# East Anglia TWO Offshore Windfarm

# Appendix 14.1

## Navigational Risk Assessment

Preliminary Environmental Information
Volume 3
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# East Anglia TWO Offshore Windfarm

# Navigation Risk Assessment

# (Appendix 14.1)

| | |
|---|---|
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| Revision Number | Date | Summary of Change |
|---|---|---|
| 00 | 10th August 2018 | Initial Draft |
| 01 | 14th January 2019 | Updates following changes to layout |

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# Abbreviations Table

| Abbreviation | Definition |
|---|---|
| **AfL** | Area for Lease |
| **AIS** | Automatic Identification System |
| **ALARP** | As Low as Reasonably Practicable |
| **ALB** | All-Weather Lifeboat |
| **AtoN** | Aids to Navigation |
| **BEIS** | Department for Business, Energy and Industrial Strategy |
| **BMAPA** | British Marine Aggregate Producers Association |
| **CA** | Cruising Association |
| **CGOC** | Coastguard Operations Centre |
| **CIA** | Cumulative Impact Assessment |
| **COLREGs** | International Regulations for Preventing Collisions at Sea |
| **CoS** | Chamber of Shipping |
| **CRO** | Coastguard Rescue Officer |
| **CRT** | Coastguard Rescue Team |
| **DCO** | Development Consent Order |
| **DfT** | Department for Transport |
| **DML** | Deemed Marine Licence |
| **DWR** | Deep Water Route |
| **E** | East |
| **EIA** | Environmental Impact Assessment |
| **ERCoP** | Emergency Response Co-operation Plan |
| **ES** | Environmental Statement |
| **EU** | European Union |
| **FSA** | Formal Safety Assessment |
| **GT** | Gross Tonnage |
| **HSE** | Health and Safety Executive |
| **IALA** | International Association of Marine Aids to Navigation and Lighthouse Authorities |
| **ILB** | Inshore Lifeboat |

| Abbreviation | Definition |
|---|---|
| **IMO** | International Maritime Organization |
| **km** | kilometre |
| **LAT** | Lowest Astronomical Tide |
| **LOA** | Length Overall |
| **LPG** | Liquid Petroleum Gas |
| **m** | metre |
| **MAIB** | Marine Accident Investigation Branch |
| **MCA** | Maritime and Coastguard Agency |
| **MEHRA** | Marine Environmental High Risk Area |
| **Met Mast** | Meteorological Mast |
| **MGN** | Marine Guidance Note |
| **MHWS** | Mean High Water Springs |
| **MMO** | Marine Management Organisation |
| **MoD** | Ministry of Defence |
| **MSC** | Maritime Safety Council |
| **MW** | Megawatt |
| **N** | North |
| **nm** | Nautical mile |
| **NMOC** | National Maritime Operations Centre |
| **NOREL** | Nautical Offshore Renewable Energy Liaison |
| **NRA** | Navigation Risk Assessment |
| **NUC** | Not Under Command |
| **OfTO** | Offshore Transmission |
| **OREI** | Offshore Renewable Energy Installations |
| **PEXA** | Practice and Exercise Area |
| **PLL** | Potential Loss of Life |
| **REZ** | Renewable Energy Zone |
| **RNLI** | Royal National Lifeboat Institution |
| **Ro Ro** | Roll on Roll off |
| **RYA** | Royal Yachting Association |

| Abbreviation | Definition |
|---|---|
| **SAR** | Search and Rescue |
| **SMS** | Safety Management System |
| **SNSOWF** | Southern North Sea Offshore Wind Forum |
| **SOLAS** | International Convention for the Safety of Life at Sea |
| **SPR** | ScottishPower Renewables |
| **STS** | Ship-to-Ship |
| **TSS** | Traffic Separation Scheme |
| **UK** | United Kingdom |
| **UKHO** | United Kingdom Hydrographic Office |

# Glossary

| Term | Definition |
|---|---|
| As Low As Reasonably Practicable (ALARP) | The principle that the residual risk shall be reduced as far as reasonably practicable. |
| Allision | Contact between a moving and stationary object. |
| Automatic Identification System (AIS) | Automatic Identification System. A system by which vessels automatically broadcast their identity, key statistics e.g. length, brief navigation details e.g. location, destination, speed and current status e.g. survey. Most commercial vessels and European Union (EU) fishing vessels over 15 m are required to have AIS. |
| Baseline | The assessment of risk based on current shipping densities and traffic types as well as the marine environment. |
| Collision | The act or process of colliding (crashing) between two moving objects. |
| Environmental Statement (ES) | A document reporting the findings of the Environmental Impact Assessment (EIA) and produced in accordance with the EIA Directive as transposed into United Kingdom (UK) law by the EIA Regulations. |

| Term | Definition |
|---|---|
| Formal Safety Assessment (FSA) | A structured and systematic process for assessing the risks and costs (if applicable) associated with shipping activity. |
| Future Case | The assessment of risk based on the predicted growth in future shipping densities and traffic types as well as foreseeable changes in the marine environment. |
| Marine Environmental High Risk Area (MEHRA) | Areas in UK coastal waters where ships' masters are advised of the need to exercise more caution than usual i.e. crossing areas of high environmental sensitivity where there is a risk of pollution from commercial shipping. |
| Marine Guidance Note (MGN) | A system of guidance notes issued by the Maritime and Coastguard Agency (MCA) 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. |
| Navigational Risk Assessment (NRA) | A document which assesses the overall impact to shipping and navigation of a proposed Offshore Renewable Energy Installation (OREI) based upon formal risk assessment. |
| Not Under Command (NUC) | Under Part A of the International Regulations for Preventing Collisions at Sea (COLREGs), the term “vessel not under command” means a vessel which through some exceptional circumstance is unable to manoeuvre as required by these Rules and is therefore unable to keep out of the way of another vessel. |
| Offshore Renewable Energy Installation (OREI) | OREIs as defined by Guidance on UK Navigational Practice, Safety and Emergency Response Issues, MGN 543. For the purpose of this report and in keeping with the consistency of the EIA, OREI can mean offshore turbines and the associated electrical infrastructures such as offshore High Voltage Alternating Current (HVAC) transformer substations, offshore High |

| Term | Definition |
|---|---|
| | Voltage Direct Current (HVDC) converter substations, construction, operation and maintenance (accommodation) platforms and offshore HVAC booster stations. |
| Radar | Radio Detection And Ranging – an object-detection system which uses radio waves to determine the range, altitude, direction, or speed of objects. |
| Regular Operator | A commercial vessel operator whose vessel(s) are observed to transit through a particular region on a regular basis. |
| Safety Zone | A marine zone demarcated for the purposes of safety around a possibly hazardous installation or works / construction area under the Energy Act 2004. |

# 1 Introduction

## 1.1 Background

1. Anatec were commissioned by ScottishPower Renewables (SPR) to undertake a Navigation Risk Assessment (NRA) for the proposed East Anglia TWO project. The report presents information on the offshore development area relative to the existing and future case navigational activity.

## 1.2 Environmental Impact Assessment

2. Assessments of impacts on shipping and navigation during the construction, operation and decommissioning phase are informed by an NRA. Following the Maritime and Coastguard Agency (MCA) methodology for assessing marine navigational risk of offshore windfarms (MCA 2015) and Marine Guidance Note (MGN) 543 (MCA 2016), the NRA includes:

- Overview of base case environment;
- Marine traffic survey data and analysis;
- Assessment of navigational risk pre and post development of the offshore development area;
- Emergency response;
- Technical assessment for the Formal Safety Assessment (FSA) being undertaken as part of the EIA;
- Identification of mitigation measures; and
- Through life safety management.

3. Results from the NRA are then used to inform the EIA, a process which identifies the environmental effects of the offshore development area, both negative and positive, in accordance with EU Directives.

# 2 Regulations and Guidance

## 2.1 Primary Guidance

4. The primary guidance documents used to inform this NRA are as follows:

- MCA MGN 543 (Merchant and Fishing) Safety of Navigation Offshore Renewable Energy Installations (OREIs) – Guidance on United Kingdom (UK) Navigational Practice, Safety and Emergency Response (MCA 2016);
- MCA Methodology for Assessing Marine Navigational Safety Risks of Offshore Wind Farms (2015); and
- Guidelines for FSA – Maritime Safety Council (MSC)/Circular 1023/MEPC/Circular 392 (International Maritime Organization (IMO) 2002).

5. MGN 543 highlights issues that shall be taken into consideration when assessing the effect on navigational safety from offshore renewable energy developments, proposed in UK internal waters, territorial sea or Renewable Energy Zone (REZ).

6. The MCA require that their methodology is used as a template for preparing NRAs, including the completion of an FSA. The methodology is centred on risk management and requires a submission that shows that sufficient controls are, or will be, in place for the assessed risk (base case and future case) to be judged as broadly acceptable or tolerable with mitigation. An MGN 543 checklist referencing the sections in this report which address all MCA requirements is presented in *Appendix 14.5 MGN 543 Checklist.*

## 2.2 East Marine Plan

7. During consultation, the Chamber of Shipping (CoS) requested that the East Inshore and East Offshore Marine Plans (HM Government, 2014) be taken into consideration therefore the ports and shipping policies have been presented in *Table 2.1* along with where the policies have been addressed or where they have been addressed.

**Table 2.1 East Marine Plan Ports and Shipping Policies**

| Policy Number | Description | East Anglia TWO Approach |
|---|---|---|
| PS1 | Proposals that require static sea surface infrastructure or that significantly reduce under-keel clearance should not be authorised in IMO designated routes. | The offshore development area is not situated within IMO designated routes as presented in section 8.3. |
| PS2 | Proposals that require static sea surface infrastructure that encroaches upon important navigation routes should not be authorised unless there are external | Baseline and future vessel routeing around the offshore development area has been assessed in section 14 and section 15, respectively. |

| Policy Number | Description | East Anglia TWO Approach |
|---|---|---|
| | circumstances. Proposals should:<br>▪ Be compatible with the need to maintain space for safe navigation, avoiding economic impact;<br>▪ Anticipate and provide for future safe navigational requirements where evidence and / or stakeholder input allows; and<br>▪ Account for impacts upon navigation in-combination with other existing and proposed activities. | |
| PS3 | Proposals should demonstrate, in order of preference:<br>▪ That they will not interfere with current activity and future opportunity for expansion of ports and harbours;<br>▪ How, if the proposal may interfere with current activity and future opportunities for expansion, they will minimise this;<br>▪ How, if the interference cannot be minimised, it will be mitigated; and<br>▪ The case for proceeding if it is not possible to minimise or mitigate the interference. | Given that the East Anglia TWO windfarm site is out with the operational area or harbour limits of any ports, harbours or marinas there are not considered to be any cumulative impacts associated with the construction, operation and maintenance or decommissioning phases. Routeing to and from ports is considered in section 14 and 15 (offshore development area in isolation) and section 19.4 (cumulatively). |

## 2.3 Other Guidance

8. Other (secondary) guidance documents used during the NRA are listed below:

- MCA MGN 372 (Merchant and Fishing) OREIs Guidance to Mariners Operating in the Vicinity of UK OREIs (MCA 2008);
- International Association of Marine Aids to Navigation (AtoN) and Lighthouse Authorities (IALA) Recommendation O-139 on The Marking of Man-Made Offshore Structures, Edition Two (IALA 2013);
- Royal Yachting Association (RYA) – the RYA's Position on Offshore Renewable Energy Developments Paper One – Wind Energy (RYA 2015); and

Department for Business, Energy and Industrial Strategy (BEIS) Standard Marking Schedule for Offshore Installations (BEIS 2011).

# 3 NRA Methodology

## 3.1 Methodology for Assessing the East Anglia TWO Windfarm Site in Isolation

9. As per the primary guidance described in section 2.1, shipping and navigation impacts are assessed within the EIA based on an FSA approach. The NRA forms the technical workings of, and primary input to, the FSA.

10. The NRA has evaluated all required effects as detailed within MGN 543 (listed in *Appendix 14.5)* and as required by the MCA. Those effects associated with shipping and navigation receptors have then been carried forward to *Chapter 14 Shipping and Navigation* as impacts requiring assessment.

11. Where an impact has been identified the overall severity of consequence to the receptor and likely frequency of occurrence of the impact have been determined. As this process incorporates a degree of subjectivity both screening of significant impacts from the NRA process and the consequent assessment within the EIA have used the following sources:

- Scoping responses;
- Baseline data and assessment (including marine traffic survey data);
- Expert opinion;
- Outputs of the Hazard Workshop (*Appendix 14.2*);
- Level of stakeholder concern;
- Significance of any deviation;
- Number of transits of specific vessel and / or vessel type;
- Outputs of modelling where undertaken; and
- Lessons learnt from existing offshore projects.

12. The definitions used within the FSA for severity of consequence and frequency of occurrence are presented in *Table 3.1* and *Table 3.2*, respectively. These rankings assume the embedded mitigation measures listed in section 21 will be in place. It should be noted that the primary concern of the NRA and subsequent FSA is navigational safety (risk to the safety of vessels and / or crew) however financial and reputation consequences have also been considered from a cost benefit approach as per the methodology (MCA 2015).

**Table 3.1 Severity of Consequence Definitions**

| Rank | Severity | Definition |
|---|---|---|
| 1 | Negligible | No injury to persons.<br>No significant damage to infrastructure or vessel.<br>No significant environmental impacts. |

| Rank | Severity | Definition |
|---|---|---|
| | | No significant business (safety), operation or reputation impacts. |
| 2 | Minor | Slight injury(s) to person.<br>Minor damage to infrastructure or vessel.<br>Tier 1 pollution assistance (marine pollution).<br>Minor business (safety), operation or reputation impacts. |
| 3 | Moderate | Multiple moderate or single serious injury to persons.<br>Moderate damage to infrastructure or vessel.<br>Tier 2 pollution assistance (marine pollution).<br>Considerable business (safety), operation or reputation impacts. |
| 4 | Serious | Serious injury or single fatality.<br>Major damage to infrastructure or vessel.<br>Tier 2 pollution assistance (marine pollution).<br>Major national business (safety), operation or reputation impacts. |
| 5 | Major | More than one fatality.<br>Extensive damage to infrastructure or vessel (> £10M).<br>Tier 3 pollution assistance (marine pollution).<br>Major international business (safety), operation or reputation impacts (> £10M). |

### Table 3.2 Frequency of Occurrence Definitions

| Rank | Description | Definition |
|---|---|---|
| 1 | Negligible | < 1 occurrence per 10,000 years |
| 2 | Extremely Unlikely | 1 per 100 to 10,000 years |
| 3 | Remote | 1 per 10 to 100 years |
| 4 | Reasonably Probable | 1 per 1 to 10 years |
| 5 | Frequent | Yearly |

13. The significance of each impact is then assessed as either "**Broadly Acceptable**", "**Tolerable**", or "**Unacceptable**" based on the tolerability risk matrix presented in *Table 3.3*. Definitions of these significance rankings are presented in *Table 3.4*. Where an impact is assessed as being of **Unacceptable** significance, additional mitigation is required to reduce the significance of the impact to within the "**Broadly Acceptable**" or "**Tolerable**" ranges. The impact is then considered to be As Low as is Reasonably Practicable (ALARP).

## Table 3.3 Tolerability Risk Matrix

| | | | | | | |
|---|---|---|---|---|---|---|
| Frequency | **Frequent** | Tolerable | Tolerable | Unacceptable | Unacceptable | Unacceptable |
| | **Reasonably Probable** | Broadly Acceptable | Tolerable | Tolerable | Unacceptable | Unacceptable |
| | **Remote** | Broadly Acceptable | Broadly Acceptable | Tolerable | Tolerable | Unacceptable |
| | **Extremely Unlikely** | Broadly Acceptable | Broadly Acceptable | Broadly Acceptable | Tolerable | Tolerable |
| | **Negligible** | Broadly Acceptable | Broadly Acceptable | Broadly Acceptable | Broadly Acceptable | Tolerable |
| | | **Negligible** | **Minor** | **Moderate** | **Serious** | **Major** |
| | | **Severity** | | | | |

**Table 3.4 Significance Ranking Definitions**

| Ranking | Definition |
|---|---|
| **No Impact** | No impact on shipping and navigation receptors. |
| **Broadly Acceptable** | Risk ALARP with no additional mitigations or monitoring required above embedded mitigations. Includes impacts that have no perceptible effect (effect would not be noticeable to receptors). |
| **Tolerable** | Risk acceptable but may require additional mitigation measures and monitoring in place to control and reduce to ALARP. |
| **Unacceptable** | Significant risk mitigation or design modification required to reduce to ALARP. |

## 3.2 Scope

14. Following the Scoping Report (SPR 2017), the following receptors were identified for impact assessment during the construction, operation and decommissioning phases of the offshore development area:

- Commercial vessels;
- Commercial fishing vessels;
- Marine aggregate dredgers;
- Recreational craft; and
- Emergency response.

15. Impacts on these receptors have been assessed in *Chapter 14 Shipping and Navigation*.

16. It should be noted that impacts on communications, navigation and marine radar interference have been scoped out of the assessment following consultation with the MCA (see *Table 5.1*).

## 3.3 Methodology for Assessing Cumulative Impacts

17. Cumulative effects have been considered for shipping and navigation within this NRA; this includes impacts of other offshore developments, as well as activities associated with other marine operations. Fishing, recreation and marine aggregate dredging transits have been considered as part of the baseline assessment. Other developments and relevant marine activities have been identified within section 8

and section 12, and summarised in the baseline assessment in *Chapter 14 Shipping and Navigation*.

18. A list of screened in cumulative developments and activities is presented in section 19. Associated cumulative effects are then assessed within the Cumulative Impact Assessment (CIA) within *Chapter 14 Shipping and Navigation*.

## 3.4 Methodology of Assessing Transboundary Impacts

19. *Chapter 5 EIA Methodology* presents the methodology associated with transboundary impact assessment. Similar to the cumulative impacts this section will consider transboundary offshore wind projects with regards to vessel routeing and international ports. It should be noted that fishing, recreation and marine aggregate dredging impacts, although they have the potential to be internationally owned or located, have been considered as part of the baseline assessment.

## 3.5 Assumptions

20. The shipping and navigation baseline and impact assessment has been carried out based on the information available, and consultation responses received (including the Scoping Report (SPR 2017)) at the time of preparation. This includes design parameters of the offshore development area (as set out in the Design Envelope), and the anticipated schedule.

21. Assessment has considered a worst case scenario (from a shipping and navigation perspective) from the proposed design envelope noting the final locations of structures will not be finalised until post consent.

## 3.6 Study Areas

22. The analysis within this NRA has largely been undertaken within a ten nautical mile (nm) buffer of the East Anglia TWO windfarm site (hereafter referred to as the shipping and navigation study area). This buffer has been used as it is considered best practice for NRA and it presents a sufficient area to capture the relevant marine traffic for the project in terms of baseline data, while still remaining site specific to the East Anglia TWO windfarm site.

23. In addition, analysis of marine traffic data and relevant navigational features has been undertaken within a 2nm buffer of the offshore cable corridor (hereafter referred to as the offshore cable corridor study area). Both study areas are presented in *Figure 3.1.*

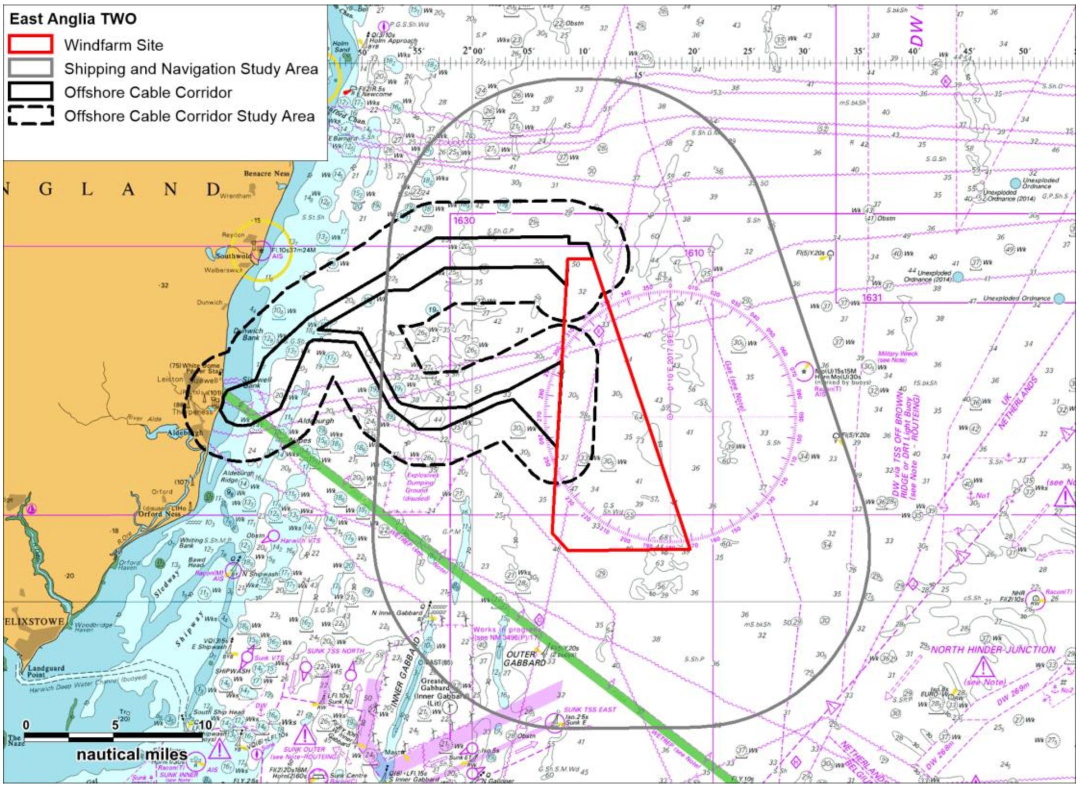



**Figure 3.1 Shipping and Navigation Study Area and Offshore Cable Corridor Study Area**

24. Cumulative impacts have been considered within a 10nm buffer around the East Anglia TWO windfarm site (as per the shipping and navigation study area) but where applicable vessel routes which transit through this area have been considered outside of this study area where they intersect another cumulative site.

# 4 Offshore Development Area Description

## 4.1 Boundaries and Layouts

25. The East Anglia TWO windfarm site is approximately 255 kilometres squared (km$^2$) in area. At its nearest point, the East Anglia TWO windfarm site is 31km from Lowestoft and 32km from Southwold. The key corner coordinates of the East Anglia TWO windfarm site are presented in *Table 4.1* below, with the corresponding corner points then plotted in *Figure 4.1.*

**Table 4.1 East Anglia TWO Windfarm Site Coordinates**

| Corner | Latitude | Longitude |
|---|---|---|
| C1 | 52° 19' 10.41" North (N) | 002° 08' 40.02" East (E) |
| C2 | 52° 19' 10.46" N | 002° 10' 57.49" E |
| C3 | 52° 02' 57.28" N | 002° 19' 46.70" E |
| C4 | 52° 02' 52.97" N | 002° 08' 40.30" E |
| C5 | 52° 03' 53.13" N | 002° 07 14.88" E |

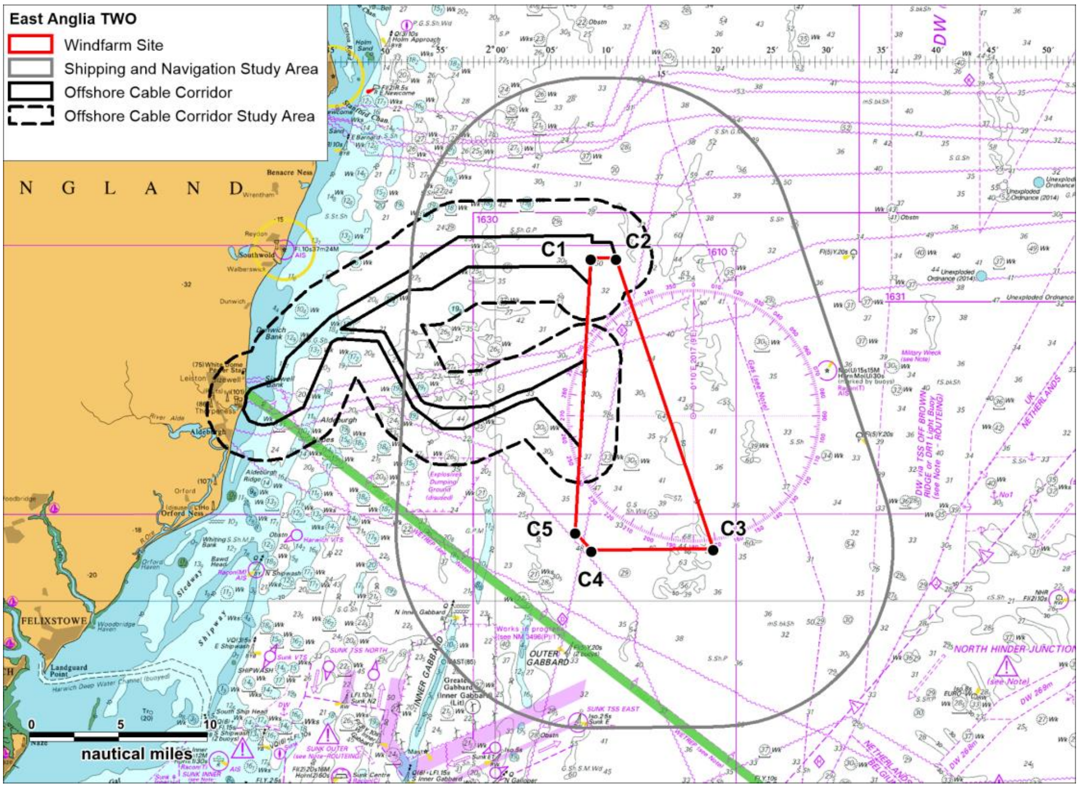



**Figure 4.1 East Anglia TWO Windfarm Site Coordinates**

## 4.2 Offshore Development Area Details

26. Within the East Anglia TWO windfarm site it is proposed that up to 75 wind turbines and an overall capacity of up to 900 Megawatt (MW) would be constructed.

27. Offshore export cables would connect the offshore electrical platforms within the East Anglia TWO windfarm site to shore, making landfall between Sizewell and Thorpeness in Suffolk.

28. The key characteristics of the offshore development area under consideration are summarised in *Table 4.2.*

**Table 4.2 Indicative Offshore Development Area Characteristics**

| Offshore Infrastructure Characteristics | |
|---|---|
| Maximum Wind Turbine Blade Tip Height (above Lowest Astronomical Tide (LAT)) | 300 metres (m) |
| Wind Turbine Rotor Diameter | Up to 250m |
| Minimum Clearance above Sea Level | A minimum of 22m (Mean High Water Springs (MHWS)) |
| Minimum Turbine Spacing | 800m |
| Number of Offshore Electrical Platforms | Up to four |
| Number of Construction, Operation and Maintenance Platforms | One |
| Number of Operational Meteorological Masts (Met Masts) | One |
| Number of Export Cables | Up to Two |
| Inter-array Cables | Up to 200km |
| Platform Link Cables | Up to seven, 15km in length per cable (max 75km length) |

29. Several foundations types are currently under consideration for use, these are:

- Monopiles;
- Suction caissons;
- Gravity base structures;
- 4-leg jackets on piles; and
- 4-leg jackets on suction caissons.

30. As site conditions, in particular water depths, vary across the East Anglia TWO windfarm site, it is possible that more than one foundation type may be used for wind turbines, offshore platforms and the Met Mast.

31. The wind turbines will maintain at least one line of orientation.

## 4.3 Worst Case Layout

32. For the purpose of this NRA, the worst case layout (from a shipping and navigation perspective) has been chosen from layouts currently under consideration for use as input to the modelling process (as described in section 16). The worst case layout from a shipping and navigation perspective is represented by the maximum number of structures covering the maximum area. Following a review of the potential layouts, the worst case is presented in *Figure 4.2* (up to 75 wind turbines). It should be noted that substations will only be installed within the Offshore Transmission (OfTO) Area for Lease (AfL)

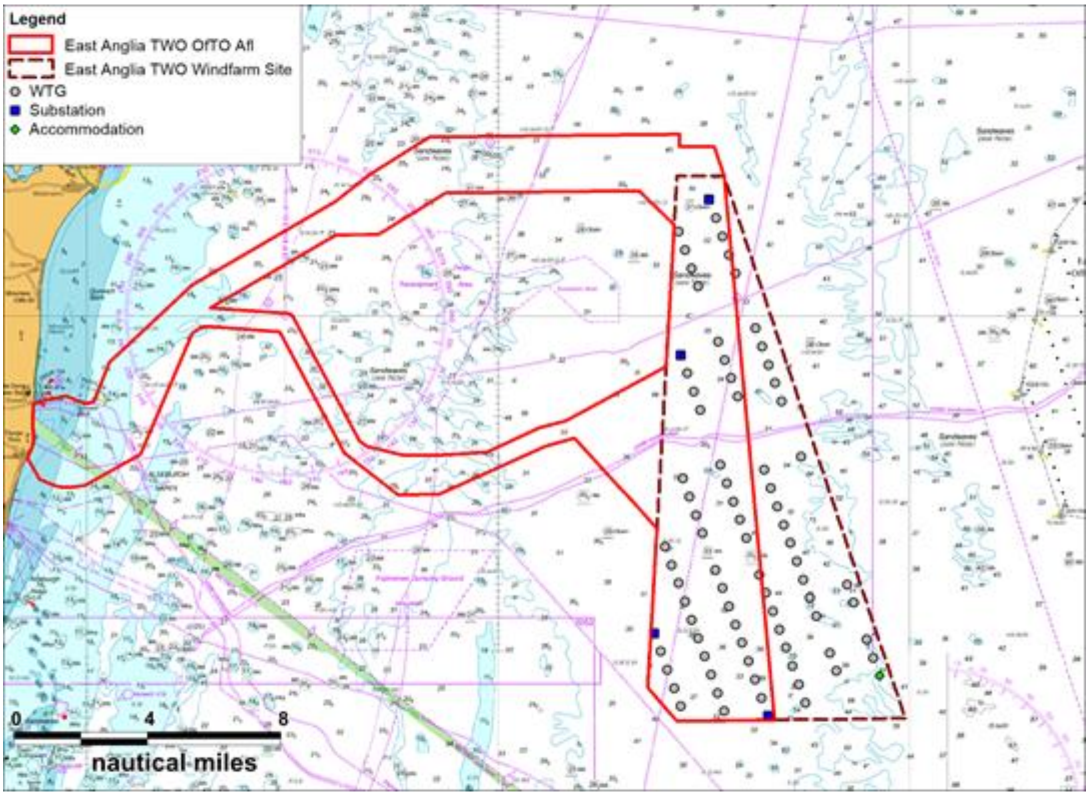



**Figure 4.2 East Anglia TWO 250m Wind Turbine Layout (Up to 75 Wind Turbines)**

# 5 Consultation

## 5.1 Introduction

33. A key input to the NRA and subsequent FSA were responses received from key statutory and non-statutory stakeholders relevant to shipping and navigation. This included consideration of responses received within the Scoping Opinion in response to the Scoping Report issued for the windfarm (SPR 2017), regular operator responses, and consultation undertaken via a Hazard Workshop.

34. The marine traffic survey data presented in section 12 was used to identify any regular operators utilising the area. Regular operator responses received are included in *Table 5.2* and key consultation output from the Hazard Workshop (see section 20.2) is summarised in *Table 5.3*.

## 5.2 Scoping and Statutory Stakeholder Responses

35. Key consultation responses arising from the scoping process and from subsequent meetings held with statutory stakeholders are provided in *Table 5.1* and *Table 5.2*, with an explanation of how the points raised have been addressed, or a reference to where they have been addressed, included.

**Table 5.1 Consultation Responses**

| Consultee | Comment | East Anglia TWO Approach |
|---|---|---|
| The Planning Inspectorate | In the absence of justification for the proposed approach the Inspectorate does not agree that the matter of impacts to communications, navigations and radar of commercial vessels can be scoped out. | Justification on this was provided to the MCA on the 25th April 2017. Agreement from the MCA was received on the 11th May 2017. |
| | The marine traffic baseline was established by utilising 14 days of data between May and June 2017 during a yacht race. The Applicant should discuss and agree with relevant consultees whether this is an appropriate level of data to inform the baseline. If necessary, a larger data set which takes into account | No issues relating to summer baseline assessment during consultation. The Cruising Association (CA) highlighted during consultation on 12th April 2018 that yacht races and regattas in the area are common therefore this should not be seen as out of the ordinary. |

| Consultee | Comment | East Anglia TWO Approach |
|---|---|---|
| | seasonal effects in order to achieve a more accurate baseline for marine traffic should be used. | |
| | The Applicant should include a clear and concise justification for the chosen study area. | Section 3.6 details the study area chosen and *Figure 3.1* presents the study area. |
| | Highlights to the Applicant the risk of invalidating the NRA if the hydrographic surveys do not fulfil the requirements according to Marine Guidance Note 543 and advises that this guidance should be taken into account. The Applicant is referred to the comments of the MCA in this regard. | Noted. Any hydrographic surveys will be undertaken in compliance with MGN 543 Annex 2 and IHO Order 1a and details will be provided to the MCA Hydrographic Manager. |
| | Recommends that the Applicant seeks agreement with the MCA on the approach of the assessment, particularly in respect to commercial traffic. | The approach to cumulative assessment has been considered as part of the NRA and PEI consultation process; as well as within the Scoping Opinion. |
| Maritime and Coastguard Agency | MCA relatively comfortable with summer only vessel survey. | Noted. Summer survey carried out by a dedicated vessel during May and June 2017. |
| | MCA currently looking at best orientations for windfarms. It may be preferable for helicopters to have turbines facing downwind rather than with prevailing winds. | Noted; will be considered post consent during layout discussions which will be secured under the Deemed Marine Licence (DML) |
| | The PEI should supply detail on the possible impact on navigational issue for both commercial and recreational | Section 14.6 of *Chapter 14 Shipping and Navigation* assesses the impacts on both commercial vessels and |

| Consultee | Comment | East Anglia TWO Approach |
|---|---|---|
| | craft. | recreational craft. |
| | A NRA will need to be submitted in accordance with MGN 543 (and MGN 372) and the MCA Methodology for Assessing the Marine Navigation Safety & Emergency Response Risks of OREIs. The NRA should be accompanied by an MGN 543 Checklist. | This NRA includes the completed MGN 543 Checklist as *Appendix 14.5* |
| | Attention needs to be paid to routeing; particularly in heavy weather ensuring shipping can continue safe passage without significant large scale deviations. The possible cumulative effects on shipping routes should also be considered. | Analysis of post windfarm routeing is provided within section 15 of this NRA. The cumulative routeing assessment is provided in section 19. Adverse weather routeing for DFDS Seaways is discussed in section 12.10. |
| | The turbine layout design will require MCA approval prior to construction. As such, MCA would seek to ensure all structures are aligned in straight rows and columns. Any additional navigation safety and / or Search and Rescue (SAR) requirements will be agreed at the approval stage. | The final layout will be agreed with the MCA post consent; this process will be secured through the DML. |
| | Particular attention should be paid to cabling routes. A Burial Protection Index study and an anchor penetration study should be undertaken if necessary. The MCA would accept a 5% reduction in depth referenced to Chart Datum. | A Cable Burial Risk Assessment will be undertaken post consent as per embedded mitigations (section 21). This will include an assessment of expected cable burial depths and a plan for other forms of protection where necessary. |

| Consultee | Comment | East Anglia TWO Approach |
|---|---|---|
| | Information on potential mooring arrangements of floating wind turbines should be included in the ES. | Floating wind turbines are not being considered for the offshore development area. |
| | Any application for safety zones would need to be carefully assessed and additionally supported by experience from the development and construction stages. | As discussed in section 21, an application for safety zones will be submitted post consent. |
| | Consideration should be given to the implications of the site size and location of SAR resources and Emergency Response Co-operation Plans (ERCoP). | The East Anglia TWO windfarm site will comply with MGN 543 as per embedded mitigations (section 21). |
| | MGN 543 Annex 2 details the requirements of hydrographic surveys. Failure to report the survey or conduct it may invalidate the NRA. | Noted. Any hydrographic surveys will be undertaken in compliance with MGN 543 Annex 2 and IHO Order 1a and details will be provided to the MCA Hydrographic Manager. |
| | The radar effects of a windfarm on ships' radars are an important issue and the effects, particularly with respect to adjacent windfarms on either side of a route, will need to be assessed on a site specific basis taking into consideration previous reports on the subject available on the MCA website. | A request to scope out the consideration of impacts of turbines on Very High Frequency, Automatic Identification System (AIS) and Radar equipment was submitted at a meeting with MCA in April 2017. A subsequent letter was submitted to MCA on the 25th April, 2017. A formal agreement to this request was received on the 11th May, 2017 which approved the scoping out of impacts of VHF, AIS and Radar equipment. |

| Consultee | Comment | East Anglia TWO Approach |
|---|---|---|
| | Suggested consultation with MCA once bathymetry data is available for the offshore cable corridor. The MCA request that SPR provide water depths at all cable crossing locations to enable consultation on appropriate conditions to be input to Development Consent Order (DCO). Assessment of under keel clearance and vessel activity may be required. | Noted. Hydrographic data and water depths will be provided to the MCA. |
| | An NRA without a current Radar traffic survey cannot be relied upon as AIS has obvious limitations. Although the Radar data may only be just outside the 24 month window, the MCA cannot be sure this will not slip further therefore we would appreciate reconsideration of the traffic surveys in line with MGN 543. | A marine traffic survey (AIS and Radar) will be undertaken in August / September 2018. The impact assessment and NRA will then be submitted as part of the ES. |
| Trinity House | Expect the NRA to include:<br>▪ vessel traffic analysis in accordance with MGN 543;<br>▪ cumulative and in-combination effects on shipping routes and patterns;<br>▪ layouts that conform with MGN 543; and<br>▪ additional risk assessment of offshore platforms or Met Masts that lie out with the wind turbine layout. | An MGN 543 checklist has been completed as part of this NRA (*Appendix 14.5*).<br><br>Up to date marine traffic survey data has been used to assess current shipping levels and patterns within the vicinity of the East Anglia TWO windfarm site. The results of the analysis are available in section 12.<br><br>Vessel routeing has been considered on a cumulative basis in section 19. Associated impacts have |

| Consultee | Comment | East Anglia TWO Approach |
|---|---|---|
| | | been assessed in *Chapter 14 Shipping and Navigation.*<br><br>The final layout will be agreed with the MCA post consent; this process will be secured through the DML. This process will include consideration of any offshore platforms and Met Masts. |
| | The development will require marking in accordance with IALA 0-139 Recommendations (IALA 2013). Additional aids to navigation may also be required. All marine navigational marking will need to be agreed with TH. | The East Anglia TWO windfarm will comply with the requirements of IALA O-139 as per embedded mitigations (section 21). All lighting and marking will be agreed with TH prior to implementation. |
| | Monitoring equipment must also be marked as required by TH. | Monitoring equipment will be marked as agreed with TH prior to implementation. |
| | A decommissioning plan which includes a scenario where an obstruction is left on site therefore a danger to navigation should be considered. | A decommissioning plan will be created post consent. Impacts associated with the decommissioning of the East Anglia TWO windfarm site are considered in *Chapter 14 Shipping and Navigation*. |
| | The impact on navigation and requirements for appropriate mitigation should be assessed for the possible requirement of marking export cables and vessels laying them. | The impacts associated with the offshore cable corridor are presented in section 14.6 of *Chapter 14 Shipping and Navigation*. |
| | Highlighted that ferries sometimes transit closer to shore during adverse weather therefore having inshore access reduced during | Noted. Adverse weather routeing for DFDS Seaways is discussed in section 12.10. |

| Consultee | Comment | East Anglia TWO Approach |
|---|---|---|
| | adverse weather may be a concern to operators. | |
| Norfolk Country Council | The PEI should indicate that suitable navigation and shipping mitigation measures can be agreed with the appropriate regulatory bodies to ensure that Norfolk's Ports (King's Lynn and Wells) are not adversely affected by this proposal. The PEI will need to consider the wider cumulative impacts taking into account existing operational windfarm; those under constructions; those consented and those in planning. | As described in section 21, embedded mitigation measures will be in place. Vessel routeing has been considered on a cumulative basis in section 19 of the NRA. Associated impacts have been assessed in section 14.6 of *Chapter 14 Shipping and Navigation.* |
| Royal Yachting Association | Any reduction in water depth is required to be marked and notified where necessary, particularly within the landfall. | Noted. |
| | Content with application for statutory safety zones during construction and major operation and maintenance activities. | Noted. No action required. |
| Chamber of Shipping | Primary concern to avoid choke points in traffic particularly entering and leaving Harwich and Felixstowe. The southern area of East Anglia TWO may be a concern due to potential impact on Eastbound and Westbound traffic. | Vessel routeing has been considered on a cumulative basis in section 19 of this NRA. |
| | Agree with safety zone approach for construction and operation and | As noted in section 21, an application for safety zones will be submitted post |

| Consultee | Comment | East Anglia TWO Approach |
|---|---|---|
| | maintenance however disagree with permanent safety zones around fixed assets. | consent. |
| | There should be consideration of shipping policies within the East Marine Plan. | Ports and shipping policies from the East Marine Plan are considered in section 2.2. |
| | It would be useful to have a breakdown of cargo vessel types recorded. | Breakdown of cargo vessels by type is provided in section 12.6 of this NRA. |
| | Queried methodology for CIA. | The CIA methodology is detailed in section 14.4 of *Chapter 14 Shipping and Navigation*. Cumulative impacts are then assessed in section 14.7. |
| Cruising Association | Concern over AIS only winter survey as it is possible that not all yachts and recreational craft have AIS systems or will turn their AIS on. | Section 12.1 highlights that only 4% of tracks recorded during summer were via Radar.<br><br>Baseline data also considers the RYA United Kingdom (UK) Coastal Atlas of Recreational Boating. Additional AIS and Radar marine traffic survey data is also being collated in 2018. |

## 5.3 Regular Operator

36. Regular commercial operators were identified from the marine traffic survey data (see section 12), and each were subsequently sent information regarding the offshore development area, and a request for a consultation response.

37. A summary of the operators contacted, and the responses received are provided in *Table 5.2*. Further details (including a template of the communication sent to each operator) are provided in *Appendix 14.6 Regular Operator Consultation*.

