Regional Cumulative Shipping and Navigational Review - Outer Firth of Forth and Tay Wind Farm Developments

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1 INTRODUCTION

1.1 Background

Proposals are being developed for the construction of offshore wind farms in the North Sea to the east of the Firths of Forth and Tay in Scotland.

There are three wind farm sites being considered in this area, two located in the Scottish Territorial Waters (STWs) and one Round 3 development Zone in the area beyond the UK territorial limits.

The Crown Estate has formed the "Forth and Tay Offshore Wind Developers Group" (FTOWDG) to collaboratively identify potential cumulative effects of multi wind farm development.

The FTOWDG comprises of:

- Mainstream Renewable Power - Neart na Gaoithe offshore wind farm
- Repsol Nuevas Energías UK - Inch Cape offshore wind farm
- Seagreen - Firth of Forth Round 3 Zone 2 developments

This report has been commissioned by FTOWDG to review the shipping and navigational aspects of the proposals on a regional level, to ensure the developments are carried out in a coherent manner.

1.2 Objectives

To assess the shipping and navigational aspects of the following offshore renewable developments full site boundaries:

- Neart na Gaoithe (450 Mega Watt [MW] capacity)
- Inch Cape (1 Giga Watt [GW] capacity)
- Firth of Forth Round 3 Zone 2 (3.5GW capacity)

1.3 Methodology

The methodology used within the report to assess the cumulative navigational effects associated with offshore wind farms located in the Firth of Forth and the Firth of Tay, East Coast Scotland principally follows the *Regional Cumulative Navigation Risk Methodology* presented by Marico Marine (Ref. i).

Based on the above methodology and The Royal Haskoning Discussion Document (2) *Approach to Cumulative Effects Assessment* (Ref. ii), a regional navigation assessment aimed at identifying the cumulative impacts of the regional wind farm developments in the area has been carried out.

1.4 Applicable Guidance

The following guidance is applicable to shipping and navigation for offshore wind farms:

- Department of Energy and Climate Change (DECC) Methodology for Assessing Marine Navigational Safety Risks of Offshore Wind Farms (Ref. iii).
- Marine Guidance Note (MGN) 371 Offshore Renewable Energy Installations (OREIs) - Guidance on UK Navigational Practice, Safety and Emergency Response Issues including 'Shipping Template' (Ref. iv) ; and
- MGN 372 Guidance to Mariners Operating in the vicinity of OREIs (Ref. v).

1.5 Abbreviations

The following abbreviations are used throughout this report:

AIS	-	Automatic Identification System
ALB	-	All-weather Lifeboat
ALARP	-	As Low as Reasonably Practicable
BMAPA	-	British Marine Aggregates and Producers Association
CA	-	Cruising Association
DECC	-	Department of Energy and Climate Change
EOWDC	-	European Offshore Wind Farm Deployment Centre
FTOWDG	-	Forth and Tay Offshore Wind Developers Group
GIS	-	Geographic Information System
GW	-	Giga Watt
IALA	-	International Association of Lighthouse Authorities
LAT	-	Lowest Astronomical Tide
ICES	-	International Council for Exploration of the Sea
ILB	-	In-shore-lifeboat
IMO	-	International Maritime Organisation
km	-	kilometre
LPG	-	Liquefied Petroleum Gas
MCA	-	Maritime and Coastguard Agency
MEHRAs	-	Marine Environmental High Risk Areas
MGN	-	Marine Guidance Note
MMO	-	Marine Management Organisation
MOD	-	Ministry of Defence
MW	-	Mega Watt
NLB	-	Northern Lighthouse Board
nm	-	Nautical Mile (1,852 metres)
NRA	-	Navigational Risk Assessment

OREIs	-	Offshore Renewable Energy Installations
PLN	-	Port Letter Number
Ro-Ro	-	Roll on / Roll off
RYA	-	Royal Yacht Association
SAR	-	Search and Rescue
SOLAS	-	Safety of Life at Sea
STW	-	Scottish Territorial Waters
TSS	-	Traffic Separation Scheme
UKHO	-	United Kingdom Hydrographic Office
VMS	-	Vessel Monitoring Systems
VTS	-	Vessel Traffic Service

2 POTENTIAL IMPACTS

2.1 Potential Effects on Individual Vessels

The impacts on navigation in the Firth of Forth, Tay and there outer approaches will be assessed for both vessels transiting through the wind farm developments and those vessels transiting in close proximity to the development sites. The following are considered:

- Recreational Vessel Hazards / Operational Hazards
    - Collision;
    - Foundering;
    - Contact;
    - Loss of sailing area;
    - Radar impacts;
    - Diverting from route;
    - Increase in fuel costs; and
    - Time costs.
- Fishing Vessel Hazards / Operational Hazards
    - Collision;
    - Foundering;
    - Contact;
    - Snagged nets;
    - Loss of fishing grounds;
    - Radar impacts;
    - Diverting from route;
    - Increase in fuel costs; and
    - Time costs.
- Commercial Vessels / Operational Hazards
    - Grounding;
    - Collision;
    - Foundering;
    - Contact;
    - Radar impacts;
    - Diverting from routes;
    - Increase in fuel costs; and
    - Time costs.

2.2 Potential Effects on Routeing

The proposed wind farms are located in the approaches to the Firth of Forth and Tay ports and in proximity to routes passing between northern and eastern UK ports. Therefore a routeing analysis is presented to calculate the likely impact to ship routeing throughout the region.

3 Wind Farms Overview

A chart overview of the outer Firth of Forth and Tay illustrating the locations of the three proposed wind farm development areas is presented in Figure 3.1.

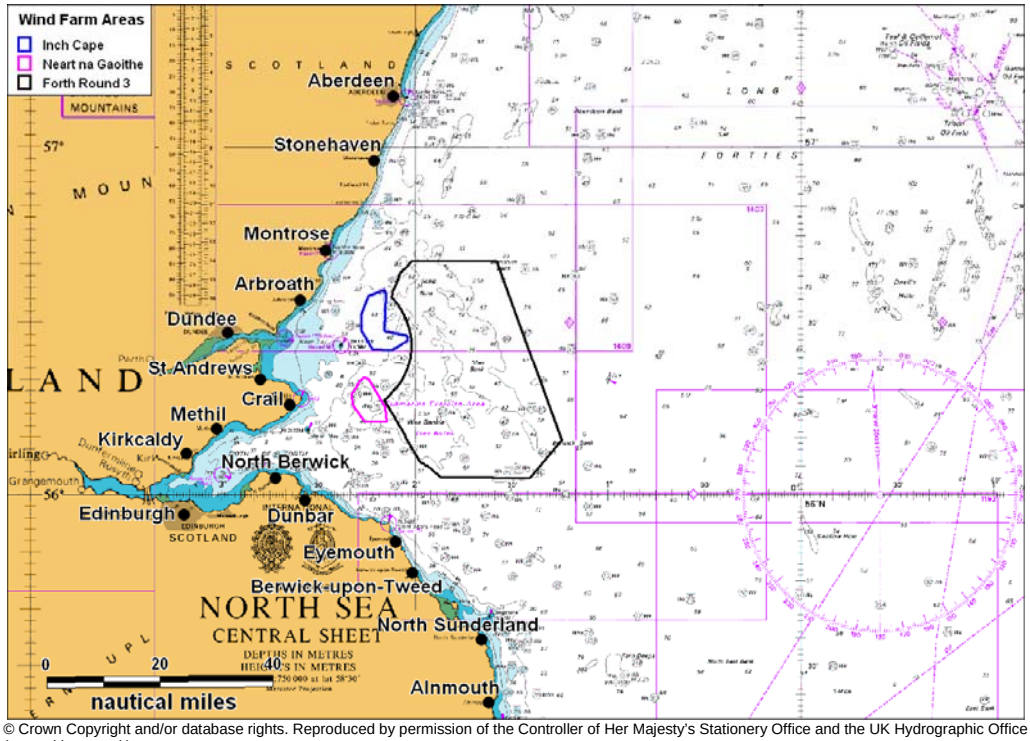

Figure 3.1 General Chart Overview of the Forth Wind Farm Developments

A summary of the locations of the outer Firth of Forth and Tay wind farm developments are given below:

- Firth of Forth Round 3 Zone – 12.1 nautical miles (nm) north east of St Abb's Head;
- Neart na Gaoithe – 8.7nm east of Fife Ness; and
- Inch Cape – 8.4nm ESE of Red Head (north of Arbroath).

4 Data Sources

4.1 Overview

The main data sources used in this assessment are listed below:

- FTOWDG Automatic Identification System (AIS) data;
- UK Coastal Atlas of Recreational Boating;
- Marine aggregates dredging data from The Crown Estate and British Marine Aggregates and Producers Association (BMAPA);
- UK Admiralty Charts;
- Admiralty Sailing Directions (NP 54);
- Fishing Vessel Monitoring Systems (VMS) (2006 & 2008) and over flight data (2005-09);
- Master Mariner Experience (Ref. vi); and
- Shipping Operator Stakeholder consultation responses/comments.

Details of each data source are summarised in the following sections:

4.2 FTOWDG AIS Data

Two sets of AIS data have been used for this project:

- Coastal Station collected AIS data; and
- Vessel collected (*M.V. Clupea*) AIS data.

AIS data was collected from August 2009 to July 2011 from four strategic coastal locations at Stonehaven, Dundee, Inner Forth and Dunbar.

As per MCA MGN 371 requirements a representative 28 day period of AIS data has been used in this analysis. The 28 days data set includes 14 days from November 2010 and 14 days from June 2011 selected to demonstrate annual and seasonal variations.

Additional vessel based AIS surveys were also undertaken on the survey vessel *Clupea* between November 2010 and February 2011 whilst she was operating within the Firth of Forth. This AIS data was processed and used to validate the coastal AIS data and ensure it provided a comprehensive overview of shipping activity in the outer Firth of Forth and Tay areas.

4.3 Recreational Data

The Royal Yacht Association (RYA), supported by the Cruising Association (CA), who represent the interests of cruising sailors and motor-boaters worldwide, have identified recreational cruising routes, general sailing and racing areas for UK waters. This work was based on extensive consultation and qualitative data collection from RYA and CA members, through the organisations' specialist and regional committees and through the RYA affiliated clubs. The consultation was also sent to berth holder associations and marinas. The results of this work were published in Sharing The Wind (Ref. vii) and updated Geographic Information System (GIS) layers published in the Coastal Atlas (Ref. viii). Data from 2010 has been used for this study.

4.4 Aggregates Data

Aggregates dredging data (licence areas and active areas) were supplied by BMAPA and The Crown Estate. A desk based study was carried out using this information to identify commercial aggregates dredging activity in the region.

4.5 UK Admiralty Charts

Admiralty charts are nautical charts issued by the United Kingdom Hydrographic Office (UKHO) and are subject to Crown Copyright (licence number 15783). The charts have been used to consider approaches and entrances to ports and harbours in the area. The charts also include data on water depths (chart datum), coastline, buoyage, land and underwater contour lines, seabed composition (for anchoring), hazards, tidal information ("tidal diamonds"), traffic separation schemes, lights, and in short anything which could assist navigation in this area to ensure it is fully considered within this regional work. The following are the main charts used in this study:

- 1407 – *Montrose to Berwick-upon-Tweed;*
- 1409 – *Buckie to Arbroath;*
- 273 – *North Sea Offshore Charts (Sheet 7);*
- 2182B – *North Sea Central Sheet; and*
- 2 – *British Isles.*

4.6 Admiralty Sailing Directions

The principal navigational features and ports/harbours are those listed in Admiralty Sailing Directions for the area. A desk based study was carried out using the North Sea (West) Pilot (NP 54).

4.7 Fishing VMS and Over Flight Data

Data on fishing vessel sightings were obtained from Marine Management Organisation (MMO), who ensure the fishing industry's compliance with UK, EU and international fisheries laws through the deployment of patrol vessels, surveillance aircraft and the sea fisheries inspectorate. Each patrol logs the positions and details of all fishing vessels (UK and

non-UK) within the Rectangle being patrolled. Data were obtained for the five-year period 2005 to 2009. Section 8.2 presents the sightings data analysis.

Fishing satellite vessel monitoring is also carried out by MMO as part of the sea fisheries enforcement programme, to track the positions of fishing vessels in UK waters. It is also used to track all UK registered fishing vessels globally. Data was analysed in Section 8.3 for UK and non-UK vessels (2009).

4.8 Master Mariner Experience

Routeing and deviations predicted for shipping passing through the region following development of the three wind farms were cross-referenced against Master Mariner experience of the area and likely passage plans (Ref. vi).

4.9 Stakeholder Consultation

Refer to Section 5.

