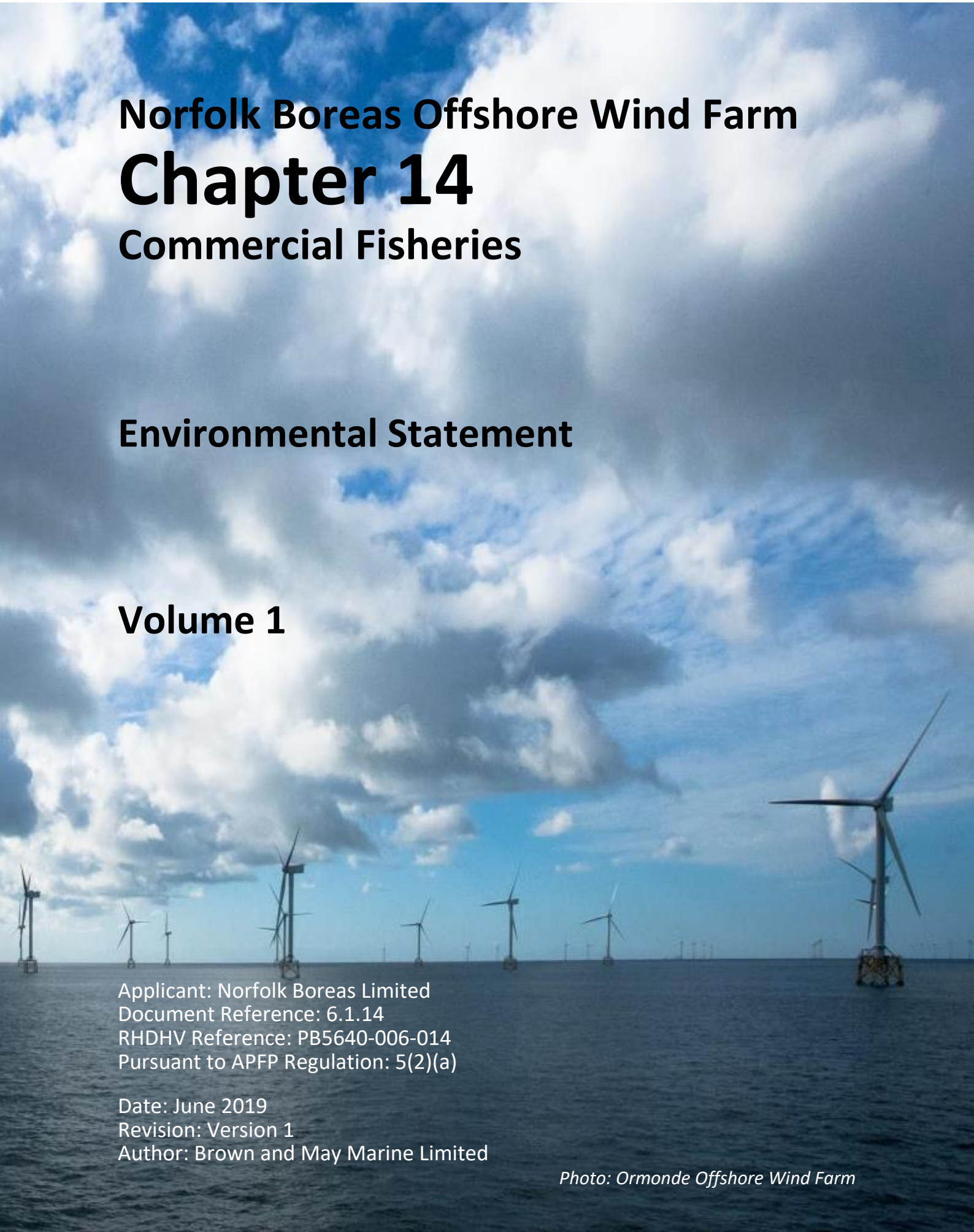
Norfolk Boreas Offshore Wind Farm

Chapter 14

Commercial Fisheries

Environmental Statement

Volume 1



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Glossary of Acronyms

ALARP	As Low As Reasonably Practicable
BMM	Brown and May Marine Limited
Cefas	Centre for Environment, Fisheries and Aquaculture Science
COLREGS	International Regulations for Preventing Collisions at Sea
CPA	Coastal Protection Act
CRPMEM	Comité Régional des Pêches Maritimes et des Elevages Marins
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
IFCA	Inshore Fisheries Conservation Authority
EIA	Environmental Impact Assessment
ES	Environmental Statement
EU	European Union
ESFJC	Eastern Sea Fisheries Joint Committee
FEPA	Food and Environmental Protection Act
FLCP	Fisheries Liaison and Co-existence Plan
FLO	Fisheries Liaison Officer
FLOWW	Fishing Liaison with Offshore Wind and Wet Renewables Group
ICES	International Council for the Exploration of the Seas
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
IPMP	In Principle Monitoring Plan
LEI	Landbouw Econmisch Instituut
LiDAR	Light Detection and Ranging
MCEU	Marine Consents and Environment Unit
MCA	Maritime Coastguard Agency
MMO	Marine Management Organisation
MPA	Marine Protected Area
NFFO	National Federation of Fishermen's Organisations
NPS	National Policy Statement
NtM	Notice to Mariners
OFLO	Offshore Fisheries Liaison Officer
PEIR	Preliminary Environmental Impact Report
SAC	Special Area of Conservation
UKFEN	UK Fisheries Economic Network
UKHO	UK Hydrographic Office
VisNED	Dutch Fisherman's Federation
VMS	Vessel Monitoring System
VWPL	Vattenfall Wind Power Limited

Glossary of Terminology

Array cables	Cables which link wind turbine to wind turbine, and wind turbine to offshore electrical platforms.
Beam trawl	A trawl net whose lateral spread is maintained by a beam across its mouth.
Beam trawl -Pulse Wing Trawling	Advanced adaptation of conventional beam trawling where the tickler chains and chain mat of the beam trawl are removed and replaced with trailing electrodes.
Demersal fish	Fish living on or near the seabed
Flatfish	Fish of the order Heterosomata of marine typically bottom-dwelling bony fishes such as soles, place and turbots, that as adults swim on one side of the laterally compressed body and have both eyes on the upper side.
ICES rectangle	Spatial unit used for the collection of fisheries statistics which covers an area of approximately 900nm^2, aligned to 30' latitude by 1° longitude.
Interconnector cables	Offshore cables which link offshore electrical platforms within the Norfolk Boreas site.
Landfall	Where the offshore cables come ashore at Happisburgh South.
Longlining	Fishing method that involves setting out short lines carrying hooks, which are attached to a longer main line at regular intervals. The short lines are suspended horizontally at a predetermined depth with the help of surface floats.
Offshore cable corridor	The corridor of seabed from the Norfolk Boreas site to the landfall site within which the offshore export cables will be located.
Offshore electrical platform	A fixed structure located within the Norfolk Boreas site, containing electrical equipment to aggregate the power from the wind turbines and convert it into a suitable form for export to shore.
Offshore export cables	The cables which transmit power from the offshore electrical platform to the landfall.
Offshore service platform	A platform to house workers offshore and/or provide helicopter refuelling facilities. An accommodation vessel may be used as an alternative for housing workers.
Offshore project area	The area including the Norfolk Boreas site, project interconnector search area and offshore cable corridor.
Otter trawl	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. Demersal fisheries as well as pelagic fisheries can apply this technique.
Pelagic fish	The term pelagic fish covers species found mainly in shoals in midwater or near the surface of the sea
Potting	Fishing method which uses baited traps (posts) to target shellfish species, most commonly lobsters and crabs. Pots have a tapered entrance that makes it easy for shellfish to enter, but very difficult for them to find the way out.
Project interconnector cable	Offshore cables which would link either turbines or an offshore electrical platform in the Norfolk Boreas site with an offshore electrical platform in one of the Norfolk Vanguard sites.
Project interconnector search area	The area within which the project interconnector cable would be installed.
Safety zone	An area around a vessel which should be avoided during offshore construction.
Seine netting	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.
Norfolk Boreas site	The Norfolk Boreas wind farm boundary. Located offshore, this will contain all the wind farm array.
The project	Norfolk Boreas Wind Farm including the onshore and offshore infrastructure.

14 COMMERCIAL FISHERIES

14.1 Introduction

1. This chapter of the Environmental Statement (ES) describes the commercial fisheries baseline in areas relevant to Norfolk Boreas ('the project') and provides and assessment of the potential impacts of the project on commercial fisheries.

2. For the purpose of this chapter, commercial fishing activity 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 Boreas. These include the local inshore fleet and larger vessels which operate further offshore and have homeports in the UK and elsewhere in Europe.

3. The areas of the project relevant to this chapter are the Norfolk Boreas site, the offshore cable corridor and the project interconnector search area. Collectively these areas are referred to as "the offshore project area".

4. There is no single data source or recognised model for defining 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 consultation with the relevant national fishermen's federations, local associations and skippers whose fishing grounds are located in the offshore project area.

5. Vattenfall Wind Power Limited (VWPL) (the parent company of Norfolk Boreas Limited) is also developing Norfolk Vanguard, a 'sister project' to Norfolk Boreas. Norfolk Vanguard's development schedule is approximately one year ahead of Norfolk Boreas and as such the Development Consent Order (DCO) application was submitted in June 2018.

6. Norfolk Vanguard may undertake some enabling works for Norfolk Boreas, but these are only relevant to the assessment of impacts onshore. This assessment does however assume a worst case which includes interconnector cables between the Norfolk Boreas and Norfolk Vanguard projects (herein, 'the project interconnector'). If Norfolk Vanguard does not proceed then the project interconnector would not be required.

7. This chapter is supported by Appendix 14.1 Commercial Fisheries Technical Report and Appendix 14.2 Commercial Fisheries Consultation Responses.

8. Other chapters that are linked with commercial fisheries, or that cover impacts that may be related to those in this chapter include:

- Chapter 11 Fish and Shellfish Ecology; and
- Chapter 15 Shipping and Navigation.

9. This chapter of the ES has been produced by Brown and May Marine Limited (BMM).

14.2 Legislation, Guidance and Policy

10. The characterisation of the existing environment and the assessment of potential impacts on commercial fisheries provided in this chapter has been made with reference to relevant National Policy Statements (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).

11. The Overarching NPS for Energy (EN-1) sets out the Government's policy for delivery of major energy infrastructure, with generic considerations which are further considered in the technology-specific NPSs such as the NPS for Renewable Energy Infrastructure (EN-3). Table 14.1 summarises guidance relevant to the ES in respect of commercial fisheries from EN-3 as well as providing the sections in this chapter where each is addressed.

Table 14.1 National Policy Statement (NPS) (EN-3) assessment guidance

NPS Guidance	NPS Reference	Where addressed in ES
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	A detailed assessment of the impacts of the project on fish and shellfish species, including commercial species, is provided Chapter 11 Fish and Shellfish Ecology. Potential impacts on the commercial fisheries that target them are assessed within this chapter (section 14.7.4.1 and section 14.7.5.1).
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 (section 14.7 and section 14.8).

NPS Guidance	NPS Reference	Where addressed in ES
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.
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, including relevant consultation undertaken for the neighbouring Norfolk Vanguard project.
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. The likely constraints on fishing associated with the project are considered in this chapter (section 14.7 and section 14.8).
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 implications 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 14.12) and for assessment of potential impacts on commercial fisheries (section 14.7). Consideration is given in this chapter to the potential impact on commercial fisheries resulting from potential impacts associated with the project on commercially exploited fish and shellfish species. 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.

12. 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 practice 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

13. Consultation is a key part of the DCO application process. To date, formal consultation regarding commercial fisheries has been conducted through the Norfolk Boreas Scoping Report (Royal HaskoningDHV, 2017a), the Norfolk Boreas Preliminary Environmental Information Report (PEIR) (Royal HaskoningDHV, 2018) and the Offshore Order Limits change report. The responses received are summarised in Appendix 14.2, including details of how these have been taken account of within this chapter.

14. As Norfolk Boreas and Norfolk Vanguard windfarm site are collocated and they share an offshore cable corridor, the pre-application consultation undertaken as part of Norfolk Vanguard has been used to inform the approach to the Norfolk Boreas commercial fisheries assessment. Furthermore, information submitted as part of the Norfolk Vanguard examination, has also been incorporated. However, in order that the programmed submission of the Norfolk Boreas DCO has not been impacted it has been necessary to use a cut-off point of the 20th March (which coincided with Norfolk Vanguard Examination Deadline 5) after which information provided at the

Vanguard examination as well as any wider information has not been included in this assessment unless it could be done without impacting the programme for submission. The information from Norfolk Vanguard which has been used to inform this assessment is also presented in Appendix 14.2.

15. Further to the formal consultation outlined above, direct consultation has been undertaken with relevant fisheries stakeholders for Norfolk Boreas and Norfolk Vanguard. A list of consultees, along with dates of consultation carried out in respect of Norfolk Boreas and Norfolk Vanguard are given in Table 14.2 and Table 14.3, respectively. Consultation with fisheries stakeholders is on-going and will continue after submission of the ES.