## Table 5.2 Regular Operator Consultation

| Date Sent | Consultee | Comment | East Anglia TWO Approach |
|---|---|---|---|
| 13/04/2018 | AdMare Ship Management | No Response | n/a |
| | Amasus Shipping | No Response | n/a |
| | Arklow Shipping | No Response | n/a |
| | Carl F. Peters | No Response | n/a |
| | Carnival | Responded on 23/04/2018. East Anglia TWO will have some impact on Carnival UK routeing when transiting from Norwegian Ports to Southampton. Consider this impact manageable therefore not significant concern.<br>In order to avoid the development area, vessels would be required to use deep water route which is not normally part of their passage. | Noted |
| | Cobelfret Ferries | No response but accepted Hazard Workshop invite on 25/04/2018 | n/a |
| | British Marine Aggregate Producers Association (BMAPA) | Forwarded email on to BMAPA representatives. Cemex responded on 17/04/2018 with request for GIS layer of offshore development area. | n/a |
| | DFDS Seaways | Response on 26/04/2018. Sent through figure with routeing of DFDS vessels within vicinity of East Anglia TWO and accepted Hazard Workshop invite. | Noted the DFDS vessel routes. These are presented in section 12.10. |
| | Döhle Group | No Response | n/a |
| | German Tanker | No Response | n/a |

| Date Sent | Consultee | Comment | East Anglia TWO Approach |
|---|---|---|---|
| | Shipping | | |
| | Hanson Aggregate Marine | No Response | n/a |
| | Hav Ship Management | No Response | n/a |
| | Herning Shipping | No Response | n/a |
| | HJH Shipmanagement | No Response | n/a |
| | James Fisher Everard | No response but accepted Hazard Workshop invite on 26/04/2018. | n/a |
| | JT Essberger | No Response | n/a |
| | Nordic Tankers | No Response | n/a |
| | Scotline | No Response | n/a |
| | Seatrans Ship Management | No Response | n/a |
| | Stena Line | No Response | n/a |
| | Stolt Tankers | No Response | n/a |
| | UECC | No Response | n/a |
| | Unibaltic Shipping | No Response | n/a |
| | W&R Shipping | No Response | n/a |
| | Wagenborg Shipping | No Response | n/a |
| | Warnecke Schiffahrt | No Response | n/a |
| | Wilson | No Response | n/a |

## 5.4 Hazard Log Consultation

### Table 5.3 Hazard Log Consultation

| Consultee | Comment | East Anglia TWO Approach |
|---|---|---|
| CoS | Queried whether lines of | Due to the distance between |

| Consultee | Comment | East Anglia TWO Approach |
|---|---|---|
| | orientation for the East Anglia TWO offshore development area and East Anglia ONE North offshore development area would be parallel. | the sites, this is unlikely. |
| | Questioned why accommodation platforms have been included within the envelope. | Accommodation (construction, operation and maintenance) platforms have been included as they are part of the worst case scenario. |
| Cobelfret Ferries | Queried capability of wind turbines to be shut down | MGN 543 requires wind turbines to have the possibility to be shut down and locked in position. Such measures will be detailed post consent in the ERCoP. |
| | Concern regarding the increased use of fuel resulting from deviations which may be required due to East Anglia TWO. The loss of a turbine(s) may theoretically be balanced by the reduction in fuel used. | Noted. |
| CA | Stated that individual safety zones do not provide any concern to recreational craft. | Noted. |
| | Concern regarding the length of internal turbine rows and that low visibility can be an issue for recreational craft. | East Anglia TWO will have large spacing between turbines (see *Table 4.2*) and markings to allow recreational craft to safely navigate the windfarm. |
| | The level of AIS usage by recreational craft further inshore will be low and contribute to the variation in recreational traffic between seasons. | Additional data sources have been utilised to assess the level of recreational activity such as the RYA Coastal Atlas (RYA 2016). |

| Consultee | Comment | East Anglia TWO Approach |
|---|---|---|
| | Queried the risk to recreational craft involved in sailing races. | Embedded mitigation measures such as marine coordination and compliance with International Regulations for Preventing Collisions at Sea (COLREGS) will reduce the risk to recreational craft.<br>Multiple windfarms are operational in key recreational areas with no reported effects on sailing vessels to date. |
| | Queried which ports will be used for operations and the level of marine traffic which could be expected. | This will be determined post consent. Windfarm vessels will be managed by marine coordination to ensure they avoid third party vessels (with consideration of COLREGS). |
| Brown & May Marine | Potting and whelking activity is more likely to occur at East Anglia TWO than East Anglia ONE North due to the presence of wrecks. Pots can be left for two to three days and should be clearly marked but this is not always the case.<br>Angling charter vessels are also common out of Lowestoft and Southwold. | Noted. |

# 6 Data Sources

38. This section lists the data sources that have been used as input to this NRA, and hence the subsequent FSA. The primary input was the marine traffic surveys, undertaken to assess the baseline traffic patterns within the vicinity of the East Anglia TWO windfarm site. Further details of the marine traffic surveys are presented in section 12 (which establishes the marine traffic baseline), with other relevant data sources considered listed below (used to supplement the marine traffic baseline, and to establish the navigational feature baseline in section 8 of this NRA):

39. Marine incident data from Marine Accident Investigation Branch (MAIB) (2005 to 2014) and maritime incident data from the Royal National Lifeboat Institution (RNLI) (2005 to 2014). Although all UK commercial vessels are required to report accidents to the MAIB, non-UK vessels do not have to report unless they are in a UK port or within 12nm territorial waters and carrying passengers to a UK port. There are also no requirements for non-commercial recreational craft to report accidents to the MAIB;

- AIS marine traffic data for DFDS vessels recorded from a Met Mast (1st January to 31st December 2017);
- Admiralty Sailing Directions – Dover Strait Pilot, NP28 United Kingdom Hydrographic Office (UKHO), 2017;
- BMAPA Routes (BMAPA, 2018);
- Admiralty Sailing Directions – North Sea West Pilot, NP54 United Kingdom Hydrographic Office (UKHO), 2016;
- UKHO Admiralty Charts 1183, 1406, 1408, 1503, 1504, 1610, 1630, 1631, 1632, 2182A and 4140;
- Department for Transport (DfT) Port Vessel Arrivals (2018);
- DFDS Seaways Vessel Routeing (2018);
- RYA UK Coastal Atlas of Recreational Boating (2016); and
- Metocean data – Health and Safety Executive (HSE) Weather Database (see section 9 for more details).

# 7 Lessons Learned

40. There is considerable benefit to developers in the sharing of lessons learned within the offshore industry. The NRA, and in particular the hazard assessment, includes general consideration for lessons learned and expert opinion from previous offshore windfarm projects and other sea users.

41. These include:

- Anatec. (2012) NRA: East Anglia ONE Offshore Windfarm, Anatec: Aberdeen;
- Anatec. (2015) NRA: East Anglia THREE Offshore Windfarm, Anatec: Aberdeen;
- Anatec. (2017) Norfolk Vanguard NRA, Anatec: Aberdeen;
- MCA. (2005) Offshore Wind Farm Helicopter SAR – Trials Undertaken at the North Hoyle Wind Farm Report of helicopter SAR Trials undertaken with Royal Air Force Valley 'C' Flight 22 Squadron on March 22nd 2005, Southampton: MCA;
- Nautical Offshore Renewable Energy Liaison (NOREL Group). (2005) A Report compiled by the Port of London Authority based on experience of the Kentish Flats Wind Farm Development, NOREL Work Paper, WP4 (2nd NOREL);
- Renewables UK. (2014 issue 2) Guidelines for Health and Safety in the Wind Energy Industry, Renewables UK: London;
- RYA and CA. (2004) Sharing the Wind – Identification of recreational boating interests in the Thames Estuary, Greater Wash and North West (Liverpool Bay), Southampton: RYA;
- The Crown Estate. (2012) Strategic Assessment of Impacts on Navigation of Shipping and Related Effects on Other Marine Activities Arising from the Development of Offshore Wind Farms in the UK REZ, The Crown Estate: London;
- SPR and Vattenfall. (2012) East Anglia ONE Offshore Windfarm ES Volume 2 Offshore, Chapter 15 – Shipping and Navigation, SPR: Glasgow; and
- SPR and Vattenfall. (2015) East Anglia THREE ES Volume 1 Chapter 15 Shipping and Navigation, SPR: Glasgow.

# 8 Existing Environment

## 8.1 Introduction

42. This section presents the navigational baseline assumed within this NRA which has been established based on the data sources outlined in section 6. This is primarily based on assessment of the Admiralty Sailing Directions (UKHO 2016) and Admiralty Charts covering the East Anglia sea area.

43. Each of the navigational features within the vicinity of the East Anglia TWO windfarm site and offshore cable corridor is discussed in the following subsections.

## 8.2 Other Windfarm Projects

44. The key navigational features within the study area of the East Anglia TWO windfarm site are the commissioned Galloper Offshore Wind Farm and Greater Gabbard Offshore Wind Farm, the consented East Anglia ONE offshore development area and the East Anglia ONE North offshore development area. These are shown in *Figure 8.1*.

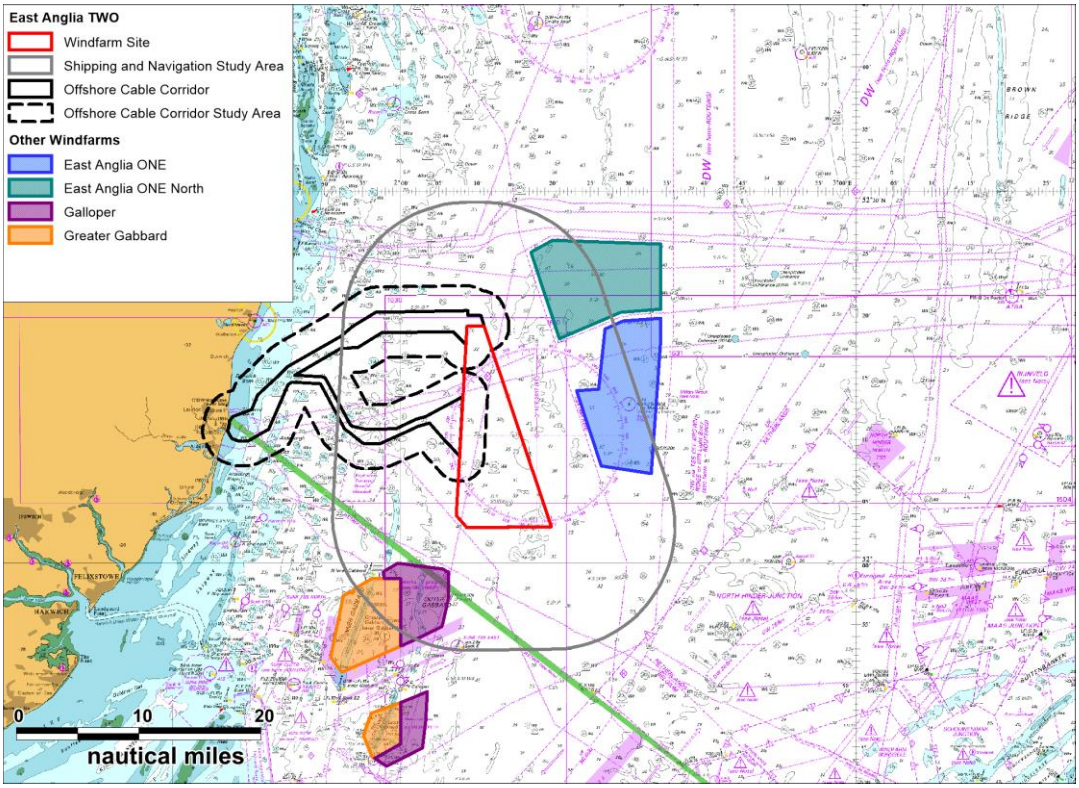



**Figure 8.1 Other Windfarms in the Vicinity of the Offshore Development Area**

## 8.3 IMO Routeing Measures

There are a number of IMO routeing measures in place within the vicinity of the East Anglia TWO windfarm site and offshore cable corridor. These are presented in *Figure 8.2*. The presence of these routeing measures would dictate a number of the vessel routes recorded within the shipping and navigation study area. These include the Sunk Traffic Separation Scheme (TSS), the North Hinder Junction and the Deep Water Route (DWR) connecting the Off Brown Ridge TSS and Off Botney Ground TSS.

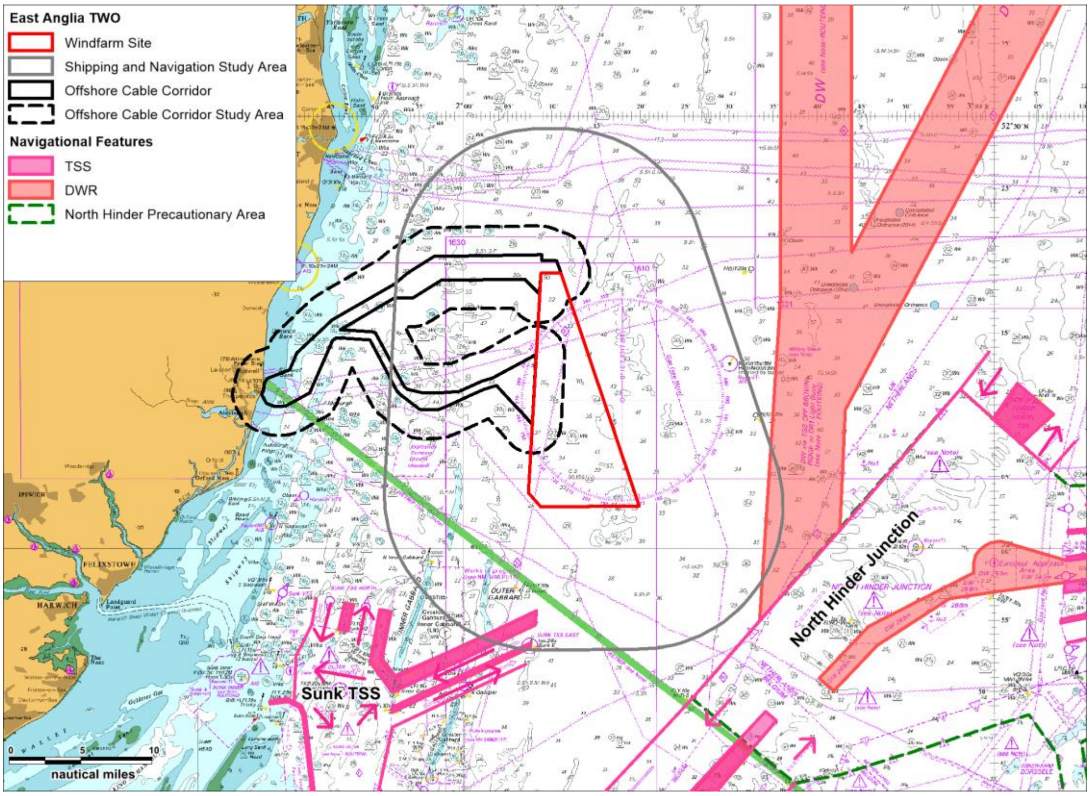
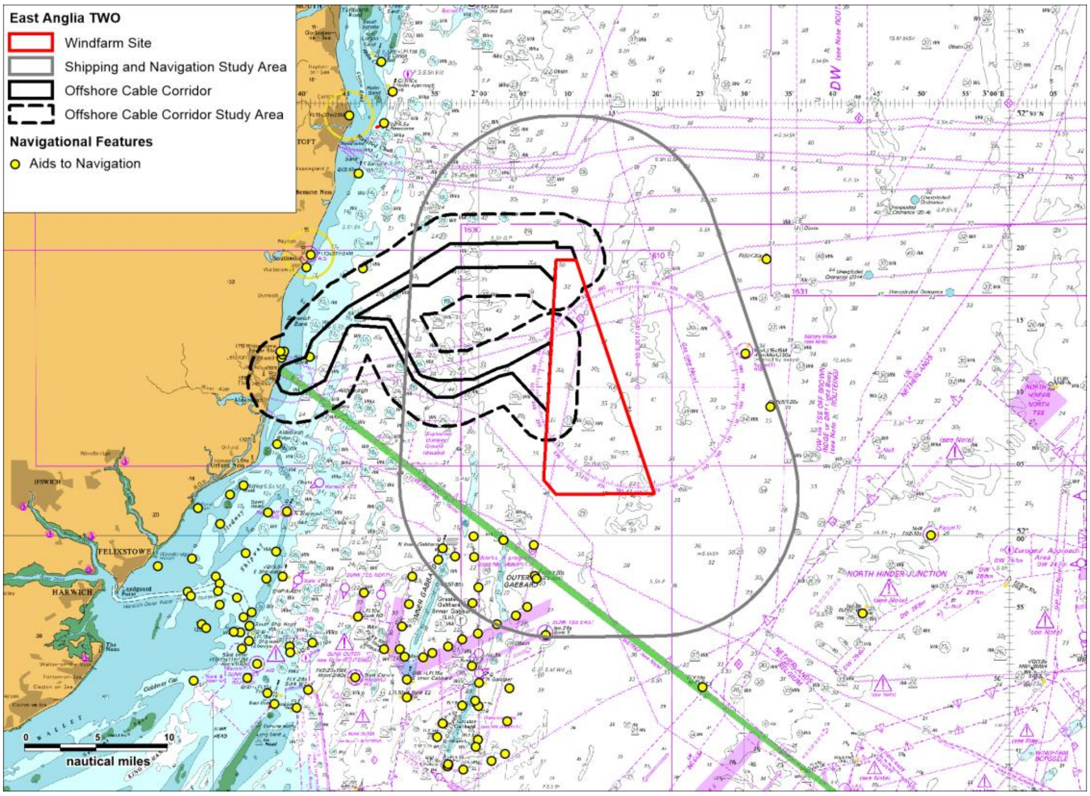



**Figure 8.2 IMO Routeing Measures in the Vicinity of the Offshore Development Area**

## 8.4 Aids to Navigation

45. There are a number of pre-existing AtoN located in proximity to the East Anglia TWO windfarm site and the offshore cable corridor as presented in *Figure 8.3*. Positions and details of the presented AtoNs are based on assessment of UKHO Admiralty Charts. It is noted that the figure includes AtoNs (cardinal and special mark buoys) placed to mark the boundaries of the Galloper Offshore Wind Farm and Greater Gabbard Offshore Wind Farm and the Sunk Traffic Separation Scheme (TSS) situated between their two sites. The Galloper Offshore Wind Farm became operational as of spring 2018. The Greater Gabbard Offshore Wind Farm has been operational since 2013.




### Figure 8.3 Navigational Aids Relative to the Offshore Development Area

## 8.5 Anchorage Areas

46. *Figure 8.4* includes charted and uncharted anchorages listed as providing suitable anchoring conditions within the Admiralty Sailing Directions (UKHO 2013 and 2016) and UKHO Admiralty Charts (1504, 1408). These are as follows:

- Corton Road, between Holm Sand and the coast, with blue clay and mud in depths of 8 to 12m (uncharted);
- Lowestoft North Road, between Holm Sand and the coast, sand and gravel in depths of approximately 10 to 13m (uncharted);
- Four miles south, south-east of Lowestoft harbour entrance, in depths between 15 to 21m;
- Eight cables east, south-east of Southwold harbour entrance; and
- Hollesley Bay, within Whiting Bank in depths between 6 to 10m, bottom mud and clay but sand close to Whiting Bank where the greatest depths are found (uncharted).

47. A number of anchorages within the sea area between Harwich and the Sunk TSS were also recorded as follows:

- Sunk Deep Water anchorage, recommended for vessels over 240m Length Overall (LOA) or with draughts greater than 10.5m;

- Sunk Inner anchorage, recommended for vessels under 240m LOA or with draughts less than 10.5m;
- Bawdsey anchorage, recommended for vessels up to 180m LOA and with draughts of 9m. This anchorage is for vessels carrying hazardous and polluting cargoes;
- Cork anchorage, recommended for vessels up to 130m LOA and with draughts of 5.5m;
- Platters anchorage is a short term or emergency anchorage for vessels up to 225m LOA and with draughts of 8m or vessels up to 170m LOA with draughts of 9m; and
- Parkeston anchorage, recommended for vessels up to 85m LOA and with draughts of 4.5m. Larger vessels may use this anchorage for a short period with prior permission of the Harbour Master.

48. The Southwold Oil Transhipment Area is also presented in the figure. It is located between the two arms of the offshore cable corridor, approximately 5.3nm west of the East Anglia TWO windfarm site.

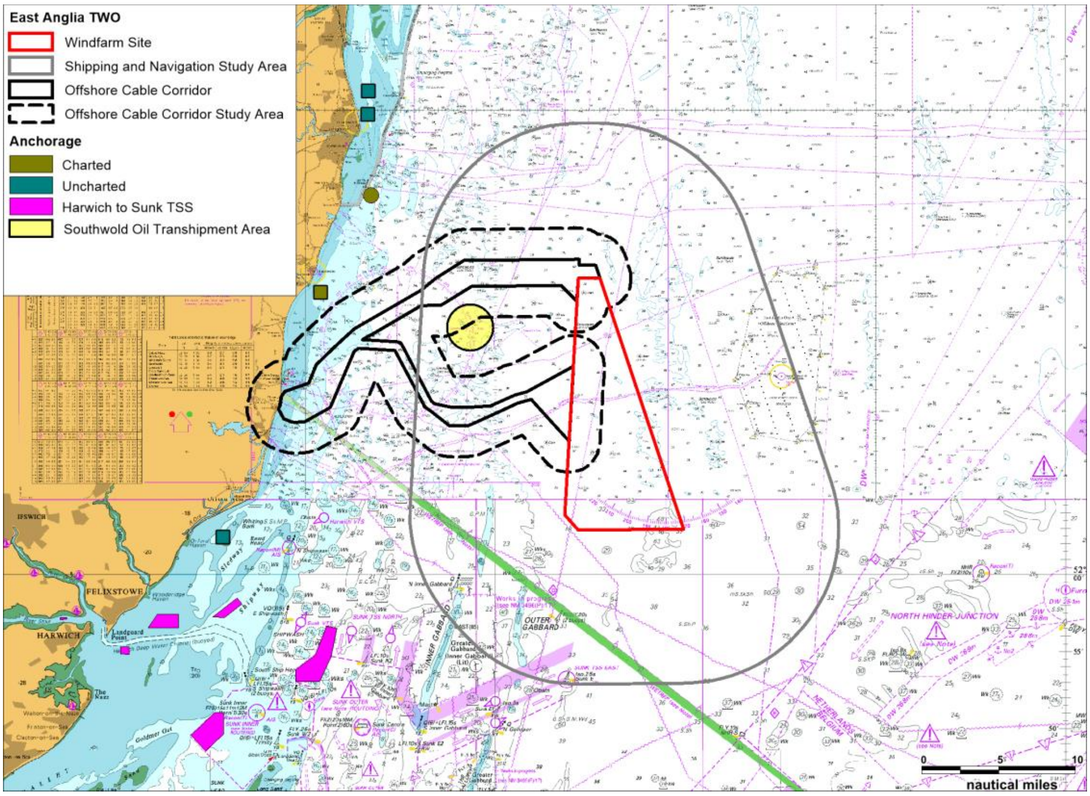



**Figure 8.4 Charted and Uncharted Anchorages within the Vicinity of the Offshore Development Area**

## 8.6 Ports

49. Major ports and harbours in the vicinity of the East Anglia TWO windfarm site are Felixstowe, Harwich, Great Yarmouth and Lowestoft. The numbers of vessel arrivals to the principal ports in the coastal area (DfT, 2018) are presented in *Figure 8.5*. It should be noted that there was no data available for the port of Southwold. These

statistics exclude some movements which occur within the port or harbour limits, however they are considered to provide a good indication of the relative traffic levels and trends.

50. Lowestoft and Southwold are the closest harbours to the East Anglia TWO windfarm site and are located approximately 17nm to the north-west and west of the East Anglia TWO windfarm site, respectively. Southwold is the closest port to the offshore cable corridor, approximately 5nm north-west.

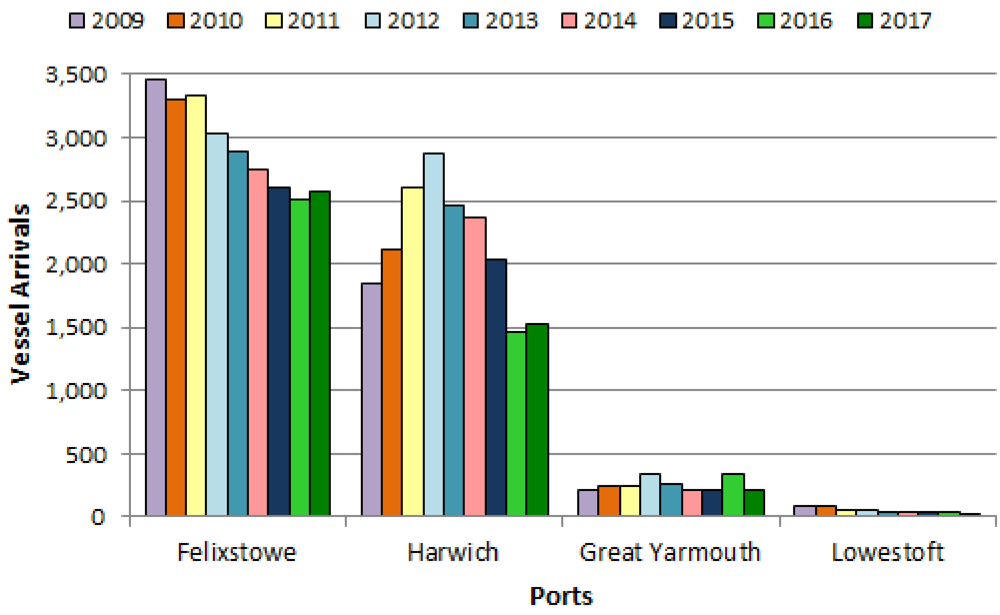



**Figure 8.5 Vessel Arrivals to Principal Ports (2009 to 2017) (DfT, 2018)**

## 8.7 Ministry of Defence (MoD) Practice and Exercise Areas (PEXAs)

51. There are no designated PEXAs within the sea area surrounding the East Anglia TWO windfarm site. The nearest area is located approximately 44nm south-east of the East Anglia TWO windfarm site.

## 8.8 Oil and Gas Infrastructure

52. There is no oil and gas infrastructure within the sea area surrounding the East Anglia TWO windfarm site.

## 8.9 Marine Aggregate Dredging Areas

53. *Figure 8.6* presents an overview of the nearby marine aggregate dredging areas and BMAPA routes in the vicinity of the East Anglia TWO windfarm site. There are five marine aggregate production areas within the study area, two of which are operated by more than one company. Outside of the study area, there are 11 marine aggregate production areas north of the East Anglia TWO windfarm site and five

south-west of the East Anglia TWO windfarm site. There are no marine aggregate dredging areas within the offshore cable corridor.

54. It should be noted that a disused explosives dumping ground is recorded approximately 1.6nm south of the offshore cable corridor and 4.8nm west of the East Anglia TWO windfarm site.

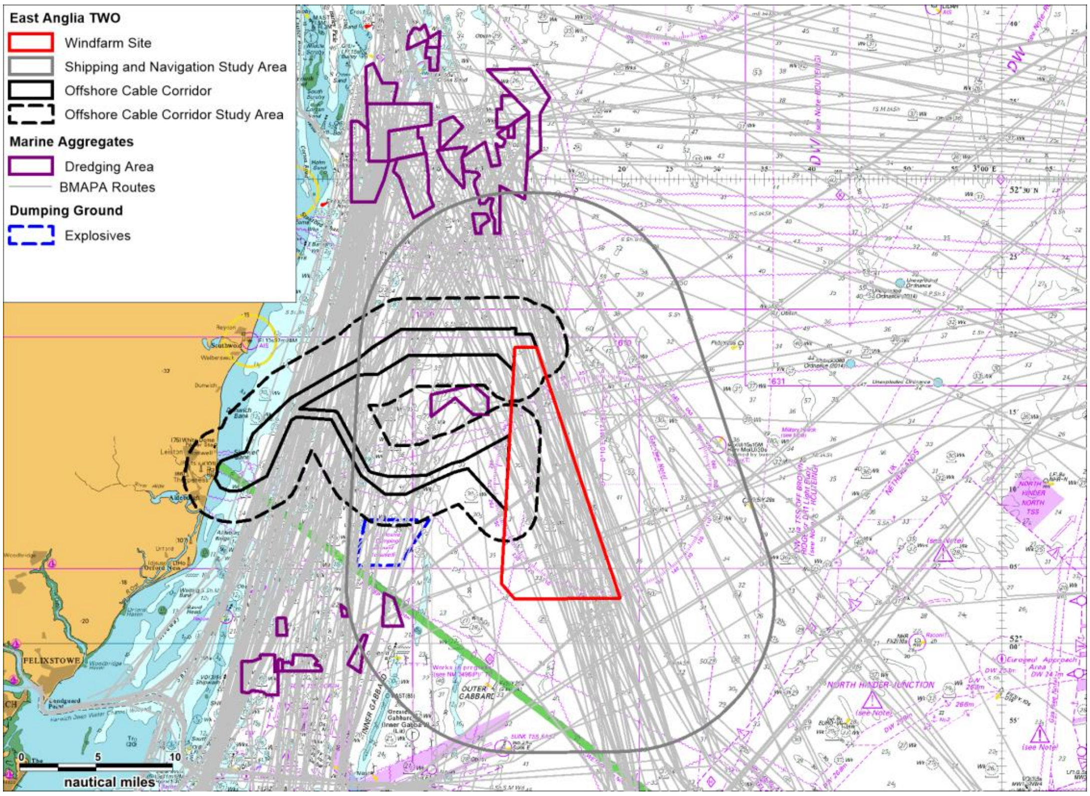



**Figure 8.6 Marine Aggregate Dredging Areas, BMAPA Routes and Explosive Dumping Ground within the Vicinity of the Offshore Development Area**

## 8.10 Cables

55. The cables in the vicinity of the East Anglia TWO windfarm site and offshore cable corridor are presented in *Figure 8.7*.

The Greater Gabbard power cables and the Britned HVDC power cable have been plotted based on UKHO Admiralty Charts. The Greater Gabbard power cables intersect the East Anglia TWO windfarm site and the offshore cable corridor. The Galloper wind farm export cables also intersect the offshore cable corridor. There are 11 telecommunication cables recorded within the shipping and navigation study area. Of these, three intersect the East Anglia TWO windfarm site and three intersect the offshore cable corridor. Two of the intersecting cables (Aldeburgh to Zandvoort and the Atlantic Crossing) are no longer active.

56. It should be noted that the offshore cable corridor route for East Anglia ONE (which is currently under construction) and the offshore cable corridor route for East Anglia THREE both intersect the offshore development area.

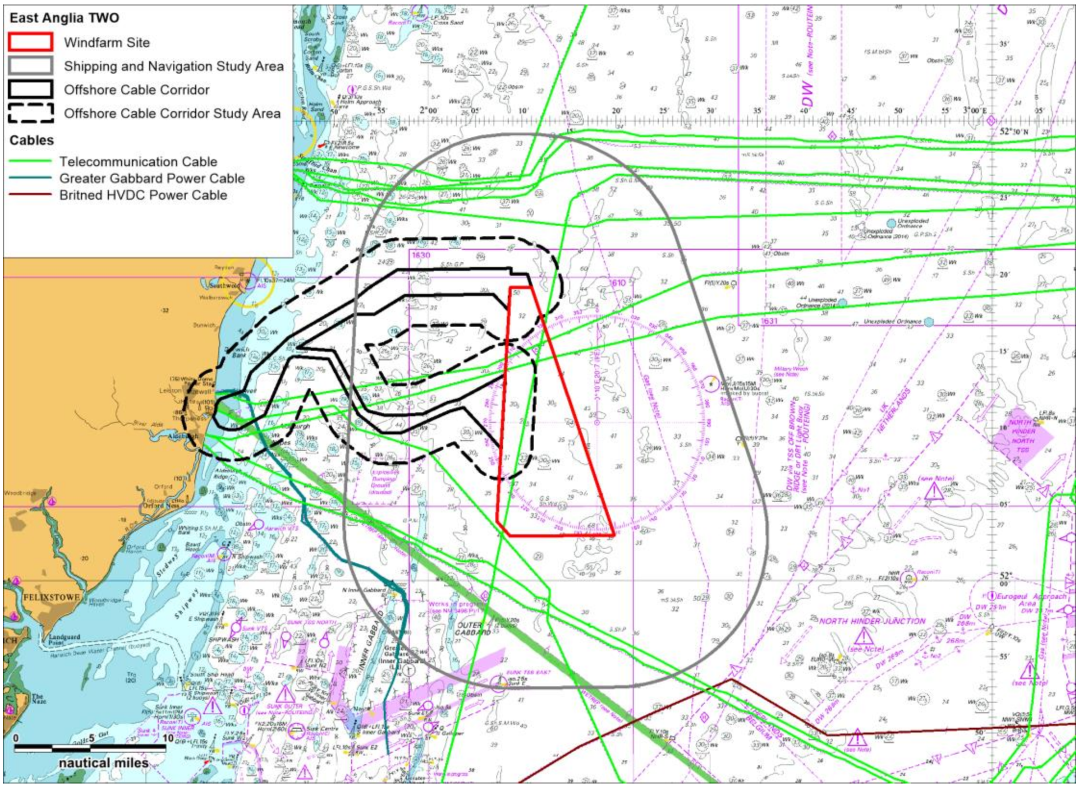


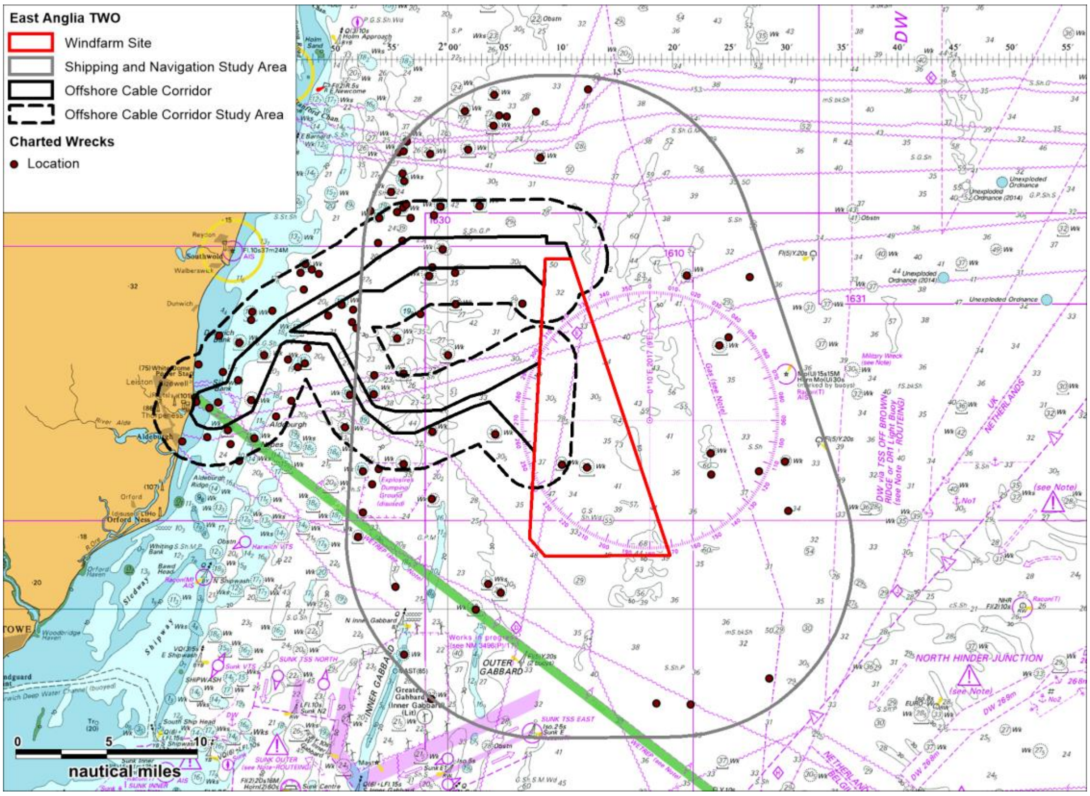

**Figure 8.7 Cables within the Vicinity of the Offshore Development Area**

## 8.11 Marine Environmental High Risk Areas (MEHRAs)

57. There are no MEHRAs in the immediate vicinity of the East Anglia TWO windfarm site; with the nearest being the Harwich and Felixstowe MEHRAs located approximately 26nm south-west of the East Anglia TWO windfarm site, on the south-east coast of England. The MEHRAs consist of a medium concentration of vulnerable seabirds and a range of fishing and amenity / economic activities. The MEHRAs lie on both sides of the entrance to Harwich and Felixstowe, both very active ports. Parts of the area off the ports are not covered by an existing vessel traffic service system and vessels entering or leaving the Thames Estuary pass the area.

## 8.12 Marine Wrecks

58. There are 67 charted wrecks within the study area with two charted wrecks within the East Anglia TWO windfarm site itself as presented in *Figure 8.8*. There are eight charted wrecks within the offshore cable corridor. There are not anticipated to be any navigational safety risks associated with these wrecks.




## Figure 8.8 Charted Wrecks Relative to the Offshore Development Area

# 9 Metocean Data

## 9.1 Introduction

59. According to the Admiralty Sailing Directions (UKHO 2016), the East Anglia TWO windfarm site has a generally mild climate with winds mostly from between the south and north-west. Strong winds and gales are common in the winter months and, in summer, gales become less frequent although winds are often fresh or strong.

60. During winter, rain and snow are common, although precipitation amounts are not large. There is little seasonal variation in rainfall and the summer months are often cloudy and cool. Fog occasionally affects the east coast, particularly in the north.

61. Metocean data from the HSE weather database was used as input to the collision risk modelling process. This provided information on the following:

- Wind direction;
- Sea state; and
- Visibility.

## 9.2 Wind Direction

62. Wind direction proportions for the area are presented in *Table 9.1*. The prevalent wind direction was from the southwest.

### Table 9.1 Wind Direction Proportions

| Wind Direction (°) | Proportion (%) |
|---|---|
| 0 | 6.8% |
| 30 | 6.7% |
| 60 | 6.2% |
| 90 | 5.3% |
| 120 | 5.4% |
| 150 | 6.5% |
| 180 | 8.8% |
| 210 | 13.5% |
| 240 | 14.4% |
| 270 | 11.3% |
| 300 | 8.3% |

| Wind Direction (°) | Proportion (%) |
|---|---|
| 330 | 6.8% |

## 9.3 Sea State

63. Sea state proportions for the area are presented in *Table 9.2*. The prevalent sea states were calm and moderate.

**Table 9.2 Sea State Proportions**

| Sea State | Proportion (%) |
|---|---|
| Calm (<1m) | 50% |
| Moderate (1–5m) | 50% |
| Severe (>5m) | 0% |

## 9.4 Visibility

64. The HSE Weather Database assumes the proportion of poor visibility (defined as the proportion of a year where the visibility can be expected to be less than 1km) is 3%. This is based upon information available within the Admiralty Sailing Directions for the region.

## 9.5 Tidal Streams

65. Tidal data used as input to the collision and allision modelling is based upon the information available from UK Admiralty charts 2052, 1543, 1504, 1610 and 1630. *Table 9.3* presents the peak flood and ebb direction and speed values for each of the charted tidal diamonds in proximity to the East Anglia TWO windfarm site.

**Table 9.3 UK Admiralty Chart Tidal Data**

| Tidal Diamond and Chart | Flood | | Ebb | |
|---|---|---|---|---|
| | Direction (°) | Speed (knots) | Direction (°) | Speed (knots) |
| A (2052) | 216 | 2.1 | 36 | 2.3 |
| B (2052) | 208 | 2.3 | 32 | 2.2 |
| C (1610) | 205 | 2.2 | 26 | 2.1 |
| D (1630) | 207 | 1.8 | 208 | 1.9 |
| M (1543) | 179 | 2.8 | 13 | 2.8 |
| P (1543) | 184 | 2.2 | 6 | 2.3 |
| Q (1543) | 195 | 2.5 | 18 | 2.6 |
| R (1543) | 188 | 3.1 | 9 | 2.4 |

| Tidal Diamond and Chart | Flood | | Ebb | |
|---|---|---|---|---|
| | Direction (°) | Speed (knots) | Direction (°) | Speed (knots) |
| S (1543) | 194 | 2.7 | 15 | 2.8 |
| U (1543) | 197 | 2.4 | 19 | 2.4 |
| V (1543) | 197 | 2.7 | 15 | 2.5 |
| S (1504) | 198 | 1.8 | 20 | 1.8 |
| T (1504) | 192 | 2.0 | 17 | 1.8 |

# 10 Emergency Response

## 10.1 Introduction

66. This section summarises the existing SAR resources in proximity to the offshore development area. It is noted that the East Anglia TWO windfarm site would be required to consider self-help capabilities for its own personnel and vessels.

## 10.2 SAR Helicopters

67. In March 2013, the Bristow Group were awarded the contract by the MCA (as an executive agency of DfT) to provide helicopter SAR operations in the UK over a ten-year period. Bristow have now been operating the service since April 2015. There are ten base locations for the SAR helicopter service. The nearest SAR helicopter base to the East Anglia TWO windfarm site is the Lydd base which is approximately 80nm south-west. This base operates two Agusta Westland AW189 aircraft.

## 10.3 RNLI

68. The RNLI is organised into six divisions, with the relevant region for the offshore development area being the East Division. Based out of more than 230 stations, there are more than 350 lifeboats across the RNLI fleet, including both all-weather lifeboats (ALBs) and inshore lifeboats (ILBs). Based on the offshore position of the East Anglia TWO windfarm site it is likely that ALBs from Lowestoft would respond to an incident in proximity to the offshore development area. Locations of RNLI lifeboat stations along the south-east coast of England and details of the types of lifeboats operating out of these stations are given in *Table 10.1*. At each station, lifeboats are available on a 24-hour basis throughout the year.

**Table 10.1 UK Lifeboats Operated from Southern North Sea RNLI Stations**

| Station | Lifeboats | ALB Class | ILB Class | Approximate Distance to East Anglia TWO windfarm site (nm) |
|---|---|---|---|---|
| Lowestoft | ALB | Shannon | - | 17 |
| Southwold | ILB | - | B Class Atlantic | 16.8 |
| Aldeburgh | ALB and ILB | Mersey | D Class | 19.3 |
| Great Yarmouth & Gorleston | ALB and ILB | Trent | B Class Atlantic | 21.8 |
| Harwich | ALB and ILB | Severn | B Class Atlantic | 31.5 |

## 10.4 HM Coastguard Stations

69. HM Coastguard, a division of the MCA, is responsible for requesting and tasking SAR resources made available to other authorities and for coordinating the subsequent SAR operations (unless they fall within military jurisdiction).

70. The HM Coastguard coordinates SAR through a network of 11 Coastguard Operations Centres (CGOC), including a National Maritime Operations Centre (NMOC) based in Hampshire. A corps of over 3,500 volunteer Coastguard Rescue Officers (CROs) around the UK form over 352 local Coastguard Rescue Teams (CRT) involved in coastal rescue, searches and surveillance.

71. All of the MCA's operations, including SAR, are divided into three geographical regions. The England Region covers the south-east coast of England, and therefore covers the area around the East Anglia TWO windfarm site.

72. Each region is divided into four districts with its own CGOC, which coordinates the SAR response for maritime and coastal emergencies within its district boundaries. The nearest rescue coordination centre to the offshore development area is the Dover CGOC based in Dover, located approximately 64nm (118km) from the East Anglia TWO windfarm site.

## 10.5 Third Party Assistance

73. Companies operating offshore typically have resources of vessels, helicopters and other equipment available for normal operations that can assist with emergencies offshore. Alongside that all vessels under IMO obligations set out in the International Convention for the Safety of Life at Sea (SOLAS) (IMO 1974) as amended, are required to render assistance to any person or vessel in distress if safely able to do so.

74. Notably, vessels associated with the nearby East Anglia ONE offshore development area, and the Galloper Offshore Windfarm would therefore be able to offer assistance to vessels in trouble within the area.

# 11 Maritime Incidents

## 11.1 Introduction

75. This section provides details of marine incidents that have occurred within the vicinity of the offshore development area over the latest available ten year period data. The analysis is intended to provide an indication as to the baseline level of incidents within the general area and show the common causes and vessel types involved. Incident data has been collected and reviewed from two sources:

- MAIB; and
- RNLI.

76. It is noted that the same incident may be recorded by both sources.

## 11.2 MAIB

77. All UK commercial vessels are required to report accidents they are involved in to the MAIB. Non-UK vessels do not have to report unless they are in a UK port, or within 12nm territorial waters and carrying passengers to a UK port. There are also no requirements for non-commercial recreational craft to report accidents to the MAIB.

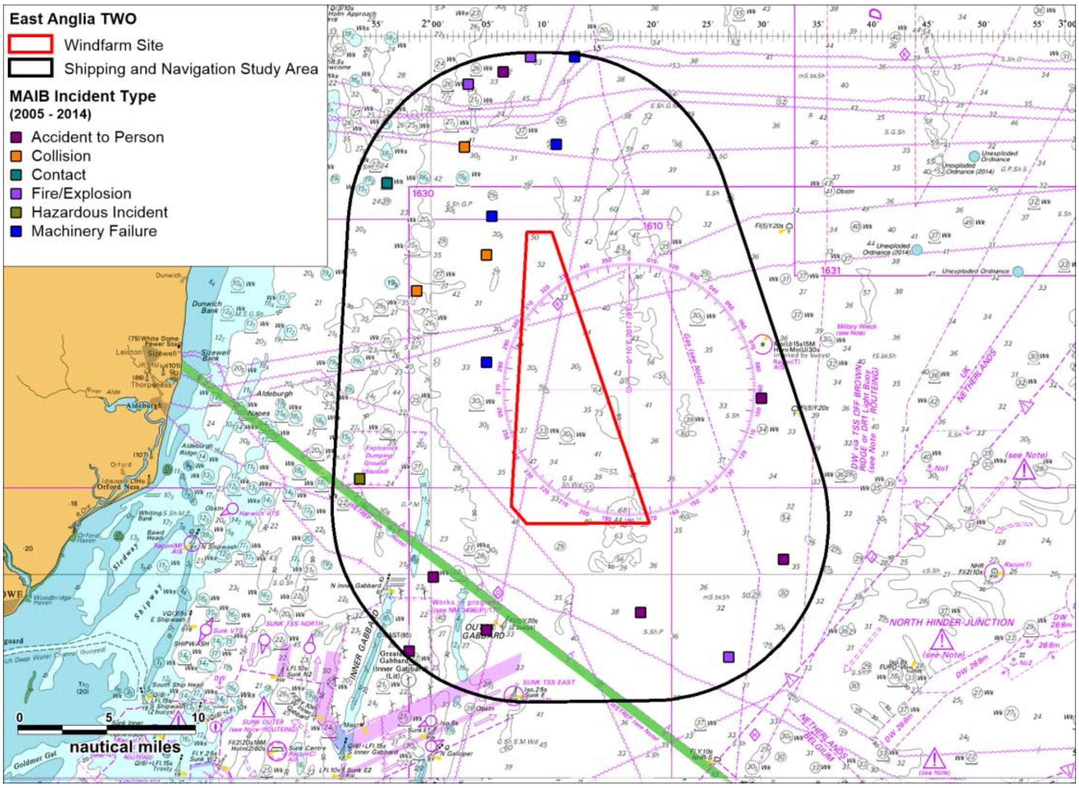
### 11.2.1 East Anglia TWO Windfarm Site

78. The locations of accidents, injuries and hazardous incidents reported to the MAIB within the shipping and navigation study area for the ten year period between January 2005 and December 2014 are presented in *Figure 11.1* and are colour-coded by incident type. It should be noted that the MAIB aim for 97% accuracy in reporting locations of incidents.

