impact significance of complete loss or restricted access to traditional fishing grounds for Dutch vessels during the operation phase

Receptor Group		Receptor sensitivity	Magnitude of Effect	Impact Significance
Dutch Beam Trawling		Low	Medium	**Minor adverse**
Dutch Seine Netting		Low	Medium	**Minor adverse**
Other Dutch Methods	Demersal (otter) trawls and mid water trawls	Low	Negligible	**Negligible**
	Nets, purse seines, traps and dredges	Medium	Negligible	**Minor adverse**

14.7.5.2.2 Belgian fishing vessels

Beam trawling

213. As previously discussed (Section 14.7.4.2.2), the sensitivity of the Belgian beam trawlers is considered to be low.

214. Belgian beam trawling activity has been observed in the general area of the project, however, the area of higher concentration of activity by this fleet is located to the south of the OWF sites, extending through the Dover Strait and into the English Channel (Figure 14.22 and Figure 14.23). Whilst the long term nature of the operation phase is recognised, considering the above together with the relatively small area that Norfolk Vanguard represents in the context of the extent of grounds available to this fleet, the magnitude of the effect is assessed as low.

215. Taking the low sensitivity of the receptor in combination with the low magnitude of the effect, the impact of complete loss or restricted access to fishing grounds for the Belgian beam trawl fleet is assessed to be of **minor adverse** significance.

Demersal (otter) trawling

216. As previously discussed (Section 14.7.4.2.2), the sensitivity of the Belgian demersal otter trawlers is considered to be low.

217. Analysis of VMS data (Figure 14.26 and Figure 14.27) for this fleet indicates that the offshore project area sustains negligible levels of activity by this category of vessels, with activity for the most concentrating south of the OWF sites and in discrete areas of the Central North Sea. Whilst the long term nature of the operation phase is recognised, considering the above together with the relatively small area that Norfolk Vanguard represents in the context of the extent of grounds available to this fleet, the magnitude of the effect is assessed as negligible.

218. Taking the low sensitivity of the receptor in combination with the negligible magnitude of the effect, the impact of complete loss or restricted access to fishing grounds for the Belgian demersal otter trawl fleet is assessed to be of **negligible** significance**.**

Belgian seine netting

219. As previously discussed (Section 14.7.4.2.2), the sensitivity of the Belgian seine netters is considered to be low.

220. Analysis of VMS data (Figure 14.26 and Figure 14.27) for this fleet indicates that the offshore project area sustains negligible levels of activity by this category of vessels, with activity for the most part concentrating in the English Channel. Whilst the long term nature of the operation phase is recognised, considering the above together

with the small area that Norfolk Vanguard represents in the context of the extent of grounds available to the fleet, the magnitude of the effect is assessed as negligible.

221. The impact of loss or restricted access to fishing grounds for the Belgian seine net fleet during operation is therefore considered to be of **negligible** significance.

222. Table 14.25 summaries the potential impact to Belgian vessels of complete loss or restricted access to traditional fishing grounds associated with the operation phase.

Table 14.25 Impact significance of complete loss or restricted access to traditional fishing grounds for Belgian vessels during the operation phase

Receptor Group	Receptor sensitivity	Magnitude of Effect	Impact Significance
Belgian Beam Trawling	Low	Low	**Minor adverse**
Belgian Demersal Otter Trawling	Low	Negligible	**Negligible**
Belgian Seine Netting	Low	Negligible	**Negligible**

14.7.5.2.3 UK fishing vessels

Beam trawling

223. As discussed above (Section 14.7.4.2.3), the sensitivity of the UK registered beam trawlers active in the area (both Anglo-Dutch and UK owned and operated beam trawlers) is considered to be low.

224. Analysis of VMS data (Figure 14.32) for the UK registered beam trawlers suggests medium to low levels of activity by these vessels in the offshore project area with patches of activity throughout the Southern North Sea and into the English Channel and highest fishing intensity in the Central North Sea. Considering this together with the small area that Norfolk Vanguard represents in the context of the extent of grounds available to this fleet but recognising the long term nature of the operation phase, the magnitude of the effect is assessed as medium. This is considered to be the case in respect of Anglo-Dutch vessels.

225. In the case of UK owned and operated beam trawlers, it is understood that only a limited number of these vessels may occasionally target sole off the coast of East Anglia on a seasonal basis and that this tends to be to the south of Norfolk Vanguard. Recognising the long term nature of the operation phase but also the low level of activity by these vessels in areas relevant to the OWF sites, the magnitude of the effect is assessed as negligible.

226. Taking the above into account, the impact of complete loss or restricted access to fishing grounds during operation is considered to be of **minor adverse** significance in the case of Anglo-Dutch beam trawlers and of **negligible** significance in the case of UK owned and operated beam trawlers.

Demersal otter trawling

227. As discussed above (Section 14.7.4.2.3), the sensitivity of the UK demersal trawl fleet active in the area (both Anglo-Dutch and UK owned and operated beam trawler) is considered to be low.

228. Analysis of VMS data (Figure 14.33, 14. 34 and 14.35) indicates that activity by UK demersal otter trawling, both single rigged and twin rigged, is either absent or at most at negligible levels in the offshore project area. Whilst the long term nature of the operation phase is recognised, considering the above together with the small area that Norfolk Vanguard represents in the context of the extent of grounds available to this fleet, the magnitude of the effect is assessed as negligible.

229. Taking the above into account the impact of complete loss or restricted access to fishing grounds during operation is considered to be of **negligible** significance**.**

Local inshore vessels

230. As described above (Section 14.7.4.2.3), the sensitivity of local inshore vessels is considered to be medium.

231. With the exception of some netting and long lining vessels that occasionally may extend their operational range further offshore, virtually all activity by local vessels that deploy static gear occurs within the 12nm limit and most of it within the 6nm limit (Section 14.7.4.2.3).

232. In the case of static gear vessels that concentrate their activity in inshore areas, with completion of offshore export cable laying activities, their activity should be able to resume in areas relevant to the offshore cable corridor as occurred prior to the onset of installation activities. On this basis the magnitude of the effect for these vessels is considered to be negligible. Taking the medium sensitivity and negligible magnitude of the effect the impact on these vessels is considered to be of **minor adverse** significance**.**

233. In the case of vessels deploying long lines and nets that occasionally operate further offshore, including in areas relevant to the OWF sites, it is likely that changes to their mode of operation would be required to allow them to resume fishing within the operational OWF sites. Recognising this as well as the long term nature of the operation phase, however also noting the fact that for the most part their activity concentrates in areas inshore of the OWF sites, the magnitude of the effect is considered to be low. Taking the medium sensitivity and low magnitude of the effect the impact on these vessels is considered to be of **minor adverse** significance**.**

234. Table 14.26 summaries the potential impact to UK vessels of complete loss or restricted access to traditional fishing grounds associated with the operation phase.

Table 14.26 Impact significance of complete loss or restricted access to traditional fishing grounds for UK vessels during the operation phase

Receptor Group	Receptor sensitivity	Magnitude of Effect	Impact Significance
UK Beam Trawling (Anglo-Dutch)	Low	Medium	**Minor adverse**
UK Beam Trawling (South-west ports)	Low	Negligible	**Negligible**
UK Demersal Otter Trawling	Low	Negligible	**Negligible**
Local inshore vessels (active in inshore areas only)	Medium	Negligible	**Minor adverse**
Local inshore vessels (active in inshore areas and occasionally further offshore)	Medium	Low	**Minor adverse**

14.7.5.2.4 French fishing vessels

235. As described above (Section 14.7.4.2.4), the sensitivity of French demersal and pelagic trawl vessels is considered to be low.