Table 14.2 Summary of Fisheries Consultation for Norfolk Boreas

Consultees	Role / Organisation	Consultation date
Representative 1	VisNED	20/06/2018
Representative 2	Comité Régional des Pêches Maritimes et des Elevages Marins (CRPMEM), Hauts de France	03/07/2018
Representative 3	Danmarks Fiskeriforening Producent Organisation	03/07/2018
Representative 4	Rederscentrale	03/07/2018
Fisherman 1	Caister fishermen	10/08/2018
Fisherman 2		
Fisherman 3		
Fisherman 4		
Fisherman 5		
Fisherman 6		
Fisherman 7		
Fisherman 8		
Fisherman 9		
Fisherman 10	Sea Palling fisherman	10/08/2018
Representative 5	National Federation of Fishermen's Organisations (NFFO)	14/08/2018
Fisherman 11	Sea Palling fishermen	22/08/2018
Fisherman 12		
Fisherman 13	Great Yarmouth fisherman	10/09/2018
Fisherman 14	Sea Palling fisherman	
Fisherman 15	Caister fisherman	
Representative 6	North Norfolk Fishermen Society	12/09/2018
Fisherman 16	Lowestoft fishermen	11/11/2018
Fisherman 17		
Fisherman 18		
Representative 7	Chair of Eastern regional NFFO committee	

Table 14.3 Summary of fisheries stakeholder consultation for Undertaken by Norfolk Vanguard but where Norfolk Boreas was also discussed

Consultees	Role / Organisation	Consultation date
Representative 6	Area Officer - Eastern IFCA	31/05/2016
Sea Palling Fishermen's Association		31/05/2016
Fisherman 1	Sea Palling fisherman	06/06/2016 18/07/2016
Fisherman 2	Great Yarmouth fisherman	06/06/2016 12/07/2016
Fisherman 3	Sea Palling fisherman	06/06/2016
Fisherman 4	Sea Palling Fisherman	08/06/2016
NFFS		10/06/2016 13/06/2016 12/07/2016 11/08/2016 05/07/2016
Fisherman 5	Caister fisherman	15/06/2016 12/07/2016
Fisherman 6	Sea Palling fisherman	17/06/2016
Representative 7	MMO – Lowestoft	19/10/2016
Representative 8, Representative 9	Eastern IFCA	21/10/2016
Representative 10, Representative 4, Representative 11, Representative 12	Rederscentrale, Vlaanderen	29/11/2016
Representative 3	Danmarks Fisheriforening PO	30/11/2016
Representative 13	Fiskbat	30/11/2016
Representative 1	VisNED	14/02/2017 11/04/2018 26/04/2018 29/05/2018
Representative 14	Fiskbat	07/03/2017
Representative 2, Representative 15	CRPMEM- Pas de Calais	14/03/2017
Fisherman 7	Lowestoft fisherman	31/03/2017 16/05/2017
Representative 5, Representative 16	NFFO	05/04/2017
Representative 17	VisNED	19/04/2017
Fisherman 8	Lowestoft fishermen	16/05/2017
Fisherman 9	Lowestoft fishermen	16/05/2017
Fisherman 10	Lowestoft fishermen	16/05/2017
Fisherman 11	Lowestoft fishermen	16/05/2017
Fisherman 12	Lowestoft fishermen	16/05/2017
Fisherman 13	Lowestoft fishermen	16/05/2017
Representative 18	Deutchser Fisherei Vernband	23/05/2017
Fisherman 14	Caister fisherman	06/06/2017
Fisherman 15	Lowestoft fisherman	15/06/2017
Fisherman 16	Happisburgh fisherman	09/08/2017

14.4 Assessment Methodology

14.4.1 Impact Assessment Methodology

16. The assessment of potential impacts of Norfolk Boreas on commercial fisheries receptors considers relevant aspects specified in the Cefas and MCEU (2004) guidelines for offshore wind developments. These are as follows:

- 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.

17. In addition, to the above aspects, consideration has also be given to the potential impacts associated with displacement of fishing activities into other areas, as concerns in this respect were raised by fisheries stakeholders during consultation (section 14.3).

18. The impact assessment presented in this chapter assesses potential impacts during the construction, operational and decommissioning phases of project. In addition, it considers potential cumulative and transboundary impacts.

19. As described above (section 14.1) VWPL (the parent company of Norfolk Boreas Limited) is also developing Norfolk Vanguard, a 'sister project' to Norfolk Boreas. Norfolk Vanguard's development schedule is approximately one year ahead of Norfolk Boreas and as such the DCO application was submitted in June 2018.

20. Norfolk Vanguard may undertake some enabling works for Norfolk Boreas, but these are only relevant to the assessment of impacts onshore. This assessment does however assume a worst case which includes project interconnector cables between the Norfolk Boreas and Norfolk Vanguard projects. If Norfolk Vanguard does not proceed then the project interconnector cables would not be required.

14.4.2 Significance criteria

14.4.2.1 Sensitivity

21. The definitions of the different sensitivity levels applied to receptors that have been used to inform the assessment on commercial fisheries are presented in Table 14.4.

Table 14.4 Definitions of Sensitivity Levels for Commercial Fisheries Receptors

Sensitivity	Definition
High	Limited operational range and ability to deploy only one gear type.

Sensitivity	Definition
	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.
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.

14.4.2.2 Magnitude

22. The criteria used to define magnitude of a potential impact on commercial fisheries are provided in Table 14.5.

23. The magnitude of an effect for each impact is described 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 a fleet is able to exploit).

24. 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 Boreas anticipated to be up to 3 years (see section 14.7.3). Impacts associated with operation are longer term, throughout the anticipated 30 year design life of Norfolk Boreas.

Table 14.5 Definitions of Magnitude Values 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.

14.4.3 Impact Significance

25. The significance of an impact is identified taking account of the magnitude of effect and sensitivity of the receptor following the impact significance matrix shown in Table 14.6. On this basis potential impacts are assessed as of negligible, minor, moderate or major significance. Those impacts which are of moderate or major significance are considered significant in Environmental Impact Assessment (EIA) terms. Impact significance definitions are provided in Table 14.7.

26. It should be noted that the definition of impact significance, whilst guided by the significance criteria matrix (Table 14.6), is largely qualitative and based on professional judgement.

Table 14.6 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 14.7 Impact Significance Definitions

Impact Significance	Definition
Major	Very large or large change in receptor condition, both adverse or beneficial, which are likely to be important considerations at a regional or district level because they contribute 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 are likely to be important considerations at a local level.
Minor	Small change in receptor condition, which may be raised as local issues but are unlikely to be important in the decision making process.
Negligible	No discernible change in receptor condition.
No change	No impact, therefore no change in receptor condition.

14.4.3.1 Safety Risks

27. Where Norfolk Boreas poses a potential safety risk to fishing vessels and crews, the significance criteria outlined previously are not considered appropriate. In these

instances, impacts are assessed in terms of potential risks in line with the parameters used in Chapter 15 Shipping and Navigation (Table 14.8).

28. Following this approach, risks which are defined to be within acceptable limits are not considered significant in EIA terms whilst risks considered to be outside acceptable limits are considered to be significant.

Table 14.8 Significance Ranking Definitions

Risk Region	Risk	Description
	No Perceptible Impact	No perceptible impact on shipping and navigation receptors.
	Broadly Acceptable	Risk as low as reasonably practicable (ALARP) with no additional mitigations or monitoring required above embedded mitigations.
	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. Impacts considered Unacceptable are considered Significant in EIA terms.

14.4.4 Cumulative Impact Assessment

29. Projects / activities which are considered to be within relevant proximity to Norfolk Boreas have been screened for assessment of cumulative impacts. Given the extent of the operational range of some of the fleets active in areas relevant to Norfolk Boreas, projects located within the North Sea and the English Channel have been considered in the cumulative assessment (see section 14.8).

14.4.5 Transboundary Impact Assessment

30. The impact assessment provided within this chapter takes account of the potential impacts of Norfolk Boreas on international fleets which are known to operate in the study area. Therefore, 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

31. Norfolk Boreas is located in ICES Division IVc (Southern North Sea). Fisheries data are recorded, collated and analysed by statistical rectangles within each ICES division.

32. The study area for the assessment of commercial fishery activities in Norfolk Boreas has therefore been defied with reference to the ICES rectangles within which the offshore project area is located. These include the following (Figure 14.1):

- ICES rectangle 35F3 – where the north east section of the Norfolk Boreas site is located;
- ICES rectangle 35F2 - where the north west section of the Norfolk Boreas site is located;
- ICES rectangle 34F3 - where the south east corner of the Norfolk Boreas site is located;
- ICES rectangles 34F2 - where the south west section of the Norfolk Boreas site, the project interconnector search area and the offshore section of the offshore cable corridor are located; and
- ICES rectangle 34F1 – where the inshore section of the offshore cable corridor is located.

33. The study area defined above has been used to identify fisheries active in areas relevant to the project and the levels of fishing that the offshore project area sustains. Where relevant, however, data and information have been analysed for wider areas to provide context and describe the full extent of the fishing activity of the fleets identified.

14.5.2 Data Sources

34. The description of the baseline has been derived using data and information from a number of sources. The key datasets used to characterise the baseline and assess the potential impacts of Norfolk Boreas on commercial fisheries receptors are summarised in Table 14.9. A detailed description of the data and information sources used is provided in Appendix 14.1.

35. In addition to analysis of fisheries statistical datasets, direct consultation is ongoing with the relevant national fishermen's federations, local associations and fishermen whose fishing grounds are located in the vicinity of Norfolk Boreas. As previously stated, in addition to that derived from consultation for Norfolk Boreas, where relevant, information gathered during consultation for Norfolk Vanguard has also been used been used to inform this chapter (see section 14.3).

Table 14.9 Data Sources

Data	Year	Coverage	Confidence	Notes
UK Marine Management Organisation (MMO) fisheries statistics	2007 to 2016	UK vessels landing in to UK and European ports. Non-UK vessels landing in to UK ports.	High	Landings data provided by value (£).
UK MMO Surveillance Sightings	2011 to 2015	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.

Data	Year	Coverage	Confidence	Notes
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 - effort (days) and value (£), by gear type
Belgian Institute for Agriculture, Fisheries and Food (ILVO) fisheries statistics (landings values data)	2010 to 2014	Landings of Belgian vessels over 10m	High	Landings values (€),provided by method and species
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 -effort (days) and value (€), by gear type.
Netherlands Institute of Marine Research (IMARES), Landbouw Economisch Instituut (LEI) VMS and integrated landings data	2013 to 2017	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 -effort (days) and value (€) provided by gear type.
Netherlands IMARES fisheries statistics (landings values data)	2013 to 2017	Landings of Dutch vessels (all vessel size categories)	High	Fisheries statistics (landings values) available from 2013 to 2017 by method and species.
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 data	2014	VMS charts provided for the Central (IVb) and Southern North Sea (IVc).	High	VMS provided by effort (days). Data of very low spatial resolution.
French Comité National des Pêches Maritimes et des Elevages Marins (CNPMEM) VMS data	2008	VMS charts provided in CNPMEM report "French Answer to the Consultation on Round 3 UK Wind farms Proposal 2009"	Medium	VMS provided by effort (days)

Data	Year	Coverage	Confidence	Notes
German Federal Office for Agriculture and Food VMS data	2011 to 2015	VMS provided by vessel density in the North Sea.	Medium	VMS provided by density.
* Given the limitation 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).				

14.5.3 Assumptions and Limitations

36. The characterisation of the existing environment has been undertaken using the data sources listed above. These are subject to a range of sensitivities and limitations which are described in detail in Appendix 14.1.

14.6 Existing Environment

14.6.1 Overview

37. This section outlines the principal nationalities active in the study area and fishing methods deployed based on MMO surveillance sightings data from 2011 to 2015 (Figure 14.2 and Figure 14.3).

38. Due to the frequency of the flights of surveillance aircraft and passages of fishery protection vessels, surveillance sightings do not accurately reflect the actual levels of fishing activity within a given area. The data does, however, give a general indication of the relative levels and distribution of activity by nationality and method.

39. The majority of sightings in inshore rectangle 34F1 (where the inshore section of the offshore cable corridor is located) are of UK vessels, primarily potter/whelkers (Figure 14.2 and Figure 14.3). French, Belgian and Dutch vessels have also been recorded in this rectangle, however in very low numbers. It should be noted that with the exception of Belgian vessels (which have historic fishing rights to fish between the UK's 6 and 12nm limit in this area), non-UK vessels do not have rights to fish within the 12nm limit. It is therefore understood that the sightings of French and Dutch vessels recorded in rectangle 34F1 correspond with vessels steaming to fishing grounds or ports rather than actively fishing.

40. Further offshore, in rectangle 34F2 (where the southwest section of the Norfolk Boreas site, the offshore section of the offshore cable corridor and the project interconnector search area are located), the majority of sightings are of Dutch vessels (beam trawlers). Sightings of other nationalities in this rectangle are comparatively low and are primarily of UK vessels (long liners, gill netters and beam trawlers) and Belgian beam trawlers. Vessels from other nationalities such as

German beam trawlers and French and Danish trawlers have also been recorded in this rectangle however to a much lesser extent (Figure 14.2 and Figure 14.3).

41. In the remaining offshore ICES rectangles that comprise the study area (rectangles 34F3, 35F2 and 35F3) the observations recorded are comparatively low and are, for the most part of Dutch beam trawlers (Figure 14.2 and Appendix 14.1).

14.6.2 Dutch Fishing Activity

14.6.2.1 Overview

42. Beam trawling for flatfish species, particularly sole and plaice, is the principal fishing method used by Dutch vessels in the study area. Activity by Dutch seine netters also occurs, however to a much lesser extent (Figure 14.4 and Figure 14.5).