79. A total of 19 unique incidents were reported within the shipping and navigation study area, corresponding to an average of approximately two incidents per year. None of the incidents occurred within the East Anglia TWO windfarm site.

80. The most frequently recorded incident type was “Accident to Person”, representing 37% of the total number of incidents.

81. *Figure 11.2* presents the same set of recorded incidents colour-coded by vessel type. Passenger Cargo vessels were the most frequently recorded casualty types, representing approximately 32% of the total number of incidents throughout the ten year period.




## Figure 11.1 MAIB Incident Locations by Incident Type within Shipping and Navigation Study Area (2005 to 2014)

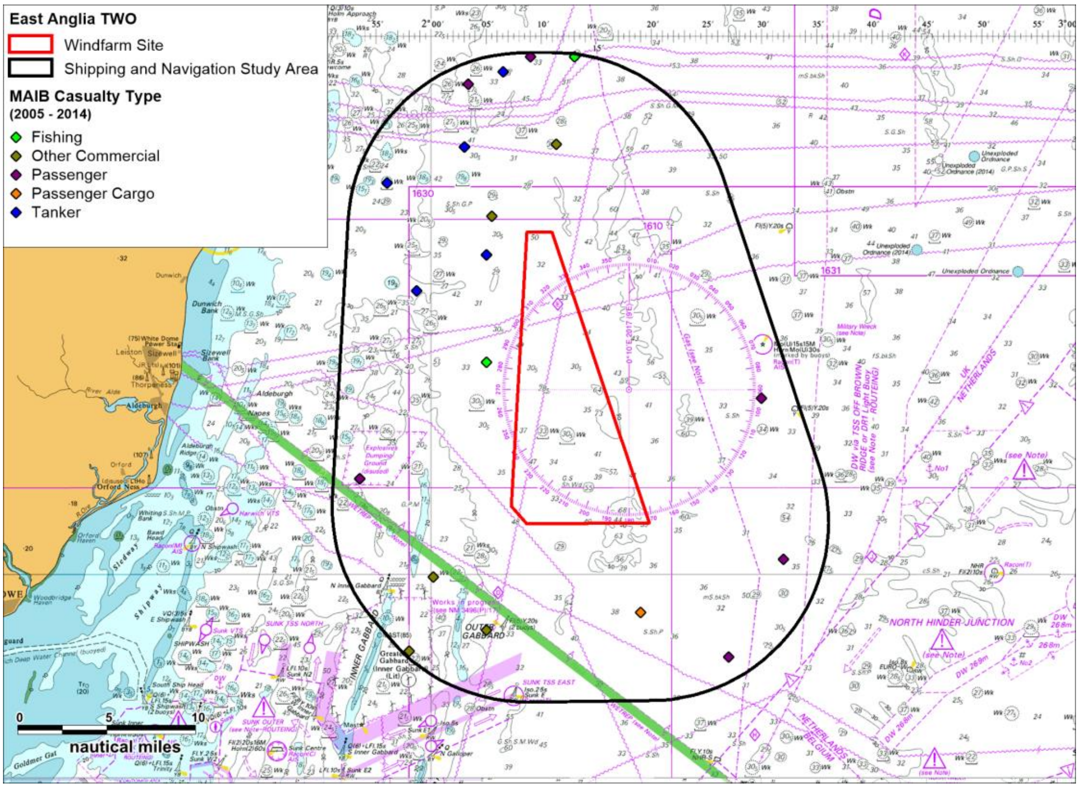



**Figure 11.2 MAIB Incident Locations by Casualty Type within Shipping and Navigation Study Area (2005 to 2014)**

### 11.2.2 Offshore Cable Corridor

82. The locations of accidents, injuries and hazardous incidents reported to the MAIB within the offshore cable corridor study area for the ten year period between January 2005 and December 2014 are presented in *Figure 11.3* and are colour-coded by incident type. It should be noted that the MAIB aim for 97% accuracy in reporting locations of incidents.

83. A total of 13 unique incidents were reported within the offshore cable corridor study area, corresponding to an average of approximately one incident per year. Five of the incidents occurred within the offshore cable corridor.

84. The most frequently recorded incident type was “Machinery Failure”, representing 54% of the total number of incidents.

85. *Figure 11.4* presents the same set of recorded incidents colour-coded by vessel type. Fishing vessels were the most frequently recorded casualty types, representing approximately 46% of the total number of incidents throughout the ten year period.

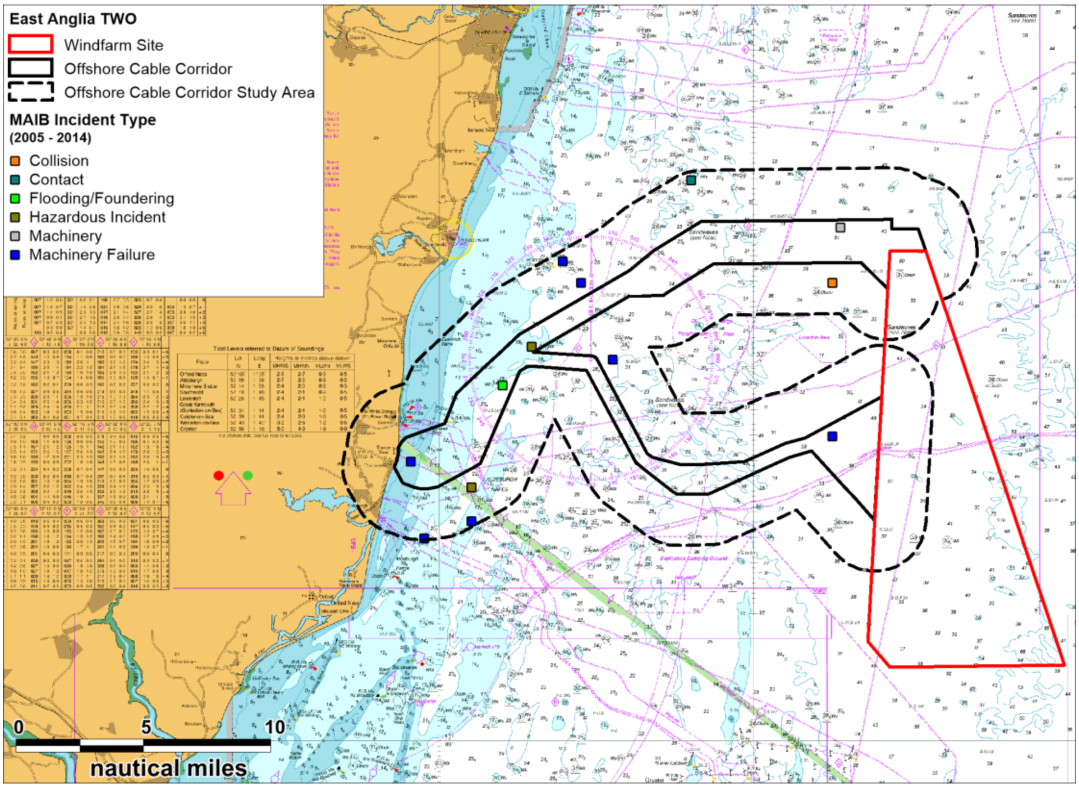



**Figure 11.3 MAIB Incident Locations by Incident Type within Offshore Cable Corridor Study Area (2005 to 2014)**

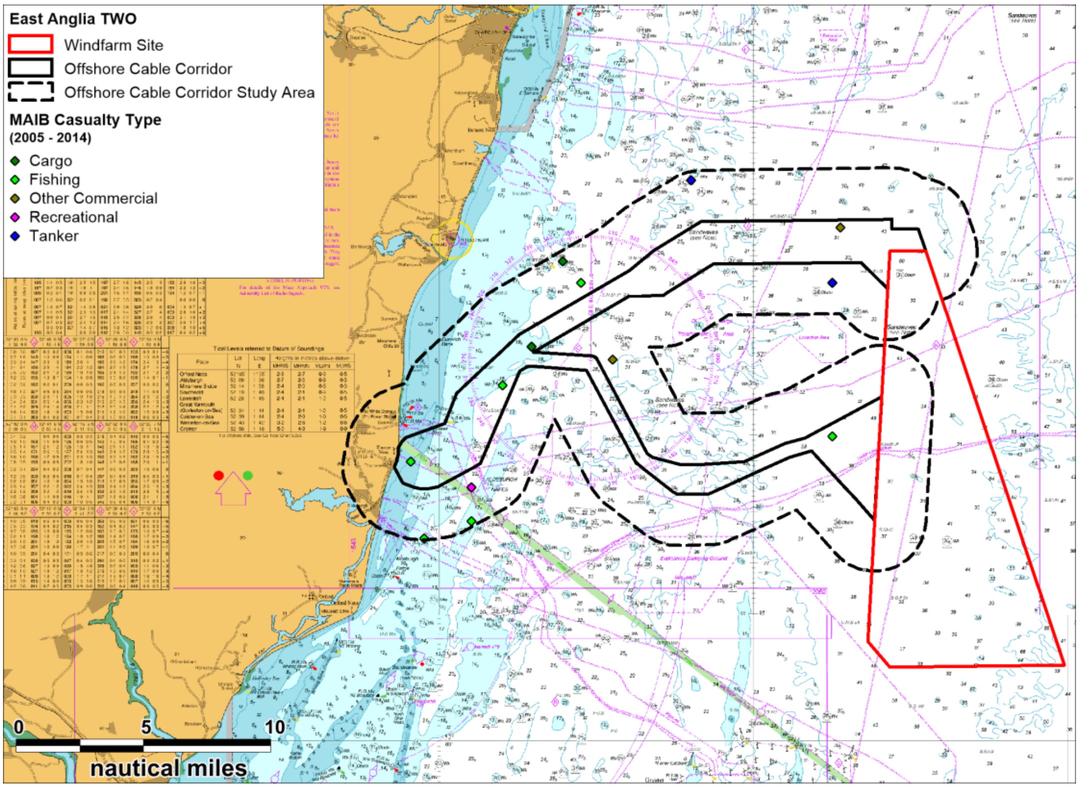



**Figure 11.4 MAIB Incident Locations by Casualty Type within Offshore Cable Corridor Study Area (2005 to 2014)**

## 11.3 RNLI

### 11.3.1 East Anglia TWO Windfarm Site

86. Data on RNLI lifeboat responses within the East Anglia TWO windfarm site and study area for the ten year period between 2005 and 2014 were analysed, with cases of a hoax or false alarm excluded. The results are presented below. It should be noted that this analysis only includes incidents to which the RNLI were alerted, and subsequently responded to.

87. The locations of incidents responded to by the RNLI (excluding hoaxes and false alarms) within the shipping and navigation study area for the ten year period between January 2005 and December 2014 are presented in *Figure 11.5* and are colour-coded by incident type.

88. A total of 40 launches were reported within the shipping and navigation study area, corresponding to an average of four incidents every year. One of the launches was to a location within the East Anglia TWO windfarm site, to assist a recreational vessel in adverse weather conditions.

89. The most frequently recorded incident type was "Machinery Failure", representing approximately 58% of the total number of incidents. Recreational vessels were the most frequently recorded casualty types, representing 75% of the total number of incidents throughout the ten year period analysed.

90. *Figure 11.6* presents the same set of launch locations colour-coded by vessel type.

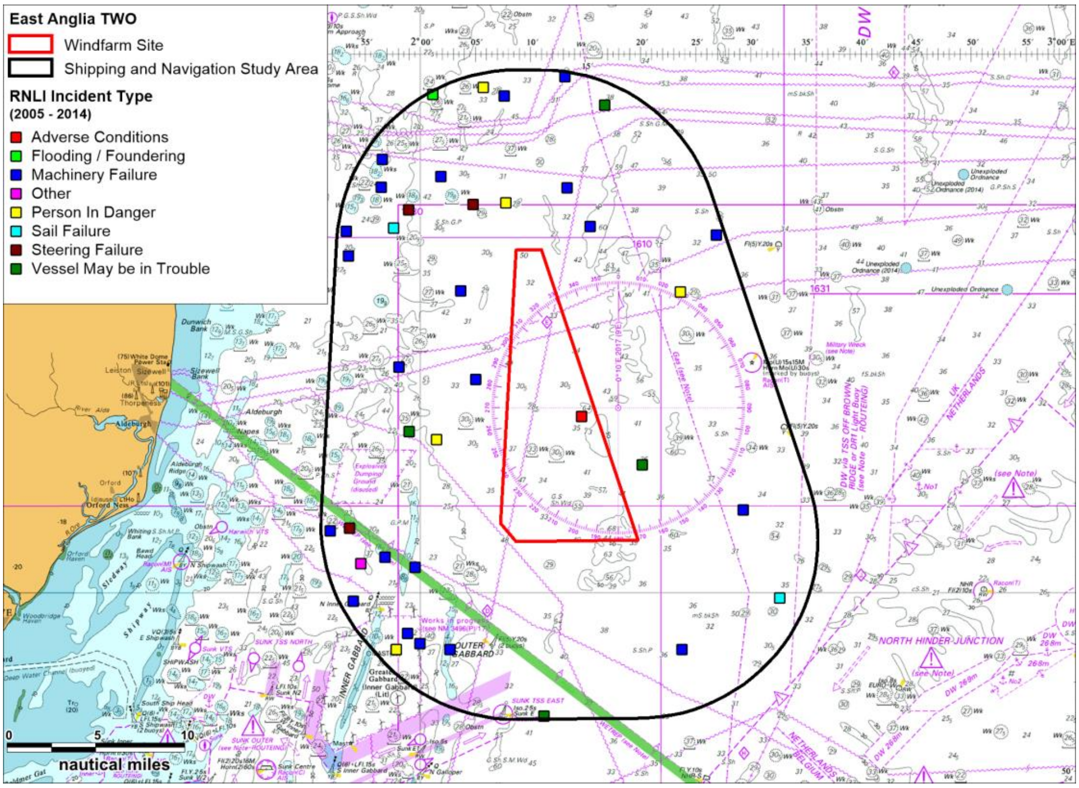



**Figure 11.5 RNLI Incident Locations by Incident Type within Shipping and Navigation Study Area (2005 – 2014)**

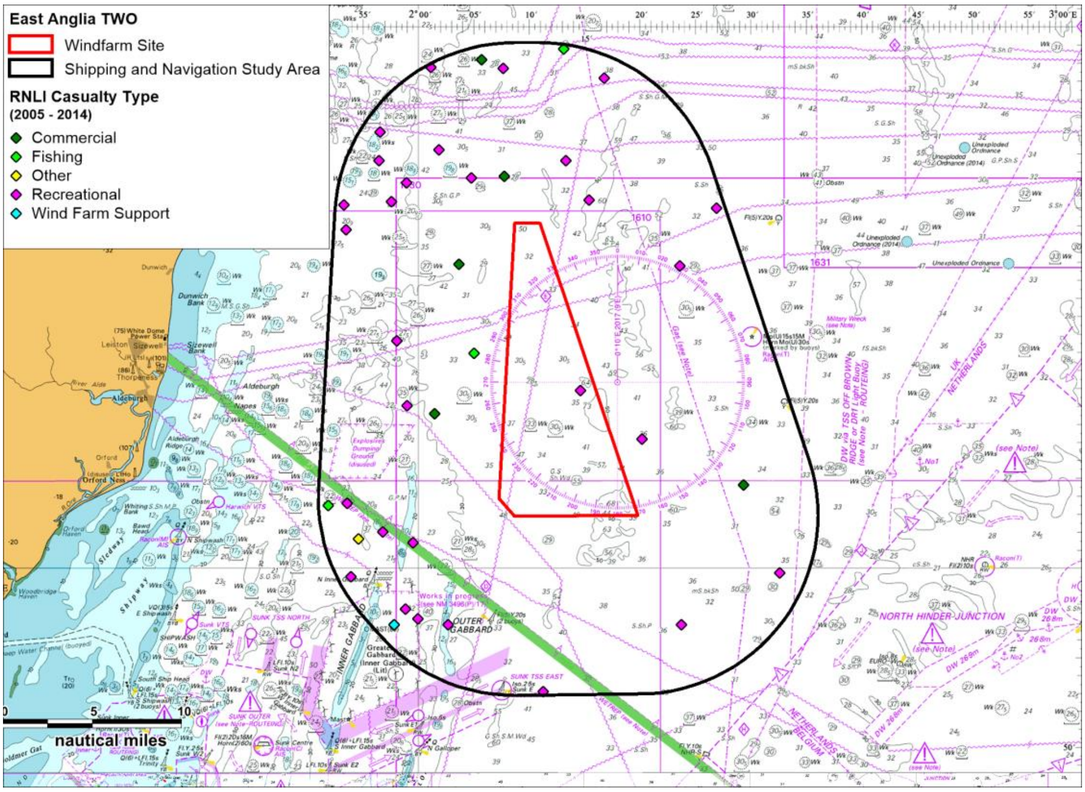



**Figure 11.6 RNLI Incident Locations by Casualty Type within Shipping and Navigation Study Area (2005 – 2014)**

## 11.3.2 Offshore Cable Corridor

91. Data on RNLI lifeboat responses within the offshore cable corridor study area for the ten year period between 2005 and 2014 were analysed, with cases of a hoax or false alarm excluded. The results are presented below. It should be noted that this analysis only includes incidents to which the RNLI were alerted, and subsequently responded to.

92. The locations of incidents responded to by the RNLI (excluding hoaxes and false alarms) within the offshore cable corridor study area for the ten year period between January 2005 and December 2014 are presented in *Figure 11.7* and are colour-coded by incident type.

93. A total of 60 launches were reported within the offshore cable corridor study area, corresponding to an average of six incidents every year. Of the launches recorded, 14 were within the offshore cable corridor.

94. The most frequently recorded incident type was "Machinery Failure", representing approximately 42% of the total number of incidents. Recreational vessels were the most frequently recorded casualty types, representing 42% of the total number of incidents throughout the ten year period analysed.

95. Figure 11.8 presents the same set of launch locations colour-coded by vessel type.

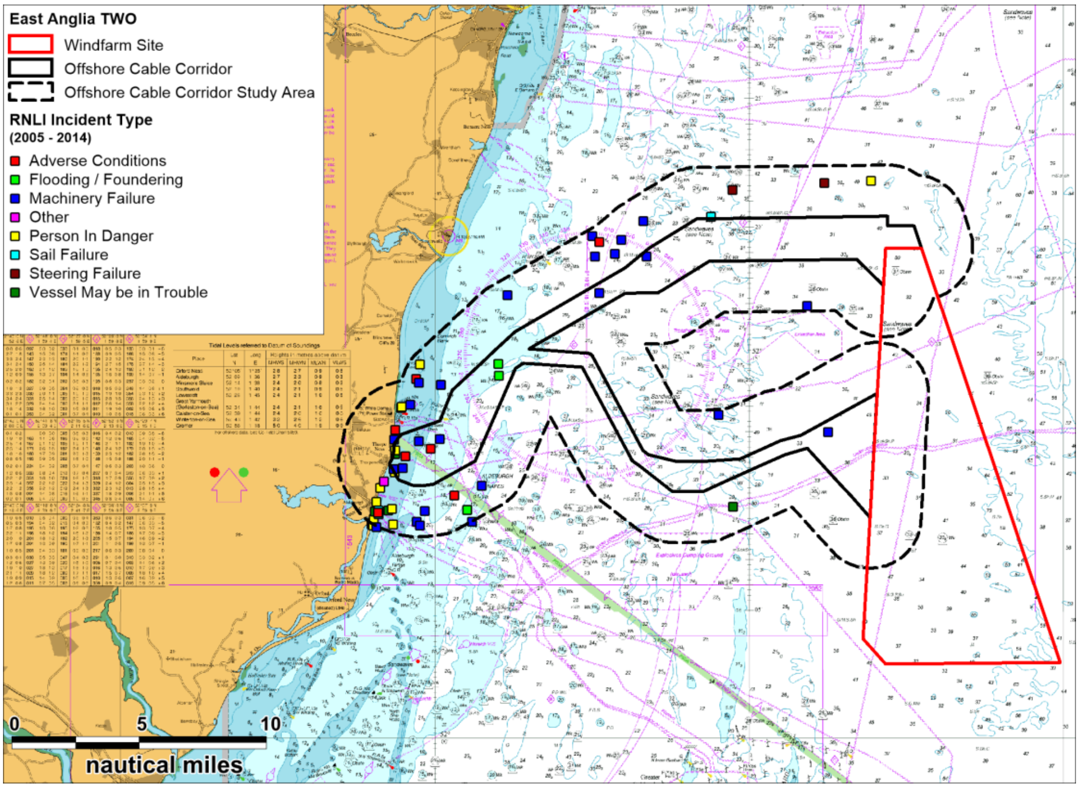
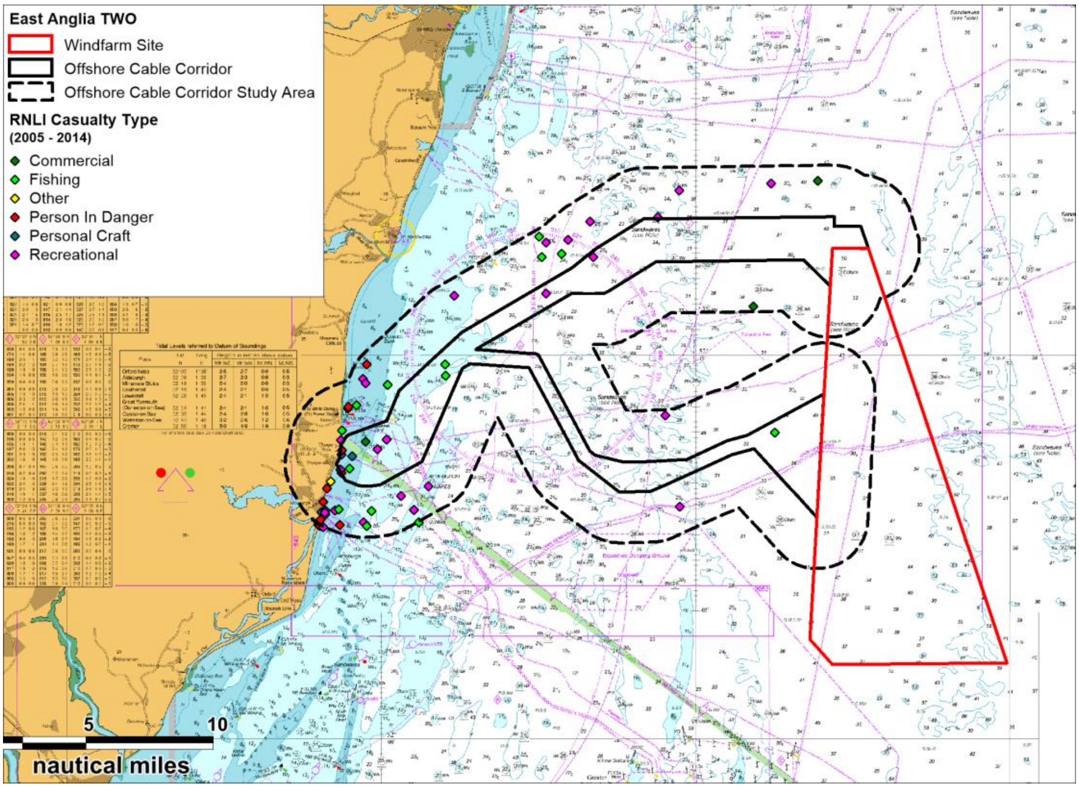



**Figure 11.7 RNLI Incident Locations by Incident Type within Offshore Cable Corridor Study Area (2005 – 2014)**




## Figure 11.8 RNLI Incident Locations by Casualty Type within Offshore Cable Corridor Study Area (2005 – 2014)

# 12 East Anglia TWO Windfarm Site Marine Traffic Survey

## 12.1 Introduction

96. This section presents shipping data in relation to the East Anglia TWO windfarm site. A summer survey was undertaken which recorded marine traffic data via AIS and Radar collection, and AIS data for a winter period was recorded from a Met Mast to account for seasonal variations. The survey periods are as follows:

- Summer 2017
  - 24th May to 31st May 2017;
  - 14th to 19th June 2017;
- Winter 2017
  - 20th November to 3rd December 2017.

97. In total the marine traffic survey consists of 14 days AIS and Radar data and 14 days of AIS only data, giving a combined total of 28 days.

98. During the summer marine traffic survey, the majority of vessels were recorded via AIS. AIS is now fitted on all commercial vessels operating in UK waters over 300 Gross Tonnage (GT) engaged on international voyages, over 500GRT on domestic voyages, passenger vessels irrespective of size built on or after 1 July 2002 and fishing vessels over 15m. Vessels not broadcasting via AIS were captured by Radar and visual observation wherever possible.

99. The summer survey was carried out by the *Ivero*. *Figure 12.1* presents the tracks for the survey vessel.

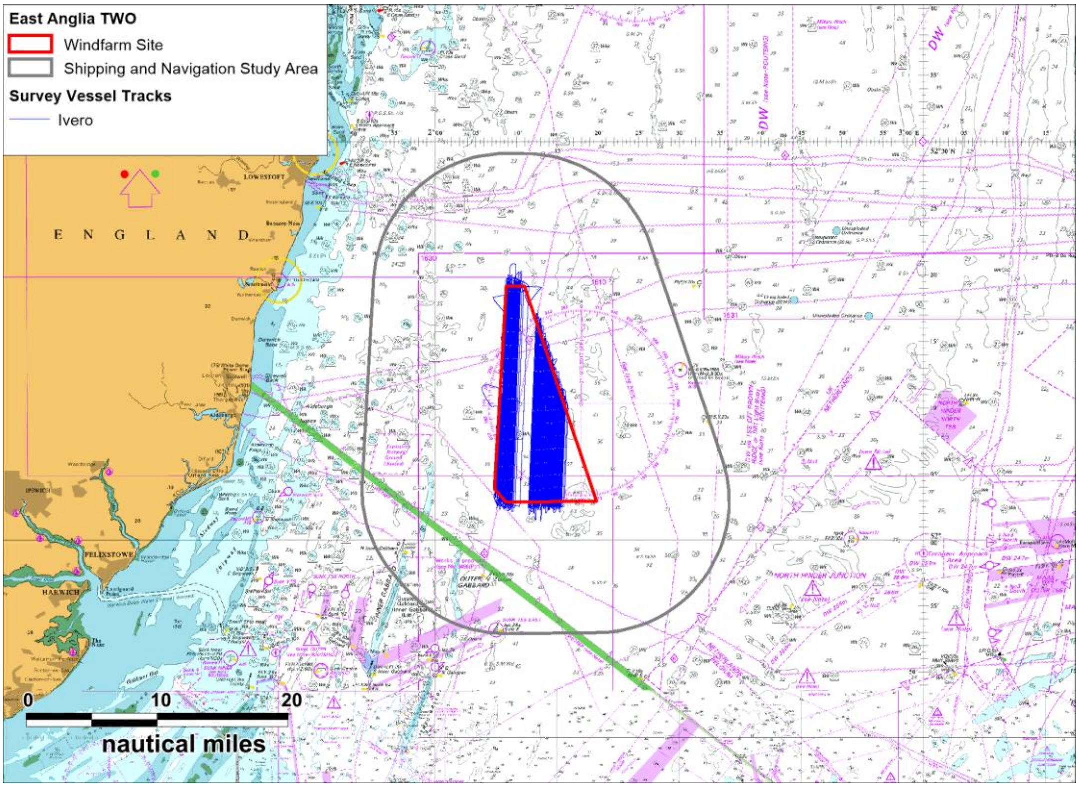



**Figure 12.1 Overview of Survey Vessel Tracks within East Anglia TWO windfarm site (14 Days Summer 2017)**

100. Plots of vessel tracks recorded within the shipping and navigation study area during the summer period and winter period, colour-coded by vessel type, are presented in *Figure 12.2* and *Figure 12.3*, respectively. It should be noted that *Figure 12.2* includes the *Ivero* survey vessel tracks during the summer survey.

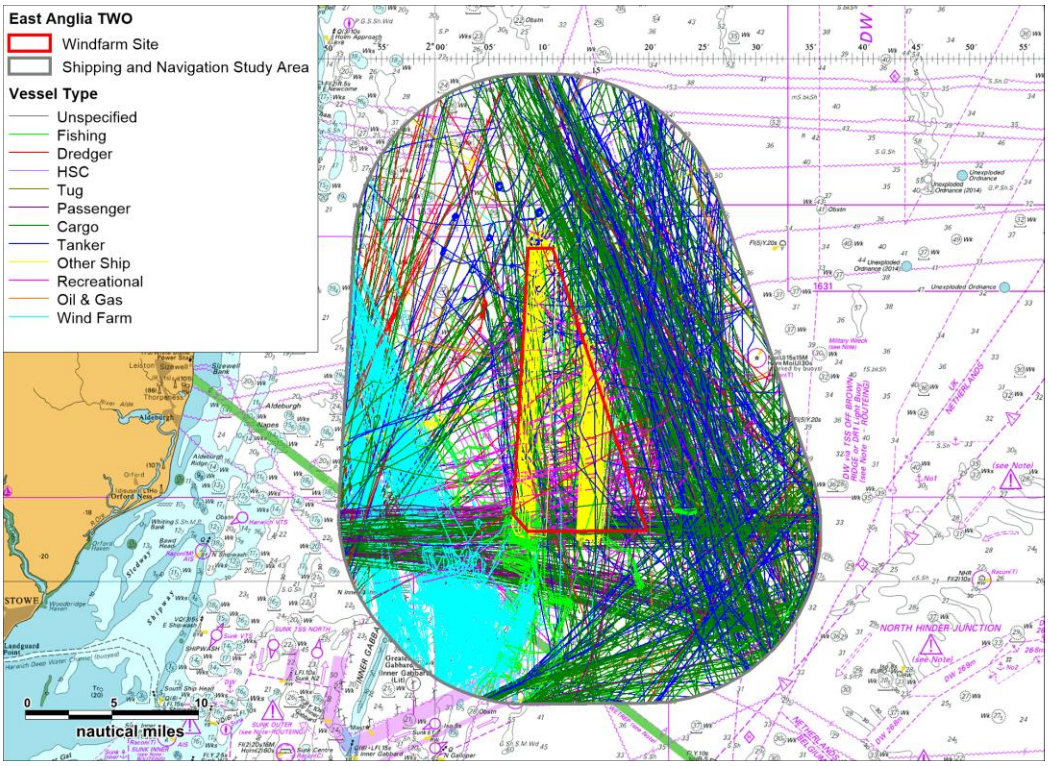



**Figure 12.2 Overview of AIS and Radar Data within Shipping and Navigation Study Area (14 Days Summer 2017)**

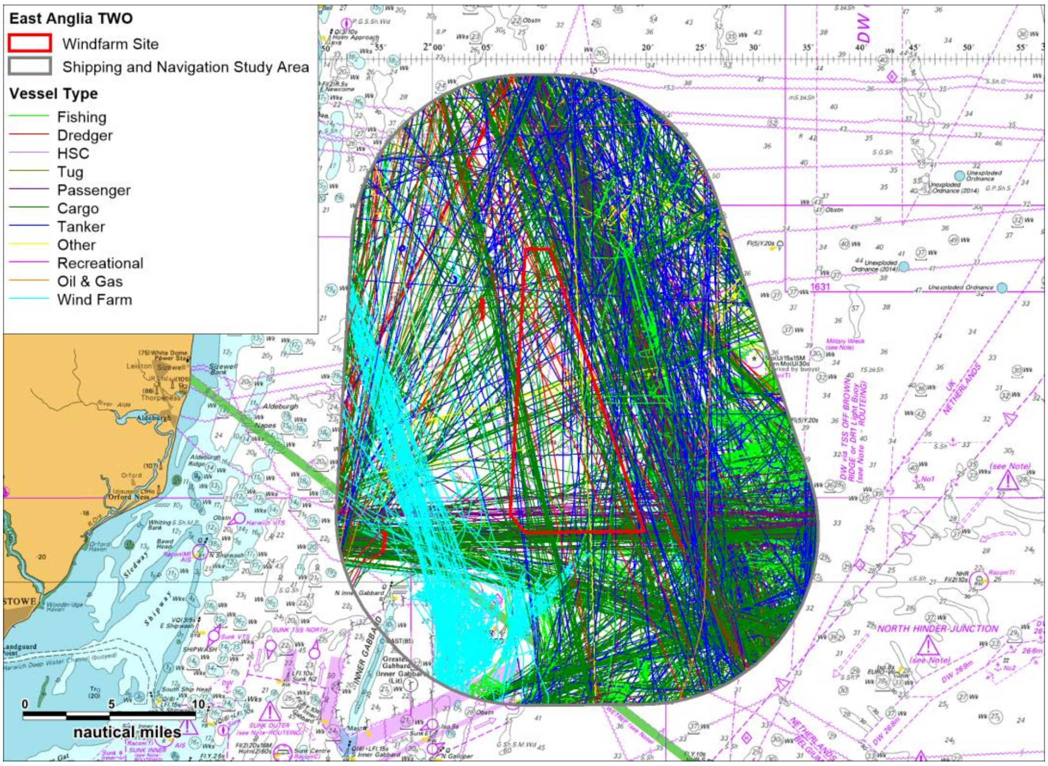



**Figure 12.3 Overview of AIS Data within Shipping and Navigation Study Area (14 Days Winter 2017)**

101. A number of tracks recorded during the summer survey were classified as temporary (non-routine), such as the tracks of the dedicated survey vessel *Ivero* and another vessel carrying out a survey within the shipping and navigation study area. Temporary traffic was also recorded during the winter period, such as vessels engaged in survey operations or guard duties. These have been excluded from further analysis.

102. Marine traffic associated with the nearby Greater Gabbard Offshore Wind Farm and Galloper Offshore Wind Farm was also recorded during the summer and winter periods. These tracks consisted of traffic involved in the construction of the Galloper Offshore Windfarm and the operation and maintenance of the Greater Gabbard Offshore Wind Farm. These tracks have been excluded from the main analysis given that operational traffic would be reduced (noting that Greater Gabbard Offshore Wind Farm is understood to have required extended maintenance post construction), which may skew the analysis of regular traffic. However, given that the vessels recorded provide an indication of operational requirements (in particular likely vessel routeing from Great Yarmouth and Lowestoft), these vessels have still been considered within the routeing assessments in section 14 and section 15. Specific assessment of the Galloper Offshore Wind Farm and Greater Gabbard Offshore Wind Farm traffic is provided in section 12.4.

103. It should be noted that windfarm traffic transiting through the shipping and navigation study area to other windfarms outwith the shipping and navigation study area has been retained within the analysis.

104. Plots of vessel tracks recorded within the shipping and navigation study area during the summer period and winter period, colour-coded by vessel type and excluding temporary traffic (as defined above) are presented in *Figure 12.4* and *Figure 12.5*, respectively. Throughout the summer period, 96% of tracks were recorded on AIS and 4% on Radar.

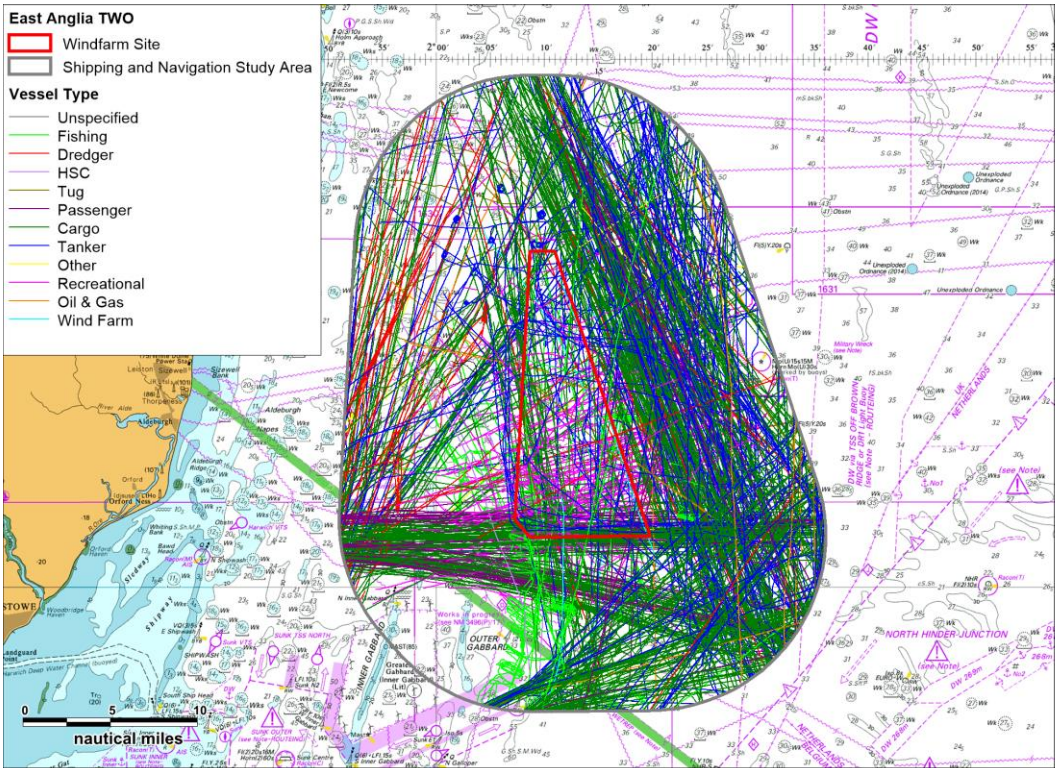



**Figure 12.4 Overview of AIS and Radar Data within Shipping and Navigation Study Area Excluding Temporary Tracks (14 Days Summer 2017)**

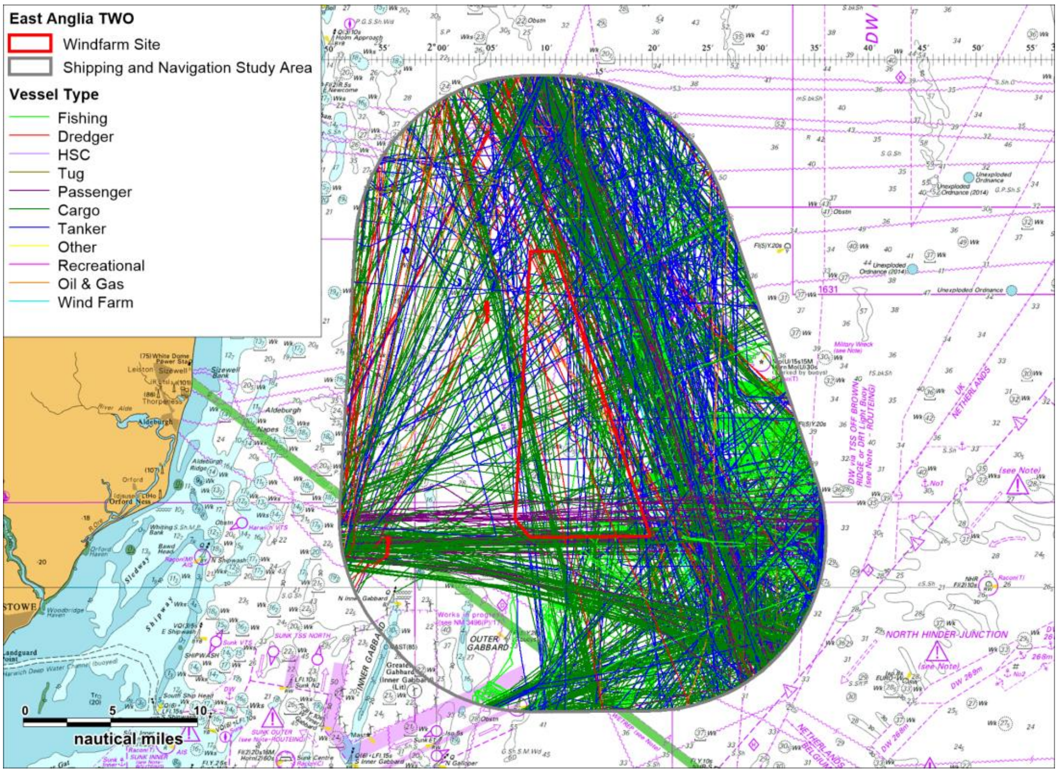



**Figure 12.5 Overview of AIS Data within Shipping and Navigation Study Area Excluding Temporary Tracks (14 Days Winter 2017)**

105. Corresponding vessel density figures for the summer and winter periods are presented in *Figure 12.6* and *Figure 12.7,* respectively. To allow direct comparison between the summer and winter periods, the same density ranges have been used in both figures.

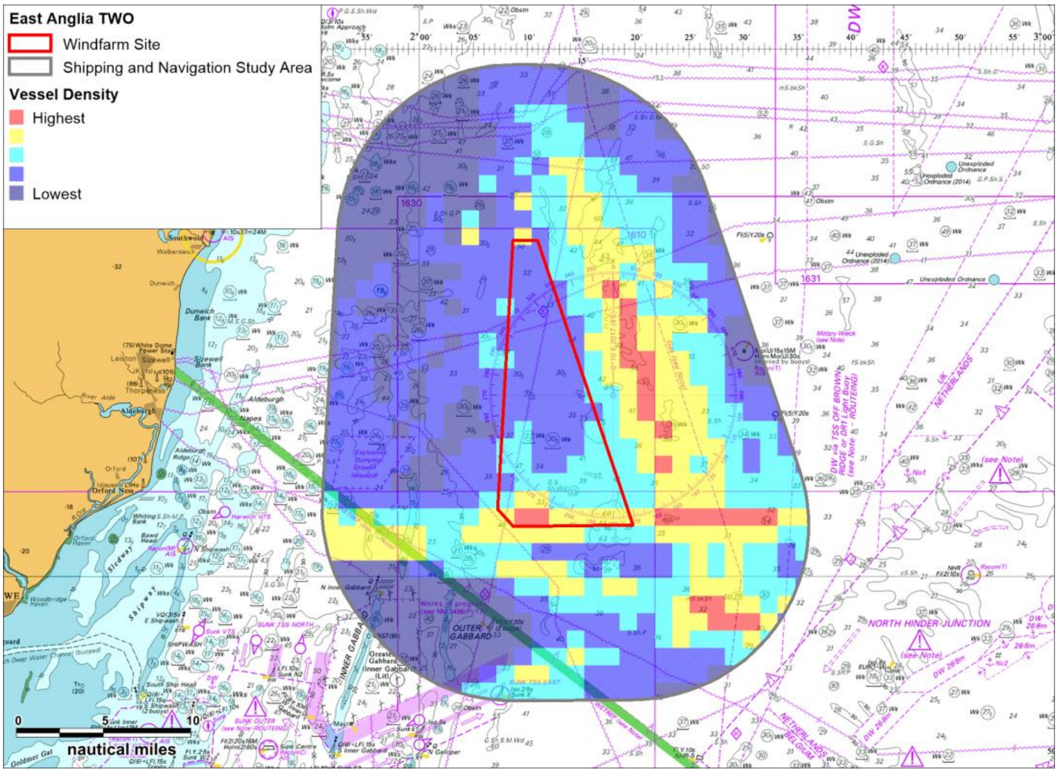



**Figure 12.6 Vessel Density from AIS and Radar within Shipping and Navigation Study Area (14 Days Summer 2017)**

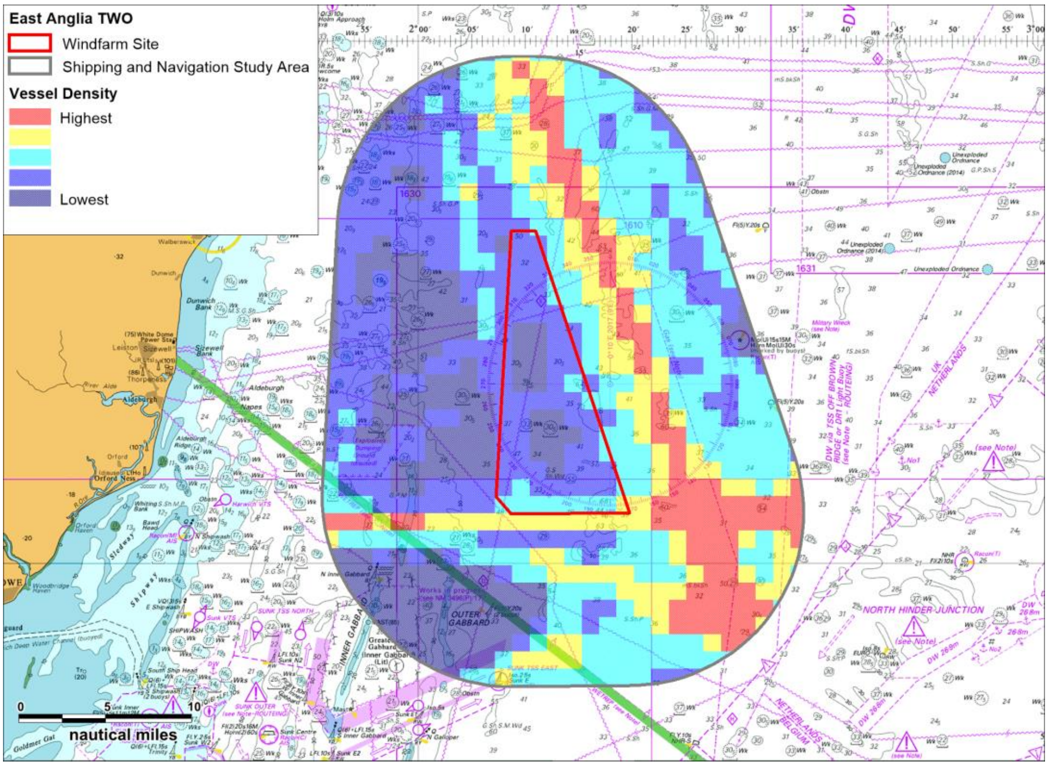



**Figure 12.7 Vessel Density from AIS within Shipping and Navigation Study Area (14 Days Winter 2017)**

106. During the summer and winter periods, the highest density areas were observed to correspond to vessel routeing within the east of the shipping and navigation study are, passing east of the East Anglia TWO windfarm site.