236. From consultation and the data that has been made available (Appendix 14.1) it is understood that activity by French vessels within the offshore project area occurs at low levels, with their activity primarily focused on grounds to the south of Norfolk Vanguard (Figure 14.42, Figure 14.43, Figure 14.44 and Figure 14.45). Whilst the long term nature of the operation phase is recognised, considering the above together with the relatively small area that Norfolk Vanguard represents in the context of the extent of grounds available to this fleet, the magnitude of the effect is assessed as low.

237. Taking the above into account the impact of temporary loss or restricted access to fishing grounds during construction is considered to be of **minor adverse** significance**.**

238. Table 14.27 summaries the potential impact to French vessels of complete loss or restricted access to fishing grounds associated with the operation phase.

Table 14.27 Impact significance of complete loss or restricted access to traditional fishing grounds for French vessels during the operation phase

Receptor Group	Receptor sensitivity	Magnitude of Effect	Impact Significance
French demersal and pelagic trawlers	Low	Low	**Minor adverse**

14.7.5.2.5 Danish fishing vessels

239. As described in Section 14.7.4.2.5, Danish sandeel industrial trawlers and pelagic trawlers are considered of low sensitivity.

240. Danish sandeel industrial trawling occurs at relatively high levels over a substantial area of the Central North Sea with very low activity recorded by this fleet in recent years in the offshore project area (Figure 14.46). Similarly, activity by pelagic trawlers has also been very low in areas relevant to the offshore project area, with the highest activity by these vessels concentrating in the Central North Sea, particularly off the Danish coast. Whilst the long term nature of the operation phase is recognised, considering the above together with the small area that Norfolk Vanguard represents in the context of the extent of grounds available to the Danish industrial sandeel trawlers and pelagic trawlers, the magnitude of the effect is assessed as negligible.

241. Taking the above into account the impact of temporary loss or restricted access to fishing grounds during operation is considered to be of **negligible** significance.

242. Table 14.28 summarises the potential impact to Danish vessels of complete loss or restricted access to fishing grounds associated with the operation phase.

Table 14.28 Impact significance of complete loss or restricted access to traditional fishing grounds for Danish vessels during the operation phase

Receptor Group	Receptor sensitivity	Magnitude of Effect	Impact Significance
Danish sandeel industrial trawling	Low	Negligible	**Negligible**
Danish pelagic trawlers	Low	Negligible	**Negligible**

14.7.5.2.6 German fishing vessels

243. As described in Section 14.7.4.2.6, German fishing vessels are considered to be of low sensitivity to loss of fishing grounds.

244. Analysis of available VMS data for this fleet (Figure 14.48) suggests negligible levels of activity in areas relevant to Norfolk Vanguard, with activity concentrating for the most part in the Dutch and Danish Sector of the Central North Sea. Whilst the long term nature of the operation phase is recognised, considering the above together with the small area that Norfolk Vanguard represents in the context of the extent of grounds available to German fishing vessels, the magnitude of the effect is assessed as negligible.

245. Taking the above into account the impact of complete loss or restricted access to fishing grounds during operation is considered to be of **negligible** significance.

246. Table 14.29 summarises the impact significance of complete loss or restricted access to traditional fishing grounds for Danish vessels during the operation phase

Table 14.29 Impact significance of complete loss or restricted access to traditional fishing grounds for German vessels during the operation phase

Receptor Group	Receptor sensitivity	Magnitude of Effect	Impact Significance
German fishing vessels	Low	Negligible	**Negligible**

14.7.5.3 Impact 3: Safety issues for fishing vessels

247. An assessment specific to safety issues associated with fishing activity in terms of potential risk of gear snagging and the manoeuvrability of vessels is given below.

248. In terms of foundation types, as given in Table 14.15, the worst case scenario in relation to safety issues takes account of the installation of 200 x 9MW turbines on tension leg platforms with up to 12 anchor lines at angles of mooring up to 30 degrees and 45m diameter of floating structures. The presence of these would result in increased potential for snagging and manoeuvrability risks for fishing vessels. In addition, snagging risks may arise as a result of sections of array, interconnector and export cables becoming exposed during the operation phase or as a consequence of interactions between fishing gear and section of cables that are protected.

249. It should be noted that safety zones will be in place around installed infrastructure during the operation phase.

250. An Outline Scour Protection and Cable Protection Plan (document reference 8.16) is provided with the Norfolk Vanguard DCO Application. A cable burial risk assessment will be undertaken post consent, in consultation with stakeholders.

251. In instances where monitoring identifies the presence of exposed cables, localised advisory safety zones over such vulnerable cables would be implemented to prevent fishing gear snagging and the consequential risks to both the cables and fishing vessels and their gears.

252. In addition, in line with standard oil and gas industry practice, measures would be undertaken to ensure that where cable protection is required, the protection methods used are as far as practically possible, compatible with fishing activities.

253. In order to minimise potential safety risks to fishing vessels the required levels of information distribution would be undertaken through the channels of the Kingfisher Information System, Notices to Mariners, as well as direct liaison with fishermen and their representatives. The primary purpose of this would be to ensure amongst fishing vessel owners and crews the required level of awareness of potential risks (section 14.7.1).

254. In conclusion, through on-going liaison with fishermen and information distribution as discussed above, with the required compliance by fishermen, safety issues for fishing vessels are considered to be **within acceptable limits**.

255. A separate assessment of potential safety issues associated with seabed obstacles is provided in Section 14.7.5.5. Safety risks associated with potential for collisions with operation and maintenance vessels and allision with project infrastructure are addressed in Chapter 15 Shipping and Navigation.

14.7.5.4 Impact 4: Increased steaming times to fishing grounds

256. During the operation phase the presence of installed infrastructure could result in some short term increases in steaming distances and times, and therefore in higher operational costs for fishing vessels.

257. As described for the construction phase (Section 14.7.4.4) the sensitivity of all fleets to increased steaming times is considered to be negligible.

258. Whilst the impact would last for the operation phase of the project, providing that weather conditions allow, fishing vessels are expected to be able to transit through the OWFs sites (see Chapter 15 Shipping and Navigation). With this in mind, the magnitude of the effect is considered to be negligible resulting in an impact of **negligible** significance.

14.7.5.5 Impact 5: Obstacles on the seabed

259. With compliance with the obligations and monitoring and policies discussed above for the construction phase (Section 14.7.4.5), risks associated with obstacles on the seabed should remain **within acceptable limits**. In instances of objects accidently dropped overboard the standard obligations of reposition recording and recovery will apply.

14.7.5.6 Impact 6: Interference with fishing activities

260. During the operation phase there may be potential for transiting operation and maintenance vessels to cause interference with fishing activities.

261. In terms of receptor sensitivities, these remain as ascribed under the construction phase, namely medium for the local static gear vessels and low for the various categories of towed gear vessels (Section 14.7.4.6).

262. The number of project related vessel transits will be substantially lower than for the construction phase. They will also be along fewer and predictable routes. The appropriate two way liaison with local fishermen would continue during the operational phase to minimise the risks of conflicts with static gears.

263. In the case of towed gear vessels, the same obligations in respect of COLREGS will apply as described above for the construction phase.

264. In view of the above, the magnitude of the effect is considered to be negligible resulting in an impact of **minor adverse** significance on local inshore static gear vessels and of **negligible** significance in the case of towed gear vessels.

14.7.5.7 Impact 7: Displacement of fishing activity into other areas

265. As described for the construction phase (Section 14.7.4.7), the sensitivity to displacement of the UK inshore local fleet operating static gear is considered to be medium.

266. Given that the vast majority of the local static gears are deployed within the 12nm, following completion of the offshore cable installation, for the most part, there should be no reason for displacement effects to occur as there would be no requirement for static gears to be relocated. The exception to this would be if there were requirements for remedial offshore cable protection, reburial or repair works. Assuming the infrequency and short duration of such works the magnitude of the effect is expected to be low resulting in an impact of **minor adverse** significance**.**

267. In the case of towed gear fleets, as outlined for the construction phase (Section 14.7.4.7), it is also considered that the sensitivity of receptors, magnitude of effect and resulting impact significance would, at worst, be as identified in relation to complete loss or restricted access to fishing grounds. As summarised in Table 14.30 this would result in an impact of **negligible to minor adverse** significance depending on the towed gear fleet under consideration.