5 Consultation

5.1 Introduction

Consultation on navigational issues has been carried out during this project to gather input from the marine community. It was carried out using three different methods as follows:

1. **Meetings**
   Meetings were held with the following:

   - The Chamber of Shipping;
   - Forth Ports;
   - Northern Lighthouse Board (NLB);
   - Department for Transport (DfT); and
   - Maritime and Coastguard Agency (MCA).

2. **Marine Stakeholder Consultation (Remote Consultation)**
   The most regular vessels using the area were identified and provided with an information pack detailing the proposals. The information pack requested feedback on the proposals and also invited further consultation should the stakeholder consider this necessary.

3. **Presentations**
   A presentation was given to The Royal Tay Yacht Club on the 6th March 2011 in Broughty Ferry.

The main meetings held were minuted and remote consultation recorded. A summary of the main consultation feedback is provided in the following sections with records of the consultation being provided in Appendix A.

5.2 The Chamber of Shipping

A meeting was held at The Chamber of Shipping offices in London on 11th January 2011. The objective of the meeting was for FTOWDG to present an overview of the regional shipping and navigation study approach, to seek a preliminary response from The Chamber of Shipping on the study methodology and proposed strategy to communicate the findings to key shipping and navigation stakeholders.

A summary of the main points is provided below:

<u>General Information and Vessel Activity:</u>

- The scope of the regional study was considered and FTOWDG, stated that the Forth Array project was not being considered as part of this regional assessment.

- The regional navigation overview was provided and The Chamber of Shipping stated that FTOWDG should consider 'entire route impacts' – not just Scottish sections and FTOWDG confirmed that this is the approach.

- The Chamber of Shipping stated that FTOWDG need to consider ship-to-ship transfers (which were proposed near the entry of the Firth of Forth in 2008). These ships have deeper draughts (up to 23 metres (m)) and need to be considered in the assessment. (It is noted that at the time of writing in January 2012 regulations were to be implemented by the UK Government which would ban ship-to-ship transfers in open water with the exception of off the Suffolk coast. Therefore rules would prevent oil transfers occurring outside port/harbour authority limits, (for example in the outer Firth of Forth off Bass Rock and Isle of May)).

- It was noted at the Forth Ports meeting in January 2011 that no ship-to-ship transfers take place in the Outer Forth area.

<u>Shipping Routes:</u>

- The Chamber of Shipping also commented on a number of the shipping routes which pass through the region (See Section 10.3 and Figure 10.3 for current routes and Figure 12.19 for the alternative routes). Their main comments were as follows:

    - Route 1 (shipping passing through the Forth Zone north/south from Aberdeen to north east England) – current alternative route scenario (vessels will pass east of all of the developments) is worthy of consideration, however it limits ships to 'non-sheltered waters', providing them with no inshore route for over 30 miles (assuming the entire Forth Zone is developed). Dialogue with vessel operators and seasonal AIS data could provide some information about current navigation strategies in extreme weather circumstances.
    - Route 4 (shipping passing through Inch Cape and the Forth Zone from Montrose to Holland) – Merging traffic issues (tankers and cargo affected). The alternative route scenario presented (vessels will pass west of developments/inshore) increases the density of shipping along an existing shipping route east and west of Bell Rock. Safety concerns raised by The Chamber of Shipping. Should also consider alternative route between Inch Cape and Neart na Gaoithe.
    - Route 6 and 9 (coastal shipping passing west of Inch Cape and Neart na Gaoithe from northern Scottish ports to the Forth (Route 6 is east of Bell Rock and Route 9 is west of Bell Rock)) – Use of shipping route north of Isle of May – The Chamber of Shipping stated that this route was used due to the high volume of traffic entering the Firth of Forth south of Isle of May. Safety concerns were raised by The Chamber of Shipping over the proposed alternative scenario (vessels will pass west of developments/inshore) due to increasing the volume of vessel traffic along an existing route. Need to assess 'safe passage' and probability of collision risk resulting from all alternative

route scenarios being considered in the regional study. Dialogue with vessel operators could provide some information about current strategies in use when navigating east and west of Bell Rock.

- In general discussion The Chamber of Shipping stated that even one vessel per day on any given route could be strategically important and must therefore be given due consideration in the regional shipping and navigation study.

- The Chamber of Shipping supports the concept of shipping lanes through offshore wind farm sites. Future designated shipping lanes within the UK will provide clarity for prospective offshore wind farm developers. (It was noted by FTOWDG developers that no plans for designated shipping lanes are proposed for the outer Firth of Forth and Tay region.)

5.3 Forth Ports and Northern Lighthouse Board

A meeting was held with the Forth Ports in January 2011. The objective of the meeting was for FTOWDG to consult with the main port authority in the area (Forth Ports Plc.) and also NLB. A summary of this meeting is provided below.

Vessel Activity in the Region:

- Forth ports have 20-22 movements per day. They stated that this is not that busy in terms of the number of movements, but is significant in terms of tonnage.

- Oil and gas accounts for 80-90% of Forth Ports' business, in addition to approximately 60 cruise liner visits during the summer.

- BP lost the contract (regarding coastal tankers routeing to/from Grangemouth), hence the *Border* vessels now mainly work out of Immingham. These vessels now pass further east when supplying fuel to ports around Scottish coast.

- It was noted that no ship-to-ship transfers take place in the Forth area as government regulations only permit ship-to-ship transfers inside their port limits. In addition, it was stated that anchorages are generally further inshore as depicted on admiralty charts.

- There is no major tidal variation in the sea area. The vessels will sit at anchor as opposed to slowing down in the North Sea.

- It was thought that it is probably personal preference as to why vessels go east/west of Bell Rock. However it was also suggested that smaller vessels travel closer to the coast for shelter. Further details on the vessel sizes on each route are presented in the detailed routeing analysis section (Section 11).

- If fishing pots are in a navigational channel, they can be moved, for example if they are located within port limits, approaches etc.

- The sand eel fishery has been suspended on Marr Bank, which was mostly operated by Danish fishing vessels.

Issues Discussed:

- General concerns were expressed regarding smaller vessels being pushed further offshore and the impact this would have on them being pushed further east and hence out in heavier weather.

- Forth Ports felt the impact could be reduced by having a route through the middle of the developments between Neart na Gaoithe and Inch Cape for the deviated route from both Forth and Dundee.

- In general it was thought it best vessels went to the east as opposed to having a north/south channel through the Forth Zone.

- It was stated that cargo/container vessels are working to small profit margins, so any deviation (even a small percentage) could potentially be damaging, from a commercial prospective. Containers and general cargo will be the greatest concern regarding this issue.

Future Developments:

- Future developments in the Forth include the potential for 3-4 biomass plants, which if constructed could bring in an increased number of large bulk carriers through the region.

5.4 Department for Trade and Maritime and Coastguard Agency

A meeting was held with DfT and MCA in January 2011. The objective of the meeting was for FTOWDG to consult and discuss the collaborative works and outline each of the projects and the subsequent development programmes. A summary of this meeting is provided below.

Background and Data Collection:

- There was a discussion around the exclusion of Forth Array from the cumulative regional assessment. FTOWDG explained that there had been consultation with The Crown Estate who advised the group not to include the Forth Array site.

- MCA discussed the datasets used in the analysis and asked that AIS, VMS, Catch Data and radar data are included in the final regional assessment. It was noted that the current data set was only for 28 days AIS and the intention is to expand the study

covering the longer term data collection across the region. (AIS shipping data provided in the report covers the combined survey period from August 2009 to July 2011).

- It was highlighted that the AIS data tracks showed poor coverage in the south of the Firth of Forth Zone and it was informed that the data used was from last year's collection (2010). In response to this it was noted the recording station in the south of the region had since been re-located by the data providers to enable greater coverage in this area (which can be observed from AIS data from 2011 as presented in Section 9.1).

Shipping Routes:

- A preliminary analysis of the regional AIS data including the collaborative work (to date) was presented along with the proposed changes to the main shipping routes through the area.

- The following comments were made by on a number of the revised routes presented – (details can be found in Section 10.3 / Figure 10.3 for current routes and Figure 12.19 for the alternative routes):

    - Route 1 – MCA recommended that all the routes were shown to be the appropriate distance away from the turbines or site boundary (in accordance with Marine Guidance Note 371 guidance). A possible issue raised was that Route 1 and Route 3 vessels could be in radar contact with turbines for at least three hours which is considered to be a long time.
    - Route 4 – MCA suggested that this route could create congestion around Bell Rock and near the mouth of the Firth of Forth and that alternatives should be considered. Stakeholders are likely to be uncomfortable with this change, (it is noted that additional 'alternative routes' are also presented where vessels route north and east of the developments, further from shore). MCA noted that a route south of Inch Cape, north of Neart ne Gaoithe and west of the Zone or a route to the north of Inch Cape and the Zone could also be considered.
    - Route 6 – MCA suggested that further investigation was made into the patterns and reasons behind vessel movements around Bell Rock. Further details on the vessel sizes on each route are presented in the detailed routeing analysis section (Section 11).

General Points:

- Overall the MCA were supportive of the approach taken in the regional assessment, however they are of the opinion that the majority of stakeholders are likely to be uncomfortable with many of the route change proposals, especially those around Bell Rock. Without stakeholder support the MCA would be unable to support the route changes.

- MCA requested further analysis to understand the percentage of traffic in the area that comprises regular running vessels as this would help to identify the appropriate stakeholders to meet/consult with. Regular vessel operators were identified from the FTOWDG AIS data and contacted for feedback on the regional development proposals – details of the responses are presented in Section 5.5 and Appendix A.

- It was also noted that with regard to vessel draught it would be better to look at maximum draught rather than average. (This is considered within the detailed routeing analysis section (Section 11).

- It was emphasised that the assessment must consider what hazards are created by the suggested route changes and that reference to potential impacts of turbines on radar and how this is impacted on the route changes. Sections 12 and 13 of the report present the revised routeing and comparison of these changes for the region. In addition, it is noted that due to uncertainty in turbine layouts and designs the regional study has focused on the three developments application/lease boundaries.

- The MCA suggested that when looking at all the routes in and around Bell Rock, an assessment needs to be made on the increase in shipping densities and encounters. It is noted that a comparison of current and predicted/simulated changes in shipping around the developments is presented in Section 13.

- There may be some value in proposing a recommended routeing system rather than a full traffic separation. In addition, MCA indicated that could try to see what information exists already on recommended routeing in the area.

- DfT asked that offshore accommodation, maintenance, Search and Rescue (SAR) were considered by the developers later in the individual projects.

- The MCA requested that they are kept informed of the progress and of any meetings being held with stakeholders and that they may send a representative to meetings (if availability allows).

5.5 Marine Stakeholder Consultation

An analysis of AIS shipping data was carried out to identify the regular vessels using routes within the outer Firth of Forth and Tay. Shipping operators were identified and contacted for feedback on the potential impact of the proposals on the navigation. An 'Information Pack' was sent to gain feedback from marine operators and vessel contacts. A summary of the main feedback received is presented below.

DFDS (Rosyth – Zeebrugge route):

- The area in question will not require DFDS to re-route from normal approaches on the passage between Zeebrugge and Rosyth.
- Based on this DFDS stated they do not need to be kept informed unless anything changes to the area under discussion.

Solstad (offshore vessels):

- The developments will not affect operations. In general port callings are to Aberdeen or Peterhead.

- If vessels pass through the region following construction of the three developments, Solstad indicated that they would not have any problems navigating through the wind farms.

Marine Scotland - Compliance (views from different fisheries law enforcement vessels):

- *MPV Jura* comments were that when entering and leaving the Firth of Forth they would not be significantly impacted. *MPV Jura* can work west of the Bell Rock to monitor compliance with St Andrews Bay closed area, and the Gourdon Box further north. It was noted that the prevailing wind is south westerly in this area; it is not perceived to pose any problems within the proximity of the wind farms. It was also stated by that with a north easterly to south easterly (onshore wind) the vessel officers are likely to make an assessment if it considered feasible to take the 'inshore' route via Bell Rock, or to transit further east prior to turning and passing east of the wind farms.

- *MPV Minna* made comments on AIS Data collected and vessels not carrying this equipment. They raised questions on if vessels would be able to navigate through the wind farms. In addition, they raised questions towards the possible environment impact from the wind farm development. In addition, operators of *MPV Minna* noted that the entire development areas do not leave much room to manoeuvre in a gale.

- General notes were made on the size of the three developments and that two sites were located within STWs which could potentially result in vessels routeing in shallower water (off Bell Rock and the coastline) rather than detouring east (of the Round 3 Zone). This could be further impacted by an Easterly or south Easterly gale.

Transmarine Management ApS (tankers bound for Dundee):

- Transmarine Management ApS noted that initial findings were that when ships are bound to Dundee (in-ward) the developments are not a problem, however when departing Dundee for Skaw (Skagen), Denmark they will require re-routeing.