107. The vessel density within the East Anglia TWO windfarm site was observed to be lower during summer than in winter. This was due to a higher number of cargo vessels recorded during the winter period compared to the summer period. However, it should be noted that the average daily count for winter was lower (average of 71 vessels per day) than that recorded for summer (average of 74 vessels per day).

## 12.2 Summer Vessel Counts

108. For the 14 days analysed in summer 2017, there was an average of 74 unique vessels per day passing within the shipping and navigation study area, recorded on AIS and Radar. In terms of vessels intersecting the East Anglia TWO windfarm site, there was an average of 23 unique vessels per day.

109. *Figure 12.8* presents the daily number of unique vessels passing through the shipping and navigation study area during summer 2017.

110. The busiest day recorded throughout the summer survey period was the 28th May 2017 when 100 unique vessels were recorded within the shipping and navigation study area.

111. The quietest day recorded throughout the summer survey period was 16th May when 54 unique vessels were recorded within the shipping and navigation study area.

112. Throughout the summer survey period, 22% of traffic recorded within the shipping and navigation study area intersected the East Anglia TWO windfarm site.

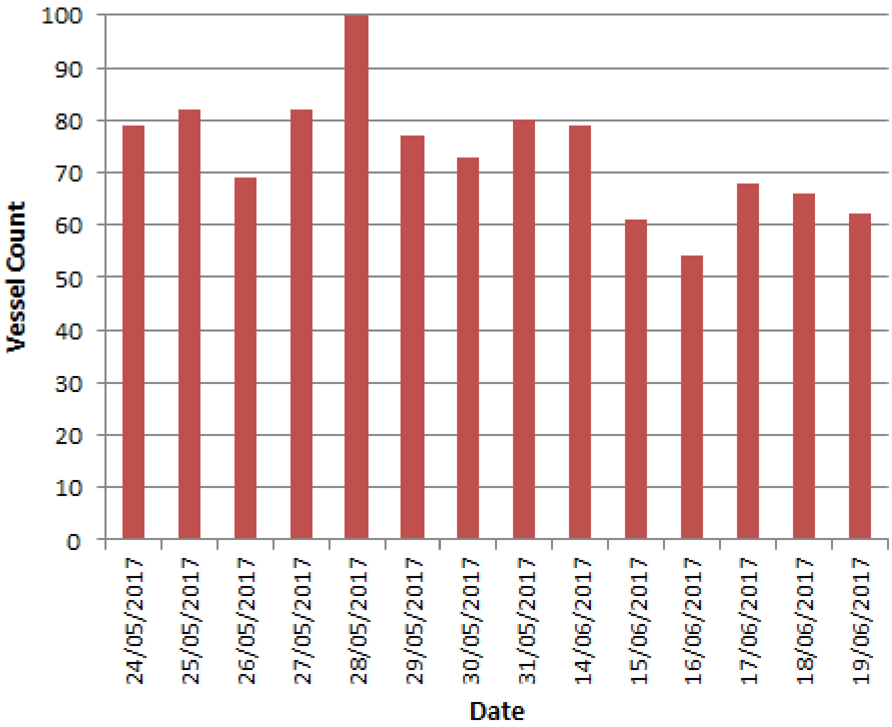



**Figure 12.8 Unique Vessels per Day from AIS and Radar within Shipping and Navigation Study Area (14 Days Summer 2017)**

## 12.3 Winter Vessel Counts

113. For the 14 days analysed in winter 2017, there was an average of 71 unique vessels per day passing within the shipping and navigation study area, recorded on AIS. In terms of vessels intersecting the East Anglia TWO windfarm site, there was an average of 14 unique vessels per day.

114. *Figure 12.9* presents the daily number of unique vessels passing through the shipping and navigation study area during winter 2017.

115. The busiest day recorded throughout the winter survey period was the 28th November 2017 when 97 unique vessels were recorded within the shipping and navigation study area.

116. The quietest day recorded throughout the winter survey period was 27th November 2017 when 58 unique vessels were recorded within the shipping and navigation study area.

117. Throughout the winter survey period, 15% of traffic recorded within the shipping and navigation study area intersected the East Anglia TWO windfarm site.

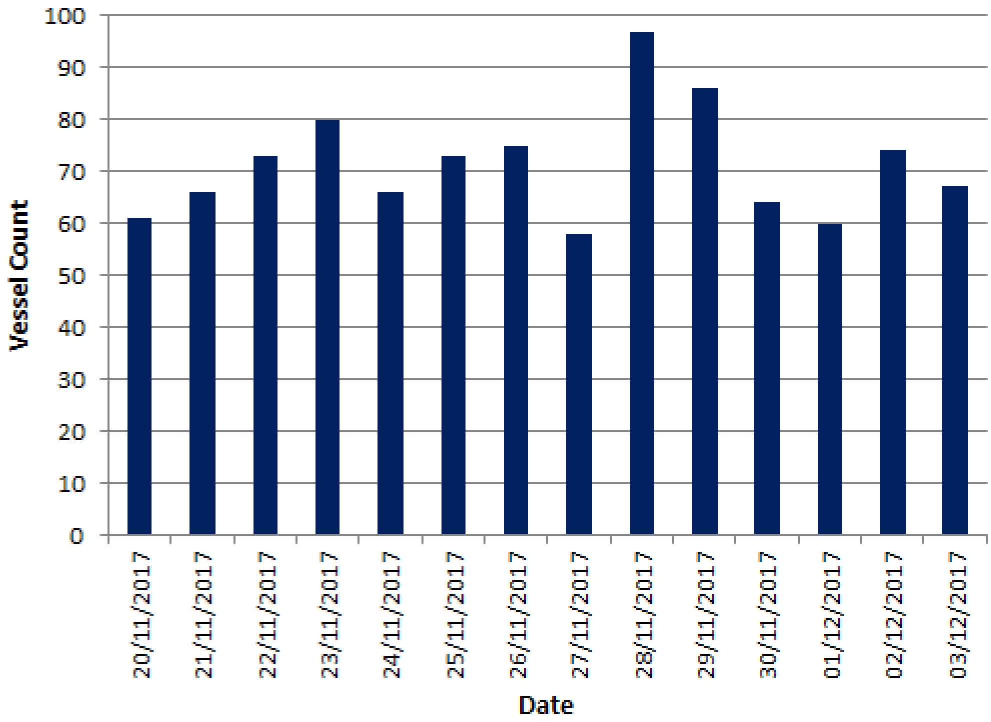



**Figure 12.9 Unique Vessels per Day from AIS within Shipping and Navigation Study Area (14 Days Winter 2017)**

## 12.4 Windfarm Vessel Activity

118. This section reviews the windfarm vessel activity associated with the construction of the nearby Galloper Offshore Wind Farm and operation and maintenance of the Greater Gabbard Offshore Wind Farm recorded during the summer and winter periods. As previously noted, these tracks have been excluded from the main analysis above given that operational traffic would be reduced (noting that Greater Gabbard Offshore Wind Farm is understood to have required extended maintenance post construction).

119. *Figure 12.10* presents a plot of temporary windfarm vessels recorded within the shipping and navigation study area on AIS and Radar throughout both the summer and winter survey periods.

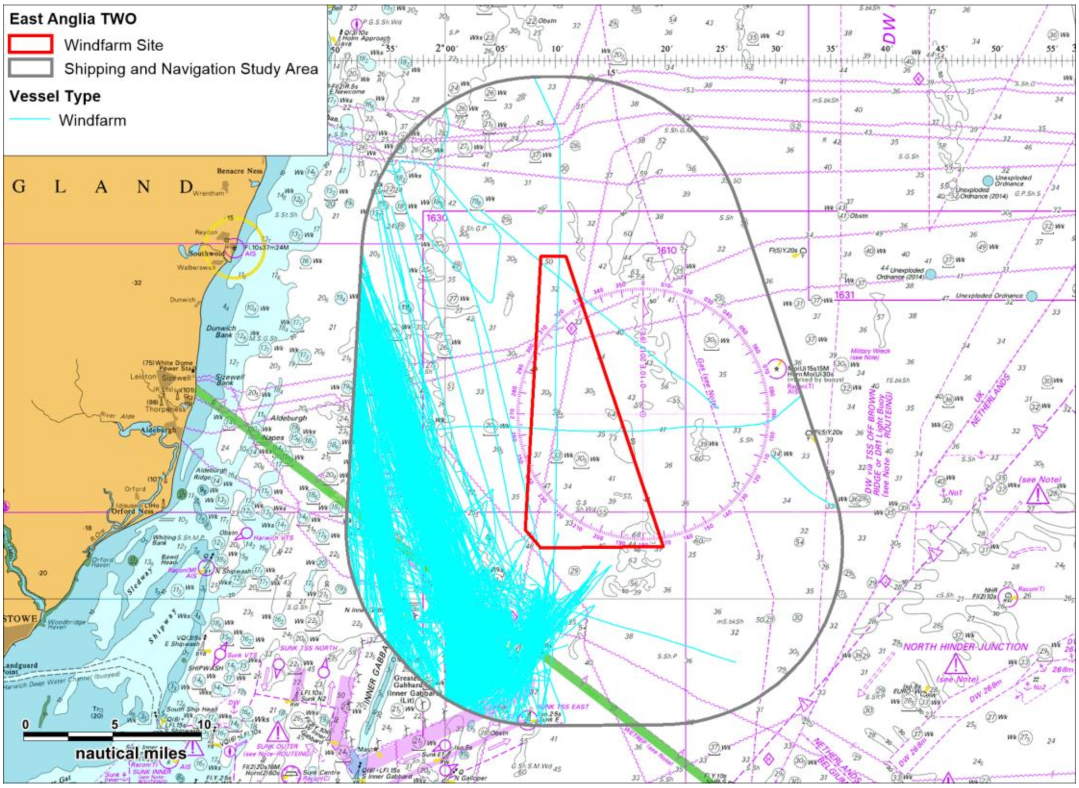



**Figure 12.10 AIS and Radar Windfarm Vessels within Shipping and Navigation Study Area (28 Days Summer and Winter 2017)**

120. Throughout the combined summer and winter survey period, an average of 16 unique windfarm vessels per day were recorded within the shipping and navigation study area.

121. It can be seen that the windfarm vessels were recorded within the west and south-west of the shipping and navigation study area, either involved in operations at the Greater Gabbard Offshore Wind Farm or Galloper Offshore Wind Farm or transiting to and from the two windfarm sites.

## 12.5 Vessel Types

122. Analysis of the vessel types recorded passing within the shipping and navigation study area and the East Anglia TWO windfarm site throughout both survey periods are presented in *Figure 12.11*. The category of "other" vessels includes those that are not large enough in quantities to be categorised separately, such as survey vessels, a training vessel and a buoy tender.

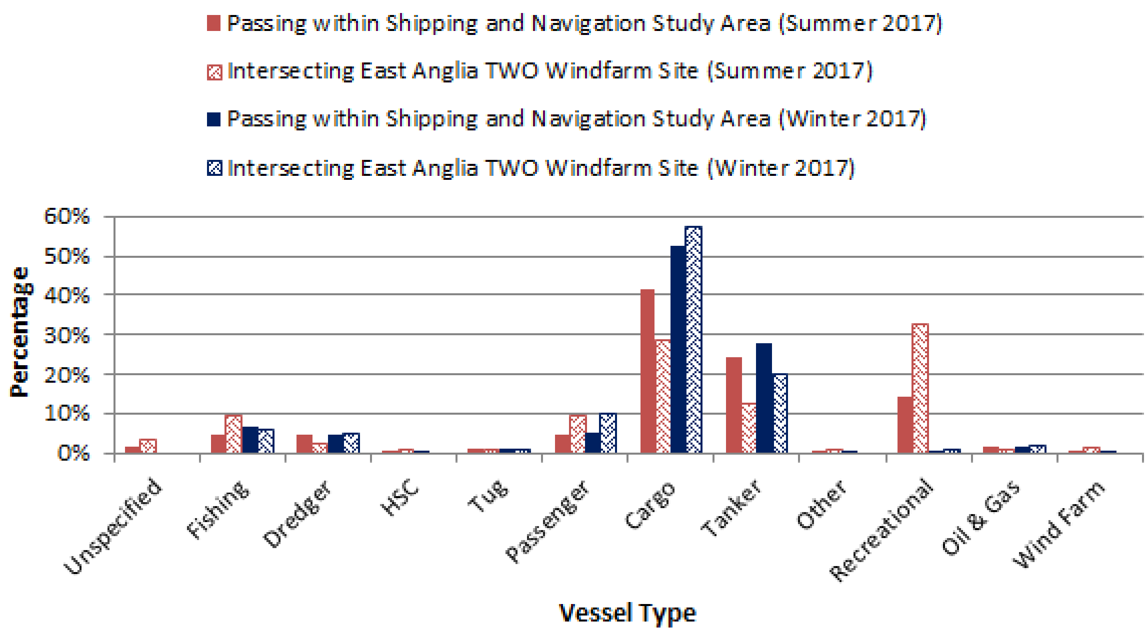



**Figure 12.11 Distribution of Vessel Types within Shipping and Navigation Study Area (28 Days Summer and Winter 2017)**

123. Throughout the summer period, the majority of tracks recorded on AIS and Radar were cargo vessels (42% within the shipping and navigation study area) and tankers (24%). Throughout the winter period the majority of tracks were cargo vessels (53% in the shipping and navigation study area) and tankers (28%). It should be noted that the cargo vessel category includes commercial ferries (e.g. DFDS Seaways) operating in the shipping and navigation study area.

124. It can be seen that cargo vessels and tankers were higher during the winter period than summer. This is reflected within the density grid presented in Figure 12.7 where vessel density is higher within the main commercial vessel channels to the east of the shipping and navigation study area. However, overall vessel density and vessel counts are higher during summer due to increased numbers of recreational craft recorded.

125. Approximately 2% of tracks recorded within the shipping and navigation study area throughout the summer survey period were unspecified vessels. These consisted of Radar tracks from which vessel types could not be identified.

## 12.6 Cargo Vessels

126. *Figure 12.12* presents a plot of cargo vessels recorded within the shipping and navigation study area throughout the survey periods, colour-coded by subtype categories. Following this, *Figure 12.13* presents the distribution of the main cargo

vessel subtypes. It should be noted that commercial ferries (Roll on Roll off (Ro Ro) cargo) are included.

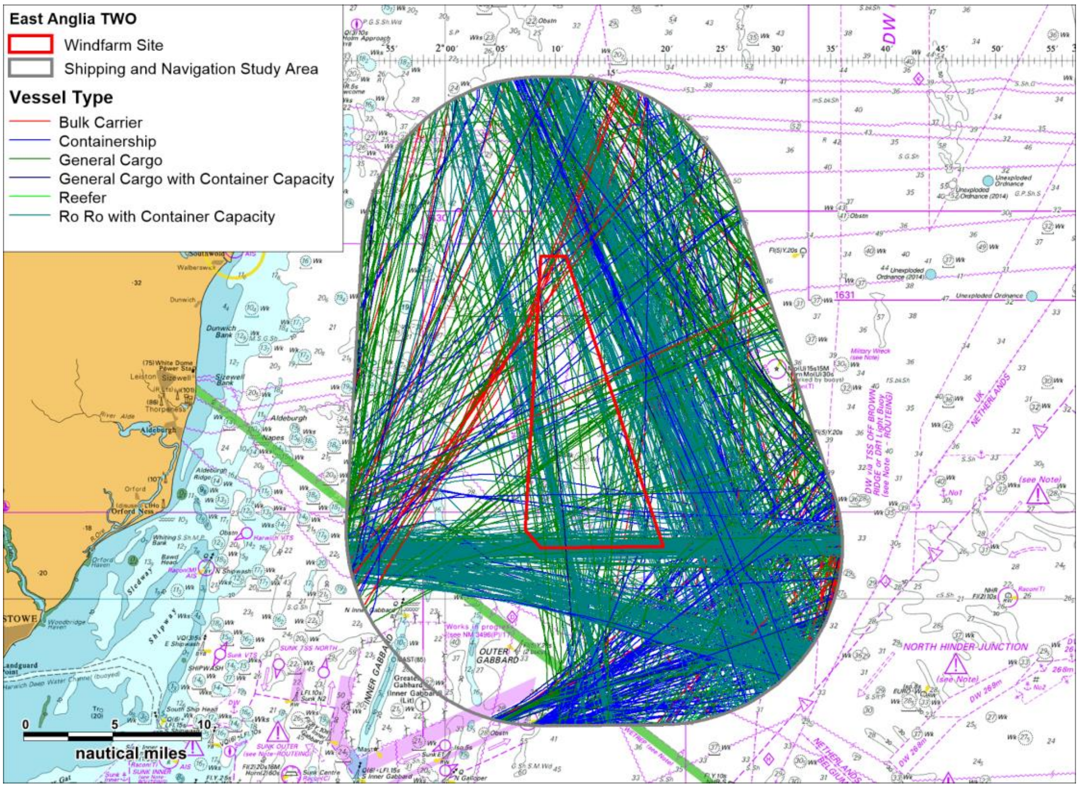



**Figure 12.12 AIS and Radar Cargo Vessels by Sub Type within the Shipping and Navigation Study Area (28 Days Summer and Winter 2017)**

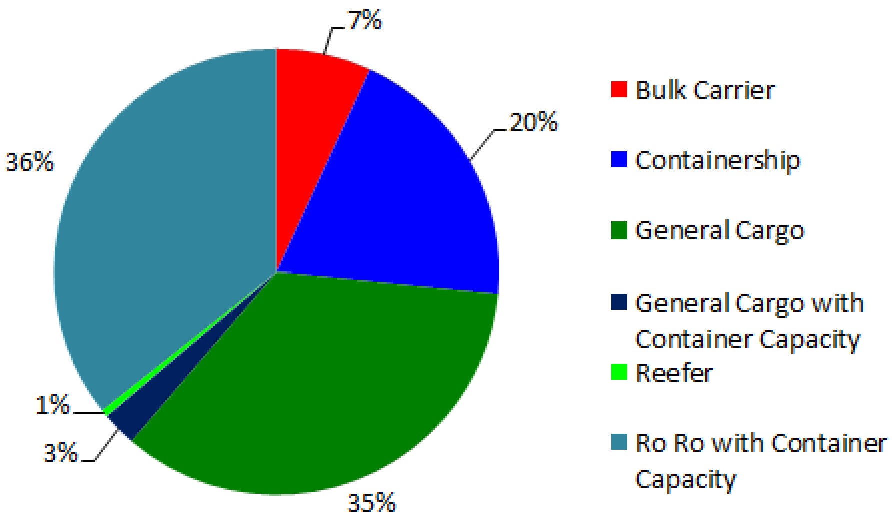



**Figure 12.13 Distribution of Main Cargo Vessel Subtypes**

127. Throughout the combined summer and winter survey period, an average of 34 unique cargo vessels per day passed within the shipping and navigation study area.

128. It can be seen that the majority of cargo vessels were transiting routes to the east and south of the East Anglia TWO windfarm site as well as the Sunk TSS within the south of the shipping and navigation study area.

129. Ro Ro cargo vessels with container capacity (36%) and general cargo vessels (35%) were the most frequently recorded cargo vessel type transiting through the shipping and navigation study area, followed by containerships (20%). Bulk carriers (7%) were also recorded frequently.

## 12.7 Tankers

130. *Figure 12.14* presents a plot of tankers recorded within the shipping and navigation study area throughout the survey periods, colour-coded by subtype categories. Following this, *Figure 12.15* presents the distribution of tanker subtypes.

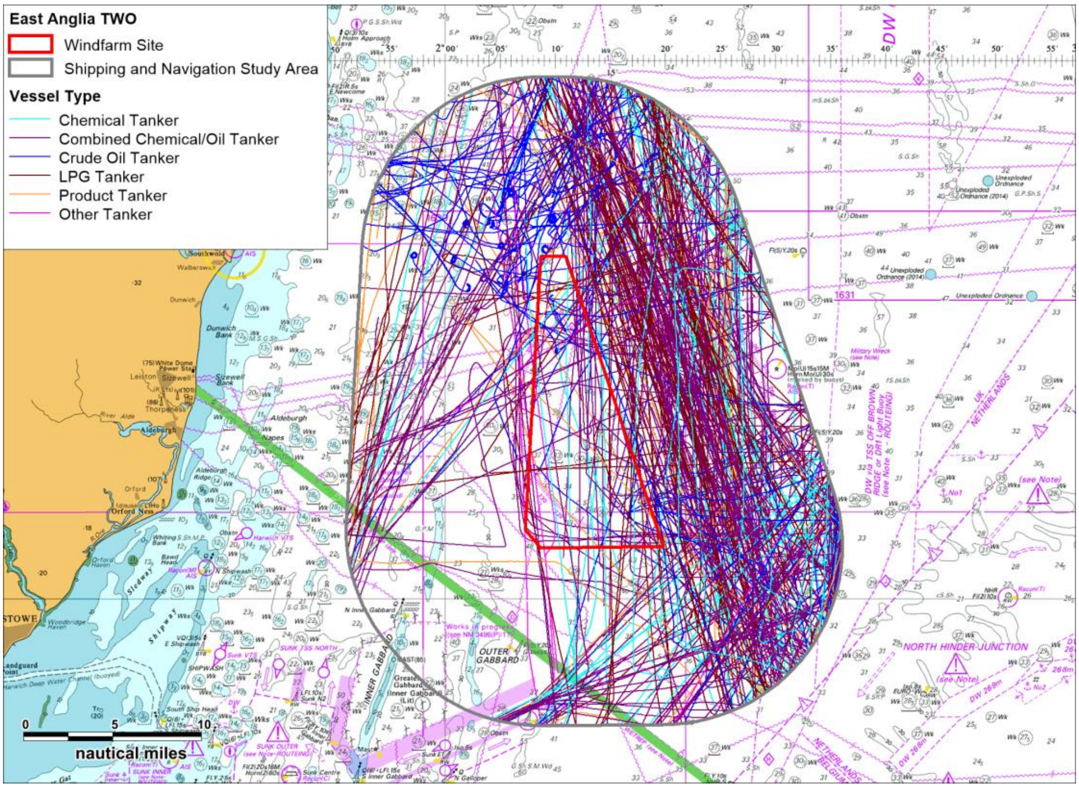



**Figure 12.14 AIS and Radar Tankers by Sub Type within the Shipping and Navigation Study Area (28 Days Summer and Winter 2017)**

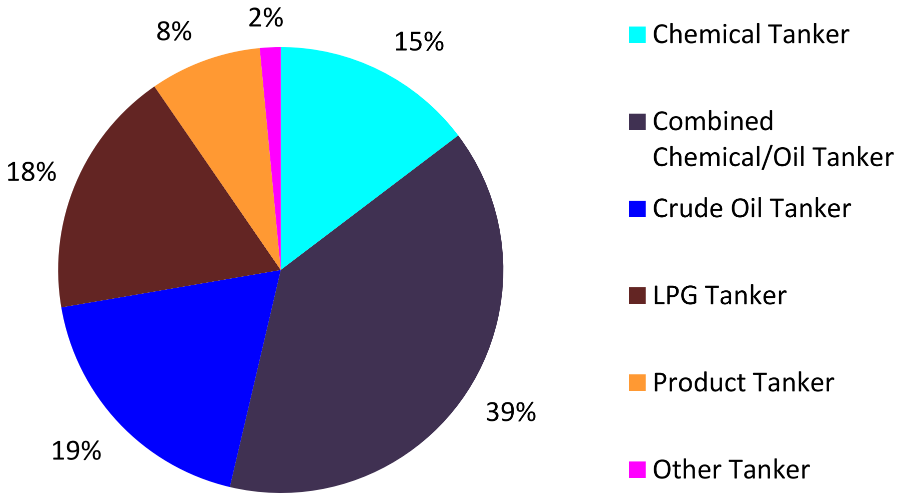



**Figure 12.15 Distribution of Tanker Subtypes**

131. Throughout the combined summer and winter survey period, an average of 19 unique tankers per day passed within the shipping and navigation study area.

132. It can be seen that the majority of tankers were transiting routes to the east of the East Anglia TWO windfarm site.

133. Combined chemical and oil tankers (39%) were the most frequently recorded tanker type transiting through the shipping and navigation study area, followed by crude oil tankers (19%) and Liquid Petroleum Gas (LPG) carriers (18%).

134. Tankers engaged in activity rather than transiting were recorded within the shipping and navigation study area as presented in *Figure 12.16*.

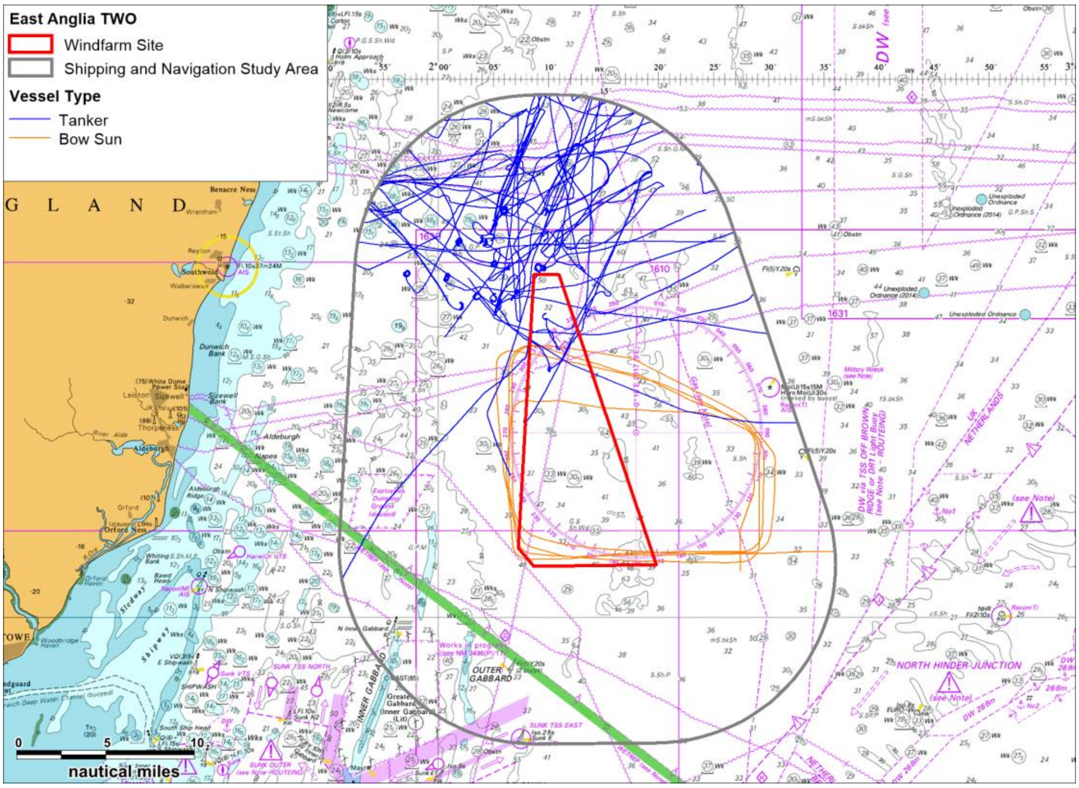



**Figure 12.16 AIS and Radar Tanker Activity within the Shipping and Navigation Study Area (28 Days Summer and Winter 2017)**

135. There is a designated Southwold Oil Transhipment Area within the UK territorial sea off the coast of Southwold where Ship-to-Ship (STS) transfers can take place. It can be seen that STS transfers were recorded within the north of the shipping and navigation study area with 5% of the tracks recorded intersecting the East Anglia TWO windfarm site. The combined chemical / oil tanker *Bow Sun* was also recorded intersecting the East Anglia TWO windfarm site carrying out a manoeuvre.

## 12.8 Oil and Gas Vessels

136. *Figure 12.17* presents a plot of oil & gas associated vessels recorded within the shipping and navigation study area throughout the survey periods.

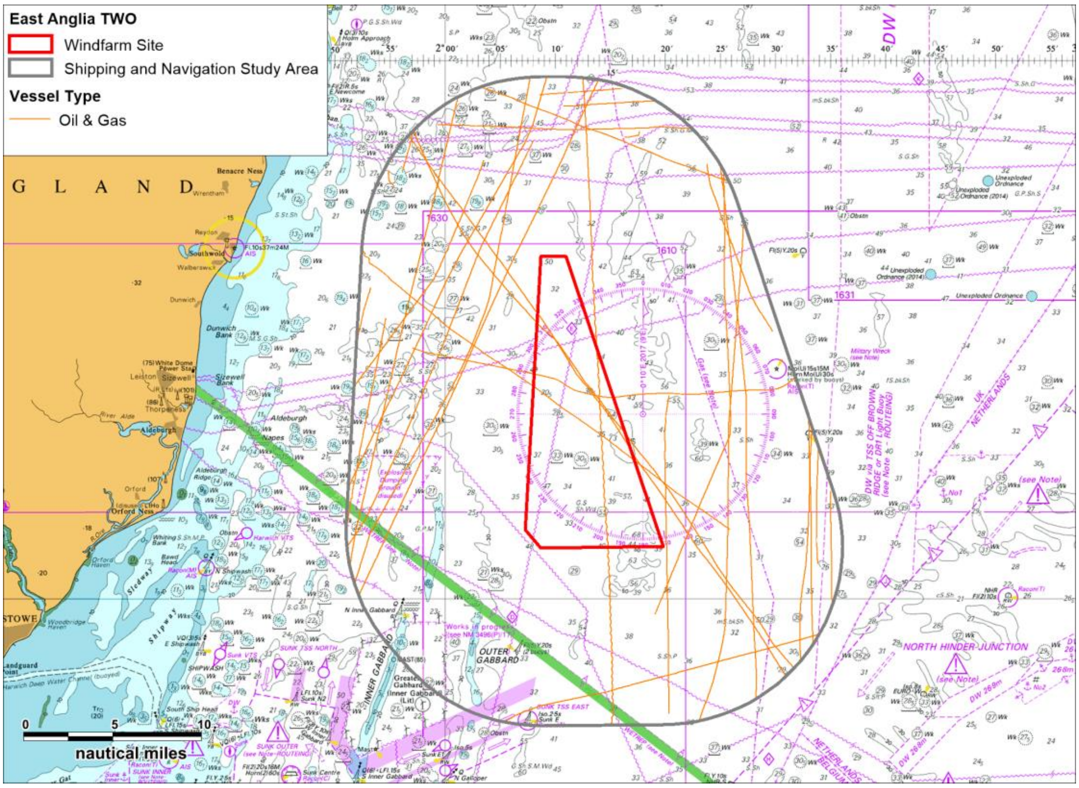



**Figure 12.17 AIS and Radar Oil & Gas Vessels within the Shipping and Navigation Study Area (28 Days Summer and Winter 2017)**

137. Throughout the combined summer and winter survey period, an average of one unique oil & gas vessel per day passed within the shipping and navigation study area.

## 12.9 Passenger Vessel Activity

138. This section reviews the passenger vessel activity within the shipping and navigation study area based upon the marine traffic surveys.

139. *Figure 12.18* presents a plot of passenger vessels recorded within the shipping and navigation study area on AIS and Radar throughout both the summer and winter survey periods.

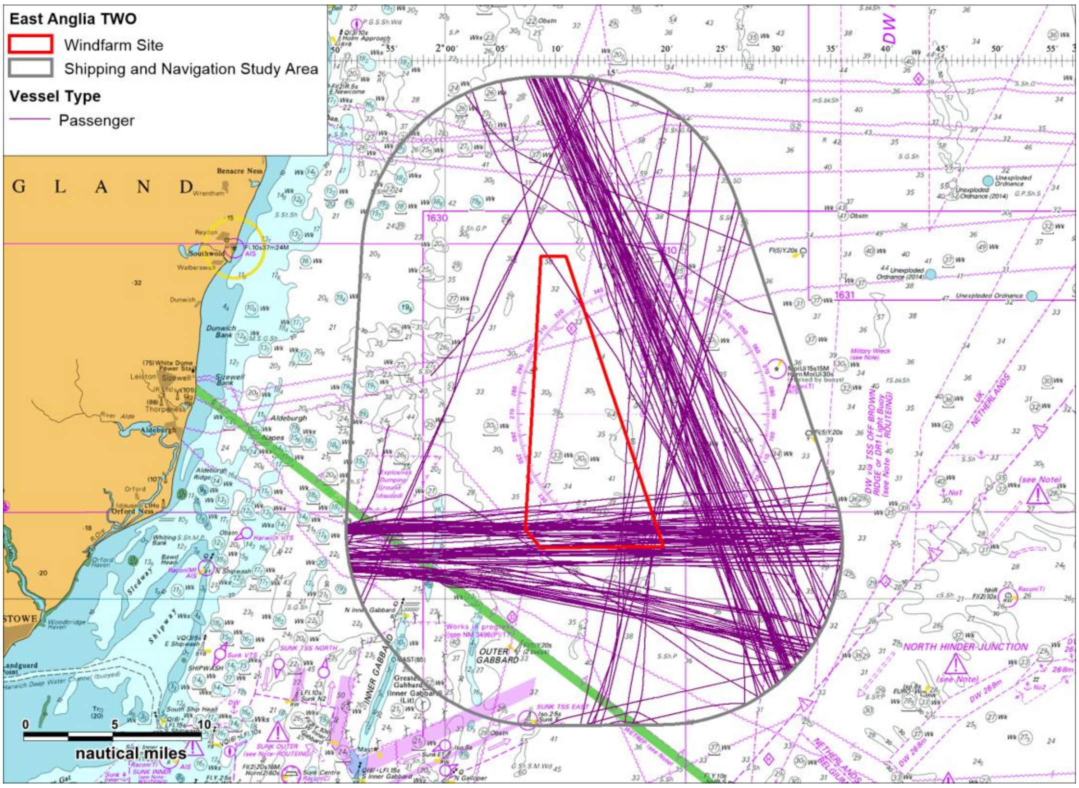



**Figure 12.18 AIS and Radar Passenger Vessels within the Shipping and Navigation Study Area (28 Days Summer and Winter 2017)**

140. It can be seen that regular passenger vessel transits were recorded to the east and south of the East Anglia TWO windfarm site.

141. An average of four unique passenger vessels per day was recorded throughout the combined summer and winter survey periods.

142. The destinations of the passenger vessels recorded throughout the summer and winter survey periods are presented in *Table 12.1*. Vessels transiting between Hull and Zeebrugge (P&O Ferries) and Rotterdam and Harwich (Stena Line) were the most frequently recorded.

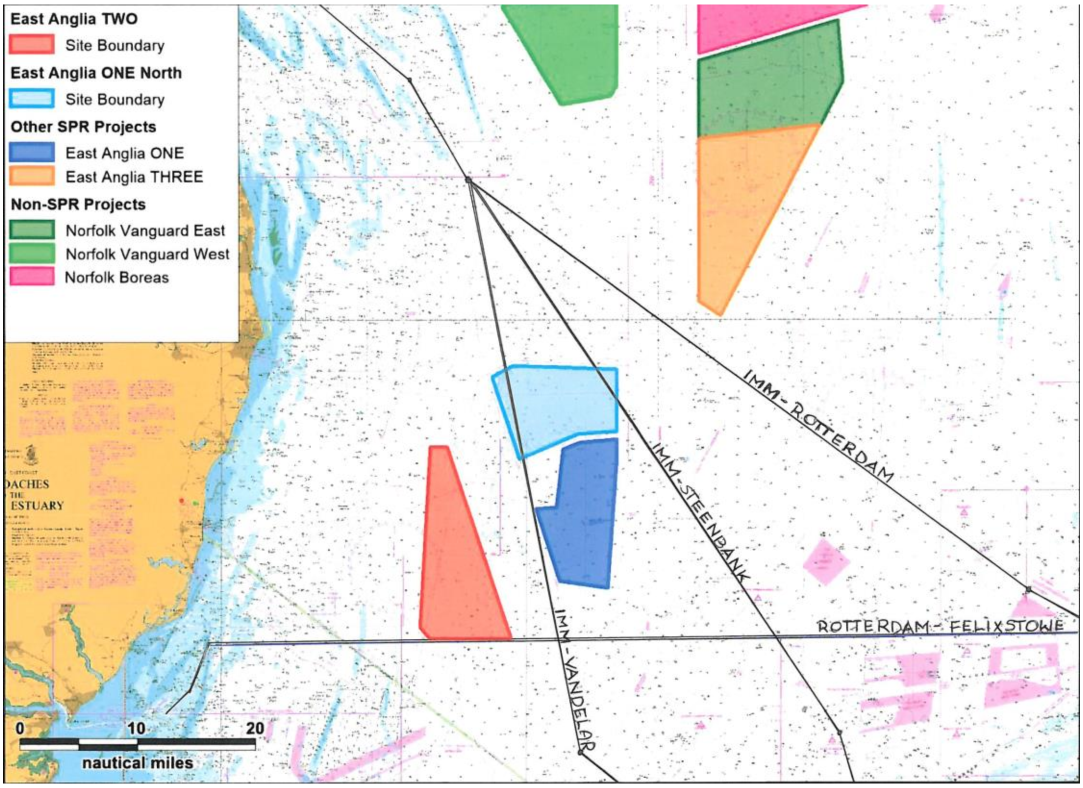
**Table 12.1 Passenger Vessel Destinations (28 Days Summer and Winter 2017)**

| Vessel Operator | Vessel | Destination |
|---|---|---|
| Carnival | *Aurora* | Stavanger to Southampton<br>Skagen to Southampton |
| | *Britannia* | Stavanger and Southampton |
| | *Queen Elizabeth* | Southampton |
| Costa Cruises | *Costa Mediterranea* | Amsterdam |

| Vessel Operator | Vessel | Destination |
|---|---|---|
| Fred. Olsen | *Black Watch* | Invergordon |
| Global Cruise Lines | *Columbus* | Eidfjord |
| | *Magellan* | Tilbury |
| P&O Ferries | *Pride of Bruges*<br>*Pride of York* | Hull - Zeebrugge |
| Royal Caribbean | *Vision of the Seas* | Edinburgh |
| Stena Line | *Stena Britannica*<br>*Stena Hollandica* | Rotterdam - Harwich |
| | *Stena Transit* | Rotterdam to Humber |
| V. Ships | *Saga Pearl II* | Stavanger |
| | *Saga Sapphire* | Kirkwall |
| Viking River Cruises | *Viking Star* | Rosyth<br>Greenwich |
| Other | *Dolly C* | Grenada |
| | *Nahlin* | Not Available |

## 12.10 DFDS Routeing

143. DFDS Seaways is a ferry operator within European waters, operating both passenger ferries and freight shipping. Following regular operator consultation (see *Table 5.2*), information on vessel routeing was provided by DFDS Seaways. This is presented in *Figure 12.19.*




## Figure 12.19 DFDS Seaways Vessel Routeing

144. It can be seen that two indicative DFDS vessel routes intersect the East Anglia ONE North windfarm site while the Rotterdam to Felixstowe route intersects the East Anglia TWO windfarm site.

145. Following the routeing provided by DFDS, one year of AIS data (1st January to the 31st December 2017) was analysed from a Met Mast within the former East Anglia Zone to validate the routeing within the vicinity of the East Anglia ONE windfarm site, East Anglia ONE North windfarm site and East Anglia TWO windfarm site.

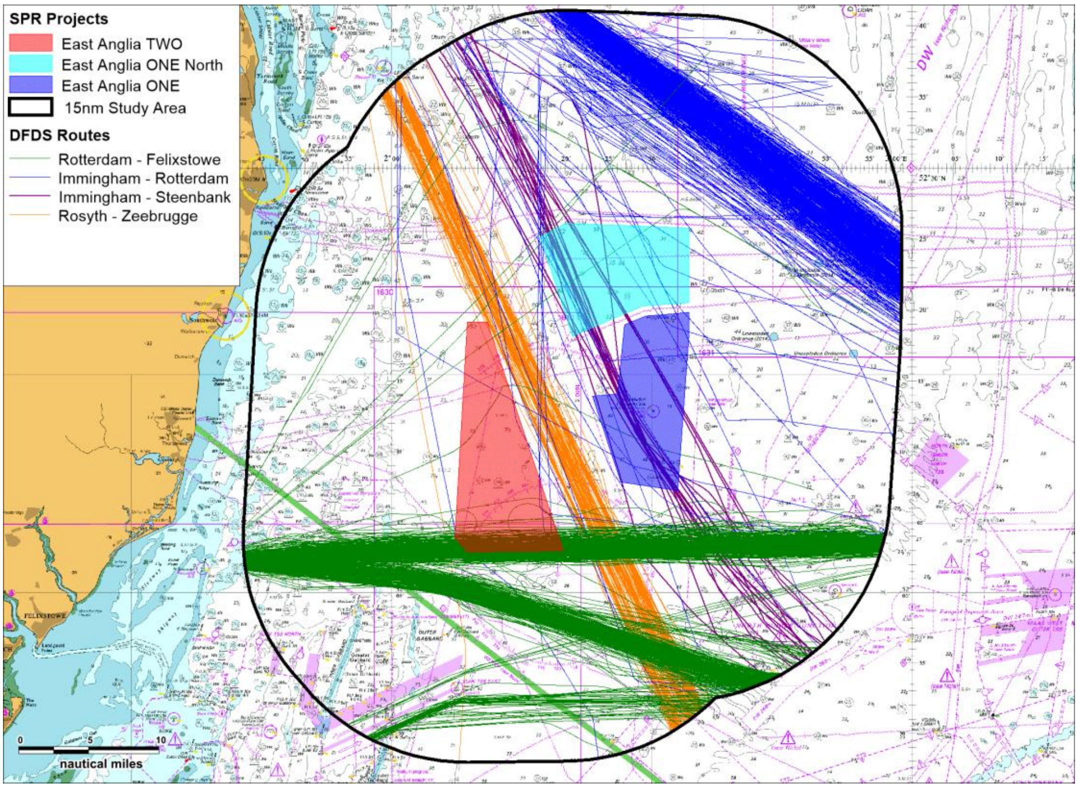



**Figure 12.20 DFDS Vessel Routes (Met Mast AIS Data January 1st and 31st December 2017)**

146. In comparison to the routeing provided by DFDS, the Rotterdam to Felixstowe route is clearly defined within the AIS data however the route is recorded as split into four rather than one as in *Figure 12.19*. The two higher density routes are recorded transiting eastbound and westbound between the two ports, with one route intersecting the south of the East Anglia TWO windfarm site (approximately 23% of vessel tracks). However two lower density routes are also recorded using the Sunk TSS located within the south-west of the study area in both the eastbound and westbound lanes. It should be noted that vessels with a destination of Felixstowe and Rotterdam were also recorded transiting north of the East Anglia ONE North windfarm site and intersecting the northern boundaries of the East Anglia ONE North windfarm site and the East Anglia TWO windfarm site. These vessel tracks were recorded during the winter period therefore are assumed to be deviations due to adverse weather conditions. One vessel with a destination other than Rotterdam or Felixstowe was also recorded on the route transiting to Gdansk, Poland.

147. The Immingham to Rotterdam route provided by DFDS was recorded between the East Anglia THREE windfarm site and East Anglia ONE North windfarm site. AIS data recorded the same route however it should be noted that some vessel tracks intersected the East Anglia THREE windfarm site (approximately 2% of vessels on the route). Vessels with a destination of Immingham and Rotterdam were also recorded transiting through the East Anglia ONE windfarm site, East Anglia ONE North

windfarm site and the East Anglia TWO windfarm site. These are assumed to due to adverse weather conditions. A small number of vessels with destinations other than Immingham and Rotterdam were also recorded on the route (approximately 0.01% of vessel tracks).

