Sheringham Shoal and Dudgeon Offshore Wind Farm Extension Projects

Environmental Statement

Volume 1

Chapter 13 - Shipping and Navigation

August 2022
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Figure 13-1 Study Area

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Appendix 13.1 Navigation Risk Assessment

Glossary of Acronyms

ABP	Associated British Ports
ALARP	As Low as Reasonably Practicable
AtoN	Aids to Navigation
AIS	Automatic Identification System
BEIS	Department for Business, Energy & Industrial Strategy
BMAPA	British Marine Aggregate Producers Association
Cefas	Centre for Environment, Fisheries and Aquaculture Science
CAA	Civil Aviation Authority
CA	Cruising Association
CIA	Cumulative Impact Assessment
CGOC	Coastguard Operation Centres
COLREGS	Convention on the International Regulations for Preventing Collisions at Sea
CoS	Chamber of Shipping
CSCB	Outline Cromer Shoal Chalk Beds
CSIMP	Cable Specification and Installation Monitoring Plan
CTV	Crew Transfer Vessel
DCO	Development Consent Order
DECC	Department for Energy and Climate Change
DEP	Dudgeon Offshore Wind Farm Extension Project
DFDS	Det Forenede Dampskibs-Selskab
DfT	Department for Transport
DML	Deemed Marine Licence
DOW	Dudgeon Offshore Wind Farm
DSC	Digital Selective Calling
EEA	European Economic Area
EEZ	Exclusive Economic Zone
EIA	Environmental Impact Assessment
EPP	Evidence Plan Process
ERCoP	Emergency Response Co-operation Plans
ES	Environmental Statement
EU	European Union
FSA	Formal Safety Assessment

GPS	Global Positioning System
HDD	Horizontal Directional Drilling
HMCG	Her Majesty's Coastguard
HVAC	High Voltage Alternative Current
IALA	International Association of Marine Aids to Navigation and Lighthouse Authorities
IHO	International Hydrographic Organisation
IMO	International Maritime Organisation
IOG	Independent Oil and Gas
IPC	Infrastructure Planning Committee
IPMP	In Principle Monitoring Plan
Km	Kilometre
LOGGS	Lincolnshire Offshore Gas Gathering System
MAIB	Maritime Accident Investigation Branch
MCA	Maritime and Coastguard Agency
MCZ	Marine Conservation Zone
MEHRA	Marine Environmental High Risk Areas
MGN	Marine Guidance Note
MMO	Marine Management Organisation
MOD	Ministry of Defence
MW	Megawatts
NFFO	National Federation of Fisherman's Organisations
NNDC	North Norfolk District Council
NPS	National Policy Statement
NRA	Navigational Risk Assessment
NSIP	Nationally Significant Infrastructure Project
NtM	Notice to Mariners
O&G	Oil and Gas
OREI	Offshore Renewable Energy Installations
OSP	Offshore Substation Platform
OWF	Offshore Wind Farm
PEIR	Preliminary Environmental Information Report
PEXA	Military Practice and Exercise Areas
REZ	Renewable Energy Zone

RNLI	Royal National Lifeboat Institution
RYA	Royal Yachting Association
SAR	Search and Rescue
SEP	Sheringham Shoal Offshore Wind Farm Extension Project
SOLAS	Safety of Life at Sea
SoS	Secretary of State
SOW	Sheringham Shoal Offshore Wind Farm
TBC	To Be Confirmed
TCE	The Crown Estate
TH	Trinity House
TSS	Traffic Separation Scheme
UK	United Kingdom
UKHO	UK Hydrographic Office
VHF	Very High Frequency

Glossary of Terms

Allision	The act of striking or collision of a moving vessel against a stationary object.
Base Case	The assessment of risk based on current shipping densities and traffic types as well as the marine environment.
Collision	The act or process of two moving objects colliding (crashing).
Dudgeon Offshore Wind Farm Extension Project (DEP)	The Dudgeon Offshore Wind Farm Extension onshore and offshore sites including all onshore and offshore infrastructure.
DEP offshore site	The Dudgeon Offshore Wind Farm Extension consisting of the DEP wind farm site, interlink cable corridors and offshore export cable corridor (up to mean high water springs).
DEP North Array Area	The wind farm site area of the DEP offshore site located to the north of the existing Dudgeon Offshore Wind Farm
DEP South array area	The wind farm site area of the DEP offshore site located to the south of the existing Dudgeon Offshore Wind Farm
DEP wind farm site	The offshore area of DEP within which wind turbines, infield cables and offshore substation platform/s will be located and the adjacent Offshore Temporary Works Area. This is also the collective term for the DEP North and South array areas.
Formal Safety Assessment (FSA)	A structured and systematic process for assessing the risks associated with the shipping activity.
Future Case	An assessment of future traffic trends by assuming a set increase in vessel numbers on identified routeing within the area.
Grid option	Mechanism by which SEP and DEP will connect to the existing electricity network. This may either be an integrated grid option providing transmission infrastructure which serves both of the wind farms, or a separated grid option, which allows SEP and DEP to transmit electricity entirely separately.
Infield cables	Cables which link the wind turbine generators to the offshore substation platform(s).
Interlink cables	Cables linking two separate project areas. This can be cables linking:

	1. DEP South array area and DEP North array area 2. SEP and DEP South array area 3. SEP and DEP North array area 1 is relevant if DEP is constructed in isolation or first in a phased development 2 and 3 are relevant where both SEP and DEP are built.
Interlink cable corridor	This is the area which will contain the interlink cables between offshore substation platform/s and the adjacent Offshore Temporary Works Area.
Integrated Grid Option	Transmission infrastructure which serves both extension projects.
Landfall	The point at the coastline at which the offshore export cables are brought onshore, connecting to the onshore cables at the transition joint bay above mean high water.
Marine Guidance Note (MGN)	A system of guidance notes issued by the Maritime and Coastguard Agency which provide significant advice relating to the improvement of the safety of shipping and of life at sea, and to prevent or minimise pollution from shipping.
Offshore cable corridors	This is the area which will contain the offshore export cables or interlink cables, including the adjacent Offshore Temporary Works Area.
Offshore export cable corridor	This is the area which will contain the offshore export cables between offshore substation platform/s and landfall, including the adjacent Offshore Temporary Works Area.
Offshore export cables	The cables which would bring electricity from the offshore substation platform(s) to the landfall. 220 – 230kV.
Offshore substation platform (OSP)	A fixed structure located within the wind farm site/s, containing electrical equipment to aggregate the power from the wind turbine generators and convert it into a more suitable form for export to shore.
Offshore Temporary Works Area	An Offshore Temporary Works Area within the offshore Order Limits in which vessels are permitted to carry out activities during construction, operation and decommissioning encompassing a 200m buffer around the wind farm sites and a 750m buffer around the offshore cable corridors. No permanent infrastructure would be installed within the Offshore Temporary Works Area.

Order Limits	The area subject to the application for development consent, including all permanent and temporary works for SEP and DEP.
PEIR order limits	The area subject to survey and preliminary impact assessment to inform the PEIR.
Safety Zone	A marine zone outlined for the purposes of safety around a possibly hazardous installation or works / construction area under the Energy Act 2004.
Separated Grid Option	Transmission infrastructure which allows each project to transmit electricity entirely separately.
Sheringham Shoal Offshore Wind Farm Extension Project (SEP)	The Sheringham Shoal Offshore Wind Farm Extension onshore and offshore sites including all onshore and offshore infrastructure.
SEP offshore site	Sheringham Shoal Offshore Wind Farm Extension consisting of the SEP wind farm site and offshore export cable corridor (up to mean high water springs).
SEP wind farm site	The offshore area of SEP within which wind turbines, infield cables and offshore substation platform/s will be located and the adjacent Offshore Temporary Works Area.
Study area	Area where potential impacts from the project could occur, as defined for each individual Environmental Impact Assessment (EIA) topic.
The Applicant	Equinor New Energy Limited
Traffic Separation Scheme (TSS)	A traffic-management route-system ruled by the International Maritime Organization.

13 SHIPPING AND NAVIGATION

13.1 Introduction

1. This chapter of the Environmental Statement (ES) describes the potential impacts of the proposed Sheringham Shoal Offshore Wind Farm Extension Project (SEP) and Dudgeon Offshore Wind Farm Extension Project (DEP) on shipping and navigation. The chapter provides an overview of the existing environment for the proposed offshore sites, followed by an assessment of the potential impacts and associated mitigation for the construction, operation, and decommissioning phases of SEP and DEP.
2. This assessment has been undertaken with specific reference to the relevant legislation and guidance, of which the primary sources are the National Policy Statements (NPS). A Navigational Risk Assessment (NRA) and Formal Safety Assessment (FSA) has also been undertaken (**Appendix 13.1 Navigation Risk Assessment**) by Anatec Limited (Anatec), in line with legislation, which is referred to in the chapter. Details of relevant legislation and guidance considered in this chapter, such as the National Policy Statements (NPS) and methodology used for the Environmental Impact Assessment (EIA) and Cumulative Impact Assessment (CIA) are presented in **Chapter 5 EIA Methodology** (document number 6.1.5) and **Section 13.4**. The assessment should be read in conjunction with the following linked chapters:
   - **Chapter 12 Commercial Fisheries** (document number 6.1.12)**;**
   - **Chapter 15 Aviation and Radar** (document number 6.1.15); and
   - **Chapter 16 Petroleum Industry and Other Marine Users** (document number 6.1.16).
3. As highlighted above, additional information used to support the shipping and navigation assessment includes:
   - NRA – A document primarily following Marine Guidance Note (MGN) 654 (Maritime & Coastguard Agency (MCA), 2021) that provides detail on the existing and future navigational activity. This document, including the MGN 654 checklist, is found in **Appendix 13.1 Navigation Risk Assessment**.
   - FSA – The key output of the NRA following International Maritime Organization (IMO) (IMO, 2018) guidance which follows a structured and systematic process for assessing risk. This assessment is presented within the NRA document in **Appendix 13.1 Navigation Risk Assessment.**

13.2 Consultation

4. Consultation with regard to shipping and navigation has been undertaken in line with the general process described in **Chapter 5 EIA Methodology** (document reference 6.1.5) and the **Consultation Report** (document reference 5.1). The key elements to date have included scoping, the ongoing evidence plan process (EPP), targeted consultation with stakeholders and regular users in proximity to SEP and DEP as part of the NRA and in line with requirements set out in the Methodology for Assessing the Marine Navigational Safety & Emergency Response Risks of Offshore Renewable Energy Installations (OREI) (MCA, 2021) and the Section 42 consultation on Preliminary Environmental Impact Report (PEIR). The feedback received throughout this process has been considered in preparing the ES. This chapter has been updated following consultation in order to produce the final assessment submitted within the Development Consent Order (DCO) application. **Table 13-1** provides a summary of the consultation responses received to date relevant to this topic and details of how the Project team has had regard to each comment and how they have been addressed within this chapter.

5. The consultation process is described further in **Chapter 5 EIA Methodology** (document reference 6.1.5). Full details of the consultation process is presented in the **Consultation Report** (document reference 5.1), which has been submitted as part of the DCO application.

Table 13-1: Consultation Responses

Consultee	Date / Document	Comment	Project Response
Scoping Responses			
The Planning Inspectorate	Scoping Opinion, 19/11/19	The Inspectorate welcomes that any impacts from proposed dredger transit activities will be assessed as part the Shipping and Navigation aspect.	Impacts from proposed dredger transit is addressed in **Section 13.5**.
The Planning Inspectorate	Scoping Opinion, 19/11/19	The Inspectorate considers that given the location of the Proposed Development, significant transboundary effects to other marine users are unlikely and that this matter can be scope out of the ES. This is on the basis that transboundary impacts on commercial fishing and shipping and navigation are assessed in their respective aspect chapters.	Transboundary effects have been considered in **Chapter 12 Commercial Fisheries** (document reference 6.1.12) and **Section 13.7** in line with the Planning Inspectorate's recommendations.
Secretary of State (SoS)	Scoping Opinion, 19/11/19	EIA should assess impacts to marine navigation equipment, marine aggregate dredger transits, and adverse weather routeing. Impacts to navigation from scour / sediment transport should also be assessed.	Effects are assessed within **Section 13.5** and within the NRA (**Appendix 13.1 Navigation Risk Assessment**).
SoS	Scoping Opinion, 19/11/19	10% increase in (future case) traffic should be justified.	The NRA has considered potential increases of 10 and 20% which are also used in the assessment within this chapter (**Section 13.5**).
SoS	Scoping Opinion, 19/11/19	Shipping and Navigation and Commercial Fishing chapters to state what "size" of safety zones will be used	Safety Zones that are expected to be applied for are detailed in **Chapter 4 Project Description** (document reference 6.1.4).
MCA	Scoping Opinion, 19/11/19	Given significant amount of through traffic to major ports, and a number of important shipping routes in close proximity, attention needs to be paid to routeing, particularly in heavy weather ensuring shipping can continue to make safe passage without large-scale deviations	Post wind farm routeing is assessed in **Section 13.5** and within the NRA (**Appendix 13.1 Navigation Risk Assessment**) including consideration of adverse weather.

Consultee	Date / Document	Comment	Project Response
MCA	Scoping Opinion, 19/11/19	A Navigational Risk Assessment will need to be submitted in accordance with MGN 654 (and MGN 372) and the MCA Methodology for Assessing the Marine Navigation Safety & Emergency Response Risks of OREI. Should include MGN 654 Checklist.	The NRA (**Appendix 13.1 Navigation Risk Assessment**) complies with the stated guidance and includes completed MGN 654 checklist.
MCA	Scoping Opinion, 19/11/19	Cumulative and in combination effects[1] on shipping routes should be considered, taking into account proximity to other wind farm developments, the impact on navigable sea room and include an appropriate assessment of the distances between wind farm boundaries and shipping routes as per MGN 654.	Post wind farm routeing is assessed in **Section 13.5**. Cumulative assessment of routeing is provided in **Section 13.6.**
MCA	Scoping Opinion, 19/11/19	A vessel traffic survey will be undertaken to the standard of MGN 654. This must consist of at least 28 days and include seasonal data (two x 14-day surveys) collected from a vessel-based survey using Automatic Identification System (AIS), radar and visual observations to capture all vessels navigating in the study area.	The approach to marine traffic data collection has been agreed with the MCA which includes two (winter and summer) 14-day surveys.
MCA	Scoping Opinion, 19/11/19	The turbine layout design will require MCA approval prior to construction to minimise the risks to surface vessels, including rescue boats, and Search and Rescue (SAR) aircraft operating within the site. As such, MCA will seek to ensure all structures are aligned with the current layout designs of Dudgeon and Sheringham Shoal wind farms, in straight rows and columns, and with at least two lines of orientation. Any additional navigation safety and/or SAR requirements, as per MGN 543 Annex 5, will be agreed at the approval stage.	The layout and SAR requirements will be agreed with the MCA (as per MGN 654 with consideration as to the Design Commitments) and Marine Management Organisation (MMO) post consent.

[1] In combination effects for shipping and navigation are considered to be the same as cumulative.

Consultee	Date / Document	Comment	Project Response
MCA	Scoping Opinion, 19/11/19	Attention should be paid to cabling routes and where appropriate burial depth for which a Burial Protection Index study should be completed and, subject to the traffic volumes, an anchor penetration study may be necessary. If cable protection are required e.g. rock bags, concrete mattresses, the MCA would be willing to accept a 5% reduction in surrounding depths referenced to Chart Datum. This will be particularly relevant where depths are decreasing towards shore and potential impacts on navigable water increase.	A Cable Burial Risk Assessment will be undertaken to determine external cable protection requirements, which will be part of the Deemed Marine License (DML) and in full MGN 654 compliance in all regards, including changes to water depths.
MCA	Scoping Opinion, 19/11/19	Particular consideration will need to be given to the implications of the site size and location on SAR resources and Emergency Response Co-operation Plans (ERCoP). Attention should be paid to the level of radar surveillance, AIS and shore-based Very High Frequency (VHF) radio coverage and give due consideration for appropriate mitigation such as radar, AIS receivers and in-field, Marine Band VHF radio communications aerial(s) (VHF voice with Digital Selective Calling (DSC)) that can cover the entire wind farm sites and their surrounding areas. A SAR checklist will also need to be completed in consultation with MCA.	The layout and any SAR requirements will be agreed with the MCA post consent. This will include the completion of a SAR checklist as required under MGN 654.
MCA	Scoping Opinion, 19/11/19	MGN 654 Annex 2 requires that hydrographic surveys should fulfil the requirements of the International Hydrographic Organisation (IHO) Order 1a standard, with the final data supplied as a digital full density data set, and survey report to the MCA Hydrography Manager.	The Applicant will comply with all aspects of MGN 654, including hydrographic survey requirements.
Ministry of Defence (MOD)	Scoping Opinion, 19/11/19	The Scoping Report makes reference to the lighting of the Dudgeon Offshore Wind Farm (OWF) and the MOD's Lighting Guidance is listed as a data source. In the interests of air safety, the SEP and DEP areas should be fitted with	Lighting and marking will be agreed with all relevant stakeholders and considering International Association of Marine Aids to Navigation and Lighthouse Authorities (IALA) O-130 (IALA, 2013)

Consultee	Date / Document	Comment	Project Response
		MOD accredited aviation safety lighting in accordance with the Air Navigation Order 2016. The MOD would need to confirm the specification of the lighting to be used.	post consent. The MOD's lighting guidance is referenced in **Chapter 15 Aviation and Radar** (document reference 6.1.15).
Trinity House (TH)	Scoping Opinion, 19/11/19	NRA should include: Comprehensive vessel traffic analysis in accordance with MGN 654. The possible cumulative and in-combination effects on shipping routes and patterns should be fully assessed, with particular reference to the current operational Dudgeon, Sheringham Shoal and Race Bank OWFs. Any proposed layouts should conform with MGN 654 and again consideration should be given to the layouts of the current Dudgeon and Sheringham Shoal OWFs. The SEP layout should align with the current site, however, as the Dudgeon OWF site has a less uniform layout, early consideration surrounding the DEP layout and risk mitigation measures will be required. If any structures, such as met masts, offshore platforms, accommodation platforms or other transmission assets, lie out with the actual wind farm turbine layout, then additional risk assessment should be undertaken.	Marine traffic analysis in accordance with MGN 654 is presented in the NRA (**Appendix 13.1 Navigation Risk Assessment**). Cumulative assessment of routeing is provided in **Section 13.6** and the NRA (**Appendix 13.1 Navigation Risk Assessment**). The layout and any SAR requirements will be agreed with the MCA post consent.
TH	Scoping Opinion, 19/11/19	The wind farms need to be marked with marine Aid to Navigation (AtoN) by the developer in line with IALA Recommendation O-139. Noted that buoys may be necessary in addition to structure marking, particularly during the construction phase. All marine navigational marking (required to be provided and maintained by the developer) should be agreed with TH. This will include meeting availability requirements and the reporting thereof.	Lighting and marking will be defined in agreement with TH and in line with IALA G1162. All availability and reporting requirements will be met.

Consultee	Date / Document	Comment	Project Response
TH	Scoping Opinion, 19/11/19	Any monitoring equipment, including met masts and LIDAR or wave buoys must also be marked as required by TH.	Lighting and marking will be defined in agreement with TH.
TH	Scoping Opinion, 19/11/19	A decommissioning programme, which includes a scenario where on decommissioning and on completion of removal operations an obstruction is left on site (attributable to the wind farm) which is considered to be a danger to navigation and which it has not proved possible to remove, should be considered. Such an obstruction may require to be marked until such time as it is either removed or no longer considered a danger to navigation, the continuing cost of which would need to be met by the developer/operator.	A decommissioning programme will be developed which will include consideration of the highlighted scenario.
TH	Scoping Opinion, 19/11/19	The possible requirement for navigational marking of the export cables and the vessels laying them. If it is necessary for the cables to be protected by rock armour, concrete mattresses or similar protection which lies clear of the surrounding sea bed, the impact on navigation and the requirement for appropriate risk mitigation measures needs to be assessed.	A Cable Burial Risk Assessment will be undertaken to determine external cable protection requirements. Impacts from under keel clearance are addressed in **Section 13.5** and the NRA (**Appendix 13.1 Navigation Risk Assessment**).
Pre-Section 42 Consultation			
MCA / TH	Online Meeting 25/09/18	Irregular areas, i.e. area divided in several smaller shapes represents challenges with respect to lighting and marking.	The final layout will be agreed with MCA post consent, including the need for any additional mitigation. Lighting and marking will be agreed with all key stakeholders including TH and MCA.
MCA / TH	Online Meeting 25/09/18	Preference for extensions to be one area as supposed to several.	The final layout will be agreed with MCA post consent, including the need for any additional mitigation.

Consultee	Date / Document	Comment	Project Response
MCA / TH	Online Meeting 25/09/18	Preference for layout which has a minimum of two lines of orientation, with turbines in straight lines. Alignment issues between Dudgeon and extension were noted in this regard.	The final layout will be agreed with MCA post consent, including the need for any additional mitigation.
MCA / TH	Online Meeting 25/09/18	MCA and TH stated required dimensions of shipping corridors should be calculated as per MGN 654 Annex 3.	Assessment of available sea room (**Section 13.5**) is calculated as per MGN 654 guidance (as detailed in **Appendix 13.1 Navigation Risk Assessment**).
MCA / TH	Online Meeting 25/09/18	Noted that a "first come first serve" principle in place regarding assessment of cumulative effects towards other lease holders.	A “tiered” approach to cumulative assessment has been undertaken in the NRA and applied within **Section 13.6**.
MCA / TH	Online Meeting 15/06/20	MCA stated good to see rows and columns of structures with no isolated / protruding turbines within the indicative layouts shown.	The final layout will be agreed with the MCA post consent and will comply with the Layout Rules.
MCA / TH	Online Meeting 15/06/20	In terms of SAR, alignment, and lighting / marking perspectives, there was greater concern over DEP than SEP.	The final layout will be agreed with the MCA post consent and will comply with the Layout Rules. Lighting and marking will be agreed with all key stakeholders including MCA and TH.
MCA / TH	Online Meeting 15/06/20	MGN 654 update referenced by MCA, but agreed current version will be considered, noting no notable changes expected.	The NRA complies with MGN 654.
MCA / TH	Online Meeting 15/06/20	MCA and TH both content with impacts to be assessed (which have been identified based on Scoping Report and subsequent Scoping Opinion).	The identified potential impacts are assessed in **Section 13.5**.
MCA / TH	Online Meeting 15/06/20	MCA and TH content with proposed approach to marine traffic data (summer 2020 survey supplemented with long term data and consultation; additional survey late 2020 / early 2021).	The agreed approach is detailed in **Section 13.4** and **Appendix 13.1 Navigation Risk Assessment**.

Consultee	Date / Document	Comment	Project Response
MCA / TH	Online Meeting 15/06/20	TH noted some alterations to operational lighting and marking of existing sites may be necessary to account for the extensions.	Lighting and marking will be agreed with all key stakeholders including TH.
MCA / TH	Online Meeting 15/06/20	MCA noted that as required under MGN 654, radio surveys should be undertaken pre and post construction for the extension projects.	There will be full MGN 654 compliance.
Cruising Association (CA)	Online Meeting 17/09/20	Content with approach to NRA and marine traffic data.	NRA provided in **Appendix 13.1 Navigation Risk Assessment**.
CA	Online Meeting 17/09/20	Concerns over increases / squeezing of traffic between the extension projects leading to rise in encounters / collision risk to recreational vessels. Noted that traffic in the area would be coming in bands associated with tidal times in the Humber.	Collision risk is assessed within **Section 13.5**.
CA	Online Meeting 17/09/20	Queries over effect of COVID situation on July / Aug 2020 traffic survey.	The approach to marine traffic data collection has been agreed with the MCA, and includes consideration of additional data sources (including long term pre-COVID marine traffic data).
CA	Online Meeting 17/09/20	Queried potential for any routeing measures in the area to assist with traffic management, and noted that marked routes (using buoyage) were helpful.	Appropriate mitigation in relation to increased encounters and collision risk will be discussed (as per **Section 13.5** and **Appendix 13.1 Navigation Risk Assessment**).
Royal Yachting Association (RYA)	Online Meeting 30/09/20	Content with approach to NRA and marine traffic data.	The agreed approach is detailed in **Appendix 13.1 Navigation Risk Assessment** and used to inform this chapter.

Consultee	Date / Document	Comment	Project Response
RYA	Online Meeting 30/09/20	Concerns for these sites were generally around under keel clearance and snagging.	Under keel clearance and cable interaction is assessed within **Section 13.5** and **Appendix 13.1 Navigation Risk Assessment**.
RYA	Online Meeting 30/09/20	Queries over whether MGN 654 will be utilised as it stands. It was confirmed this was the case given the updates have not yet been confirmed / published.	The NRA complies with MGN 654 (latest version available).
RYA	Online Meeting 30/09/20	Noted the importance of considering both elements (density grids and boating areas) of the RYA Coastal Atlas and to be aware the density grids are based on Automatic Identifying System (AIS) data only.	The RYA Coastal Atlas has been considered in full to establish the baseline in terms of recreational traffic, features and facilities.
RYA	Online Meeting 30/09/20	Pleased to see that the summer survey was undertaken in July and August and was content with the marine traffic survey approach.	The agreed approach to data collection is detailed in **Section 13.4**.
RYA	Online Meeting 30/09/20	Noted that recreational vessels were currently transiting in areas used by commercial vessels (i.e. area between the sites) and extensions may therefore increase collision risk.	Collision risk is assessed within **Section 13.5** and the NRA (**Appendix 13.1 Navigation Risk Assessment**).
Chamber of Shipping (CoS)	Online Meeting 0610/20	Queried alignment with the existing turbines.	The final layout will be agreed with the MCA post consent and will comply with the Layout Commitments.
CoS	Online Meeting 06/10/20	Queried whether any future updates to MGN 543 would be incorporated / complied with noting these updates are out for consultation. Content with approach to NRA and marine traffic data.	Agreed approach detailed in **Appendix 13.1 Navigation Risk Assessment**. The NRA will comply with latest version of MGN 654 available at the time of completion of the final NRA.
CoS	Online Meeting 06/10/20	Pleased to see that seasonal variation (or lack thereof) was being captured via the assessment of 12 months of AIS to supplement the marine traffic survey data.	Agreed data collection is detailed in **Section 13.4**.