43. Due to the absence of historic rights, Dutch vessels can only access grounds outside the UK's 12nm limit. Therefore, in areas relevant to the project, their activity takes place around the offshore section of the offshore cable corridor, the project interconnector search area and the Norfolk Boreas site, with no activity in areas relevant to the inshore section of the export cable corridor.

14.6.2.2 Beam Trawling

44. Over the last ten years there has been a progressive conversion from traditional beam trawls to the use of pulse wing trawls amongst the Dutch beam trawler fleet. The use of pulse wing trawls is permitted over a wide area of the North Sea, including ICES Division IVc (Southern North Sea) and ICES Division IVb (Central North Sea) to the south of 55 degrees N. It is understood from consultation that there are currently only six Dutch registered vessels using traditional beam trawls all year round with a further eight vessels using them seasonally to access grounds where pulse wings are not permitted (Appendix 14.1).

45. The majority of Dutch beam trawlers operating in the study area use pulse wing gear and are of the larger size category (40-43m in length) which target flatfish species, principally sole and plaice (Appendix 14.1).

46. Fishing activity by the Dutch beam trawl fleet occurs at relatively high levels across a wide section of Southern North Sea, including the offshore project area (beyond the 12nm limit). However, the highest levels of activity are recorded along the southern coast of the Netherlands and the coast of Belgium. Although at comparatively lower levels, fishing activity is also recorded further north over large areas of the Central North Sea (Figure 14.6 and Figure 14.7).

47. With specific reference to the offshore project area, surveillance sightings and VMS data suggest that the highest levels of beam trawl activity occurs around the central section of the offshore cable corridor (Figure 14.2, Figure 14.6. and Figure 14.7).

48. It should be noted that on 16th January 2018 as part of the overhaul of EU fishing regulations, and as a consequence of lobbying by French, Belgian and UK fishermen, the European Parliament has voted to ban pulse fishing. Subsequently, a full EU ban to pulse fishing was approved on 8th February 2019. The ban will be phased in with 42 of the current 84 pulse fishing licences to be withdrawn in 2019 and the remaining 42 by July 2021.

49. It should be noted that in the UK context, regardless of EU regulations, it is anticipated that after Brexit, under the Common Fisheries Policy and Aquaculture (Amendment)(EU Exit) Regulations 2019, EU vessels will no longer be able to carry out electric pulse fishing in UK waters.

50. It should also be noted that in recognition of objections from UK East Coast fishermen, voluntary spatial separation agreements are already in place in discrete areas off the east coast of England. In these areas Dutch fishermen avoid using pulse gear. The areas where voluntary agreements apply in 2019 are shown in (Figure 14.8).

14.6.2.3 Seine Netting

51. Dutch seine netting occurs at significantly lower levels than beam trawling across the Southern and Central North Sea, including in the offshore project area. The majority of activity by these vessels concentrates in the English Channel (Figure 14.9 and Figure 14.10).

52. Seine nets make a small contribution to landings in rectangles 34F2 and 34F3, where the offshore section of the offshore cable corridor, project interconnector search area and southern section of the Norfolk Boreas site are located (Figure 14.4).

14.6.3 Belgian Fishing Activity

14.6.3.1 Overview

53. The Belgian fleet comprises approximately 70 vessels, the majority of which are beam trawlers. From consultation with VisNED it is understood that 20 of these vessels are Belgian-registered, but Dutch-owned vessels which deploy traditional beam trawls (Appendix 14.1). In addition to beam trawling, other methods such as demersal trawling and seine netting are also used in the study area, however to a much lesser extent (Figure 14.11 and Figure 14.12).

54. The Belgian fleet has historic fishing rights between the UK's 6 and 12nm limit and are therefore allowed to fish in the area of the offshore cable corridor which falls within those limits (Figure 14.13). However, from analysis of surveillance sightings (Figure 14.2) landings (Figure 14.11 and Figure 14.12) and VMS data (Figure 14.14, Figure 14.15 to Figure 14.19), it is apparent that in the section of the UK's 6-12nm

limit that overlaps within the offshore project area, fishing by Belgian vessels does not occur at any significant levels (Appendix 14.1).

14.6.3.2 Beam trawling

55. The majority of activity by Belgian beam trawlers occurs in the southern section of the Southern North Sea and the English Channel. Fishing activity within the offshore project area, particularly within the Norfolk Boreas site, is comparatively low (Figure 14.14 and Figure 14.15).

56. Most Belgian beam trawlers area are classed as “Eurokotters” with main engines of just under 300HP and operate from Ostende. As previously mentioned, however, it is understood that a number of Belgium-registered beam trawlers are Dutch-owned and operated (Appendix 14.1).

14.6.3.3 Demersal otter trawling and seine netting

57. 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 14.16 and Figure 14.17).

58. Similarly, activity by seine netters also occurs at low levels with patches of activity across the Southern North Sea and the Central North Sea and more significantly in the English Channel (Figure 14.18 and Figure 14.19).

59. Fishing activity by both methods occurs at very low levels in the offshore project area Figure 14.16, Figure 14.17, Figure 14.18 and Figure 14.19).

14.6.4 UK Fishing Activity

14.6.4.1 Overview

60. Local UK vessels active in the inshore section of the study area (rectangle 34F1) operate from beach launches at Sea Palling, Caister, Cromer and the ports of Lowestoft and Great Yarmouth.

61. Given their small size (generally under 10m) and limited operational range and, in order to reduce the risk of potential conflicts with trawl gears, these vessels primarily fish grounds within the UK's 12nm limit and mostly within the 6nm limit.

62. A number of these local 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 with netting and long-lining for fish species also taking place, however at much lower levels (Figure 14.2, Figure 14.3, Figure 14.20 and Figure 14.21).

63. Further offshore, beyond the 12nm limit (rectangles 34F2, 34F3, 35F2 and 35F3), fishing activity by UK vessels is comparatively low. Of this activity, beam trawling represents the main fishing method. It should be noted that the majority of UK landings from these rectangles are into Dutch ports, and it is understood that most beam trawlers, whilst UK flagged, are Dutch owned and operated (Anglo-Dutch beam trawlers) (Appendix 14.1). Demersal trawling, longlining and netting are also used in offshore areas, however at comparatively lower levels Figure 14.2, Figure 14.3, Figure 14.20 and Figure 14.21).

14.6.4.2 Local inshore fleet

64. The UK under 10m fleet, which operates static gears, namely potting, longlining and netting, targets local fishing grounds within the inshore section of the offshore cable corridor, mostly within 6nm (Figure 14.3, Figure 14.20 to Figure 14.25).

65. Analysis of landings data indicates that static gears account for a significant proportion of landings in inshore rectangle 34F1, where the near shore section of the offshore cable corridor is located (Figure 14.20). In contrast to larger vessels, these smaller vessels have reduced capability to endure adverse weather and lack the capacity to exploit more extensive commercial fishing grounds.

66. Lobsters, edible crab and whelk are the main species targeted by under 10m inshore vessels (Figure 14.21). The principal gear types employed are pots. Fish species are targeted less frequently, mostly with the use of drifting and static nets and longlines. Target species are Dover sole, bass, skate, cod, plaice and herring (Appendix 14.1).

67. Further offshore, longlining and to a lesser extent netting, are undertaken on a seasonal basis and when weather conditions allow (Figure 14.24).

14.6.4.3 Beam trawling

68. Analysis of MMO landings data (Figure 14.20) and surveillance sightings (Figure 14.3) in the offshore rectangles within the study area (34F2, 34F3, 35F2 and 35F3) indicates that beam trawling is the main fishing activity undertaken by UK vessels. As previously mentioned, it is understood that most of these vessels, whilst UK flagged, are Dutch owned and operated (Anglo-Dutch beam trawlers) (Appendix 14.1). These operate over wide areas in the Southern and Central North Sea, with relatively low levels of activity across the majority of the offshore project area, including the Norfolk Boreas site (Figure 14.26 and Figure 14.27).

69. In addition to activity by Anglo-Dutch vessels, UK owned and operated beam trawlers from ports in the south west of the UK such as Brixham, Penzance and Newlyn, may also fish occasionally in the study area. However, these vessels for the most part target grounds in the Celtic Sea, Western Approaches and English Channel rather than in areas relevant to the project.

14.6.4.4 Demersal otter trawling

70. With regards to demersal otter trawling, as shown in Figure 14.28 to 14.31, VMS data indicates negligible levels of fishing activity within the offshore project area with the majority of activity concentrating in areas outside and to the north of the project in the Central and Northern North Sea.

14.6.5 French Fishing Activity

71. The principal methods deployed by French vessels in the study area are bottom trawls and to a lesser extent pelagic trawls. From consultation and available fisheries data it is apparent that the study area sustains low levels of activity by French vessels.

14.6.5.1 Demersal and pelagic trawling

72. Available VMS data for French vessels (Figure 14.32 to Figure 14.35) indicates that activity by demersal and pelagic trawls occurs at low levels in the Norfolk Boreas site and the central section of the export cable corridor. These fleets primarily focus on grounds to the south of Norfolk Boreas, in areas off the Essex and Kent coasts.

73. In line with the above, during consultation with the Comité Régional des Pêches Maritimes et des Elevages Marins (CRPMEM), Hauts de France (Table 14.2) it was noted that there is limited activity by the French fleet in the offshore project area, with French fishing vessels generally operating to the south of the project, at considerable distance. CRPMEM also noted that up to 10 demersal trawlers of over 20m in length target North Sea grounds, traditionally off Grimsby, and that these may occasionally fish in the proximity of the Norfolk Boreas site on their way back to port.

14.6.6 Danish Fishing Activity

74. 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 study area (Appendix 14.1).

14.6.6.1 Sandeel Trawling and Pelagic Trawling

75. Danish sandeel trawling is mainly undertaken by specifically designed industrial trawlers as well as occasionally by pelagic trawlers whose principal fishing activity is the capture of higher value pelagic species, namely mackerel, herring and horse mackerel.

76. 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 and occurs at negligible levels within the offshore project area (Figure 14.36).

77. Whilst there are known sandeel grounds in areas relevant to the project (Jensen et al. 2011), the Danmarks Fiskeriforening Producent Organisation confirmed during consultation carried out for the neighbouring Norfolk Vanguard project (Representative 3, 22/12/2016) that activity in these areas has been at very low levels in recent years.

78. Similarly, activity by pelagic trawlers in areas relevant to Norfolk Boreas is also limited, with the highest levels of fishing recorded to the west of the Danish coast (Figure 14.37). From consultation carried out for Norfolk Boreas (Per.Comm: H.Lund 03/07/2018) it is understood that some of the largest pelagic Danish vessels (45 to 90m) occasionally target a small fishery for sprat in some years in the vicinity of the Norfolk Boreas site.

14.6.7 German Fishing Activity

79. German fishing vessels have been recorded on very few occasions in surveillance sightings within the offshore project area (Figure 14.2). The majority of observations are of beam trawlers.

80. From consultation with VisNed (Table 14.2) it is understood that a proportion of the German fishing fleet whilst being on the German register of fishing vessels, fishing German licences and quotas, is actually Dutch owned and operated with eight German-registered pulse beam trawlers owned and operated by the Dutch.

81. Analysis of the currently available VMS data for German vessels (2011 to 2015) (Figure 14.38) indicates that negligible activity by German-registered vessels occurs in the offshore project area. Fishing activity by these vessels appears to mainly concentrate in the Dutch and Danish sectors of the Central North Sea.

14.7 Potential Impacts

14.7.1 Embedded Mitigation

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

- Following the submission of the PEIR, Norfolk Boreas Limited has refined the design envelope, removing the 9MW, so that the 10MW is now the smallest turbine under consideration. This has reduced the maximum number of turbines from 200 to 180, while maintaining a maximum export capacity of up to

1,800MW. This results in an increase in the minimum spacing between turbines from 680m to 720m;

- Following the submission of the PEIR, Norfolk Boreas Limited has reviewed the project design and floating foundations are no longer included in the envelope. This reduces potential safety issues for fishing vessels;
- Following Scoping, Norfolk Boreas Limited has committed to using an HVDC solution in order to reduce the number of export cables and volume of cable protection. Additionally, this results in reduced seabed disturbance during cable installation;
- Norfolk Boreas Limited is committed to burying offshore export cables where possible, therefore reducing the need for surface cable protection. The results of an export cable installation study (Appendix 5.2) commissioned by VWPL, indicate 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 14.12);
- Norfolk Boreas 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 to ensure that they are fully informed of development planning, construction and maintenance activities, vessel transit routes 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;
    - An Outline Fisheries Liaison and Co-existence Plan (FLCP) is provided with the Norfolk Boreas DCO application (document reference 8.19). This will be further developed post consent;
    - The UK Hydrographic Office (UKHO) would be informed of both the progress and the completion of Norfolk Boreas;
    - 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;
    - 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 Plan is provided with the Norfolk Boreas DCO application (document reference 8.16). 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

83. An Offshore In Principle Monitoring Plan (IPMP) is submitted with the Norfolk Boreas DCO application (document reference 8.12). Of specific relevance to commercial fisheries is the monitoring of cables. An Outline Scour Protection and Cable Protection Plan is also be submitted with the DCO application (document reference 8.16).

14.7.3 Worst Case

84. The offshore project area consists of:

- The Norfolk Boreas site;
- The offshore cable corridor with landfall at Happisburgh South; and
- The project interconnector search area.