148. The Immingham to Vlaardingen route provided by DFDS is not reflected within the AIS data. However, the Rosyth to Zeebrugge route was recorded in the AIS data transiting the area between the East Anglia TWO windfarm site, East Anglia ONE windfarm site and East Anglia ONE North windfarm site with approximately 0.9% vessel tracks intersecting the East Anglia TWO windfarm site. It was announced by DFDS in April 2018 that they were closing this route.

149. The Immingham to Steenbank route provided by DFDS was recorded as intersecting the East Anglia ONE North windfarm site. Within the AIS data, this route is recorded as transiting further to the west and intersecting both the East Anglia ONE North windfarm site and East Anglia ONE windfarm site.

150. *Table 12.2* presents details of the vessel routes recorded from the Met Mast AIS during 2017.

**Table 12.2 DFDS Vessel Routes (Met Mast AIS Data January 1st and 31st December 2017)**

| Vessel | Route | Average Vessels per Day |
|---|---|---|
| Gardenia Seaways | Rotterdam to Felixstowe | 1 |
| Corona Seaways | | |
| Britannia Seaways | | |
| Anglia Seaways | | |
| Tulipa Seaways | Immingham to Rotterdam | 2 |
| Anglia Seaways | | |
| Magnolia Seaways | | |
| Ark Germania | | |
| Britannia Seaways | | |
| King Seaways | | |
| Princess Seaways | | |
| Corona Seaways | | |
| Hafnia Seaways | | |
| Fionia Seaways | | |

| Vessel | Route | Average Vessels per Day |
|---|---|---|
| Jutlandia Seaways | | |
| Gardenia Seaways | | |
| Finlandia Seaways (operations now ceased) | Rosyth to Zeebrugge | 1 |
| Anglia Seaways | Immingham to Steenbank | 1 every 20 days |

151. The most frequently used DFDS route identified during 2017 was the Immingham to Rotterdam route with an average of two vessels recorded per day. The Immingham to Steenbank route was the least used with a vessel transit recorded only once every 20 days.

## 12.11 Other Operational Vessels

152. *Figure 12.21* presents a plot of other operational vessels recorded within the shipping and navigation study area throughout the survey periods.

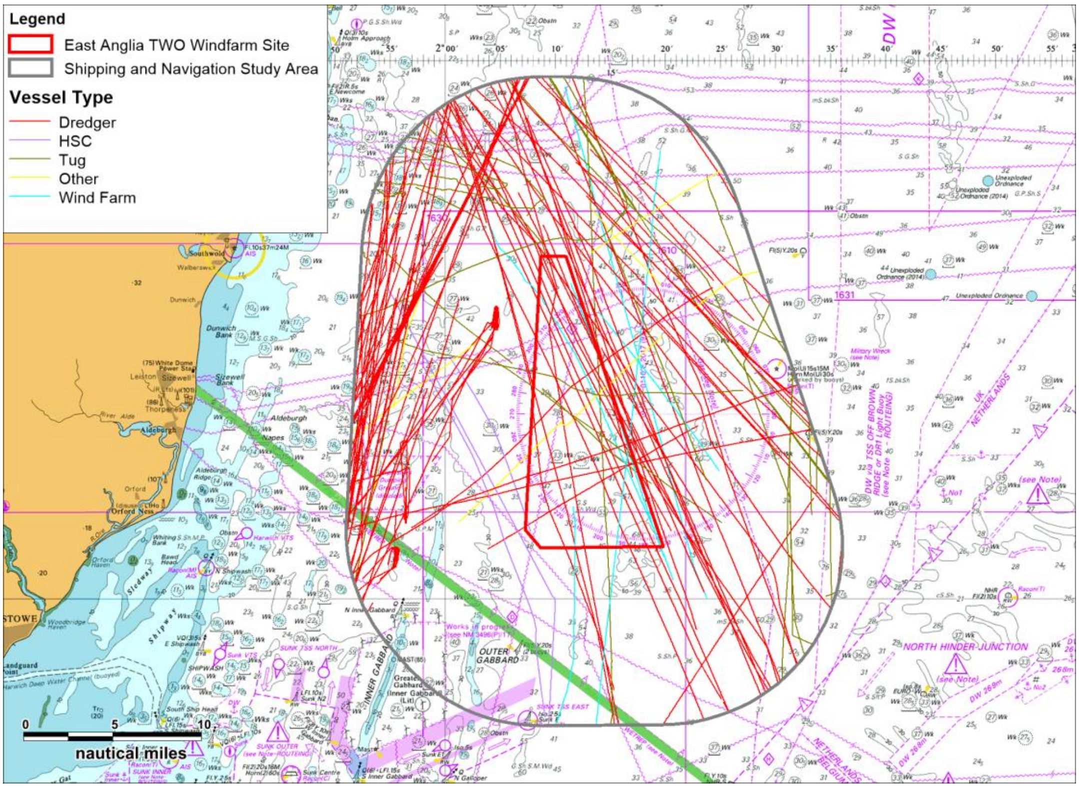



**Figure 12.21 AIS and Radar Other Operational Vessels within the Shipping and Navigation Study Area (28 Days Summer and Winter 2017)**

153. It can be seen that the majority of vessels transiting through the shipping and navigation study area were dredgers (68%), with vessels recorded transiting west of the shipping and navigation study area as well as through the East Anglia TWO

windfarm site while transiting to and from marine aggregate dredge areas. Tugs (17%), High Speed Craft (HSC) (5%), "other" vessels (5%) and windfarm associated vessels (5%) were also recorded. As previously mentioned, "other" vessels include those that are not large enough in quantities to be categorised separately, such as survey vessels, a training vessel and a buoy tender.

## 12.12 Fishing Vessel Activity

154. Fishing vessel activity recorded within the shipping and navigation study area during the AIS and Radar marine traffic surveys is presented in *Figure 12.22*, colour-coded by fishing gear type. Following this, *Figure 12.23* presents the distribution of fishing gear types.

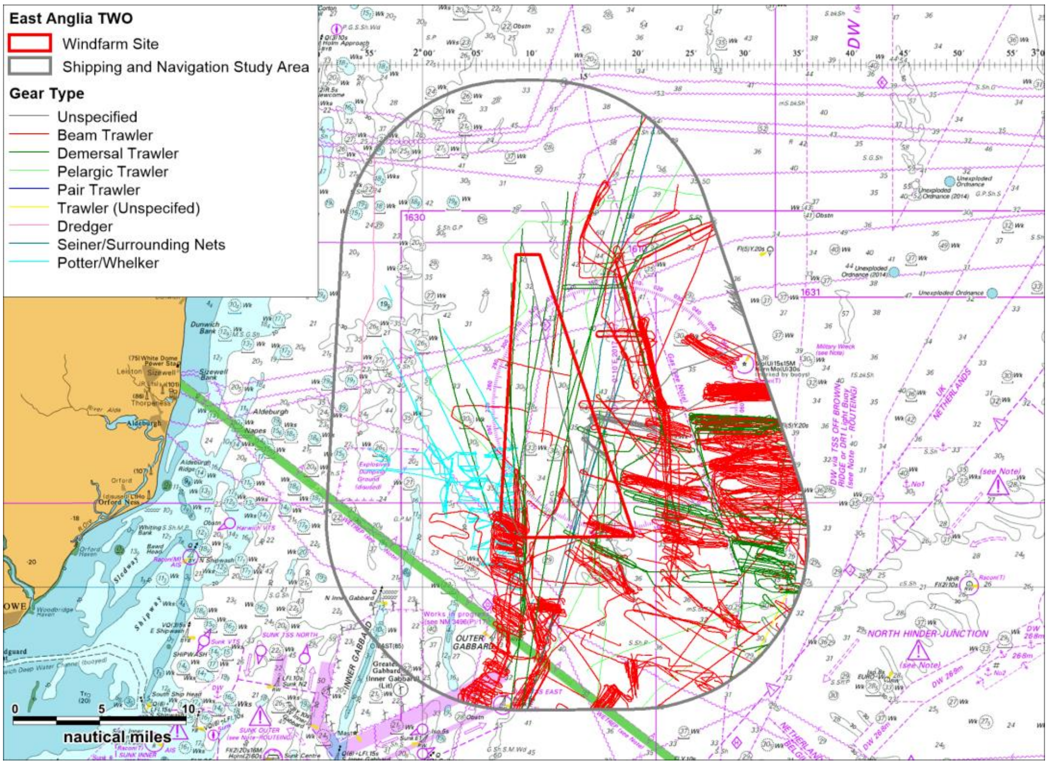



**Figure 12.22 AIS and Radar Fishing Vessels within the Shipping and Navigation Study Area (28 Days Summer and Winter 2017)**

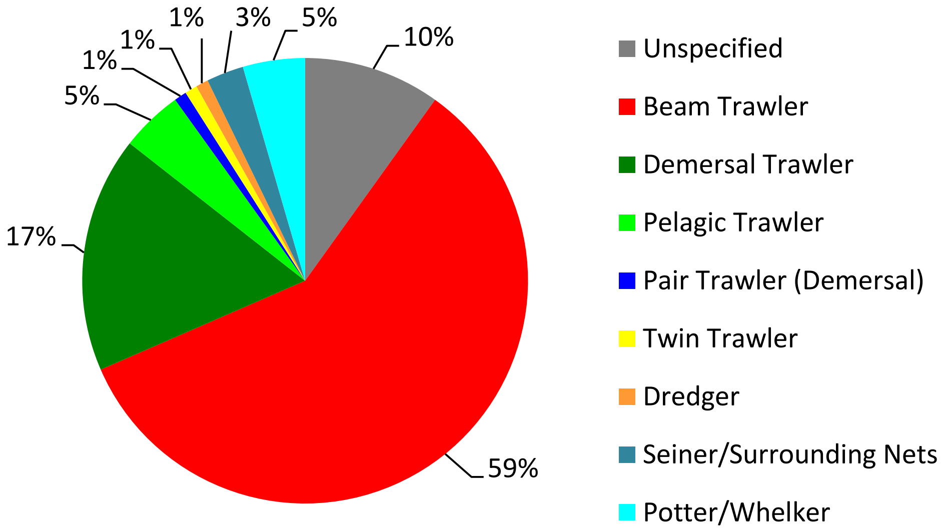



**Figure 12.23 Distribution of Fishing Gear Types**

155. Throughout the combined summer and winter survey periods, an average of four unique fishing vessels per day passed within the shipping and navigation study area. It can be seen that fishing vessels recorded were recorded engaged in fishing activity and transiting through the shipping and navigation study area. An average of two vessels every two days was recorded within the East Anglia TWO windfarm site.

156. Flag state (nationality) information was available for approximately 98% of fishing vessels recorded within the shipping and navigation study area with the 2% of unspecified nationalities corresponding to Radar tracks. Of the nationalities identified, the most common was the Netherlands (65%) followed by the UK (15%) and France (14%). Other nationalities recorded included Germany, Spain, Norway and Russia, each of which accounted for 1%.

157. Fishing method information was available for 90% of fishing vessels recorded within the shipping and navigation study area. Of the fishing methods identified, the most common were beam trawlers (59%) followed by demersal trawlers (17%). Other fishing methods recorded included pelagic trawlers (5%), potter / whelkers (5%) and seiner / surrounding nets (3%). Demersal pair trawlers, twin trawlers and dredgers each accounted for 1% of fishing methods recorded.

## 12.13 Recreational Vessel Activity

158. Recreational vessel activity recorded within the shipping and navigation study area during the AIS and Radar marine traffic surveys is presented in *Figure 12.24*, colour-coded by subtype categories. As per Recreational Craft Regulation 2013 (Directive 2013/53/EU), sailing vessels and motor craft recorded as between 2.5 and 24m in length have been classed as recreational vessels.

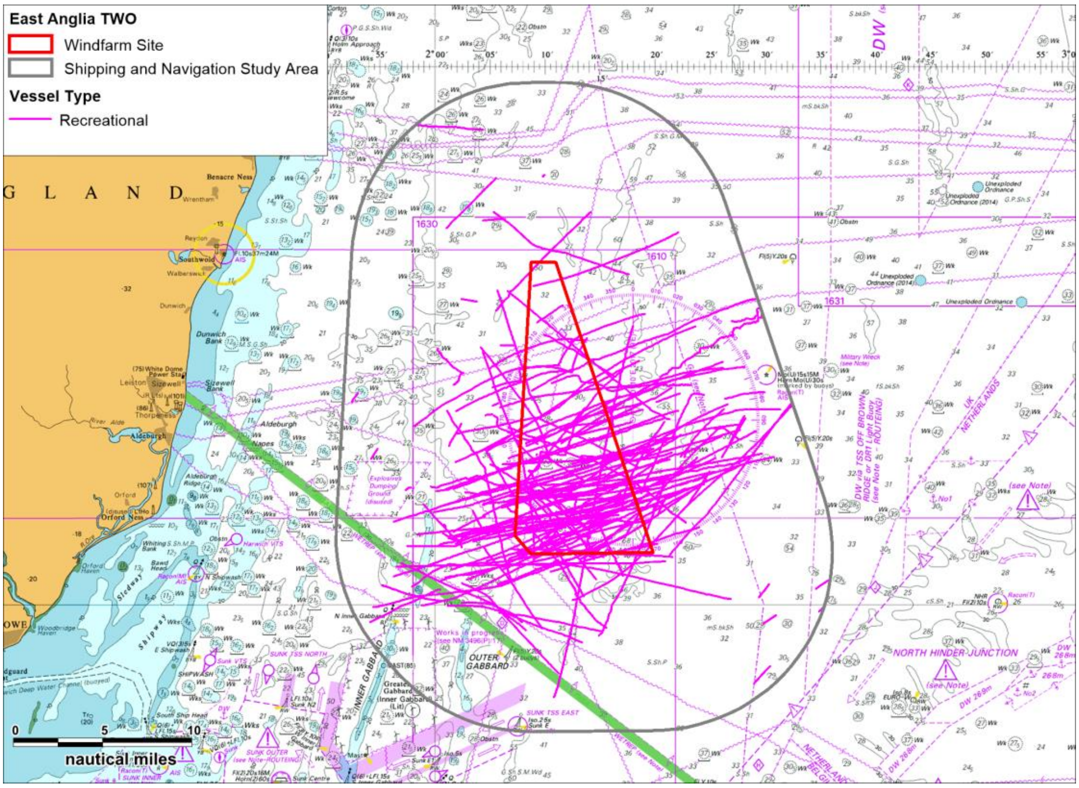



**Figure 12.24 AIS and Radar Recreational Vessels within the Shipping and Navigation Study Area (28 Days Summer and Winter 2017)**

159. An average of 11 unique recreational vessel transits per day were recorded within the shipping and navigation study area during the summer period and a total of two unique vessels recorded during winter. The majority of recreational vessels recorded were sailing vessels (92%).

160. It should be noted that during the summer survey period, two races passed through or in proximity to the East Anglia TWO windfarm site. These were the Vuurschepen yacht race between Scheveningen and Harwich on the 27th and 28th May 2017 and the North Sea yacht race between Harwich and Scheveningen on 30th May 2017. Therefore it is likely that the activity was inflated above typical levels, with vessels transiting to the start point in the days preceding the event, and running the course on the day of the race itself.

### 12.13.1 RYA Coastal Atlas

161. The RYA Coastal Atlas (RYA, 2016) is presented relative to the East Anglia TWO windfarm site in Figure 12.25. This includes a recreational density grid up to the 12nm UK territorial limit and the locations of clubs, training centres and marinas. To illustrate offshore routeing, the coastal atlas also provides offshore route indicators showing typical recreational routes.

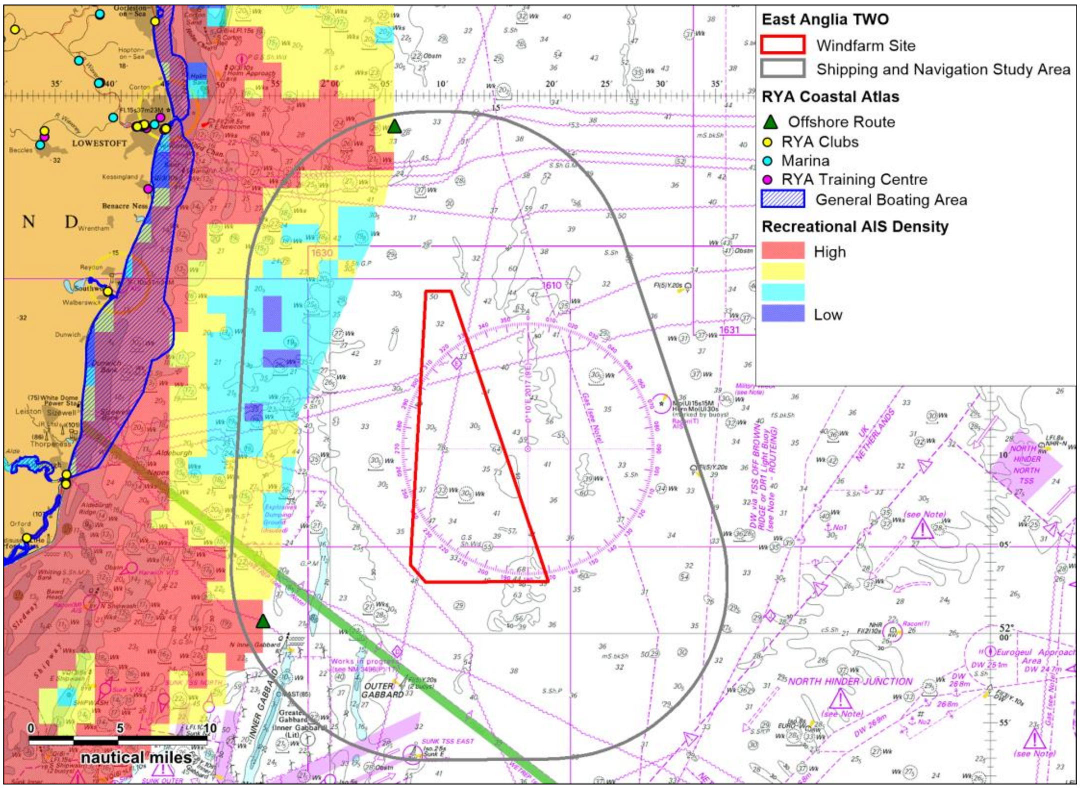



**Figure 12.25 RYA Coastal Atlas (2016)**

Higher recreational density was observed to be largely coastal, with the west of the shipping and navigation study area categorised as low to medium intensity. There are two offshore route indicators within the shipping and navigation study area, both operating in an eastbound direction.

## 12.14 Anchoring

162. This section presents analysis of the anchoring activity in the vicinity of the shipping and navigation study area. *Figure 12.26* presents a plot of the anchored vessels recorded during the combined summer and winter survey periods.

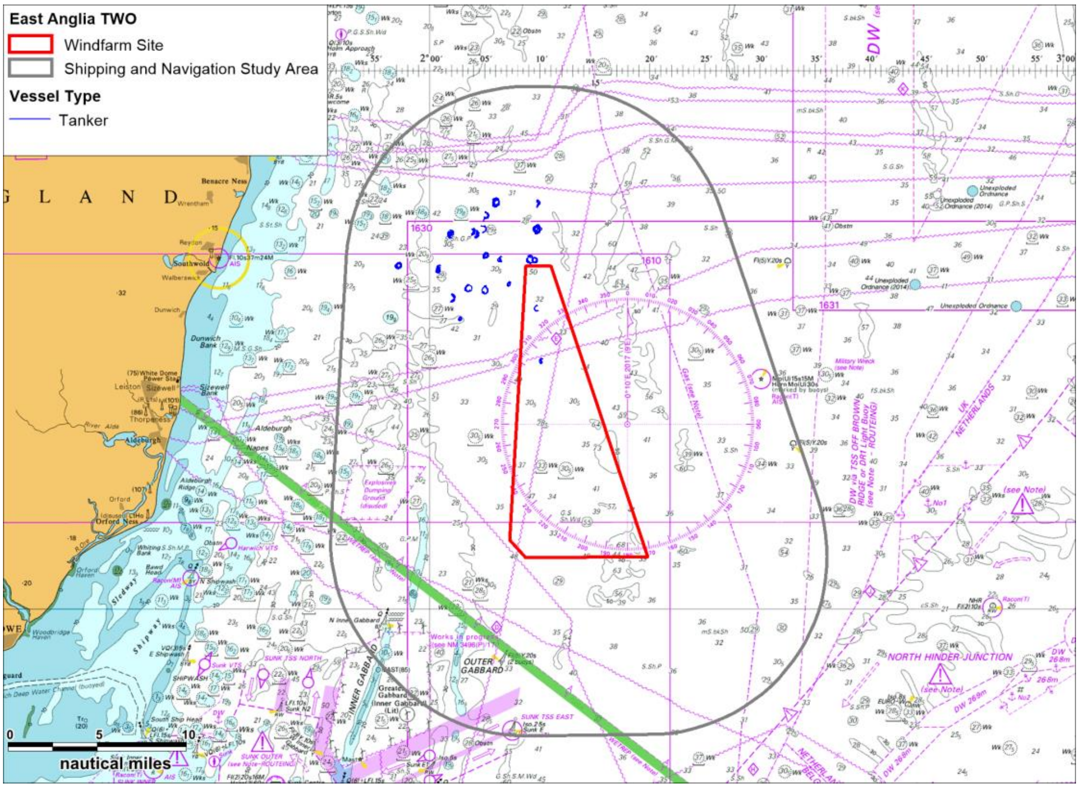



**Figure 12.26 AIS and Radar Anchored Vessels within the Shipping and Navigation Study Area (28 Days Summer and Winter 2017)**

163. A total of 18 tankers were recorded at anchor during the combined summer and winter survey periods. Two tankers were recorded anchoring within the East Anglia TWO windfarm site. There is a designated area of the UK territorial sea off the coast of Southwold where STS transfers are permitted therefore the anchored tankers within the shipping and navigation study area are likely to be anchored in preparation for a STS transfer with another tanker (see section 12.7).

# 13 Offshore Cable Corridor Marine Traffic Survey

## 13.1 Introduction

164. This section presents analysis of marine traffic survey data recorded within the offshore cable corridor study area. It is noted that the study area, and therefore the analysis, is based on a 2nm buffer of the most up to date iteration of the offshore cable corridor available to Anatec at the time of analysis.

165. The marine traffic survey data set used for the analysis was the same as that in section 12 for the East Anglia TWO windfarm site.

166. A summer survey was undertaken which recorded marine traffic data via AIS and Radar collection, and AIS data for a winter period was recorded from a Met Mast to account for seasonal variations. It should be noted that due to the distance of the windfarm from shore, the marine traffic survey data collected within the East Anglia TWO windfarm site did not provide good coverage of the entirety of the offshore cable corridor. Therefore, the summer and winter survey data has been supplemented with AIS data collected from onshore receivers to ensure comprehensive coverage of the entire offshore cable corridor.

167. The survey periods are as follows:

- Summer 2017
  - 24th May to 31st May 2017; and
  - 14th to 19th June 2017.
- Winter 2017
  - 20th November to 3rd December 2017.

168. In total the marine traffic survey consists of 14 days AIS and Radar data and 14 days of AIS only data, giving a combined total of 28 days.

169. Plots of the vessel tracks recorded within the offshore cable corridor study area during the summer and winter periods are presented in *Figure 13.1* and *Figure 13.2*, respectively.

170. A number of tracks recorded during the summer and winter surveys were classified as temporary (non-routine), such as the tracks of survey vessels and a cable guard vessel. These have therefore been excluded from the analysis.

171. Marine traffic associated with the nearby Greater Gabbard Offshore Wind Farm and Galloper Offshore Wind Farm was also recorded during the summer and winter periods. These tracks consisted of traffic involved in the construction of the Galloper Offshore Wind Farm and the operation and maintenance of the Greater Gabbard

Offshore Wind Farm. These tracks have been excluded from the main analysis given that operational traffic would be reduced (noting that Greater Gabbard Offshore Wind Farm is understood to have required extended maintenance post construction), which may skew the analysis of regular traffic as it is difficult to define whether or not they are temporary tracks. However, given that the vessels recorded provide an indication of operational requirements (in particular likely vessel routeing from Great Yarmouth and Lowestoft), these vessels have still been considered within the routeing assessments in section 14 and section 15. Specific assessment of the Galloper Offshore Wind Farm and Greater Gabbard Offshore Wind Farm traffic is provided in section 13.4.

172. It should be noted that windfarm traffic transiting through the offshore cable corridor study area to other windfarms out with the study area has been retained within the analysis.

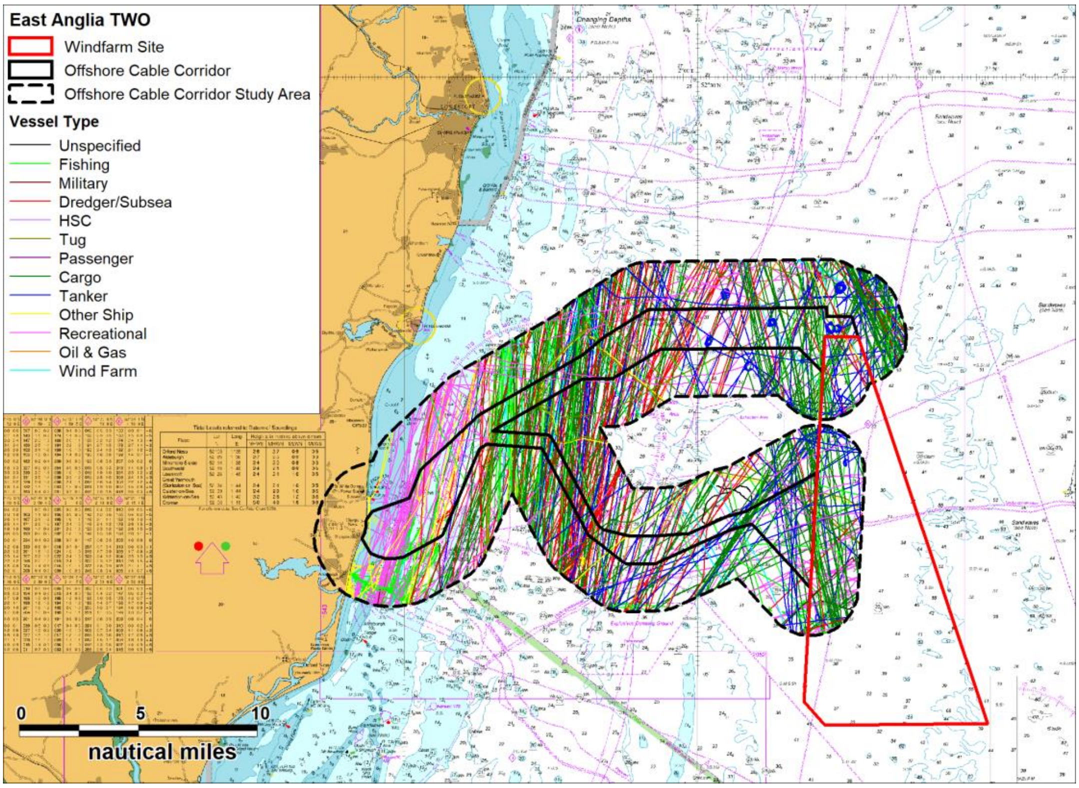



**Figure 13.1 Overview of AIS and Radar Data Excluding Temporary Tracks (14 Days Summer 2017)**

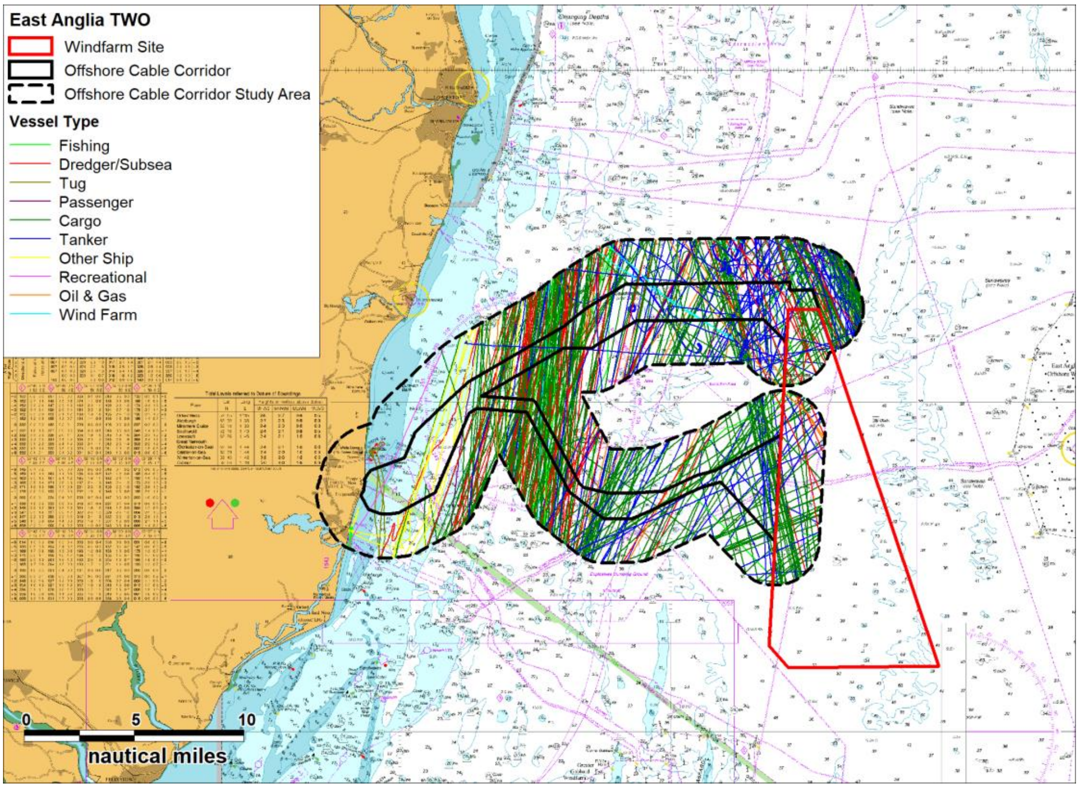
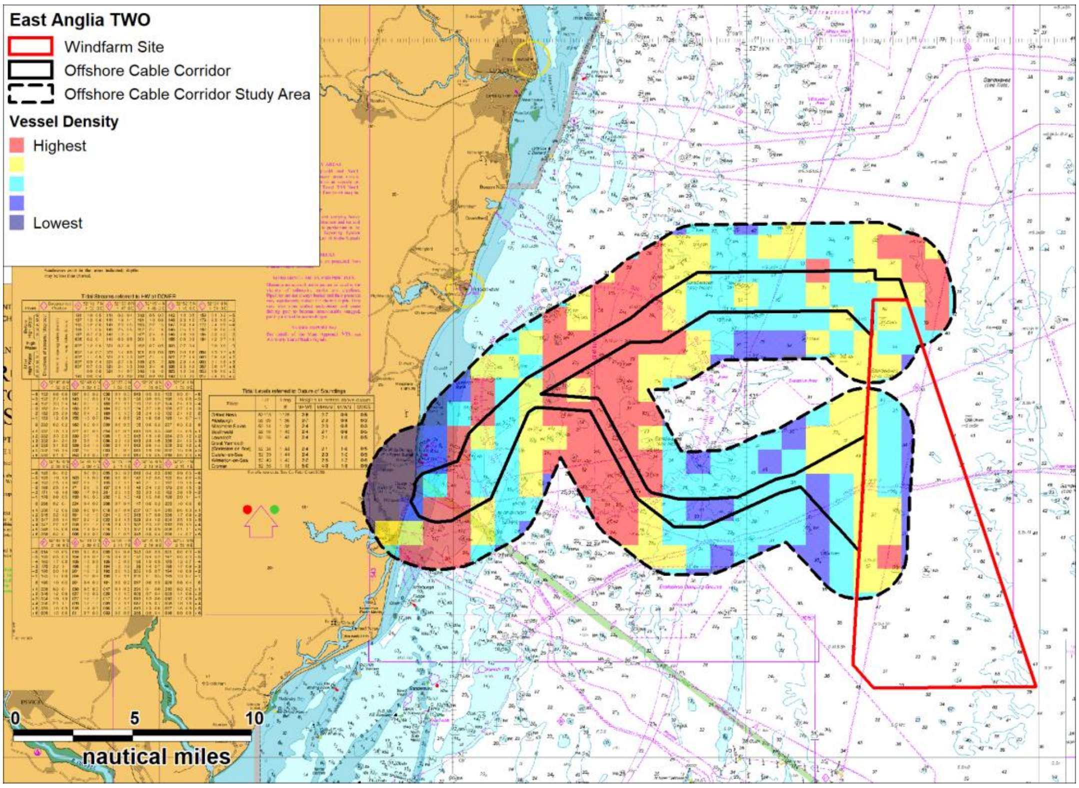



**Figure 13.2 Overview of AIS Data Excluding Temporary Tracks (14 Days Winter 2017)**

173. Corresponding vessel density figures for the summer and winter periods are presented in Figure 13.3 and Figure 13.4, respectively. To allow direct comparison between the summer and winter periods, the same density ranges have been used in both figures.




## Figure 13.3 Vessel Density from AIS and Radar within Offshore Cable Corridor Study Area (14 Days Summer 2017)

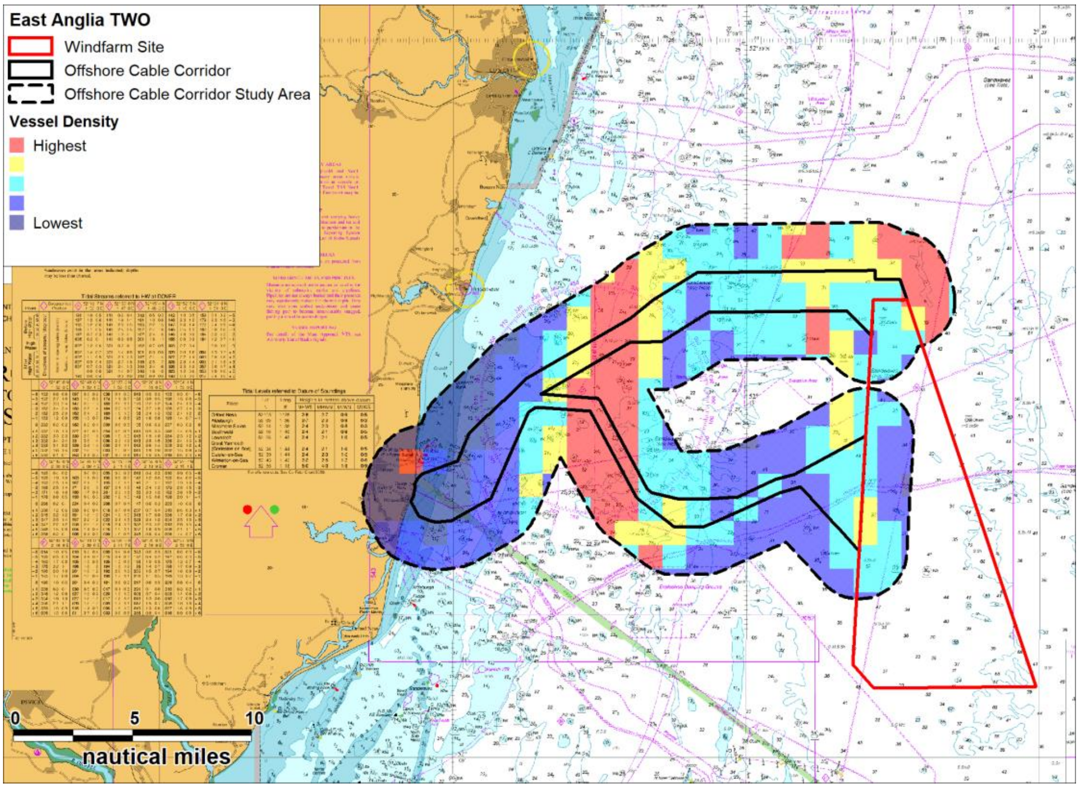



**Figure 13.4 Vessel Density from AIS within Offshore Cable Corridor Study Area (14 Days Winter 2017)**

174. During the summer and winter periods, the highest density areas were observed within the sea area where the offshore cable corridor branches into two. This was due to high numbers of cargo vessels and tankers recorded transiting northbound and southbound.

175. The vessel density within the offshore cable corridor was observed to be higher during summer than in winter. This was due to a higher number of recreational craft and fishing vessels recorded during the summer, particularly within the coastal area of the offshore cable corridor study area.

## 13.2 Summer Vessel Counts

176. For the 14 days analysed in summer 2017, there was an average of 43 unique vessels per day passing within the offshore cable corridor study area, recorded on AIS and Radar. In terms of vessels intersecting the offshore cable corridor, there was an average of 32 unique vessels per day.

177. *Figure 13.5* presents the daily number of unique vessels passing through the offshore cable corridor study area during summer 2017.

178. The busiest day recorded throughout the summer survey period was the 28th May 2017 when 66 unique vessels were recorded within the offshore cable corridor study area.

179. The quietest day recorded throughout the summer survey period was the 18th June 2017 when 32 unique vessels were recorded within the offshore cable corridor study area.

180. Throughout the summer survey period, 69% of traffic recorded within the offshore cable corridor study area intersected the offshore cable corridor.

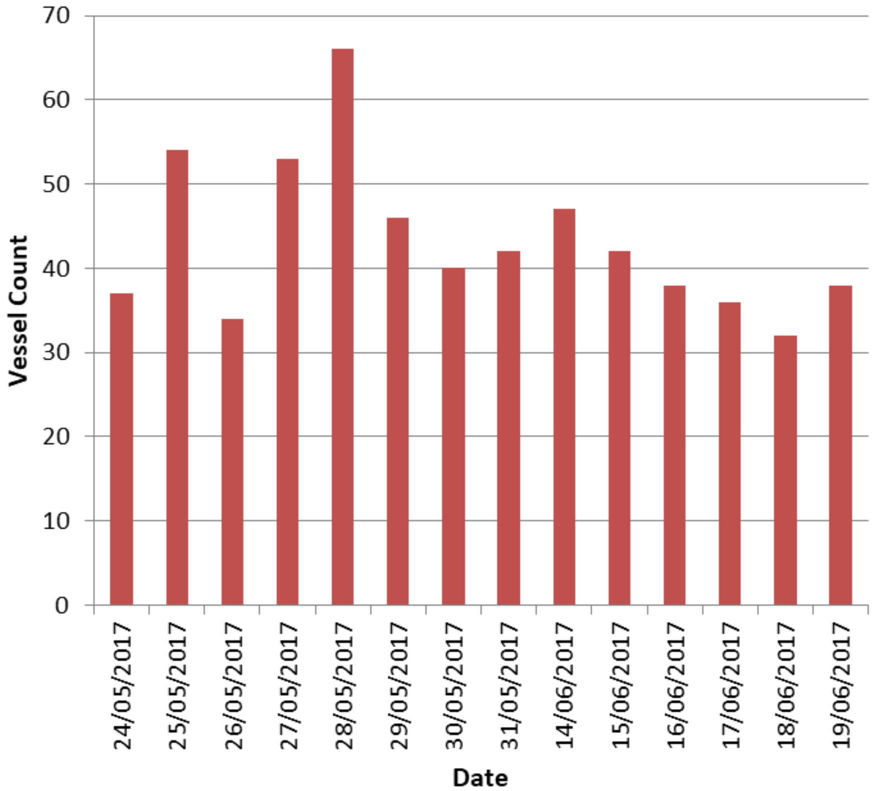



**Figure 13.5 Unique Vessels per Day from AIS and Radar within Offshore Cable Corridor Study Area (14 Days Summer 2017)**

## 13.3 Winter Vessel Counts

181. For the 14 days analysed in winter 2017, there was an average of 31 unique vessels per day passing within the offshore cable corridor study area, recorded on AIS. In terms of vessels intersecting the offshore cable corridor, there was an average of 23 unique vessels per day.

182. As reflected in Figure 13.4 the winter period for the offshore cable corridor was notably quieter when compared to the summer period. This was due to a higher

number of recreational craft and fishing vessels recorded during the summer, particularly within the coastal area of the offshore cable corridor study area.

183. *Figure 13.6* presents the daily number of unique vessels passing through the offshore cable corridor study area during winter 2017.

184. The busiest days recorded throughout the winter survey period were the 24th November 2017 and 25th November 2017 when 38 unique vessels were recorded within the offshore cable corridor study area.

185. The quietest day recorded throughout the winter survey period was the 29th November 2017 when 18 unique vessels were recorded within the offshore cable corridor study area.

186. Throughout the winter survey period, 63% of traffic recorded within the offshore cable corridor study area intersected the offshore cable corridor.

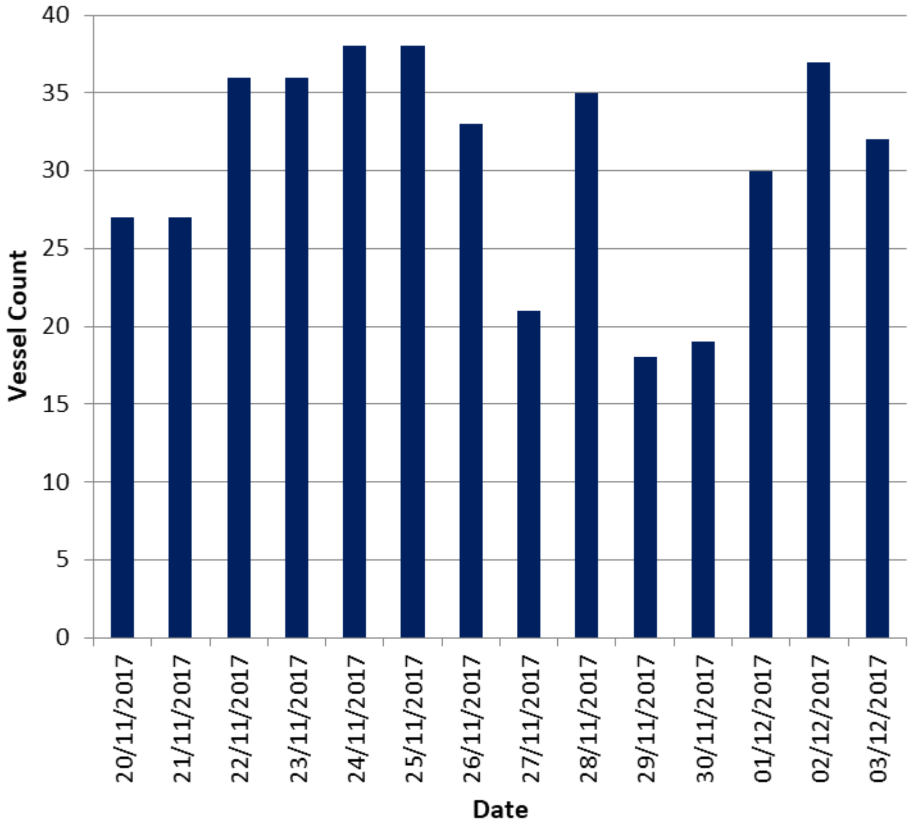



**Figure 13.6 Unique Vessels per Day from AIS within Offshore Cable Corridor Study Area (14 Days Summer 2017)**

## 13.4 Windfarm Vessel Activity

187. This section reviews the windfarm vessel activity associated with the construction of the nearby Galloper Offshore Wind Farm and operation and maintenance of the Greater Gabbard Offshore Wind Farm recorded during the summer and winter periods. As previously noted, these tracks have been excluded from the main analysis above given that operational traffic would be reduced (noting that Greater Gabbard Offshore Wind Farm is understood to have required extended maintenance post construction).

188. *Figure 13.7* presents a plot of temporary windfarm vessels recorded within the offshore cable corridor study area on AIS and Radar throughout both the summer and winter survey periods.