Table 14.30 Impact significance of displacement of fishing activity into other areas for towed gear fleets

Receptor Group		Receptor sensitivity	Magnitude of Effect	Impact Significance
Dutch Beam Trawling		Low	Medium	**Minor adverse**
Dutch Seine Netting		Low	Medium	**Minor adverse**
Other Dutch Methods	Demersal (otter) trawls and mid water trawls	Low	Negligible	**Negligible**
	Nets, purse seines, traps and dredges	Medium	Negligible	**Minor adverse**
Belgian Beam Trawling		Low	Low	**Minor adverse**
Belgian Demersal Otter Trawling		Low	Negligible	**Negligible**
Belgian Seine Nets		Low	Negligible	**Negligible**
UK Beam Trawling (Anglo-Dutch)		Low	Medium	**Minor adverse**

Receptor Group	Receptor sensitivity	Magnitude of Effect	Impact Significance
UK Beam Trawling (South-west ports)	Low	Negligible	**Negligible**
UK Demersal Otter Trawling	Low	Negligible	**Negligible**
French demersal and pelagic trawlers	Low	Low	**Minor adverse**
Danish sandeel industrial trawling	Low	Negligible	**Negligible**
Danish pelagic trawlers	Low	Negligible	**Negligible**
German fishing vessels	Low	Negligible	**Negligible**

14.7.6 Potential Impacts during Decommissioning

268. Decommissioning will be subject to a separate licensing process and EIA at that time, taking account of the latest scientific understanding and available guidance.

269. Decommissioning is likely to include removal of all of the wind turbine components and part of the foundations (those above seabed level). Some or all of the array cables, interconnector cables, and offshore export cables may be removed. Scour and cable protection would likely be left *in situ.*

270. Norfolk Vanguard Limited would return the seabed to a usable state in accordance with the decommissioning guidance provided by the Offshore Petroleum Regulator for Environment and Decommissioning under the Department of Business, Energy and Industrial Strategy (OPRED, 2018).

271. During the decommissioning phase, there is potential for wind turbine, foundation and cable removal activities to cause disruption to normal fishing activity.

272. The types of effect would be comparable to those identified for the construction phase, namely:

- Impact 1: Adverse Impacts on Commercially Exploited Fish and Shellfish Populations
- Impact 2: Temporary loss or restricted access to traditional fishing grounds;
- Impact 3: Safety issues for fishing vessels;
- Impact 4: Increased steaming times to fishing grounds;
- Impact 5: Obstacles on the seabed;
- Impact 6: Increased steaming times; and
- Impact 7: Displacement of fishing activity into other areas.

273. The sensitivity of receptors during decommissioning is assumed to be the same as given for the construction phase. The magnitude of effect is considered to be no greater, and in all probability less, than considered for the construction phase.

Therefore, it is anticipated that any decommissioning impacts would be no greater, and probably less than that assessed for the construction phase.

14.8 Cumulative Impacts

274. There is potential for cumulative impacts to occur on the commercial fisheries receptors identified for the project if all the other potential developments, regulated activities and conservation areas listed in Table 14.31 are implemented (Figure 14.49).

275. The likelihood of any significant impacts occurring would largely depend on the operational practices of each particular fleet, the location and extent of their grounds relative to other developments and the timing of construction phases.

276. For the purposes of this assessment it is taken that already operational offshore wind farms, active licenced activities and implemented measures are part of the existing environment, as commercial fishing activity would already be adapted to them. In addition, any effect they might have had would be reflected in the baseline characterisation used to inform this chapter (Appendix 14.1).

277. With regard to oil and gas activity, whilst new areas are being licenced and may be developed, a significant amount of oil and gas infrastructure is entering decommissioning and removal phases which, once complete, may lead to some increase in fishable area. At this stage it is not however possible to quantify the extent of any such effects.

278. In respect of areas of conservation, it should be noted that the final boundaries of some of these have yet to be defined and at present some of the published boundaries are only indicative of the maximum extent of the areas under consideration. Furthermore, the spatial extent and nature of potential restrictions on fishing associated with the implementation of conservation areas are in most cases also yet to be defined or finalised.

279. In the case of aggregate dredging areas, it should be noted that only a small percentage of these areas would be actively dredged at any one time.

280. The potential impacts considered for cumulative assessment are in line with those described above for assessment of the project alone and include the following:

- Impact 1: Adverse impact of commercially exploited fish and shellfish species;
- Impact 2: Loss or restricted access to traditional fishing grounds;
- Impact 3: Safety issues for fishing vessels;
- Impact 4: Increased steaming times to fishing grounds;
- Impact 5: Obstacles on the seabed;

- Impact 6: Interference with fishing activities; and
- Impact 7: Displacement of fishing activity into other areas.

281. In the case of safety issues for fishing vessels (Impact 3) and risks associated with seabed obstacles (Impact 5), it is considered that the same factors and obligations discussed for Norfolk Vanguard alone would apply to other projects/activities and this would therefore negate the potential for cumulative impacts to occur. As such, the potential cumulative effects associated with these impacts are not discussed further within this section.

Table 14.31 Projects considered for the cumulative impact assessment in relation to commercial fisheries

Project	Distance from site (km)	Size (MW)	Maximum number of turbines
Norfolk Vanguard	**N/A**	**1,800**	**200**
Wind Farms under Construction			
UK Wind Farms			
Beatrice	668	588	84
Galloper	93	336	56
Rampion	292	400	116
East Anglia One	40	714	102
Hornsea Project One	95	1,200	174
Hywind 2 Demonstration	544	30	5
Aberdeen Offshore Wind Farm	514	93.2	11
German Wind Farms			
OWP (Demonstrations projekt) Albatros I	280	112	16
Belgium Wind Farms			
Rentel	126	309	42
Danish Wind Farms			
Horns rev 3	424	407	49

Project	Distance from site (km)	Size (MW)	Maximum number of turbines
Wind Farms Consented			
UK Wind Farms			
East Anglia THREE	0	1,200	172
Hornsea Project Two	107	1,386	174
Doggerbank Teesside A	213	1,200	200
Doggerbank Teesside B	200	1,200	200
Doggerbank Creyke Beck A	184	1,200	200
Doggerbank Creyke Beck B	207	1,200	200
Triton Knoll	101	860	90
Inch Cape	481	784	110
Seagreen Alpha-Bravo	481	1,500	140-150
Neart na Gaoithe	465	448	54
Moray East (MORL Stevenson, Telford and MacColl)	660	950	100
Blyth Array 3A&4	339	58.4	10
Belgian Wind Farms			
Norther	132	370	44
Seastar	121	252	42
Mermaid	112	288	48
Northwester 2	115	309	42
Dutch Wind Farms			
Borssele Site I & II	107	725	94
Borssele Site III & IV	108	740	93
Borssele Site V -	109	20	2

Project	Distance from site (km)	Size (MW)	Maximum number of turbines
Leeghwater			
Hollandse Kust Zuid Holland I and II – Chinook	85	760	58-126
Danish Wind Farms			
Vesterhavet Syd/Nord	467	350	38-48
German Wind Farms			
Deutsche Bucht	235	252	30
OWP West	235	240	16-18
Gode Wind 03	291	110	8
Gode Wind 04	290	336	42
Borkum Riffgrund West I	256	270	45
Borkum Riffgrund II	252	450	56
Nördlicher Grund	343	384	64
Application submitted and not yet determined			
UK Wind Farms			
Hornsea Project Three	88	2,400	342
French Wind Farms			
Parc eolien en mer de Fecamp	348	740	93
Parc Eolien en mer de du Calvados	421	20	2
In Planning (scoped), Application not yet submitted			
UK Wind Farms			
Norfolk Boreas	30	1,800	200
East Anglia North	38	600-800	TBC
East Anglia Two	56	400-900	TBC