Consultee	Date / Document	Comment	Project Response
CoS	Online Meeting 06/10/20	Queried whether marine aggregate dredging presence in the area would be assessed, and whether the British Marine Aggregate Producers Association (BMAPA) routes would be considered.	Assessed within **Section 13.5** and the NRA (**Appendix 13.1 Navigation Risk Assessment**).
CoS	Online Meeting 06/10/20	Queried whether post wind farm routeing would consider both sites being built.	The scenario where both sites are built has been assessed within **Section 13.5** and the NRA (**Appendix 13.1 Navigation Risk Assessment**).
DFDS (commercial ferries)	Request letter (16/09/20) response	The area is utilised by DFDS vessels on adverse weather routes, but no significant impacts are expected.	Assessed within **Section 13.5** and the NRA (**Appendix 13.1 Navigation Risk Assessment**).
Furetank	Request letter (16/09/20) response	Queried what safety zones would be utilised.	Safety Zones that are expected to be applied for are detailed in **Chapter 4 Project Description** (document reference 6.1.4).
Whitaker Tankers	Request letter (16/09/20) response	No impacts are expected.	Noted.
Sentinel	Request letter (16/09/20) response	Stated no comments on the project.	Noted.
P&O	Request letter (16/09/20) response	Noted that routes would require to deviate to avoid the SEP wind farm site, and that this would lead to increased distance and fuel costs.	Deviation / displacement impacts are assessed within **Section 13.5** and the NRA (**Appendix 13.1 Navigation Risk Assessment**).
Boston Putford	Request letter (16/09/20) response	Noted that routes would be required to deviate and that this may cause increases in levels of traffic in other areas. Also, the site is particularly close to the Perenco Waveney platform and could cause restricted access to this platform.	Deviation / displacement impacts are assessed within **Section 13.5** and the NRA (**Appendix 13.1 Navigation Risk Assessment**). Access / proximity impacts associated with Oil and Gas (O&G) assets are assessed within **Section 13.5** and **Chapter 16**

Consultee	Date / Document	Comment	Project Response
		Indicated that Boston Putford vessels would likely not transit through the array.	**Petroleum Industry and Other Marine Users** (document reference 6.1.16)**.**
Essberger	Request letter (16/09/20) response	Deviations will be limited on an individual basis but will have cumulative effect in terms of emissions. Further, the deviations may lead to a concentration of shipping activity in certain areas, leading to increased collision risk.	Impacts are assessed within **Section 13.5** and the NRA (**Appendix 13.1 Navigation Risk Assessment**).
Stena Lines	Request letter (16/09/20) response	Certain routeing will be required to deviate, and the reduction in sea room may lead to increased collision risk. Indicated that Stena vessels would not transit through the array.	Impacts are assessed within **Section 13.5** and the NRA (**Appendix 13.1 Navigation Risk Assessment**).
GEFO	Request letter (16/09/20) response	Anticipate limited / manageable deviation.	Impacts are assessed within **Section 13.5** and the NRA (**Appendix 13.1 Navigation Risk Assessment**).
Section 42 Responses			
MCA	Section 42 Response 13/05/21	We note in Section 5.4 that an additional 14-day traffic survey (radar, AIS and visual) will be conducted post-Preliminary Environmental Information Report (PEIR) in order to meet the required survey guidelines in MGN 654 (28-day).	In line with MGN 654, the additional marine traffic data has been collected and included within the NRA (**Appendix 13.1 Navigation Risk Assessment**).
MCA	Section 42 Response 13/05/21	We note in Sections 19.2.4 that consequence scoring will be completed post-PEIR and we also note under Section 21 that “the hazard workshop has not yet been undertaken and that impacts will need to be agreed with stakeholder post PEIR but pre-ES submission”. We expect the NRA to be updated with the additional data incorporated and MCA will provide further comments once completed.	The Hazard Workshop discussions are summarised in (**Table 13-1**) and the Hazard Log is provided in the NRA (**Appendix 13.1 Navigation Risk Assessment**).

Consultee	Date / Document	Comment	Project Response
MCA	Section 42 Response 13/05/21	We appreciate the early opportunity to comment on the draft MGN 543 checklist, and we can discuss the elements further as the project progresses. A new version of the checklist is available following the recent publication of MGN 654 which will need to be used for the NRA update. We are content at this stage with regards to the process you have undertaken in order to comply with MGN 654 and its annexes, and we welcome the work undertaken for addressing the guidance and recommendations so far.	The NRA is MGN 654 compliant. The MGN 654 checklist is contained within the NRA. (**Appendix 13.1 Navigation Risk Assessment**).
MCA	Section 42 Response 13/05/21	The turbine layout design will require MCA agreement prior to construction to minimise the risks to surface vessels, including rescue boats, and Search and Rescue aircraft operating within the site. As such, MCA will seek to ensure all structures are aligned in straight rows and columns, including any platforms. Any additional navigation safety and/or Search and Rescue requirements, as per MGN 654 Annex 5, will be agreed at the approval stage.	Noted. The final layout will be agreed with MCA will comply with MGN 654 and the agreed layout commitments (**Appendix 13.1 Navigation Risk Assessment**).
MCA	Section 42 Response 13/05/21	We are aware of a proposed seaweed farm west of the Sheringham Shoal wind farm site which we would expect to be assessed within the NRA update for potential impacts to traffic deviations.	The proposed seaweed farm is considered within the Cumulative Impact Assessment within **Section 13.6** and the NRA (**Appendix 13.1 Navigation Risk Assessment**)
MCA	Section 42 Response 13/05/21	MGN 654 Annex 4 requires that hydrographic surveys should fulfil the requirements of the International Hydrographic Organisation (IHO) Order 1a standard, with the final data supplied as a digital full density data set, and survey report to the MCA Hydrography Manager. This information will need to be submitted, ideally at the EIA Report stage.	Noted.

Consultee	Date / Document	Comment	Project Response
MCA	Section 42 Response 13/05/21	Export cable corridors, cable burial protection index and cable protections are issues that are yet to be fully developed. However due cognisance needs to address cable burial and protection, particularly close to shore where impacts on navigable water depth may become significant. Any consented cable protection works must ensure existing and future safe navigation is not compromised. The MCA would accept a maximum of 5% reduction in surrounding depth referenced to Chart Datum. Where burial depths are not achieved consultation will need to take place with MCA regarding the locations, impact and potential risk mitigation measures.	Noted. Cables will comply with MGN 654 under-keel clearance requirements. Any changes exceeding 5% will be discussed with the MCA and TH.
MCA	Section 42 Response 13/05/21	Safety zones during the construction, maintenance and decommissioning phases are supported, however it should be noted that operational safety zones may have a maximum 50m radius from the individual turbines. A detailed justification would be required for a 50m operational safety zone, with significant evidence from the construction phase in addition to the baseline NRA required supporting the case.	Any safety zone applications will be accompanied by a detailed safety case. Operational safety zones, outside of those required during major maintenance are not anticipated.
MCA	Section 42 Response 13/05/21	An Emergency Response Cooperation Plan is required to meet the requirements of MGN 654 Annex 5 and will need to be in place prior to construction. The ERCoP is an active operational document and must remain current at all stages of the project including during construction, operations & maintenance and decommissioning. A SAR checklist will be discussed as the project progresses to track all requirements detailed in MGN 654 Annex 5.	An ERCoP will be produced detailing how the Project would cooperate and assist in the event of an incident. The requirement for an ERCoP is embedded in the project design (**Section 13.3.3**). The Applicant will comply with all requirements of MGN 654 including in relation to creation of an ERCoP.

Consultee	Date / Document	Comment	Project Response
TH	Section 42 Response 10/06/21	Suggest that the Sustainable Seaweed Limited Norfolk proposed seaweed farm project should be assessed in the "In-Combination" section of the Navigation Risk Assessment.	The proposed seaweed farm is considered within the Cumulative impact assessment within **Section 13.6** and the NRA (**Appendix 13.1 Navigation Risk Assessment**)
TH	Section 42 Response 10/06/21	TH would welcome earliest possible consultation regarding proposed layouts.	The final layout will be agreed with MCA and will comply with MGN 654 with due cognisance of TH marking and lighting requirements.
Chamber of Shipping (CoS)	Section 42 Response 09/06/21	Referenced and reiterated CoS response to TCE as part of the Round Three Extension consultation. Sheringham Shoal: The Chamber does not have any specific navigational concerns at this stage given the insufficient information provided on layout or placement of potential turbines, however, would like to raise some concerns over the potential significant loss of sea room from proposed extension, particularly when viewed in combination with the proposed extension for Race Bank of which the boundaries overlap. Smaller vessels and vessels with shallow drafts would be particularly affected since they choose to separate their routeing from larger vessels thereby reducing any risk of collision. Accordingly, the reduction in sea room would likely force them to re-route onto tracks with larger vessels thereby increasing congestion and collision risk. The Chamber has concerns that a significant level of commercial traffic intersects with the eastern boundary and that an extension to the red line boundary would result in further constriction of that commercial traffic as vessels maintain what they consider a safe navigational distance from any turbines or navigational marks. Hence the Chamber recommends a boundary change.	Impacts associated with loss of sea room are considered in **Section 13.4** and in the NRA (**Appendix 13.1 Navigation Risk Assessment**). A collision risk assessment has been undertaken as part of the NRA (**Appendix 13.1 Navigation Risk Assessment**) and impacts are assessed in **Section 13.5**. It is noted that smaller vessels with shallower drafts, such as recreational vessels, will be able to transit within SEP and DEP except where 500m safety zones are enforced during construction and major maintenance.

Consultee	Date / Document	Comment	Project Response
		Dudgeon: The Chamber does not have any specific navigational concerns at this stage given the insufficient information provided on layout or placement of potential turbines however has serious navigational concerns over the suitability of western extent of the northern element to Dudgeon extension and the intersection with a high density route. Accordingly, the Chamber objects to the full extent of the boundary due to the constriction of safe navigational sea room and does not consider the site suitable. With regard to the southern proposed extension, the area is used regularly by traffic travelling in a northwest-southeast direction and also traffic in a north south direction. Accordingly, this traffic would be required to deviate into alternative routeing, increasing the frequency of traffic in existing routes and risk should the extension be granted. The Chamber has specific concerns over the southwest corner with the highest density of commercial traffic and objects to the present boundary with a strong recommendation for a boundary change to prevent significant vessel channel constriction and loss of safe navigational sea room.	
CoS	Section 42 Response 09/06/21	Poorly planned proliferation of OWFs could become an existential threat to the safety of navigation for commercial shipping and the cumulative impact of OWFs in the UK Exclusive Economic Zone (EEZ) is having a significant impact on the flexibility and efficiency of shipping routes.	Cumulative impacts are assessed in **Section 13.6**. Cumulative projects have to be considered in a tiered approach in line with Environmental Impact Assessment requirements and Planning Inspectorate advice. The Offshore Wind Evidence and Change Programme aims to assess wider cumulative impacts through its project 'The cumulative impact of offshore renewables on shipping and navigation'. Cumulative impacts within the EEZ are considered outside of the scope of this assessment.

Consultee	Date / Document	Comment	Project Response
CoS	Section 42 Response 09/06/21	The Chamber notes with concern the strict interpretation of the width requirements as stated with MGN 543. The Chamber does not contend that the calculations used are incorrect when considering to the strict letter of the guidance, however, the Chamber asserts that the strict interpretation as outlined in 292 of 18.4 within the NRA is not in the spirit of safe navigation.	Impacts associated with loss of sea room are considered in **Section 13.4** and in the NRA (**Appendix 13.1 Navigation Risk Assessment**). The calculations, as stated, were undertaken in accordance with MGN 654 requirements. Additional text has been included to clarify the extent of sea room reduction.
CoS	Section 42 Response 09/06/21	The Chamber believes that for the long-term safe co-location of OWFs and commercial shipping, it is incorrect for developers to foresee the safe distance that mariners transit off OWFs as area for development, as this simply pushes further commercial vessels into ever closer passing's, increasing collision risk.	Impacts associated with loss of sea room are considered in **Section 13.4** and in the NRA (**Appendix 13.1 Navigation Risk Assessment**). A collision risk assessment has been undertaken as part of the NRA (**Appendix 13.1 Navigation Risk Assessment**) and impacts are assessed in **Section 13.5**.
CoS	Section 42 Response 09/06/21	The Chamber, for purposes of Search and Rescue, along with navigational safety, wish to see at least one line of orientation maintained between the existing OWFs and the proposed developments. Furthermore, within the proposed SEP and DEP, the Chamber wishes to see two lines of orientation as set out within MGN 654 unless a sufficient safety case can be presented to the MCA.	Full consideration will be given to MGN 654 including SAR Annex 5 as the project progresses, in consultation with the MCA and TH.
CoS	Section 42 Response 09/06/21	The Chamber trusts that as MGN 654 has now been released following extensive consultation with industry that the developer will be making the proposal in full compliance with it at DCO.	The updated NRA has been undertaken in accordance with MGN 654 and includes an updated MGN 654 checklist. (**Appendix 13.1 Navigation Risk Assessment**).
CoS	Section 42 Response 09/06/21	As the Chamber has found customary with such proposals, the documentation uses a dataset of Marine Accident Investigation Branch (MAIB) accidents for a ten-year period (2008-2017). The Chamber, having consulted with the	The assessment has been updated to consider 20 years of MAIB data (**Section 13.4.9** and **Appendix 13.1 Navigation Risk Assessment**).

Consultee	Date / Document	Comment	Project Response
		MAIB and been informed that digital spatial data exists and is accessible for developers dating back to 1992. The Chamber considers that a single 10-year period to be an unnecessarily short period for accident data to be used and that it may not accurately reflect historic accidents and safety to navigation.	
CoS	Section 42 Response 09/06/21	Recommendations that the wind farm site boundaries be reframed so as to provide more safe navigable sea room, or that commitments be made to the same effect. It must be recognised that through widening of the navigable channel between SEP and DEP, both allision risk and the "concentrated" collision risk will be reduced.	A worst-case approach has been taken to buildable area at NRA stage to ensure a safe and viable layout can be agreed. The final layout will be agreed with MCA and will comply with MGN 654 and the agreed layout commitments (**Appendix 13.1 Navigation Risk Assessment**) with due cognisance of TH marking and lighting requirements.
Essberger Tankers	Section 42 Response 27/05/21	The reduction of the navigable water clearance from 8Nm to 2Nm should not endanger the safety of navigation in a significant way and we are ready to accommodate this arrangement.	Noted. Impacts associated with loss of sea room are considered in **Section 13.4** and in the NRA (**Appendix 13.1 Navigation Risk Assessment**).
Independent Oil and Gas (IOG)	Section 42 Response 10/06/21	Both the Blythe and Elgood assets are regularly serviced by supply and emergency response / standby vessels, therefore, careful coordination is required to ensure IOG can access the Blythe platform and the Elgood well 500m zone at all times. Periodic pipeline and sea bed surveys are required outside of these safety zones and therefore, coordination is also required to ensure that these operations can continue unimpeded.	Access / proximity impacts associated with Oil and Gas are assessed within **Chapter 16 Petroleum Industry and Other Marine Users** (document reference 6.1.16).
North Norfolk District	Section 42 Response	NNDC would defer to the advice of the Maritime and Coastguard Agency, TH, Ministry of Defence (MOD) and	Noted.

Consultee	Date / Document	Comment	Project Response
Council (NNDC)	10/06/21	other experts in respect of matters within this Chapter of the PEIR.	
NRA Consultation			
P&O Ferries	Online Meeting 09/07/21	Pride of York and Pride of Bruges have been sold since 2019, however chartered vessels are being used on the same routes, and Mean Route Positions and schedules have not changed. There have been no transit reductions on any routes (including those associated with Teesside) since 2019. On this basis P&O confirmed content with baseline assessment.	Noted.
P&O Ferries	Online Meeting 09/07/21	Stated no navigational safety concerns with regards to reduced sea room (P&O vessels navigate more restricted areas than would be the case here). Primary P&O concern is around the potential for additional journey distances over the life of the wind farm leading to increased cost.	Noted. Deviation / displacement impacts are assessed within **Section 13.5** and the NRA (**Appendix 13.1 Navigation Risk Assessment**).
P&O Ferries	Online Meeting 09/07/21	Noted related concern over “indirect” impacts from SEP and DEP, in particular from deviations taken to avoid wind farm traffic both near the wind farm sites and in port approaches.	Deviation / displacement impacts are assessed within **Section 13.5** and the NRA (**Appendix 13.1 Navigation Risk Assessment**). Marine Coordination is included as an embedded mitigation measure (**Section 13.3.3**).
P&O Ferries	Online Meeting 09/07/21	Stated consideration of shipping routes during the site design process could help with deviations and the commercial impacts.	A worst-case approach has been taken to buildable area to ensure a safe and viable layout can be agreed. The final layout will be agreed with MCA and will comply with MGN 654 with due cognisance of TH marking and lighting requirements.

Consultee	Date / Document	Comment	Project Response
P&O Ferries	Online Meeting 09/07/21	Suggested procedures / commitments in relation to project vessel routeing would be beneficial in terms of limiting a need to deviate. In particular, consideration of crossing angles with existing shipping routes. Noting the International Regulations for Preventing Collisions at Sea (COLREGS) compliance, specified routeing for wind farm vessels would limit the need for P&O vessels to deviate.	Deviation / displacement impacts are assessed within **Section 13.5** and the NRA (**Appendix 13.1 Navigation Risk Assessment**). A Navigation Management Plan has been included as an additional mitigation within the impact assessment (**Section 13.5**).
CoS	Online Meeting 16/07/21	Due to the levels of traffic within the area, the layout of the array within the red line boundary needs to consider the volume of traffic within the area. This should include consideration of low use / adverse weather routeing.	A worst-case approach has been taken to buildable area to ensure a safe and viable layout can be agreed. The final layout will be agreed with MCA and will comply with MGN 654 with due cognizance of TH marking and lighting requirements. Impacts to adverse weather routeing has been considered within **Section 13.5**.
CoS	Online Meeting 16/07/21	CoS consider the navigational risk on a holistic basis to be the main concern within the area. Particularly, the loss of navigable sea room increasing the encounters in the area and, therefore, the collision risk.	Impacts associated with loss of sea room are considered in **Section 13.4** and in the NRA (**Appendix 13.1 Navigation Risk Assessment**). Vessel to vessel, and project vessels to third party vessel collision impacts are assessed in **Section 13.5**.
CoS	Online Meeting 16/07/21	Stated that whilst the minimum passing distance of 1 nm assumed in the NRA was suitable for assessment purposes, other sources (e.g. Witherby Guide) recommend 2 nm.	Noted. This has been considered within the impacts associated with loss of sea room in **Section 13.4** and in the NRA (**Appendix 13.1 Navigation Risk Assessment**).

Consultee	Date / Document	Comment	Project Response
CoS	Online Meeting 16/07/21	Agreed that marine coordination controlling and promulgating the movements of project vessels to ensure they did not encounter commercial vessels would partially mitigate the sea room impact.	Deviation / displacement impacts are assessed within **Section 13.5** and the NRA (**Appendix 13.1 Navigation Risk Assessment**). Marine Coordination is included as an embedded mitigation measure (**Section 13.3.3**). A Navigation Management Plan is included as additional mitigation within the impact assessment (**Section 13.5**).
CoS	Online Meeting 16/07/21	Noted that strict application of the “corridor” width calculations provided within MGN 654 and assumed within the PEIR NRA means additional loss of sea room is not accounted for.	Impacts associated with loss of sea room are considered in **Section 13.4** and in the NRA (**Appendix 13.1 Navigation Risk Assessment**). The calculations have been undertaken in accordance with MGN 654 requirements. Additional text has been included to clarify the extent of sea room reduction.
CoS	Online Meeting 16/07/21	The cumulative reduction in sea room is the primary CoS concern.	Cumulative impacts are assessed in **Section 13.6**.
CoS	Online Meeting 16/07/21	It was agreed that the “corridor” calculations as they stood would be retained in the application NRA, however additional text would be added to make it clear the additional areas of sea room that could be lost (assuming full build out).	Impacts associated with loss of sea room are considered in **Section 13.4** and in the NRA (**Appendix 13.1 Navigation Risk Assessment**). The calculations have been undertaken in accordance with MGN 654 requirements. Additional text has been included to clarify the extent of sea room reduction.

Consultee	Date / Document	Comment	Project Response
CoS	Online Meeting 16/07/21	Noted the potential for increased passing distances to account for radar interference issues.	Impacts associated with radar are considered in **Section 13.5** and discussed further in the NRA (**Appendix 13.1 Navigation Risk Assessment**).
CoS	Online Meeting 16/07/21	CoS were content with the post wind farm routing, assuming concerns over loss of sea room were also made clear in the NRA.	Deviation / displacement impacts are assessed within **Section 13.5** and the NRA (**Appendix 13.1 Navigation Risk Assessment**). Impacts associated with loss of sea room are considered in **Section 13.4** and in the NRA (**Appendix 13.1 Navigation Risk Assessment**).
P&O / CoS	Hazard Workshop 10/08/21	General operator consensus was that individual deviations did not pose a navigation safety risk, however, there was a commercial concern. The CoS reiterated concerns over general loss of sea room on a cumulative basis, but also specific sections of the wind farm sites (as per previous CoS consultation).	Impacts associated with deviations and displacement are assessed in **Section 13.5.** Cumulative impacts are assessed within **Section 13.6**. Impacts associated with loss of sea room are considered in **Section 13.4** and in the NRA (**Appendix 13.1 Navigation Risk Assessment**).
Commercial Operators	Hazard Workshop 10/08/21	Operators agreed it was unlikely commercial vessels would transit through the wind farm sites. O&G vessels do so under certain circumstances at other projects, however it was considered unlikely they would so in the case of SEP and DEP.	Noted.
Commercial Operators / P&O	Hazard Workshop 10/08/21	The general consensus was that the management of project vessels via marine coordination to ensure that impacts on third party movements were minimised would be of benefit.	Marine co-ordination has been included as an embedded mitigation measure in **Section 13.3.3**. A Navigation Management Plan has been included as additional mitigation within the impact assessment

Consultee	Date / Document	Comment	Project Response
			(**Section 13.5**) to mitigate impacts associated with vessels crossing between the wind farm sites.
Cobelfret	Hazard Workshop 10/08/21	Concerns raised at a cumulative level over reduction of sea room leading to increased need to emergency anchor or engage salvage tugs.	Impacts associated with loss of sea room are considered in **Section13.4** and in the NRA (**Appendix 13.1 Navigation Risk Assessment**).
Associated British Ports (ABP) Humber	Hazard Workshop 10/08/21	No direct impacts foreseen on ports or port operations.	Noted.
Perenco	Hazard Workshop 10/08/21	Queries from O&G operators around pipeline access.	Impacts assessed within **Chapter 16 Petroleum Industry and Other Marine Users** (document reference 6.1.16)**.**
RYA	Hazard Workshop 10/08/21	Queried whether the nearby Sustainable Seaweed site would be included within the cumulative assessment within the NRA.	Cumulative impacts are assessed within **Section 13.6** and the NRA (**Appendix 13.1 Navigation Risk Assessment**).
RYA	Hazard Workshop 10/08/21	Requested that details of visual logs from the surveys.	Visual survey data is provided within the NRA (**Appendix 13.1 Navigation Risk Assessment**).
RYA	Hazard Workshop 10/08/21	Noted that the “General Boating Areas” of the RYA Coastal Atlas will provide good indication of non AIS traffic. The intersection between these areas and the offshore export cable corridor should be considered in regards to potential for underkeel interaction.	A Cable Burial Risk Assessment will be undertaken pre-construction (**Section 13.3.3**). Impacts to under keel clearance have been assessed in **Section 13.5**.
RYA	Hazard Workshop 10/08/21	Concerns over impacts to recreational users were largely around nearshore areas including port approaches and centred on project vessel traffic and underkeel clearance.	Vessel to vessel, and project vessels to third party vessel collision impacts are assessed in **Section 13.5**.

Consultee	Date / Document	Comment	Project Response
			Impacts to under keel clearance have been assessed in **Section 13.5**.
RYA	Hazard Workshop 10/08/21	Suggested mitigations of relevance to recreational users were maintenance of aids to navigation and effective / targeted promulgation of information to relevant clubs and organisations. Targeted promulgation of information was also recommended for fishing vessels.	Embedded mitigation measures are presented in **Section 13.3.3**.
National Federation of Fisherman's Organisations (NFFO)	Hazard Workshop 10/08/21	Queried whether fishing gear snagging would be assessed within the ES.	Commercial impacts are assessed within **Chapter 12 Commercial Fisheries** (document reference 6.1.12). H&S impacts are assessed within **Section 13.5**.
NFFO	Hazard Workshop 10/08/21	Noted that fishing vessels will likely seek to transit through and fish within the wind farm sites.	Impacts to fishing vessels on transit are assessed in **Section 13.5**. Displacement of fishing activity and potential impact to commercial fisheries receptors are assessed within **Chapter 12 Commercial Fisheries** (document reference 6.1.12).
COS	10/02/2022	The COS queried whether the COS input on the corridor calculations could be visualised in figure form for CoS review.	A visualisation of the COS' input on the corridor calculations was sent to the COS for review. It was agreed that the "corridor" calculations as they stood would be retained in the application NRA, however, additional text would be added to make it clear the additional areas of searoom that could be lost (assuming construction of the worst-case development scenario).