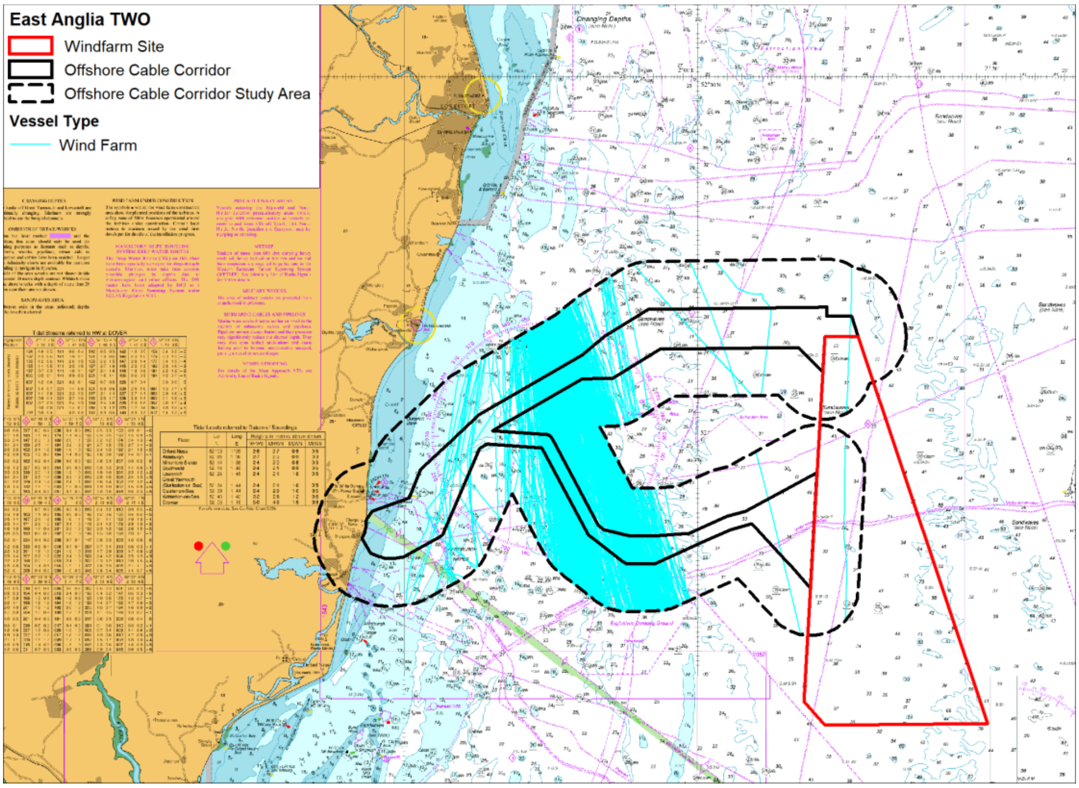



**Figure 13.7 AIS and Radar Windfarm Vessels within Offshore Cable Corridor Study Area (28 Days Summer and Winter 2017)**

189. Throughout the combined summer and winter survey period, an average of 14 unique windfarm vessels were recorded within the offshore cable corridor study area.

190. It can be seen that the windfarm vessels were recorded within the centre of the offshore cable corridor study area, transiting to and from the Greater Gabbard Offshore Wind Farm and Galloper Offshore Wind Farm.

## 13.5 Vessel Types

191. Analysis of the vessel types recorded passing within the offshore cable corridor study area and the offshore cable corridor throughout both survey periods are presented in *Figure 13.8*. The category of "other" vessels includes those that are not large enough in quantities to be categorised separately, such as survey vessels, a floating crane, a guard vessel, a dive vessel, a law enforcement vessel, a workboat, a barge vessel, a motorboat, a buoy-laying vessel, RNLI lifeboats, a buoy tender and a training vessel.

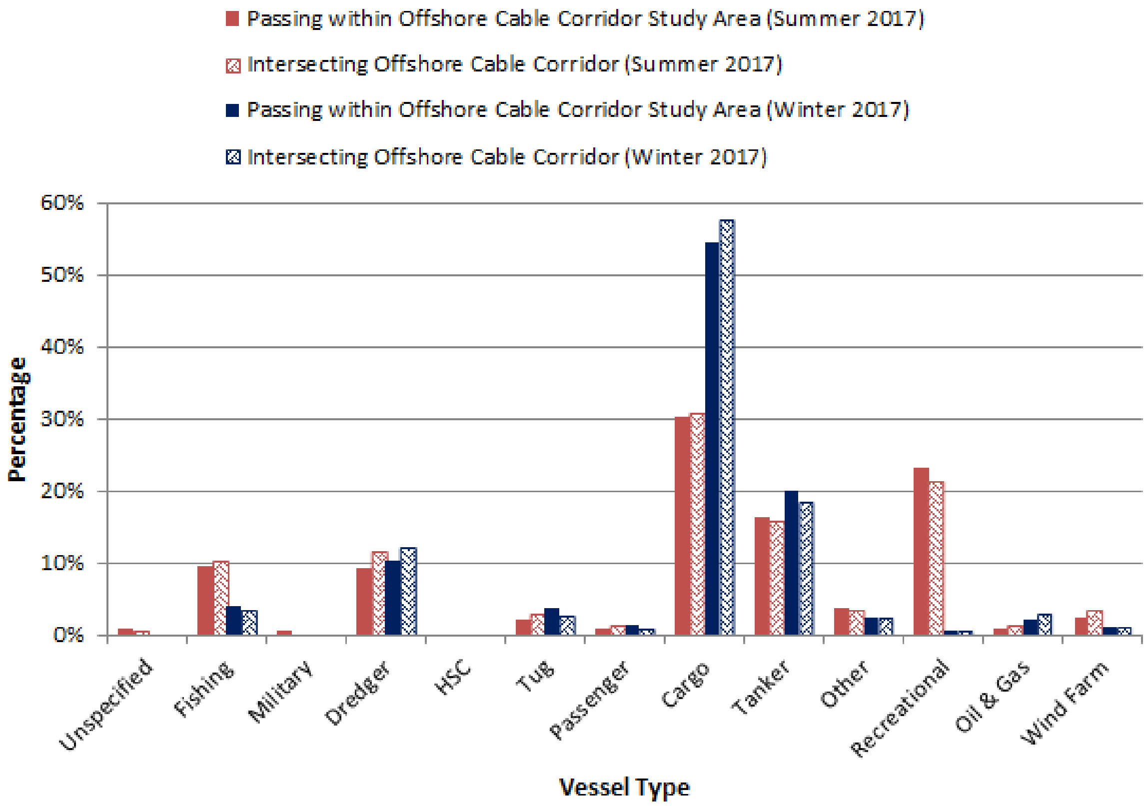



**Figure 13.8 Distribution of Vessel Types within Offshore Cable Corridor Study Area (28 Days Summer and Winter 2017)**

192. Throughout the summer period, the majority of tracks recorded on AIS and Radar were cargo vessels (30% in the offshore cable corridor study area) and recreational vessels (23%). Throughout the winter period the majority of tracks were cargo vessels (55% in the offshore cable corridor study area) and tankers (20%). It should be noted that the cargo vessel category includes Ro Ro cargo ferries (e.g. Stena Line) operating in the offshore cable corridor study area.

193. Approximately 1% of tracks recorded within the offshore cable corridor study area throughout the summer survey period were unspecified vessels. These consisted of Radar tracks from which vessel types could not be identified.

## 13.6 Cargo Vessels

194. Figure 13.9 presents a plot of cargo vessels recorded within the offshore cable corridor study area throughout the survey periods. It should be noted that commercial ferries (Ro Ro cargo) are included.

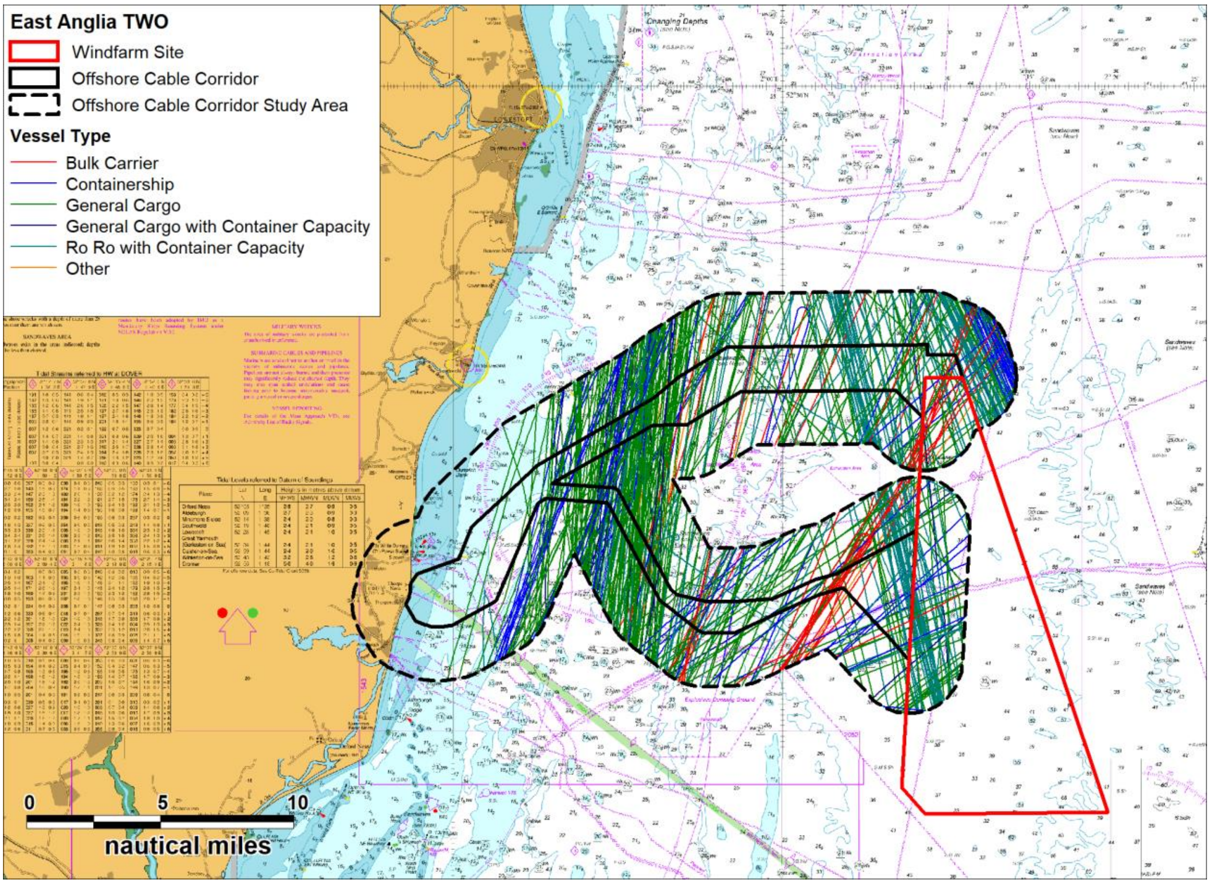



**Figure 13.9 AIS and Radar Cargo Vessels by Sub Type within the Offshore Cable Corridor Study Area (28 Days Summer and Winter 2017)**

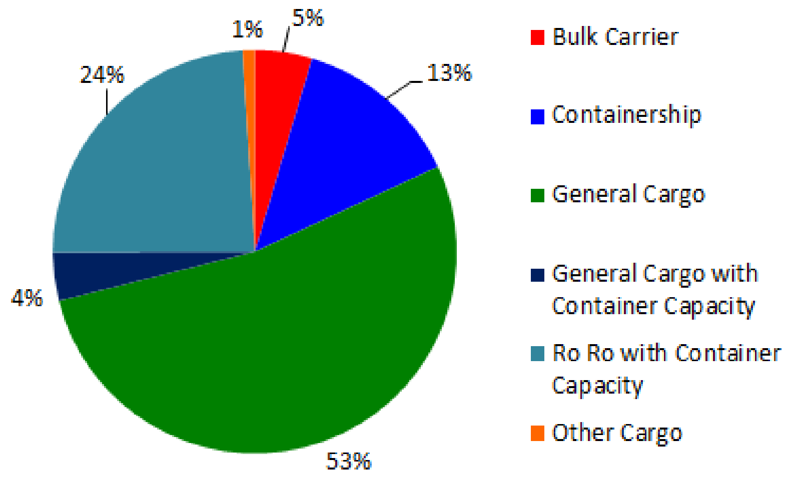



**Figure 13.10 Distribution of Main Cargo Vessel Subtypes**

195. Throughout the combined summer and winter survey period, an average of 15 unique cargo vessels per day passed within the offshore cable corridor study area.

## 13.7 Tankers

196. Figure 13.11 presents a plot of tankers recorded within the offshore cable corridor study area throughout the survey periods.

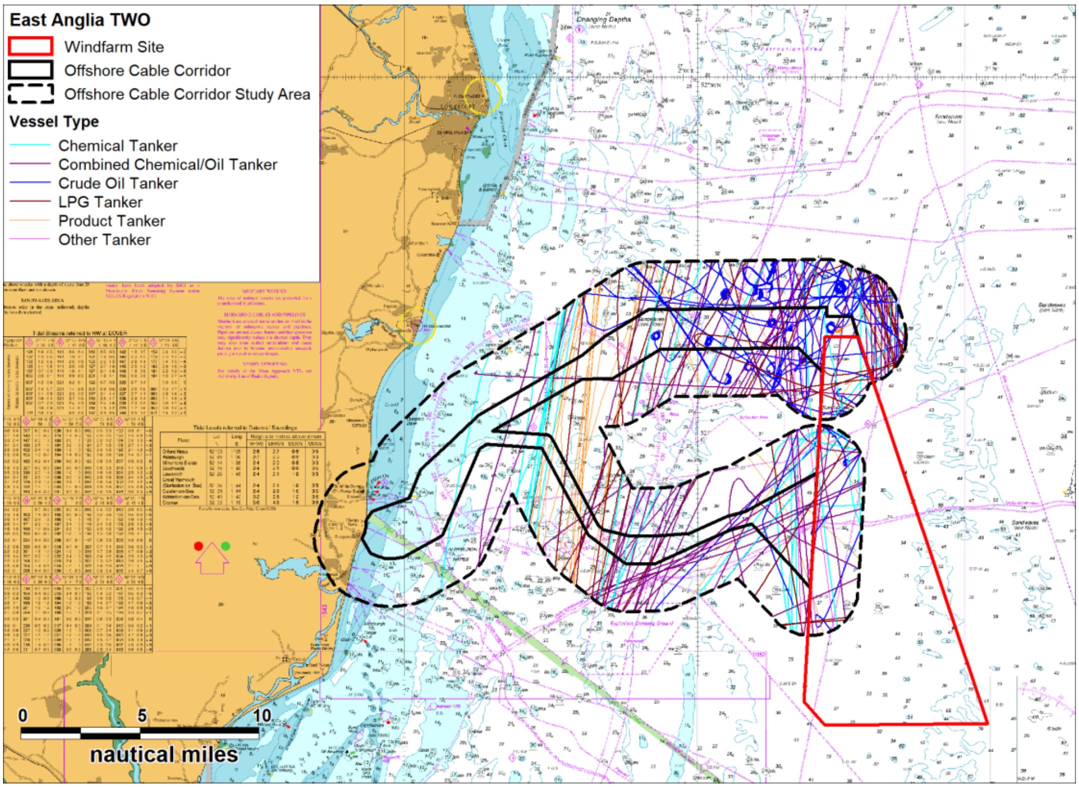
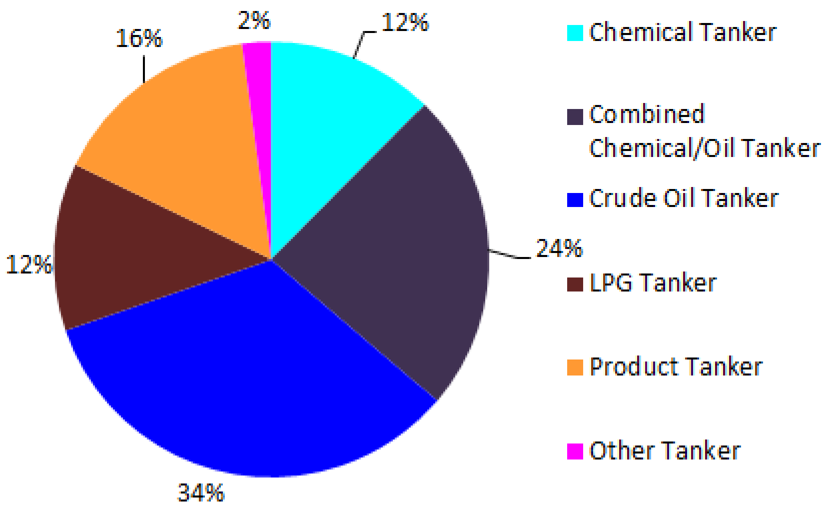



**Figure 13.11 AIS and Radar Tankers within the Offshore Cable Corridor Study Area (28 Days Summer and Winter 2017)**




197. Throughout the combined summer and winter survey period, an average of seven unique tankers per day passed within the offshore cable corridor study area.

198. Crude oil tankers (34%) were the most frequently recorded tanker type transiting through the offshore cable corridor study area, followed by combined chemical and oil tankers (24%) and product tankers (16%).

## 13.8 Oil and Gas Vessels

Figure 13.12 presents a plot of oil & gas associated vessels recorded within the offshore cable corridor study area throughout the survey periods.

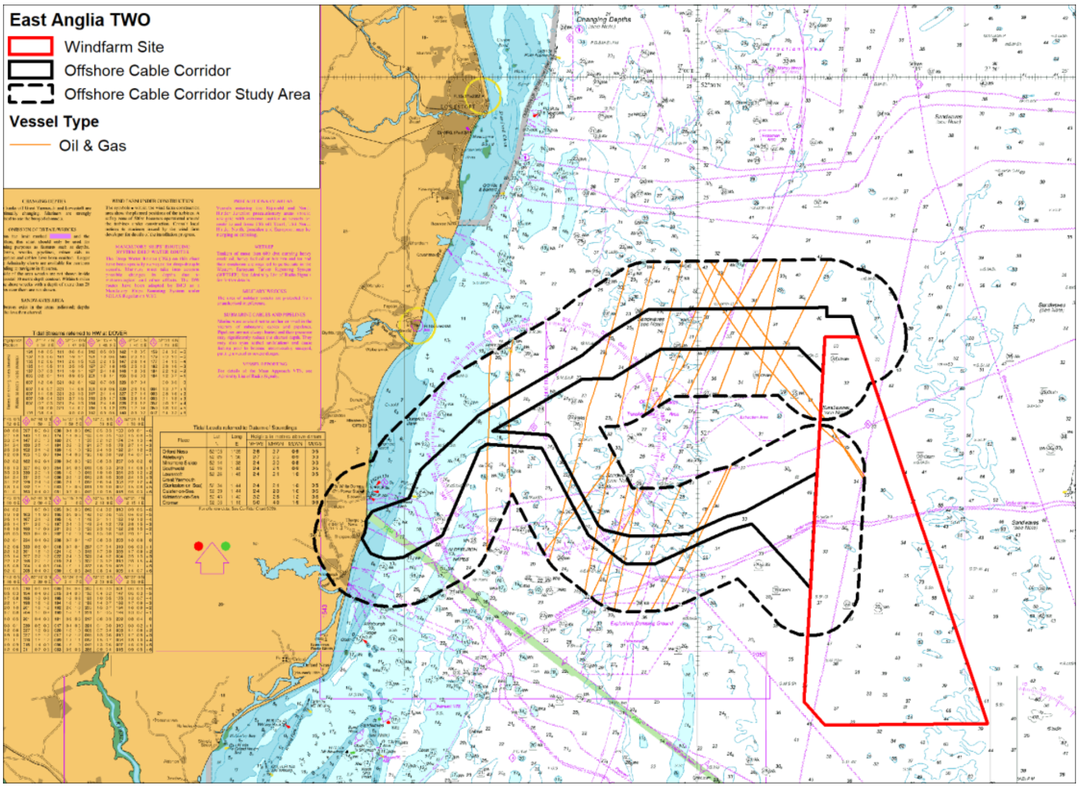



**Figure 13.12 AIS and Radar Oil & Gas Vessels within the Offshore Cable Corridor Study Area (28 Days Summer and Winter 2017)**

199. Throughout the combined summer and winter survey period, an average of one unique oil & gas vessel every three days passed within the offshore cable corridor study area.

## 13.9 Passenger Vessel Activity

200. *Figure 13.13* presents a plot of passenger vessels recorded within the offshore cable corridor study area on AIS and Radar throughout both the summer and winter survey periods.

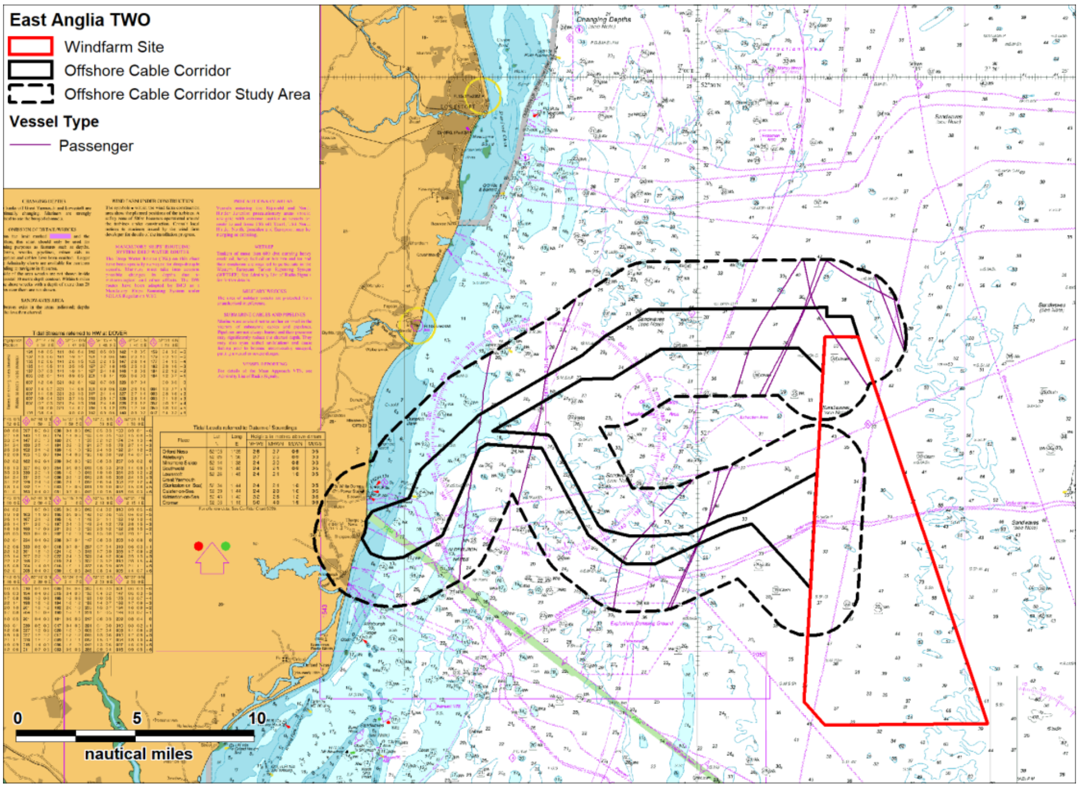



**Figure 13.13 AIS and Radar Passenger Vessels within the Offshore Cable Corridor Study Area (28 Days Summer and Winter 2017)**

201. It can be seen that occasional transits within the offshore cable corridor study area are made by passenger vessels.

202. An average of one unique passenger vessels every three days was recorded throughout the combined summer and winter survey periods.

## 13.10 Other Operational Vessels

203. Figure 13.4 presents a plot of other operational vessels recorded within the offshore cable corridor study area throughout the survey periods.

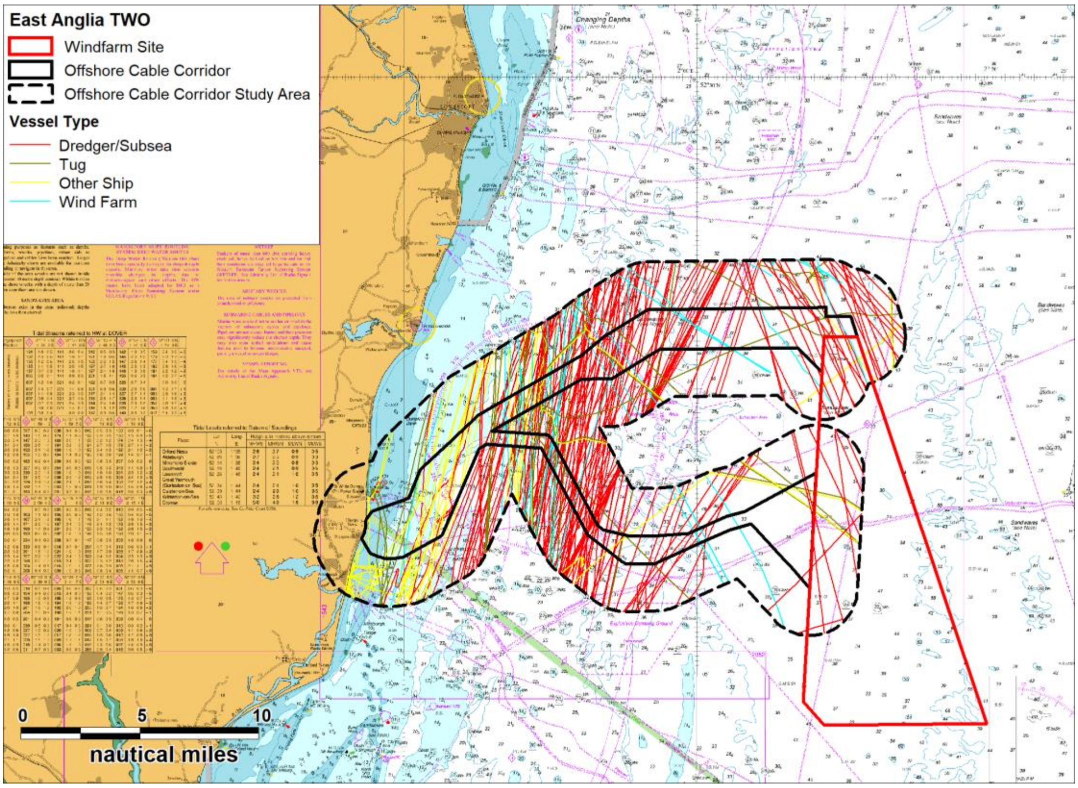



**Figure 13.14 AIS and Radar Other Operational Vessels within the Offshore Cable Corridor Study Area (28 Days Summer and Winter 2017)**

204. It can be seen that the majority of vessels transiting through the offshore cable corridor study area were dredgers (56%), with the majority of dredgers recorded transiting where the offshore cable corridor branches into two. Tugs (16%), "other" vessels (18%) and windfarm associated vessels (11%) were also recorded. As mentioned previously, "other" vessels includes those that are not large enough in quantities to be categorised separately, such as survey vessels, a floating crane, a guard vessel, a dive vessel, a law enforcement vessel, a workboat, a barge vessel, a motorboat, a buoy-laying vessel, RNLI lifeboats, a buoy tender and a training vessel.

## 13.11 Fishing Vessel Activity

205. Fishing vessel activity recorded within the offshore cable corridor study area during the AIS and Radar marine traffic surveys is presented in *Figure 13.15*.

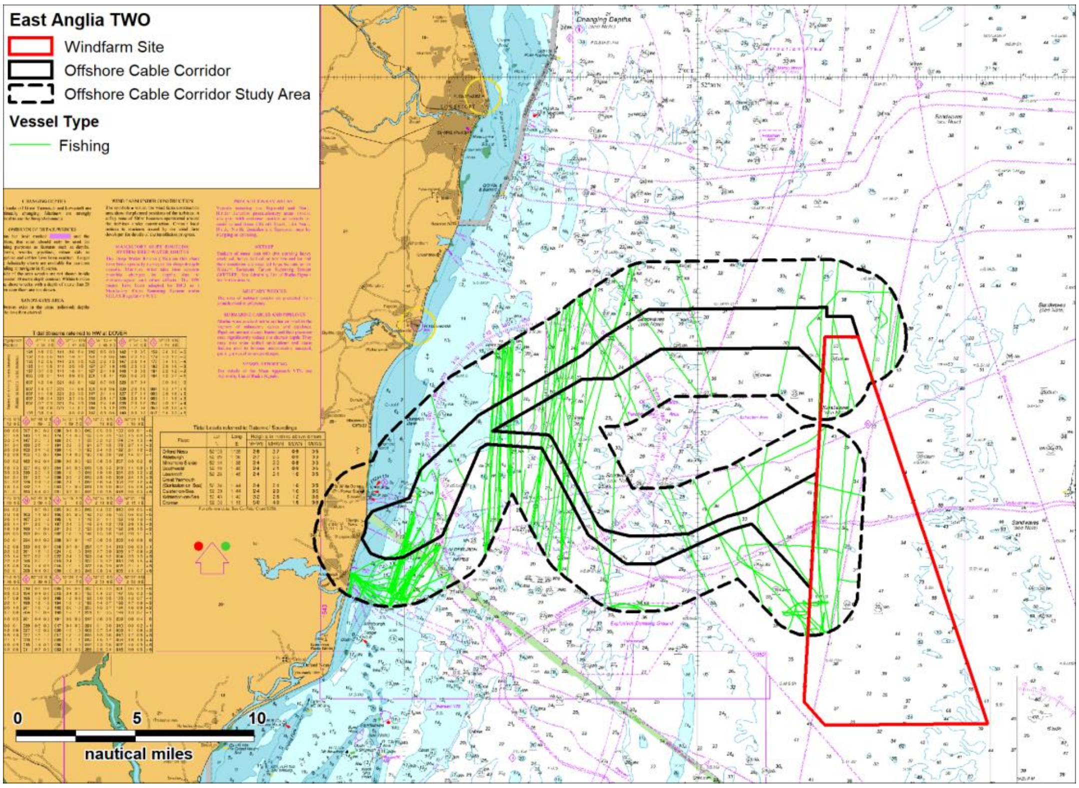



**Figure 13.15 AIS and Radar Fishing Vessels within the Offshore Cable Corridor Study Area (28 Days Summer and Winter 2017)**

206. Throughout the combined summer and winter survey periods, an average of three unique fishing vessels per day passed within the offshore cable corridor study area.

207. Flag state (nationality) information was available for 100% of fishing vessels recorded within the offshore cable corridor study area. Of the nationalities identified, the most common was UK (50%) followed by France (41%) and the Netherlands (9%).

208. Fishing method information was available for 100% of fishing vessels recorded within the offshore cable corridor study area. Of the fishing methods identified, the most common were demersal trawlers (59%) followed by set gillnets (anchored) (11%). Other fishing methods recorded included beam trawlers (8%), potter / whelkers (8%), Danish seines (5%), unspecified trawlers (3%), dredgers (3%), pair trawlers (3%) and pelagic trawlers (1%).

## 13.12 Recreational Vessel Activity

209. Recreational vessel activity recorded within the offshore cable corridor study area during the AIS and Radar marine traffic surveys is presented in *Figure 13.16*. As per Recreational Craft Regulations 2004 (Directive 2013/53/EU), sailing vessels and motor craft recorded as between 2.5 and 24m in length have been classed as recreational vessels.

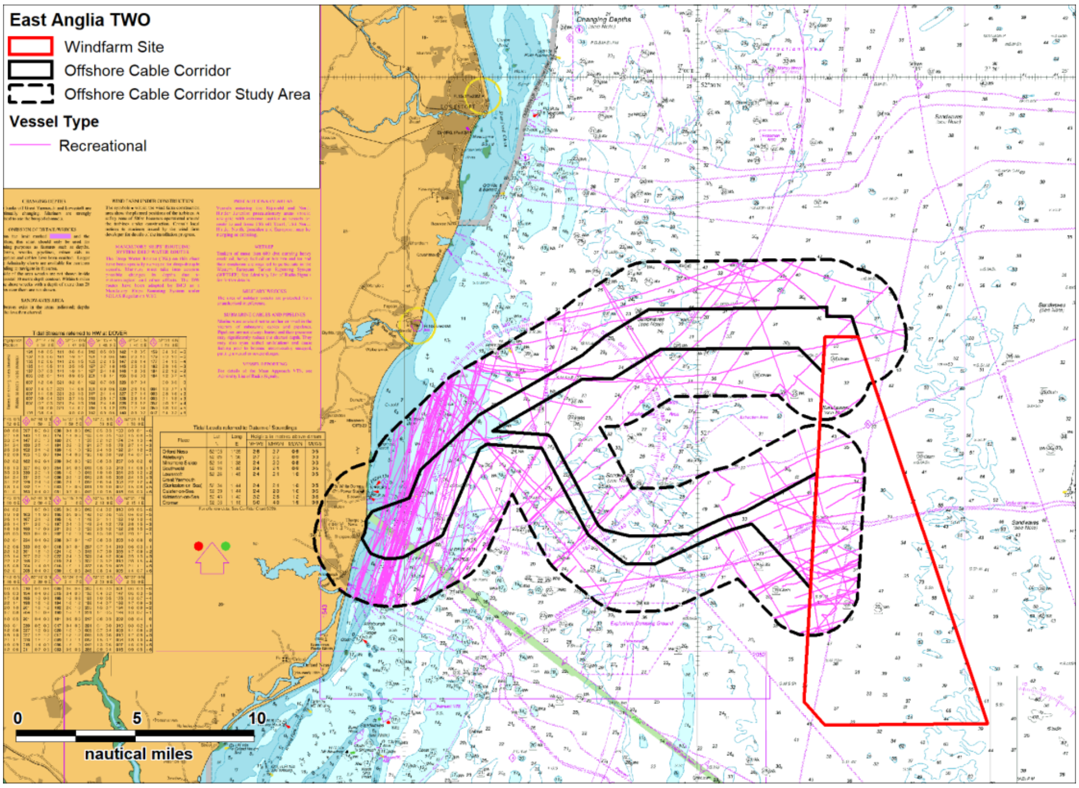


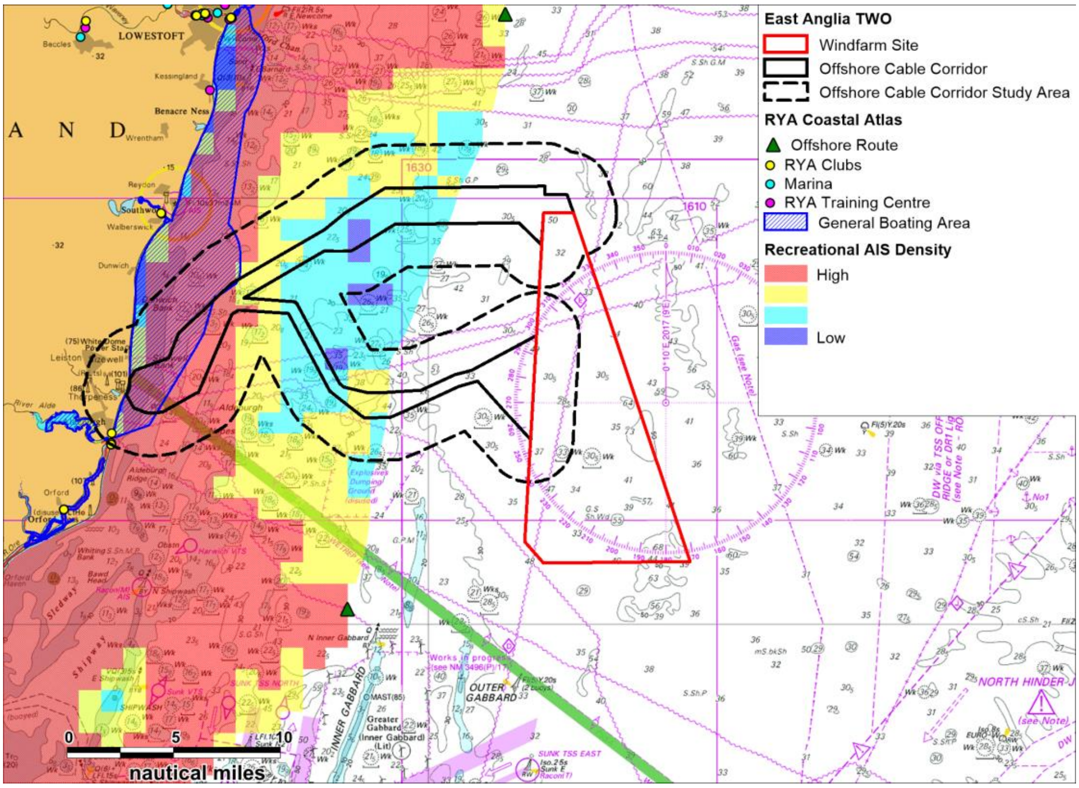

**Figure 13.16 AIS and Radar Recreational Vessels within the Offshore Cable Corridor Study Area (28 Days Summer and Winter 2017)**

210. Five unique recreational vessel transits per day were recorded within the offshore cable corridor study area during the summer period and a total of two unique vessels recorded during the entire winter period.

211. It should be noted that during the summer survey period, the Vuurschepen Race between Scheveningen and Harwich and the North Sea Race between Harwich and Scheveningen were held on the 27th May and 30th May 2017, respectively, therefore a higher number of recreational vessels are likely to have been recorded due to this event.

### 13.12.1 RYA Coastal Atlas

212. The RYA Coastal Atlas (RYA 2016) is presented relative to the offshore cable corridor in Figure 13.17. This includes a recreational density grid up to the 12nm UK territorial limit and the locations of clubs, training centres and marinas. To illustrate offshore routeing, the coastal atlas also provides offshore route indicators showing typical recreational routes.




### Figure 13.17 RYA Coastal Atlas (2016)

Higher recreational density was observed to be largely coastal, with the landfall area categorised as medium to high intensity. No route indicators were observed within the offshore cable corridor study area.

## 13.13 Anchoring

213. This section presents analysis of the anchoring activity in the vicinity of the offshore cable corridor study area. *Figure 13.18* presents a plot of the anchored vessels recorded during the combined summer and winter survey periods.

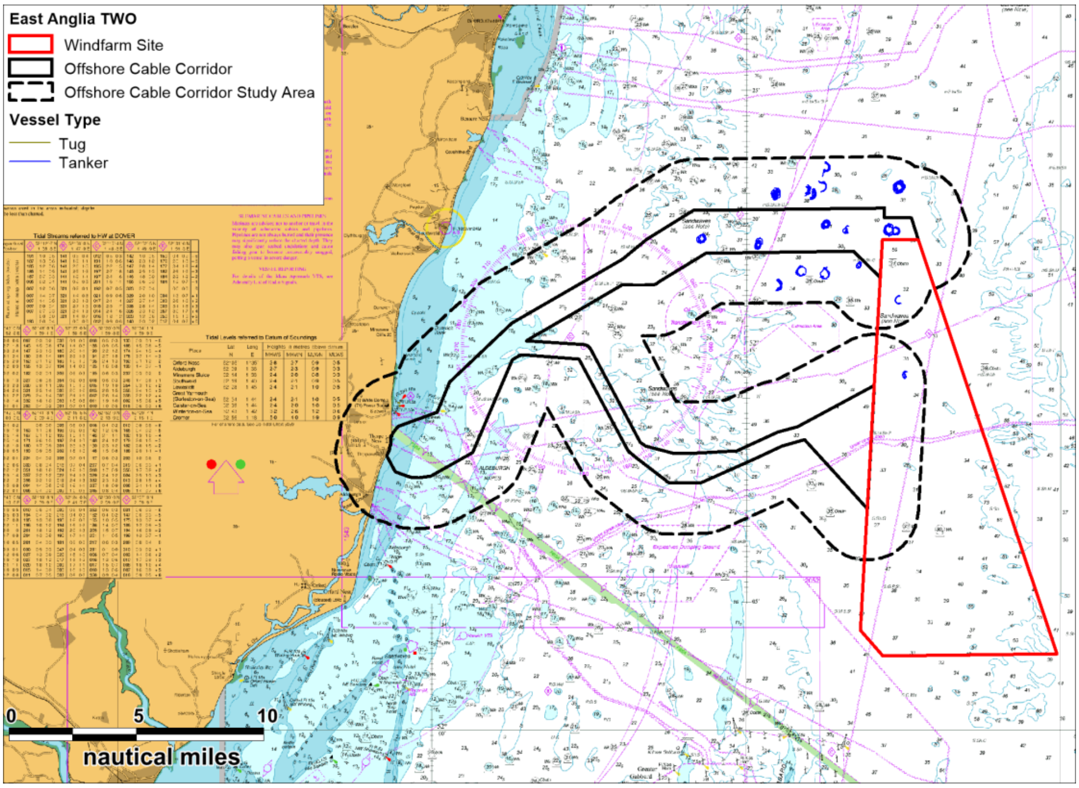



**Figure 13.18 AIS and Radar Anchored Vessels within the Offshore Cable Corridor Study Area (28 Days Summer and Winter 2017)**

214. A total of 17 unique tankers and one tug were recorded at anchor during the combined summer and winter survey periods. Seven tankers and one tug were recorded anchoring within the offshore cable corridor. There is a designated area of the UK territorial sea off the coast of Southwold where STS transfers are permitted therefore the anchored tankers within the offshore cable corridor study area are likely to be anchored in preparation for a STS transfer with another tanker (see section 12.7).

# 14 Base Case Routeing Analysis (Pre Windfarm)

## 14.1 Introduction

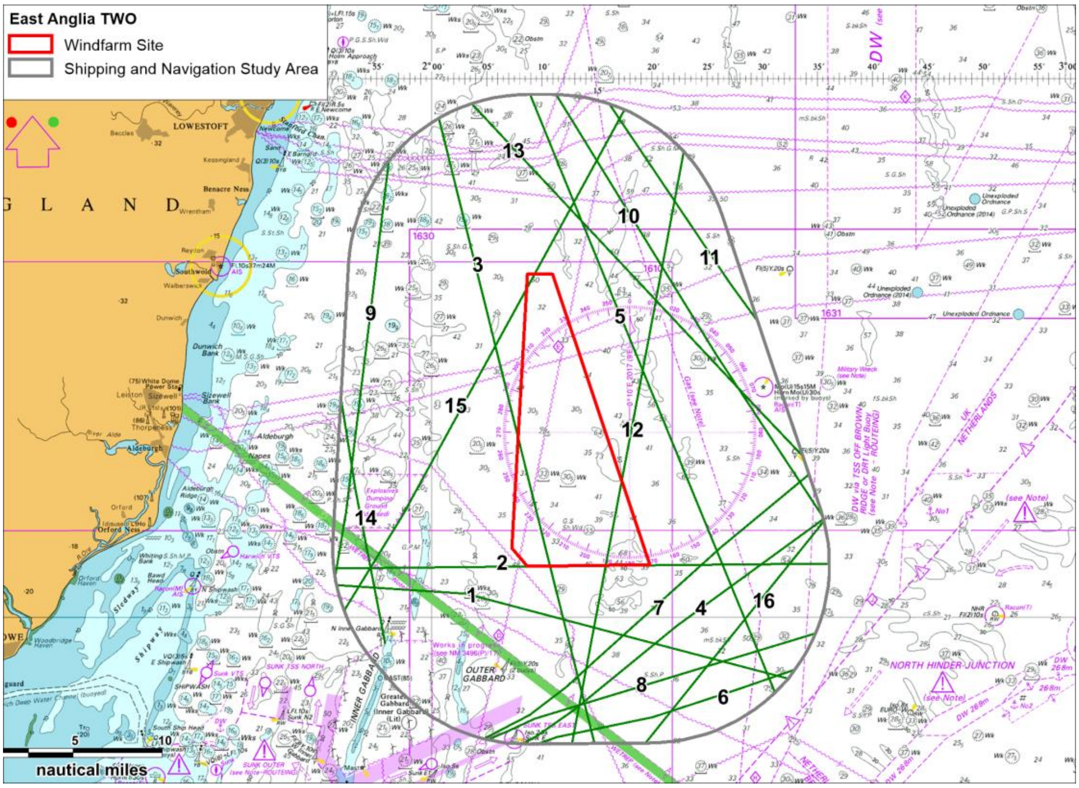
215. The marine traffic survey data shown in section 12 was used to identify the main vessel routes within 10nm of the East Anglia TWO windfarm site. The information transmitted via AIS and Radar was used to estimate the types and sizes of vessels using each route, and the origin / terminus ports. Anatec's internal UK-wide route database and the charted IMO Routeing measures were then used to validate the findings, and to extend the routes beyond the 10nm threshold of the AIS and Radar data.

216. In addition, to being the basis for the 90th percentile analysis provided below, the final routes were also used as input to the collision and allision risk modelling for the offshore development area, as summarised in section 16.

## 14.2 Main Routes

217. The main routes identified are presented in *Figure 14.1*, with a summary of each route then presented in *Table 14.1*. It is noted that the origin and destination ports for each route shown represent the most common destinations transmitted via AIS and Radar by vessels using those routes within the shipping and navigation study area. Actual destinations and origin ports may vary per route.

218. It should be noted that the Rosyth to Zeebrugge route operated by the Finlandia Seaways was recorded during the marine traffic surveys however this route ceased operations in spring of 2018 therefore this route has been removed from the routeing analysis.