- Therefore Transmarine Management ApS stated they will need to deviate for a total of approximately 40nm to go around each time. So there will be additional passage time, costs and fuel used.

Northern Lighthouse Board (NLB) (view from service vessels):

- NLB stated their main role is providing safety of all at sea in the waters surrounding Scotland and the Isle of Man and in pursuance of this role NLB will access all sea areas around the coast and not be limited to regular sea routes or shipping lanes.

- NLB also require to conduct operations involving airlifting cargo and equipment to our sites during maintenance periods.

- NLB summarised that although vessels would not be directly affected by the installation of offshore wind farms within the Forth and Tay area, they would however respond directly through the consenting and licensing process, ensuring a Navigational Risk Assessment (NRA) is carried out for each development and raising any issues specific to the intended site.

SAGA Cruises (cruise vessels)

- On a small number of occasions SAGA Cruises noted the use of Leith for embarking customers, (i.e. once a year). SAGA also operates up to ten cruises a year that operate around the UK, which may or may not transit the East Coast of Scotland.

- SAGA Cruises stated that on cruises that travel to the north of the region vessels would be forced to travel inshore of the ideal route, particularly by the Inch Cape development. However this would not be a major issue for SAGA Cruises and would add little distance onto the planned route.

- To summarise SAGA Cruises noted that in general the proposals do not pose a safety risk to their vessels; however they would like to be retained on the list of Marine Stakeholders.

Fred Olsen Cruises (cruise vessels):

- Fred Olsen Cruise vessels stated that they transit through the area, especially during the summer months, however they have no concerns regarding the impact on their operations.

James Fisher Everard (coastal tankers bound for Forth, Tay and Northern Ports):

- It was noted that James Fisher Everard have discussed the regional proposals with their Marine team, and have no comments at this time (27th May 2011).

Armac Marine Management Ltd (cargo vessels bound for Montrose):

- Armac Marine Management Ltd stated that some routes in the area will be affected, however provided that the constructions are adequately marked and correctly charted they do not have any concerns regarding safe navigation, (this was the opinion of several Masters in Armac Marine Management Ltd at the time of response in June 2011).

6 Navigational Features and Ports

6.1 Navigational Features

Figure 6.1 presents an overview of the main navigational features in the vicinity of the proposed wind farm developments.

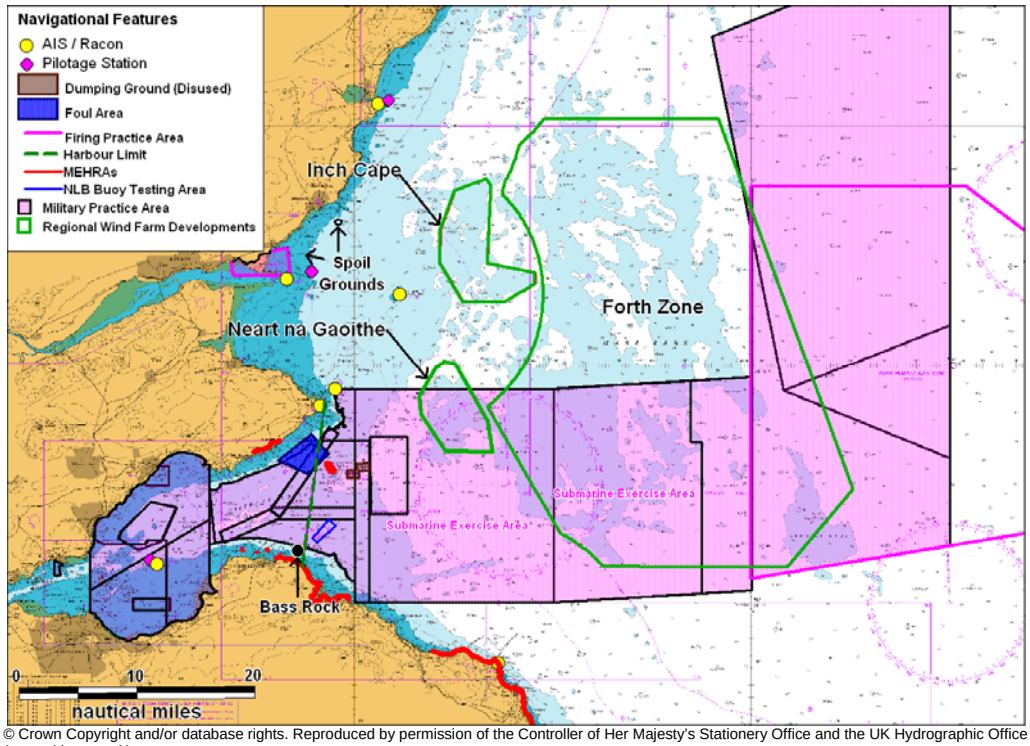

Figure 6.1 Overview of Navigational Features in the Region

Submarine practice exercise areas intersect part of the Neart na Gaoithe site and Firth of Forth Zone, with general firing practice areas within the Firth of Forth, Buddon Ness and north west of Berwick Bank (in the southern section of the Forth Zone). No restrictions are placed on the right to transit firing practice areas at any time. Exercises and firing only take place when the areas are considered to be clear of all shipping.

The only aggregate dredging license in Scotland (leased to Westminster Gravels Ltd) was located within the inner Firth of Forth, approximately 30nm south east of the Neart na Gaoithe. It is noted that the 10 year lease between Westminster Gravels Ltd and the Crown Estate ended in January 2011.

The International Maritime Organisation (IMO) recommends that laden tankers should avoid the area between Bass Rock and the coast (due to water depth restrictions).

Marine Environmental High Risk Areas (MEHRAs) as identified by the UK Government are areas of environmental sensitivity and at high risk of pollution from ships. Areas around the Fife/East Lothian coastline, Bass Rock and the Isle of May are classified as MEHRAs (identified in 2002).

The UK Government expects mariners to take note of MEHRAs and either keep well clear or, where this is not practicable, exercise an even higher degree of care than usual when passing nearby.

6.2 Ports

The main ports and marinas in the region from Montrose (in the north) to Eyemouth (in the south) are presented in the Figure 6.2.

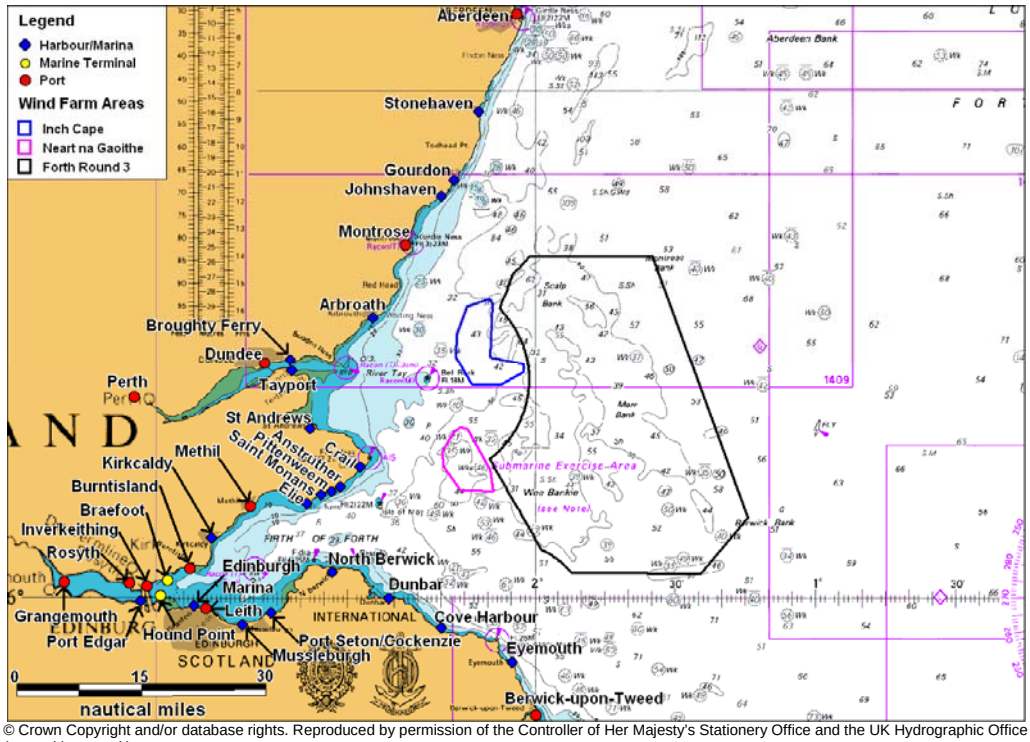

Figure 6.2 Overview of Ports and Marinas in Region

The ports, marine terminals, harbours and marinas are summarised below based on a review of the Admiralty Sailing Directions North Sea (West) Pilot (NP 54).

<u>North & East of the Firth of Tay (Buddon Ness):</u>

- Aberdeen – the port is the main marine support centre for the North Sea oil and gas industry. In addition to the oil and gas support services there are regular shipping services to Orkney, Shetland and Scandinavia via roll on/roll off (Ro-Ro) services for

passengers and cargo. Aberdeen also has a large modern fish market and although there are no commercial fisheries within the area of jurisdiction of Aberdeen Harbour or proximity, deep-sea fishing vessels and a number of locally registered potters land their catches at the Aberdeen fish market located at Palmerston Quay. The maximum size of a vessel accommodated is 160m, beam 23m and draught of 9.1m.

- Stonehaven – formerly a fishing port, now mainly used by recreational craft and a small number of inshore fishing boats. The maximum size of a vessel accommodated is 34m and draught of 3m.
- Gourdon – this is a fishing station 1 mile SSW of Inverbervie. There is an outer harbour and a breakwater, which is used by recreational vessels. The main harbour is used by fishing vessels.
- Johnshaven – the harbour dries and consists of two basins separated by a jetty. The harbour provides shelter for fishing boats in all weathers.
- Montrose –formally a small commercial and fishing port but has seen an increase in its commercial activity over recent years, mainly as a result of the offshore industries. Vessels up to 165m in length and 7m in draught can be accommodated.
- Arbroath - mainly a fishing port used by medium and small fishing vessels. Also has a small marina for sailing vessels.

Tay Ports:

- Broughty Ferry – harbours a lifeboat station, with one All-weather lifeboat (ALB) and one Inshore-lifeboat (ILB).
- Dundee – the port handles general cargo and imports of crude oil. The repair and servicing of offshore gas and oil installations is undertaken also. Vessels with a maximum length of 250m, beam 50m and draught up to 9m can normally be accommodated.
- Perth – handles about 100,000 tonnes of cargo a year, mainly agricultural products, sand, chemicals and forest products. The largest vessel received at the port was 94.7m in length in 2009.
- Tayport Harbour – is a small tidal harbour and marina which dries on low tide.

East Neuk and St Andrews:

- St Andrews – minor harbour used by small fishing vessels, potters and recreational craft.
- East Neuk harbours (including Crail, Anstruther, Pittenweem, Saint Monans and Elie) are mostly used by small to medium sized fishing vessels and recreational craft.

Forth Ports:

- Methil – a commercial port handling wood pulp and timber, fertiliser, stone and general cargoes. The maximum size of vessel handled is up to 102m in length, 14.6m beam and 5.5.m draught.

- Kirkcaldy – little or no commercial traffic and is mainly used by local fishing vessels.
- Burntisland – small commercial port handling general cargo. The maximum size of vessel handled is 122m in length, beam 16.8m and draught 6.7m.
- Breafoot Gas Terminal – is situated on the north west side of Mortimer's Deep on the north bank of the Firth of Forth. It is a gas tanker terminal serving the Mossmorran petro-chemical complex. The maximum size of vessel handled is draught of 10.8m.
- Inverkeithing – vessels up to 90m in length (approx.) load scrap at the Deep Water Berth and No 1 Berth. Smaller vessels up to 70m load stone at the quarry berth.
- Rosyth – is a commercial port handling general cargo and cruise liners. Additionally there is a Ro-Ro passenger and freight service to Zeebrugge. There is no restriction on length and beam for vessels using the tidal harbour but the maximum permitted draught is 7.8 m. It is noted that de-commissioned nuclear submarines are also located in the Royal Dockyard.
- Grangemouth – handles all types of vessels including container vessels, tankers and Liquefied Petroleum Gas (LPG) carriers, with a maximum draught to of 11.7m at the entrance lock at high water.
- Port Edgar – accommodates a yacht marina, with vessels up to 18m in length using the harbour at all states of the tide.
- Hound Point Oil Terminal – is on the western extremity of the Forth Deep Water Channel. The terminal can accommodate tankers of draught 21.64m (springs) and 20.71m (neaps) tides.
- Edinburgh Marina (Granton Harbour) – formerly a small commercial port, now used by leisure craft.
- Leith – the port for Edinburgh and handles cruise liners, general cargoes and dry and liquid cargoes in bulk. It is also a support base for the North Sea offshore industry. The port can accommodate vessels up to 210m in length, beam 30m draught 9.1m, however larger vessels can be accommodated dependant on the high tide.
- Musselburgh – mainly used by recreational vessels up to 18m in length and 2m in draught.
- Port Seton/Cockenzie – used by small to medium sized fishing vessels and a number of recreational craft.