Consultee	Date / Document	Comment	Project Response
COS	10/02/2022	COS do appreciate that the area is very constrained, and the worst-case layout shown is as was expected, albeit not what the CoS would have liked to see from a navigational safety perspective. CoS have no further actions on the project at this point and are pleased that their comments have been retained within the NRA and were happy with the level of engagement to date.	Noted.
MCA	29/06/22	It was stated at PEIR that additional data was to be collected following PEIR. Has this occurred?	The winter survey data was not presented at PEIR and is now included within the updated NRA. **Appendix 13.1 Navigation Risk Assessment.**

13.3 Scope

13.3.1 Study Area

6. The study area for shipping and navigation has been defined on the basis of a 10nm buffer of the wind farm sites and a 2nm buffer of the offshore export cable corridor to ensure that all relevant passing traffic is captured in the assessment. The buffers are shown in **Figure 13-1**, which shows the collective study area (incorporating all buffers) as well as that for SEP and DEP separately.
7. Where relevant the assessment also considers existing, as well as planned projects and activities, where information is within the planning system, otherwise publicly available, or has been made available through the consultation process, within 100nm of the wind farm sites.

13.3.2 Realistic Worst-Case Scenario

13.3.2.1 General Approach

8. The final design of SEP and DEP will be confirmed through detailed engineering design studies that will be undertaken post-consent to enable the commencement of construction. In order to provide a precautionary but robust impact assessment at this stage of the development process, realistic worst-case scenarios have been defined in terms of the potential effects that may arise. This approach to EIA, referred to as the Rochdale Envelope, is common practice for developments of this nature, as set out in Planning Inspectorate Advice Note Nine (2018). The Rochdale Envelope for a project outlines the realistic worst-case scenario for each individual impact, so that it can be safely assumed that all lesser options will have less impact. Further details are provided in **Chapter 5 EIA Methodology** (document reference 6.1.5).
9. The realistic worst-case scenarios for the shipping and navigation assessment are summarised in **Table 13-2**. This also reflects the maximum design scenario used within the NRA and FSA (**Appendix 13.1 Navigation Risk Assessment**). These are based on the project parameters described in **Chapter 4 Project Description** (document reference 6.1.4), which provides further details regarding specific activities and their durations.
10. In addition to the design parameters set out in **Table 13-2**, consideration is also given to:
    - How SEP and DEP will be built out as described in **Section 13.3.2.2** to **Section13.3.2.4**. This accounts for the fact that whilst SEP and DEP are the subject of one DCO application, it is possible that either one or both SEP and DEP will be developed, and if both are developed (SEP and DEP concurrently scenario), that construction may be undertaken either concurrently or sequentially.
    - A number of further development options which either depend on pre-investment or anticipatory investment, or that relate to the final design of the wind farms.

- Whether one offshore substation platform (OSP) or two OSPs are required (relevant only to the offshore assessments).
- The design option of whether to use all of the DEP North and DEP South array areas, or whether to use the DEP North array area only (relevant only to the offshore assessments); and,
- In order to ensure that a robust assessment has been undertaken, all development scenarios and options have been considered to ensure the realistic worst-case scenario for each topic has been assessed. Further details are provided in **Chapter 4 Project Description** (document reference 6.1.4).

13.3.2.2 Construction Scenarios

11. In the event that both SEP and DEP are built, the following principles set out the framework for how SEP and DEP may be constructed:
    - SEP and DEP may be constructed at the same time, or at different times;
    - If built at the same time both SEP and DEP could be constructed in four years;
    - If built at different times, either Project could be built first;
    - If built at different times, each Project would require a four year period of construction;
    - If built at different times, the offset between the start of construction of the first Project, and the start of construction of the second Project may vary from two to four years;
    - Taking the above into account, the total maximum period during which construction could take place is eight years for both Projects; and
    - The earliest construction start date is 2025.
12. The impact assessment for shipping and navigation considers the following development scenarios in determining the worst-case scenario for each topic:
    - Build SEP or build DEP in isolation – one OSP only; and
    - Build SEP and DEP or sequentially – with either two OSPs, one for SEP and one for DEP, or with one OSP only to serve both SEP and DEP.

13. For each of these scenarios it has been considered whether the build out of the DEP North and DEP South array areas, or the build out of the DEP North array area only, represents the worst-case for that topic. Any differences between SEP and DEP, or differences that could result from the manner in which the first and the second projects are built (concurrent or sequential and the length of any gap) are identified and discussed where relevant in the impact assessment section of this chapter (**Section 13.5**. For each potential impact, where necessary, only the worst-case construction scenario for two Projects is presented, i.e. either concurrent or sequential. In the case of the shipping and navigation assessment, concurrent development is considered to be the worst-case project scenario for all impacts as it represents the maximum (worst-case) spatial footprint and, as such, the sequential project scenario is not discussed in detail.

13.3.2.3 Operation Scenarios

14. Operation scenarios are described in detail in **Chapter 4 Project Description** (document reference 6.1.4). Where necessary, the assessment considers the following three scenarios:

- Only SEP in operation;
- Only DEP in operation; and
- The two Projects operating at the same time, with a gap of two to four years between each Project commencing operation.

15. The operational lifetime of each Project is expected to be 40 years.

13.3.2.4 Decommissioning Scenarios

16. Decommissioning scenarios are described in detail in **Chapter 4 Project Description** (document reference 6.1.4). Decommissioning arrangements will be agreed through the submission of a Decommissioning Programme prior to construction, however for the purpose of this assessment it is assumed that decommissioning of SEP and DEP could be conducted separately, or at the same time.

Table 13-2: Realistic Worst-Case Scenarios

Impact	DEP in Isolation	SEP in Isolation	SEP & DEP	Notes and Rationale
Construction				
Impact 1: Vessel displacement	**Wind farm site:** Two wind farm sites (DEP North and South) totalling **114.75km²** Installation of up to **32 x 15MW** wind turbines and **one OSP** in DEP North	**Wind farm site:** One wind farm site totalling **97km²** Installation of up to **23 x 15MW wind turbines** and **one OSP** in SEP	**Wind farm sites:** Three farm sites totalling **196.1km²** (SEP, DEP North and DEP South) Installation of up to **53 x 15MW wind turbines** and **two OSPs** (one in DEP North and one in SEP if projects are built with a separated grid option)	The worst-case wind farm site scenario represents a buoyed construction area deployed around the maximum extent of the wind farm site(s) including 500m construction safety zones.
	Safety Zones: **500m** safety zones around construction activities = 0.79km² per structure under construction at any one time; and **50m** safety zones around incomplete structures = 7,854m² per partially constructed structure at any one time.	Same as DEP in Isolation	Same as DEP in Isolation	

Impact	DEP in Isolation	SEP in Isolation	SEP & DEP	Notes and Rationale
	Offshore substation platforms • **1** OSP in DEP North • Maximum scour protection area (per foundation, comprising all legs where relevant): **1,662m2**.	**Offshore substation platforms** **1** OSP in SEP • Maximum scour protection area (per foundation, comprising all legs where relevant): **1,662m²**.	**Offshore substation platforms** • **1** or **2** OSPs, with an OSP in SEP and in DEP North. • Maximum scour protection area (per foundation, comprising all legs where relevant): **1,662m²**.	
	Maximum temporal footprint • Duration of offshore construction: **2 years**	Maximum temporal footprint • Duration of offshore construction: **2 years**	Maximum temporal footprint • Duration of offshore construction activities: **8 years** if built sequentially with a maximum gap between offshore construction activities of one year	The worst-case for SEP and DEP considers concurrent construction as it accounts for maximum construction activity in the study area at the same time.
	Construction vessels: • Maximum number of construction vessels on site at any one time: up to **16** vessels • Construction vessel trips to port: **603** over **2**-year construction period.	Construction vessels: • Maximum number of construction vessels on site at any one time: up to **16** vessels • Construction vessel trips to port: **603** over **2-year** construction period.	Construction Vessels: • Maximum number of construction vessels on site at any one time: up to **25** (in total if both SEP and DEP constructed concurrently) • Construction vessel trips to port: **1,196** during **4-year** construction period if constructed sequentially.	

Impact	DEP in Isolation	SEP in Isolation	SEP & DEP	Notes and Rationale
Impact 2: Adverse weather routeing	As for Impact 1 (Construction Phase)	As for Impact 1 (Construction Phase)	As for Impact 1 (Construction Phase)	
Impact 3: Increased collision risk	As for Impact 1 (Construction Phase)	As for Impact 1 (Construction Phase)	As for Impact 1 (Construction Phase)	
Impact 4: Increased allision risk	As for Impact 1 (Construction Phase)	As for Impact 1 (Construction Phase)	As for Impact 1 (Construction Phase)	
Impact 5: Interaction with subsea cables	Offshore cables: Up to **263km** of offshore cables comprising: • **1** High Voltage Alternate Cable (HVAC) export cable up to 62km in length • 135km of infield cables (DEP North: 90km; DEP South: 45km) • Up to 3 parallel interlink cables between DEP South and OSP in DEP North: up to 66km in length (combined) • Burial depth: **0.5** to **1.5m** (excluding burial in sand waves up to **20m**.	Offshore cables: Up to **130km** of cables comprising: • **1** HVAC export cable up to **40km** in length • **90km** of infield cables • No interlink cables • Burial depth: Same as DEP in isolation	Offshore cables: Up to **481km** [2] of cables comprising: • **2** HVAC export cables up to **102km** in length • Up to **225km** of infield cables • Up to **7** interlink cables from DEP North to OSP in SEP, up to **154km** total length • Burial depth: Same as SEP or DEP in isolation **Realistic worst-case scenario** Up to **448km** of cables: **80km** of export cables **225km** of infield; and	The worst-case scenario for the cable corridor is the maximum length of export cable, infield cables and interlink cables and construction buffers allowing for safe passing. **SEP and DEP worst-case scenario per cable** **Export:** SEP and DEP are developed with a separated grid option (each having their own substation and export cable). **Infield:** Assumes SEP, DEP North and DEP South are all developed.

[2] The individual worst-case scenarios presented for export, interlink and infield cables would not represent a developable scenario if taken as a total, therefore a 'realistic' worst-case scenario for all cables is presented for this and for all other activities that vary depending on the development scenario in question. This includes sandwave clearance and number of OSP.

Impact	DEP in Isolation	SEP in Isolation	SEP & DEP	Notes and Rationale
			143km of interlink • based on realistic scenario: **1.35km²** (Export cable **0.24km²**, Infield cables **0.68km²**, Interlink cables **0.43km²**)	**Interlink:** Assumes SEP and DEP are developed with an integrated grid option but only DEP North is developed. **SEP and DEP realistic worst-case scenario for all cables** The realistic worst-case scenario for cables is associated with the SEP and DEP integrated grid option where both DEP North and DEP South are developed.
	Subsea cable surface protection • **Export cables** up to **0.5km** (including 100m in the Marine Conservation Zone (MCZ)) of cable protection **6m wide** = 3,000m². For this impact worst-case = **2,400m²** to account for 600m² in the MCZ which is assessed in the below impact • **Interlink cables** up to **1.5km** of cable protection 6m wide = **9,000m²**	**Subsea cable surface protection** • **Export cables** up to **0.5km** (including 100m in the MCZ) of cable protection **6m wide** = 3,000m². For this impact worst-case = **2,400m²** to account for 600m² in the MCZ which is assessed in the below impact • **Infield cables** up to **1km** of cable protection 4m wide = **4,000m²** •	**Subsea cable surface protection** • Same as for DEP in isolation scenario. **Pipeline crossings** • Up to **21 crossings** (over trawlable) each with **2,100m²** footprint (Total = **44,100m²**)	

Impact	DEP in Isolation	SEP in Isolation	SEP & DEP	Notes and Rationale
	• **Infield cables** up to **1km** of cable protection 4m wide = **4,000m²** Total = **15,400m² (0.0154km²)** • • **Pipeline crossings** Up to **17 crossings** (overtrawlable) each with **2,100m²** footprint (Total = **35,700m²**)	• **Pipeline crossings** Up to **4 crossings** (overtrawlable) each with **2,100m²** footprint (Total = **8,400m²**)		
Impact 6: Under keel clearance	As for Impact 5 (Construction Phase)	As for Impact 5 (Construction Phase)	As for Impact 5 (Construction Phase)	
Impact 7: Emergency service	As for Impact 1 (Construction Phase)	As for Impact 1 (Construction Phase)	As for Impact 1 (Construction Phase)	
Operation				
Impact 1: Displacement of activities	**Wind farm site:** Two wind farm sites (DEP North and South) totalling **114.750km²** Up to **30 wind turbines** with jacket foundations (maximum structure dimensions at the sea surface) and **one OSP** in DEP North with jacket foundation.	**Wind farm site:** One wind farm site totalling **97km²** Up to **23 wind turbines** with jacket foundations (maximum structure dimensions at the sea surface) and **one OSP** in SEP with jacket foundation.	**Wind farm site**: Three farm sites totalling **196.1km²** (SEP, DEP North and DEP South) Up to **53 wind turbines** with jacket foundations (maximum structure dimensions at the sea surface) and **two OSPs** (one in DEP North and one in SEP if SEP and DEP are built	Layout worst-case places turbines on the periphery. Modelling within the NRA which informs this chapter includes a flood tide dominated scenario which upon analysis gave the worst-case modelling results. **Re-routeing assumptions:** All alternative routes maintain a minimum mean distance of

Impact	DEP in Isolation	SEP in Isolation	SEP & DEP	Notes and Rationale
	Separation distances: 500m from existing operational infrastructure and wind turbines proposed and 1.05km between DEP turbines. Minimum air gap: 30m	Separation distances: 500m from existing operational infrastructure and wind turbines proposed and 1.05km between SEP turbines. Minimum air gap: 30m	with a separated grid option) with jacket foundations. Separation distances: 500m from existing operational infrastructure and wind turbines proposed and 1.05km between both SEP and DEP turbines. Minimum air gap: 30m	1nm from offshore installations and existing wind turbine boundaries in line with the MGN 654 Shipping Route Template (MCA, 2021). This distance is considered for shipping and navigation from a safety perspective. Sandbanks, adverse weather and known routeing preferences are also taken into account.
	Safety Zones: Up to 500m when major maintenance is in progress (use of jack-up vessel or similar).	Same as DEP in isolation	Same as DEP in isolation	
	Maximum temporal footprint: The operational lifetime is expected to be 40 years	**Maximum temporal footprint:** The operational lifetime is expected to be 40 years	**Maximum temporal footprint:** The operational lifetime is expected to be 40 years	
	Vessel movements: Maximum number of vessels on site at any one time: **6** Operation and maintenance vessel trips to	Vessel movements: Maximum number of vessels on site at any one time: **6** Operation and maintenance vessel trips to port per year:	Vessel movements: Maximum number of vessels on site at any one time: **7** (in total if both SEP and DEP	

Impact	DEP in Isolation	SEP in Isolation	SEP & DEP	Notes and Rationale
	port per year: approximately **604** per year (although majority (600) will be small O&M vessel (Crew Transfer Vessel (CTV)))	approximately **604** per year (although majority (600) will be small O&M vessel (CTV))	constructed concurrently) Operation and maintenance vessel trips to port per year: approximately **1,206** per year (although majority (1,200) will be small O&M vessel (CTV))	
Impact 2: Adverse weather routeing	As for Impact 1 (Operational Phase)	As for Impact 1 (Operational Phase)	As for Impact 1 (Operational Phase)	
Impact 3: Increased collision risk	As for Impact 1 (Operational Phase)	As for Impact 1 (Operational Phase)	As for Impact 1 (Operational Phase)	
Impact 4: Increased allision risk	As for Impact 1 (Operational Phase)	As for Impact 1 (Operational Phase)	As for Impact 1 (Operational Phase)	
Impact 5: Interaction with subsea cables	See construction phase Impact 5.	See construction phase Impact 5.	See construction phase Impact 5.	
Impact 6: Under Keel Clearance	See construction phase Impact 5.	See construction phase Impact 5.	See construction phase Impact 5.	
Impact 7: Emergency service	See Impact 1	See Impact 1	See Impact 1	
Decommissioning				
No decision has yet been made regarding the final decommissioning policy. It is also recognised that legislation and industry best-practice change over time. The detail and scope of decommissioning works will be determined by the relevant legislation and guidance at the time of decommissioning and will be agreed with the regulator. It is anticipated that for the purposes of a worst-case scenario, the impacts will be no greater than those identified in the construction phase.				

13.3.3 Summary of Mitigation Embedded in the Design

17. This section outlines the embedded mitigation relevant to the shipping and navigation assessment, which has been incorporated into the design of SEP and DEP (**Table 13-3**:). Where other mitigation measures are proposed, these are detailed in the impact assessment (**Section 13.5** and **Appendix 13.1 Navigation Risk Assessment**).

18. The location of the wind farm sites and proposed offshore export cable corridor has been selected to avoid routes and areas of high density shipping as far as possible. This is the key embedded mitigation with regard to shipping and navigation. **Chapter 3 Site Selection and Assessment of Alternatives** (document reference 6.1.3) describes the process of development of the wind farm sites and the proposed offshore export cable corridor.

19. Notably through site selection, SEP and DEP avoids IMO routeing measures (closest 30nm away), existing platforms, areas licenced for dredging and aggregate extraction, and MoD practice and exercise areas. Potential interactions with neighbouring infrastructure, navigational features, main routes, pipelines, telecommunication and transmission cables have also been minimised as far as possible given other constraints.

20. In addition to site selection considerations, other embedded mitigation measures which will be in place (as detailed further in the NRA (**Appendix 13.1 Navigation Risk Assessment**)), are shown in **Table 13-3**.

Table 13-3: Embedded Mitigation

Parameter	Mitigation Measures Embedded into the Project Design
Lighting and marking	Lighting and marking in consultation and agreement with TH, MCA, and the Civil Aviation Authority (CAA), and considering IALA G1162/ O-139 (IALA, 2013) including an AtoN Management Plan covering the construction period. Secured via Development Consent Order (DCO)/deemed Marine Licence (dML) condition
Application for safety zones	Application for safety zones during construction and periods of major maintenance. Application for safety zones will be made post consent under 'The Electricity (Offshore Generating Stations) (Safety Zones) (Applications Procedures and Control of Access) Regulations 2007.
Compliance by all project vessels with international maritime law	Compliance by all project vessels with International maritime law and flag state regulations, COLREGS (IMO, 1972) and the International Convention for the Safety of Life at Sea (SOLAS) (IMO, 1974).
Agreement of layout	Layout will be discussed and agreed with the MCA and TH. It is noted that the final layout will comply with the agreed layout commitments. Secured via DCO/DML condition
Compliance with MGN 654	Compliance with all aspects of MGN 654 including its annexes. This condition of the DCO / DML includes the completion of checklist (Search and Rescue Checklist) to

Parameter	Mitigation Measures Embedded into the Project Design
	ensure all elements of MGN 654 have been effectively addressed. Secured via DCO/DML condition.
Marine coordination	Marine coordination via a dedicated onshore base from where the project including associated vessel movements will be coordinated and managed. There will be close cooperation and coordination between the existing sites and SEP and DEP.
Promulgation of information	Promulgation of Information: Advance warning and accurate location details of construction, maintenance and decommissioning operations, associated Safety Zones and advisory passing distances will be given via Notices to Mariners (NtM) and Kingfisher Bulletins and other appropriate media. Secured via DCO/DML condition.
ERCoP	ERCoP to be completed in the required format and structure (MCA, 2019), as per the requirements of MGN 654. The ERCoP will require cooperation with other developments in proximity and to be updated and agreed on a live basis in liaison with the MCA. Secured via DCO/DML condition.
Use of guard vessels	Use of guard vessels identified as necessary via risk assessment, as required under MGN 654. Secured via DCO/DML condition.
Display of project infrastructure on appropriately scaled nautical charts	Display of project infrastructure on appropriately scaled nautical charts, including cables. Secured via DCO/DML condition.
Cable Burial Risk Assessment	Cable Burial Risk Assessment. All subsea cables suitably protected with periodic monitoring of cable burial / protection to ensure it remains effective to reduce snagging risk to anchors and fishing gear. A Cable Burial Risk Assessment will be undertaken pre-construction, including consideration of under keel clearance. Secured via DCO/DML condition.
Monitoring arrangements	Monitoring arrangements to be agreed with the MCA before construction, including marine traffic monitoring during construction and hydrographic surveys (as per MGN 654). Secured via DCO/DML condition.

13.4 Impact Assessment Methodology

13.4.1 Policy, Legislation and Guidance

13.4.1.1 National Policy Statements

21. The assessment of potential impacts upon shipping and navigation has been made with specific reference to the relevant NPS. These are the principal decision making documents for Nationally Significant Infrastructure Projects (NSIPs). Those relevant to SEP and DEP are:

- The Overarching NPS for Energy (EN-1) (Department of Energy and Climate Change (DECC) 2011).
- The NPS for Renewable Energy Infrastructure (EN-3) (Department of Energy and Climate Change (DECC) 2011) is the NPS of most relevance to shipping and navigation.
- The NPS for Ports (Department for Transport, 2012) also provides relevant information.

22. The specific assessment requirements for shipping and navigation, as detailed in the NPS, are summarised in **Table 13-4** together with an indication of the section of the ES chapter where each is addressed.

23. It is noted that the NPS for Renewable Energy Infrastructure (EN-3) is in the process of being revised. Draft versions were published for consultation in September 2021 (Department for Business Energy and Industrial Strategy (BEIS), 2021). A review of the draft versions has been undertaken in the context of this ES chapter. No new requirements applicable to shipping and navigation were identified within the draft EN-3 document (BEIS, 2021).

Table 13-4: NPS Assessment Requirements

NPS Requirement	NPS Reference	Section Reference
EN-3 NPS for Renewable Energy Infrastructure		
There may be constraints imposed on the siting or design of offshore wind farms because of restrictions resulting from the presence of other offshore infrastructure and activities.	Section 2.6, paragraph 2.6.35	**Chapter 3 Site Selection and Assessment of Alternatives** (document reference 6.1.3) provides the rationale for the location of the SEP and DEP offshore sites, infield cables and proposed offshore export cable corridor, which includes consideration of constraints associated with shipping activities.
Applicants should establish stakeholder engagement with interested parties in the navigation sector early in the development phase of the proposed offshore wind farm and this should continue throughout the life of the development including during the construction, operation and decommissioning phases. Such engagement should be taken to ensure that solutions are sought that allow offshore wind farms and navigation uses of the sea to successfully co-exist.	Section 2.6, paragraph 2.6.153	Consultation with stakeholders including regular operators is being undertaken by The Applicant, consultation responses received to date are shown in. **Table 13-1.**

Assessment should be underpinned by consultation with the MMO, MCA, the relevant General Lighthouse Authority, the relevant industry bodies (both national and local) and any representatives of recreational users of the sea, such as the RYA, who may be affected.	Section 2.6, paragraph 2.6.154	Consultation with stakeholders including regular operators is being undertaken by The Applicant, consultation responses received to date are shown in **Table 13-1.**
Information on internationally recognised sea lanes is publicly available and this should be considered by applicants prior to undertaking assessments. The assessment should include reference to any relevant, publicly available data available on the Maritime Database.	Section 2.6, paragraph 2.6.155	There are no IMO routeing measures in proximity to the wind farm sites or the offshore export cable corridor. The nearest is approximately 30nm north west of the wind farm sites. Main routes are identified in **Section 13.4** and **Appendix 13.1 Navigation Risk Assessment.**
Applicants should undertake a NRA in accordance with relevant Government guidance prepared in consultation with the MCA and the other navigation stakeholders. The navigation risk assessment will for example necessitate: ● a survey of vessels in the vicinity of the proposed wind farm; ● a full NRA of the likely impact of the wind farm on navigation in the immediate area of the wind farm in accordance with the relevant marine guidance; and ● cumulative and in-combination risks associated with the development and other developments (including other wind farms) in the same area of sea.	Section 2.6, paragraph 2.6.156 and 157	The NRA is found in **Appendix 13.1 Navigation Risk Assessment** which is fully compliant with relevant guidance and has been developed in consultation with the MCA and other stakeholders.
Where there is a possibility that safety zones will be sought around offshore infrastructure, potential effects should be included in the assessment on navigation and shipping. Where the precise extents of potential safety zones are unknown, a realistic worst-case scenario should be assessed. Applicants should consult the MCA and refer to the Government guidance on safety zones.	Section 2.6, paragraph 2.6.158 and 159	Safety zones that are expected to be applied for are detailed in **Chapter 4 Project Description** (document reference 6.1.4).
The potential effect on recreational craft, such as yachts, should be considered in any assessment.	Section 2.6, paragraph 2.6.160	Assessment of recreational craft is located within **Section 13.5**.