## Figure 14.1 Base Case Vessel Routeing

## Table 14.1 Main Routes

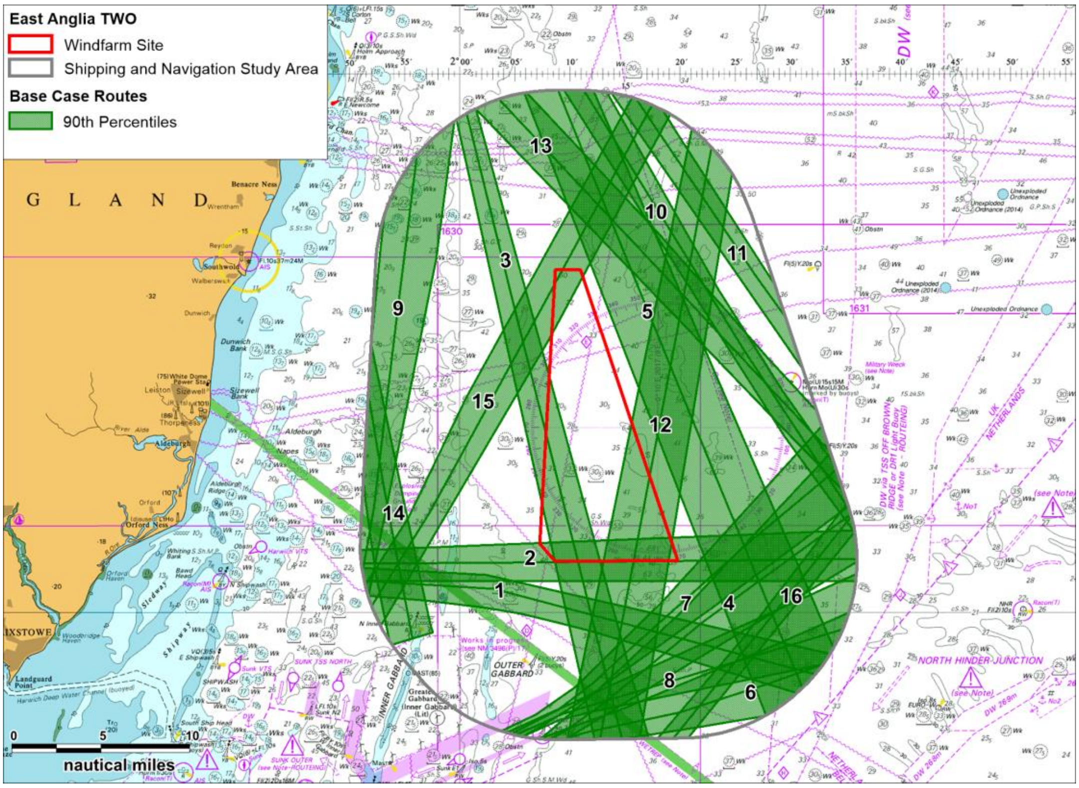
| Route Number | Main Destination and Origin Ports | Average Vessels per Day | Main Vessel Types | Description |
|---|---|---|---|---|
| 1 | Harwich and Felixstowe – Hook of Holland | 5 | Commercial Ferry | Traffic transiting east and south-east between Harwich and Felixstowe and the Hook of Holland. |
| 2 | Hook of Holland – Harwich and Felixstowe | 7 | Commercial Ferry | Traffic transiting west between the Hook of Holland and Harwich and Felixstowe. |
| 3 | Zeebrugge – Humber | 2 | Cargo and Commercial Ferry | Traffic transiting both northbound and southbound between Zeebrugge and the Humber. |
| 4 | Thames – East Europe Ports | 1 | Cargo and Tanker | Traffic transiting north-east between |

| Route Number | Main Destination and Origin Ports | Average Vessels per Day | Main Vessel Types | Description |
|---|---|---|---|---|
| | | | | ports within the Thames and east Europe ports. Uses the Sunk TSS. |
| 5 | Zeebrugge and Flushing – Main UK East Coast | 10 | Cargo, Commercial Ferry and Tanker | Traffic transiting both northbound and southbound between Zeebrugge and Flushing and ports along the main UK east coast. |
| 6 | Sunk – Germany and Netherlands | 2 | Cargo | Traffic transiting north-east between the Sunk TSS and the Germany and Netherlands. |
| 7 | East Europe Ports – Thames | 1 | Cargo and Tanker | Traffic transiting south-east between east Europe ports and ports within the Thames. Uses the Sunk TSS. |
| 8 | Germany and Netherlands – Sunk | 2 | Cargo | Traffic transiting south-east between the Germany and Netherlands and the Sunk TSS. |
| 9 | Humber – Sunk | 3 | Cargo, Dredger and Tanker | Inshore route with traffic transiting both northbound and southbound between the Humber and the Sunk TSS. |
| 10 | Humber – Netherlands and Antwerp | 1 | Cargo and Tanker | Traffic transiting both north-west and south-east between the Humber and the Netherlands and |
| 11 | Humber – Netherlands and Antwerp | 1 | Cargo and Tanker | |

| Route Number | Main Destination and Origin Ports | Average Vessels per Day | Main Vessel Types | Description |
|---|---|---|---|---|
| | | | | Antwerp. Split into two separate routes due to deviation around Racon. |
| 12 | Newcastle upon Tyne – Dover Strait | 1 | Cargo, Commercial Ferry and Tanker | Traffic transiting northbound and southbound between Newcastle upon Tyne and the Dover Strait. |
| 13 | Hull – Antwerp | 1 | Cargo and Dredger | Traffic transiting north-west and south-east between Hull and Antwerp. |
| 14 | Lowestoft – Greater Gabbard Offshore Wind Farm | 6 | Windfarm Support | Northbound and southbound windfarm support traffic associated with the operational Greater Gabbard Offshore Wind Farm. |
| 15 | Thames – Norway and Sweden | 1 | Cargo and Tanker | Traffic transiting north-east and south-west between ports within the Thames and Norway and Sweden. |
| 16 | Thames – Scandinavian Ports | 1 | Cargo and Tanker | Traffic transiting north-east and south-west between ports within the Thames and Scandinavian ports. |

## 14.3 Main Route 90th Percentiles

219. The AIS and Radar data was used to estimate the 90th percentiles within the study area surrounding the East Anglia TWO windfarm site (as per the requirements of MGN 543 (MCA 2016)). The 90th percentiles are presented in *Figure 14.2*.




## Figure 14.2 Base Case Routeing 90th Percentiles

# 15 Post Windfarm Routeing Analysis

## 15.1 Introduction

220. This section assesses the potential impacts of the East Anglia TWO windfarm site on each of the main routes identified in section 14. For each route which may deviate, the worst case from a modelling perspective has been presented both when considering East Anglia TWO windfarm site in isolation and cumulatively with other offshore windfarm developments scoped into the cumulative assessment.

221. Based on the marine traffic presented in section 12, it is considered that five main routes could be potentially affected by the East Anglia TWO windfarm site. These four routes are presented in *Figure 15.1* and described in more detail below. The cumulative impact of East Anglia TWO windfarm site with other offshore windfarm developments on vessel routeing has been assessed in section 19.

222. It should be noted that any base case routes which do not intersect the East Anglia TWO windfarm site but are recorded as intersecting the East Anglia ONE windfarm site (located to the east of the East Anglia TWO windfarm site) have not been deviated as the focus of the post windfarm routeing analysis is the East Anglia TWO windfarm site.

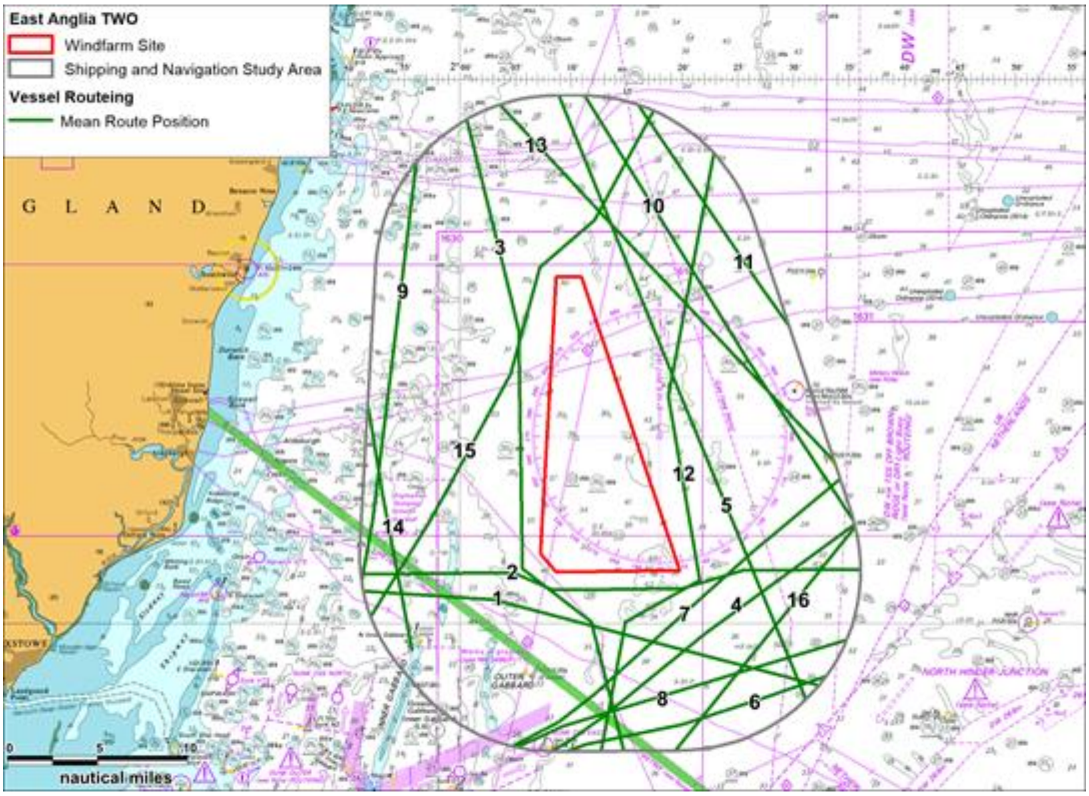



**Figure 15.1 Main Routes – Showing Post Windfarm Worst Case Deviations**

## 15.2 Individual Worst Case Route Deviations

223. The deviations shown in the following sections are worst case whereby a vessel leaves and returns to its original course as soon as possible. These deviations are shown to demonstrate the worst case increase in time and distance, however in reality vessels are likely to passage plan so as to deviate sooner from their existing course and thus reducing time and distance changes.

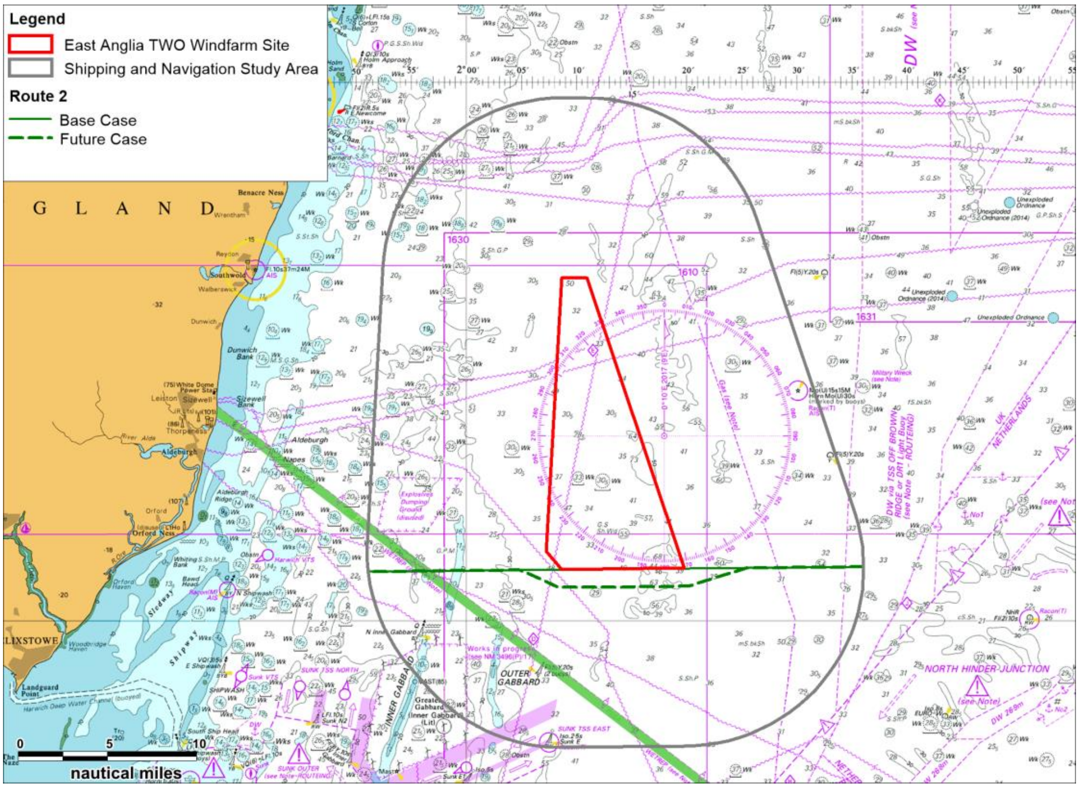
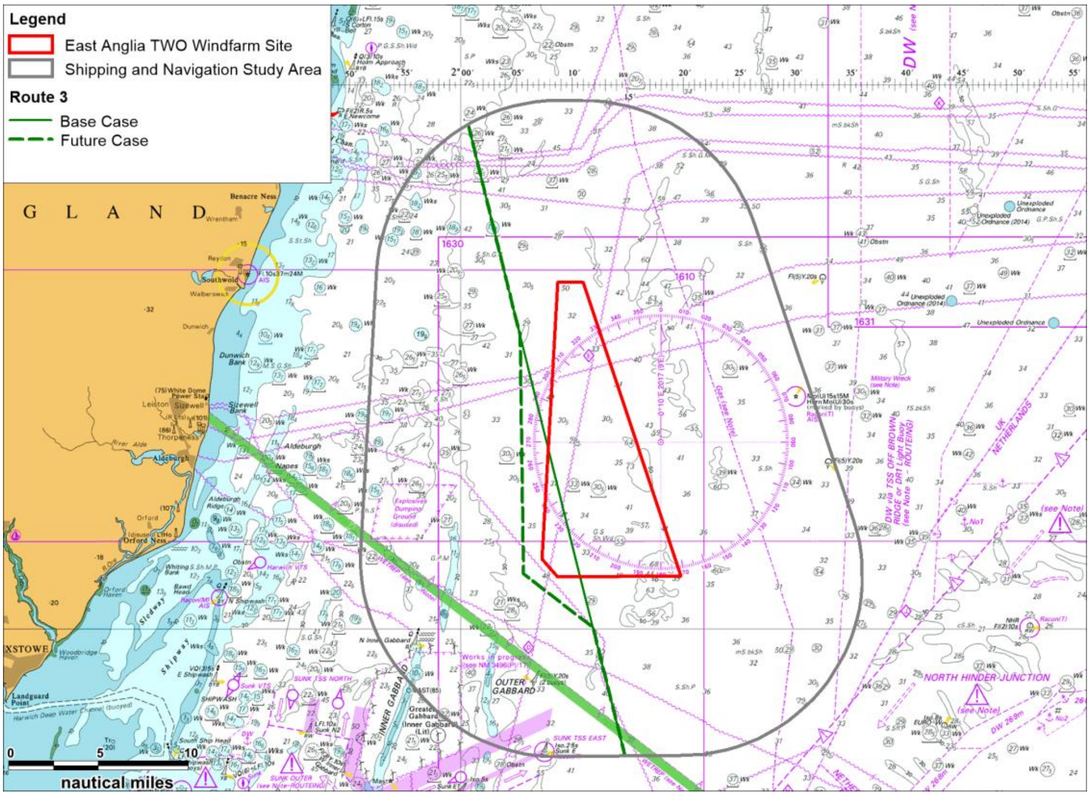
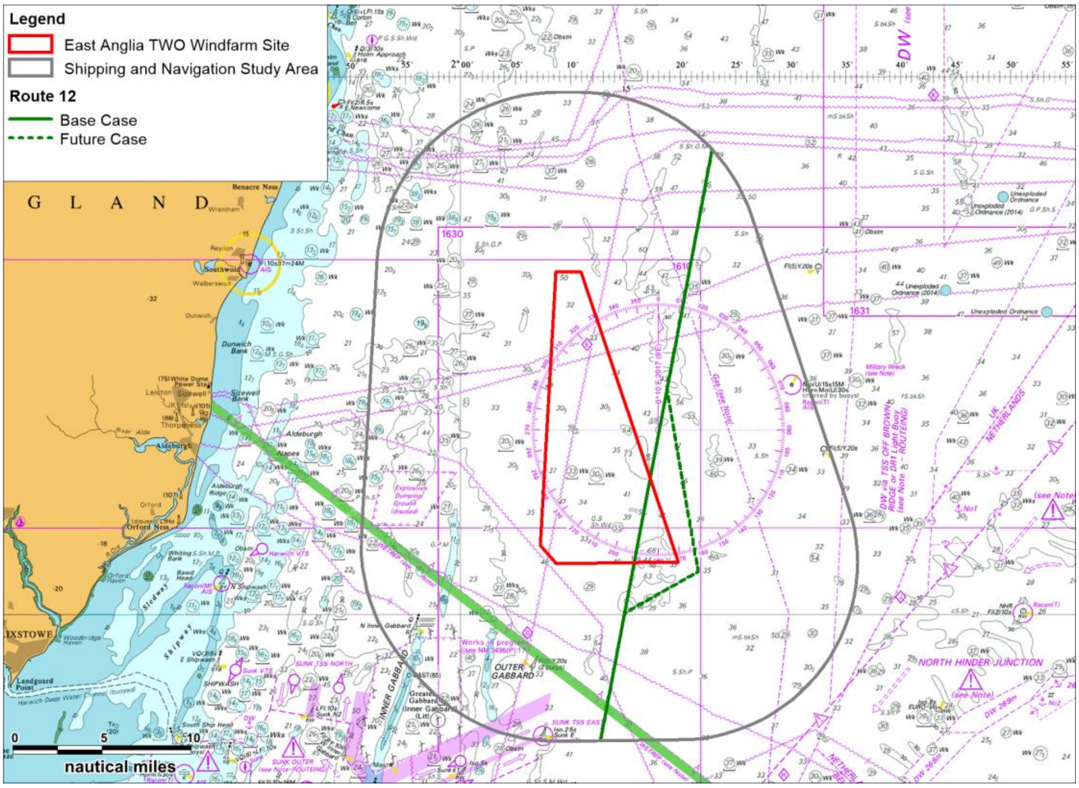



**Figure 15.2 Route 2 Deviation**




## Figure 15.3 Route 3 Deviation




## Figure 15.4 Route 12 Deviation

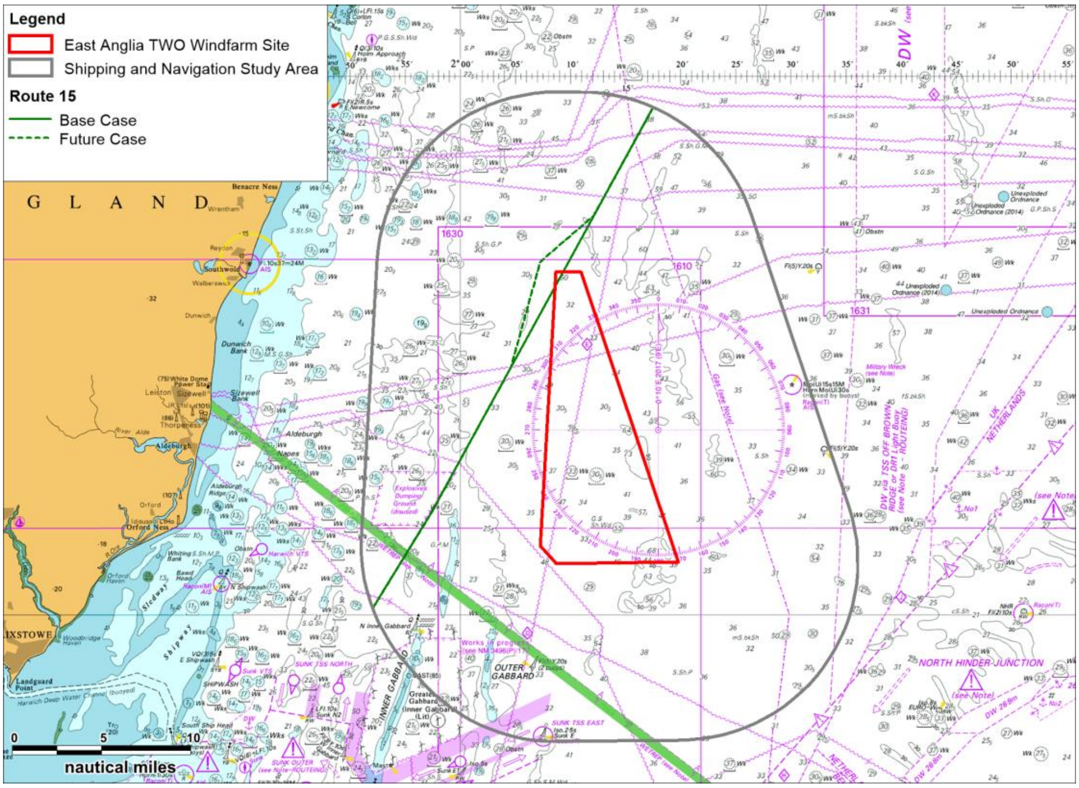
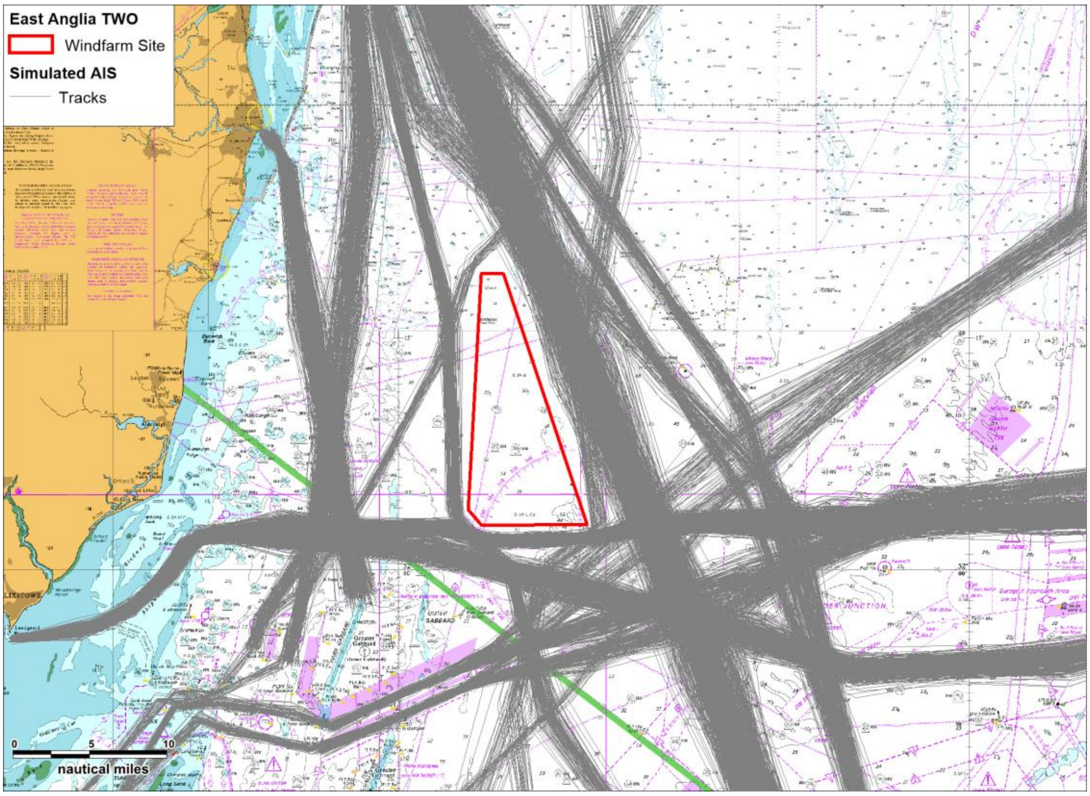



**Figure 15.5 Route 15 Deviation**

224. Based on the baseline routeing through the East Anglia TWO windfarm site and deviations identified around the site, Anatec's AIS track simulation program has been used to illustrate what the re-routed traffic would look like post development. This is presented in *Figure 15.6*.

## 15.3 Simulated AIS – Future Case

225. To illustrate the anticipated vessel activity from regular routed traffic, the deviated routes presented in *Figure 15.1* were used as input to Anatec's AIS simulator. This program creates randomised AIS tracks on each input route, based on the mean route positions, standard deviations, and vessel numbers. The results for a 28 day period are presented in *Figure 15.6*. It is noted that deviations are presented as realistic worst case and in reality vessels would distance themselves appropriately from the East Anglia TWO windfarm site, in line with MGN 543 (MCA, 2016), depending on weather (notably visibility) and sea state.




## Figure 15.6 Simulated AIS Post Windfarm (28 Day Period)

# 16 Collision and Allision Risk Modelling Overview

## 16.1 Introduction

226. The following sections provide quantitative assessment of the major hazards associated with the development of the offshore development area. This is divided into a base case and a future case assessment with and without the development and includes major hazards associated with:

- Increased vessel to vessel collision risk;
- Additional vessel to structure allision risk;
- Additional fishing vessel to structure allision risk;
- Additional risk associated with vessels NUC.

227. The base case assessment used the marine traffic survey data in combination with the consultation responses and other baseline data sources to estimate the current encounter probability, and vessel to vessel collision risk. Conservative assumptions of shipping level increases and route deviations were then made to model future case results.

228. A pre windfarm assessment is provided in section 17, with the post windfarm scenario then assessed in section 18.

## 16.2 Potential Traffic Increases (Future Case)

229. There is the potential for traffic levels to increase during the lifespan of the East Anglia TWO windfarm site, which may lead to increases in allision and collision risk within the area. Accurate forecasts of traffic increases are difficult, as a large number of variables require consideration. For this reason, an indicative increase of 10% for all vessel types has been assessed within this NRA, in addition to an assessment of risk should traffic levels remain constant. This increase is in line with the assessments undertaken for other UK offshore windfarms, including East Anglia ONE Offshore Windfarm and Norfolk Vanguard Offshore Windfarm and therefore ensures a consistent approach with existing assessments. It is noted that this value relates to the number of vessels, rather than increases in overall tonnage.

230. The increase was implemented by increasing the total vessel numbers per route shown in *Table 14.1* by 10%, whilst maintaining the breakdowns by vessel type and size. The updated vessel numbers were then rounded to the nearest whole number.

## 16.3 Modelled Layout and Structure Dimensions

231. The worst case indicative layout which has been used as input to the modelling process is presented in *Figure 4.2* (section 4.3). The wind turbine, offshore substation and construction, operation and maintenance platform dimensions which have been modelled are presented in *Table 16.1*.

232. The orientation modelled consisted of the flat side facing into the predominant wind direction (240°).

### Table 16.1 Modelled Dimensions

| Structure | Shape | Dimensions |
|---|---|---|
| Wind Turbine | Square | 55.5m x 55.5m |
| Offshore Substation | Rectangle | 50m x 70m |
| Construction, Operation and Maintenance Platform | Rectangle | 50m x 70m |

# 17 East Anglia TWO Windfarm Site in Isolation Assessment – Base Case

## 17.1 Encounters

### 17.1.1 Introduction

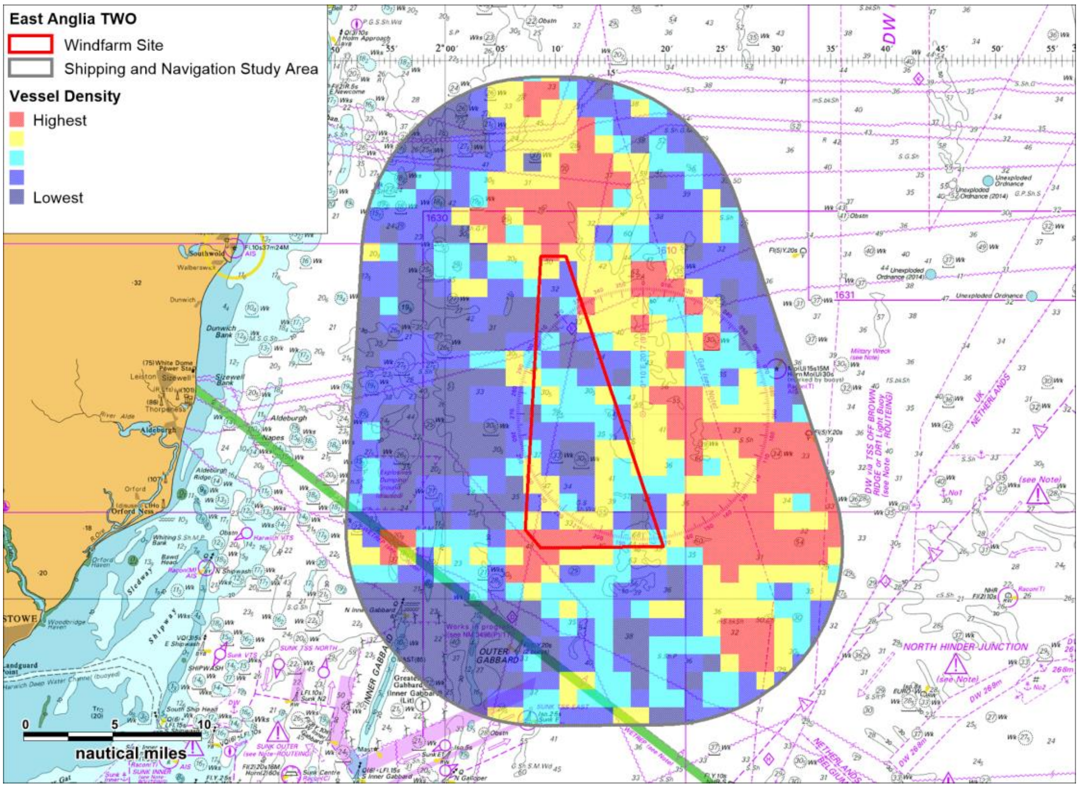
233. An assessment of current vessel to vessel encounters has been carried out by replaying at high speed the AIS and Radar data collected for the East Anglia TWO windfarm site. An encounter distance of 1nm has been considered, i.e. two vessels passing within 1nm of each other has been classed as an encounter. This helps to illustrate where existing shipping congestion is highest and therefore where offshore developments, such as windfarms, could potentially increase congestion and therefore also increase the risk of encounters and / or collisions.

234. It is noted that as not all vessels recorded by radar during the marine traffic surveys could be identified, there were instances of there being doubt as to if an identified encounter was actually a vessel encountering itself. Cases where an encounter was clearly false have been removed; however cases which could not be confirmed as false have been included in the following analysis.

235. It is also noted that encounters involving recreational vessels partaking in the Vuurschepen yacht race and / or the North Sea yacht race have been excluded from the encounters analysis as this racing activity likely inflated recreational transits above typical levels, with vessels transiting to the start point in the days preceding the event, and running the course on the day of the race itself.

### 17.1.2 Encounters Overview

236. The vessel density from the tracks of the encounters identified within 10nm of the East Anglia TWO windfarm is presented in *Figure 17.1*. It is noted that both single points and tracks were produced for encounters.




## Figure 17.1 Vessel Encounters relative to 1x1nm Grid

237. The majority of encounters occurred to the east and north of the East Anglia TWO windfarm site. In comparison there were relatively few encounters within the west and south-west of the shipping and navigation study area. Within the East Anglia TWO windfarm site, the majority of encounters occurred to the south. The 'hotspots' for encounters correspond with areas where the base case main routes intersect (see *Figure 14.1*).

### 17.1.3 Daily Counts

238. The number of encounters recorded during the combined summer and winter survey periods is presented in *Figure 17.2*.

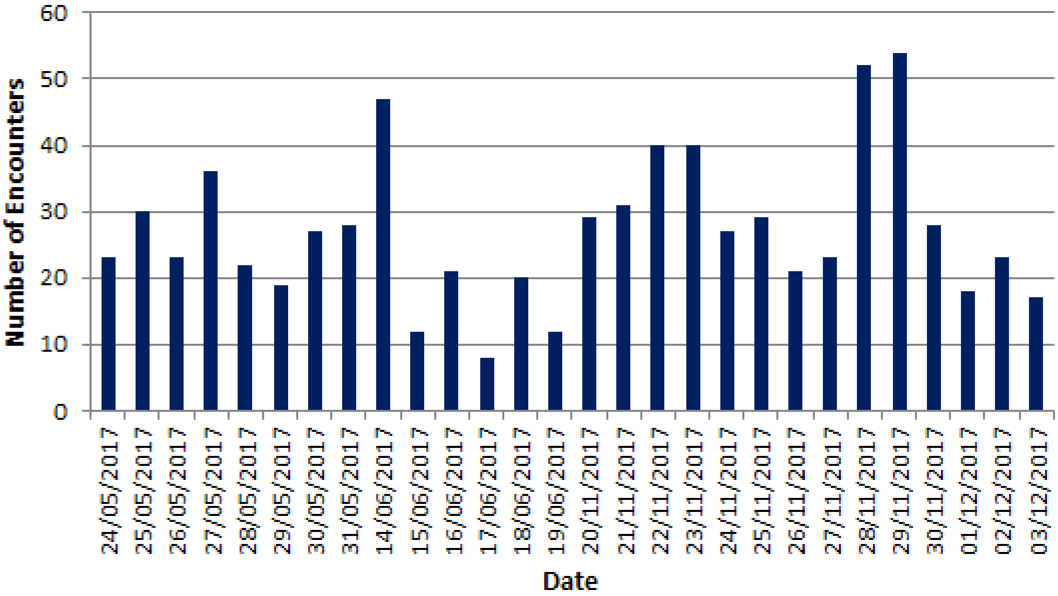



**Figure 17.2 Number of Encounters – 28 Day Summer and Winter Period (AIS and Radar)**

239. The busiest day in terms of encounters was the 29th November 2017, when 54 encounters were identified.

240. It is noted that encounter levels were slightly lower in summer than in winter (an average of 23 per day during summer, compared to 31 during winter).

### 17.1.4 Vessel Type Distribution

241. *Figure 17.3* presents the distribution of vessel types involved in encounters within 10nm of the East Anglia TWO windfarm site.

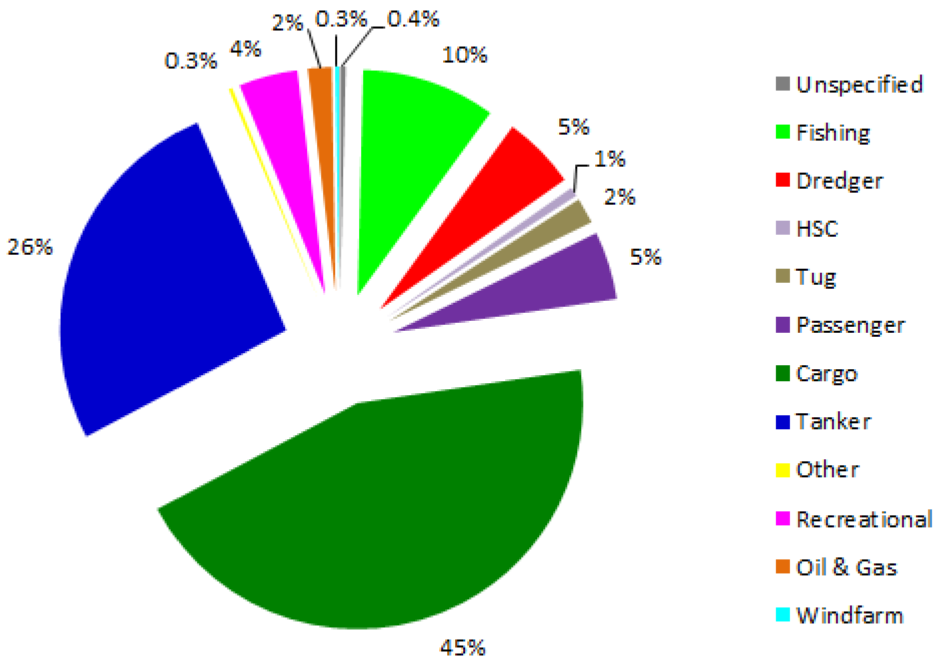
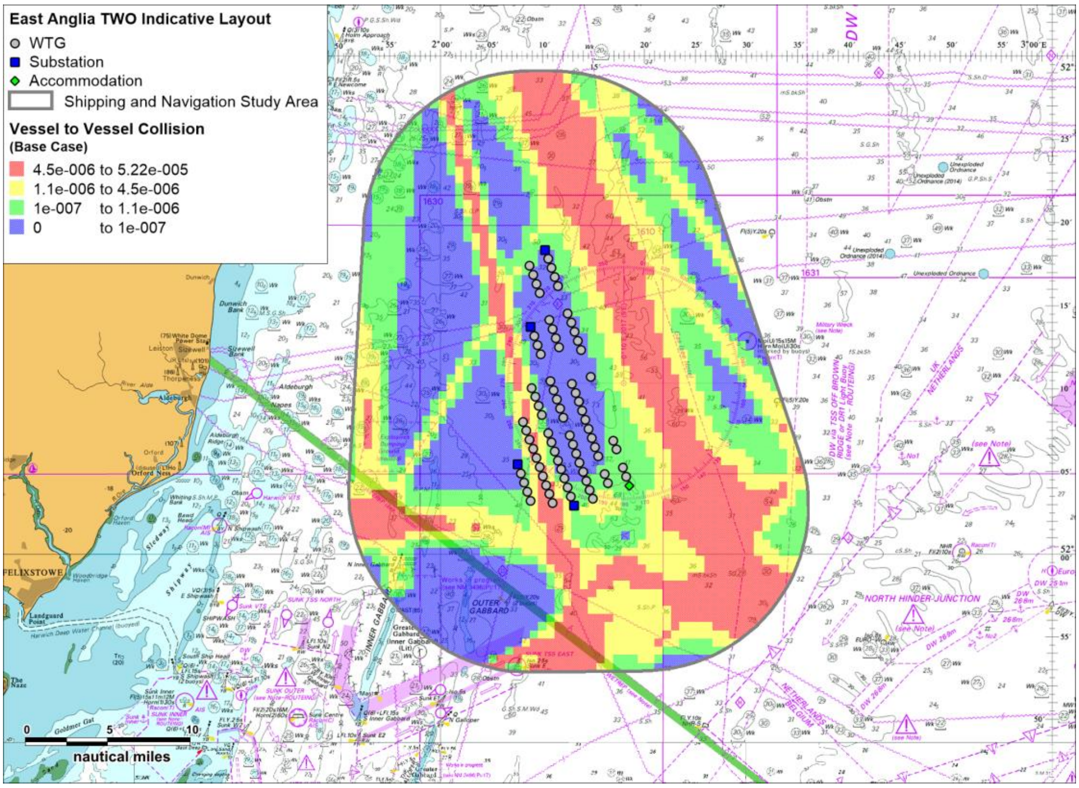



**Figure 17.3 Vessel Types involved in Encounters**

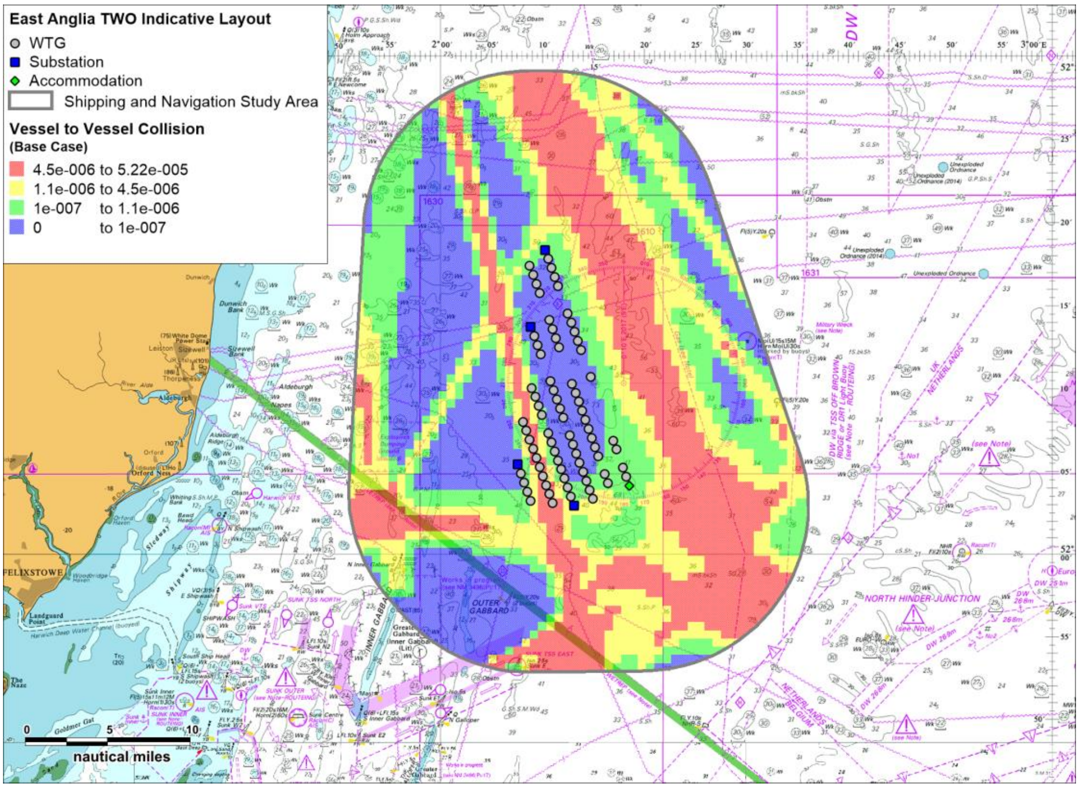
242. Cargo vessels were the most common vessel type involved in identified encounters followed by tankers and fishing vessels.

## 17.2 Vessel to Vessel Collisions

243. The baseline routeing and encounter levels in the area were used as input to the vessel to vessel collision model within Anatec's CollRisk model suite to estimate the base case vessel to vessel collision risk within the vicinity of the East Anglia TWO windfarm site. The model was then run again assuming a 10% increase in traffic levels (future case). The results are presented as density grids in Figure 17.4 and Figure 17.5 respectively.




## Figure 17.4 Vessel to Vessel Collision Frequency – Pre Windfarm Base Case




## Figure 17.5 Vessel to Vessel Collision Frequency – Pre Windfarm Future Case

# 18 East Anglia Two in Isolation – Future Case

## 18.1 Vessel to Vessel Collisions

244. The revised routeing shown in section 15 was used as input to the vessel to vessel collision model within Anatec's CollRisk model suite to estimate the potential rise in vessel to vessel collisions as a result of the East Anglia TWO windfarm site. The results are compared with the base case in *Table 18.1.*

**Table 18.1 Vessel to Vessel Collision Rate Increases**

| Scenario | Annual Collision Frequency | Return Period (Years) | Increase from Base Case – Pre Wind Farm |
|---|---|---|---|
| Pre Windfarm – Base Case | $1.01 \times 10^{-2}$ | 99 years | n/a |
| Post Windfarm – Base Case | $1.13 \times 10^{-2}$ | 88 years | 12% |
| Pre Windfarm – Future Case | $1.23 \times 10^{-2}$ | 81 years | 22% |
| Post Windfarm – Future Case | $1.38 \times 10^{-2}$ | 73 years | 36% |

245. Assuming no growth in traffic (base case), it was estimated that post windfarm a vessel would be involved in a collision once every 88 years. This represents an increase of 12% from the base case pre windfarm. If traffic levels were to increase by 10% (future case post windfarm), it was estimated that collision rates would increase by approximately 36% from the base case pre windfarm results.

## 18.2 Vessel Allision with Structure

246. Based on the vessel routeing identified for the area, the anticipated change in routeing due to the offshore development area, and assumptions that effective mitigation measures are in place, the frequency of an errant vessel under power deviating from its route to the extent that it comes into proximity with a structure is not considered to be a probable outcome.

247. From experience at other UK windfarms it is also assumed that merchant vessels would not navigate between wind turbine rows due to the restricted sea room and would be directed by the navigational aids in the area.

248. The deviated routes presented in section 15 were used as input to the powered allision function of Anatec's CollRisk modelling suite. This model estimates the likelihood that a vessel would allide with one of the windfarm structures whilst under power.

### 18.2.1 Impacts of Structures on Wind Masking / Turbulence or Shear

249. The offshore wind turbines have the potential to affect vessels under sail when passing through the East Anglia TWO windfarm site from impacts such as wind shear, masking and turbulence.

250. From previous windfarm studies it has been concluded that wind turbines do reduce wind velocity by the order of 10% downwind of a wind turbine. The temporary effect is not considered as being significant and similar to that experienced passing a large vessel or close to other large structures (e.g. bridges) or the coastline. In addition, practical experience to date from RYA members taking vessels into other sites indicates that this is not likely to be an issue. A number of windfarms are operational within UK waters and no impacts have been reported by recreational users.

### 18.2.2 Powered Vessel Allision

251. A powered allision is defined as a vessel making contact with a structure whilst under power. This model estimates the likelihood that vessels would allide with one of the windfarm structures whilst under power. It is noted that the result presented was run with a shielding range of 0nm as this is the worst case scenario.