Project	Distance from site (km)	Size (MW)	Maximum number of turbines
Thanet Extension	159	340	34
Moray West	659	750	90
Dutch Wind Farms			
Holland Kust Zuid Holland I & II	76	700	58-126
Holland Kust Zuid Holland III & IV	76	700	58-126
Holland Kust Nord Holland I & II	74	700	58-126
French Wind Farms			
Parc Eolien en mer de Dieppe – le treport	300	496	62
Identified in strategic plans but not yet in planning			
UK Wind Farms			
Hornsea Project Four	112	1,000	TBC
Danish Wind Farms			
Hornsrev Reserved Area	387	TBC	TBC
Ringkobing Reserved Area	435	TBC	TBC
Aggregate Dredging Areas			
Application			
North West Rough	241	N/A	N/A
Southernmost Rough	186	N/A	N/A
Humber 3	60	N/A	N/A
Humber 4 and 7	79	N/A	N/A
Humber 5	66	N/A	N/A
New Sand Hole and Humber Extension	150	N/A	N/A

Project	Distance from site (km)	Size (MW)	Maximum number of turbines
Sole Pit	82	N/A	N/A
Outer Dowsing East Extension	91	N/A	N/A
Humber Overfalls	139	N/A	N/A
North Dowsing	129	N/A	N/A
Inner Dowsing	124	N/A	N/A
North Cross Sands	33	N/A	N/A
Lowestoft Extension	28	N/A	N/A
Benacre	74	N/A	N/A
Shipwash	103	N/A	N/A
Longsand	128	N/A	N/A
Owers Extension	309	N/A	N/A
Inner Owers North	309	N/A	N/A
South of Needles Channel	373	N/A	N/A
West Channel	374	N/A	N/A
South West Isle of Wight	340	N/A	N/A
EEC 5 South	282	N/A	N/A
South Wight	380	N/A	N/A
South East Isle of Wight	333	N/A	N/A
Needles Isle of Wight	368	N/A	N/A
St Catherine's	352	N/A	N/A
South West Isle of Wight	377	N/A	N/A
South Hastings	261	N/A	N/A
South East Isle of Wight	342	N/A	N/A

Project	Distance from site (km)	Size (MW)	Maximum number of turbines
Pre-Licence			
North Inner Gabbard	90	N/A	N/A
North Falls East	114	N/A	N/A
Outer Owers	307	N/A	N/A
Area 451 Extension	339	N/A	N/A
East English Channel 1	282	N/A	N/A
Oil and Gas			
Leman South Gas Field	34	N/A	N/A
Aberdonia Gas Field	26	N/A	N/A
Offshore Marine Protected Areas (MPAs)			
Bassurelle Sandbank SAC	258	N/A	N/A
Dogger Bank SAC	133	N/A	N/A
Inner Dowsing, Race Bank and North Ridge SAC	91	N/A	N/A
Haisborough, Hammond and Winterton SAC	7	N/A	N/A
North Norfolk Sandbanks and Saturn Reef SAC	2	N/A	N/A
Scanner Pockmark SAC	591	N/A	N/A
Wight-Barfleur Reef SAC	362	N/A	N/A
Southern North Sea cSAC	0	N/A	N/A
Greater Wash SPA	37	N/A	N/A
Outer Thames Estuary SPA	21	N/A	N/A
Farnes East MCZ	367	N/A	N/A
Fulmar MCZ	340	N/A	N/A

Project	Distance from site (km)	Size (MW)	Maximum number of turbines
North East Farnes Deep MCZ	350	N/A	N/A
South Dorset MCZ	407	N/A	N/A
Swallow Sand MCZ	284	N/A	N/A
Western Channel MCZ	589	N/A	N/A
Offshore Brighton MCZ	329	N/A	N/A
Offshore Overfalls MCZ	320	N/A	N/A
Central Fladen NCMPA	663	N/A	N/A
East of Gannet and Montrose fields NCMPA	434	N/A	N/A
Firth of Forth Banks Complex NCMPA	426	N/A	N/A
Norwegian Boundary Sediment Plain NCMPA	553	N/A	N/A
Turbot Bank NCMPA	523	N/A	N/A

14.8.1 Impact 1: Adverse impact on Commercially Exploited Fish and Shellfish Populations

282. There is the potential for Norfolk Vanguard to have adverse impacts on commercially exploited fish and shellfish as a result of cumulative impacts with other projects. This could in turn indirectly affect the productivity of the fisheries that target them. The potential cumulative impacts of the project on fish and shellfish species, including those of commercial importance, are assessed in Chapter 11 Fish and Shellfish Ecology and are not expected to exceed minor adverse significance. Consequently, any impacts on the commercial fisheries that target them are also not expected to exceed **minor adverse** significance**.**

14.8.2 Impact 2: Loss or Restricted Access to Traditional Fishing Grounds

283. The potential cumulative impact of Norfolk Vanguard with other projects, activities and conservation measures on commercial fisheries is given below by individual fleet.

284. In respect of other offshore wind farm projects, it is taken that fishing will be able to resume in operational offshore wind farms with the exception of projects in countries where fishing within them is prohibited.

14.8.2.1 Dutch Fishing Vessels

14.8.2.1.1 Dutch beam trawlers

285. Analysis of VMS data for the Dutch beam trawl fleet shows high to moderate levels of activity over the majority of the Southern North Sea with fishing activity extending into the southern section of the Central North Sea at relatively lower levels (Figure 14.4, Figure 14.15). The potential for cumulative impacts with the project in respect of loss of fishing grounds on this fleet would for the most part be a result of the development of other offshore wind farms off the Dutch and Belgian coast, as fishing within operational wind farms is prohibited in these countries. In addition, the overlap of the construction of the project with construction phases in other offshore wind farms or with aggregate dredging activity in the Southern North Sea, could also significantly contribute to the potential for cumulative impacts (Figure 14.49).

286. Additionally, potential restrictions on towed gear fishing implemented in conservation areas where these overlap with the grounds of this fleet, would also add to any cumulative loss of grounds.

287. Considering the large extent and intensity of fishing activity by this fleet, particularly across the Southern North Sea, this would result in potential for a moderate extent of their grounds being affected and therefore the magnitude of the impact is considered medium.

288. As discussed above for the construction and operation phase, the sensitivity of Dutch beam trawlers to loss of fishing grounds is considered to be low, resulting in a cumulative impact of **minor adverse** significance.

14.8.2.1.2 Dutch Seine netting

289. Dutch seine netting grounds extend over the north of Denmark, south to the English Channel and Western Approach. The highest concentration of activity by Dutch seine netters occurs within the English Channel (Figure 14.7 and Figure 14.8). Other developments/activities/conservation measures in these areas would therefore have the greatest potential to result in cumulative loss of grounds to this fleet. It is also recognised that in the case of wind farm developments, there is little potential for this activity to be able to resume once they are operational. Considering this, together with the increased area of potential exclusion, particularly when taking account of other wind farms, but recognising the extent of grounds and location of

other projects (Figure 14.49), the magnitude of the impact is considered to be medium.

290. As discussed above for the construction and operation phase, the sensitivity of Dutch seine netting to loss of fishing grounds is considered to be low, resulting in a cumulative impact of **minor adverse** significance.