85. The detailed design of Norfolk Boreas (including numbers of wind turbines, layout configuration, requirement for scour protection, etc.) will not be finalised until after the DCO has been granted. Therefore, realistic worst case scenarios in relation to impacts on commercial fisheries are adopted which have been informed by the information on project design provided in Chapter 5 Project Description and taking account of the embedded mitigation outlined in section 14.7.1. Worst case assumptions are described in Table 14.12.

14.7.3.1 Foundations

86. Within Norfolk Boreas, several different sizes of wind turbine are being considered in the range of 10MW and 20MW. In order to achieve the maximum 1,800MW installed capacity, there would be between 90 (and 180 wind turbines.

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

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

- Wind turbines - jacket, gravity base structure (GBS), suction caisson, monopile and TetraBase;
- Offshore electrical platform –Jackets with pin-pile or suction caisson, or multi-legged gravity base;
- Service platform – Jackets with pin-pile or suction caisson or multi-legged gravity base;
- Met masts - GBS, monopile or Jacket with pin-pile;
- Lidar - floating with anchors or monopile; and
- Wave buoys – floating with anchors.

89. The worst case scenario of turbine foundations in respect of commercial fisheries takes account of the design option that would result in the greatest potential interaction risks with fishing gears. This would be the installation of 180 x 10MW turbines on TetraBase foundations. This would result in a minimum spacing between turbines of 720m. Under the scenario where TetraBase foundations area used (radius of legs on the seabed up to 35m), the minimum width of the corridor left clear of infrastructure between foundations would be 650m (Table 14.12).

14.7.3.1 Cables

90. There would be four main types of cable used in the offshore project area. These are as follows:

- Array cables - cables that connect wind turbine to wind turbine and connect wind turbine to offshore electrical platform;
- Interconnector cables - offshore cables which link offshore electrical platforms within the Norfolk Bores site; or
- Project interconnector cables - offshore cables which connect an offshore electrical platform or wind turbines within the Norfolk Boreas site with an offshore electrical platform within one of the Norfolk Vanguard OWF sites. This would be located within the project interconnector search area (Figure 14.1); and
- Export cables - the cables which bring electricity from the offshore electrical platform to the landfall.

91. There would be a requirement for either the interconnector cables or the project interconnector cables, never both. Detailed information on the electrical solutions is provided in section 5.4.12 Chapter 5 Project Description.

14.7.3.2 Phasing

92. Norfolk Boreas Limited is currently considering constructing the project in one of the following phase options.

- A single phase of up to 1,800MW capacity; or
- Two phases of up to a combined 1,800MW capacity.

93. Phasing is only applicable to the assessment of construction and decommissioning impacts and not the assessment of impacts during the O&M phase.

94. For the purposes of this assessment it is considered that the two phase approach constitutes the worst case scenario as this would result in a slightly longer construction programme (up to 39 months compared to 36 months under the single phase approach) and therefore in the longest potential disturbance to normal fishing activities.

14.7.3.3 Programme

95. The full construction window is expected to be up to three years for the full 1,800MW capacity. Table 14.10 and Table 14.11 provide indicative construction programmes for the single phase and two phase options, respectively. Should Norfolk Vanguard not proceed to construction, Norfolk Boreas's construction phase could be bought forward by up to one year.

Table 14.10 Indicative Norfolk Boreas 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
Pre-construction survey	9 months																				
UXO survey and licensing	9 months																				
UXO clearance following licencing	9 months																				
Foundation seabed preparation	3 months																				
Foundation installation	18 months																				
Scour protection installation	12 months																				
Offshore electrical platform Installation Works	12 months																				
Array & interconnector (or project interconnector) cable seabed preparation	6 months																				
Array & interconnector (or project interconnector) cable installation	18 months																				
Export cable installation seabed preparation	6 months																				
Export cable installation	18 months																				
Cable protection installation	18 months																				
Wind turbine installation	18 months																				
Total construction works	36 months																				

Table 14.11 Indicative Norfolk Boreas construction programme – two phases

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
Pre-construction survey	9 months				■	■	■														
UXO survey and licensing	9 months				■	■	■														
UXO clearance following licencing	9 months							■	■	■											
Foundation seabed preparation	3 months									■											
Foundation installation	2 x 9 months										■	■	■		■	■	■				
Scour protection installation	2 x 6 months									■	■			■	■						
Offshore electrical platform Installation Works	2 x 6 months										■	■			■	■					
Array & interconnector (or project interconnector) cable seabed preparation	2 x 3 months									■				■							
Array & interconnector (or project interconnector) cable installation	2 x 9 months										■	■	■		■	■	■				
Export cable installation seabed preparation	2 x 3 months								■				■								
Export cable installation	2 x 9 months									■	■	■		■	■	■					
Cable protection installation	2 x 9 months										■	■	■		■	■	■				
Wind turbine installation	2 x 9 months														■	■	■		■	■	■
Total construction works	39 months								■	■	■	■	■	■	■	■	■	■	■	■	■

Table 14.12 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	500m rolling safety zones surrounding all fixed structures where work is being undertaken by a construction vessel. 50m safety zones around all surface structures up until the point of commissioning. Temporary 500m advisory safety zones along exposed sections of cables (i.e. cables awaiting burial or protection). The above would lead to a theoretical worst case under which fishing activities would be excluded from the offshore project area. Offshore construction works taking place in two phases over a maximum 39 months construction window. Within this period export cable seabed preparation and installation would take place over two phases of 12 months each (3 months for seabed preparation and 9 months for cable installation during each phase).	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: Displacement of fishing activity into other areas	As for Construction Impact 2 (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 displacement of fishing activity into other areas.
Impact 4: Increased steaming times to fishing grounds	500m rolling safety zones surrounding all fixed structures where work is being undertaken by a construction vessel. 50m safety zones around all surface structures up until the point of commissioning. Offshore construction works taking place in two phases two phases over a maximum 39 months construction window. Within this period export cable	Represents the maximum potential disruption to established steaming routes.

Impact	Key design parameters forming the realistic worst case scenario	Rationale
	seabed preparation and installation would take place over two phases of 12 months each (3 months for seabed preparation and 9 months for cable installation).	
Impact 5: Interference with fishing activities	Construction vessels operating over the indicative offshore construction works window (approximately 3 years) with construction works occurring over 2 phases. 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 6: 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 90km or project interconnector cables: 92km (one pair of DC cables and single AC cable) • Export cables: 500km (4 cables (2x DC cable 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). Assumes cables are surface laid before being buried/protected. <u>Maximum extent of cables requiring protection measures:</u> <u>*Array cable protection*</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 footprint of 300,000m^2 (based on protection width of 5m). Array cable protection at turbines 100m cable length x 5m width x 180 turbines = 90,000m^2 Array cable crossings protection 10 crossings x 100m x 10m = 10,000m^2	

Impact	Key design parameters forming the realistic worst case scenario	Rationale
	Export cable protection Up to 5km of cable protection may be required in the unlikely event that export cables within the Norfolk Boreas site cannot be buried (based on 10% of the length) resulting in a footprint of 25,000m^2 (based on protection width of 5m). Export cable protection at platforms 50m cable length x 5m width x two cables = 500m^2 • Crossings A total of thirteen crossings (eleven cables and two pipelines) are required for each cable pair (i.e. up to 26 crossings in total) resulting in a total footprint of 26,000m^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 86m^2 • Unburied cables In the unlikely event that cable burial is not possible due to hard substrate being encountered, up to 20km per cable pair could require additional protection resulting in a footprint of 100,000m^2 (based on protection width of 5m). *Interconnector cable protection* 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 6,000m (10% of the length) = 30,000m^2 Interconnector cable crossings protection crossings – captured within array	

Impact	Key design parameters forming the realistic worst case scenario	Rationale
	cable crossing total *Project interconnector cable protection* • Unburied cables Surface laid project interconnector cable protection 5m width x 92,000m (10% of the length) = 46,000m^2 • Cable crossings A total maximum of 10 crossings (all across the BBL pipeline) are required for each cable or pair of cables (i.e. up to 10 crossings in total) resulting in a total footprint of 10,000m^2 (based on a width of 10m and length of 100m of cable protection per crossing) • Approach to electrical platform A total of 10 cables on approaching to platform 100m cable length x 5m width = 5,000m^2 **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: • 180 x 10MW turbines on Tetrabase foundations • Two offshore electrical platform; • One service platform; • Two met masts; • Two Lidar; and • Two wave buoys. Safety risks in relation to seabed obstacles are addressed separately under Construction Impact 7. Safety issues for fishing vessels associated with the potential for collision with construction vessels and allision with infrastructure are described and assessed in Chapter 15 Shipping and Navigation.	

Impact	Key design parameters forming the realistic worst case scenario	Rationale
Impact 7: 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
Operation		
Impact 8: Adverse impacts on commercially exploited fish and shellfish populations	See Chapter 11 Fish and Shellfish Ecology	

Impact 9: Complete loss or restricted access to traditional fishing grounds	Maximum area lost/maximum restriction in access to fishing as a result of the following:
	• 180 x 10MW turbines
	• Two offshore electrical platforms;
	• One service platform;
	• Two LIDAR;
	• Two met masts;
	• Two wave buoys;
	• Rolling 500m safety zones around all fixed structures where work is undertaken by a maintenance vessel;
	• Minimum spacing between turbines: 720m. Under the scenario where TetraBase foundations area used (radius of legs on the seabed up to 35m), the minimum width of the corridor left clear of infrastructure between foundations would be 650m;
	• Maximum length of cables:
	  ○ Array cables: 600km
	  ○ Interconnector/ project interconnector cables: 90km of interconnector or 180km of project interconnector cables.
	  ○ Export cables: 500km (4 cables, 2 x DC cable 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
		Represents the maximum loss of fishing grounds throughout Norfolk Boreas site.

Impact	Key design parameters forming the realistic worst case scenario	Rationale
	crossings); and Maximum area of cables requiring protection (as above for construction impact 6: safety issues for fishing vessels)	
Impact 10: Displacement of fishing activity into other areas	As for operation impact 9 'Complete loss or restricted access to traditional fishing grounds'	The worst case represents the maximum duration and extent of fishing exclusion throughout the operation phase and hence the greatest potential to displacement of fishing activity into other areas.
Impact 11: Increased steaming times	• 180 turbines with a minimum in row and inter row spacing of 720m (10MW turbines); • Two offshore electrical platforms; • One service platform; • Two meteorological masts; • Two 2 LiDAR stations; and • Two wave buoys.	Results in the maximum potential disruption to established steaming routes.
Impact 12: 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 maintenance results in the greatest potential for conflict between operation and maintenance vessels and fishing gear.
Impact 13: 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 Operational Impact 9 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 grounds or at crossings); • Maximum extent of cables requiring protection measures (as in Operational Impact 9 complete loss or restricted access to fishing grounds). **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	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
	installed infrastructure (as per in Impact 6 Safety issues for fishing vessels in the construction phase). Safety risks in relation to seabed obstacles are addressed separately under Operation Impact 14. Safety issues for fishing vessels associated with the potential for collision with construction vessels and allision with infrastructure are described and assessed in Chapter 15 Shipping and Navigation.	
Impact 14: 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
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.		

14.7.4 Potential Impacts during Construction

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

96. There is the potential for the construction phase of the project to result in impacts on commercially exploited fish and shellfish species. This could in turn indirectly affect the productivity of the fisheries that are associated with 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/restricted access to fishing grounds

97. 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.

98. The theoretical worst case scenario associated with construction activities in the Norfolk Boreas site would be for commercial fishing activity to be excluded from the entirety of the site for the duration of the overall offshore construction works window (approximately 39 months under the two phase approach) (see Table 14.12). 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.

99. With regards to cable installation in the offshore cable corridor and the project interconnector search area, the theoretical worst case would be for commercial fishing activity to be excluded for a period of up to24 months (two installation phases of 12 months with 3 months for seabed preparation and 9 months for cable installation during each phase.

100. In practice, the actual area and duration of exclusion associated with installation of export cables and project interconnector cables 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.

101. The 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

102. The majority of Dutch beam trawlers active in areas relevant to the project are the larger class of vessel of up to 43m in length with main engines of up to 2,000hp (Appendix 14.1). 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 from operating. With these considerations in mind their sensitivity to loss of fishing grounds is considered to be low.

103. Fishing activity by the Dutch beam trawl fleet occurs at relatively high levels across a wide section of Southern North Sea, including the offshore project area (beyond the 12nm limit). However, the highest levels of activity are recorded along the coasts of the Netherlands and Belgium. Although at comparatively lower levels, fishing activity is also recorded further north over large areas of the Central North Sea (Figure 14.6 and Figure 14.7). With this in mind and recognising the relatively small proportion of the grounds available to Dutch beam trawlers that the offshore project area represents and the temporary nature of the construction phase, the magnitude of the effect is assessed as low.

104. Based on the low magnitude of the effect and 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

105. Dutch seine netting occurs at significantly lower levels than beam trawling across the Southern and Central North Sea, including in the offshore project area. These vessels have wide operational ranges with their fishing opportunities extending over a large area from the north of Denmark, south to the English Channel towards the Western Approaches. Considering their operational range and availability of grounds, they are considered as receptors of low sensitivity to loss or restricted access to fishing grounds.

106. Analysis of VMS data indicates that Dutch seine netting occurs at relatively low levels in the Norfolk Boreas site, the offshore section of the export cable corridor and

project interconnector search area, with comparatively higher effort and values recorded in other areas, particularly in the English Channel, where the majority of activity concentrates (Figure 14.9 and Figure 14.10). Considering this together with the relatively small proportion of the overall grounds available to these vessels that the offshore project area represents and the temporary nature of the construction phase, the magnitude of the effect is considered to be low.