252. The results are presented in *Table 18.2*.

**Table 18.2 Vessel to Structure Allision Risk - Powered**

| Scenario | Annual Frequency | Return Period (Years) |
|---|---|---|
| Post Windfarm – Base Case | $4.64\times10^{-3}$ | 215 |
| Post Windfarm – Future Case | $5.11\times10^{-3}$ | 196 |

253. The structures most at risk were observed to be the periphery wind turbines on the east of the East Anglia TWO windfarm site, as a result of two routes passing the western boundary, in particular route 5 which was recorded with a high density of traffic (see section 14). Traffic passing to the west and south of the East Anglia TWO windfarm site passed at a large enough distance to avoid significant risk to wind turbines. This is illustrated in *Figure 18.1*, which shows a graduated plot of risk to the structures.

254. It should be noted that two of the structures with the higher risk of allision were a construction, operation and maintenance platform and a substation (see *Figure 4.2*).

However, as previously mentioned the layout modelled is indicative and the worst case scenario. The position of the construction, operation and maintenance platform and substations may be changed.

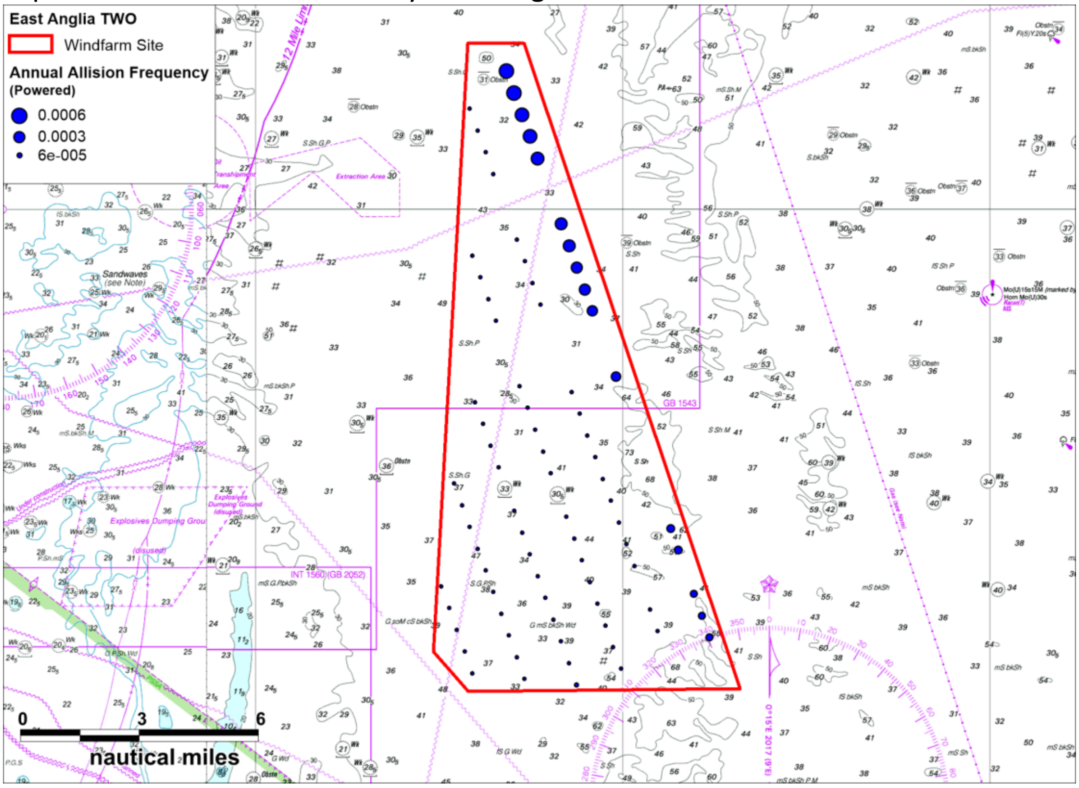



**Figure 18.1 Powered Allision – 10% Traffic Growth (Future Case)**

### 18.2.3 Drifting Vessel Allision

255. This model is based on the premise that propulsion on a vessel must fail before a vessel would drift, and takes account of the type and size of the vessel, number of engines, average time to repair, and differing weather conditions.

256. The exposure times for a drifting scenario are based on the vessel hours spent in proximity to the East Anglia TWO windfarm site. These were estimated based on the traffic levels, speeds and revised routeing pattern. The exposure was divided by vessel type and size, to ensure these factors, which based on analysis of historical accident data have been shown to influence accident rates, were taken into account within the modelling.

257. Using this information the overall rate of breakdown within the area surrounding the East Anglia TWO windfarm site was estimated. The probability of a vessel drifting towards a structure and the drift speed are dependent on the prevailing wind, wave and tidal conditions at the time of the accident.

258. The following drift scenarios were modelled:

- Wind;
- Peak spring flood tide; and
- Peak spring ebb tide.

259. The probability of vessel recovery from drift is estimated based on the speed of drift and hence the time available before reaching the windfarm structure. Vessels that do not recover within this time are assumed to allide.

260. The ebb tide based scenario was observed to produce the worst case results, and this scenario was therefore chosen for presentation. The results for the 0% (base case) and 10% (future case) traffic increase cases are presented in *Table 18.3*.

**Table 18.3 Vessel to Structure Allision Results - Drifting**

| Scenario | Annual Allision Frequency | Return Period (Years) |
|---|---|---|
| Base Case – Post Windfarm | $1.57\times10^{-3}$ | 637 years |
| Future Case – Post Windfarm | $1.73\times10^{-3}$ | 579 years |

261. The structures most at risk were observed to be the periphery wind turbines on the south and south-west of the East Anglia TWO windfarm site, as a result of three routes transiting close to the southern boundary and the north-eastern direction of the ebb tide. Traffic passing to the east and north-east of the East Anglia TWO windfarm site passed at a large enough distance to avoid significant risk to wind turbines. This is illustrated in Figure 18.2, which shows a graduated plot of risk to the structures.

262. It should be noted that the risk bands differ from those used to illustrate the powered allision results shown in Figure 18.1 and therefore direct comparison of allision frequency should not be made between the figures. However, comparison between the “hot spot” allision frequency locations can be made.

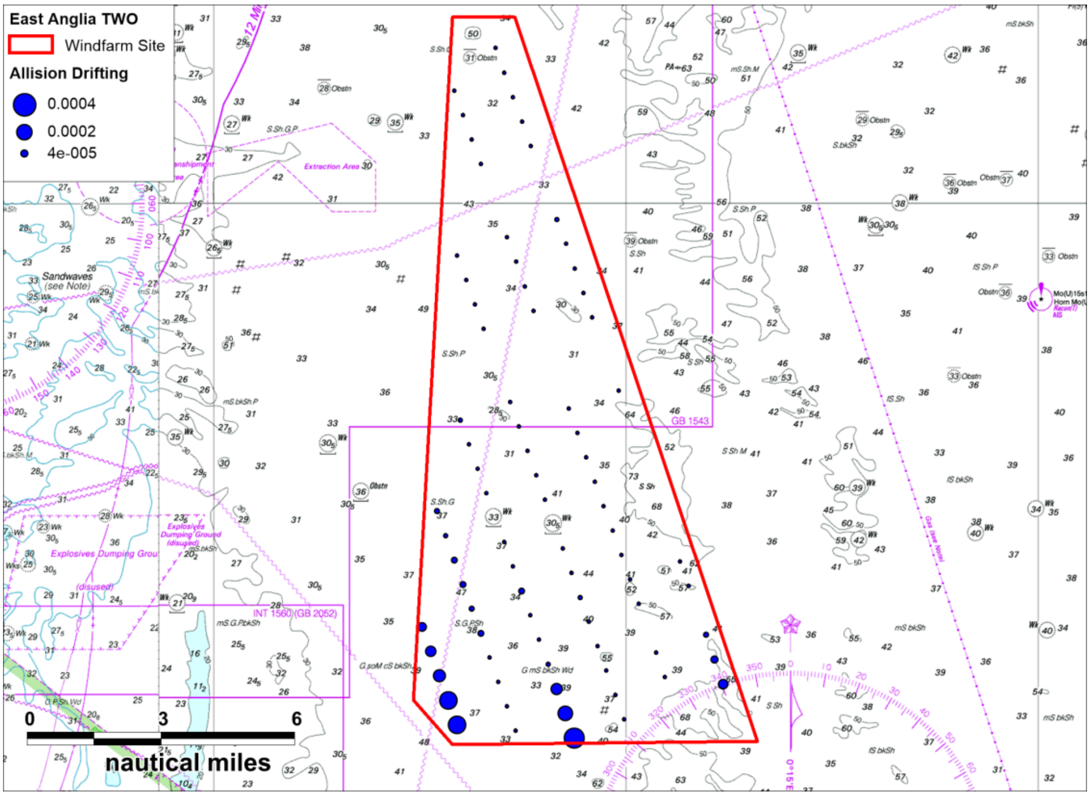



**Figure 18.2 Drifting Allision – 10% Traffic Growth (Future Case)**

## 18.3 Fishing Vessel Allision

263. Anatec's CollRisk fishing vessel risk model has been calibrated using fishing vessel activity data along with offshore installation operating experience in the UK (oil and gas) and the experience of allisions between fishing vessels and UKCS offshore installations (published by the HSE).

264. The two main inputs to the model are the fishing vessel density for the area and the structure details including the number and dimensions of the structures. The fishing vessel density in the area of the East Anglia TWO windfarm site was based upon the 2017 marine traffic data, consisting of AIS and Radar data.

265. The results are presented in *Table 18.4.*

**Table 18.4 Vessel to Structure Allision Results - Fishing**

| Scenario | Annual Allision Frequency | Return Period (Years) |
|---|---|---|
| Base Case – Post Windfarm | $6.52\times10^{-2}$ | 15 |
| Future Case – Post Windfarm | $7.17\times10^{-2}$ | 14 |

266. The fishing allision results are high when compared to the results of the allision assessment of regular routed vessels provided in section 18.2. This reflects the

assumption that the presence of the structures within the East Anglia TWO windfarm site would have no impact on current fishing levels (i.e. takes no account of vessels deviating around the structures, whereas it has been assumed that regular routed commercial traffic would deviate to avoid the East Anglia TWO windfarm site). It is also noted that any allision from a fishing vessel within the East Anglia TWO windfarm site is expected to be low speed (the estimated average speed of fishing vessels intersecting the East Anglia TWO windfarm site was approximately seven knots), and therefore lower risk to the crew, vessel, and structure.

## 18.4 Modelling Results Summary

267. A summary of the collision and allision risk frequency modelling results for the East Anglia TWO windfarm site is provided in *Table 18.5*.

**Table 18.5 Allision and Collision Risk Results Summary**

| Scenario | Base Case | | Future Case | |
|---|---|---|---|---|
| | Pre Windfarm | Post Windfarm | Pre Windfarm | Post Windfarm |
| Vessel to Vessel | $1.01\times10^{-2}$ (99 years) | $1.13\times10^{-2}$ (88 years) | $1.23\times10^{-2}$ (81 years) | $1.38\times10^{-2}$ (73 years) |
| Allision – Powered | n/a | $4.64\times10^{-3}$ (215 years) | n/a | $5.11\times10^{-3}$ (196 years) |
| Allision – Drifting | n/a | $1.57\times10^{-3}$ (637 years) | n/a | $1.73\times10^{-3}$ (579 years) |
| Allision – Fishing | n/a | $6.52\times10^{-2}$ (15 years) | n/a | $7.17\times10^{-2}$ (14 years) |
| Total | $1.01\times10^{-2}$ (99 years) | $8.27\times10^{-2}$ (12 years) | $1.23\times10^{-2}$ (81 years) | $9.23\times10^{-2}$ (11 years) |

268. The overall annual level of collision risk is calculated based on the combined risk results from the four scenarios above. This gives an estimate that the annual level of collision risk would increase due to the East Anglia TWO windfarm site to approximately one in 12 years (base case) and one in 11 years (future case). The vast majority of this increase is attributed to the higher fishing vessel allision risk in both cases (15 years and 14 years respectively).

## 18.5 Consequences

269. The consequences associated with the probable outcomes of a collision or allision are expected to be minor. However, the worst case outcomes could have severe consequences, including events with the potential for multiple fatalities. This section presents a summary of the consequences assessment; the full assessment is

presented in *Appendix 14.4 Consequences Assessment*. The consequences assessment is primarily based on the results of the allision and collision modelling undertaken in this NRA.

270. An allision involving a larger vessel may result in the collapse of a wind turbine with limited damage to the vessel. Breach of a vessel's fuel tank is considered unlikely and in the case of vessels carrying hazardous cargoes, e.g., tanker or gas carrier, the additional safety features associated with these vessels will further mitigate the risk of pollution (for example double hulls). Similarly, in a drifting allision, the proposed windfarm structures are likely to absorb the majority of the impact energy, with some energy also being retained by the vessel in terms of rotational movement (glancing blow).

271. In terms of smaller vessels such as fishing and recreational craft, the worst case scenario would be risk of vessel damage leading to foundering of the vessel and Potential Loss of Life (PLL).

272. The overall increase in PLL estimated due to the East Anglia TWO windfarm site is $4.02 \times 10^{-4}$ fatalities per year (base case), which equates to approximately one fatality per 2485 years. The annual increase in PLL due to the impact of the East Anglia TWO windfarm site for the future case is estimated to be $4.44 \times 10^{-4}$, which equates to one additional fatality in 2253 years.

273. In terms of individual risk to people, the incremental increase for commercial vessels (approximately $9.25 \times 10^{-8}$ for the base case) is negligible compared to the background risk level for the UK sea transport industry of $2.9 \times 10^{-4}$ per year.

274. For fishing vessels, the change in individual risk attributed to the East Anglia TWO windfarm site is higher than commercial vessels (approximately $9.30 \times 10^{-6}$ for the base case), which is minor compared to the background risk level for the UK sea fishing industry of $1.2 \times 10^{-3}$ per year.

275. The overall total increase in oil spilled due to the East Anglia TWO windfarm site is estimated at 0.003% per year for both the base and future case (see *Appendix 14.4 Consequences Assessment* for the full assessment). From research undertaken as part of the DfT MEHRA project (DfT 2001) the average annual tonnes of oil spilled in the waters around the British Isles, due to marine accidents in the 10-year period from 1989 to 1998 was 16,111. Therefore, the overall increase in pollution estimated for the East Anglia TWO windfarm site is very low compared to the historical average pollution quantities from marine accidents in the UK waters.

276. The impact of the East Anglia TWO windfarm site on people and the environment is relatively low compared to the existing background risk levels in UK waters. However, it should be noted that this is the localised impact of the East Anglia TWO

windfarm site. There may be additional maritime risks associated with other offshore windfarm developments in and around the southern North Sea and the UK as a whole, however, the purpose of the EIA is to consider the East Anglia TWO windfarm site in isolation; with cumulative impacts where interaction is identified.

277. Impacts associated with the allision and collision modelling are considered within *Chapter 14 Shipping and Navigation*.

278. Further detail on the consequences assessment is presented in *Appendix 14.4 Consequences Assessment.*

# 19 East Anglia Two Cumulative Assessment

## 19.1 Introduction

279. This section provides an assessment of likely cumulative vessel routeing in the vicinity of the East Anglia TWO windfarm site, if other potential nearby projects are taken into consideration. Data from the 2017 marine traffic surveys has been used as the input to the cumulative routeing assessment. This assessment feeds into the CIA undertaken in *Chapter 14 Shipping and Navigation.*

## 19.2 Methodology of Assessing Cumulative Impacts

280. Cumulative impacts have been considered for shipping and navigation receptors, this includes other offshore projects, as well as activities associated with other marine operations. However, it should be noted that fishing, recreation and marine aggregate dredging transits have been considered as part of the baseline assessment.

281. Other developments which may increase the impacts to shipping and navigation receptors when considered with the offshore development area were assessed, and screened in or out depending upon the outcome of the assessment.

282. Cumulative impacts identified through the Scoping Report (SPR 2017) have then been assessed when considered with the developments scoped in during the screening stage undertaken as part of the NRA process. As raised during consultation, the key cumulative impact was considered to be vessel routeing when considered with the other southern North Sea windfarm developments, however all impacts presented have been considered cumulatively in *Chapter 14 Shipping and Navigation.*

283. Given the limited spatial extent of gas platforms and fields within the area there is not considered to be any cumulative routeing impacts and therefore collision risk associated with existing gas installations in the southern North Sea.

284. Should any future surface gas developments be applied for within the gas fields within the area they would be subject to their own navigational risk assessments, including at a cumulative level.

## 19.3 Cumulative Screening

285. *Appendix 14.3 Cumulative Impact Assessment* presents the cumulative screening process and highlights projects within 100nm where a potential cumulative impact has been identified. *Table 19.1* presents the projects screened into the assessment as a result of this.

286. Cumulative impacts are initially considered within a 10nm study area around the East Anglia TWO windfarm site but then extended to 100nm where applicable to encompass vessel routeing. This includes consideration of transboundary offshore windfarm projects and shipping routes. However, for a cumulative or transboundary windfarm to be considered in the cumulative routeing assessment a vessel route needs to be impacted (route through or in proximity to) by both the screened windfarm and the offshore development area.

287. It should be noted that any projects with a currently dormant status or development zones have not been included within the cumulative screening.

**Table 19.1 Summary of Projects Included for the CIA in Relation to Shipping and Navigation**

| Development | Distance from East Anglia TWO Windfarm Site | Status | Rationale |
|---|---|---|---|
| **UK Windfarms** | | | |
| East Anglia ONE | 5.4nm | Under construction | Creation of gap between East Anglia TWO, East Anglia ONE North and East Anglia ONE |
| East Anglia ONE North | 5.4nm | Concept and early planning | |
| East Anglia THREE | 24nm | Consented | Close to DWR used by cumulative routeing |
| Galloper | 3.9nm | Fully commissioned | Reduction of available sea room between East Anglia TWO, Great Gabbard and Galloper |
| Hornsea Project One | 90nm | Under construction | Route 12 cumulatively deviates between Hornsea Project Three, Hornsea Project One and Hornsea Project Two |
| Hornsea Project Two | 92nm | Pre-construction | Route 12 impacted by both Hornsea Project Two and East Anglia TWO |
| Hornsea Project | 86nm | Application submitted | Route 12 |

| Development | Distance from East Anglia TWO Windfarm Site | Status | Rationale |
|---|---|---|---|
| Three | | | cumulatively deviates between Hornsea Project Three, Hornsea Project One and Hornsea Project Two |
| Norfolk Boreas | 39nm | Concept and early planning | Route 15 impacted by both Norfolk Boreas and East Anglia TWO |
| Norfolk Vanguard | 30nm | Application submitted | Routes 12 and 15 impacted by both Norfolk Vanguard and East Anglia TWO |
| **EU Windfarms** | | | |
| Mermaid | 24nm | Consented | Route 5 impacted by both Mermaid and East Anglia TWO |
| Northwester 2 | 26nm | Consented | Route 5 impacted by both Mermaid and East Anglia TWO |
| Poseidon P60 - Mermaid | 25nm | Concept and early planning | Route 5 impacted by both Poseidon P60 - Mermaid and East Anglia TWO |

## 19.4 Cumulative Routeing

288. The routes that are impacted by other windfarms (including transboundary developments) are routes 2, 3, 5, 12, and 15 which are cumulatively impacted by the offshore development area and other projects. Cumulative re-routeing taking account of UK and transboundary windfarms is discussed in the following subsections. It should be noted that some of the projects are not yet consented. However, given the future potential for the project to be constructed and potential cumulative impact on vessel routeing, the development has been considered throughout the following subsections.

### 19.4.1 Cumulative Deviations

289. An overview of the anticipated cumulative vessel routes (obtained by deviating the base case routes from section 14 and taking into account cumulative routeing proposed as part of the Southern North Sea Offshore Wind Forum (SNSOWF) in 2013 (SNSOWF 2013) to account for the projects considered) are presented in *Figure 19.1*. Following this, Figure 19.2 presents the cumulative routeing within the vicinity of the shipping and navigation study area. The route ID numbering shown in the figures corresponds to that presented in section 14 and section 15)

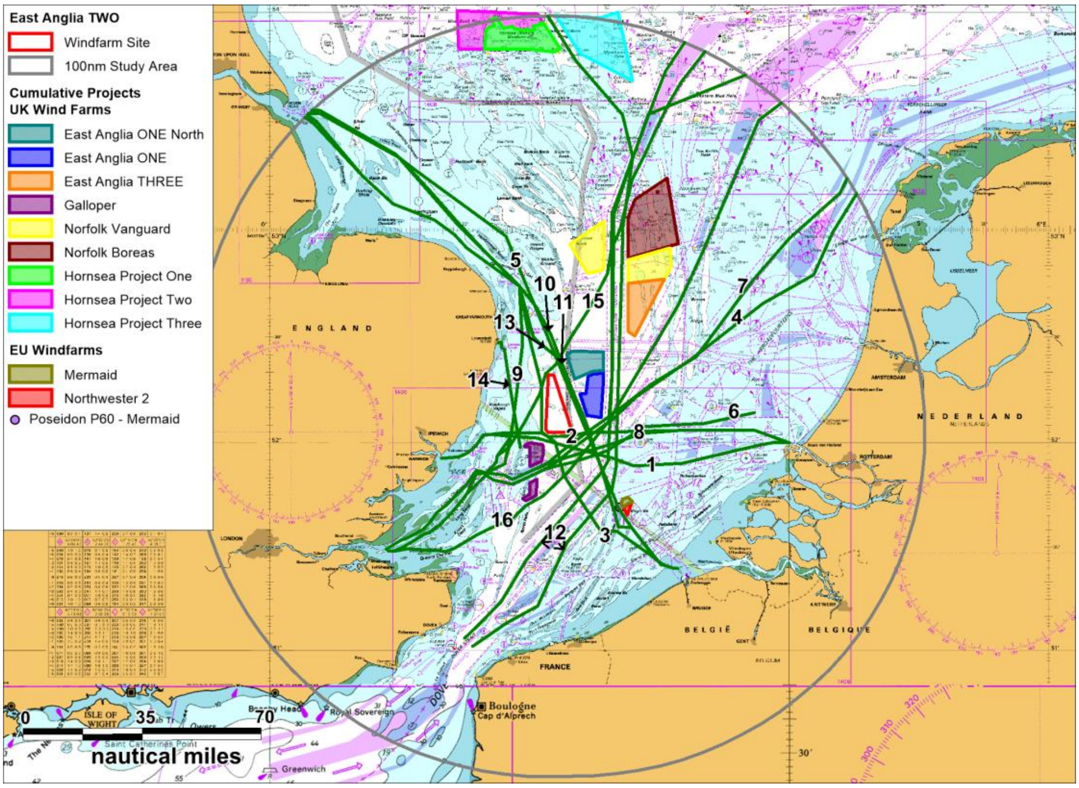



Figure 19.1 Cumulative Routeing within 100nm Study Area

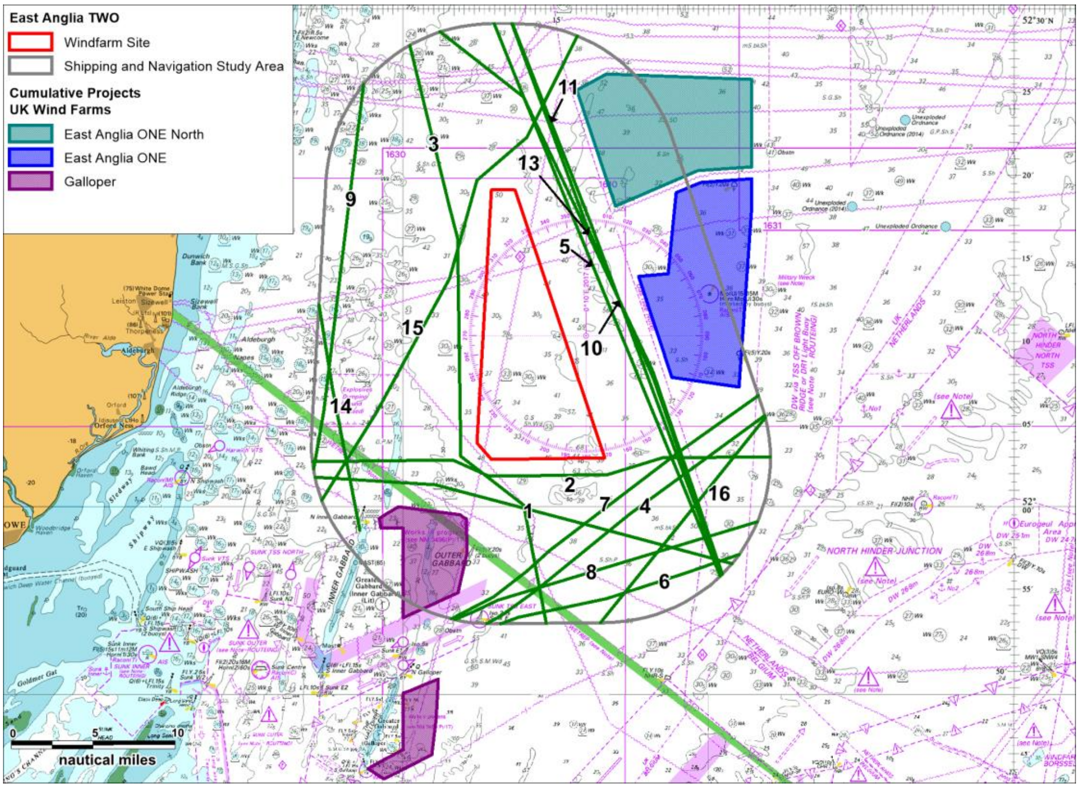



**Figure 19.2 Cumulative Routeing within Shipping and Navigation Study Area**

290. Based on cumulative routeing proposed as part of the SNSOWF (SNSOWF 2013), route 12 is predicted to deviate at the TSS far south of the East Anglia TWO windfarm site and route around the boundaries of the East Anglia ONE North offshore development area and the East Anglia ONE offshore development area (see Figure 19.1). This results in route 12 no longer transiting within the shipping and navigation study area.

291. It should be noted that the boundaries used are indicative and should any navigational corridor be developed between the East Anglia ONE North offshore development area, East Anglia TWO offshore development area and the East Anglia ONE offshore development area it will comply with MCA and TH requirements.

292. *Table 19.2* presents the projects which affect each individual route.

## Table 19.2 Routes Affected by Cumulative Projects

| Route ID | East Anglia TWO | East Anglia ONE | East Anglia ONE North | East Anglia THREE | Galloper | Hornsea Project One | Hornsea Project Two | Hornsea Project Three | Norfolk Boreas | Norfolk Vanguard | Mermaid | Northwester 2 | Poseidon P60 - Mermaid |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | x | x | x | x | ✓ | x | x | x | x | x | x | x | x |
| 2 | ✓ | x | x | x | ✓ | x | x | x | x | x | x | x | x |
| 3 | ✓ | x | x | x | ✓ | x | x | x | x | x | x | x | x |
| 4 | x | x | x | x | ✓ | x | x | x | x | x | x | x | x |
| 5 | ✓ | ✓ | ✓ | x | x | x | x | x | x | x | ✓ | ✓ | ✓ |
| 6 | x | x | x | x | ✓ | x | x | x | x | x | x | x | x |
| 7 | x | x | x | x | ✓ | x | x | x | x | x | x | x | x |
| 8 | x | x | x | x | ✓ | x | x | x | x | x | x | x | x |
| 9 | x | x | x | x | x | x | x | x | x | x | x | x | x |
| 10 | x | ✓ | ✓ | x | x | x | x | x | x | x | ✓ | ✓ | ✓ |
| 11 | x | ✓ | ✓ | x | x | x | x | x | x | x | ✓ | ✓ | ✓ |
| 12 | ✓ | ✓ | ✓ | ✓ | x | ✓ | ✓ | ✓ | ✓ | ✓ | x | x | x |

| Route ID | East Anglia TWO | East Anglia ONE | East Anglia ONE North | East Anglia THREE | Galloper | Hornsea Project One | Hornsea Project Two | Hornsea Project Three | Norfolk Boreas | Norfolk Vanguard | Mermaid | Northwester 2 | Poseidon P60 - Mermaid |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 13 | x | ✓ | ✓ | x | x | x | x | x | x | x | ✓ | ✓ | ✓ |
| 14 | x | x | x | x | x | x | x | x | x | x | x | x | x |
| 15 | ✓ | x | x | x | x | x | x | x | ✓ | ✓ | x | x | x |
| 16 | x | x | x | ✓ | ✓ | x | x | x | x | x | x | x | x |

## 19.5 Spacing between Cumulative Projects

293. Annex 3 of MGN 543 (MCA 2016) provides a template from which the required width of shipping lanes located in a ‘corridor’ between two or more wind farm sites can be calculated. Where such a lane exists, the MCA require that there is room within the corridor between the wind farms for a vessel to deviate up to 20°. The East Anglia TWO offshore development area, East Anglia ONE North offshore development area and East Anglia ONE offshore development area create a gap, and it was therefore necessary to check this gap against the guidance.

294. Given a gap is only formed if the East Anglia ONE North offshore development area and East Anglia ONE offshore development area are also considered, the calculations have been undertaken cumulatively, with the gap defined as running between the southernmost point of the East Anglia ONE offshore development area, and the northernmost point of the eastern East Anglia TWO windfarm site boundary. This ensures the East Anglia TWO windfarm site is incorporated into the calculations given its eastern boundary (i.e. the boundary forming the western edge of the corridor) is accounted for. This should be considered a conservative approach given that the northern and southern extents of the gap as defined for the purpose of this assessment are bordered by wind turbines on both sides.

295. The gap is required to be of width at least 5nm, based on length of 13.8nm, and the required 20° deviation. The actual width of the gap is 5.4nm, and therefore is compliant with the MGN 543 corridor guidance.

## 19.6 CIA within the EIA

296. Cumulative impacts have been assessed in *Chapter 14 Shipping and Navigation* and take the projects listed in section 19.3 into account.

# 20 Hazard Log

## 20.1 Introduction

297. As per the required MCA methodology (MCA 2015), a Hazard Log has been created detailing the potential hazards to shipping and navigation receptors that may arise from the construction, operation, and decommissioning of the East Anglia TWO windfarm site. The Hazard Log itself is included in Appendix 14.2, with this section providing an overview of the methodology used to create the log, and a summary of the results.

## 20.2 Hazard Workshop

298. Key to the creation of a Hazard Log is the incorporation of comment and experience of both local and national shipping and navigation stakeholders relevant to the offshore development area. For this reason a Hazard Workshop was held in London on the 9th May 2018 for the purpose of gathering the knowledge and experience of the attendees to use as input to the final Hazard Log. The workshop invitees are listed in *Table 20.1*, including those parties invited but who were unable to attend.

**Table 20.1 Hazard Workshop Invitees**

| Stakeholder | Attended |
|---|---|
| Brown & May Marine | Yes |
| CoS | Yes |
| Cruising Association | Yes |
| Cobelfret Ferries | Yes |
| DFDS | Yes |
| James Fisher Everard | Yes |
| Associated British Ports | No |
| BMAPA | No |
| DfT | No |
| Hanson Marine | No |
| Harwich Haven Authority | No |
| MCA | No |
| National Federation of Fishermen’s Organisations | No |
| Port of London Authority | No |

| Stakeholder | Attended |
|---|---|
| Rederscentrale (Belgian Fisheries) | No |
| RNLI | No |
| Royal Yachting Association | No |
| Stena Line | No |
| Trinity House | No |
| VISNED | No |

299. The attendees were provided with an overview of the offshore development area, including the intended timeline, and the key relevant parameters. Following this, potential hazards to shipping and navigation receptors associated with the offshore development area were identified and discussed. This included discussion of potential mitigation measures that could be implemented to reduce risk to ALARP where appropriate.

300. Post-workshop, the Hazard Log was drafted and distributed to all attendees, with the final version incorporating the feedback received. The final, agreed version of the Hazard Log is presented in *Appendix 14.2.*

## 20.3 Results

301. A total of 15 hazards were identified and included in the Hazard Log. These are summarised in *Table 20.1* (noting that construction and decommissioning impacts were grouped on the basis that these phases presented similar scenarios).

### Table 20.2 Summary of Impacts Identified in Hazard Log

| Phase(s) | Hazard Title | Hazard Detail |
|---|---|---|
| Construction, operation and decommissioning | Displacement of vessels. | Activities within the East Anglia TWO windfarm site may lead to the displacement of established commercial vessel routes and third party marine activity. |
| Construction, operation and decommissioning | Displacement of vessels during periods of adverse weather. | Activities within the East Anglia TWO windfarm site may lead to the displacement of established commercial vessel adverse weather routes. |
| Construction, operation and decommissioning | Increased collision risk between two third party vessels. | The displacement of vessels due to activities within the East Anglia TWO windfarm site may lead to an increasing number of encounters between third party vessels and therefore an increase in vessel collision risk between third party vessels. |

| Phase(s) | Hazard Title | Hazard Detail |
|---|---|---|
| Construction, operation and decommissioning | Increased collision risk between a third party vessel and project vessel. | The displacement of vessels due to activities within the East Anglia TWO windfarm site may lead to an increasing number of encounters between a third party vessel and project vessel and therefore an increase in vessel collision risk between a third party vessel and project vessel. |
| Construction and decommissioning | Creation of allision risk associated with partially constructed / decommissioned windfarm structures. | The presence of a partially constructed or decommissioned windfarm structure may create an allision risk. |
| Construction and decommissioning | Creation of allision risk for vessels NUC associated with partially constructed / decommissioned windfarm structures. | The presence of a partially constructed or decommissioned windfarm structure may create an allision risk for vessels NUC. |
| Operation | Creation of allision risk for commercial vessels associated with unmanned windfarm structures. | The presence of windfarm infrastructure may create an allision risk for passing commercial vessels. |
| Operation | Creation of allision risk for commercial vessels NUC associated with unmanned windfarm structures. | The presence of windfarm infrastructure may create an allision risk for commercial vessels NUC. |
| Operation | Creation of allision risk for commercial fishing vessels associated with unmanned windfarm structures. | The presence of windfarm infrastructure may create an allision risk for commercial fishing vessels. |
| Operation | Creation of allision risk for recreational vessels associated with unmanned windfarm structures. | The presence of windfarm infrastructure may create an allision risk for recreational vessels. |
| Construction, operation and decommissioning | Creation of allision risk for project vessels associated with unmanned windfarm structures. | The presence of windfarm infrastructure may create an allision risk for vessels associated with the project and operating in proximity to structures. |
| Operation | Creation of allision risk associated with manned platforms. | The presence of manned construction, operation and maintenance platforms may create an allision risk. |
| Construction, operation and decommissioning | Anchor interaction with sub-sea cables or structures during normal anchoring operations. | A vessel may drop anchor or drag anchor over sub-sea structures including a sub-sea cable. |
| Construction, operation and decommissioning | Anchor interaction with sub-sea cables during emergency anchoring operations. | A vessel may drop anchor or drag anchor over sub-sea structures including a sub-sea cable in an emergency situation. |

| Phase(s) | Hazard Title | Hazard Detail |
|---|---|---|
| Construction, operation and decommissioning | Diminished emergency response capability within the region. | The increased activity associated with the project may lead to an increase in incidents requiring an emergency response resulting in a reduction in SAR resources available within the region. |

# 21 Next Steps and Embedded Mitigation Measures

302. Following identification of both future case impacts and the outcomes of the FSA, an impact assessment in line with EIA guidance has been undertaken. The impact assessment considers the identified impacts from the NRA with regards to shipping and navigation receptors and assumes embedded mitigation measures will be in place. This EIA is presented in *Chapter 14 Shipping and Navigation*.

303. The EIA requires compiling and reviewing available data. For shipping and navigation this includes the marine traffic surveys, base case assessment and a NRA. The likely impacts of the offshore development area during the construction, operation and decommissioning stages are assessed and feedback provided to the design and engineering teams to mitigate or modify the offshore development area in order to avoid, prevent, reduce and, where possible, offset any significant adverse impacts. Following this is the identification of any residual effects and any further mitigation measures that may be required.

304. Those measures assumed to be embedded mitigation are listed below. The EIA has been undertaken on the understanding that these measures will be in place.

- Application for and use of safety zones during construction, major maintenance work during operations and decommissioning;
- Cable Burial Risk Assessment undertaken pre-construction, including consideration of under keel clearance. All sub-sea cables will be suitably protected based on risk assessment, and the protection will be monitored and maintained as appropriate;
- Compliance from all vessels associated with the offshore development area with international maritime regulations as adopted by the relevant flag state (most notably COLREGS (IMO 1972) and SOLAS (IMO 1974));
- Consideration of MGN 543 – including the SAR annex;
- An ERCoP will be developed and implemented for the construction, operational & maintenance and decommissioning phases. The ERCoP is based on the standard MCA template and will consider the potential for self-help capability as part of the ongoing process;
- Information relevant to the offshore development area will be promulgated via Notice to Mariners and other appropriate media;
- Marine traffic coordination;
- Suitable lighting and marking of the East Anglia TWO windfarm site complying with IALA Recommendations O-139 (IALA 2013), to be finalised in consultation with TH and the MCA;
- Use of guard vessels when deemed appropriate following risk assessment;
- Wind turbines will have at least 22m clearance above MHWS as required by MGN 543 (MCA 2016) and RYA (RYA 2015) requirements; and

- Wind turbines, cables and substations marked on Admiralty Navigational Charts and Admiralty Sailing Directions.

# 22 Future Monitoring

## 22.1 Safety Management Systems (SMS) and Emergency Response Planning

305. Health and safety documentation, including a policy statement, SMS and emergency response plans will be in place for the offshore development area post consent and prior to construction. This will be continually updated throughout the development process. The following sections provide an overview of documentation and how it will be maintained and reviewed with reference where required to specific marine documentation.

306. Monitoring, reviewing and auditing will be carried out on all procedures and activities and feedback actively sought. Any designated person, managers and supervisors are to maintain continuous monitoring of all marine operations and determine if all required procedures and processes are being correctly implemented.

## 22.2 Future Monitoring of Marine Traffic

307. The DCO is expected to include the requirement for construction traffic monitoring by AIS, including continual collection of data from a suitable location at the East Anglia TWO windfarm site with an assessment of a minimum of 28 days submitted to the MCA annually. This is likely to continue through to the first year of operation to ensure mitigations put in place are effective.

## 22.3 Sub-sea Cables

308. The sub-sea cable routes will be subject to periodic inspection to monitor the cable protection, including burial depths.

## 22.4 Hydrographic Surveys

309. As required by MGN 543, detailed and accurate hydrographic surveys will be undertaken periodically at agreed intervals.

## 22.5 Decommissioning Plan

310. A decommissioning plan will be developed. With regards to impacts on shipping and navigation this will also include consideration of the scenario where, on decommissioning and on completion of removal operations, an obstruction is left on site (attributable to the windfarm) which is considered to be a danger to navigation and which it has not proved possible to remove. Such an obstruction may require marking until such time as it is either removed or no longer considered a danger to navigation, the continuing cost of which will need to be met by the operator.

# 23 Summary

## 23.1 Marine Traffic

311. Two 14 day marine traffic surveys were undertaken for the offshore development area, with periods chosen to cover seasonal variations. Based on the survey data recorded during summer it was estimated that 74 unique vessels per day passed within 10nm of the East Anglia TWO windfarm site, and 43 within 2nm of the offshore cable corridor. During winter, this reduced to 71 unique vessels per day within 10nm of the East Anglia TWO windfarm site, and 31 within 2nm of the offshore cable corridor.

312. The majority of vessels recorded during the surveys were commercial (either cargo or tanker), however, a high number of recreational vessels were also recorded due to the Vuurschepen race and North Sea race. Five routes were identified as requiring deviation due to the offshore development area.

313. Passenger vessels were also identified within the shipping and navigation study area. The three most frequently operated routes include:

- Between Harwich and Rotterdam (the Netherlands) (Stena Britannica and Stena Hollandica, passing south of windfarm site); and
- Between Hull and Zeebrugge (Belgium) (Pride of Bruges and Pride of York passing east of windfarm site).

314. A number of DFDS Seaways vessel routes were recorded throughout 2017 with vessels on the Rotterdam to Felixstowe route recorded intersecting the south of the East Anglia TWO windfarm site (23% of vessel tracks). The most frequently used DFDS route during 2017 was the Immingham to Rotterdam route (average of two unique vessels per day) which was recorded to the north-east of the East Anglia TWO windfarm site.

315. The majority of fishing activity recorded in the shipping and navigation study area was from beam trawlers, however demersal trawlers, pelagic trawlers, and potters / whelkers were also common. Demersal pair trawlers, twin trawlers and dredgers were also observed. The majority of fishing recorded in the vicinity of the offshore cable corridor was from demersal trawlers. Coastal activity was largely from fishing vessels in transit.

316. Regular windfarm traffic to the Greater Gabbard Offshore Wind Farm and Galloper Wind Farm was recorded from Lowestoft (UK). It is noted that as Galloper Wind

Farm was still under construction during the marine traffic surveys, the associated activity may not be representative of the traffic during its operational phase.

317. Anchoring was observed to occur within the East Anglia TWO windfarm site itself, and to the north and north-west of the windfarm site. Anchored vessels consisted of tankers bound for either Southwold (UK) or Rotterdam (the Netherlands). This area is not charted as a designated anchorage; however there is a designated area of the UK territorial sea off the coast of Southwold where STS transfers are permitted therefore the anchored tankers may be anchored in preparation for a STS transfer.

## 23.2 Allision and Collision Modelling

318. It was estimated that the construction of the offshore development area would raise current vessel to vessel collision rates by approximately 12% (assuming no growth in traffic). Increases in traffic of 10% raised the collision risk by 36%.

319. It was estimated that a vessel would allide with a windfarm structure under power once every 215 years assuming no growth in traffic. An allision from an NUC vessel was estimated to occur once every 637 years assuming no growth in traffic. It was estimated that an allision between a fishing vessel and a windfarm structure would occur once every 15 years, however it is noted that this assumes fishing levels would remain unchanged following construction of the offshore development area.

## 23.3 Cumulative Impacts

320. Cumulative impacts have been considered for the offshore development area including the impacts on shipping and navigation arising from other proposed offshore wind developments. This includes consideration for projects within 10nm of the East Anglia TWO windfarm site and then extended to 100nm to consider cumulative routeing.

321. Following a cumulative screening process in *Appendix 14.3 Cumulative Impact Assessment*, the following projects have been taken forward to the EIA:

- East Anglia ONE;
- East Anglia ONE North;
- East Anglia THREE;
- Galloper;
- Hornsea Project One;
- Hornsea Project Two;
- Hornsea Project Three;
- Norfolk Boreas;
- Norfolk Vanguard;
- Mermaid;

- Northwester 2; and
- Poseidon P60 – Mermaid.

## 23.4 Hazard Log

322. Following a hazard workshop, a hazard log was drafted by Anatec to detail all hazards identified following a review of the baseline assessment. Each hazard was ranked in terms of significance, and further mitigation proposed where required. The initial draft was distributed to the relevant shipping and navigation stakeholders, and any responses were taken into consideration in the final version. The final log was then used to inform the significance rankings used within the FSA in the PEIR, in addition to the modelling results and expert opinion.

## 23.5 Receptors Carried forward to the EIA

323. Following consideration of the results of the NRA including baseline data, consultation, the hazard log and modelling results, the following receptors identified in the Scoping Report (SPR 2017) were taken forward for consideration in the EIA:

- Commercial vessels;
- Commercial fishing vessels;
- Marine aggregate dredgers;
- Recreational craft; and
- Emergency response.

324. Impacts on communications, navigation and marine radar interference have been scoped out of the assessment at this stage.

# 24 References


- BEIS. (2011) Standard Marking Schedule for Offshore Installations, London: BEIS.
- BEIS. (2016) The Recreational Craft Directives 2013/53/EU, London: BEIS.
- DfT. (2001) Identification of MEHRAs in the UK, DfT: London.
- IALA. (2013) O-139 the Marking of Man-Made Offshore Structures, Edition 2. Saint Germain en Laye, France: IALA.
- IMO. (1972) COLREGS, London: IMO.
- IMO. (1974) SOLAS, London: IMO.
- IMO. (2002) IMO Guidelines for FSA, London: IMO.
- MCA. (2008) Marine Guidance Notice 372 (MGN 372 M+F) OREIs: Guidance to Mariners Operating in the Vicinity of UK OREIs, Southampton: MCA.
- MCA. (2015) MCA Methodology for Assessing the Marine Navigational Safety of Offshore Wind Farms, Southampton: MCA.
- MCA. (2016) MGN 543 OREIs – Guidance of UK Navigational Practice, Safety and Emergency Response, Southampton: MCA.
- MMO. (2014) East Inshore and East Offshore Marine Plans, London: MMO.
- RYA. (2015) The RYA's Position on Offshore Renewable Energy Developments Paper 1 (of 4) – Wind Energy, RYA: Southampton.
- RYA. (2016) UK Coastal Atlas of Recreational Boating, Southampton: RYA.
- SPR. (2017) East Anglia TWO Offshore Windfarm Scoping Report, SPR: Glasgow.
- UKHO. (2016) Admiralty Sailing Directions - North Sea West Pilot, NP54, Somerset: UKHO.
- UKHO. (2017) Admiralty Sailing Directions – Dover Strait Pilot, NP28, Somerset: UKHO.