The Infrastructure Planning Committee (IPC) should not grant development consent in relation to the construction or extension of an offshore wind farm if it considers that interference with the use of recognised sea lanes essential to international navigation is likely to be caused by the development. The use of recognised sea lanes essential to international navigation means: (a) anything that constitutes the use of such a sea lane for the purposes of article 60(7) of the United Nations Convention on the Law of the Sea 1982; or (b) any use of waters in the territorial sea adjacent to Great Britain that would fall within paragraph (a) if the waters were in a Renewable Energy Zone (REZ).	Section 2.6, paragraph 2.6.161	An assessment of impact to existing shipping routes has been undertaken in **Section 13.6** and is further detailed within the **Appendix 13.1 Navigation Risk Assessment.**
The IPC should be satisfied that the site selection has been made with a view to avoiding or minimising disruption or economic loss to the shipping and navigation industries with particular regard to approaches to ports and to strategic routes essential to regional, national and international trade, lifeline ferries and recreational users of the sea	Section 2.6, paragraph 2.6.162	The process of site selection is detailed within **Chapter 3 Site Selection and Assessment of Alternatives** (document reference 6.1.3) which includes avoiding existing shipping lanes and areas of high shipping density. Increases in journey distances along main routes in vicinity of the Project are assessed in **Table 18.1** of **Appendix 13.1 Navigation Risk Assessment.**
Where a proposed development is likely to affect major commercial navigation routes, for instance by causing appreciably longer transit times, the IPC should give these adverse effects substantial weight in its decision making.	Section 2.6, paragraph 2.6.162	Increases in journey distances along main routes in vicinity of the Project are assessed in **Table 18.1** of **Appendix 13.1 Navigation Risk Assessment.** A maximum change of 4% was identified.
Where a proposed offshore wind farm is likely to affect less strategically important shipping routes, a pragmatic approach should be employed by the IPC. For example, vessels usually tend to transit point to point routes between ports (regional, national and international). Many of these routes are important to the shipping and ports industry as is their contribution to the UK economy. In such circumstances the IPC should expect the	Section 2.6, paragraph 2.6.163	Increases in journey distances along main routes in vicinity of the Project are assessed in **Table 18.1** of **Appendix 13.1 Navigation Risk Assessment.** A maximum change of 4% was identified.

applicant to minimise negative impacts to as low as reasonably practicable (ALARP).		
A detailed Search and Rescue Response Assessment should be undertaken prior to commencement of construction should consent for the offshore wind farm be granted. This assessment could be secured by a requirement to any consent. However, where there are significant concerns over the frequency or the consequences of such incidents, a full assessment may be required before the application can be determined.	Section 2.6, paragraph 2.6.164	Historic incident rates are assessed within **Appendix 13.1 Navigation Risk Assessment.** An ERCoP will be drafted and agreed in consultation with the MCA prior to the commencement of construction activities (**Section 13.3.3**).
The IPC should not consent applications which pose unacceptable risks to navigational safety after all possible mitigation measures have been considered.	Section 2.6, paragraph 2.6.165	The impact assessment in **Section 13.5** details mitigation and the resulting residual impacts. All hazards identified within **Appendix 13.1 Navigation Risk Assessment** were assessed to be ALARP or lower with the identified mitigation.
The IPC should be satisfied that the scheme has been designed to minimise the effects on recreational craft and that appropriate mitigation measures, such as buffer areas, are built into applications to allow for recreational use outside of commercial shipping routes.	Section 2.6, paragraph 2.6.166	Impacts to recreational craft are assessed in **Section 13.5**. Recreational activity is highest to the south of the project close to shore.
Providing proposed schemes have been carefully designed by the applicants, and that the necessary consultation with the MCA and the other navigation stakeholders listed above has been undertaken at an early stage, mitigation measures may be possible to negate or reduce effects on navigation to a level sufficient to enable the IPC to grant consent.	Section 2.6, paragraph 2.6.167	MCA consultation is detailed in **Table 13-1** and will continue post application.
The IPC should, in determining whether to grant consent for the construction or extension of an offshore wind farm, and what requirements to include in such a consent, have regard to the extent and nature of any obstruction of or danger to navigation which (without amounting to interference with the use of such sea lanes) is likely to be caused by the development.	Section 2.6, paragraph 2.6.168	Impacts to all shipping and navigation receptors are assessed in **Section 13.5**.
In considering what interference, obstruction or danger to navigation and shipping is likely and its extent and nature, the IPC should have	Section 2.6, paragraph 2.6.169	Impacts to all shipping and navigation receptors are assessed

regard to the likely overall effect of the development in question and to any cumulative effects of other relevant proposed, consented and operational offshore wind farms.		in **Section 13.5**. Cumulative impacts are assessed in **Section 13.6**.
Mitigation measures will include site configuration, lighting and marking of projects to take account of any requirements of the General Lighthouse Authority and also the provision of an acceptable Active Safety Management System.	Section 2.6, paragraph 2.6.174	Embedded mitigation measures are listed within **Section 13.3.3** and additional mitigation measures are detailed within **Section 13.5.**
NPS for Ports		
Shipping will continue to provide the only effective way to move the vast majority of freight in and out of the UK, and the provision of sufficient sea port capacity will remain an essential element in ensuring sustainable growth in the UK economy.	Section 3.1, paragraph 3.1.4	Nearby ports are identified in **Section 13.4**. **Section 13.5** assesses associated vessel movements.
Demand for port capacity to service manufacture, operation and maintenance of offshore wind farms will be substantial, especially in the short term in support of the 'Round 3' offshore developments. To some extent, capacity provided for by container terminal consents may help to contribute, on an interim basis, to meeting this demand. Because of the Government's renewables targets and in light of the policies set out in the Renewable Energy NPS (EN-3), there is a strong public interest in enabling ports to service these developments.	Section 3.4, paragraph 3.4.10	Nearby ports are identified in **Section 13.4**. **Section 13.5** assesses associated vessel movements. **Chapter 27 Socio-Economics and Tourism** considers socio economic effects on ports.

13.4.1.2 Other

24. In addition to those above, there are a number of pieces of guidance applicable to the shipping and navigation assessment. These include:

- MGN 654 (Merchant and Fishing) Safety of Navigation: Offshore Renewable Energy Installations (OREIs) – Guidance on United Kingdom (UK) Navigational Practice, Safety and Emergency Response (MCA, 2021);
- MGN 372 (Merchant and Fishing) OREIs: Guidance to Mariners Operating in the Vicinity of UK OREIs (MCA, 2008);
- Methodology for Assessing the Marine Navigational Safety & Emergency Response Risks of OREI (MCA, 2021);
- Revised Guidelines for FSA for use in the Rule-Making Process IMO, 2018);
- The IALA Recommendation G 1162 on The Marking of Man-Made Offshore Structures (IALA, 2022);
- The RYA's Position on Offshore Renewable Energy Developments: Paper 1 (of 4) – Wind Energy (RYA, 2019);

- Standard Marking Schedule for Offshore Installations (DECC, 2011a); and
- HM Government (2014) East Inshore and East Offshore Marine Plans.

25. Further detail is provided in **Chapter 2 Policy and Legislative Context** (document reference 6.1.2).

13.4.2 Data and Information Sources

26. Data sources used to inform the assessment are listed in **Table 13-5** and reflect those gathered and analysed as part of the NRA (**Appendix 13.1 Navigation Risk Assessment**).

Table 13-5: Available Data and Information Sources

Data set	Spatial coverage	Year	Notes
Vessel Traffic Survey	Study Area	2020	14 days of AIS, radar, and visual observation data collected during July and August of 2020
	Study Area	2021	14 days of AIS, radar and visual observation data collected during January and February 2021
Vessel Traffic (AIS data)	Study Area	2019	12 months of AIS data covering the entirety of 2019
	Study Area	2020	14 days of AIS, radar, and visual observation data collected during July /August 2020
Maritime incidents	Study Area	2000-2019	MAIB marine accidents database. At UK CoS request (**Appendix 13.1 Navigation Risk Assessment**), an additional ten years of MAIB incident data covering 2000-2009 has been considered in addition to 2010-2019 data to bring the total up to 20 years. However, it should be considered that the 2000-2009 data precedes key features of the area (notably the operational wind farms), and, therefore, the most recent ten years remains the focus of the analysis

Data set	Spatial coverage	Year	Notes
	Study Area	2008–2017	Royal National Lifeboat Institution (RNLI) incident data
	Study Area	2016-2018	Department for Transport (DfT) UK civilian SAR helicopter taskings
Marine Aggregate Dredging Features	Study Area	Crown Estate, Cefas and MMO layers. Downloaded 2020.	Marine aggregate dredging areas (licenced and active)
	Study Area	Published 2009 (downloaded 2020)	Transit routes, BMAPA
Recreational vessel traffic and facilities	Study Area	2018 (downloaded 2020)	RYA Coastal Atlas (RYA, 2018)
Other Navigational Features	Study Area	2020	United Kingdom Hydrographic Office (UKHO) Admiralty Charts
Weather Data	Study Area	2019	SEP & DEP, UK Metocean Summary, Doc Ref: MAD, CDEZ 11.10.2019, Metocean ME2019–144 (The Applicant 2019)
	Study Area	2016	Admiralty Sailing Directions NP54 North Sea West
	Study Area	2020	UKHO Admiralty Charts, tidal flow data

13.4.3 Impact Assessment Methodology

27. **Chapter 5 EIA Methodology** (document reference 6.1.5)provides a summary of the general impact assessment methodology applied to SEP and DEP. The following sections confirm the methodology used to assess the potential impacts on shipping and navigation.

28. The assessment of impacts to shipping and navigation has focused on establishing potential for overlaps, interactions and the potential for conflict between activities and through consultation with the relevant stakeholders as discussed in **Section 13.1**.

13.4.3.1 Definitions

29. For each effect, the assessment identifies receptors that are exposed to that effect and implements a systematic approach to understanding the impact pathways and the level of impacts on given receptors. The definitions, frequency and severity of consequence (broadly similar to sensitivity and magnitude as described in **Chapter 5 EIA Methodology** (document reference 6.1.5)), for the purpose of the shipping navigation assessment are provided in **Table 13-6** and **Table 13-7**, and align with FSA criteria where impacts are considered acceptable where they are assessed to be ALARP.

Table 13-6: Definition of Frequency of Occurrence on Shipping and Navigation Receptor

Frequency (& ranking)	Definition
Frequent (5)	Yearly
Reasonably probable (4)	1 per 1–10 years
Remote (3)	1 per 10–100 years
Extremely unlikely (2)	1 per 100–10,000 years
Negligible (1)	< 1 occurrence per 10,000 years

Table 13-7: Definition of Severity of Consequence on Shipping and Navigation Receptor

Severity of Consequence (& ranking)	Definition			
	People	Property	Environment	Business
Major (5)	More than one fatality.	Total loss of property.	Tier 3 national assistance required.	International reputational impacts.
Serious (4)	Multiple serious injury or single fatality.	Damage resulting in critical impact on operations.	Tier 2 regional assistance required.	National reputation impacts.
Moderate (3)	Multiple minor or single serious injury.	Damage not critical to operations.	Tier 2 limited external assistance required.	Local reputation impacts.
Minor (2)	Slight injury(s).	Minor damage to property i.e. superficial damage.	Tier 1 local assistance required.	Minor reputational impact – limited to users.
Negligible (1)	No perceptible impact.	No perceptible impact.	No perceptible impact.	No perceptible impact.

13.4.3.2 Impact Significance

30. In basic terms, the potential significance of an impact is a function of the sensitivity of the receptor and the magnitude of the effect (see **Chapter 5 EIA Methodology** (document reference 6.1.5) for further details). For the shipping and navigation assessment, the terms frequency and severity of consequence (which are used within the FSA) are used in a comparable way. The determination of significance is guided by the use of a matrix, as shown in **Table 13-8**. Definitions of each level of significance in EIA terms are provided in **Table 13-9**.

31. Potential impacts identified within the assessment as major are regarded as significant in terms of the EIA regulations. Impacts identified within the assessment as moderate are regarded as significant in terms of EIA regulations unless assessed to be ALARP within the FSA. Appropriate mitigation has been identified, where possible, in consultation with the regulatory authorities and relevant stakeholders. The aim of mitigation measures is to avoid or reduce the overall impact in order to determine a residual impact upon a given receptor and reduce impact significance.

Table 13-8: 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 13-9: Definition of Impact Significance

	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.
	Intermediate change in receptor condition, which are likely to be important considerations at a local level.
	Small change in receptor condition, which may be raised as local issues but are unlikely to be important in the decision-making process.
	No discernible change in receptor condition.

13.4.4 Cumulative Impact Assessment Methodology

32. The CIA considers other plans, projects and activities that may impact cumulatively with SEP and DEP. As part of this process, the assessment considers which of the residual impacts the potential to contribute to a cumulative impact, the data and information available to inform the cumulative assessment and the resulting confidence in any assessment that is undertaken. **Chapter 5 EIA Methodology** (document reference 6.1.5) provides further details of the general framework and approach to the CIA.

33. Projects and plans within 100nm of SEP and DEP have been screened and characterised (based on proximity and effect on routeing) as part of the NRA process (**Appendix 13.1 Navigation Risk Assessment**) so that developments which may increase impacts to shipping and navigation receptors when considered alongside the Project have been considered as appropriate. Further detail on potential cumulative impacts is also provided in **Section 13.6**.

13.4.5 Transboundary Impact Assessment Methodology

34. The transboundary assessment considers the potential for transboundary effects to occur on shipping and navigation receptors as a result of SEP and DEP; either those that might arise within the EEZ of European Economic Area (EEA) states or arising on the interests of EEA states e.g. a non UK fishing vessel. **Chapter 5 EIA Methodology** (document reference 6.1.5) provides further details of the general framework and approach to the assessment of transboundary effects.

35. For shipping and navigation, the potential for transboundary effects has been scoped in given that the main destinations of cargo vessels include European ports (see **Section 13.7**).

13.4.6 Assumptions and Limitations

36. No overarching assumptions or limitations have been identified that apply to the assessment for shipping and navigation which has been informed by the NRA and undertaken based on information available and responses received at the time of preparation. The NRA and FSA were undertaken based on a conservative scenario, noting that the layout will be finalised post consent. Where routine assumptions have been made in the course of undertaking the assessment, these are noted in **Sections 13.5** to **13.7**.

37. The full baseline characterisation is provided in the NRA (**Appendix 13.1 Navigation Risk Assessment**) and summarised here.

13.4.7 Navigational Features

13.4.7.1 Offshore wind infrastructure

38. There are three operational offshore wind farms (OWF) within the study area i.e. the existing Sheringham Shoal and Dudgeon OWFs (SOW and DOW) and Race Bank. Triton Knoll OWF, which is under construction, is also within the study area.

13.4.7.2 Oil and gas infrastructure

39. Six gas platforms (three operational and three undergoing decommissioning) are located within the study area, with the Perenco-operated Waveney gas platform the closest, being approximately 0.55km from the northern boundary of the DEP North wind farm site. It is also understood that the Blythe platform (operator: Independent Oil and Gas) will be established in 2021. There are no active wells located within the SEP and DEP wind farm sites but a number of wells and pipelines are located within the study area. Further details regarding oil and gas infrastructure are provided in **Chapter 16 Petroleum Industry and Other Marine Users** (document reference 6.1.16).

13.4.7.3 Aids to Navigation (AtoN)

40. AtoN within the study area are primarily associated with the peripheral turbine lighting at the operational winds farms as well as those that mark the shallow banks. There are also cardinal buoys marking Triton Knoll OWF.

13.4.7.4 Submarine cables

41. There are 12 submarine cables within the study area. The other charted cables within the shipping and navigation study area are all disused.

13.4.7.5 Marine Aggregate Dredging and Disposal Grounds

42. The nearest licenced areas for aggregate production are the Outer Dowsing areas (515/1 and 515/2), licenced to Westminster Gravels Ltd and located to the north and west of SEP and DEP.

43. There is a closed disposal site (HU147) within the Dudgeon OWF boundary as well as the closed Dudgeon disposal site (HU145) to the north west of the study area. To the east of the study areas is a disposal site associated with the Race Bank OWF export cable corridor (HU126).BMAPA transit routes are found within the study area. AIS analysis over 2019 (**Section 13.4.2**) shows six marine aggregate dredger transits were recorded to intersect the wind farm sites, including transit to the Outer Dowsing aggregate dredging areas, but with the majority passing outside of the SEP and DEP boundaries.

13.4.7.6 Wrecks

44. A total of 172 charted wrecks are located within the study area, with nine of these located within the SEP wind farm site and three within the DEP wind farm sites. See **Chapter 14 Offshore Archaeology and Cultural Heritage** (document reference 6.1.14) for further details.

13.4.7.7 Navigation Control Measures

45. There are no IMO routeing measures in proximity to the SEP or DEP wind farm sites or the offshore cable corridors. The nearest are those associated with the Humber (the Rosse Reach and Sea Reach Traffic Separation Scheme (TSS) lanes), which are located approximately 30nm north west of the wind farm sites.

46. There are no Marine Environmental High Risk Areas (MEHRA) within the study area.

13.4.7.8 Ports

47. Cromer is within the study area, with a number of other ports along the coast but outside of the study area, including Blakeney Harbour Boston, Great Yarmouth, Grimsby and Immingham, King's Lynn and Sutton Bridge. Of these, Grimsby and Immingham port are the busiest based on vessel arrival data.

13.4.7.9 Anchorages

48. There is one charted anchorage within the study area found south of SEP wind farm site offshore of Cromer. Vessel anchor activity is discussed further in **Section 13.4.10**

13.4.7.10 Military Practice Exercise Areas

49. There are no Military Practice and Exercise Areas (PEXA)s in the study area. Military vessel activity is discussed in **Section 13.4.10** .

13.4.8 Meteorological and Oceanographic Data

50. Wind, wave, tidal and visibility data have been analysed within the NRA (**Section 14.4.2** of **Appendix 13.1 Navigation Risk Assessment**), given the use of this data within collision and allision risk modelling, and is further detailed in **Chapter 6 Marine Geology, Oceanography and Physical Processes** (document reference 6.1.6).

13.4.9 Maritime Incidents

51. MAIB data (**Section 13.4.2**) has been reviewed within the NRA (**Appendix 13.1 Navigation Risk Assessment**) to establish the incident history within the study area.
52. At UK CoS request (**Appendix 13.1 Navigation Risk Assessment**), an additional ten years of MAIB incident data covering 2000-2009 has also been considered in addition to 2010-2019 data to bring the total up to 20 years. However, it should be considered that the 2000-2009 data precedes key features of the area (notably the operational wind farms), and, therefore, the most recent ten years remains the focus of the analysis.
53. There are a number of incidents recorded, largely attributed to 'mechanical failure', 'hazardous incident' or 'accident to person' classifications. One collision was recorded between a passenger vessel and commercial workboat in the area between the SEP and DEP wind farm sites between 2010 and 2019
54. RNLI responses (**Section 13.4.2**) were predominantly coastal **Appendix 13.1 Navigation Risk Assessment** and largely attributed to machinery failure and persons in danger. In terms of emergency response coordination, the following are relevant to SEP and DEP:

- SAR – Given the UK base locations, Humberside is the most likely to respond to any incident requiring SAR helicopter services.
- RNLI – The RNLI have a 100nm operational limit and a number of stations associated with the 'East' division could respond to an incident within the study area.
- Her Majesty's Coastguard (HMCG) – The East of England Region encompasses the study area with the closest Coastguard Operation Centre (CGOC) located in Bridlington, in East Yorkshire.
- Assistance from offshore operators – All vessels under IMO obligations, set out in SOLAS (IMO, 1974) as amended, are required to render assistance to any person or vessel in distress if safely able to do so.

13.4.10 Vessel Movements

13.4.10.1 Traffic Counts

55. Three primary traffic data sets, two 14 day surveys and 12 months AIS analysis (**Section 13.4.2**), alongside consultation responses, have been analysed to establish a comprehensive understanding of exiting vessel movements within the study area as part of the NRA (and to inform the EIA). The data approach has been agreed with the MCA and TH through consultation (**Section 13.1**). Full details are provided in the NRA with supporting figures (**Appendix 13.1 Navigation Risk Assessment**) and summarised here. As the study area (10nm buffer around the wind farm sites) encompasses the 2nm buffer around the cable corridors and there is little differentiation between vessel movements within the two buffers, the cable corridor study area is not described separately.

13.4.10.2 Survey data

56. Survey data shows that the main vessel types within the study area were cargo, tankers, oil and gas support vessels and wind farm support vessels. Aggregate dredgers, passenger, fishing and recreational vessels were also recorded.
57. The regular cargo vessels operating within the study area included Roll On Roll Off vessels operated by Cobelfret Ferries, DFDS Seaways, P&O Ferries and Stena Line. Main destinations included Humber-based ports such as Immingham (UK) and Hull (UK), and European ports such as Rotterdam (Netherlands) and Zeebrugge (Belgium).The main destinations recorded for tankers within the study area were the Humber and mainland Europe. Smaller tankers (and cargo vessels) typically used inshore routes, south of Sheringham Shoal, while the larger tankers (and cargo vessels) transited further offshore between the SEP and DEP wind farm sites.
58. Oil and gas traffic was largely in the eastern half of the study area, intersecting or within close proximity to the DEP wind farm sites. Traffic was typically associated with the Waveney, West Sole or Pickerill and Hewett fields.
59. Wind farm support vessels within the study area were typically operating at the Dudgeon, Sheringham Shoal, and Race Bank OWFs.

60. Fishing vessels were recorded on passage through the study area; and also actively engaged in fishing, particularly inshore off Cromer and to the north of the SEP wind farm site.

61. Recreational vessels were predominantly seen transiting along the coast inshore of the SEP wind farm site in the summer months.

62. An average of two dredgers per day were recorded within the shipping and navigation study area over the 28 days survey data; one per day was recorded in the DEP study area and two per day in the SEP study area. The majority of aggregate were observed passing to the south of SEP and aligned with the corresponding BMAPA routes.

13.4.10.3 Long term AIS analysis

63. Long term AIS data (2019 data) has been analysed to validate survey data and to identify any seasonal variations not reflected within the short term (28 day) survey data. In addition, the 2019 data has been checked against 28-day survey data to identify and account for any potential effect the COVID-19 pandemic may have had on shipping activity recorded by the survey. Analysis within the NRA showed annual AIS data in the study area to have comparable trends to the survey data results in terms of vessel type and numbers as well as routeing.

64. The main types of vessels detected within the DEP shipping and navigation study area during 2019 were cargo vessels (42%), tankers (22%), and O&G vessels (16%). Similarly, the main types of vessels detected during the 2020 summer survey within the DEP wind farm site were cargo vessels (39%), tankers (20%), and O&G vessels (15%). Smaller but significant numbers of passenger vessels were also detected during both periods. Throughout the winter survey period in the DEP shipping and navigation study area, the main vessel types recorded were also cargo vessels (including passenger (42%), tankers (22%), and O&G vessels (18%).

65. The main types of vessels detected within the SEP shipping and navigation study area during 2019 were cargo vessels (53%), tankers (18%), and O&G vessels (6%). The main types of vessels detected during the 2020 summer survey within the SEP wind farm site were cargo vessels (48%), tankers (15%), wind farm vessels (13%), and O&G vessels (7%). Throughout the winter survey study period in the SEP shipping and navigation study area the main vessel types were also cargo vessels (57%), tankers (18%), and wind farm vessels (6%). Passenger vessels and O&G vessels comprised 6% of vessels. It is noted that wind farm support vessels, which accounted for a relatively large proportion of vessels, was due to operational traffic associated with the existing Sheringham project.

13.4.10.4 Routeing

66. Survey data, AIS data (2019), as well as operator timetables, highlight 13 existing main routes (as defined in MGN 654 (MCA, 2021)) within the study area as shown in **Plate 13-1**.

67. Of the 13 routes, four intersect the DEP wind farm site and ten intersect the cable corridor. Two routes overlap the SEP wind farm site boundary.

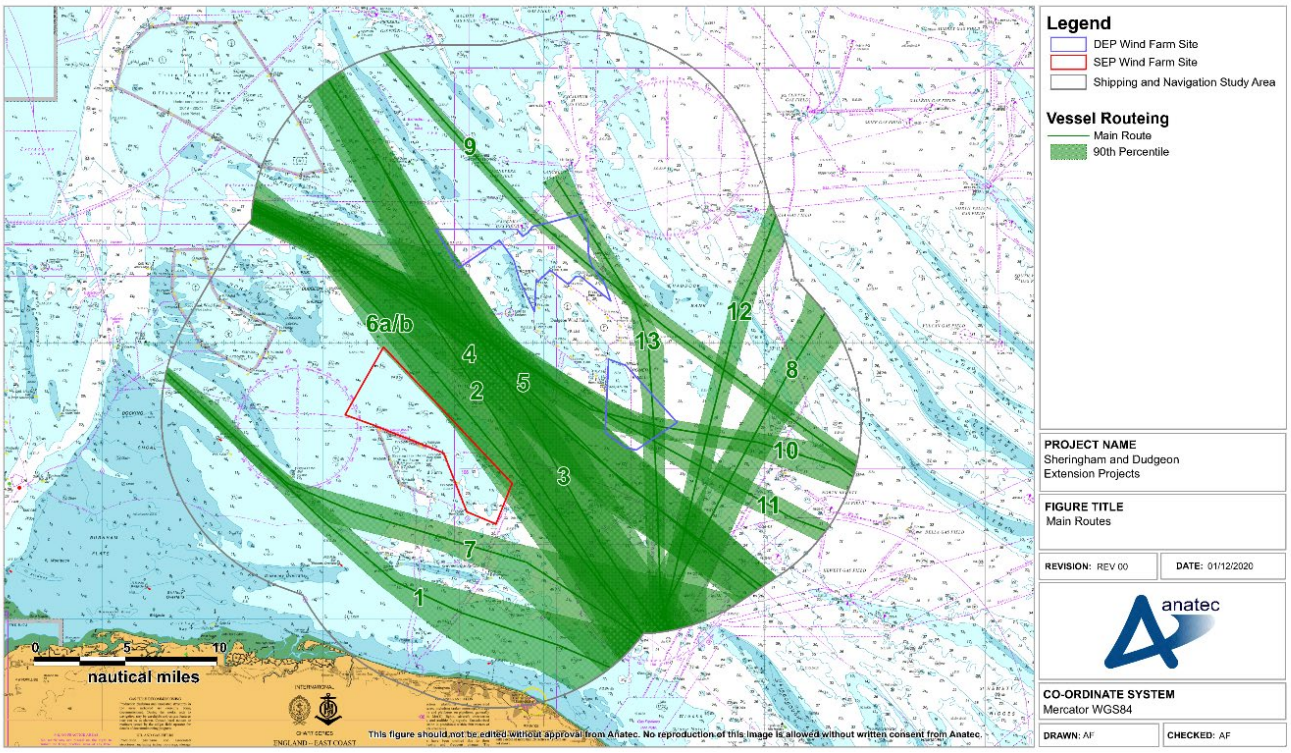

Plate 13-1: Main Routes within the Study Area

Table 13-10: Main Routes within the Study Area

Route	Terminus Ports	Vessels Per Day	Intersection		
			DEP wind farm site	SEP wind farm site	Cable corridor
1	Humber (UK) / Rotterdam (Netherlands)	20	No	No	Yes
2	Humber (UK) / Rotterdam (Netherlands)	13	No	No	Yes
3	Tees (UK) / Zeebrugge (Belgium)	12	No	No	Yes
4	Humber (UK) / Rotterdam (Netherlands)	12	No	No	Yes
5	Tees (UK) / Rotterdam (Netherlands)	4	No	No	Yes
6a	Hull (UK) / Zeebrugge (Belgium)	2	No	No	Yes
6b	Hull (UK) / Rotterdam (Netherlands)	2	No	No	Yes
7	Humber (UK) / Rotterdam (Netherlands)	3	No	No	Yes

Route	Terminus Ports	Vessels Per Day	Intersection		
			DEP wind farm site	SEP wind farm site	Cable corridor
8	Great Yarmouth (UK) / Lincolnshire Offshore Gas Gathering System (LOGGS) (UK waters)	2	No	No	Yes
9	Tees (UK) / Rotterdam (Netherlands)	1	Yes	No	No
10	Humber (UK) / Rotterdam (Netherlands)	< 1	Yes	No	No
11	Humber (UK) / Rotterdam (Netherlands)	< 1	Yes	No	No
12	Great Yarmouth (UK) / Clipper (UK waters)	< 1	No	No	Yes
13	Great Yarmouth (UK) / Lancelot (UK waters)	< 1	Yes	No	No

68. Adverse weather (wind, wave, and tidal conditions as well as reduced visibility due to fog) can hinder a vessel's standard route. AIS data, as well as consultation responses highlight that the DFDS Newcastle / Amsterdam route, which is not within the study area, may utilise the "Beach Route" during periods of adverse weather, and that this route is located within the study area, transiting between SOW and DOW.