14.8.2.1.3 Other Dutch fishing methods

291. As described for the project specific assessment, the obtained evidence indicates either no activity or minimal activity in areas relevant to Norfolk Vanguard by Dutch demersal (otter) trawls, midwater trawls, purse seines, nets, traps and dredges. The project would therefore not contribute significantly in terms of magnitude to any cumulative loss or, or restricted access to fishing grounds. As a result, the magnitude of the impact is considered to be as assigned for the project alone, namely negligible.

292. The sensitivity of these methods ranges from low in the case of demersal (otter) trawls and mid water trawls to medium in the case of vessels deploying nets, purse seines, traps and dredges. Considering this together with the magnitude of the effect the impacts of loss or restricted access to fishing grounds is considered to be of **negligible** significance (otter trawls and mid water trawls) to **minor adverse** significance (vessels deploying nets, purse seines, traps and dredges).

Table 14.32 Impact significance of cumulative loss or restricted access to traditional fishing grounds for Dutch vessels

Receptor Group		Receptor sensitivity	Magnitude of Effect	Impact Significance
Dutch Beam Trawling		Low	Medium	**Minor adverse**
Dutch Seine Netting		Low	Medium	**Minor adverse**
Other Dutch Methods	Demersal (otter) trawls and mid water trawls	Low	Negligible	**Negligible**
	Nets, purse seines, traps and dredges	Medium	Negligible	**Minor adverse**

14.8.2.2 Belgian fishing vessels

14.8.2.2.1 Beam trawling

293. The highest concentration of activity by this fleet is located to the south of the OWF sites, extending through the Dover Strait and into the English Channel (Figure 14.22 and Figure 14.23). The potential for cumulative impacts in respect of loss of fishing grounds on this fleet would for the most part be a result of the development of other offshore wind farms off the Dutch and Belgian coasts, as fishing within operational wind farms is prohibited in these countries. In addition, the overlap of

the construction of the project with construction phases in other offshore wind farms or aggregate dredging activity in the Southern North Sea and the English Channel could also significantly contribute to the potential for cumulative impacts (Figure 14.49). Similarly, potential restrictions on towed gear fishing implemented in conservation areas in areas which overlap with the grounds of this fleet, would also add to any cumulative loss of grounds.

294. Considering the distribution and intensity of fishing activity by this fleet, particularly across the southern section of the Southern North Sea and the English Channel, relative to the location of other projects/activities and conservation areas, there may be potential for a small to moderate extent of their grounds being affected. With this in mind the magnitude of the impact is assessed to be medium.

295. As discussed above for the construction and operation phase the sensitivity of Belgian beam trawlers to loss of fishing grounds is considered to be low, resulting in a cumulative impact of **minor adverse** significance.

14.8.2.2.2 Demersal (Otter) Trawling

296. Analysis of VMS data (Figure 14.26 and Figure 14.27) for this fleet indicates that the offshore project area sustains negligible levels of activity by this category of vessels, with activity for the most concentrating south of the OWF sites and in discrete areas of the Central North Sea. The project would therefore not contribute significantly in terms of magnitude to any cumulative loss or, or restricted access to fishing grounds. As a result, the magnitude of the impact is considered to be as assigned for the project alone, namely negligible.

297. As discussed above for the construction and operation phase the sensitivity of Belgian demersal otter trawlers to loss of fishing grounds is considered to be low, resulting in a cumulative impact of **negligible** significance.

14.8.2.2.3 Belgian seine netting

298. Analysis of VMS data (Figure 14.26 and Figure 14.27) for this fleet indicates that the offshore project area sustains negligible levels of activity by this category of vessels, with activity for the most part concentrating in the English Channel. The project would therefore not contribute significantly in terms of magnitude to any cumulative loss or, or restricted access to fishing grounds. As a result, the magnitude of the impact is considered to be as assigned for the project alone, namely negligible.

299. As discussed above for the construction and operation phase the sensitivity of Belgian seine netter to loss of fishing grounds is considered to be low, resulting in a cumulative impact of **negligible** significance.

Table 14.33 Impact significance of cumulative loss or restricted access to traditional fishing grounds for Belgian vessels

Receptor Group	Receptor sensitivity	Magnitude of Effect	Impact Significance
Belgian Beam Trawling	Low	Medium	**Minor adverse**
Belgian Demersal Otter Trawling	Low	Negligible	**Negligible**
Belgian Seine Netting	Low	Negligible	**Negligible**

14.8.2.3 UK fishing vessels

14.8.2.3.1 Beam trawling

300. Analysis of VMS data (Figure 14.32) for the UK registered beam trawlers suggests medium to low levels of activity by these vessels in the offshore project area with patches of activity throughout the Southern North Sea and into the English Channel and highest fishing intensity in the Central North Sea.

301. As described above, the majority of these vessels are Anglo-Dutch, being UK registered but Dutch owned and operated. The potential for cumulative impacts in respect of loss of fishing grounds on this fleet would for the most part be a result of the overlap in the construction phase of the project with other offshore wind farms or aggregate dredging activity, particularly in the Central North Sea. These vessels record limited activity off the Dutch and Belgian coasts, and therefore impacts from operational wind farms in these countries, where access to fishing is prohibited, would not add significantly to cumulative impacts. Additionally, potential restrictions on towed gear fishing implemented in conservation areas where these overlap with the grounds of this fleet, would also add to any cumulative loss of grounds (Figure 14.49).

302. Considering the distribution and intensity of fishing activity by this fleet, particularly in the Central North Sea, relative to the location of other projects/activities and conservation areas, there may be potential for a small to moderate extent of their grounds being affected. With this in mind the magnitude of the impact is assessed to be medium.

303. In the case of UK owned and operated beam trawlers, it is understood that only a limited number of these vessels may occasionally target sole off the coast of East Anglia on a seasonal basis and that this tends to be to the south of Norfolk Vanguard. The project would therefore not contribute significantly in terms of magnitude to any cumulative loss or, or restricted access to fishing grounds. As a result, the magnitude of the impact is considered to be as assigned for the project alone, namely negligible.

304. As discussed for the construction and operation phase the sensitivity of the Anglo-Dutch and UK owned and operated beam trawlers is considered to be low

305. Taking the above into account, the cumulative impact of loss or restricted access to fishing grounds is considered to be of **minor adverse** significance in the case of Anglo-Dutch beam trawlers and of **negligible** significance in the case of UK owned and operated beam trawlers.

14.8.2.3.2 Demersal otter trawling

306. Analysis of VMS data (Figure 14.33., 14. 34 and 14.35) indicates that activity by UK demersal otter trawling, both single rigged and twin rigged, is either absent or at most at negligible levels in the offshore project area. The project would therefore not contribute significantly in terms of magnitude to any cumulative loss or, or restricted access to fishing grounds. As a result, the magnitude of the impact is considered to be as assigned for the project alone, namely negligible.

307. As discussed for the construction and operation phase the sensitivity of demersal otter trawling fleets to loss of fishing grounds is considered to be low, resulting in a cumulative impact of **negligible** significance.

14.8.2.3.3 Local inshore vessels

308. With the exception of some netting and long lining vessels that occasionally may extend their operational range further offshore, virtually all activity by local vessels that deploy static gear occurs within the 12nm limit and most of it within the 6nm limit (Section 14.7.4.2.3). Therefore, in the case of static gear vessels that concentrate their activity in inshore areas, there would be no potential for significant cumulative impacts associated with other operational offshore wind farm projects, as with completion of export cable laying activities they should be able to resume activity in these areas.

309. In the case of vessels that occasionally venture further offshore, as described for the project alone, with changes to their mode of operation it is possible that they would be able to resume fishing within operational OWF sites. Considering this, together with the fact that for the most part their activity occurs in inshore areas (i.e. in areas relevant to export cables) there would be little potential for significant cumulative impacts to occur with other offshore wind farm projects during the operation phase.