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

14.7.4.2.2 Belgian fishing vessels

Beam trawling

108. The fishing grounds of Belgian beam trawlers cover substantial areas of the Southern North Sea, 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.

109. Fishing activity within the offshore project area, particularly within the Norfolk Boreas site, is comparatively low with fishing activity for the most part concentrating in areas south of the offshore project area, extending through the Dover Strait and into the English Channel (Figure 14.14 and Figure 14.15). Considering this together with the small proportion of the overall grounds available to these vessels that the offshore project area represents and the temporary nature of the construction phase, the magnitude of the effect is assessed as low.

110. Taking the low sensitivity of the receptor and 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 and seine netting

111. The operational range and associated fishing opportunities of the Belgian demersal otter trawl fleet and seine netting 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.

112. Analysis of VMS data for demersal otter trawlers (Figure 14.16 and Figure 14.17)) and seine netters (Figure 14.18 and Figure 14.19) indicates that the offshore project area sustains very low levels of activity by these methods, with activity for the most concentrating south of the Norfolk Boreas site and in discrete areas of the Central North Sea. Considering this together with the temporary nature of the construction phase, the magnitude of the effect is assessed as negligible.

113. Taking the low sensitivity of the receptors and the negligible magnitude of effect the impact of loss or restricted access to fishing grounds for the Belgian demersal otter trawl and seine netter fleets during construction is considered to be of **negligible** significance.

14.7.4.2.3 UK fishing vessels

Local inshore vessels

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

115. 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.

116. The available data and information obtained during consultation suggest that in areas relevant to Norfolk Boreas, potting occurs within the 12nm limit with the majority of activity concentrated within 6nm off the coast, including within the inshore section of the offshore cable corridor (Figure 14.22 and Figure 14.23).

117. 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 (Figure 14.24 and Figure 14.25).

118. 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 temporary nature of export cable installation and the localised area that would be affected in inshore areas, the magnitude of the effect is considered to be low.

119. 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.

120. It is however recognised that there may be occasions when certain vessels may need to relocate their gear as a result of construction activities. In these instances, evidence based mitigation, as specified in the FLOWW Guidelines will be applied.

Beam trawling

121. As previously mentioned (section 14.6.4.3), the majority of fishing activity by UK beam trawlers in the vicinity of Norfolk Boreas is by Anglo-Dutch vessels (UK

registered but Dutch owned and operated). As such, these vessels are effectively Dutch beam trawlers and therefore are assigned the same sensitivity as described above for assessment of the Dutch beam trawl fleet (section 14.7.4.2.1), namely low.

122. Similarly, in the case of UK owned beam trawlers operating from south-west ports which predominantly target grounds in the Celtic Sea, Western Approaches and English Channel, in view of their wide operational range and associated fishing opportunities, they are also considered of low sensitivity to loss or restricted access to fishing grounds.

123. Analysis of UK VMS data indicates that in the offshore project area activity by beam trawlers mainly occurs in areas relevant to the offshore cable corridor (beyond the 12nm limit) and in the project interconnector search area, with limited activity recorded within the Norfolk Boreas site (Figure 14.26 and Figure 14.27). Patches of activity are recorded throughout the Southern North Sea and the Central North Sea. Considering this together with the small proportion of the overall grounds available to these vessels that the offshore project area represents and the temporary nature of 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.

124. In the particular case of UK owned and operated beam trawlers for south-west ports, 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. Considering the comparatively low levels of activity by these vessels in areas relevant to the project, the magnitude of the effect is assessed as negligible.

125. 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

126. 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.

127. As shown in Figure 14.28 to 14.31, VMS data indicates negligible levels of fishing activity by demersal trawlers within the offshore project area with the majority of activity concentrating to the north of the Norfolk Boreas site in the Central and Northern North Sea. Considering this and the temporary nature the construction phase, the magnitude of the effect is assessed as negligible.

128. 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.

14.7.4.2.4 French fishing vessels

129. 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.

130. 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 Boreas, particularly in areas off the Essex and Kent coast (Figure 14.32 to Figure 14.35). Considering this together with the small proportion of the overall grounds available to French vessels that the offshore project area represents and the temporary nature of the construction phase, the magnitude of the effect is assessed as low.

131. 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.

14.7.4.2.5 Danish fishing vessels

132. Danish sandeel and pelagic trawlers have wide operational ranges and fishing opportunities being active over wide areas of the Central North Sea and therefore their sensitivity to loss of fishing grounds is considered to be low.

133. 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 14.36). 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 (Figure 14.37). Considering this and the temporary nature of the construction phase, the magnitude of the effect is assessed as negligible.

134. 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.

14.7.4.2.6 German fishing vessels

135. It is understood that German fishing activity in the vicinity of the project is mainly by beam trawlers. Some of these are German registered fishing German quotas but Dutch owned and operated. These vessels have wide operational ranges and therefore, as previously described for other beam trawl fleets, they are considered of low sensitivity to loss of fishing grounds.

136. Analysis of available VMS data for this fleet (Figure 14.38) suggests negligible levels of activity in areas relevant to Norfolk Boreas, with activity concentrating for the most part in the Dutch and Danish Sector of the Central North Sea. Considering this together with the temporary nature of the construction phase, the magnitude of the effect is assessed as negligible.

137. Taking the low sensitivity of the receptors and negligible magnitude of the effect, the impact of temporary loss or restricted access to fishing grounds during construction is considered to be of **negligible** significance.

14.7.4.3 Impact 3: Displacement of fishing activity into other areas

138. 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 for fishing on grounds in other areas (section 14.3).

139. For local vessels that deploy static gears, there could be potential for displacement impacts to occur whereby vessels and gears that have to be temporarily removed (particularly from the offshore cable corridor) are relocated into grounds where other static gear vessels operate. However, considering 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, in instances where static gear needs to be relocated appropriate procedures as specified in FLOWW Guidelines would be implemented.

140. 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 14.6.4.2, the majority of the static gear vessels operate within the 12nm limit. Activity in areas relevant to the project beyond the 12nm 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. However, it is acknowledged that 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 offshore project area rather than in areas relevant to Norfolk Boreas. Similarly, activity by the remaining fleets in the offshore project area is also relatively low.

141. 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.

142. 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.

143. 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.

144. For the most part, the fleets that operate towed gear 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 14.13 this would result in an impact of **negligible** to **minor adverse** significance depending on the towed gear fleet under consideration.

Table 14.13 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
Belgian Beam Trawling	Low	Low	Minor adverse
Belgian Demersal Otter Trawling and Seine Netting	Low	Negligible	Negligible
UK Beam Trawling (Anglo-Dutch)	Low	Low	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 and pelagic trawling	Low	Negligible	Negligible
German fishing vessels	Low	Negligible	Negligible

14.7.4.4 Impact 4: Increased steaming times to fishing grounds

145. 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.

146. In the case of the UK local inshore vessels, these vessels generally concentrate their activity within the 12nm limit, and therefore do not normally venture as far offshore as the Norfolk Boreas site. 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.

147. 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.

148. 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 the sensitivity of these receptors to the potential impact is also considered to be negligible.

149. In terms of magnitude, the short duration and temporary nature of safety zones and their small footprint confers a low magnitude.

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

14.7.4.5 Impact 5: Interference with fishing activities

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

152. 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. 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. Considering this and the static nature of the gear used, the sensitivity the UK inshore local fleet is considered to be medium.

153. As outlined in section 14.7.1, appropriate liaison will be undertaken with fisheries stakeholders to ensure that they are informed of the project development activities. This will include provisions for enabling awareness of construction vessels crews of the locations of static gears and fishermen's awareness of construction vessel transit routes. With the implementation of the above the magnitude of the effect on the local static gear fleet is assessed to be low, giving an impact of **minor adverse** significance.

154. 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.

14.7.4.6 Impact 6: Safety issues for fishing vessels

155. With regard to safety issues for fishing vessels, as outlined in section 14.4 the use of the standard impact assessment matrix is not considered appropriate. Safety issues are instead considered as risks and therefore assessed in terms of being within or outside of acceptable limits.

156. 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.

157. In terms of foundation types, as described in Table 14.12, the worst case scenario in relation to safety issues takes account of the installation of 180 x 10MW turbines on Tetrabase foundations. The progressive installation of these during the construction phase would result in an increasing potential for snagging and manoeuvrability risks to fishing vessels. In addition, snagging risks may arise during the construction phase as a result of sections of array, interconnector/project interconnector and export cables remaining exposed on the seabed for short periods of time whilst awaiting burial or remedial protection measures.

158. Safety zones will be in place around all surface structures up until the point of commissioning. In addition, in instances where sections of offshore cables are exposed, localised advisory safety zones over vulnerable cables would be implemented to prevent fishing gear snagging and the consequential risks to both the cables and fishing vessels and their gears.

159. 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, NtMs, 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 zones. In addition, as noted in the Outline FLCP (document reference 8.19) where appropriate, guard vessels and Offshore Fisheries Liaison Officers (OFLOs) would be employed.

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

161. A separate assessment of potential safety issues associated with seabed obstacles is provided in section 14.7.4.7. Safety risks associated with potential for collisions with construction vessels and allision with project infrastructure are addressed in Chapter 15 Shipping and Navigation.

14.7.4.7 Impact 7: Seabed obstacles

162. 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.

163. 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.

164. As previously mentioned (section 14.7.1), an Outline Scour Protection and Cable Protection Plan is provided with the Norfolk Boreas DCO (document reference 8.16) Application and a cable burial risk assessment will be undertaken post consent, in consultation with stakeholders.

165. Post-lay and burial inspection surveys will be undertaken after the cables are installed into the seabed 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.

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

14.7.5 Potential Impacts during Operation

167. The impacts described below should be considered in the context of the design life of the Norfolk Boreas (approximately 30 years).

168. The same receptor sensitivities identified for the construction phase 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 8: Potential impacts on commercially exploited fish and shellfish species

169. There is the potential for the operational phase of Norfolk Boreas to result in 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. 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 9: Complete loss or restricted access to fishing grounds

170. Existing legislation does not prevent fishing from occurring within operational wind farm sites. In addition, as outlined in section 14.7.1., Norfolk Boreas is committed to facilitate co-existence. It is therefore likely that fishing could resume within the Norfolk Boreas site during the operational phase.

171. The worst case scenario in respect of complete loss or restricted access to traditional fishing grounds (Table 14.12) considers the installation of 180 X 10MW turbines on Tetrabase foundations with a minimum in-row and inter-row distances of 720m between wind turbines. The footprint of these foundations (legs of up to 35m radius on the seabed) would mean that in effect the minimum width of the corridor clear of infrastructure which would be left for fishing would be of 650m.

172. In respect of potential loss of fishing grounds associated with the presence of array, interconnector/project 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.

173. 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.

174. 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, and discrete areas where temporary advisory safety zones may be necessary (i.e. around sections of offshore cables which may become exposed during the operational phase).

175. As such the assessment of the impact of complete loss or restricted access to traditional fishing grounds during operation is focused on the Norfolk Boreas site.

176. The assessment of loss or restricted access to traditional fishing grounds is discussed below on a fleet by fleet basis. As previously noted in relation to the assessment of impacts during construction, 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.

14.7.5.2.1 Dutch Fishing Vessels

Beam trawling

177. Fishing activity by the Dutch beam trawl fleet occurs at relatively high levels across a wide section of Southern North Sea, including the offshore project area (beyond the 12nm limit). However, the highest levels of activity are recorded along the southern coast of the Netherlands and the coast of Belgium (Figure 14.6 and Figure 14.7). It is anticipated that during the operational phase, beam trawling would be able to resume within the site. The level at which fishing would resume will however depend on the perception of individual skippers with regards to risks associated with operating their gear within the site at a given time. With this in mind and acknowledging the long term duration of the operational phase, the magnitude of the effect is considered to be low (where skippers resume fishing in the site) to medium (where skippers elect not to fish within the site).

178. 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 in respect of loss of fishing grounds is low.

179. Taking the low receptor sensitivity and the low to medium magnitude of the effect, the impact of complete loss or restricted access to fishing grounds during operation is considered of **minor adverse** significance.

Seine netting

180. Analysis of VMS data indicates that Dutch seine netting occurs at low levels in the Norfolk Boreas site, with comparatively higher effort and values recorded in other areas, particularly in the English Channel, where the majority of activity concentrates. In addition, the area that the Norfolk Boreas site represents in the context of the extent of fishing grounds available to this fleet is comparatively low (Figure 14.9 and Figure 14.10). With this in mind but recognising the long term nature of the operation phase and the fact that there is limited potential for this fishing method to resume within operational wind farms due to the dimensions of the gear used, the magnitude of the effect is considered to be medium.

181. As previously discussed (section 14.7.4.2.1), Dutch seine netters are considered to be receptors of low sensitivity in respect of loss of fishing grounds.

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

14.7.5.2.2 Belgian fishing vessels

Beam trawling

183. Fishing activity by Belgian beam trawlers within the Norfolk Boreas site is low with fishing activity for the most part concentrating in areas south of the offshore project area, extending through the Dover Strait and into the English Channel (Figure 14.14 and Figure 14.15). Whilst the long term nature of the operation phase is recognised, considering the above together with the relatively small proportion of the grounds available to this fleet that the Norfolk Boreas site represents, the magnitude of the effect is assessed as low.