<u>South & East of the Forth:</u>

- North Berwick – mainly used by recreational vessels and a small number of fishing boats.
- Dunbar – used for landing fish and recreational vessels.
- Cove Harbour – a small fishing harbour.
- Eyemouth – busy fishing harbour, with marina facilities.
- Berwick-upon-Tweed – is a small commercial and fishing port. The largest vessel that can be handled is length 115m (with a bow thruster), beam 16.5m and a draught of 4.6m at high water springs and 3.7m at high water neaps.

7 RECREATIONAL REVIEW

7.1 Overview

An overview of the recreational sailing activity and facilities in eastern Scotland and north eastern England is presented in Figure 7.1. This is based on the latest RYA data (2010) as described in Section 4.3.

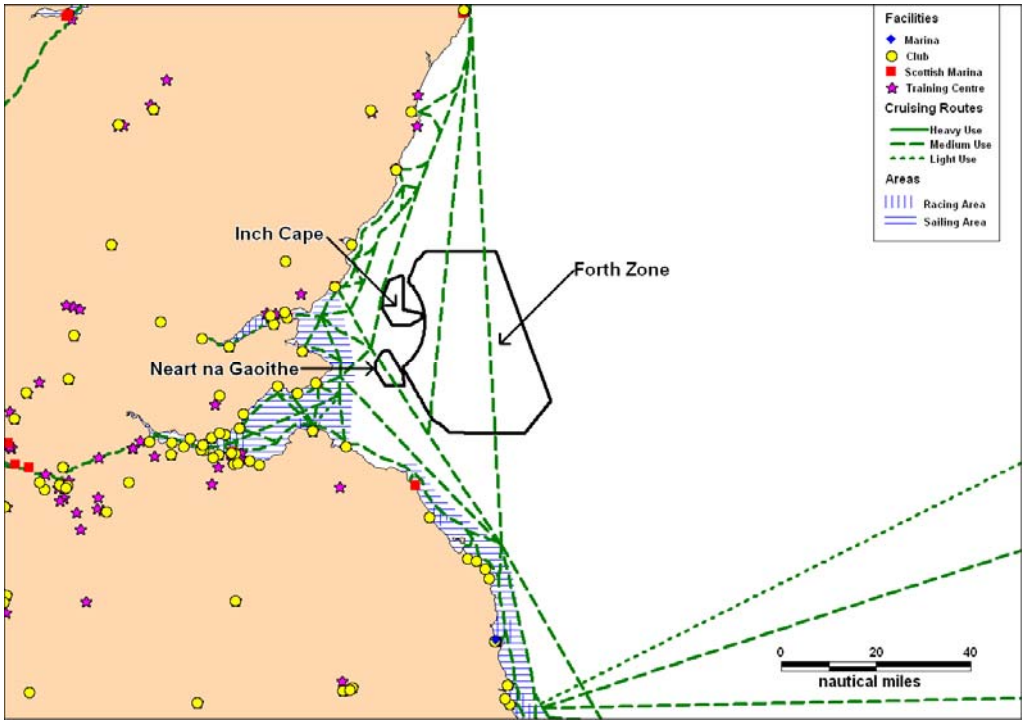

Figure 7.1 Recreational Information for Eastern Scotland and North East England

Recreational boating, both under sail and power is highly seasonal and highly diurnal. The division of recreational craft routes into 'Heavy', 'Medium' and 'Light' use is therefore based on the following classification:

- Heavy use cruising routes: - Very popular routes on which a minimum of six or more recreational vessels will probably be seen at all times during summer daylight hours. These also include the entrances to harbours, anchorages and places of refuge.
- Medium use cruising routes: - Popular routes on which some recreational craft will be seen at most times during summer daylight hours.
- Light use cruising routes: - Routes known to be in common use but which do not qualify for medium or heavy classification.

The recreational vessel activity and facilities in the vicinity of the Firth of Forth and Tay wind farm developments are presented in Figure 7.2.

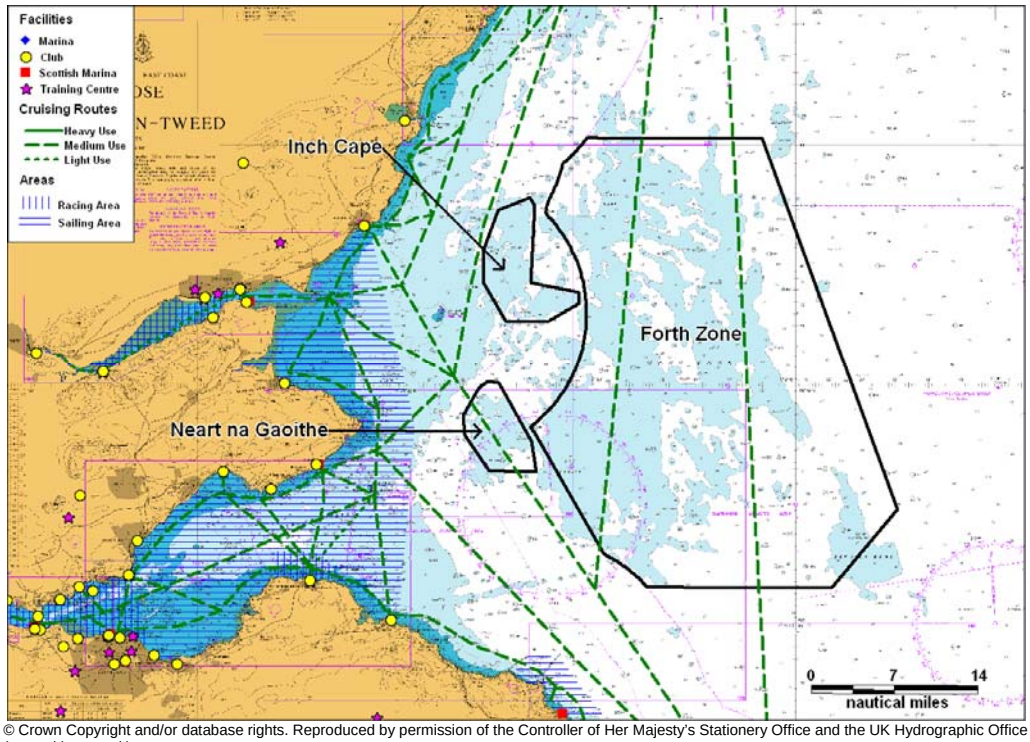

Figure 7.2 Detailed Recreational Data for Region

Based on the RYA published data, Neart na Gaoithe is approximately 4nm east of the general sailing areas off the Fife coast, Inch Cape is 8nm east of sailing areas in the outer Tay and the Forth Zone is 9.5nm north east of sailing areas off Saint Abb's Head. There is one 'medium use' cruising route passing through Neart na Gaoithe and two 'medium use' cruising routes passing through the Forth Zone, heading from the Tay, Arbroath and Scottish marinas to north eastern English marinas including Amble and South Shields.

In terms of facilities, there are established marinas at Anstruther, Tayport, Arbroath, Eyemouth and within the Firth of Forth. A full description of harbours and marinas is provided in Section 6.2.

7.2 Summary of Potential Impacts

The following potential impacts were highlighted within Section 2.1.

- Collision;
- Foundering;
- Contact;
- Loss of sailing area;

- Radar impacts;
- Diverting from route;
- Increase in fuel costs; and
- Time costs.

By review, the AIS and radar survey data gathered to date recorded limited recreational activity within the outer Firth of Forth and Tay region. However, as shown in Figure 7.2 the recreational sailing atlas indicates that medium use cruising routes pass through two of the developments, with a higher density of recreational activity taking place off the Fife and within the Firth of Forth and Tay.

The main potential impacts are therefore more likely to relate to the navigation of recreational vessels further offshore, in closer proximity to the proposed developments.

With an assumed turbine blade clearance over 22m at lowest astronomical tide (LAT), buoyage and marking on admiralty charts, vessels will be able to navigate between the wind farm turbines in a safe manner. As a result it is expected that the potential impacts will be low overall, with the main hazards likely to be associated with these smaller craft as they exit the sites in proximity to shipping routes.

It is noted that these conclusions assume that appropriate mitigation measures are put in place as identified from project hazard workshops with key stakeholders, (for example marking of turbines on admiralty charts, lighting and recommended blade clearance >22m) and that the spacing between turbines is adequate to allow safe navigation by these vessels.

It is also highlighted that alignment of turbines may require further discussion with relevant stakeholders. However, from initial feedback following a consultation meeting at Royal Tay Yacht Club this did not appear a major concern.

8 FISHING REVIEW

8.1 Overview

This section reviews the fishing vessel activity within the region based on surveillance and satellite data for the area. A plot of fishing vessel tracks recorded during the maritime shipping surveys is also presented in the AIS Shipping Data section (Figure 9.16).

8.2 Surveillance Data

Fisheries statistics in the UK are reported by International Council for Exploration of the Sea (ICES) statistical Rectangles and Subsquares. The three developments are located within ICES Rectangles (41E7, 42E7, 41E8 and 42E8) as shown in Figure 8.1.

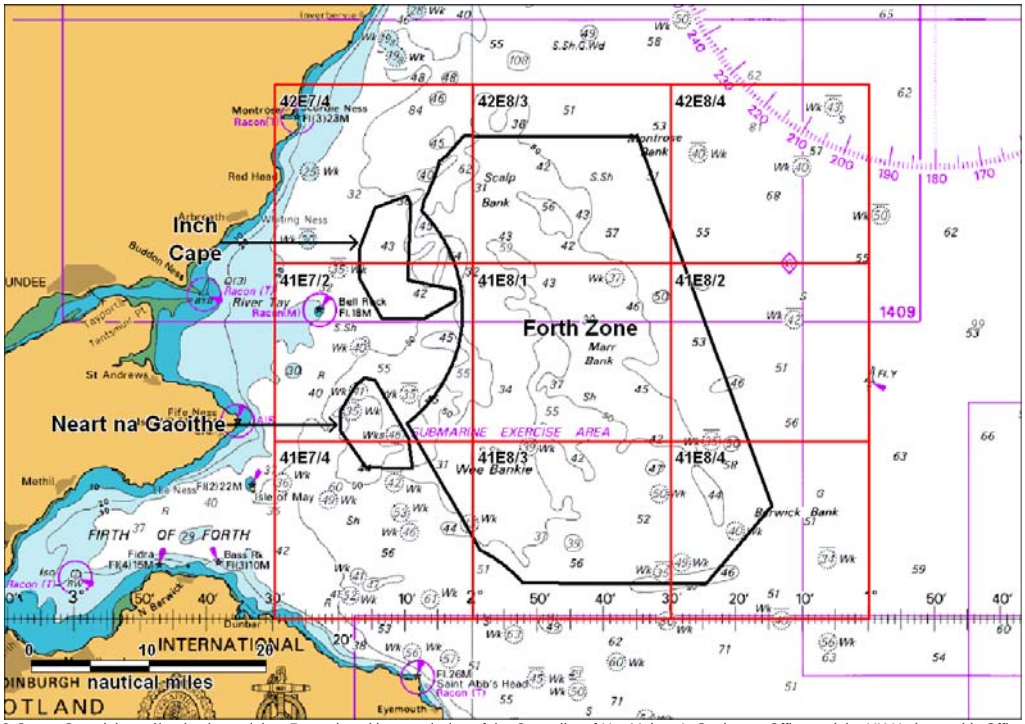

Figure 8.1 ICES Subsquares Encompassing the Proposed Developments

Data on fishing vessel sightings were obtained from Marine Scotland Compliance, who ensure the fishing industry's compliance with UK, EU and international fisheries laws through the deployment of patrol vessels, surveillance aircraft and the sea fisheries inspectorate.

Each patrol logs the positions and details of all fishing vessels (UK and non-UK) within the Rectangle being patrolled. All vessels are logged, irrespective of size, provided they can be identified by their Port Letter Number (PLN).

Data were obtained for the five-year period 2005 to 2009. Analyses are presented within the following subsections.

8.2.1 Sightings per Patrol

The numbers of fishing vessel sightings, surveillance patrols and hence average sightings per patrol within each ICES Subsquare encompassing the proposed wind farm sites in the five-year period 2005-09 are presented in Table 8.1.