13.4.11 Future Trends

69. The deployment of offshore wind in the UK is set to continue and there is an existing pipeline of projects in planning and further expansion expected with a target of 40GW offshore wind farm capacity by 2030. Offshore wind deployment in the southern North Sea and wider North Sea is likely to increase over the next 10 to 20 years.

70. Traffic trends are difficult to predict but the following potential increases are considered representative of future trends over the lifespan of SEP and DEP:

- 10-20% increase in commercial traffic;
- 10% increase in commercial fishing vessel transit; and
- 10% increase in recreational activity.

13.5 Potential Impacts

71. This section uses the navigational safety assessments within the NRA and outcomes of the FSA found within **Appendix 13.1 Navigation Risk Assessment**. The FSA is closely linked to the significance of impacts in EIA terms (**Table 13-9**) which are detailed below for each shipping and navigation receptor. The FSA results are presented alongside the EIA significance assessment.

72. The impacts to be assessed have been identified via the Scoping Report and Scoping Opinion (**Section 13.1**).

73. Impacts to communications including (VHF, AIS, Global Positioning System (GPS), Navigational Telex and radar) from interference (including that from noise and electromagnetic effects) are not assessed, following detailed analysis within the NRA (**Appendix 13.1 Navigation Risk Assessment**) which has highlighted that there are no anticipated effects during the lifecycle of SEP and DEP, with consideration of other plans and projects, both in isolation and where SEP and DEP are both constructed.

13.5.1 Potential Impacts during Construction

13.5.1.1 Impact 1: Displacement of Activities

13.5.1.1.1 SEP or DEP in Isolation

74. Existing traffic within the study area, as identified in **Section 13.4.10**, could be displaced during construction due to the presence of buoyed construction areas (including 500m rolling active safety zones around fixed structures where work is being undertaken), construction vessels and partially completed or pre-commissioned structures. While construction areas will be defined post consent it is assumed that the construction area could extend 500m beyond the SEP and DEP wind farm site boundaries.

75. Installation of cables may also temporarily displace traffic. However, given that operations will be effectively communicated, managed with minimum safe passing distances (likely 1,000m), and will be both temporary and small in scale, there are not expected to be any identifiable impacts in terms of navigational safety of displacement. As such the assessment below focuses on construction within the SEP and DEP wind farm site boundaries.

76. In order to manage displacement impacts, The Applicant will communicate information to ensure third party vessels are aware of construction activities and display information on charts (considered embedded mitigation). Further, vessel traffic will be monitored throughout the construction period, with a yearly report to provide a means of ensuring mitigation is effective. An AtoN Management Plan covering the construction period will also be agreed.

77. SEP and DEP are largely outside the highest density traffic areas within the study area (**Plate 13-2**), however vessels, including commercial (passenger, cargo and tanker), oil and gas, wind farm, aggregate dredger, fishing, and recreation are recorded within the SEP and DEP wind farm boundaries and could be displaced by construction activities.

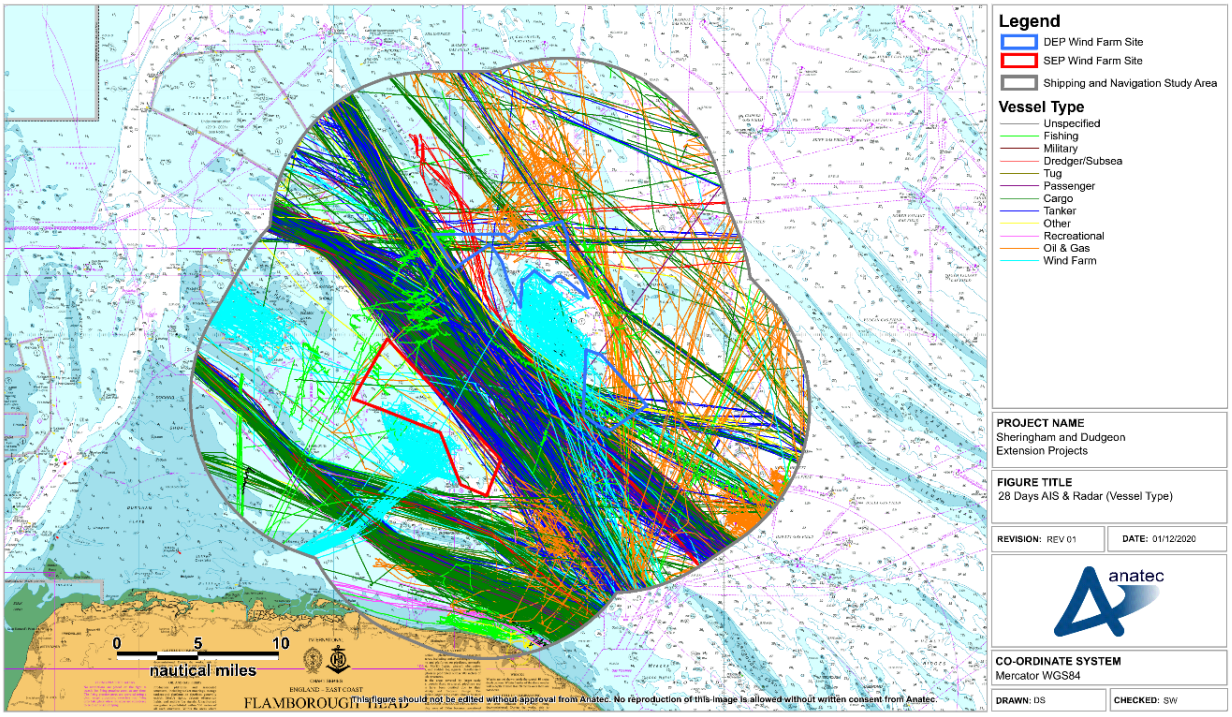

Plate 13-2: Vessel Traffic Survey Data

78. Outside of safety zones vessels are able to access construction areas, however, experience from existing OWF projects highlights that commercial vessels would avoid construction areas, whereas smaller and recreation vessels may enter construction areas. Effects for each receptor (main vessel types identified in **Section 13.4**) are outlined in the following sections (with differentiation between SEP and DEP highlighted where differences are identified).

13.5.1.1.2 Commercial Vessels

79. Commercial vessels (including cargo, tanker and passenger) were the vessel type most frequently recorded within the study area. As noted above, these vessels are most likely to avoid construction areas. There are, however, limited commercial vessels within the SEP wind farm site boundary that would be particularly exposed to any displacement effects, with vessels largely passing between the SEP and DEP wind farm site boundaries out with a 500m buffer. More notable are interactions with the DEP wind farm site boundaries, with some cargo vessels intersecting DEP South in a northwest to southeast direction, and DEP North in a west to east direction..

13.5.1.1.3 *Oil and Gas Vessels*

80. Oil and gas vessels are less exposed to displacement effects at SEP given the low counts of vessels recorded inside the wind farm boundary or that pass close to it. For DEP, construction in the DEP South wind farm site would cause displacement to oil and gas vessels in transit as well as those that may access the planned Blythe platform and associated subsea infrastructure (including the Elgood subsea well and pipeline tie-back). In the DEP North wind farm site, displacement effects would be to oil and gas vessels in transit as well as those associated with the Waveney platform. The location of the Waveney platform close to the northern boundary of DEP North may cause restricted access to the platform during DEP construction. Impacts to oil and gas operations are further assessed in **Chapter 16 Petroleum Industry and Other Marine Users** (document reference 6.1.16), and **Appendix 16.1 Vessel Access Study**.

13.5.1.1.4 Wind Farm Support Vessels

81. Wind farm support vessels in the study area are mainly those supporting the existing SOW and DOW which are mainly located within the operational boundary of those sites. There are also wind farm support vessels in transit within the study area, e.g. transiting to Race Bank OWF. Some displacement of vessels during construction is expected, however, there will be close cooperation and coordination between the existing sites and SEP and DEP.

13.5.1.1.5 Marine Aggregate Dredger Vessels

82. Aggregate dredgers in transit intersect the DEP wind farm site boundaries and to a lesser extent the SEP wind farm site boundary, including vessels transiting to the Outer Dousing aggregate areas. Vessels would be expected to be exposed to some displacement, however the majority of dredger vessels pass outside of the SEP and DEP wind farm site boundaries and would not be exposed to displacement effects.

13.5.1.1.6 Fishing Vessels

83. Fishing vessels within the study area would be displaced by construction activities, however fishing vessels are active in the SEP and DEP wind farm sites in low numbers, with limited use of the wind farm site boundaries for active fishing. It is noted that vessels undertaking active fishing would be exposed to displacement effects over a longer time period than those in transit.

84. Displacement to fishing activity and the associated commercial impacts are further considered in **Chapter 12 Commercial Fisheries** (document reference 6.1.12).

13.5.1.1.7 Recreational Vessels

85. Recreational vessels make up a small proportion of overall vessel activity within the study area and predominantly pass inshore of both the SEP and DEP wind farm site boundaries. Displacement would occur from within the SEP and DEP wind farm site boundaries, although there is low usage of these areas by recreational vessels. For inshore waters which see higher numbers cable laying will cause short term displacement, but this will be effectively communicated to reduce disturbance.

13.5.1.2 Overall Assessment

13.5.1.2.1 SEP or DEP in isolation

86. Displacement will occur daily, thus at a frequent frequency for all receptors during construction. The severity of consequence is negligible given the level of disturbance and deviations required and when considering the embedded mitigation which is in place to manage and communicate construction activities. The overall displacement assessment in FSA terms (**Appendix 13.1 Navigation Risk Assessment**) is *tolerable* . The impact of displacement is therefore of **moderate adverse** significance in EIA terms for both SEP or DEP in isolation.

13.5.1.2.2 SEP and DEP

87. Should SEP and DEP be constructed concurrently, there would be an increase in construction vessels and disturbance, however, there would be no overlap in construction areas and construction areas would be rolling, coordinated and allow flexible access. The severity of consequence would therefore not measurably increase. Thus potential displacement impacts of SEP and DEP would be the same (**moderate adverse**) as in isolation (**Section 13.5.1.1.1**). Impacts associated with reduced sea room between the SEP and DEP boundary are assessed as operational effects in **Section 13.5.2**.

13.5.1.2.3 Mitigation

88. Relevant additional mitigation includes development of a navigation management plan which will include project vessel procedures to manage crew transfer vessels (including daughter craft) during the construction and operations phase of the project in addition to identifying navigation stakeholders that should be contacted for targeted promulgation of information.

13.5.1.2.4 Residual Impact - SEP or DEP in Isolation

89. The residual impact of Displacement of Activities in the construction phase as a result of SEP or DEP in isolation, although reduced, remains tolerable with additional mitigation and is therefore considered ALARP. In EIA terms the residual impact of displacement is **moderate adverse** for both SEP or DEP in isolation, however, with mitigation the risk is ALARP within the FSA and therefore not significant in EIA terms.

13.5.1.2.5 Residual Impact - SEP and DEP

90. Should SEP and DEP be constructed concurrently, there would be an increase in construction vessels and disturbance, however, there would be no overlap in construction areas and construction areas would be rolling, coordinated and allow flexible access. The duration of the construction phase would also be reduced when compared to the sequential development scenario. The severity of consequence would therefore not measurably increase and the potential displacement impacts of SEP and DEP would be the same (**moderate adverse**) as in isolation (**Section 13.5.1.2.4**) which is not significant in EIA terms.

13.5.1.3 Impact 2: Adverse Weather Routeing

91. Existing traffic routeing within the study area, including adverse weather routes, could be displaced during construction due to the presence of buoyed construction areas (including 500m rolling active safety zones around fixed structures where work is being undertaken), construction vessels and partially completed or pre-commissioned structures. While construction areas will be defined post consent it is assumed that the construction area could extend 500m beyond the SEP and DEP wind farm site boundaries.

92. Installation of cables may also temporarily displace traffic and adverse weather routes. However, given that operations will be effectively communicated, managed with minimum safe passing distances (likely 1,000m), and will be both temporary and small in scale, there are not expected to be any identifiable impacts in terms of navigational safety of displacement.

93. SEP and DEP are largely outside the highest density traffic areas within the study area (**Plate 13-2**), however, commercial vessel (passenger, cargo and tanker) adverse weather routes could be impacted and displaced by SEP and DEP wind farm boundaries and construction activities. Adverse weather includes wind, wave, and tidal conditions as well as reduced visibility due to fog that can hinder a vessel's normal route and/or speed of navigation. Adverse weather routes are defined as significant course adjustments to mitigate vessel movement in adverse weather conditions. When transiting in adverse weather conditions, a vessel is likely to encounter various kinds of weather and tidal phenomena, which may lead to severe roll motions, potentially causing damage to cargo, equipment and/or danger to persons on board. The sensitivity of a vessel to these phenomena will depend on the actual stability parameters, hull geometry, vessel type, vessel size and speed.

94. The presence of offshore structures within or near to any adverse weather routes may prevent the route from being utilised during adverse conditions. Mitigations for vessels include adjusting their heading to position themselves 45° to the wind, altering or delaying sailing times, reducing speed and/or potentially cancelling journeys. However, there is considered to be sufficient sea room between the SEP and DEP wind farm sites to accommodate safe transit including in adverse conditions (**Plate 13-3** and **Appendix 13.1 Navigation Risk Assessment**).

95. DFDS raised during consultation (**Table 13-1**) that their "Beach Route" (a known DFDS adverse weather route) passed within the shipping and navigation study area, however they stated that they do not anticipate any negative effects on the route arising from SEP and DEP. Similarly, P&O as the other key commercial ferry operator in the area, stated they had no concerns associated with navigational safety. This aligned with the output of the Hazard Workshop (**Table 13-1**).

96. Lighting and marking will be defined in consultation with TH as required under the DCO, and this will include consideration of requirements during periods of poor visibility (e.g. sound signals). Under COLREGS (IMO, 1972), vessels are also required to take appropriate measures with regard to determining a safe speed, taking into account various factors including the state of visibility, the state of the wind, sea, and current, as well as the proximity of navigational hazards.

13.5.1.3.1 SEP or DEP in isolation

97. Displacement is considered reasonably probable during adverse weather events, which are infrequent. The severity of consequence is minor given the potential for slight injuries or pollution. The overall displacement assessment in FSA terms (**Appendix 13.1 Navigation Risk Assessment**) is *tolerable with embedded mitigations and ALARP*. The impact of displacement is therefore **moderate adverse** in EIA terms for both SEP or DEP in isolation which is not significant in EIA terms given its assessment as ALARP with embedded mitigation within the FSA.

13.5.1.3.2 SEP and DEP

98. Should SEP and DEP be constructed concurrently, there would be an increase in construction vessels and disturbance compared to the in isolation scenario, however, there would be no overlap in construction areas and construction areas would be rolling, coordinated and allow flexible access. The duration of the construction phase would also be reduced. Further, impacts to adverse weather routeing would not measurably increase in terms of percentage should both projects be developed. The severity of consequence would, therefore, not measurably increase. Thus, potential displacement of vessels transiting adverse weather routes as a result of construction activities for SEP and DEP would be the same (**moderate adverse**) as in isolation (**Section 13.5.1.1.1**). Impacts associated with reduced sea room between the SEP and DEP boundary are assessed as operational effects in **Section 13.5.2**.

13.5.1.3.3 Mitigation

99. General operator consensus during the hazard workshop was that the implementation project vessel procedures would mitigate this concern. A Navigation Management Plan will be developed post consent to mitigate impacts associated with CTVs (including daughter craft) crossing the route between SEP and DEP/Dudgeon OWF during the construction phase and to identify Navigation stakeholders that should be contacted with project vessel movements.

13.5.1.3.4 Residual Impacts - SEP or DEP in isolation

100. The residual impact to adverse weather routeing in the operation phase as a result of SEP and DEP is *Broadly Acceptable with additional mitigation and ALARP.* The residual impact of displacement is therefore reduced to **minor adverse** for both SEP or DEP in isolation which is not significant in EIA terms.

13.5.1.3.5 Residual Impacts - SEP and DEP

101. The residual impact to adverse weather routeing would be the same as SEP or DEP in isolation as impacts to adverse weather routeing would not measurably increase in terms of percentage should both projects be developed.

13.5.1.4 Impact 3: Increased Collision Risk

13.5.1.4.1 SEP or DEP in Isolation

102. Vessel to vessel (third party), and construction vessel to third party vessel collision risk, may be increased by the physical presence of pre-commissioned structures and associated works via the displacement of existing vessel activity and increased vessel numbers associated with construction activities within the study area.

103. Within the study area the highest existing encounter rates are found between the existing SOW and DOW with large volumes of traffic utilising similar passage. Encounters are lowest within the SEP and DEP wind farm site boundaries and flexible access to the wind farm sites will be maintained throughout construction. Given this, and the mitigation that will be in place during construction, collision risk is typically lower during construction than operation and as such collision risk modelling is only considered within the assessment for operational effects (**Section 13.5.2**), with a qualitative assessment made during construction. However, it is noted that at peak development when the maximum Project footprint has been installed, the construction phase collision risk will become that of the operational phase.

104. In order to manage collision risk the Applicant will coordinate and communicate information to ensure third party vessels are aware of construction activities and display information on charts. Vessels will also adhere to COLREGS (IMO, 1972) and SOLAS (1974). Further, vessel traffic and encounters will be monitored throughout the construction period, with a yearly report to provide means of ensuring mitigation is effective. An AtoN Management Plan will also be agreed covering the construction period.

105. Within the study area there is existing operational traffic transiting to the existing Dudgeon and Sheringham Shoal wind farm sites, and as such vessels will largely be familiar with wind farm traffic in the area, noting that similar transit routes to the SEP and DEP wind farm sites by project vessels are likely. Moreover, there has not been any recorded incident within a buoyed construction area of a UK wind farm whereby a third party vessel has collided with a construction vessel.

106. Given the level of displacement as well as existing encounter and collision rates adjacent to and between the SEP and DEP wind farm boundaries, a remote frequency is assigned. The embedded mitigation is tried and tested within the industry, however, given the potential for serious injury should an incident occur, a serious consequence is assigned.

107. In FSA terms, the increase in collision risk for SEP or DEP in isolation (covering the entire project lifecycle) between third party vessels is assessed as being *tolerable* and *broadly acceptable and ALARP* for third party to project vessels, resulting in a **moderate adverse** significance in EIA terms for both SEP or DEP in isolation.

13.5.1.4.2 SEP and DEP

108. Should SEP and DEP be constructed concurrently, the potential collision impacts would be the same (**moderate adverse** in EIA terms) as if they were to be constructed in isolation (**Section 13.5.1.1.1**). This is because there would be no overlap in construction areas and construction areas would be rolling, coordinated and allow flexible access. The severity of consequence would therefore not measurably increase. Impacts associated with reduced sea room between the SEP and DEP boundary are assessed within operational effects in **Section 13.5.2**.

13.5.1.4.3 Mitigation

109. A Navigation Management Plan will be developed which will include project vessel procedures to manage crew transfer vessels (including daughter craft) during the construction and operations phase of the project in addition to identifying navigation stakeholders that should be contacted for targeted promulgation of information.

110. The RYA noted concern during the hazard workshop over the potential for interactions between recreational vessels and project vessels particularly in nearshore areas including port approaches. The RYA also recommended project details and any project vessel movements should be promulgated on a targeted basis to specific recreational clubs and organisations that may be impacted. The Navigation Management Plan will include a list of stakeholders to whom information will be promulgated.

13.5.1.4.4 Residual Impacts - SEP or DEP in isolation

111. The residual impact of Increased Collision Risk in the construction phase as a result of SEP or DEP in isolation, although reduced, remains tolerable with additional mitigation, and ALARP. In EIA terms, the residual impact is **moderate adverse** for both SEP or DEP in isolation, however, with mitigation the risk is ALARP within the FSA and therefore **not significant** in EIA terms.".

13.5.1.4.5 Residual Impacts - SEP and DEP

112. Should SEP and DEP be constructed concurrently, there would be an increase in construction vessels and disturbance, however, there would be no overlap in construction areas and construction areas would be rolling, coordinated and allow flexible access. The duration of the construction phase would also be reduced. The severity of consequence would therefore not measurably increase, and the potential collision risk impacts of SEP and DEP would be the same (**moderate adverse**) as in isolation (**Section 13.5.1.2.4**) which is not significant in EIA terms.

13.5.1.5 Impact 4: Increased Allision Risk

13.5.1.5.1 SEP or DEP in Isolation

113. The physical presence of pre-commissioned structures would create a vessel to structure allision risk (both vessels under power and drifting) for a vessel navigating within the study area. As per collision risk, allision risk is less likely during construction than operation up to the point of the final infrastructure installation. The modelling undertaken to support the FSA is considered within operational phase impacts (**Section 13.5.2**).

114. Commercial vessels (cargo, tanker and passenger) and dredgers, which account for the majority of vessels recorded in the study area, would likely avoid the buoyed construction area and not be exposed to allision risks. Other vessels types are discussed below.

115. Wind farm vessels in particular are likely to have crew who are experienced in safely transiting OWF construction areas, and those associated with the operational Dudgeon and Sheringham Shoal wind farm will also be experienced in working in the local maritime environment.

116. Oil and gas support vessels associated with the Waveney platform spend longer in the DEP North boundary than other vessels in transit and may experience increased allision risk, given access requirements to the platform. Allision risk to vessels in transit is within the scope of the NRA, whereas vessels associated with servicing the platforms upon arrival is not. Thus, the details of the rolling construction plan will be used alongside further consultation with the operators, Perenco, to identify any specific mitigation required in relation to potential DEP impacts on oil and gas vessels and access arrangements at Waveney. This also applies to the Blythe platform (Independent Oil and Gas) where construction near the DEP South boundary may impact access. Potential impacts to oil and gas operations are further assessed in **Chapter 16 Petroleum Industry and Other Marine Users** (document reference 6.1.16) and **Appendix 16.1 Vessel Access Study**.

117. Fishing vessels engaged in fishing are at increased risk given the increased time spent in proximity to structures, compared to passing vessels, however as described in **Section 13.4**, fishing activity is low within the SEP and DEP wind farm site boundaries where allision risk would occur.

118. Recreation vessels are present in very low numbers within the SEP and DEP wind farm boundaries where allision risk would occur, with any vessels also likely to be traveling at low speeds which would reduce the severity of consequence. Allision incidents between a vessel and a wind turbine (under construction, operational or disused) in the UK are low with an average return rate of one per 1,620 years including both operational and non-operational turbines.

119. Given the vessel traffic within the SEP and DEP wind farm boundaries, the likelihood of interaction, incident history and the embedded mitigation, the frequency is remote and the severity of consequence, should an incident occur, is serious. In FSA terms allision risk for SEP or DEP (covering the entire project lifecycle) is assessed as being *tolerable with embedded mitigation* and *ALARP.* This results in a potential impact of **moderate adverse** which is not significant in EIA terms given its assessment as ALARP with embedded mitigation within the FSA.

13.5.1.5.2 SEP and DEP

120. Should SEP and DEP be constructed concurrently, the potential allision impacts would be the same (**moderate adverse**, which is not significant in EIA terms) as in isolation. This is because there would be no overlap in construction areas and the severity of consequence would not measurably increase. Impacts associated with reduced sea room between the SEP and DEP boundaries is assessed within operational effects (**Section 13.5.2**).

13.5.1.5.3 Mitigation

121. No additional mitigation above that embedded (**Section 13.3.3**) is proposed.

13.5.1.6 Impact 5: Interaction with Partially Completed Subsea Cables

13.5.1.6.1 SEP or DEP in Isolation

122. Scenarios that could lead to cable interaction during construction include:

- Vessel dragging an anchor over partially completed cable following anchor failure; and
- Vessel anchoring in an emergency, inadvertently (e.g. mechanical failure) or negligently over a partially completed cable.

123. Interaction could occur between vessels within the SEP and DEP offshore cable corridor study area (**Section 13.3.1**). Vessel count observations, during the 28-day survey (**Section 13.4.2**) showed most anchored vessels were oil and gas support vessels and cargo vessels located near the Weybourne landfall area. An average of approximately one unique vessel every three days was determined to be at anchor during the survey period within the offshore export cable corridor shipping and navigation study area. The closest anchored vessel to the export cable corridor was an oil and gas vessel situated approximately 0.36nm from the export cable corridor.

124. Given the vessel traffic and baseline anchoring activity within the SEP and DEP export cable study area and the likelihood of interaction, as well as embedded mitigation such as safe passing distances, the impact frequency is extremely unlikely and the severity of consequence is moderate. In FSA terms the likely navigation safety risk of cable interaction is assessed as being broadly acceptable with embedded mitigation, and ALARP. The impact is thus **minor adverse** which is **not significant** in EIA terms for both SEP and DEP insolation.

13.5.1.6.2 SEP and DEP

125. In FSA terms the likely navigation safety risk is assessed as being *broadly acceptable with embedded mitigation, and ALARP*. Should SEP and DEP both be constructed, the potential impacts would be the same as those if SEP and DEP were constructed in isolation (**minor adverse** which is not significant in EIA terms). This is because while the overall offshore cable length would increase (**Table 13-2**), the cables in closest proximity to anchoring activity (the offshore export cables and landfall) would be the same as assessed for SEP or DEP in isolation and there would be no measurable increase in incident frequency or consequence.