310. In respect of the construction phase, there could be potential for some local inshore vessels to be affected by concurrent construction activities in other offshore wind farm projects in the immediate vicinity of Norfolk Vanguard, depending on the extent and location of their preferred fishing grounds and on the level of overlap between construction phases at different projects. In the case of the of small beach

launched vessels which operate static gear in the immediate vicinity of the cable corridor in the nearshore area, given the highly localised distribution of their fishing grounds and limited operational range, cumulative impacts are not expected to occur. In the case of vessels that have wider operational ranges (i.e. longliners), whilst there may be potential for these vessels to be affected by construction activities from additional wind farms, the areas potentially affected at a given time would be small in the context of the extent of their grounds (Figure 14.39). Furthermore, whilst occasionally these vessels venture to offshore areas, their activity predominantly occurs inshore. Therefore, where potential cumulative impacts occur these would be primarily a result of export cable installation activity at other projects and therefore localised and short term.

311. In addition to the above, there may be potential for aggregate dredging in areas in the vicinity of Norfolk Vanguard to cumulatively add to loss of, or restricted access to fishing grounds. Any impact in this respect would however be localised and short term. In the case of potential restriction to fishing associated with the implementation of conservation measures in protected areas, it should be noted that, where implemented, these are likely to only apply to towed gear methods, and therefore local inshore fishing vessels deploying static gear would likely remain unaffected (Figure 14.49).

312. With the above considerations in mind, the magnitude of the potential cumulative impact is considered to be low.

313. As described for the construction and operation phase the sensitivity of local inshore static gear vessels to loss of fishing grounds is considered to be medium, resulting in a cumulative impact of **minor adverse** significance.

Table 14.34 Impact significance of cumulative loss or restricted access to traditional fishing grounds for UK vessels

Receptor Group	Receptor sensitivity	Magnitude of Effect	Impact Significance
UK Beam Trawling (incl. Anglo-Dutch)	Low	Medium	**Minor adverse**
UK Beam Trawling (South-west ports)	Low	Negligible	**Negligible**
UK Demersal Otter Trawling	Low	Negligible	**Negligible**
Local inshore vessels	Medium	Low	**Minor adverse**

14.8.2.4 French fishing vessels

314. From consultation and the data that has been made available (Appendix 14.1) it is understood that activity by French vessels within the offshore project area occurs at low levels, with their activity primarily focused on grounds to the south of Norfolk Vanguard and into the English Channel (Figure 14.42, Figure 14.43, Figure 14.44 and

Figure 14.45). Other developments/activities/conservation measures in these areas would therefore have the greatest potential to result in cumulative loss of grounds to this fleet. Considering this, together with the increased area of potential exclusion during construction and operation, particularly when taking account of other wind farms, but recognising the extent of grounds and location of other projects (Figure 14.49), the magnitude of the impact is considered to be medium.

315. As discussed above for the construction and operation phase, the sensitivity of French demersal and pelagic trawlers to loss of fishing grounds is considered to be low, resulting in a cumulative impact of **minor adverse** significance.

Table 14.35 Impact significance of complete loss or restricted access to traditional fishing grounds for French vessels during the operation phase

Receptor Group	Receptor sensitivity	Magnitude of Effect	Impact Significance
French demersal and pelagic trawlers	Low	Medium	**Minor adverse**

14.8.2.5 Danish fishing vessels

316. Danish sandeel industrial trawling occurs at relatively high levels over a substantial area of the Central North Sea with very low activity recorded by this fleet in recent years in the offshore project area (Figure 14.46). Similarly, activity by pelagic trawlers has also been very low in areas relevant to the offshore project area, with the highest activity by these vessels concentrating in the Central North Sea, particularly off the Danish coast. The project would therefore not contribute significantly in terms of magnitude to any cumulative loss or, or restricted access to fishing grounds. As a result, the magnitude of the impact is considered to be as assigned for the project alone, namely negligible.

317. As discussed for the construction and operation phase the sensitivity of Danish sandeel industrial trawling and pelagic trawlers to loss of fishing grounds is considered to be low, resulting in a cumulative impact of **negligible** significance.

Table 14.36 Impact significance of cumulative loss or restricted access to traditional fishing grounds for Danish vessels

Receptor Group	Receptor Sensitivity	Magnitude of Effect	Impact Significance
Danish sandeel industrial trawling	Low	Negligible	**Negligible**
Danish pelagic trawlers	Low	Negligible	**Negligible**

14.8.2.6 German fishing vessels

318. Analysis of available VMS data for this fleet (Figure 14.48) suggests negligible levels of activity in areas relevant to Norfolk Vanguard, with activity concentrating for the most part in the Dutch and Danish Sector of the Central North Sea. The project would therefore not contribute significantly in terms of magnitude to any cumulative

loss or, or restricted access to fishing grounds. As a result, the magnitude of the impact is considered to be as assigned for the project alone, namely negligible.

319. As discussed for the construction and operation phase the sensitivity of German fishing vessels to loss of fishing grounds is considered to be low, resulting in a cumulative impact of **negligible** significance.

Table 14.37 Impact significance of cumulative loss or restricted access to traditional fishing grounds for German vessels

Receptor Group	Receptor Sensitivity	Magnitude of Effect	Impact Significance
German fishing vessels	Low	Negligible	**Negligible**

14.8.3 Impact 4: Increased Steaming Times to Fishing Grounds

320. The implementation of safety zones at Norfolk Vanguard and other projects could in theory, result in some short term increases in steaming distances and times, and therefore higher operational costs for fishing vessels.

321. Considering the increased amount of safety zones potentially in place at a given time as a result of other proposed projects/activities, but recognising the relative small footprint of these zones both during construction and operation, and the fact that that fishing vessels would be expected to be able to transit through operational sites, the magnitude of the cumulative impact is considered to be low.

322. As described for the construction and operation phase of the project alone, the sensitivity of all fleets to increased steaming times is considered to be negligible, resulting in a cumulative impact of **negligible** significance.

14.8.4 Impact 6: Interference with Fishing Activities

323. There could be potential for construction and operation and maintenance activities at Norfolk Vanguard and other projects, particularly other offshore wind farms, to result in interference with fishing activities as a result of increased construction/operation vessel transits.

324. It should be noted, however, that it would be expected that appropriate liaison, enabling awareness to vessels in transit on the location of static gears and fishermen's awareness of vessel transit routes, would be undertaken at all offshore wind farm projects included in the assessment. In the case of towed gear vessels, the same obligations in respect of COLREGS outlined in the assessments for the project alone, would also apply to construction/operation vessels for other wind farm projects. Whilst the relative increase in the level of vessel transits resulting from Norfolk Vanguard in conjunction with other projects is recognised, with the appropriate two way liaison with fishermen and adherence to COLREGs obligations

by construction/operation vessels outlined above, the magnitude of the effect is considered to be low.

325. As described for the operation and construction phase for the project alone, the sensitivity to interference is considered to be medium for the local static gear vessels and low for the various categories of towed gear vessels. This in combination with the low magnitude of effect, results in a cumulative impact of **minor adverse** significance.

14.8.5 Impact 7: Displacement of Fishing Activity into Other Areas

326. As described for assessment of displacement during construction for the project alone, considering the construction phase in other projects and other activities, there would also be limited potential for displacement to result in increased levels of competition between local inshore static gear vessels. It is assumed that if required adequate mitigation such as that proposed for the project would be applied by other projects/activities to minimise loss of fishing grounds and prevent potential conflicts between static gear vessels.

327. Similarly, as described for assessment of displacement during construction for the project alone, considering the construction phase in other projects and other activities, there would also be little potential for cumulative displacement to result in conflicts between towed and static gear vessels. Fishing activity by the main fleets that would be subject to potential cumulative displacement (i.e. Dutch, Anglo-Dutch and Belgian beam trawling) for the most part occurs beyond the 12nm limit and therefore outside of the operational range of most local inshore static gear vessels, and activity by other towed gear methods is comparatively low in the area.