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

185. 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 and seine netting

186. Analysis of VMS data for demersal otter trawlers (Figure 14.16 and Figure 14.17)) and seine netters (Figure 14.18 and Figure 14.19) indicates that the Norfolk Boreas site sustains negligible levels of activity by these methods, with activity for the most concentrating south of the Norfolk Boreas site and in discrete areas of the Central North Sea. Whilst the long term nature of the operation phase is recognised, considering the above, the magnitude of the effect is assessed as negligible.

187. As previously described in section 14.7.4.2.2, the sensitivity of Belgian demersal trawlers and seine netters to loss of fishing grounds is low.

188. 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.

14.7.5.2.3 UK fishing vessels

Local inshore vessels

189. As previously discussed (section 14.7.4.2.3), the sensitivity of local inshore vessels to loss of fishing grounds is considered to be medium.

190. With the exception of some netting and long lining vessels that occasionally may extend their operational range further offshore, fishing activity by local vessels that deploy static gear occurs within the 12nm limit and most of it within the 6nm limit.

191. In the case of static gear vessels that concentrate their activity in inshore areas, following completion of offshore export cable laying activities, fishing should be able to resume as previously (Figure 14.22, Figure 14.23 and Figure 14.25). 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.

192. In the case of vessels deploying long lines and nets that operate further offshore, it is likely that changes to their mode of operation would be required to allow them to fish within the operational Norfolk Boreas site. It should be noted, however, that given the small size of these vessels, their activity in offshore areas as far out as the Norfolk Boreas site is understood to only occur on an occasionally basis, when weather and other factors affecting fishing conditions allow. Furthermore, for the most part, their grounds are located in areas inshore of the Norfolk Boreas site (Figure 14.24). Whilst the long term nature of the operation phase is recognised, considering the above, the magnitude of the effect is assessed 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.

Beam trawling

193. As previously discussed for the construction phase (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.

194. In the offshore project area activity by UK registered beam trawlers mainly occurs in areas relevant to the offshore cable corridor (beyond the 12nm limit) and in the

project interconnector search area, with comparatively lower activity recorded within the Norfolk Boreas site (Figure 14.26 and Figure 14.27). As previously noted with regards to Dutch registered beam trawlers, during the operational phase beam trawling would be able to resume within the site. The level at which fishing would resume will depend on the perception of individual skippers with regards to risks associated with operating their gear within the site at a given time. With this in mind and acknowledging the long term duration of the operational phase, the magnitude of the effect is considered to be low (where skippers resume fishing in the site) to medium (where skippers elect not to fish within the site). This is considered to be the case in respect of Anglo-Dutch vessels.

195. In the particular case of UK owned and operated beam trawlers from south-west ports, 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. Recognising the long term nature of the operation phase but also the low activity by these vessels in areas relevant to the project, the magnitude of the effect is assessed as negligible.

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

Demersal otter trawling

197. Analysis of VMS data (Figure 14.28 to 14.31) indicates that fishing activity by demersal trawlers within the offshore project area, including within the Norfolk Boreas site, occurs at negligible levels, with the majority of activity concentrating to the north in the Central and Northern North Sea. Whilst the long term nature of the operation phase is recognised, considering the above, the magnitude of the effect is assessed as negligible.

198. As previously discussed for the construction phase (section 14.7.4.2.3), the sensitivity of the UK demersal trawl fleet to loss of fishing grounds is considered to be low.

199. Taking the low receptor sensitivity and negligible magnitude of effect, the significance of the impact of complete loss or restricted access to fishing grounds during operation is considered **negligible.**

14.7.5.2.4 French fishing vessels

200. 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

Boreas (Figure 14.32 to Figure 14.35). Whilst the long term nature of the operation phase is recognised, considering the above together with the relatively small proportion of the overall grounds available to French vessels that the Norfolk Boreas site represents, the magnitude of the effect is assessed as low.

201. As previously discussed for the operation phase (section 14.7.4.2.4), the sensitivity of French demersal and pelagic trawl vessels to loss of fishing grounds is considered to be low.

202. Taking the low receptor sensitivity and low magnitude of the effect, the significance of the impact of complete loss or restricted access to fishing grounds during operation is considered to be of **minor adverse** significance.

14.7.5.2.5 Danish fishing vessels

203. Danish industrial sandeel trawling occurs at relatively high levels over a substantial area of the Central North Sea with negligible activity recorded by this fleet in in the offshore project area (Figure 14.36). 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 (Figure 14.37).

204. Whilst the long term nature of the operation phase is recognised, considering the above, the magnitude of the effect is assessed as negligible.

205. As previously discussed for the construction phase (section 14.7.4.2.5), the sensitivity of Danish sandeel industrial trawlers and pelagic trawlers to loss of fishing grounds is considered to be low.

206. Taking the low receptor sensitivity and the negligible magnitude of the effect the significance of the impact of temporary loss or restricted access to fishing grounds during operation is considered **negligible**.

14.7.5.2.6 German fishing vessels

207. Analysis of available VMS data for this fleet (Figure 14.38) suggests negligible levels of activity in areas relevant to Norfolk Boreas, 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, the magnitude of the effect is assessed as negligible.

208. As previously discussed for the construction phase (section 14.7.4.2.6), the sensitivity of German fishing vessels to loss of fishing grounds is considered to be low.

209. Taking the low receptor sensitivity and negligible magnitude of the effect, the significance of the impact of complete loss or restricted access to fishing grounds during operation is considered **negligible**.

14.7.5.3 Impact 10: Displacement of fishing activity into other areas

210. As described for the construction phase (section 14.7.4.3), the sensitivity of the UK inshore local fleet operating static gear to displacement is considered to be medium.

211. Given that the vast majority of the local static gears in areas relevant to the project are deployed within 6nm , following completion of the offshore cable installation there should be minimal, if any, potential displacement effects 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 in respect of local vessels operating static gear is considered to be low resulting in an impact of **minor adverse** significance**.**

212. In the case of towed gear fleets, as outlined for the construction phase (section 14.7.4.3), 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 loss or restricted access to fishing grounds (section 14.7.5.2). As summarised in Table 14.14 this would result in an impact of **negligible to minor adverse** significance depending on the towed gear fleet under consideration.

Table 14.14 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 to Medium	Minor adverse
Dutch Seine Netting	Low	Medium	Minor adverse
Belgian Beam Trawling	Low	Low	Minor adverse
Belgian Demersal Otter Trawling and seine netting	Low	Negligible	Negligible
UK Beam Trawling (Anglo-Dutch)	Low	Low to 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	Low	Minor adverse
Danish sandeel industrial trawling and pelagic trawling	Low	Negligible	Negligible
German fishing vessels	Low	Negligible	Negligible

14.7.5.4 Impact 11: Increased steaming times to fishing grounds

213. 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.

214. As discussed for the construction phase (section 14.7.4) the sensitivity of all fleets to increased steaming times is considered to be negligible.

215. Whilst the impact would last for the operation phase of the project, fishing vessels would to be able to transit through the Norfolk Boreas site (see Chapter 15 Shipping and Navigation) with the exception of areas where 500m safety zones may be in place to carry out major maintenance works. 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 12: Interference with fishing activities

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

217. As discussed for the construction phase, the sensitivity to interference is considered to be medium for static gear vessels and low for towed gear vessels (section 14.7.4.5).

218. The appropriate two-way liaison with local fishermen described for the construction phase, would continue during the operational phase to minimise the risks of interference with static gears.

219. In the case of towed gear vessels, the same obligations in respect of COLREGS will apply as described above for the construction phase (section (section 14.7.4.5).

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

14.7.5.6 Impact 13: Safety issues for fishing vessels

221. 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.

222. In terms of foundation types, as described in Table 14.12, the worst case scenario in relation to safety issues takes account of the installation of 180 x 10MW turbines on TetraBase foundations. 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 sections of cables that are protected.

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

224. In instances where monitoring identifies the presence of exposed cables, this will be communicated to fisheries stakeholders through appropriate channels. In addition, 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.

225. Furthermore, 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.

226. In order to minimise potential safety risks to fishing vessels, as noted in the Outline FLCP (document reference 8.19) the required levels of information distribution would be undertaken through the channels of the Kingfisher Information System, NtMs, as well as direct liaison with fishermen and their representatives. The primary purpose of this would be to ensure the required level of awareness of potential risks amongst fishing vessel owners and crews.

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

14.7.5.7 Impact 14: Seabed obstacles

228. With compliance with the obligations and monitoring and policies discussed above for the construction phase (section 14.7.4.7), risks associated with obstacles on the seabed should remain **within acceptable limits**.

229. In instances of objects accidently dropped overboard the standard obligations of reposition recording and recovery will apply.

14.7.6 Potential Impacts during Decommissioning

14.7.6.1 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.

14.7.6.2 Therefore, during decommissioning, there would be potential for wind turbine, foundation and cable removal activities to cause disruption to normal fishing activity.

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

- Impact 1: Potential Impacts on commercially exploited fish and shellfish populations;
- Impact 2: Temporary loss or restricted access to traditional fishing grounds;
- Impact 3: Displacement of fishing activity into other areas;
- Impact 4: Increased steaming times to fishing grounds;
- Impact 5: Interference with fishing activities;
- Impact 6: Safety issues for fishing vessels; and
- Impact 7: Obstacles on the seabed.

230. The sensitivity of receptors during decommissioning would be as described above for the construction phase. Given the nature of decommissioning activities, the magnitude of effect for each potential impact would be expected to be no greater, and in all probability less, than that considered for the construction phase. Therefore, it is anticipated that any decommissioning impacts would be no greater, and probably less than those identified in relation to construction.

231. It should be noted that decommissioning will be subject to a separate licensing process and EIA at that time, taking account of the latest scientific understanding and available guidance.

14.8 Cumulative Impacts

232. There may be potential for cumulative impacts to occur on the commercial fisheries as a result of the development of other offshore wind farms and projects/activities.

233. 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: Displacement of fishing activity into other areas;
- Impact 4: Increased steaming times to fishing grounds;
- Impact 5: Interference with fishing activities;
- Impact 6: Safety issues for fishing vessels; and
- Impact 7: Obstacles on the seabed.

234. The potential for cumulative impacts to occur 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.

235. Given the wide operational range of some of the fleets active in areas relevant to Norfolk Boreas, consideration has been given to projects/activities over a wide spatial extent, including the North Sea and English Channel.

236. Other projects/activities with potential to result in cumulative impacts include offshore wind farm projects, aggregate dredging activity, oil and gas activity and the implementation of restrictions to fishing in marine protected areas (MPAs).

237. 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).

238. In the case of oil and gas activity, it should be noted that whilst new areas are being licenced, there is currently no information on if or when these would be developed. In addition, 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. The information currently available on oil and gas future activities does not allow for the level and location of oil and gas infrastructure which may be developed/decommissioned during the operation, construction and operation phase of the project be evaluated. As such, oil and gas activities have not been considered in the assessment.

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

240. Offshore wind farms and aggregate dredging areas considered in the cumulative assessment are outlined in Table 14.15, and Table 14.16, respectively.

241. With regards to MPAs, from information provided by NFFO/VisNed during the examination phase of Norfolk Vanguard, it is understood that proposals for fishing closures within MPAs which are of key concern to fisheries stakeholders include those proposed in the following MPAs in UK, German and Dutch waters:

- Dogger Bank SAC (UK, Dutch and German sites);
- Inner Dowsing, Race Bank and North Ridge SAC (UK);
- North Norfolk Sandbanks and Saturn Reef SAC (UK);
- Haisborough, Hammond and Winterton SAC (UK);
- Sylt Outer Reef SAC (Germany);
- Borkum Reef Ground SAC (Germany); and
- Cleaver Bank SAC (The Netherlands).

242. In addition, NFFO/VisNed have expressed concern in relation to additional potential closures in Dutch waters under the Marine Strategy Framework Directive (MSFD).

243. It should be noted that current proposals for closed areas in the Haisborough, Hammond and Winterton SAC include areas within the 6nm under the Eastern IFCA Marine Protected Areas Byelaw 2019, as well as areas further offshore (beyond 6 nm limit). The latter are located within a Department for Environment, Food and Rural Affairs (DEFRA) management area.

244. Some of the proposals for closed areas in UK offshore waters are still open for amendment as they only become final once they are submitted to the European Commission and ratified following scrutiny. On the basis of the information available at the time of writing, it is understood that other Member States have not yet consented to the UK's proposals for closed areas in UK waters and this has prevented the UK from submitting proposals to the European Commission. The proposals for closed areas in the Dogger Bank SAC (which includes proposals within the UK, Dutch and German sites) is an exception to this. In this case, the proposal has been agreed by all interested Member States and it is anticipated that it will be submitted to the European Commission in the near future (DEFRA, pers.comm., 10.04.2019).

245. From information provided by NFFO/VisNED during the examination phase of Norfolk Vanguard (Rep2- SOCG – 26.1), it is understood that the proposals for closures in German waters were submitted by the German Government to the European Commission on 1st February 2019 and that these are expected to be implemented in the forthcoming months (following the three month period that the European Commission has to adopt a delegated act). The closures proposed in Dutch waters are at a similar stage to those in German waters and are expected to come into force in December 2019.

246. As shown, the proposals for closed areas listed above are progressed at varying degrees. For the purposes of the cumulative assessment a conservative approach has been taken and it has been assumed that all the current proposals for closed areas will be approved and implemented and that their boundaries will remain as currently proposed.

247. The location of the offshore wind farm projects, aggregate dredging areas and proposals for closed areas to fishing included for assessment is illustrated in Figure 14.39.