Table 8.1 Average sightings per patrol (2005-09)

ICES Subsquare	Sightings	Patrols	Sightings per Patrol
41E7/2	154	264	0.6
41E7/4	129	184	0.7
41E8/1	22	57	0.4
41E8/2	2	32	0.1
41E8/3	17	12	1.4
41E8/4	0	44	0.0
42E7/4	209	326	0.6
42E8/3	82	151	0.5
42E8/4	7	73	0.1

Therefore, the Subsquares had an average of approximately 1 fishing vessel sighting every two patrols. Subsquare 41E8/3 had a slightly larger average sighting per patrol due to the low number of patrols.

8.2.2 Sightings Nationality Analysis

The fishing vessel sightings colour-coded by nationality are presented in Figure 8.2.

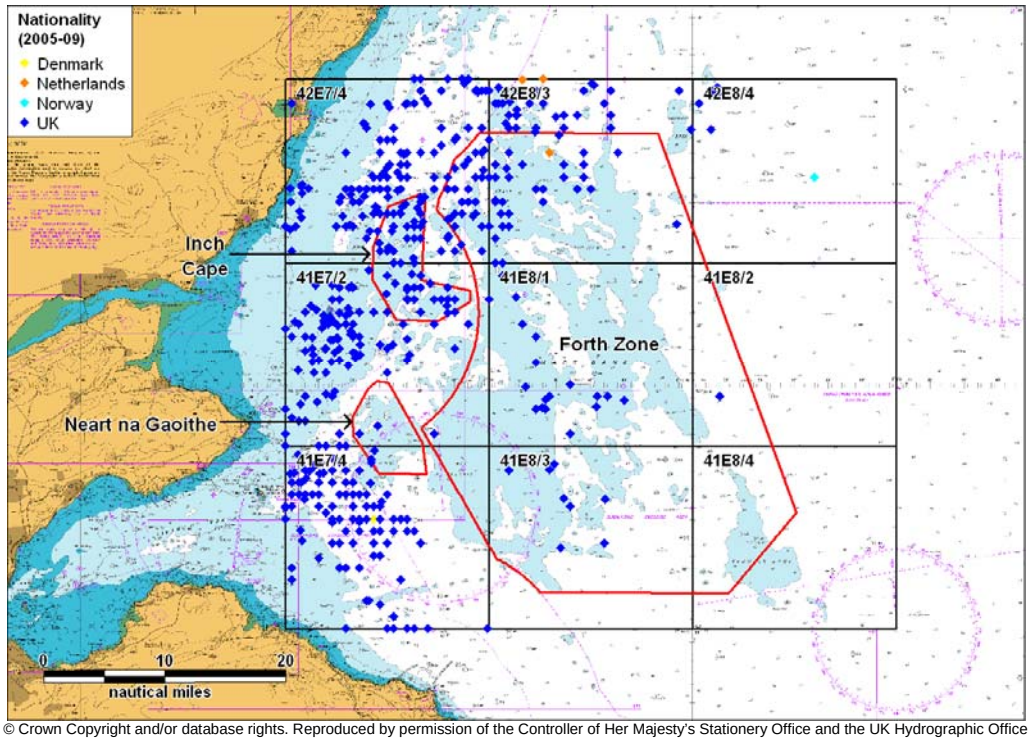

Figure 8.2 Fishing Vessel Sightings by Nationality (2005 – 2009)

It can be seen that all but four fishing vessel sightings were UK-registered with one Danish fishing vessel and three Dutch vessels recorded.

8.2.3 Sightings Gear Analysis

The fishing vessel sightings colour-coded by gear type are presented in Figure 8.3.

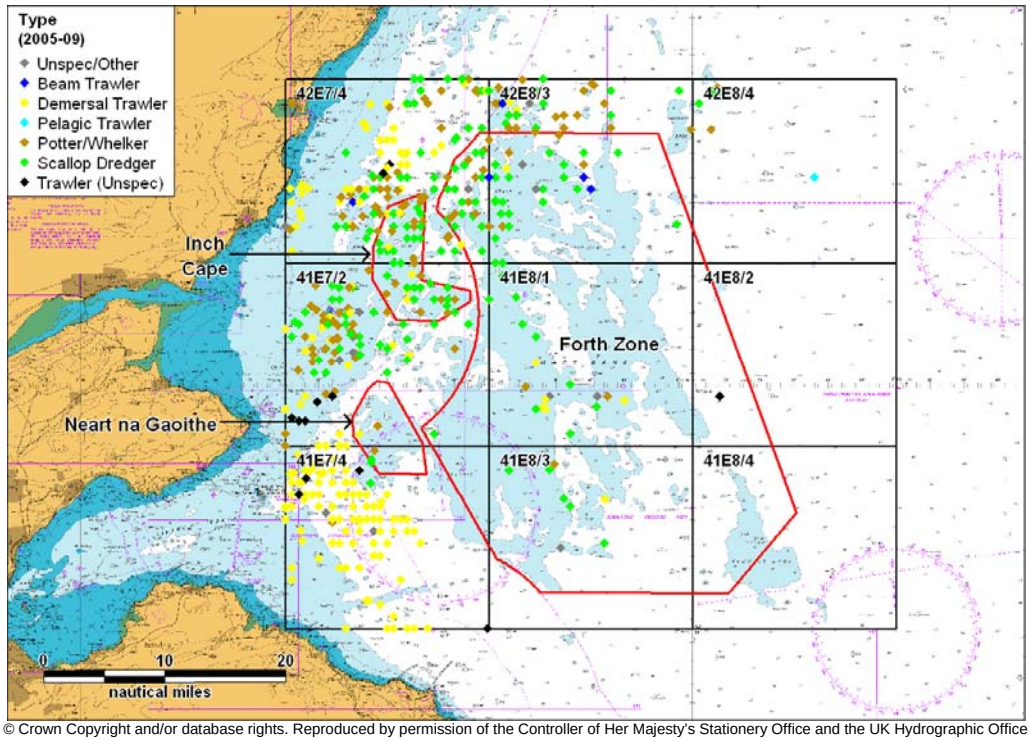

Figure 8.3 Fishing Vessel Gear Types

The main fishing methods were scallop dredging (37%), demersal stern trawling (32%) and potter/whelkers (24%).

8.2.4 Sightings Activity Analysis

The fishing vessels colour-coded by activity when sighted are presented in Figure 8.4.

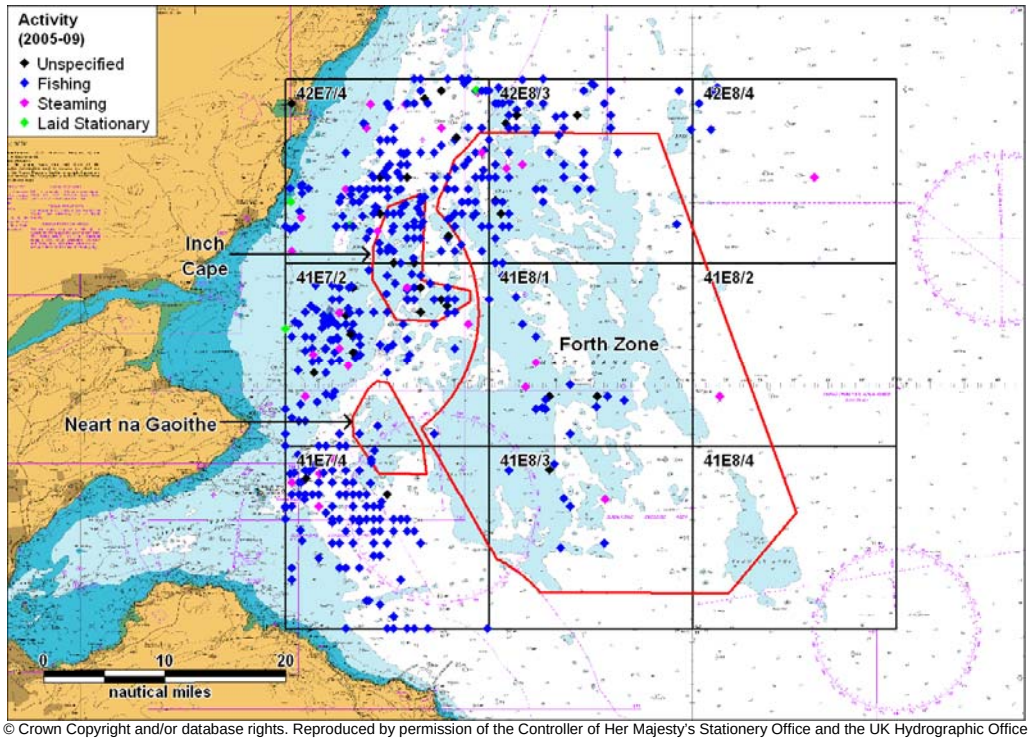

Figure 8.4 Fishing Vessel by Activity

Excluding unspecified, 93.6% of vessels sighted were engaged in fishing, i.e., gear deployed, 5.7% were steaming (transiting to/from fishing grounds) and less than 0.7% were laid stationary (vessels at anchor or pair vessels whose partner vessel is taking the catch whilst the other stands by).

8.3 Satellite Data

The MMO, formerly the Marine and Fisheries Agency, operates a satellite vessel monitoring system from its Fisheries Monitoring Centre in London. The vessel monitoring system is used, as part of the sea fisheries enforcement programme, to track the positions of fishing vessels in UK waters. It is also used to track all UK registered fishing vessels globally.

Vessel position reports are received approximately every two hours unless a vessel has a terminal on board which cannot be polled and then it must report once per hour. The data covers all EC countries within British Fisheries Limits and certain Third Countries, e.g., Norway and the Faroes. Vessels used exclusively for aquaculture and operating exclusively within baselines are exempt.

A one year period of satellite data (2009) was analysed to provide information on both UK and non-UK fishing vessel positions across the region.

8.3.1 Satellite Data (2009)

The latest data set analysed including non-UK fishing vessels is from 2009. Figure 8.5 presents the 2009 satellite data by vessel nationally (where available) operating in the area.

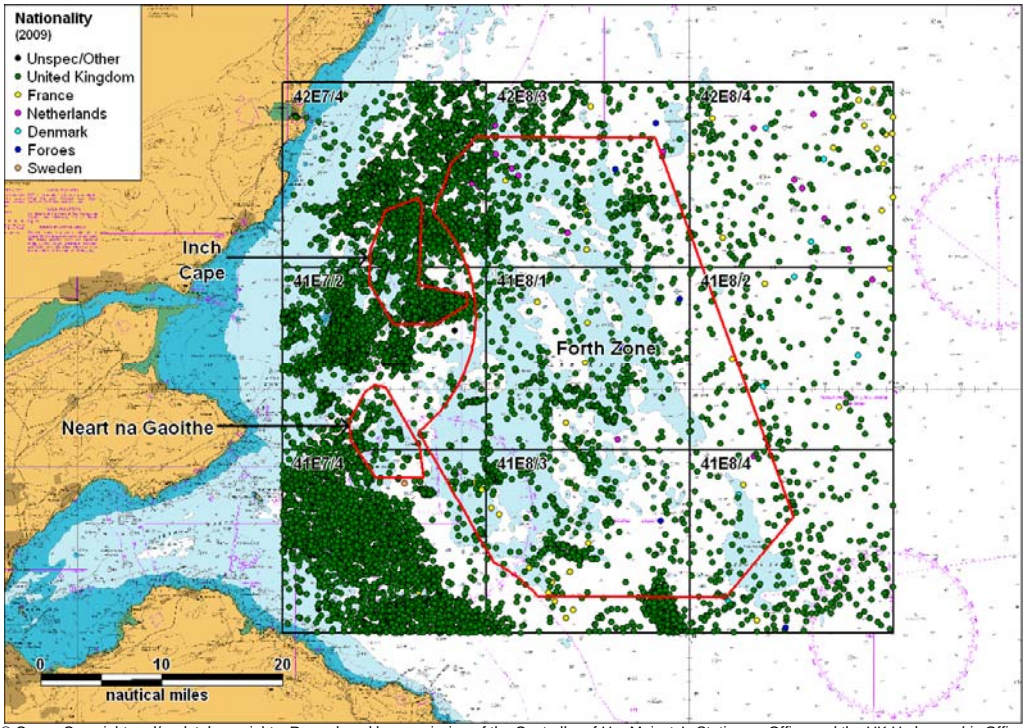

Figure 8.5 Chart of Fishing Vessel Positions by Nationality (2009)

The nationality analysis shows that 99% of vessels recorded in the region were UK registered. Of the vessels registered outside the UK (1%), the majority were made up of Dutch and French vessels.