328. In respect of cumulative impacts associated with the operational phase of Norfolk Vanguard and other projects in its vicinity, as the majority of the local UK static gears are deployed within the 12nm limit, with completion of the offshore cable installation in these projects, for the most part, there should be no reason for displacement effects to occur.

329. With the above in mind the cumulative magnitude of displacement on the local inshore static gear fleet is considered to be low. Taking this and the medium sensitivity to displacement of this fleet, the cumulative impact is assessed to be of **minor adverse** significance**.**

330. In the case of towed gear fleets, as outlined for the construction and operation phase of the project alone, it is considered that the sensitivity of receptors, magnitude of effect and resulting impact significance would, at worst, be as identified in relation to cumulative loss or restricted access to fishing grounds. As

summarised in Table 14.38 this would result in an impact of **negligible to minor adverse** significance depending on the towed gear fleet under consideration.

Table 14.38 Impact significance of cumulative displacement of fishing activity into other areas for towed gear fleets

Receptor Group		Receptor sensitivity	Magnitude of Effect	Impact Significance
Dutch Beam Trawling		Low	Medium	**Minor adverse**
Dutch Seine Netting		Low	Medium	**Minor adverse**
Other Dutch Methods	Demersal (otter) trawls and mid water trawls	Low	Negligible	**Negligible**
	Nets, purse seines, traps and dredges	Medium	Negligible	**Minor adverse**
Belgian Beam Trawling		Low	Medium	**Minor adverse**
Belgian Demersal Otter Trawling		Low	Negligible	**Negligible**
Belgian Seine Nets		Low	Negligible	**Negligible**
UK Beam Trawling (Anglo-Dutch)		Low	Medium	**Minor adverse**
UK Beam Trawling (South-west ports)		Low	Negligible	**Negligible**
UK Demersal Otter Trawling		Low	Negligible	**Negligible**
French demersal and pelagic trawlers		Low	Medium	**Minor adverse**
Danish sandeel industrial trawling		Low	Negligible	**Negligible**
Danish pelagic trawlers		Low	Negligible	Negligible
German fishing vessels		Low	Negligible	Negligible

14.9 Inter-relationships

331. The assessment of the impacts arising from construction, operation and decommissioning of the project, indicates that impacts on receptors addressed in other ES chapters may potentially further contribute to the impacts assessed on commercial fisheries and vice versa.

332. The principle linkages identified are summarises in the Table 14.39 below. No inter-relationships have been identified where an accumulation of residual impacts on commercial fisheries gives rise to a need for additional mitigation.

Table 14.39 Table of inter-relationships

Topic and Description	Related Chapter	Where addressed in this Chapter	Rationale
Adverse Effects on Commercially Exploited Fish and Shellfish	Chapter 11 Fish and Shellfish Ecology	Sections 14.7.4.1 and 14.7.5.1	Impacts on fish and shellfish species of commercial importance could indirectly affect the fisheries that target them.
Safety Issues for Fishing Vessels	Chapter 15 Shipping and Navigation	Section 14.7.4.3 and Section 14.7.5.3.	In addition to safety issues for fishing vessels associated with snagging risks and manoeuvrability issues and seabed obstacles (addressed in this chapter), fishing vessels would also be affected by safety issues associated with potential for collision or allision with project vessels and infrastructure. The latter are addressed in Chapter 15 Shipping and Navigation.
Increased steaming times	Chapter 15 Shipping and Navigation	Section 14.7.4.4 and Section 14.7.5.4.	Potential increases in steaming times to fishing grounds would arise depending on the potential for fishing vessels to be able to transit the area of the project during construction and operation.

14.10 Interactions

333. The impacts identified and assessed in this chapter have the potential to interact with each other, which could give rise to synergistic impacts as a result of that interaction. The worst case impacts assessed within the chapter take these interactions into account and therefore the impact assessments are considered conservative and robust. For clarity the areas of interaction between impacts are presented in Table 14.40.

Table 14.40 Interactions between impacts

Potential interaction between impacts Construction	Impact 1: Adverse impacts on commercially exploited fish and shellfish populations	Impact 2: Temporary loss or restricted access to traditional grounds	Impact 3: Safety issues for fishing vessels	Impact 4: Increased steaming times to fishing grounds	Impact 5: Obstacles on the sea bed post construction	Impact 6: Interference with fishing activities	Impact 7: Displacement of fishing activity into other areas
Impact 1: Adverse impacts on commercially exploited fish and shellfish populations	-	No	No	No	No	No	No
Impact 2: Temporary loss or restricted access to traditional grounds	No	-	No	No	No	No	Yes
Impact 3: Safety issues for fishing vessels	No	No	-	No	Yes	No	No
Impact 4: Increased steaming times to fishing grounds	No	No	No	-	No	No	No
Impact 5: Obstacles on the sea bed post construction	No	No	Yes	No	-	No	No
Impact 6: Interference with fishing activities	No	No	No	No	No	-	No
Impact 7: Displacement of fishing activity into other areas	No	Yes	No	No	No	No	-

Potential interaction between impacts Operation							
	Impact 1: Adverse impacts on commercially exploited fish and shellfish populations	Impact 2: Complete loss or restricted access to traditional fishing grounds	Impact 3: Safety issues for fishing vessels	Impact 4: Increased steaming times	Impact 5: Obstacles on the sea bed	Impact 6: Interference with fishing activities	Impact 7: Displacement of fishing activity into other areas
Impact 1: Adverse impacts on commercially exploited fish and shellfish populations	-	No	No	No	No	No	No
Impact 2: Complete loss or restricted access to traditional fishing grounds	No	-	No	No	No	No	Yes
Impact 3: Safety issues for fishing vessels	No	No	-	No	Yes	No	No
Impact 4: Increased steaming times	No	No	No	-	No	No	No
Impact 5: Obstacles on the sea bed	No	No	Yes	No	-	No	No
Impact 6: Interference with fishing activities	No	No	No	No	No	-	No
Impact 7: Displacement of fishing activity into other areas	No	Yes	No	No	No	No	-
Decommissioning							
It is anticipated that the decommissioning impacts will be similar in nature to those of construction.							

14.11 Summary

334. A summary of the impact assessment on commercial fisheries is given in Table 14.41. As shown, the impacts of Norfolk Vanguard on commercial fisheries receptors are not anticipated to exceed minor adverse significance.

Table 14.41 Potential impacts identified for commercial fisheries

Potential Impact	Receptor	Sensitivity	Magnitude	Significance	Mitigation	Residual Impact
Construction						
Impact 1: Adverse effects on commercially exploited Fish and Shellfish Populations	All commercial fisheries fleet	See Chapter 11: Fish and Shellfish Ecology		Minor adverse	See Chapter 11: Fish and Shellfish Ecology	**Minor Adverse**
Impact 2: Temporary Loss or Restricted Access to Traditional Fishing Grounds	Dutch Beam Trawling	Low	Low	Minor adverse	N/A	**Minor adverse**
	Dutch Seine Netting	Low	Low	Minor adverse	N/A	**Minor adverse**
	Dutch demersal otter and mid water trawling	Low	Negligible	Negligible	N/A	**Negligible**
	Dutch nets, purse seines, traps and dredges	Medium	Negligible	Minor adverse	N/A	**Minor adverse**
	Belgian Beam Trawling	Low	Low	Minor adverse	N/A	**Minor adverse**
	Belgian Demersal Otter Trawling	Low	Negligible	Negligible	N/A	**Negligible**
	Belgian Seine Netting	Low	Negligible	Negligible	N/A	**Negligible**
	UK Beam Trawling (Anglo-Dutch)	Low	Low	Minor adverse	N/A	**Minor Adverse**
	UK Beam Trawling (South-west ports)	Low	Negligible	Negligible	N/A	**Negligible**