13.5.1.6.3 Mitigation

126. No additional mitigation above that embedded (**Section 13.3.3**) is proposed.

13.5.1.7 Impact 6: Under Keel Clearance

13.5.1.7.1 SEP or DEP in Isolation

127. The use of external cable protection may be necessary if target burial depths cannot be achieved. This surface protection would be installed within the construction period and could lead to reductions in under keel clearance for passing vessels and potential grounding / interaction risks. During consultation, the RYA raised concerns about under keel clearance, particularly close to the landfall, noting the potential for higher levels of non AIS traffic in this area. The RYA Coastal Atlas also shows that the offshore export cable corridor is within a “general boating area” on approach to landfall.

128. The Applicant will consult with the MCA and TH in any instances where water depths are reduced by more than 5% as a result of external cable protection to determine whether additional mitigation is necessary to ensure the safety of passing vessels.

129. Horizontal Directional Drilling (HDD) will be used at export cable landfall with exit pits offshore in an area of between 8m and 10m water depth, potentially reducing the likelihood of interaction near landfall, although final design options will be considered in full detail when known. A cable burial risk assessment will be undertaken prior to construction. The **Outline Cromer Shoal Chalk Beds (CSCB) MCZ Cable Specification, Installation and Monitoring Plan (CSIMP)** (document reference 9.7) provides further detail on export cable installation and cable protection requirements for the export cable(s).Commercial impacts associated with fishing gear snagging as a result of the installation of cables is assessed in **Chapter 12 Commercial Fisheries** (document reference 6.1.12). As identified within the Commercial Fisheries technical report (**Appendix 13.1 Navigation Risk Assessment**), trawling is limited in the study area with over 99% of landed species caught by pots and traps. Maximum snagging risk is presented by mobile gear, however, the infield cables, interlink cables, export cables and associated external cable protection, together with any partially constructed structures, may also represent potential snagging points for static fishing gear and could potentially lead to injury.

130. The frequency of impacts to under keel clearance, including snagging, is assessed as extremely unlikely given the preference for cable burial where possible and promulgation of information including advance warning of construction activities. The severity of consequence is moderate given the potential for serious injury. In FSA terms, under keel clearance is determined to be *broadly acceptable and ALARP* resulting in a **minor adverse** impact in EIA terms for both SEP or DEP in isolation which is not significant.

13.5.1.7.2 SEP and DEP

131. In FSA terms, the likely navigation safety risk is assessed as being *broadly acceptable with embedded mitigation, and ALARP.* Should SEP and DEP be constructed concurrently, the potential impacts would be the same as those if SEP and DEP were constructed in isolation (**minor adverse**). This is because while the overall offshore cable length would marginally increase (**Table 13-2**) the temporal and spatial impact of the cable installation in the critical depths of the offshore export cable corridor on approach to landfall would be temporary and similar to that assessed for the in isolation scenario with no measurable increase in incident frequency or consequence.

13.5.1.7.3 Mitigation

132. No additional mitigation above that embedded (**Section 13.3.3**) is proposed.

13.5.1.8 Impact 7: Emergency Service

13.5.1.8.1 SEP or DEP in Isolation

133. Construction traffic will lead to an increased number of vessels and personnel in the study area, and as such there may be an increase in the number of incidents requiring emergency response.

134. Existing incident rates are considered low in the study area based on the data studied within the NRA (**Appendix 13.1 Navigation Risk Assessment**), and it is not anticipated that SEP and DEP would notably increase the observed existing incident rates.

135. Further, it should be considered that the on-site presence of SEP and DEP construction vessels will form additional resource to respond to any incidents in the area in liaison with the MCA, both in terms of incidents associated with SEP and DEP (i.e. self-help resources), but also incidents occurring to third party vessels outside of the SEP and DEP offshore sites. As required under MGN 654, The Applicant will produce and submit an ERCoP to the MCA detailing how they would cooperate and assist in the event of an incident.

136. Given the embedded mitigation, an extremely unlikely frequency (noting low baseline incident rates) is assigned and a serious consequence. In FSA terms the impacts on emergency response is assessed as being tolerable with embedded mitigation. The impact is therefore **minor adverse** in EIA terms for both SEP or DEP in isolation.

13.5.1.8.2 SEP and DEP

137. In FSA terms, the safety risk associated with emergency response for SEP and DEP is assessed as being *tolerable with embedded mitigation*. Should SEP and DEP be constructed concurrently, there would be an increase in vessels and personnel across the study area during construction but not at a level that the potential impacts would measurably increase from that in isolation (**minor adverse** in EIA terms), particularly given coordination of construction activities and embedded mitigation.

13.5.1.8.3 Mitigation

138. No additional mitigation above that embedded (**Section 13.3.3**) is proposed.

13.5.2 Potential Impacts during Operation

13.5.2.1 Impact 1: Displacement of Activities

13.5.2.1.1 SEP or DEP in Isolation

139. During the operational phase, there would be restrictions on entry into the wind farm sites via safety zones around major maintenance work. Given the separation distance of turbines of 1.05km, usage of the operational area outside of safety zones is accommodated. That said, vessels, particularly commercial vessels, are likely to avoid operational areas, and thus the SEP and DEP wind farm sites.

140. Maintenance associated with offshore cables (infield, interlink and export) may also temporarily displace traffic, however, operations will be transient, localised, effectively communicated and managed to have minimal impacts.

141. SEP and DEP are largely outside the highest density traffic routes (**Plate 13-1**), however vessels, including cargo, tanker, oil and gas, wind farm, aggregate dredger, passenger, fishing and recreation within the study area could be displaced from the SEP and DEP wind farm sites during operation.

142. Concern was raised by certain regular operators during consultation (**Table 13-1**) around a need to deviate to avoid project vessels. It is noted that these concerns were not safety related, but were instead linked to cumulative impacts over time pertaining to transit distances and times.

143. In order to manage displacement impacts The Applicant will communicate information to ensure third party vessels are aware of maintenance activities and display information on charts. Further, vessel traffic will be monitored three years after construction within the operational period.

144. Effects on each receptor (main vessel types identified in **Section 13.4**) are outlined in the following sections (with differentiation between SEP and DEP highlighted where differences are identified).

13.5.2.1.2 Commercial Vessels

145. Commercial vessels (including cargo, tanker and passenger) are those recorded most frequently within the study area and are the vessel type most likely to avoid operational areas, with a minimum distance of 1nm assumed between shipping routes and the SEP and DEP wind farm site boundaries.

146. In terms of main routes, the Tees to Rotterdam main route intersects the DEP North wind farm site boundary, and the Humber to Rotterdam route intersects the DEP South wind farm site boundary. Displacement to these routes to both the east and west of the DEP boundary would result during operation, with at worst a 4% change in route length.

147. During operation, SEP is likely to cause slight displacement to the Hull to Zeeburgge and Hull to Rotterdam routes which runs parallel to the northeastern edge of the SEP wind farm site boundary. Displacement would cause the route to move eastwards, with the worst-case showing a 0.1% change in route length.

13.5.2.1.3 Oil and Gas Vessels

148. Disturbance to vessels in transit includes the Great Yarmouth to Lancelot main route, where a 4% change in route length is predicted due to the presence of the DEP wind farm site. Other displacement effects would be as described for construction **Section 13.5.1.1**.

149. Considering vessels not in transit (associated with platforms) there is a 500m safety zone around oil and gas platforms where support vessels operate. Other larger vessels are also associated with operations that may also be stationed around the platform. Access to the south of the Waveney platform (and the planned Blythe platform) may be restricted given the boundary of DEP is 500m from the Waveney platform and vessel tracks show usage beyond the 500m safety zone. Impacts to oil and gas operations including a detailed assessment of marine and aviation access to oil and gas platforms are further assessed in **Chapter 16 Petroleum Industry and Other Marine Users**.. Further consultation will be also be undertaken as part of layout planning to establish both the planned and emergency access requirements of the platforms, to determine the full extent of access restrictions and mitigation that facilitate safe coexistence.

13.5.2.1.4 Wind Farm Support Vessels

150. Wind farm support vessels in the study area are mainly made up of those supporting the existing SOW and DOW which are mainly located within the operational boundary of the existing sites as well as those in transit to Race Bank OWF. There will be access to the operational area for wind farm vessels.

13.5.2.1.5 Aggregate Dredgers

151. As described for construction effects, aggregate dredgers would experience a level of disruption, although marine aggregate dredgers would be free to transit through the wind farm sites given the turbine spacing of 1.05km. There are, however, also, as identified in the NRA, alternate routeing options to the Outer Dowsing aggregate production areas as follows:

- Vessels accessing area 515/1 that intersect the DEP South wind farm site can make a minor deviation to the south; and
- Vessels accessing area 515/2 that intersect the DEP North wind farm site can either pass east, or deviate further west, and pass north avoiding the Outer Dowsing shallows.

13.5.2.1.6 Recreational Vessels

152. Recreational vessels make up a small proportion of overall vessel activity within the study area and predominantly pass inshore of both SEP and DEP wind farm site boundaries (where displacement would primarily occur). Displacement could occur within the SEP and DEP wind farm site boundaries during maintenance activities, although vessels would largely be free to transit through the wind farm sites given the turbine spacing of 1.05km.

153. Recreational vessels are associated with the coast in higher numbers, any cable maintenance will be short term and communicated effectively to reduce disturbance.

13.5.2.1.7 Fishing Vessels

154. Fishing vessels would be displaced by operational maintenance activities, and as shown by the limited numbers of vessels recorded within the existing sites, also likely to avoid the SEP and DEP wind farm boundaries. However, fishing vessels show limited use of the SEP and DEP wind farm boundaries for active fishing. Displacement to fishing activity and economic effects are further considered in **Chapter 12 Commercial Fisheries**.

13.5.2.2 Overall Assessment

13.5.2.2.1 SEP or DEP in isolation

155. Displacement will occur daily, thus at a frequent frequency for all receptors during operation. The severity of consequence is negligible given the level of disturbance and deviations required as well as mitigation in place to manage and communicate maintenance activities. The overall assessment in the FSA (**Appendix 13.1 Navigation Risk Assessment**) is *tolerable with additional mitigation, and ALARP*. The impact of displacement is therefore **moderate adverse** in EIA terms for both SEP or DEP in isolation.

156. Adverse weather routes are identified in the study area and includes the DFDS beach route. However, routes, as discussed in the NRA, are either unaffected by SEP and DEP or there is considered to be sufficient sea room between the SEP and DEP wind farm sites to accommodate safe transit including in adverse conditions and the overall assessment above applies.

13.5.2.2.2 SEP and DEP

157. Potential impacts to all vessel types would be the same (**moderate adverse**) as for SEP or DEP in isolation given route deviations would not measurably increase in terms of the deviation percentage. This is detailed further within the NRA (**Appendix 13.1 Navigation Risk Assessment**).

13.5.2.2.3 Mitigation

158. Relevant additional mitigation includes development of a navigation management plan which will include project vessel procedures to manage crew transfer vessels (including daughter craft) during the construction and operation phase of the project.

159. These procedures would be managed centrally via Marine Coordination, and would be promulgated including on a targeted basis to any operators of relevance. This will include the key operators in the area such as P&O, Stena, DFDS, and Cobelfret.

13.5.2.2.4 Residual Impacts - SEP or DEP in isolation

160. The residual impact of Displacement of Activities in the operation phase as a result of SEP or DEP in isolation, although reduced, remains tolerable with additional mitigation, and ALARP. In EIA terms, the residual impact is **moderate adverse** for both SEP or DEP in isolation, however, with mitigation the risk is ALARP within the FSA and therefore not significant in EIA terms." SEP or DEP in isolationResidual Impacts - SEP and DEP.

161. The residual impact of Displacement of Activities would be the same as SEP or DEP in isolation (**moderate adverse**, which is not significant in EIA terms) as route deviations would not measurably increase in terms of deviation percentage. This is detailed further within the NRA (**Appendix 13.1 Navigation Risk Assessment**). Impact 2: Adverse Weather Routeing

162. SEP and DEP are largely outside the highest density traffic areas within the study area (**Plate 13-2**), however, commercial vessel (passenger, cargo and tanker) adverse weather routes could be impacted and displaced by the boundaries of SEP and DEP.

163. Adverse weather routes are defined as significant course adjustments to mitigate vessel movement in adverse weather conditions. Adverse weather includes wind, wave, and tidal conditions as well as reduced visibility due to fog that can hinder a vessel's normal route and/or speed of navigation. When transiting in adverse weather conditions, a vessel is likely to encounter various kinds of weather and tidal phenomena, which may lead to severe roll motions, potentially causing damage to cargo, equipment and/or danger to persons on board. The sensitivity of a vessel to these phenomena will depend on the actual stability parameters, hull geometry, vessel type, vessel size and speed.

164. Mitigations for vessels include adjusting their heading to position themselves 45° to the wind, altering or delaying sailing times, reducing speed and/or potentially cancelling journeys. The presence of offshore structures within or near to any adverse weather routes may prevent existing routes from being utilised during adverse conditions.

165. Twelve months of AIS data was analysed and identified that vessels associated with the Newcastle / Amsterdam route (the *King Seaways* and the *Princess Seaways*) were recorded in the shipping and navigation study area during January, February, March, October, and December of 2019 (**Plate 13-3**). Vessels were found to transit between the wind farm sites during adverse conditions.

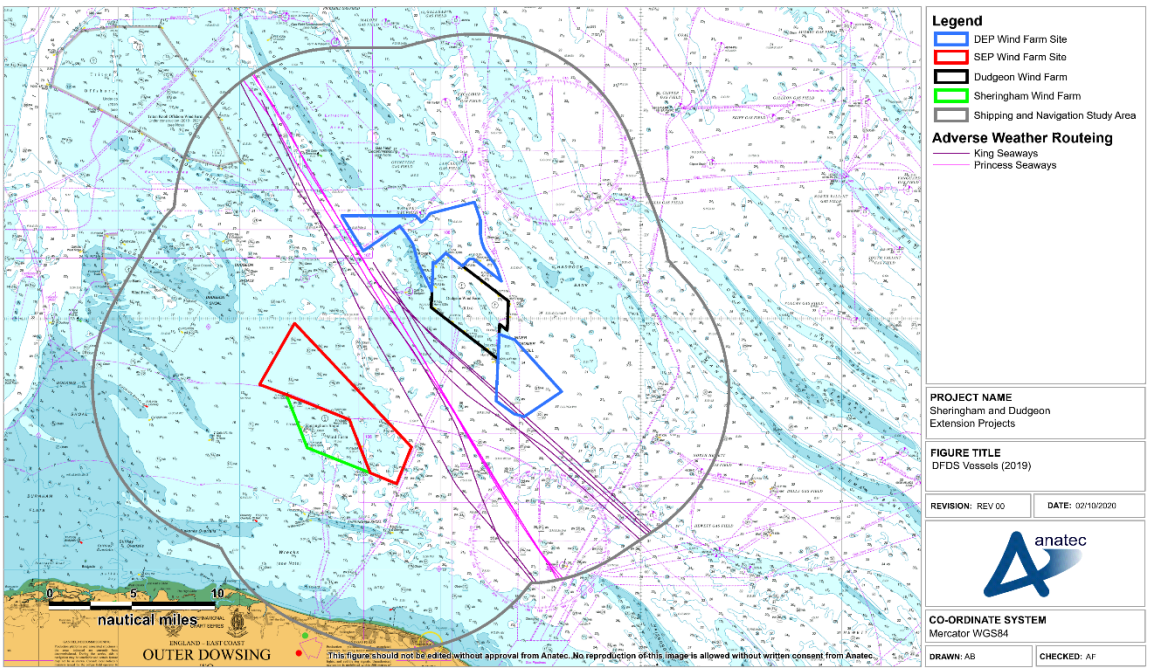

Plate 13-3: Adverse Weather Routes – Newcastle /Amsterdam Route (2019)

166. DFDS raised during consultation that their "Beach Route" (a known DFDS adverse weather route) passed within the shipping and navigation study area (**Table 13-1**), however, they stated that they do not anticipate any negative effects on the route arising from SEP and DEP. Similarly, P&O as the other key commercial ferry operator in the area stated they had no concerns associated with navigational safety. This aligned with the output of the Hazard Workshop (**Table 13-1**).

167. Lighting and marking will be defined in consultation with TH as required under the DCO, and this will include consideration of requirements during periods of poor visibility (e.g. sound signals). Under COLREGS (IMO, 1972), vessels are also required to take appropriate measures with regard to determining a safe speed, taking into account various factors including the state of visibility, the state of the wind, sea, and current as well as the proximity of navigational hazards.

13.5.2.2.5 SEP or DEP in isolation

168. Displacement is considered reasonably probable during the low frequency of adverse weather events. The severity of consequence is minor. The overall displacement assessment in FSA terms (**Appendix 13.1 Navigation Risk Assessment**) is therefore *tolerable with embedded mitigations and ALARP*. The impact of displacement is **moderate adverse** in EIA terms for both SEP or DEP in isolation which is not significant in EIA terms given its assessment as ALARP with embedded mitigation within the FSA.

13.5.2.2.6 SEP and DEP

169. Should SEP and DEP be constructed concurrently the severity of consequence would not measurably increase given there is considered to be sufficient sea room between the SEP and DEP wind farm sites to accommodate safe transit including in adverse conditions (**Plate 13-3**).Thus potential displacement of adverse weather routeing impacts of SEP and DEP would be the same (**moderate adverse**) as in isolation (**Section 13.5.3.3.1**). Impacts associated with reduced sea room between the SEP and DEP boundary are assessed in **Section 13.5.2.3**.

13.5.2.2.7 Mitigation

170. General operator consensus during the hazard workshop was that the implementation and promulgation of project vessel procedures would mitigate this concern. A Navigation Management Plan will be developed post consent to mitigate impacts associated with crew transfer vessels (including daughter craft) crossing the route between SEP and DEP/Dudgeon OWF during both the construction and operation phases of the Project and to identify navigation stakeholders that should be contacted for targeted promulgation of information.

13.5.2.2.8 Residual Impacts - SEP or DEP in isolation

171. The residual impact to Adverse Weather Routeing in the operation phase as a result of SEP and DEP is *Broadly Acceptable with additional mitigation and ALARP.* The residual impact of displacement is therefore reduced to **minor adverse** for both SEP or DEP in isolation which is not significant in EIA terms.

13.5.2.2.9 Residual Impacts - SEP and DEP

172. The residual impact to Adverse Weather Routeing would be the same as SEP or DEP in isolation as impacts to adverse weather routeing would not measurably increase in terms of percentage should both projects be developed.

13.5.2.3 Impact 3: Increased Collision Risk

13.5.2.3.1 SEP or DEP in Isolation

173. Vessel to vessel, and project vessels to third party vessel collision risk may be increased by the physical presence of structures restricting navigable routes and displacing vessels, and the presence of project vessels associated with maintenance works increasing vessel numbers within the study area.

174. Based upon the pre wind farm modelling undertaken within the NRA, baseline collision rates in the study area are high, with a vessel estimated as being involved in a collision once per 9.6 years. This broadly aligns with the baseline incident data, with the MAIB data showing that one collision occurred within the study area between 2008 and 2017. This high collision rate is due to the high volumes of vessels utilising similar passage.

175. Collision risk modelling using vessel traffic data and conservative route deviations has been undertaken within the NRA considering a number of scenarios including:

- Pre wind farm with base case vessel traffic levels;
- Pre wind farm with future case vessel traffic levels;
- Post wind farm with base case vessel traffic levels for SEP or DEP in isolation and together; and
- Post wind farm with future case vessel traffic levels for SEP or DEP in isolation and together.

176. Collision rates (modelling results) are given in **Table 13-11** below:

Table 13-11: Collision Rates in Isolation

Scenario	0% (base traffic)	10% (traffic increase)	20% (traffic increase)
DEP Only pre- wind farm	1 per 10 years	1 per 8 years	1 per 7 years
DEP Only post- wind farm	1 per 9 years	1 per 7 years	1 per 6 years
SEP Only pre-wind farm	1 per 10 years	1 per 8 years	1 per 7 years
SEP Only post-wind farm	1 per 9 years	1 per 8 years	1 per 7 years

177. Third party vessels will be familiar with wind farm traffic in the area given the operational traffic associated with the existing SOW and DOW sites. Further, given the embedded mitigation (that is tried and tested within the industry) and operational procedures, the assigned frequency is remote and the consequence is serious. In FSA terms, the assessment for collision is *broadly acceptable, and ALARP* (third party to project vessels) and *tolerable* (third party to third party vessels). The impact therefore is of **moderate adverse** significance in EIA terms.

13.5.2.3.2 SEP and DEP

178. It is estimated within the NRA that a vessel would be involved in a collision once every 8.5 years for the base case (**Table 13-12**), which represents a 13% increase over the pre-wind farm base case. Future case collision risk increases to one per seven years and one per six years for the 10% and 20% traffic increases, respectively.

Table 13-12: Collision Rates for SEP and DEP

Scenario	0% (base traffic)	10% (traffic increase)	20% (traffic increase)
SEP and DEP pre-wind farm	1 per 10 years	1 per 8 years	1 per 7 years
SEP and DEP post-wind farm	1 per 8 years	1 per 7 years	1 per 6 years

179. The greatest increases in collision risk, assessed within the NRA, were observed to be associated with the routes that passed between the SEP and DEP wind farm sites, which is reflective of a reduced width (**Plate 13-4**) within which vessels will be able to transit following construction of the wind farms.

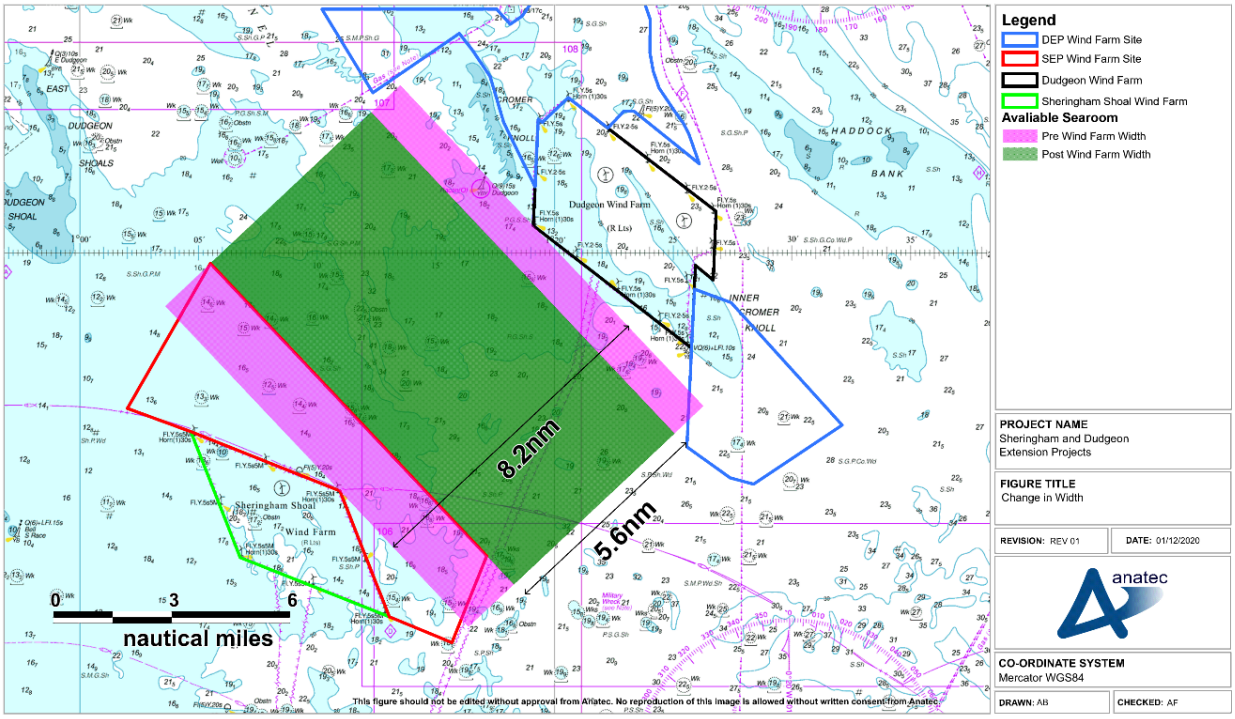

Plate 13-4: Reduction in Available Sea Room

180. As detailed in the NRA while the available sea room is compliant with the MGN 654 width requirements, there is a reduction in width between the existing SOW and DOW sites (8.2nm reduced to 5.6nm if both SEP and DEP were built). This reduction in sea room and volume of traffic was raised as a concern during consultation, however, these concerns were largely in relation to impacts on journey distance and time as opposed to navigational safety.

181. In particular, the CoS raised within their Section 42 response (see **Section 13.1**) that while the MGN 654 (MCA, 2021) calculations do provide good indication as to appropriate widths for a rectangular “corridor”, the shape of the area between the existing SOW and DOW sites means that simple application of these calculations does not capture additional areas of sea room outside of the corridors. The CoS noted that the 5.6nm width estimated by the MGN 654 corridor calculations is based on the “pinch point” between the wind farm sites, and that measurements taken from other points exceed the 5.6nm value. The relevant distances quoted by the CoS are summarised as follows:

- 9.5nm between the north west corner of the existing Sheringham Shoal site and the Dudgeon Cardinal Buoy; and
- 10.1nm between the south east corner of the existing Sheringham Shoal site and south east corner of the existing Dudgeon site.

182. It is, however, important to note that the “additional” areas lost that sit outside of the existing “corridor” are not heavily transited and are largely avoided by established routeing due to numerous existing routeing constraints located in the area including the shallow banks. Additionally, experience shows that commercial vessels are frequently and comfortably passing within 1nm of operational wind farms, and that effects on radar at these distances are manageable. There have been no reported allisions to date between routeing commercial vessels and UK wind farms.