The fishing vessel satellite positions, colour-coded by vessel type (where available), are presented in Figure 8.6.

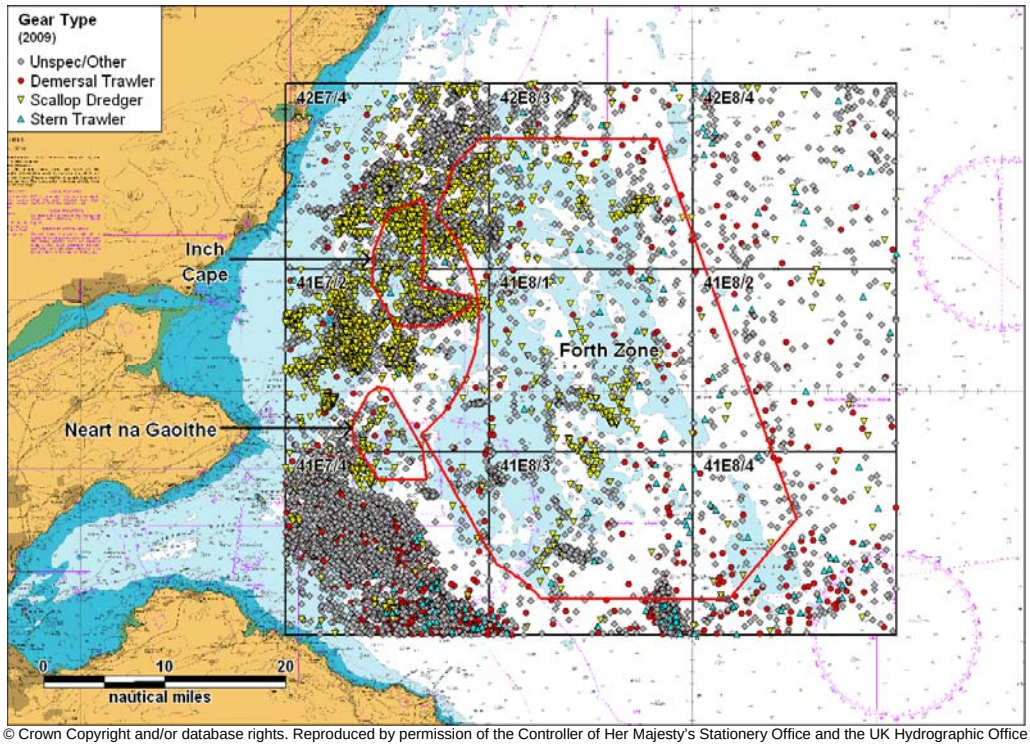

Figure 8.6 Chart of Fishing Vessel Positions by Type (2009)

It can observed that the large majority of vessels sighted in the area were unspecified vessels (67%), with scallop dredgers (22%), demersal trawlers (9%), the main vessels operating in the region.

8.4 Summary of Potential Impacts

The following potential impacts were highlighted within Section 2.1.

- Collision;
- Foundering;
- Contact;
- Snagged nets;
- Radar impacts;
- Loss of fishing grounds;
- Diverting from route;

- Increase in fuel costs; and
- Time costs.

By review of the data it is observed that the higher areas of fishing activity are in and around the Inch Cape STWs site and the north west corner of the Firth of Forth Round 3 Zone. In addition there is a higher density area to the south west of the Neart Na Gaoithe STWs site.

The impact of the proposals on the fishing carried out by these vessels is to be considered within a Commercial Fisheries Study carried out by Brown and May Fisheries Consultants.

In terms of navigation of these vessels travelling to and from fishing grounds it is considered that the potential impact will be low provided these vessels have access to the sites and are not forced to migrate into the busier shipping lanes.

As with recreational vessels review, the main hazard identified relates to exiting the wind farms into shipping routes. However, it is noted that over time the risks associated with this "interface" will reduce further as AIS carriage on fishing vessels becomes mandatory. The schedule for mandatory carriage of AIS by fishing vessels is summarised below:

- Fishing vessels of overall length 24m and upwards but less than 45m: not later than 31 May 2012;

- Fishing vessels of overall length 18m and upwards but less than 24m: not later than 31 May 2013; and

- Fishing vessels of overall length exceeding 15m but less than 18m: not later than 31 May 2014.

New built fishing vessels of overall length exceeding 15m are subject to carrying AIS from 30 November 2010.

It is noted that this conclusion assumes that reasonable safe measures are adopted by the projects, including but not limited to: buoyage / lighting, notification to FishSAFE of subsea structures and chart updates via the UKHO / Kingfisher awareness will aid navigation between the wind farm developments. Cables will also require trenching/protection to reduce the likelihood of fishing gear interactions.

Turbine alignment may require further discussions with this stakeholder group.

9 PRELIMINARY AIS ANALYSIS

9.1 Overview of AIS Data Collected

FTOWDG collected AIS shipping data from four coastal survey stations at Stonehaven, Dundee, Inner Forth and Dunbar between August 2009 to July 2011 (some small periods of downtime were observed in this period). This long term data set allows for seasonal fluctuations in movements of shipping through the outer Firth of Forth and Tay and adjacent wind farm development areas to be assessed.

Monthly plots of the AIS data colour-coded by ship type are presented in Figure 9.1 to Figure 9.6.

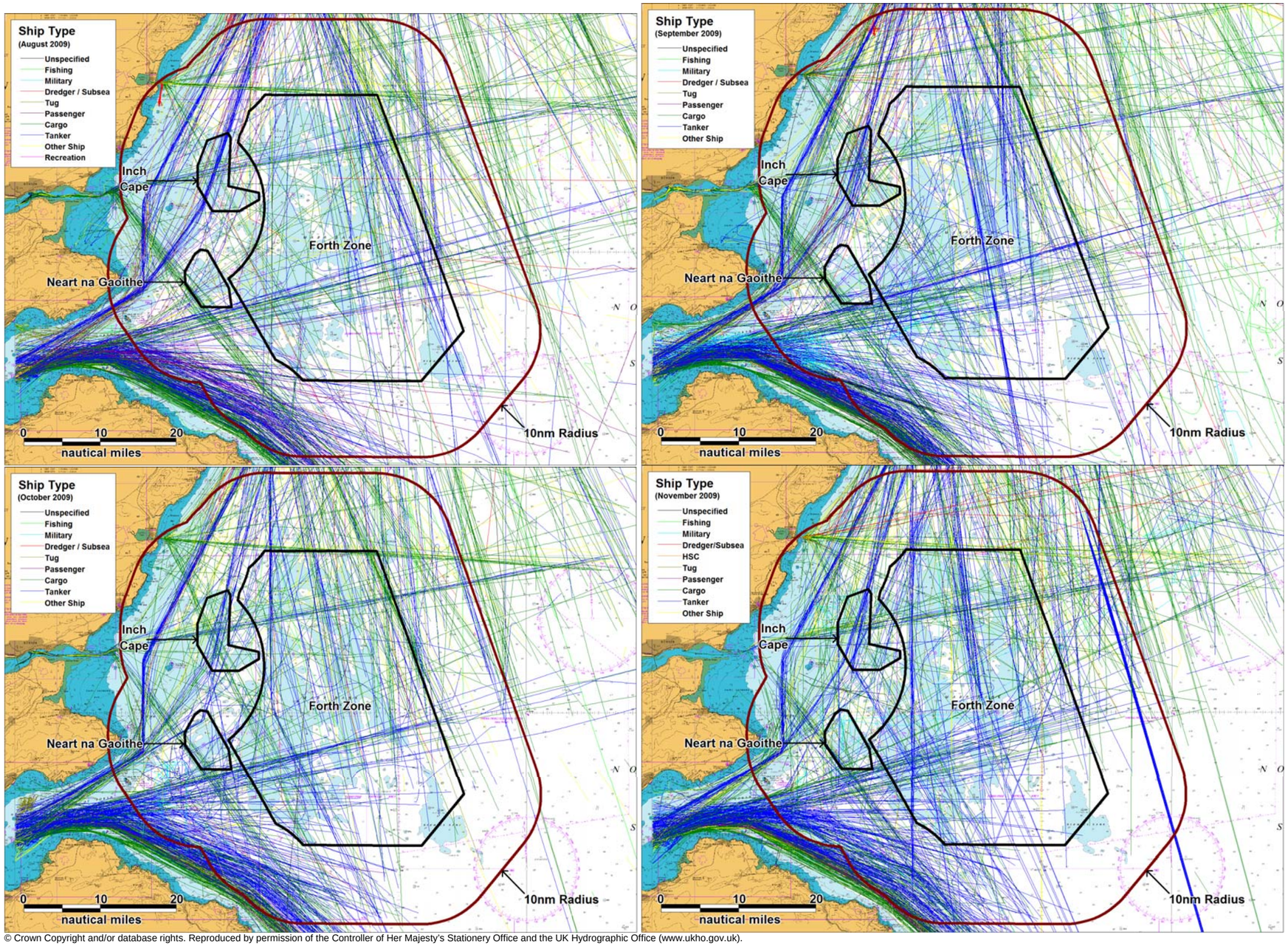

Figure 9.1 Chart of Coastal AIS Data (Clock-wise August 2009 to November 2009)

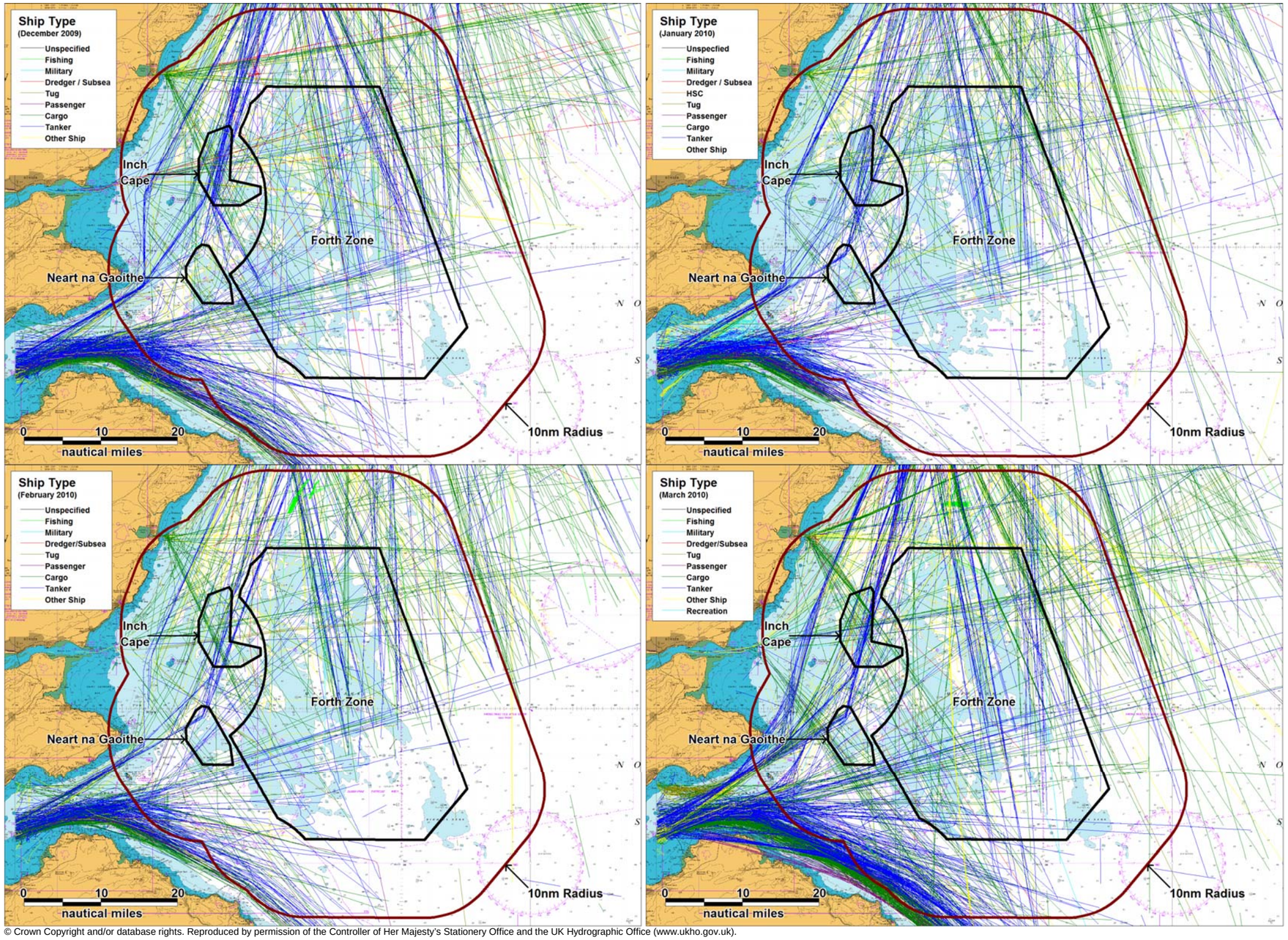

Figure 9.2 Chart of Coastal AIS Data (Clock-wise December 2009 to March 2010)