248. The same receptor sensitivities identified for assessment of the project alone apply for assessment of cumulative impacts. Therefore, where relevant, reference is made

to the sensitivity levels identified for assessment of Norfolk Boreas alone (section 14.7) throughout the cumulative assessment.

Table 14.15 Offshore wind farms

Offshore Wind Farm	Distance from site (km)	Size (MW)	Maximum number of turbines
Norfolk Boreas	**N/A**	**1,800**	**180**
Wind Farms under Construction			
UK Wind Farms			
Beatrice	665	588	84
East Anglia One	62	714	102
Hornsea Project One	86	1,200	174
Hornsea Project Two	101	1,386	174
Belgium Wind Farms			
Rentel	140	309	42
Danish Wind Farms			
Horns rev 3	397	407	49
German Wind Farms			
OWP (Demonstrations projekt) Albatros I	250	112	16
Trianel Windpark Borkum Phase 2 (aka Borkum West II phase 2)	238	203	32
Hohe See	251	497	71
Borkum Riffgrund 2	237	450	56
Merkur	243	396	66
Wind Farms Consented			
UK Wind Farms			
East Anglia THREE	13.2	1,200	172
Doggerbank Teeside A	191	1,200	200
Sofia (previously Doggerbank Teeside B)	185	1,200	200
Doggerbank Creyke Beck A	173	1,200	200
Doggerbank Creyke Beck B	196	1,200	200
Triton Knoll	124	860	90
Inch Cape	490	784	110
Firth of Forth Phase 1 Alpha-Bravo	500	1,500	140-150
Neart na Gaoithe	468	448	54
Kinkardine (floating turbines)	574	50	7
Moray East (MORL Stevenson, Telford and MacColl)	657	950	100
Blyth Array 3A&4	351	58.4	10
Dutch Wind Farms			
Borssele Site III & IV	128	740	93
Borssele Site I & II	120.92	725	94
Borssele Site V -Leeghwater	126	20	2
Hollandse Kust Zuid Holland I & II (Tender 2017)	82	700	58-126

Offshore Wind Farm	Distance from site (km)	Size (MW)	Maximum number of turbines
Belgian Wind Farms			
Norther	145	370	44
Seastar	134	252	42
Mermaid	126	288	48
Northwester 2	128	309	42
French Wind Farms			
Parc éolien en mer du Calvados	437	450	75
Parc éolien en mer de Fécamp	364	498	83
Project éolien en el mer de la Baie de Saint-Brieuc	576	496	62
Danish Wind Farms			
Vesterhav Nord/Syd	519	344	41
German Wind Farms			
Deutsche Bucht	213	252	30
Deutsche Bucht Pilot Park	217	16.8	2
OWP West	220	240	16-18
Gode Wind 03	280	110	8
Gode Wind 04	277	336	42
Borkum Riffgrund West I	225	270	45
Borkum Riffgrund West II	219	240	16-18
EnBW He Dreiht	236	900	90
Application submitted and not yet determined			
UK Wind Farms			
Hornsea Project Three	53	2,400	342
Thanet Extension	175	340	34
Norfolk Vanguard	0.5	1,800	180
Moray West	629	750	90
French Wind Farms			
Parc Eolien en mer de Dieppe – Le Treport	314	496	62
In Planning, Application not yet submitted			
UK Wind Farms			
East Anglia North	51	600-800	67
East Anglia Two	73	400-900	75
Hornsea Four	120	1,000	180
Identified in strategic plans but not yet in planning			
Greater Gabbard Extension	164	504	TBC
Galloper Extension	100	353	TBC
Sheringham Shoal Extension	99	317	TBC
Race Bank Extension	116	573	TBC
Dudgeon Extension	83	402	TBC
Rampion Extension	325	400	TBC
Dutch Wind Farms			
Holland Kust Zuid Holland III & IV (Tender	98	700	58-126

Offshore Wind Farm	Distance from site (km)	Size (MW)	Maximum number of turbines
2018)			
Hollandse Kust Noord Holland I & II (Tender 2019)	78	700	58-126
Belgian Wind Farms			
Poseidon P60 - Mermaid	130	2-2.3	1
Danish Wind Farms			
Horns rev Reserved Area	391	TBC	TBC
Ringkobing Reserved Area	411	TBC	TBC

Table 14.16 Aggregate Dredging Areas (Exploration and Option Areas)

Area name	Area number	Distance to Norfolk Boreas site (km)
West Wight	522	386
New 495	525	49
Thames D	524	132
Colbart	530	230
EEC 1	529	298
Outer OTE	528/2	154

14.8.1 Impact 1: Potential Impact on Commercially Exploited Fish and Shellfish Populations

249. There is the potential for Norfolk Boreas in combination with other projects to result in cumulative impacts on commercially exploited fish and shellfish species. 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

250. The potential cumulative impact of Norfolk Boreas with other projects/activities on commercial fisheries is given below by individual fleet.

251. 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

252. Fishing activity by the Dutch beam trawl fleet occurs at relatively high levels across a wide section of Southern North Sea, including the offshore project area (beyond the 12nm limit). The highest levels of activity are recorded along the southern coast of the Netherlands and the coast of Belgium (Figure 14.6 and Figure 14.7).

253. The operational phase of other offshore wind farm projects, particularly in the case of projects located in areas that sustain high levels of beam trawling activity, will add to loss of grounds on this fleet. This will be of greater relevance in the case of offshore wind farm projects off the Dutch and Belgian coast as fishing within operational wind farms is prohibited in these countries. Another important contribution to the overall cumulative impact would come from potential restrictions on towed gear fishing implemented in MPAs. As shown in Figure 14.40 and 14.41, current proposals for towed gear closures cover considerable areas and sections of these overlap with grounds targeted by Dutch beam trawlers.

254. The overlap of the construction/decommissioning phase of the project with construction/decommissioning works in other offshore wind farms and/or with aggregate dredging activity in the Southern North Sea, would also add to potential cumulative impacts. However, impacts associated with these activities would be temporary and therefore would contribute to cumulative impacts to a lesser extent than operational projects and closed areas to fishing.

255. Considering the potential increased area from which fishing by Dutch beam trawlers could be excluded when taking account of other projects/activities, particularly the implementation of closed areas to fishing and the prohibition to fishing in operational wind farms in some countries, the magnitude of the impact is considered to be high.

256. As discussed above for assessment of Norfolk Boreas alone (section 14.7) the sensitivity of Dutch beam trawlers to loss of fishing grounds is low, resulting in a cumulative impact of **moderate adverse** significance.

257. In the context of this assessment it is important to note that the contribution of the project to the cumulative impact would be small with the conclusion of moderate adverse impact significance remaining the same regardless of whether or not the project was considered in the assessment.

14.8.2.1.2 Dutch seine netters

258. Analysis of VMS data indicates that Dutch seine netting occurs at low levels in the Norfolk Boreas site, with comparatively higher effort and values recorded in other

areas, particularly in the English Channel, where the majority of activity concentrates (Figure 14.9 and Figure 14.10). As shown in Figure 14.42 and Figure 14.43, there is little overlap between seine netting grounds in the Channel and other projects/activities that could result in cumulative impacts. However, in a North Sea context, particularly when taking account of offshore wind farm developments and the extent of closed areas in Dutch and German waters, this could result in a considerable loss of grounds to the fleet in this area. In this context, it is important to note that it is considered highly unlikely that this method would be able to resume within operational wind farms. With this in mind, and assuming that some vessels rely on grounds in the North Sea at times, the magnitude of the impact is considered to be high.

259. As discussed for assessment of Norfolk Boreas alone (section 14.7), the sensitivity of Dutch seine netting to loss of fishing grounds is considered to be low. This combined with the high impact magnitude identified above, results in a cumulative impact of **moderate adverse** significance.

260. In the context of this assessment it is important to note that the Norfolk Boreas site supports seine netting activity at low levels. Therefore, the contribution of the project to the cumulative impact on this fleet would be very small. The conclusion of the assessment of moderate adverse impact significance would apply regardless of whether or not the project was considered in the assessment.

14.8.2.2 Belgian Fishing Vessels

14.8.2.2.1 Belgian beam trawlers

261. The fishing grounds of Belgian beam trawlers cover substantial areas of the Southern North Sea, English Channel and parts of the Central North Sea with activity for the most part concentrating in areas south of the offshore project area, extending through the Dover Strait and into the English Channel (Figure 14.14 and Figure 14.15).

262. 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, particularly those off the Dutch and Belgian coasts, as fishing within operational wind farms is prohibited in these countries. In addition, the overlap of the construction/decommissioning of Norfolk Boreas with construction/decommissioning works in other offshore wind farms or aggregate dredging activity in the Southern North Sea and the English Channel could also contribute to the potential for cumulative impacts. Similarly, potential restrictions to demersal fishing gear in areas which overlap with the grounds of this fleet, would add to cumulative loss of grounds. Note that activity by these fleet is higher in the

southern section of the Southern North Sea and the English Channel, therefore the principal fishing grounds of this fleet would largely remain unaffected by the current proposals for closed areas to demersal fishing (the most part located to the north of the project) (Figure 14.44 and Figure 14.45).

263. Considering the increased area of potential exclusion, particularly when taking account of other wind farms, but in view of the extent of grounds available and location of other projects/activities/measures (Figure 14.44 and Figure 14.45) the magnitude of the impact is assessed to be medium.

264. As discussed for assessment of Norfolk Boreas alone (section 14.7) 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 Belgian demersal trawlers and seine netters

265. Analysis of VMS data for demersal otter trawlers (Figure 14.16 and Figure 14.17) and seine netters (Figure 14.18 and Figure 14.19) indicates that the offshore project area sustains very low levels of activity by these methods, with activity for the most concentrating south of the Norfolk Boreas site and in discrete areas of the Central North Sea.

266. 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.

267. As discussed for assessment of Norfolk Boreas alone (section 14.7) the sensitivity of Belgian demersal otter trawlers and seine netter to loss of fishing grounds is considered to be low, resulting in a cumulative impact of **negligible** significance.

14.8.2.3 UK Fishing Vessels

14.8.2.3.1 Local inshore vessels

268. With the exception of some netting and long lining vessels that occasionally may extend their operational range further offshore, fishing activity by local vessels that deploy static gear occurs within the 12nm limit and most of it within the 6nm limit.

269. In the case of static gear vessels that concentrate their activity in inshore areas (Figure 14.22, Figure 14.23, Figure 14.25), 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.

270. 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 wind farms. 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) (Figure 14.24), there would be little potential for cumulative impacts to occur with other offshore wind farm projects during the operation phase.

271. In respect of the construction/decommissioning activities, there could be potential for some local inshore vessels to be affected by concurrent activities in other offshore wind farm projects in the immediate vicinity of Norfolk Boreas, depending on the extent and location of their preferred fishing grounds and on the level of overlap between activities at different projects. In the case of the 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. long-liners), 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. Furthermore, whilst occasionally these vessels venture to offshore areas, their activity predominantly occurs inshore (Figure 14.3 and Figure 14.24). 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.

272. Considering the relatively small operational range of local inshore vessels, and the distance from aggregate dredging exploration and option areas to Norfolk Boreas, the closest being 49km away (Table 14.16), there is limited potential for cumulative impacts in relation to aggregate dredging activity to occur. In the case of potential restrictions to fishing associated with the implementation of conservation measures in MPAs, it should be noted that, measures proposed to date in areas relevant to the local fleet relate to towed gear methods, and therefore local inshore fishing vessels deploying static gear would remain unaffected.

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

274. As discussed for assessment of Norfolk Boreas alone (section 14.7) the sensitivity of local inshore vessels to loss of fishing grounds is considered to be medium, resulting in a cumulative impact of **minor adverse** significance.

14.8.2.3.2 UK Beam trawlers

275. In the offshore project area activity by beam trawlers mainly occurs in areas relevant to the offshore cable corridor (beyond the 12nm limit) and in the project interconnector search area, with limited activity recorded within the Norfolk Boreas site (Figure 14.26 and Figure 14.27). The majority of these vessels are Anglo-Dutch, and operate over wide areas in the Southern and Central North Sea.

276. The overlap of construction/decommissioning activities associated with the project and other offshore wind farms or aggregate dredging activity, particularly in the Central North Sea, where activity by these vessels is highest, would contribute to cumulative impacts on this fleet (Figure 14.46 and Figure 14.47). However, it would be the implementation of the current proposals for closed areas to demersal gear , being long term, that would result in the greatest contribution to cumulative impacts on this fleet (Figure 14.46 and Figure 14.47).

277. It should be noted that fishing activity by Anglo-Dutch beam trawlers off the Dutch and Belgian coasts is limited (Figure 14.26 and Figure 14.27). There impacts from wind farms which may become operational in these countries, where access to fishing is prohibited, would have little potential to contribute to cumulative impacts. In the case of operational wind farms in UK waters, given that access for fishing is permitted, it would be expected that fishing activity would resume to some extent in these projects during the operational phase.

278. Considering the increased area from where fishing may be excluded at a given time, particularly when taking account of the extent of the proposals for closed areas to fishing, the magnitude of the cumulative effect is assessed to be high.

279. In the case of UK owned and operated beam trawlers from south-west ports, 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. 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 in respect of these vessels is considered to be as assigned for the project alone, namely negligible

280. As discussed for assessment of Norfolk Boreas alone (section 14.7) the sensitivity of the Anglo-Dutch and UK owned and operated beam trawlers is considered to be low.