183. Operational traffic associated with the existing SOW and DOW sites will be familiar with wind farm traffic in the area. Further, given the embedded mitigation (that is tried and tested within the industry), operational procedures and evidence from existing UK wind farms, the assigned frequency is remote and the consequence is serious. In FSA terms the assessment for collision is *tolerable* for vessel to vessel and *broadly acceptable* for third party to project vessel collisions. The impact therefore is **moderate adverse** in EIA terms.

13.5.2.3.3 Mitigation

184. Relevant additional mitigation includes development of a navigation management plan which will include project vessel procedures to manage crew transfer vessels (including daughter craft) during the construction and operation phase of the project in addition to identifying navigation stakeholders that should be contacted for targeted promulgation of information.

185. The RYA noted concern during the hazard workshop over the potential for interactions between recreational vessels and project vessels particularly in nearshore areas including port approaches. The RYA also recommended project details and any project vessel movements should be promulgated on a targeted basis to specific recreational clubs and organisations that may be impacted. The Navigation Management Plan will include a list of stakeholders to whom information will be promulgated.

186. These mitigating procedures would be managed centrally via Marine Coordination, and would be promulgated including on a targeted basis to any operators of relevance. This will include the key operators in the area such as P&O, Stena, DFDS, and Cobelfret).

13.5.2.3.4 Residual Impacts - SEP or DEP in isolation

187. The residual impact of Increased Collision Risk in the operation phase as a result of SEP or DEP in isolation, although reduced, remains *tolerable with additional mitigation, and ALARP*. In EIA terms, the residual impact is **moderate adverse** for both SEP or DEP in isolation, however, with mitigation the risk is ALARP within the FSA and therefore not significant in EIA terms. SEP or DEP in isolation

13.5.2.3.5 Residual Impacts - SEP and DEP

188. Should SEP and DEP both be constructed the severity of consequence would not measurably increase. The potential collision risk impacts of SEP and DEP are considered the same (**moderate adverse,** which is not significant in EIA terms) as in isolation (**Section 13.5.2.3.4**).

13.5.2.4 Impact 4: Increased Allision Risk

13.5.2.4.1 SEP or DEP in Isolation

189. The physical presence of structures would create a vessel to structure allision risk for a vessel navigating within the study area.

190. Commercial vessels (cargo, tanker and passenger) as well as dredgers, which account for the majority of vessels recorded in the study area, would likely avoid the SEP and DEP boundaries and not be exposed to allision risks. Other vessel types are discussed below.

191. Wind farm vessels in particular are likely to have crew who are experienced in safely transiting OWF sites, and those associated with the operational SOW and DOW will also be experienced in working in the local maritime environment.

192. Oil and gas support vessels associated with the Waveney platform spend longer in the DEP North boundary than other vessels in transit and may experience increased allision risk, given access requirements to the platform. Allision risk to vessels in transit is within the scope of the NRA, whereas vessels associated with servicing the platforms upon arrival is not. A detailed assessment of both marine and helicopter access and potential restrictions has been undertaken with results provided within **Chapter 16 Petroleum Industry and Other Marine Users** (document reference 6.1.16) and **Appendix 16.1 Vessel Access Study**. Fishing vessels engaged in fishing are at increased risk given the increased time spent in proximity to structures, compared to passing vessels, however as described in **Section 13.4.7**, fishing activity is low within the SEP and DEP wind farm site boundaries where allision risk would occur.

193. Fishing vessel to structure allision risk was modelled separately within the NRA (**Appendix 13.1 Navigation Risk Assessment**) since fishing vessels may be either in transit or actively fishing within the area. It is noted that the model assumes no changes to baseline activity in terms of proximity to structures and assumes vessels do not alter their navigational patterns based on the presence of structures in line with good seamanship. Based on these assumptions, modelling estimated that a fishing vessel would allide with a structure within the wind farm sites once per 37 years for the SEP and DEP scenario. The majority of this risk was observed to be associated with the structures within the SEP wind farm site, Modelling is considered very conservative given that experience shows that while commercial fishing vessels do continue to transit operational arrays, activity immediately around the structures is very likely to reduce, resulting in a reduced return rate.

194. Recreation vessels are present in very low numbers within the SEP and DEP wind farm boundaries where allision risk would occur, with any vessels also likely to be traveling at low speeds which would reduce the severity of consequence.

195. Allision incidents between a vessel and a wind turbine (under construction, operational or disused) in the UK are low with an average of one per 1,620 years including both operational and non-operational turbines.

196. Based on the allision modelling (**Table 13-13**) undertaken as part of the NRA, it is estimated that an allision under power with a structure within the wind farm sites would occur once per 1,347 years (SEP) and once per 1,104 years (DEP) for the base case. Drifting rates are once per 950 years (SEP) and 1,336 years (DEP) for the base case.

Table 13-13: Allision Rates in Isolation Post Wind Farm

Scenario	0% (base traffic)	10% (traffic increase)	20% (traffic increase)
SEP Only powered	1 per 1,347 years	1 per 1,225 years	1 per 1,123 years
SEP Only drifting	1 per 950 years	1 per 864 years	1 per 792 years
DEP Only powered	1 per 1,104 years	1 per 1,003 years	1 per 920 years
DEP Only drifting	1 per 1,336years	1 per 1,215 years	1 per 1,113 years

197. Experience from existing OWFs and consultation, as further discussed in the NRA, shows that commercial vessels will avoid the SEP and DEP operational wind farm sites. Minimum turbine spacing of 1.05km is considered as being sufficient to accommodate safe transit, allowing other vessels to maintain safe distances from structures (and hence minimising allision risk). Further, The Applicant has developed a set of Layout Commitments (**Appendix 13.1 Navigation Risk Assessment**), which include commitment to ensuring straight line edges and lines of sight without dangerously protruding or isolated structures. The layout will be agreed with the MCA and TH.

198. The frequency of allision events is remote and the consequence serious. In FSA terms, the assessment for allision is *tolerable with embedded mitigation, and ALARP*. The impact is therefore **moderate adverse** which is not significant in EIA terms given its assessment as ALARP with additional mitigation within the FSA.

13.5.2.4.2 SEP and DEP

199. In FSA terms, the assessment for allision is *tolerable with embedded mitigation, and ALARP.* Potential impacts in EIA terms would be the same as for SEP and DEP in isolation (**moderate adverse,** which is not significant in EIA terms given its assessment as ALARP with additional mitigation within the FSA.) because there would not be a marked (**Table 13-14**) increase in terms of likelihood of allision events or consequence.

Table 13-14: Allision Rates Together Post Wind Farm

Scenario	0% (base traffic)	10% (traffic increase)	20% (traffic increase)
SEP and DEP powered	1 per 618 years	1 per 562 years	1 per 515 years
SEP and DEP drifting	1 per 898 years	1 per 816 years	1 per 748 years

13.5.2.4.3 Mitigation

200. No additional mitigation above that embedded (**Section 13.3.3**) is proposed.

13.5.2.5 Impact 5: Interaction with Subsea Cables

13.5.2.5.1 SEP or DEP in Isolation

201. Vessel count observations during the 28-day survey (**Section 13.4.2**) showed the majority of anchored vessels were near the landfall, comprising of mainly oil and gas support vessels and cargo vessels. An average of approximately one unique vessel every three days was determined to be at anchor during the survey period within the offshore export cable corridor shipping and navigation study area. The closest anchored vessel to the export cable corridor was an oil and gas vessel situated approximately 0.36nm from the export cable corridor.

202. Scenarios that could lead to cable interaction during operation are as per construction (**Section 13.5.3.5**) but associated with fully completed cables.

203. HDD will be used to install the export cable(s) at landfall with exit pits offshore in an area of between 8m and 10m water depth, potentially reducing the likelihood of interaction near landfall, although final design options will be considered in full detail at post-consent stage.

204. Given the vessel traffic and baseline anchoring activity within the SEP and DEP export cable study area, embedded mitigation and the likelihood of interaction, the frequency is extremely unlikely and the severity of consequence is moderate. In FSA terms, cable interaction is assessed as *being broadly acceptable with embedded mitigation, and ALARP*, resulting in a **minor adverse** impact which is not significant in EIA terms.

13.5.2.5.2 SEP and DEP

205. In FSA terms, the risk is assessed as being broadly *acceptable with embedded mitigation, and ALARP*. In EIA terms the impact would be the same as for SEP or DEP in isolation (**minor adverse**). This is because while there could be two cables and the overall offshore cable length would be greater (**Table 13-2**), the extent of cables in proximity to anchoring activity (the offshore export cables approaching landfall) would be the similar and would not result in a measurable increase in frequency or consequence. It is noted that any reduction in navigational depth of greater than 5% requires approval from the MCA.

13.5.2.5.3 Mitigation

206. No additional mitigation above that embedded **(Section 13.3.3**) is proposed.

13.5.2.6 Impact 6: Under Keel Clearance

13.5.2.6.1 SEP or DEP in Isolation

207. The impact is as described for construction impacts (**Section 13.5.1.7**) and during operation, external cable protection monitoring will be undertaken. The Applicant will consult with the MCA and TH in any instances where water depths are reduced by more than 5% as a result of external cable protection to determine whether additional mitigation is necessary to ensure the safety of passing vessels.

208. There are no significant impacts identified in relation to sediment transport and scour (**Chapter 6 Marine Geology, Oceanography and Physical Processes** (document reference 6.1.6)), however any changes in depths associated with scour or sediment transportation which may impact upon navigational safety will be discussed with the MCA and TH to determine any required mitigation.

209. Commercial impacts associated with fishing gear snagging as a result of the installation of cables is assessed in **Chapter 12 Commercial Fisheries** (document reference 6.1.12). As identified within the Commercial Fisheries technical report (**Appendix 13.1 Navigation Risk Assessment**) trawling is limited in the study area with over 99% of landed species caught by pots and traps. Maximum snagging risk is presented by mobile gear, however, the infield cables, interlink cables, export cables and associated external cable protection, together with any structures on the sea bed may represent potential snagging points for static fishing gear and could potentially lead to injury.

210. The frequency is extremely unlikely given the limited use of mobile gear, preference for cable burial where possible and promulgation of information. The consequence is moderate given the potential for serious injury. In FSA terms, the risk is determined to be *broadly acceptable and ALARP* and the impact is assessed as being **minor adverse** which is not significant in EIA terms.

13.5.2.6.2 SEP and DEP

211. Potential impacts would be the same as those for SEP or DEP in isolation (**minor adverse**) because while the total length of cable would be marginally greater and there could be up to two export cables,(**Table 13-2**) there would be no significant increase in incident frequency and consequence in the offshore export cable corridor on approach to landfall, where receptor sensitivity is considered greatest. It is noted that any reduction in navigational depth of greater than 5% triggers a requirement for MCA consultation and approval.

13.5.2.6.3 Mitigation

212. No additional mitigation above that embedded **(Section 13.3.3**) is proposed.

13.5.2.7 Impact 7: Emergency Service

13.5.2.7.1 SEP or DEP in Isolation

213. Operation and maintenance traffic will lead to an increased level of vessels and personnel in the study area. As a result, there may be an increase in the number of incidents requiring emergency response.

214. The final layout of the SEP and DEP wind farm sites will be agreed with the MCA and TH post consent as required under the DCO, and these discussions will include SAR considerations. It is also noted that the Layout Commitments (**Appendix 13.1 Navigation Risk Assessment**) include provision for facilitating SAR access, in that so far as is practicable, all wind turbines will be arranged in straight lines in an easily understandable pattern with at least one clear line of site within individual wind farm site layouts, avoiding structures which break this pattern.

215. Existing incident rates are considered low in the study area based on the data studied within the NRA (**Appendix 13.1 Navigation Risk Assessment**), and it is not anticipated that SEP or DEP would notably increase the observed existing incident rates.

216. As per construction, an extremely unlikely frequency (noting low baseline incident rates) and serious consequence is assigned. In FSA terms, impact to emergency response is assessed as being *tolerable with embedded mitigation*. The impact is therefore **minor adverse** which is not significant in EIA terms.

13.5.2.7.2 SEP and DEP

217. In FSA terms, the impact to emergency response is assessed as being *tolerable with embedded mitigation*. In EIA terms, with SEP and DEP, there would be an increase in vessels and personnel across the study area during operation, but the potential impacts would not increase from that in isolation (**minor adverse**) given coordination of maintenance activities and embedded mitigation.

13.5.2.7.3 Mitigation

218. No additional mitigation above that embedded (**Section 13.3.3**) is proposed.

13.5.3 Potential Impacts during Decommissioning

13.5.3.1 Impact 1: Displacement of Activities

13.5.3.1.1 SEP or DEP in Isolation

219. Displacement of vessels within the study area could arise from the physical presence of structures undergoing decommissioning. As well as vessels associated with decommissioning of the infield and offshore cables.

220. Buoyed areas would be established during decommissioning activities but vessel access would be allowed to areas not being worked on. NtM and other methods of communication would also ensure that vessels are able to effectively plan to minimise deviations.

221. In FSA terms, displacement is assessed as being *tolerable* across the project lifecycle. As per construction, **Section 13.5.1.1** each receptor will experience displacement to a varying degree, depending on frequency of use and geographical spread across the study area. Given that the worst-case scenario for decommissioning considers the same parameters as construction (and the same embedded mitigation will be in place), the impacts in EIA terms are considered to be the same (of **moderate adverse** significance) as during construction, with detailed mitigation measures to be identified within the Decommissioning Programme.

13.5.3.1.2 SEP and DEP

222. In FSA terms, displacement is assessed as being tolerable with *additional mitigation, and ALARP* across the project lifecycle, as per in isolation. Should SEP and DEP both be decommissioned, the potential impact significance in EIA terms would be the same (**moderate adverse**) as if they were to be decommissioned separately (**Section 13.5.1.1.1**). This is because there would be no overlap in decommissioning areas and buoyed areas would be rolling, coordinated and allow flexible access.

13.5.3.1.3 Mitigation

223. Relevant additional mitigation is the same as that proposed for the construction phase. This includes a navigation management plan which identifies stakeholders for targeted promulgation of information and vessel procedures for crew transfer vessels.

13.5.3.2 Residual Impact Significance

13.5.3.2.1 SEP or DEP in isolation

224. The residual impact of Displacement of Activities in the decommissioning phase as a result of SEP or DEP in isolation, although reduced, remains *tolerable with additional mitigation, and ALARP*. In EIA terms, the residual impact is **moderate adverse** for both SEP or DEP in isolation, however, with mitigation the risk is ALARP within the FSA and therefore not significant in EIA terms SEP or DEP in isolation.

13.5.3.2.2 SEP and DEP

225. Should SEP and DEP be decommissioned, there would be an increase in vessels and disturbance, however, there would be no overlap in construction areas and construction areas would be rolling, coordinated and allow flexible access. The severity of consequence would therefore not measurably increase and the potential displacement impacts of SEP and DEP would be the same (**moderate adverse**) as in isolation.

13.5.3.3 Impact 2: Adverse Weather Routeing

226. Existing traffic within the study area, including adverse weather routes, could be displaced during decommissioning due to the presence of safety zones around fixed structures where work is being undertaken. It is assumed that decommissioning areas could extend 500m beyond the SEP and DEP wind farm site boundaries.

227. Installation of cables may also temporarily displace traffic and adverse weather routes. However, given that operations will be effectively communicated, managed with minimum safe passing distances (likely 1,000m), and will be both temporary and small in scale, there are not expected to be any identifiable impacts in terms of navigational safety of displacement.

228. Lighting and marking will be defined in consultation with TH as required under the DCO, and this will include consideration of requirements during periods of poor visibility (e.g. sound signals).

13.5.3.3.1 SEP or DEP in isolation

229. Displacement is considered reasonably probable during the low frequency of adverse weather events. However, it is noted that operator alternative adverse weather routes will be well established by decommissioning. The severity of consequence is minor given the potential for slight injuries or pollution. The overall adverse weather routeing assessment in FSA terms (**Appendix 13.1 Navigation Risk Assessment**) is *tolerable with embedded mitigations and ALARP*. The impact of displacement is therefore **moderate adverse** in EIA terms for both SEP or DEP in isolation which is not significant in EIA terms given its assessment as ALARP with embedded mitigation within the FSA.

13.5.3.3.2 SEP and DEP

230. Should SEP and DEP be decommissioned, there would be an increase in vessels and disturbance, however, there would be no overlap in decommissioning areas and decommissioning areas would be rolling, coordinated and allow flexible access. The duration of the decommissioning phase would also be reduced. The severity of consequence would therefore not measurably increase. Thus, potential displacement of adverse weather routeing impacts of SEP and DEP would be the same (**moderate adverse,** which is not significant in EIA terms) as in isolation (**Section 13.5.3.3.1**). Impacts associated with reduced sea room between the SEP and DEP boundary are assessed as operational effects, **Section 13.5.2**.

13.5.3.3.3 Mitigation

231. No additional mitigation above that embedded (**Section 13.3.3**) is proposed. Impact 3: Increased Collision Risk

13.5.3.3.4 SEP or DEP in Isolation

232. During decommissioning there would an increase in vessels associated with decommissioning activities. In FSA terms, the increase in collision risk for SEP or DEP in isolation (covering the entire project lifecycle) between third party vessels is assessed as being *tolerable with additional mitigation and ALARP* and *broadly acceptable and ALARP* for third party to project vessels.

233. The impact is not expected to be greater than that during construction or operation, noting minimal commercial vessels are likely to be transiting through the SEP and DEP wind farm boundary during operation. Resulting encounters and vessel to vessel collision risk is, at worst-case, anticipated to be comparable to the construction phase and as such would be of **moderate adverse** significance in EIA terms.

13.5.3.3.5 SEP and DEP

234. In FSA terms, the increase in collision risk for SEP or DEP in isolation (covering the entire project lifecycle) between third party vessels is assessed as being *tolerable with additional mitigation and ALARP* and *broadly acceptable and ALARP* for third party to project vessels. Should SEP and DEP both be decommissioned, the potential collision impacts would be the same (**moderate adverse** in EIA terms) as if they were to be undertaken in isolation (**Section 13.5.3.3.4**. This is because there would be no overlap in buoyed areas and work areas would be rolling, coordinated and allow flexible access.

13.5.3.3.6 Mitigation

235. Relevant additional mitigation is the same as that proposed for the construction phase. This includes a navigation management plan which includes vessel procedures for crew transfer vessels.

236. These procedures would be managed centrally via Marine Coordination and would be promulgated including on a targeted basis to any operators of relevance. This will include the key operators in the area such as P&O, Stena, DFDS, and Cobelfret).

13.5.3.3.7 Residual Impacts - SEP or DEP in isolation

237. The residual impact of Increased Collision Risk in the decommissioning phase as a result of SEP and DEP, although reduced, *remains tolerable with additional mitigation and is therefore considered ALARP.* The residual impact of Increased Collision Risk is therefore **moderate adverse** in EIA terms for both SEP or DEP in isolation which is not significant in EIA terms given its assessment as ALARP with additional mitigation within the FSA.

13.5.3.3.8 Residual Impacts - SEP and DEP

238. Should SEP and DEP both be constructed, the severity of consequence would not measurably increase. The potential collision risk impacts of SEP and DEP are considered the same (**moderate adverse,** which is not significant in EIA terms) as in isolation.

13.5.3.4 Impact 4: Increased Allision Risk

13.5.3.4.1 SEP or DEP in Isolation

239. There is a potential for allision with structures not fully decommissioned. In FSA terms the impact across the project lifecycle is assessed as being *tolerable with embedded mitigation, and ALARP*. The impacts, up to the point that all surface infrastructure is decommissioned, would not differ greatly from the construction phase with the same embedded mitigation including safety zones and guard vessels where required that will prevent vessels approaching areas not fully decommissioned and charted presence of structures left *in situ*. The impact of allision during the decommissioning phase is assessed as being **moderate adverse** which is not significant in EIA terms noting its assessment as *tolerable with embedded mitigation, and ALARP* in the FSA.

13.5.3.4.2 SEP and DEP

240. In FSA terms the impact across the project lifecycle is assessed as *being tolerable with embedded mitigation, and ALARP*. Should SEP and DEP be decommissioned, the potential allision impacts would be the same (**moderate adverse** significance in EIA terms) as SEP or DEP in isolation. This is because there would be no spatial overlap or measurable effects on the frequency or severity of impacts.

13.5.3.5 Impact 5: Interaction with Subsea Cables

13.5.3.5.1 SEP or DEP in Isolation

241. Cables would be removed or decommissioned *in situ* with their presence charted. Snagging potential during and post decommissioning is considered the same as during construction and operation.

242. The frequency is low and with third party impacts most likely related to the loss of fishing gear, the consequence is low. In FSA terms, the impact across the project lifecycle is assessed as being broadly *acceptable with embedded mitigation, and ALARP*, resulting in and impact of **minor adverse** which is not significant in EIA terms.

243. It is noted that cable monitoring will not be in place as standard, although future case monitoring will be considered in the Decommissioning programme alongside data from the operational phase.

13.5.3.5.2 SEP and DEP

244. In FSA terms, the impact across the project lifecycle is assessed as being *broadly acceptable with embedded mitigation, and ALARP*. In EIA terms the impact would be the same as if they are decommissioned in isolation (**minor adverse**) since there would be no measurable increase in the frequency or consequence.

13.5.3.5.3 Mitigation

245. No additional mitigation above that embedded (**Section 13.3.3**) is proposed.

13.5.3.6 Impact 6: Under Keel Clearance

13.5.3.6.1 SEP or DEP in Isolation

246. When considering the impact where cables are decommissioned *in situ*, impacts will be expected to be the same as during construction. In FSA terms, the impact is *broadly acceptable and ALARP* which is **minor adverse** in EIA terms which is not significant.

13.5.3.6.2 SEP and DEP

247. Considering SEP and DEP, the potential impacts would be the same as those in isolation (*broadly acceptable and ALARP* in FSA terms and **minor adverse** in EIA terms) because there would be no measurable increase in the frequency or consequence of incident.

13.5.3.6.3 Mitigation

248. No additional mitigation above that embedded (**Section 13.3.3**) is proposed.

13.5.3.7 Impact 7: Emergency Service

13.5.3.7.1 SEP or DEP in Isolation

249. Decommissioning of SEP and DEP will lead to an increased level of project vessels and personnel in the area, and as such there may be an increase in the number of incidents requiring emergency response.

250. The impact is considered to reflect the assessment during construction. In FSA terms, the impact is assessed as being *broadly acceptable and ALARP*, resulting in an impact of **minor adverse** which is not significant in EIA terms.

13.5.3.7.2 Mitigation

251. No additional mitigation above that embedded (**Section 13.3.3**) is proposed.

13.5.3.7.3 SEP and DEP

252. Should SEP and DEP be decommissioned, there would be an increase in vessels and personnel across the study area compared to an in isolation scenario however this would not be at a level which would increase the potential impacts. In FSA terms, the impact is assessed as being *broadly acceptable and ALARP* (**minor adverse** in EIA terms) given coordination of activities.

13.6 Cumulative Impacts

13.6.1 Identification of Potential Cumulative Impacts

253. The first step in the cumulative assessment is the identification of which residual impacts assessed for SEP and/or DEP on their own have the potential for a cumulative impact with other plans, projects and activities (described as 'impact screening'). This information is set out in **Table 13-15** below. Only potential impacts assessed as negligible or above in **Section 13.5** are included in the CIA (i.e. those assessed as 'no impact' are not taken forward as there is no potential for them to contribute to a cumulative impact).

254. **Table 13-15** concludes that in relation to Shipping and Navigation where effects are very localised, for example cable corridor interactions, there is no potential for interaction with other projects that would cause cumulative effects. Where impacts relate to vessel movement across the study area there is the potential for cumulative effects, and other plans and projects also have the potential to change existing traffic levels and distributions.

Table 13-15: Potential Cumulative Impacts (Impact Screening)

Impact	Potential for Cumulative Impact	Data Confidence	Rationale
Construction			

Impact	Potential for Cumulative Impact	Data Confidence	Rationale
Impact 1: Displacement	Yes	Medium	There is the potential for interaction which may lead to cumulative displacement.
Impact 2: Adverse weather Routeing	Yes	Medium	There is potential for disruption to existing adverse weather routeing which may lead to cumulative routeing implications.
Impact 3: Collision risk	Yes	Medium	There is the potential for interaction which may lead to cumulative collision risk.
Impact 4: Allision risk	Yes	Medium	There is the potential for interaction which may lead to cumulative allision risk.
Impact 5: Interaction with subsea cables	No	Medium	The risk is localised with no interaction with other cables or cumulative projects. Existing cables will be considered within the Cable Burial Risk Assessment undertaken for SEP and DEP. The developers of any future cables in proximity would be undertaking their own similar assessments. On this basis, project alone impacts remain.
Impact 6: Under keel clearance	Yes	Low	There is the potential for interaction which may lead to cumulative impacts.
Impact 7: Emergency response	Yes	Medium	There is the potential for interaction which may lead to cumulative pressure on emergency response.
Operation			
Impact 1: Displacement	Yes	Medium	There is the potential for interaction which may lead to cumulative displacement and rerouting.
Impact 2: Adverse weather Routeing	Yes	Medium	There is potential for disruption to existing adverse weather routeing which may lead to cumulative routing implications.