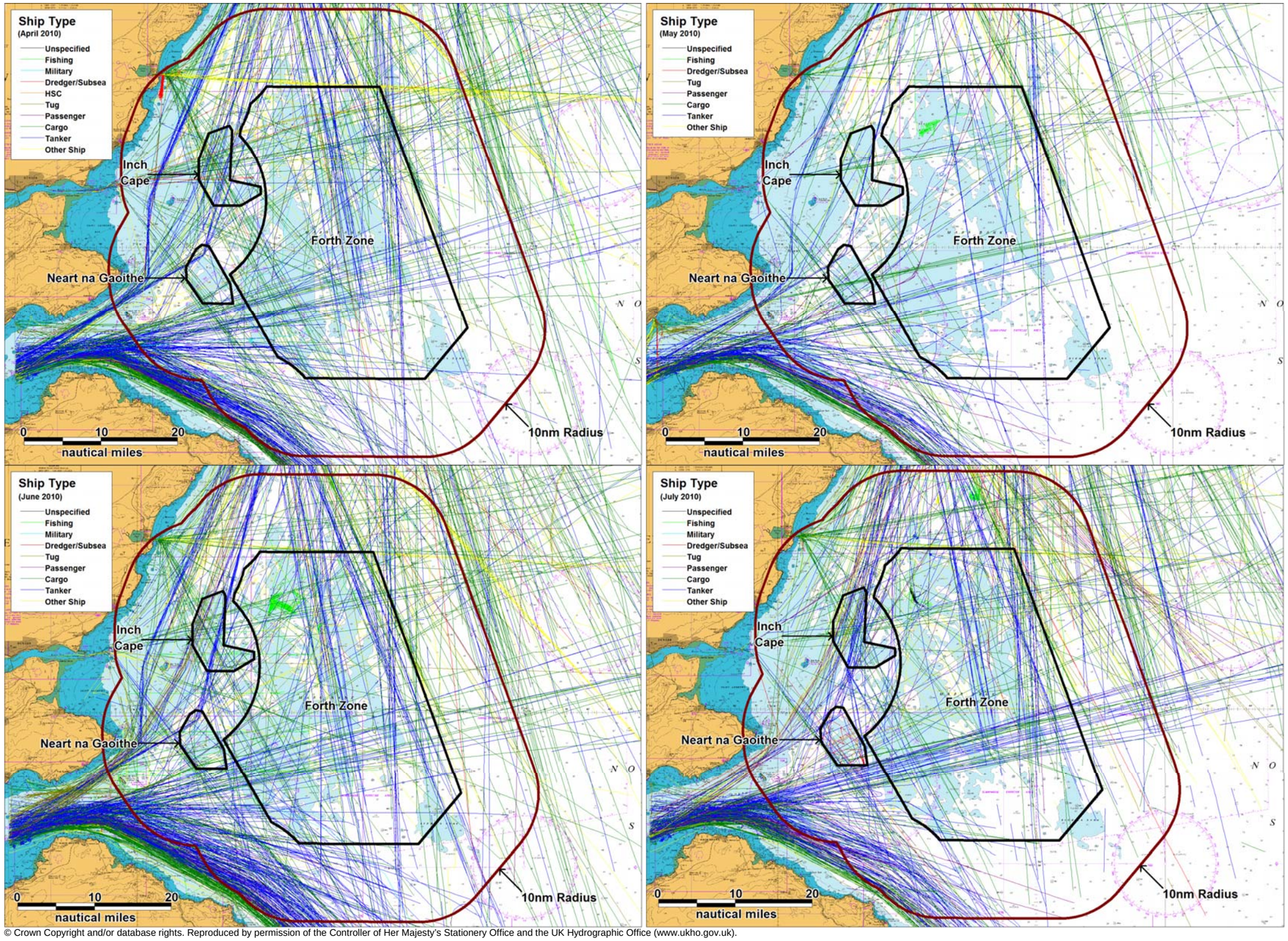

Figure 9.3 Chart of Coastal AIS Data (Clock-wise April 2010 to July 2010)

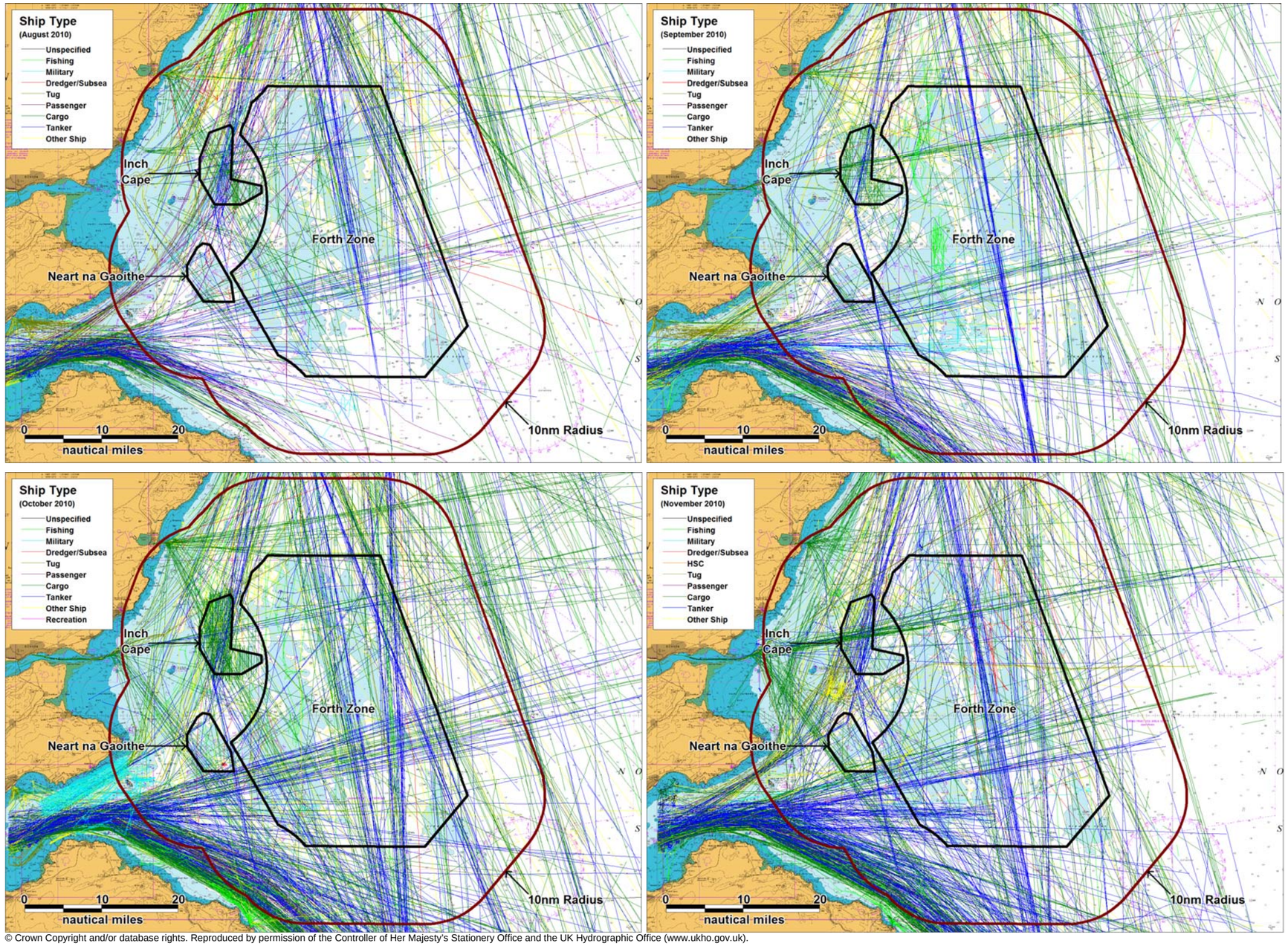

Figure 9.4 Chart of Coastal AIS Data (Clock-wise August 2010 to November 2010)

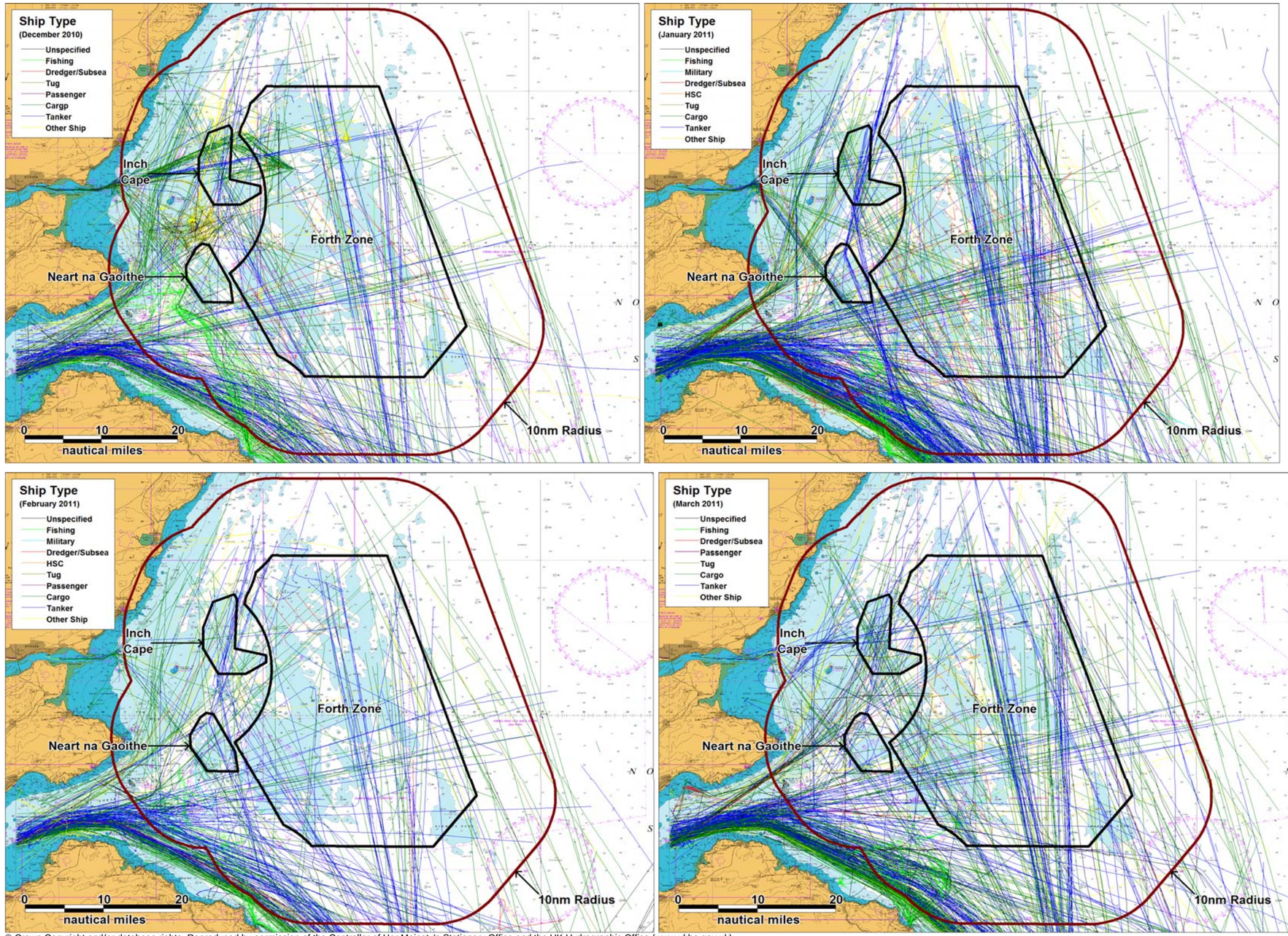

Figure 9.5 Chart of Coastal AIS Data (Clock-wise December 2010 to March 2011)