Potential Impact	Receptor	Sensitivity	Magnitude	Significance	Mitigation	Residual Impact
	UK Demersal Otter Trawling	Low	Negligible	Negligible	N/A	**Negligible**
	UK inshore local static gear vessels	Medium	Low	Minor adverse	Implementation of evidence based mitigation in line with FLOWW guidelines, where appropriate	**Minor Adverse**
	French demersal and pelagic trawlers	Low	Low	Minor adverse	N/A	**Minor adverse**
	Danish industrial sandeel trawls and midwater trawls	Low	Negligible	Negligible	N/A	**Negligible**
	German fishing vessels	Low	Negligible	Negligible	N/A	**Negligible**
Impact 3: Safety Issues for Fishing vessels	All commercial fishing vessels	N/A	N/A	Within acceptable limits	N/A	**Within acceptable limits**
Impact 4: Increased Steaming Times to Fishing Grounds	All commercial fishing vessels	Negligible	Negligible	Negligible		**Negligible**
Impact 5: Obstacles on the seabed post construction	All commercial fishing vessels	N/A	N/A	Within acceptable limits	N/A	**Within acceptable limits**
Impact 6: Interference with Fishing Activities	Static gear	Medium	Low	Minor Adverse	N/A	**Minor Adverse**
	Mobile Gear	Low	Negligible	Negligible	N/A	**Negligible**

Potential Impact	Receptor	Sensitivity	Magnitude	Significance	Mitigation	Residual Impact
Impact 7: Displacement of Fishing Activity into other areas	Static Gear	Medium	Negligible	Negligible	N/A	**Negligible**
	All towed gear methods	Low to Medium	Negligible to Low	Negligible to Minor Adverse	N/A	**Negligible to Minor Adverse**
Operation						
Impact 1: Adverse impacts on Commercially Exploited Fish and Shellfish populations	All commercial fishing vessels	See Chapter 11: Fish and Shellfish Ecology		Minor adverse	N/A	**Minor adverse**
Impact 2: Complete Loss or Restricted access to Traditional Fishing Grounds	Dutch Beam Trawling	Low	Medium	Minor adverse	N/A	**Minor adverse**
	Dutch Sein Netting	Low	Medium	Minor adverse	N/A	**Minor adverse**
	Dutch demersal otter and mid water trawling	Low	Negligible	Negligible	N/A	**Negligible**
	Dutch nets, purse seines, traps and dredges	Medium	Negligible	Minor adverse	N/A	**Minor adverse**
	Belgian Beam Trawling	Low	Negligible	Negligible	N/A	**Negligible**
	Belgian Demersal Otter Trawling	Low	Negligible	Negligible	N/A	**Negligible**
	Belgian Seine Netting	Low	Negligible	Negligible	N/A	**Negligible**
	UK Beam Trawling (Anglo-Dutch)	Low	Medium	Minor adverse	N/A	**Minor Adverse**
	UK Beam Trawling (South-west ports)	Low	Negligible	Negligible	N/A	**Negligible**

Potential Impact	Receptor	Sensitivity	Magnitude	Significance	Mitigation	Residual Impact
	UK Demersal Otter Trawling	Low	Negligible	Negligible	N/A	**Negligible**
	UK Local Static Gears	Medium	Negligible	Negligible	N/A	**Minor adverse**
	French demersal and pelagic trawls	Low	Low	Minor adverse	N/A	**Minor adverse**
	Danish sandeel industrial trawlers and midwater trawlers	Low	Negligible	Negligible	N/A	**Negligible**
	German fishing vessels	Low	Negligible	Negligible	N/A	**Negligible**
Impact 3: Safety Issues for Fishing Vessels	All commercial fishing vessels	N/A	N/A	Within acceptable limits	N/A	**Within acceptable limits**
Impact 4: Increased Steaming Times to Fishing Grounds	All commercial fishing vessels	Negligible	Negligible	Negligible	N/A	**Negligible**
Impact 5: Obstacles on the seabed	All commercial fishing vessels	N/A	N/A	Within acceptable limits	N/A	**Within acceptable limits**
Impact 6: Interference with Fishing Activities	Static Gear fleets	Medium	Negligible	Minor adverse	N/A	**Minor adverse**
	Mobile gear fleets	Low	Negligible	Negligible	N/A	**Negligible**
Impact 7: Displacement of Fishing Activity into Other Areas	Static gear vessels	Medium	Low	Minor adverse	N/A	**Minor adverse**
	Towed gear vessels	Low to Medium	Negligible to Medium	Negligible to Minor adverse	N/A	**Negligible to Minor adverse**

Potential Impact	Receptor	Sensitivity	Magnitude	Significance	Mitigation	Residual Impact
Decommissioning						
Impact 1 - **Impact 7** These impacts are assumed to be the same as during the construction phase	The sensitivity of the receptors is considered to be the same to that identified for the construction phase. The magnitude of effect is considered to be no greater, and in all probability less, than in the construction phase. Therefore, it is anticipated that any decommissioning impacts would be no greater, and probably less than that assessed for the construction phase.					
Cumulative						
Impact 1: Adverse effects on commercially exploited Fish and Shellfish Populations	All commercial fishing vessels	See Chapter 11: Fish and Shellfish Ecology		Minor adverse	N/A	**Minor adverse**
Impact 2: Loss or Restricted Access to Traditional Fishing Grounds	Dutch Beam Trawling	Low	Medium	Minor adverse	N/A	**Minor adverse**
	Dutch Sein Netting	Low	Medium	Minor adverse	N/A	**Minor adverse**
	Dutch demersal otter and mid water trawling	Low	Negligible	Negligible		**Negligible**
	Dutch nets, purse seines, traps and dredges	Medium	Negligible	Minor adverse	N/A	**Minor adverse**
	Belgian Beam Trawling	Low	Medium	Minor adverse	N/A	**Minor adverse**
	Belgian Demersal Otter Trawling	Low	Negligible	Negligible	N/A	**Negligible**
	Belgian Seine Netting	Low	Negligible	Negligible	N/A	**Negligible**
	UK Beam Trawling (Anglo-Dutch)	Low	Medium	Minor adverse	N/A	**Minor adverse**
	UK Beam Trawling (South-west ports)	Low	Negligible	Negligible	N/A	**Negligible**

Potential Impact	Receptor	Sensitivity	Magnitude	Significance	Mitigation	Residual Impact
	UK Demersal Otter Trawling	Low	Negligible	Negligible	N/A	**Negligible**
	UK Local Static Gears	Medium	Low	Minor adverse	N/A	**Minor adverse**
	French demersal and pelagic trawls	Low	Medium	Minor adverse	N/A	**Minor adverse**
	Danish sandeel industrial trawlers and midwater trawlers	Low	Negligible	Negligible	N/A	**Negligible**
	German fishing vessels	Low	Negligible	Negligible	N/A	**Negligible**
Impact 3: Safety Issues for Fishing Vessels	It is assumed that the same obligations in respect of safety issues will apply to other projects/activities					
Impact 4: Increased Steaming Times to Fishing Grounds	All fishing fleets	Negligible	Low	Negligible	N/A	**Negligible**
Impact 5: Obstacles on the seabed	It is assumed that the same obligations in respect of seabed obstacles will apply to other projects/activities					
Impact 6: Interference with Fishing Activities	Local static gear vessels	Medium	Low	Minor adverse	N/A	**Minor adverse**
	Towed gear vessels	Low	Low	Minor adverse	N/A	**Minor adverse**
Impact 7: Displacement of Fishing Activity into Other Areas	Local static gear vessels	Medium	Low	Minor adverse	N/A	**Minor adverse**
	Towed gear vessels	Low to Medium	Negligible to Medium	Negligible to Minor adverse	N/A	**Negligible to Minor adverse**

14.12 References

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