Impact	Potential for Cumulative Impact	Data Confidence	Rationale
Impact 3: Collision risk	Yes	Medium	There is the potential for interaction which may lead to cumulative collision risk.
Impact 4: Allision risk	Yes	Medium	There is the potential for interaction which may lead to cumulative allision risk.
Impact 5: Interaction with subsea cables	No	Medium	The risk is localised with no interaction with other cables or cumulative projects. Existing cables will be considered within the Cable Burial Risk Assessment undertaken for the SEP and DEP. The developers of any future cables in proximity would be undertaking their own similar assessments. On this basis, project alone impacts remain.
Impact 6: Under keel clearance	Yes	Medium	There is the potential for interaction which may lead to cumulative impacts.
Impact 7: Emergency response	Yes	Medium	There is the potential for interaction which may lead to cumulative pressure on emergency response.
Decommissioning			
Impact 1: Displacement	Yes	Medium	There is the potential for interaction which may lead to cumulative displacement.
Impact 2: Adverse weather Routeing	No	Medium	Alternative adverse weather routeing, where required, will be established prior to decommissioning.
Impact 3: Collision risk	Yes	Medium	There is the potential for interaction which may lead to cumulative collision risk.
Impact 4: Allision risk	Yes	Medium	There is the potential for interaction which may lead to cumulative allision risk.
Impact 5: Interaction with subsea cables	No	Medium	The risk is localised with no interaction with other cables or cumulative projects. Existing cables will be considered within the Cable Burial Risk Assessment

Impact	Potential for Cumulative Impact	Data Confidence	Rationale
			undertaken for the SEP and DEP. The developers of any future cables in proximity would be undertaking their own similar assessments. On this basis, project alone impacts remain.
Impact 6: Under keel clearance	Yes	Medium	There is the potential for interaction which may lead to cumulative impacts.
Impact 7: Emergency response	Yes	Medium	There is the potential for interaction which may lead to cumulative pressure on emergency response.

13.6.2 Other Plans, Projects and Activities

255. The second step in the cumulative assessment is the identification of the other plans, projects and activities that may result in cumulative impacts for inclusion in the CIA (described as 'project screening'). This information is set out in **Table 13-16** (noting the same list of projects applies during construction, operation and decommissioning) together with a consideration of the relevant details of each, including current status (e.g. under construction), planned construction period, closest distance to SEP and DEP, status of available data and rationale for including or excluding from the assessment. It is noted that for shipping and navigation, operational developments are considered within the existing environment and not cumulatively.

256. The project screening has been informed by the development of a CIA Project List which forms an exhaustive list of plans, projects and activities in a very large study area relevant to SEP and DEP. The list has been appraised, based on the confidence in being able to undertake an assessment from the information and data available, enabling individual plans, projects and activities to be screened in or out. For this chapter a tier classification has also been determined as detailed in the NRA (**Appendix 13.1 Navigation Risk Assessment**).

Table 13-16: Summary of Projects Considered for the CIA

Project	Status	Construction Period	Closest Distance from the Project (km)	Confidence in Data	Included in the CIA (Y/N)	Rationale
Seaweed Farm (Sustainable Seaweed Ltd)	Application submitted	N/A	1.5 (array area) 8 (cable corridor)	Low	Yes	Within 100nm and has an effect on cumulative routeing
Seaweed Farm (Norfolk Seaweed Ltd)	Application submitted	N/A	12 (cable corridor) 17 (array area)	High	Yes	Within 100nm and has an effect on cumulative routeing
Outer Dowsing	Pre scoping	TBC	13 (array area) 16 (cable corridor)"	High	N	The project was at an early stage at the point of assessment, and, as such, not enough information was known to carry out any meaningful assessment
Norfolk Vanguard OWF	Consented	2025 – 2027 (offshore construction)	28 (cable corridor) 58 (array area)	High	Yes	Within 100nm and has an effect on cumulative routeing
Norfolk Boreas OWF	Consented	2025 - 2029	22 (cable corridor)	High	Yes	Within 100nm and has an effect on cumulative routeing

Project	Status	Construction Period	Closest Distance from the Project (km)	Confidence in Data	Included in the CIA (Y/N)	Rationale
			82 (array area)			
East Anglia THREE	Consented	2023 - 2026	94 (cable corridor) 95 (array area)	High	Yes	Within 100nm and has an effect on cumulative routeing
East Anglia ONE North	Consented	2023 - 2026	97 (cable corridor) 98 (array area)	Medium	Yes	Within 100nm and has an effect on cumulative routeing
East Anglia TWO	Consented	2023 - 2026	98 (cable corridor) 103 (array area)	Medium	Yes	Within 100nm and has an effect on cumulative routeing
Hornsea Project Two	Under Construction	2020-2022 (offshore construction)	34 (cable corridor) 52 (array area)	High	Yes	Within 100nm and has an effect on cumulative routeing

Project	Status	Construction Period	Closest Distance from the Project (km)	Confidence in Data	Included in the CIA (Y/N)	Rationale
Hornsea Project Four	Application submitted	2024 -2029	52 (array area) 70 (cable corridor)	Medium	Yes	Preapplication wind farm within 100nm
Hornsea Project Three	Consented	2023-2026	0 (cable corridor) 83 (array area)	High	Yes	Wind farm within 50nm
Five Estuaries	Pre PEIR	Late 2020s	127 (cable corridor) 135 (array area)	Low	Yes	Wind farm within 100nm
North Falls	Pre PEIR	Late 2020s	120 (cable corridor) 128 (array area)	Low	Yes	Wind farm within 100nm

Project	Status	Construction Period	Closest Distance from the Project (km)	Confidence in Data	Included in the CIA (Y/N)	Rationale
Dogger Bank South East	Pre scoping	TBC	115 (array area) 121 (cable corridor)"	High	N	The project was at an early stage at the point of assessment, and, as such, not enough information was known to carry out any meaningful assessment
Dogger Bank South West	Pre scoping	TBC	129 (array area) 134 (cable corridor)	High	N	The project was at an early stage at the point of assessment, and, as such, not enough information was known to carry out any meaningful assessment
Dogger Bank A	Consented	2022-2024 (offshore construction)	110 (cable corridor) 148 (array area)	High	Yes	Wind farm within 100nm
Dogger Bank B	Consented	2022-2024 (offshore construction)	110 (cable corridor) 167 (array area)	High	Yes	Wind farm within 100nm

Project	Status	Construction Period	Closest Distance from the Project (km)	Confidence in Data	Included in the CIA (Y/N)	Rationale
Dogger Bank C and Sofia	In construction	2024-2025 (offshore)	166 (cable corridor) 172 (array area)	High	Yes	Wind farm within 100nm

13.6.3 Assessment of Cumulative Impacts

257. Having established the residual impacts from SEP and/or DEP with the potential for a cumulative impact, along with the other relevant plans, projects and activities, the following sections provide an assessment of the level of cumulative impacts that may arise. Within the FSA, the cumulative safety risks for SEP or DEP in isolationare assessed to be the same as the projects in isolation.

13.6.3.1 Displacement of Activities

258. A cumulative deviation assessment of the main routes and adverse weather routeing within the NRA identified that cumulative increases in existing vessel routeing represented only minor increases in journey distances. Sea space is unaffected when the projects screened into the cumulative assessment are incorporated.

259. Regular operators of the area raised concern during consultation over long term cumulative impacts associated with deviations to avoid project vessels in the area. These concerns were related to commercial impacts on transit times and distances. The operator feedback was that the implementation of project vessel procedures including transit routes to and between the wind farm sites would mitigate this impact. It is noted that given the existing baseline projects, third party vessels in the area will be familiar with wind farm traffic.

260. The proposals by Sustainable Seaweed Ltd for a macroalgae/seaweed farm within the area (**Appendix 13.1 Navigation Risk Assessment**) was not observed from AIS and survey data to impact upon any main routes, noting local shallow banks to the west of the SEP wind farm site mean all main routes already pass south of the proposed seaweed farm site location.

261. In FSA terms, the risk is *broadly acceptable and ALARP* with embedded mitigation which is **minor adverse** and not significant in EIA terms.

13.6.3.1.1 Mitigation

262. Relevant additional mitigation has been identified. This includes project vessel procedures including transit routes to and between wind farm sites defined with consideration of crossing angles relative to existing shipping lanes, and targeted promulgation of information to specific operators, organisations and users. Further, a Navigational Management Plan will be drafted post consent, however, it is noted that given the existing baseline projects, third party vessels in the area will be familiar with wind farm traffic in the area.

263. These procedures would be managed centrally via Marine Coordination and would be promulgated including on a targeted basis to any operators of relevance. This will include the key operators in the area such as P&O, Stena, DFDS, and Cobelfret.

13.6.3.1.2 Residual Impacts - SEP or DEP in isolation

264. The residual cumulative impact of Displacement of Activities as a result of SEP and DEP, although reduced, *remains broadly acceptable with additional mitigation and is therefore considered ALARP.* The residual impact of cumulative displacement is, therefore, **minor adverse** in EIA terms for both SEP or DEP in isolation which is not significant.

13.6.3.1.3 Residual Impacts - SEP and DEP

265. The residual impact of Displacement of Activities in the cumulative assessment would be the same as SEP or DEP in isolation as route deviations would not measurably increase in terms of deviation percentage. This is detailed further within the NRA (**Appendix 13.1 Navigation Risk Assessment**).

13.6.3.2 Adverse weather routeing

266. SEP and DEP are not anticipated to impede adverse weather routeing on the basis that there is sufficient sea room between the wind farm sites to accommodate transit during periods of adverse weather. This sea space is unaffected when the screened in cumulative projects are incorporated.

267. On this basis, noting the size of the cumulative area assessed, any cumulative impacts on adverse weather routeing are assessed as being of minor consequence and remote occurrence, meaning they are *broadly acceptable and ALARP* which is **minor adverse** and not significant in EIA terms.

13.6.3.2.1 Mitigation

268. No additional mitigation measures are proposed.

13.6.3.3 Vessel to Vessel Collision

269. There is no notable change in sea space and vessel traffic when the cumulative projects are incorporated. Given Lowestoft and Great Yarmouth are likely to be utilised for base ports for future wind farm projects, there may be an increase in wind farm associated traffic on a cumulative basis as other projects are being constructed. However, all developers should be establishing appropriate vessel management procedures (e.g., marine coordination, transit routes, site access points), and it is noted that vessels in the study area will be familiar with wind farm traffic. In FSA terms, vessel to vessel collision is assessed as being *tolerable with embedded mitigation* and third party to project vessels is assessed as being *broadly acceptable and ALARP*.

270. Given the distances and orientation of cumulative projects from SEP and DEP, the impact in EIA terms is the same as SEP and DEP i.e. **moderate adverse**.

13.6.3.3.1 Mitigation

271. Relevant additional mitigation has been identified. This includes project vessel procedures (including transit routes to and between wind farm sites defined with consideration of crossing angles relative to existing shipping lanes), the implementation of a Navigation Management Plan and targeted promulgation of information to specific operators, organisations and users.

272. These procedures would be managed centrally via Marine Coordination and would be promulgated including on a targeted basis to any operators of relevance. This will include the key operators in the area such as P&O, Stena, DFDS, and Cobelfret.

13.6.3.3.2 Residual Impacts

273. The residual cumulative collision impact while reduced with additional mitigation remains *tolerable and is ALARP*. This is **moderate adverse** in EIA terms, which is not significant owing to its assessment of ALARP within the FSA.

13.6.3.4 Vessel to Structure Allision

274. As highlighted above sea space is unaffected when the screened in cumulative projects are incorporated. Lighting and marking will require cumulative consideration, and requirements will be discussed and agreed with key stakeholders, including TH and the MCA. In FSA terms, vessel to vessel collision is assessed as being *tolerable with embedded mitigation and ALARP.*

275. Given the distances and orientation of cumulative projects from SEP and DEP, the impact in EIA terms is the same as SEP and DEP i.e. **moderate adverse** which is not significant owing to its assessment of ALARP within the FSA.

13.6.3.5 Changes in Under Keel Clearance

276. In accordance with MGN 654, any future OWF projects will be required to discuss changes in water depth of greater than 5% with the MCA.

277. Effects will be localised to each project and interaction between SEP and DEP with cumulative projects in terms of under keel clearance is limited and in FSA terms the impact is assessed as being *broadly acceptable and ALARP.*

278. There may be under keel clearance restrictions for navigational access associated with the proposed seaweed farm, however, any cumulative impact is expected to be limited. The Applicant will continue to consult with the relevant developer, and it is assumed that the Sustainable Seaweed Ltd will seek to mitigate under keel risks in consultation with the MCA. Given the cumulative projects considered and that under keel clearance impacts arising from SEP and DEP are likely to be associated with the areas in the vicinity of the HDD exit point, the impact is the same as for SEP and DEP (**minor adverse**).

13.6.3.5.1 Mitigation

279. No additional mitigation measures are proposed.

13.6.3.6 Emergency Response

280. An increase in incident rates may arise as a result of the cumulative interaction of SEP and DEP with other projects, leading to an impact on emergency response resources.

281. Given the low baseline incident rates (**Section 13.4.9**) and noting the additional "self-help" resources that would be available at other projects, it is not considered likely that there will be an adverse effect on emergency response resources at a cumulative level. In FSA terms, the impact is assessed as being *broadly acceptable and ALARP.*

282. The final layout will be agreed with the MCA post-consent, and these discussions will include SAR considerations at a cumulative level. On this basis, the impact in EIA terms is the same as SEP and DEP (**minor adverse**).

13.6.3.6.1 Mitigation

283. No additional mitigation measures are proposed.

13.7 Transboundary Impacts

284. Transboundary impacts relate to impacts that may occur from an activity within one EEA state on the environment or interests of another. Given the international nature of shipping and navigation, as identified in **Section 13.4.10**, transboundary impacts are possible. These are assessed in terms of impacts to international shipping routes in **Sections 13.5** and **13.6**. This includes effects on main routes with destinations at European ports such as Rotterdam (Netherlands) and Zeebrugge (Belgium).

285. SEP in isolation would cause deviation to two main routes (Hull (UK) / Zeebrugge (Belgium) and Hull (UK) / Rotterdam (Netherlands)) by 0.1%. DEP in isolation, would cause deviation to three main routes with a European destination (Tees (UK) / Rotterdam (Netherlands) and two Humber (UK) / Rotterdam (Netherlands) routes), with a maximum change of 4%.

286. Considering SEP and DEP, while the total number of transboundary routes experiencing deviation would increase to five, the change in distance to the routes would remain as per the sites in isolation.

287. European Union (EU) member states will be included in all formal stages of consultation and it is also noted that the deviations highlighted above have been raised by one operator, P&O, who highlight the increased distance and fuel costs associated with the deviations. As per the operational impacts on main routes, transboundary impacts are expected at a frequent frequency and a negligible consequence given the minimal deviations that would be required as well as the embedded mitigation in place to manage operational activities. The impact has therefore been classed as **moderate adverse** significance SEP or DEP in isolation and together, which is not significant in EIA terms given the maximum route deviation of 4% (**Appendix 13.1 Navigation Risk Assessment**) and the assessment of Displacement of Activities and Adverse Weather Routeing as ALARP in the FSA.

13.8 Inter-relationships

288. **Table 13-17** illustrates the inter-relationship between impacts discussed in this chapter and those discussed in other chapters.

Table 13-17: Shipping and Navigation Users Inter-Relationships

Topic and description	Related chapter	Where addressed in this chapter	Rationale
Construction			
Impacts on fishing vessels (displacement)	**Chapter 12 Commercial Fisheries**	The impact to vessel displacement and navigational safety are assessed in **Section 13.5**.	Displacement (and the safety implications) impacts based on vessel type and their usage of the study area are assessed in **Section 13.5.1** Commercial effects of displacement are considered in **Chapter 12 Commercial Fisheries**.
Interference with oil and gas operations	**Chapter 16 Petroleum Industry and Other Marine Users**	The impact to oil and gas vessels are assessed in **Section 13.5.**	Impacts on oil and gas vessels and platform access are considered in **Section 13.5** and are detailed in **Chapter 16 Petroleum Industry and Other Marine Users.**
Operation			
Changes to wave and tidal currents	**Chapter 6 Marine Geology,**	Oceanographic conditions are included within	Changes to waves and tidal currents are not predicted at a

Topic and description	Related chapter	Where addressed in this chapter	Rationale
	Oceanography and Physical Processes	modelling scenarios within the NRA (**Appendix 13.1 Navigation Risk Assessment**)	scale whereby the conditions inputted into modelling would show any measurable difference.
Collision and allision risk	**Chapter 12 Commercial Fisheries**	Allision and collision risk in **Section 13.5**.	Allision and collision risk modelling includes all vessel types. The number and vessel types associated with fishing are further defined within the **Chapter 12 Commercial Fisheries**.
Impacts on communications and SAR	**Chapter 15 Aviation and Radar**	The impacts to communication and emergency response vessels are considered in **Section 13.5.**	Vessel to vessel communication and vessel response are assessed in **Section 13.5** with impacts associated with aviation assessed in **Chapter 15 Aviation and Radar.**
Decommissioning			
As per construction			

13.9 Interactions

289. The impacts identified and assessed in this chapter have the potential to interact with each other. The areas of potential interaction between impacts are presented in **Table 13-18**. This provides a screening tool for which impacts have the potential to interact.

290. Within **Table 13-18** the impacts are assessed relative to each development phase (phase assessment, i.e. construction, operation or decommissioning) to see if (for example) multiple construction impacts affecting the same receptor could increase the level of impact upon that receptor.

Table 13-18: Interaction Between Impacts - Screening

Potential Interaction between Impacts Construction, operation and decommissioning phases							
	Impact 1: Displacement	Impact 2: Adverse weather routeing	Impact 3: Collision Risk	Impact 4: Allision Risk	Impact 5: Interaction with subsea cables	Impact 6: Under keel clearance	Impact 7: Emergency response
Impact 1: Displacement	-	No	Yes	Yes	No	No	No
Impact 2: Adverse weather routeing	No	-	Yes	Yes	No	No	No
Impact 3: Collision Risk	Yes	Yes	-	Yes	No	No	Yes
Impact 4: Allision Risk	Yes	Yes	Yes	-	No	No	Yes
Impact 5: Interaction with subsea cables	No	No	No	No	-	Yes	Yes
Impact 6: Under keel clearance	No	No	No	No	Yes	-	No
Impact 7: Emergency response	No	No	Yes	Yes	Yes	No	-

291. The worst-case impacts assessed within the chapter take these potential interactions into account for each phase, and therefore the impact assessments are considered conservative and robust, and the levels of significance identified in **Sections 13.5** and **13.6** are not increased.

13.10 Monitoring Requirements

292. Monitoring requirements are described in the **Offshore In-Principle Monitoring Plan (IPMP)** (document reference 9.5) submitted alongside the DCO application and will be further developed and agreed with stakeholders prior to construction based on the IPMP and taking account of the final detailed design of the Projects.

293. The following monitoring is proposed to be undertaken in accordance with standard navigation conditions for inclusion within DMLs for offshore renewable energy installations:

- Construction and post construction (over three years, unless agreed otherwise with the MMO) monitoring of marine traffic (by AIS) with a report submitted each year to the MMO, TH and the MCA.
- Aids to Navigation Management plan that remains functional throughout the lifetime of the Project with reporting to TH.
- A swath bathymetric survey to IHO Order 1a of the installed cable corridor (post construction and decommissioning). Data is to be supplied to the MCA, UKHO and survey report to the MMO.
- Periodic monitoring of cable burial / protection with a risk-based approach to the management (this work will be undertaken for engineering and asset integrity purposes, with the frequency determined by need).

13.11 Assessment Summary

294. This chapter provides a characterisation of the existing environment for shipping and navigation based on existing datasets, long term AIS analysis and site-specific survey. Analysis of the existing environment highlights the high levels of vessel passage between the operational SOW and DOW sites, with commercial vessels (including cargo, tanker and passenger) accounting for the majority of the traffic. Aggregate dredgers, oil and gas, wind farm support, fishing and recreational vessels are also all active within the study area.

295. Assessment of the impacts across the project lifecycle, summarised in **Table 13-19** below, has established that there will be some residual impacts during the construction, operation and decommissioning phases of SEP and DEP. However, residual impacts are not considered significant since they are assessed as ALARP or lower in the FSA.

296. Potential impacts from cable lay activities, interaction with cables once installed and reductions in under keel clearance are considered to be localised and, with the embedded mitigation outlined (largely associated with established communication procedures and use of HDD near landfall), are not significant in EIA terms.

297. Impacts on emergency response resources were assessed and, given baseline incident rates and the additional ‘self-help’ resources that would be available, are also not considered to be significant in EIA terms.

298. Disruption and deviations to all vessel types will occur at a high frequency resulting in **moderate adverse** impacts. Routes, including adverse weather routeing, have been assessed for the entire project lifecycle, including future vessel traffic increase scenarios (increases of 10% and 20%). In terms of main routes, deviations would be required for six out of the 14 main routes identified within the study area assuming both SEP and DEP are constructed, with a maximum 4% change in route length.

299. While deviations are considered minimal in terms of change in journey distance, the affected vessels are being displaced at a high frequency (and with an assessed significant impact) into a smaller navigable space (sea room) than is currently available, leading to increased encounters and collision risk. Collision and allision modelling was undertaken for SEP in isolation, DEP in isolation and SEP and DEP. Results show the annual vessel to vessel collision risk within the study area following installation of SEP and DEP for the base case traffic levels corresponds with a collision return period of approximately one in eight years (a 13% increase in collision frequency). The annual allision risk for the base case traffic levels, following construction of SEP and DEP, was estimated to correspond to an allision return period of approximately 470 years (powered) and 750 years (drifting). This presents a potential impact of **moderate adverse** significance.

300. Additional mitigation measures were identified as informed by the NRA, FSA and stakeholder consultation. The measures are considered particularly effective at mitigating impacts relating to displacement/deviation and collision and include:

- Project vessel procedures including transit routes to and between wind farm sites defined with consideration of crossing angles relative to existing shipping lanes.
- Targeted promulgation of project information and vessel procedures to specific operators, organisations and users (including commercial, recreational and fishing users):

  A Navigation Management Plan, which will be developed post consent to manage crew transfer vessels (including daughter craft) during the construction and operations phase of the Project. The navigation management plan will not apply to large construction and operation vessels including the Service Operation Vessels, which will adhere to flag state regulations as required, including COLREGS. The navigation management plan will include:

  Application – who the plan applies to;

  Navigation stakeholders that should be contacted with project vessel movements;

  A summary of the commercial vessel movements within the area; and

  What considerations the applicable vessels need to have when navigating across the corridor i.e., clear intentions as the give way/stand on vessel (under COLREGS), safe speeds and restricted visibility.

301. All impacts from both SEP or DEP in isolation, from SEP and DEP, and on a cumulative basis are assessed as being at most *tolerable with additional mitigation and ALARP*, which is not significant in EIA terms.

Table 13-19: Summary of Potential Impacts in EIA Terms on Shipping and Navigation Receptors (SEP or DEP in isolation and SEP and DEP)

Potential impact	Receptor	Frequency	Consequence	Pre-additional mitigation impact	Additional Mitigation measures proposed	Residual impact
Construction and Decommissioning						
Impact 1: Displacement	Commercial vessels, Wind farm support vessels, Oil and gas vessels, Aggregate dredgers, Fishing vessels, Recreational vessels	Frequent	Negligible	**Moderate adverse**	Project vessel procedures. Targeted promulgation of information. Navigation Management Plan	**Moderate adverse (not significant)**
Impact 2: Adverse weather routeing	Commercial vessels	Reasonably probable	Minor	**Moderate adverse**	Navigation Management Plan	**Minor adverse**
Impact 3: Collision risk	All vessel types	Remote	Serious	**Moderate adverse**	Project vessel procedures. Targeted promulgation of information. Navigation Management Plan	**Moderate adverse (not significant)**
Impact 4: Allision risk	All vessel types	Remote	Serious	**Moderate adverse**	N/A	**Moderate adverse (not significant)**

Impact 5: Interaction with subsea cables	All vessel types	Extremely Unlikely	Moderate	**Minor adverse**	N/A	**Minor adverse (mitigation considered embedded)**
Impact 6: Under keel clearance	All vessel types	Extremely Unlikely	Moderate	**Minor adverse**	N/A	**Minor adverse**
Impact 7: Emergency response	All vessel types	Extremely Unlikely	Serious	**Minor adverse**	N/A	**Minor adverse (mitigation considered embedded)**
Operation						
Impact 1: Displacement	Commercial vessels, Wind farm support vessels, Oil and gas vessels, Aggregate dredgers, Fishing vessels, Recreational vessels	Frequent	Negligible	**Moderate adverse**	Project vessel procedures including targeted promulgation of information. Navigation Management Plan.	**Moderate adverse (not significant)**
Impact 2: Adverse weather routeing	Commercial vessels	Reasonably probable	Minor	**Moderate adverse**	Navigation Management Plan.	**Minor adverse**
Impact 3 - Collision risk	All vessel types	Remote	Serious	**Moderate adverse**	Project vessel procedures including targeted promulgation of information.	**Moderate adverse (not significant)**

					Navigation Management Plan.	
Impact 4: Allision risk	All vessel types	Remote	Serious	**Moderate adverse (not significant)**	N/A	**Moderate adverse (not significant)**
Impact 5: Interaction with subsea cables	All vessel types	Extremely Unlikely	Moderate	**Minor adverse**	N/A	**Minor adverse**
Impact 6: Under keel clearance	All vessel types	Extremely Unlikely	Moderate	**Minor adverse**	N/A	**Minor adverse**
Impact 7: Emergency response	All vessel types	Extremely Unlikely	Serious	**Minor adverse**	N/A	**Minor adverse**
Cumulative						
Impact 1: Displacement	Commercial vessels, Wind farm support vessels, Oil and gas vessels, Aggregate dredgers, Fishing vessels, Recreational vessels	Reasonably Probable	Negligible	**Minor adverse**	Project vessel procedures including targeted promulgation of information. Navigation Management Plan.	**Minor adverse**
Impact 2: Adverse weather routeing	Commercial vessels	Remote	Minor	**Minor adverse**	N/A	**Minor adverse**

Impact 3: Collision risk	All vessel types	Remote	Serious	**Moderate adverse**	Project vessel procedures including targeted promulgation of information. Navigation Management Plan.	**Moderate adverse (not significant)**
Impact 4: Allision risk	All vessel types	Remote	Serious	**Moderate adverse (not significant)**	N/A	**Moderate adverse (not significant)**
Impact 5: Interaction with subsea cables	All vessel types	Extremely Unlikely	Moderate	**Minor adverse**	N/A	**Minor adverse**
Impact 6: Under keel clearance	All vessel types	Extremely Unlikely	Moderate	**Minor adverse**	N/A	**Minor adverse**
Impact 7: Emergency response	All vessel types	Extremely Unlikely	Serious	**Minor adverse**	N/A	**Minor adverse**

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