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

282. In the context of the assessment in respect of Anglo-Dutch vessels, it is important to note that the contribution of the project to the overall cumulative impact would be small, with the conclusions of the assessment remaining the same regardless of whether or not the project was considered in the assessment.

14.8.2.3.3 UK Demersal otter trawlers

283. Analysis of VMS data (Figure 14.28 to 14.31) indicates that fishing activity by demersal trawlers within the offshore project area, including within the Norfolk Boreas site, occurs at negligible levels, with the majority of activity concentrating to the north in the Central and Northern North Sea.

284. 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.

285. As discussed for assessment of Norfolk Boreas alone (section 14.7) the sensitivity of demersal otter trawling fleet to loss of fishing grounds is considered to be low, resulting in a cumulative impact of **negligible** significance.

14.8.2.4 French Fishing Vessels

286. 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 Boreas and into the English Channel (Figure 14.32 to Figure 14.35). Other projects/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, particularly when taking account other wind farms in these areas, but recognising the extent of fishing grounds and location of other projects (Figure 14.48 to Figure 14.51), the magnitude of the impact is considered to be medium.

287. As discussed for assessment of Norfolk Boreas alone (section 14.7) the sensitivity of demersal and pelagic French trawlers to loss of grounds is considered to be low, resulting in a cumulative impact of **minor adverse** significance.

14.8.2.5 Danish Fishing Vessels

288. 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 14.36). 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 (Figure 14.37).

289. 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.

290. As discussed for assessment of Norfolk Boreas alone (section 14.7) 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.

14.8.2.6 German Fishing Vessels

291. Analysis of available VMS data for this fleet (Figure 14.38) suggests negligible levels of activity in areas relevant to Norfolk Boreas, with activity concentrating for the most part in the Dutch and Danish sector of the Central North Sea.

292. 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.

293. As discussed for assessment of Norfolk Boreas alone (section 14.7) the sensitivity of German fishing vessels to loss of fishing grounds is considered to be low, resulting in a cumulative impact of **negligible** significance.

14.8.3 Impact 3: Displacement of Fishing Activity into other Areas

294. Given the limited operational range of local static gear fisheries and the localised and short term duration of export cable installation activities, considering construction/decommissioning activities in other projects, there would be limited potential for displacement to result in increased levels of competition between local static gear vessels. Similarly, 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.

295. In respect of cumulative impacts associated with the operational phase of Norfolk Boreas 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.

296. With the above in mind the cumulative magnitude of displacement on the local inshore static gear fleet is considered to be low. As discussed for Norfolk Boreas alone, the sensitivity of the local inshore fleet to displacement is medium. This in combination with the low magnitude of the effect, results in a cumulative impact of **minor adverse** significance.

297. In the case of towed gear fleets, as outlined for the project alone (section 14.7), 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 14.17 this would result in an impact of **negligible to moderate adverse** significance depending on the towed gear fleet under consideration.

Table 14.17 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	High	Moderate adverse
Dutch Seine Netting	Low	High	Moderate adverse
Belgian Beam Trawling	Low	Medium	Minor adverse
Belgian Demersal Otter Trawling and Seine Netting	Low	Negligible	Negligible
UK Beam Trawling (Anglo-Dutch)	Low	High	Moderate 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 and pelagic trawling	Low	Negligible	Negligible
German fishing vessels	Low	Negligible	Negligible

14.8.4 Impact 4: Increased Steaming Time to Fishing Grounds

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

299. Considering the increased amount of safety zones potentially in place at a given time as a result of other projects and activities, but recognising the relative small footprint of these zones both during construction, decommissioning and operation, and the

fact that that fishing vessels would be expected to be able to transit through operational offshore wind farm sites, the magnitude of the cumulative impact is considered to be low.

300. 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.

14.8.5 Impact 5: Interference with Fishing Activity

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

302. 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 assessment for Norfolk Boreas alone, would also apply to other wind farm projects. Whilst the relative increase in the level of vessel transits resulting from Norfolk Boreas in conjunction with other projects is recognised, with the appropriate two way liaison with fishermen and adherence to COLREGs obligations as outlined above, the magnitude of the effect is considered to be low.

303. As discussed for assessment of Norfolk Boreas alone (section 14.7), 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.

14.8.6 Impact 6: Safety Issues for Fishing Vessels and Impact 7: Seabed obstacles

304. It is recognised that in addition to the project, other projects and activities included for assessment of cumulative impacts, particularly other offshore wind farms, could result in additional safety issues and seabed obstacles for fishing vessels.

305. It should be noted, however, that the same factors and obligations with regards to safety and seabed obstacles applied to the project would also apply to other projects/activities. Safety risks in a cumulative context would therefore remain as assessed for the project alone; **within acceptable limits.**

14.9 Inter-relationships

306. 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.

307. The principle linkages identified are summarises in the Table 14.18 below.

Table 14.18 Chapter topic inter-relationships

Topic and description	Related Chapter	Where addressed in this Chapter
Adverse Effects on Commercially Exploited Fish and Shellfish. Impacts on fish and shellfish species of commercial importance could indirectly affect the fisheries that target them.	Chapter 11 Fish and Shellfish Ecology	Section 14.7.4.1 and Section 14.7.5.1.
Safety Issues for Fishing Vessels. 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.	Chapter 15 Shipping and Navigation	Section 14.7.4.6 and Section 14.7.5.6
Increased steaming times. 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	Chapter 15 Shipping and Navigation	Section 14.7.4.4 and Section 14.7.5.4

14.10 Interactions

308. 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 for the impact assessments are considered conservative and robust. For clarity, the areas of interaction between impacts are presented in Table 14.19, along with an indication as to whether the interaction may give rise to synergistic impacts.

Table 14.19 Interaction between impacts

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

Potential interaction between impacts							
Impact 7: Obstacles on the seabed	No	No	No	No	No	Yes	-
Operation							
	Impact 8: Potential impacts on commercially exploited fish and shellfish populations	Impact 9: Complete loss or restricted access to traditional grounds	Impact 10: Displacement of fishing activity into other areas	Impact 11: Increased steaming times to fishing grounds	Impact 12: Interference with fishing activities	Impact 13: Safety issues for fishing vessels	Impact 14: Obstacles on the seabed
Impact 8: Potential impacts on commercially exploited fish and shellfish populations	-	No	No	No	No	No	No
Impact 9: Complete loss or restricted access to traditional grounds	No	-	Yes	No	No	No	No
Impact 10: Displacement of fishing activity into other areas	No	Yes	-	No	No	No	No
Impact 11: Increased steaming times to fishing grounds	No	No	No	-	No	No	No
Impact 12: Interference with fishing activities	No	No	No	No	-	No	No
Impact 13: Safety issues for fishing	No	No	No	No	No	-	Yes

Potential interaction between impacts							
vessels							
Impact 14: Obstacles on the seabed	No	No	No	No	No	Yes	-
Decommissioning							
It is anticipated that the decommissioning impacts will be similar in nature to those of construction.							

14.11 Summary

309. A summary of the impact assessment for commercial fisheries is given in Table 14.20. As shown, the impacts of Norfolk Boreas on commercial fisheries receptors are not anticipated to exceed minor adverse significance.

Table 14.20 Potential Impacts Identified for Commercial Fisheries

Potential Impact	Receptor	Sensitivity	Magnitude	Significance	Mitigation	Residual Impact
Construction						
Impact 1: Potential Impacts on commercially exploited fish and shellfish populations	All commercial fisheries	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**
	Belgian beam trawling	Low	Low	**Minor adverse**	N/A	**Minor adverse**
	Belgian demersal otter trawling and seine netting	Low	Negligible	**Negligible**	N/A	**Negligible**
	UK Local inshore vessels	Medium	Low	**Minor adverse**	Implementation of evidence based mitigation in line with FLOWW guidelines, where appropriate	**Minor adverse**
	UK beam trawlers (Anglo-Dutch)	Low	Low	**Minor adverse**	N/A	**Minor adverse**
	UK beam trawlers (south-west ports)	Low	Negligible	**Negligible**	N/A	**Negligible**
	UK demersal trawlers	Low	Negligible	**Negligible**	N/A	**Negligible**
	French demersal and pelagic trawlers	Low	Low	**Minor adverse**	N/A	**Minor adverse**
	Danish industrial sandeel and pelagic trawlers	Low	Negligible	**Negligible**	N/A	**Negligible**
	German fishing vessels	Low	Negligible	**Negligible**	N/A	**Negligible**

Potential Impact	Receptor	Sensitivity	Magnitude	Significance	Mitigation	Residual Impact
Impact 3: 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**
Impact 4; Increased steaming times to fishing grounds	All commercial fishing vessels	Negligible	Negligible	**Negligible**		**Negligible**
Impact 5: Interference with fishing activities	Static gear	Medium	Low	**Minor Adverse**	N/A	**Minor Adverse**
	Mobile Gear	Low	Negligible	**Negligible**	N/A	**Negligible**
Impact 6: Safety issues for fishing vessels	All commercial fishing vessels	N/A	N/A	**Within acceptable limits**	N/A	**Within acceptable limits**
Impact 7: Obstacles on the seabed	All commercial fishing vessels	N/A	N/A	**Within acceptable limits**	N/A	**Within acceptable limits**
Operation						
Impact 8: Potential Impacts on commercially exploited fish and shellfish populations	All commercial fisheries	See Chapter 11 Fish and Shellfish Ecology		**Minor adverse**	See Chapter 11 Fish and Shellfish Ecology	**Minor adverse**
Impact 9: Complete loss or restricted access to traditional fishing grounds	Dutch beam trawling	Low	Low to Medium	**Minor adverse**	N/A	**Minor adverse**
	Dutch seine netting	Low	Medium	**Minor adverse**	N/A	**Minor adverse**
	Belgian beam trawling	Low	Low	**Minor adverse**	N/A	**Minor adverse**
	Belgian demersal otter trawling and seine netting	Low	Negligible	**Negligible**	N/A	**Negligible**
	UK Local inshore vessels	Medium	Low	**Minor adverse**	N/A	**Minor adverse**
	UK beam trawlers (Anglo-Dutch)	Low	Low to Medium	**Minor adverse**	N/A	**Minor adverse**

Potential Impact	Receptor	Sensitivity	Magnitude	Significance	Mitigation	Residual Impact
	UK beam trawlers (south-west ports)	Low	Negligible	**Negligible**	N/A	**Negligible**
	UK demersal trawlers	Low	Negligible	**Negligible**	N/A	**Negligible**
	French demersal and pelagic trawlers	Low	Low	**Minor adverse**	N/A	**Minor adverse**
	Danish industrial sandeel and pelagic trawlers	Low	Negligible	**Negligible**	N/A	**Negligible**
	German fishing vessels	Low	Negligible	**Negligible**	N/A	**Negligible**
Impact 10: 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**
Impact 11: Increased steaming times to fishing grounds	All commercial fishing vessels	Negligible	Negligible	**Negligible**	N/A	**Negligible**
Impact 12: 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 13: Safety issues for fishing vessels	All commercial fishing vessels	N/A	N/A	**Within acceptable limits**	N/A	**Within acceptable limits**
Impact 14: Obstacles on the seabed	All commercial fishing vessels	N/A	N/A	**Within acceptable limits**	N/A	**Within acceptable limits**

Potential Impact	Receptor	Sensitivity	Magnitude	Significance	Mitigation	Residual Impact
Decommissioning						
Impact 1 to 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: Potential Impacts on commercially exploited fish and shellfish populations	All commercial fisheries	See Chapter 11 Fish and Shellfish Ecology		**Minor adverse**	See Chapter 11 Fish and Shellfish Ecology	**Minor adverse**
Impact 2: Loss or restricted access to traditional fishing grounds	Dutch beam trawling	Low	High	**Moderate adverse**	N/A	**Moderate adverse**
	Dutch seine netting	Low	High	**Moderate adverse**	N/A	**Moderate adverse**
	Belgian beam trawling	Low	Medium	**Minor adverse**	N/A	**Minor adverse**
	Belgian demersal otter trawling and seine netting	Low	Negligible	**Negligible**	N/A	**Negligible**
	UK Local inshore vessels	Medium	Low	**Minor adverse**	N/A	**Minor adverse**
	UK beam trawlers (Anglo-Dutch)	Low	High	**Moderate adverse**	N/A	**Moderate adverse**
	UK beam trawlers (south-west ports)	Low	Negligible	**Negligible**	N/A	**Negligible**
	UK demersal trawlers	Low	Negligible	**Negligible**	N/A	**Negligible**
	French demersal and pelagic trawlers	Low	Medium	**Minor adverse**	N/A	**Minor adverse**
	Danish industrial sandeel and	Low	Negligible	**Negligible**	N/A	**Negligible**

Potential Impact	Receptor	Sensitivity	Magnitude	Significance	Mitigation	Residual Impact
	pelagic trawlers					
	German fishing vessels	Low	Negligible	**Negligible**	N/A	**Negligible**
Impact 3: 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**
Impact 4: Increased steaming times to fishing grounds	All commercial fishing vessels	Negligible	Negligible	**Negligible**	N/A	**Negligible**
Impact 5: 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 6: Safety issues for fishing vessels	All commercial fishing vessels	N/A	N/A	**Within acceptable limits**	N/A	**Within acceptable limits**
Impact 7: Obstacles on the seabed	All commercial fishing vessels	N/A	N/A	**Within acceptable limits**	N/A	**Within acceptable limits**

14.12 References

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