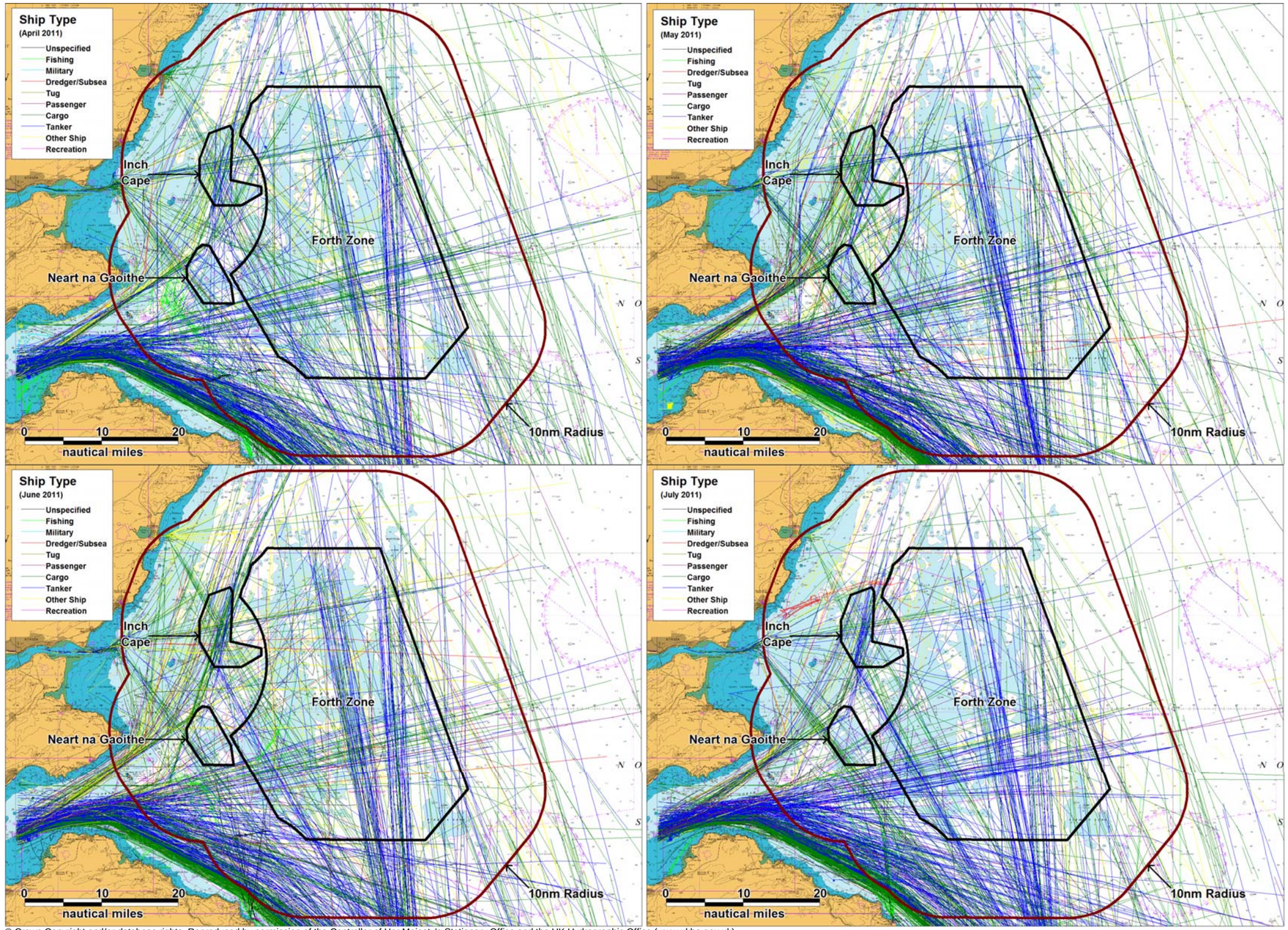

Figure 9.6 Chart of Coastal AIS Data (Clock-wise April 2011 to July 2011)

9.2 AIS Data Analysis

AIS data for a 28 day period recorded from the coastal survey stations was analysed which included data from November 2010 (14 days) and June 2011 (14 days). Figure 9.7 presents an overview of all vessels recorded during this period excluding survey ships operating within the region (for example on behalf of the project developers), to focus the assessment on passing shipping.

Data analysed in Figure 9.8 (and onwards) is presented relative to a 10nm buffer which provides an indication of meaningful survey data coverage relative to the regional wind farm developments.

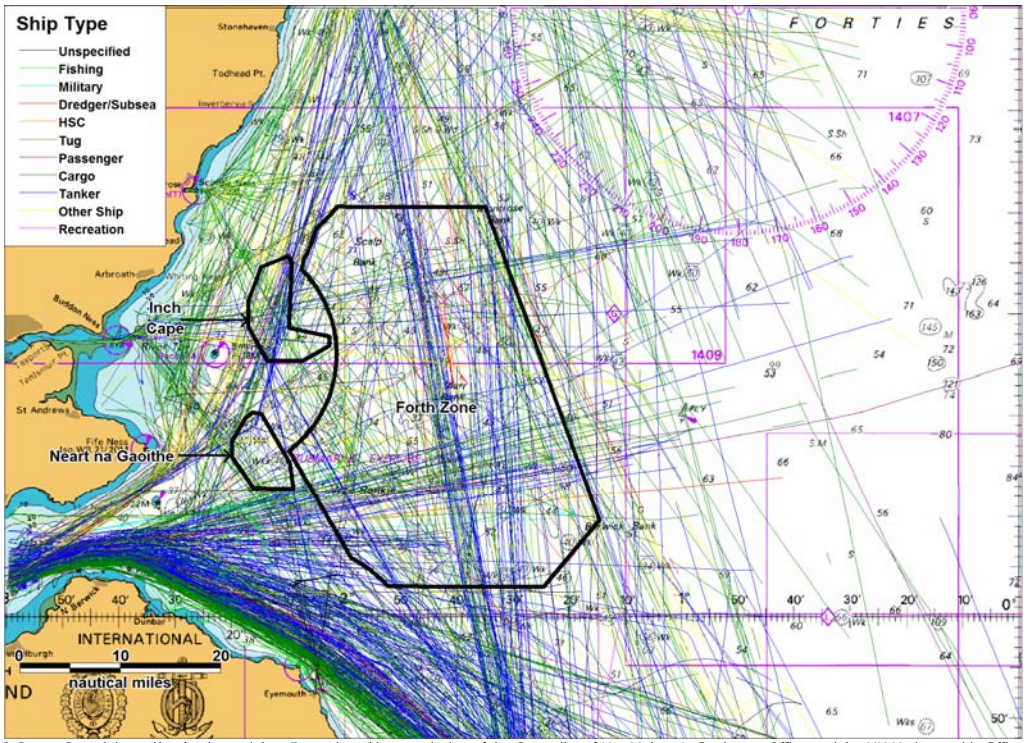

Figure 9.7 Overview of 28 Days AIS by Ship Type Excluding Survey Ships

Overall it can be seen that the vast majority of vessels passing through or in proximity to the sites are destined for or have departed from east coast Scottish parts; mainly Aberdeen and the Forth ports. A smaller number of ship tracks were also recorded in/out of the River Tay (Dundee/Perth) and Montrose.

Figure 9.8 presents a detailed overview of the ships recorded over the 28 day period relative to a 10nm buffer of the three developments colour-coded by ship type.

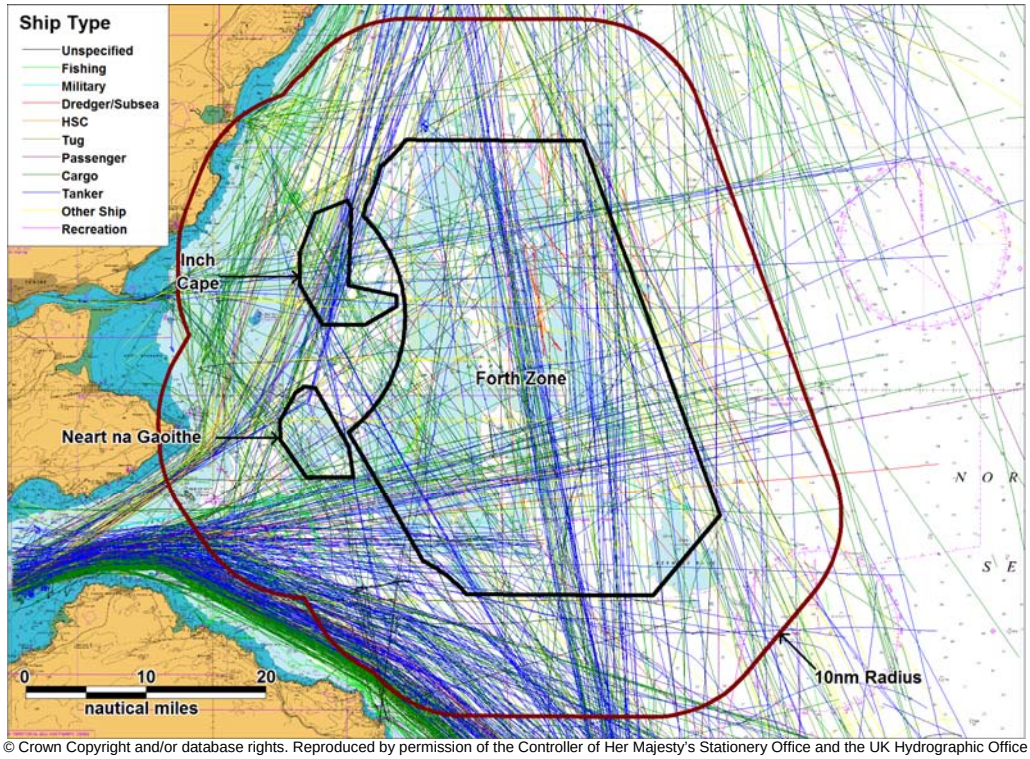

Figure 9.8 Plot of 28 Days AIS by Ship Type relative to a 10nm Buffer

On average 26 tracks per day were recorded within 10nm of the wind farm developments, with approximately 23% of vessels broadcasting a destination within the Forth, (Grangemouth, Leith, Rosyth, Methil and Hound Point / Breafoot Bay oil and gas terminals.)

A graph of daily number of unique ships passing within 10nm of the each wind farm development is presented in Figure 9.9.

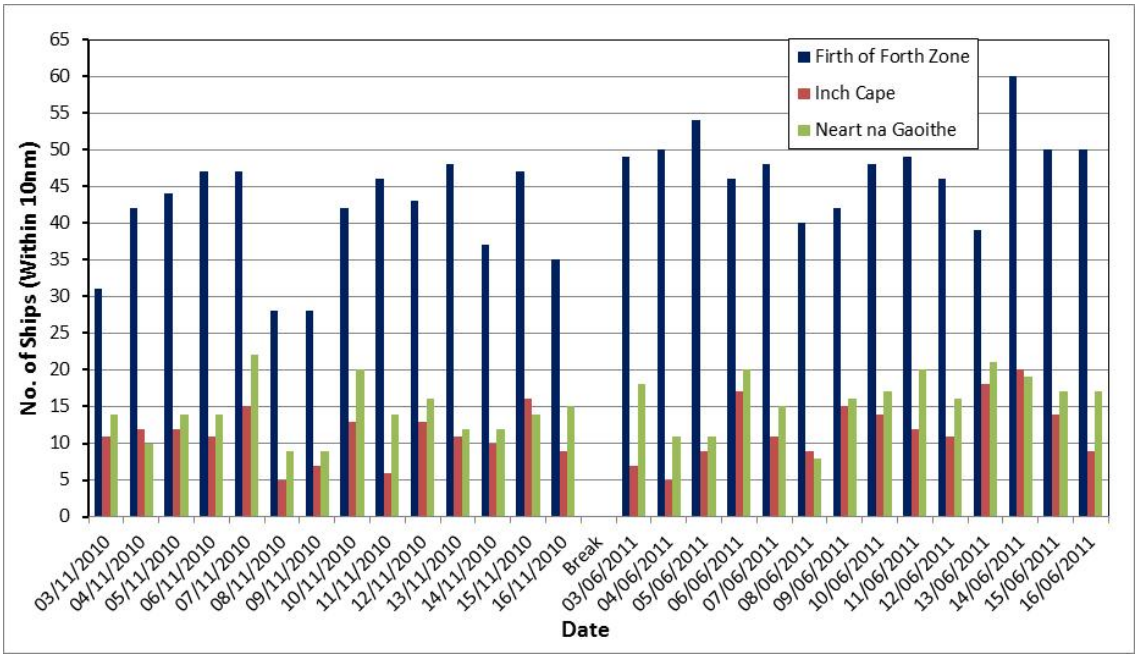

Figure 9.9 Daily Number of Vessels recorded within 10nm of Each Development

On average there were 44 ships passing within 10nm of the Forth Zone, 15 ships within 10nm of Neart na Gaoithe and 12 vessels within 10nm of Inch Cape recorded per day.

Figure 9.10 and Figure 9.11 present combined busiest and quietest days within 10nm of the three developments with Figure 9.12 showing a typical (average) day.

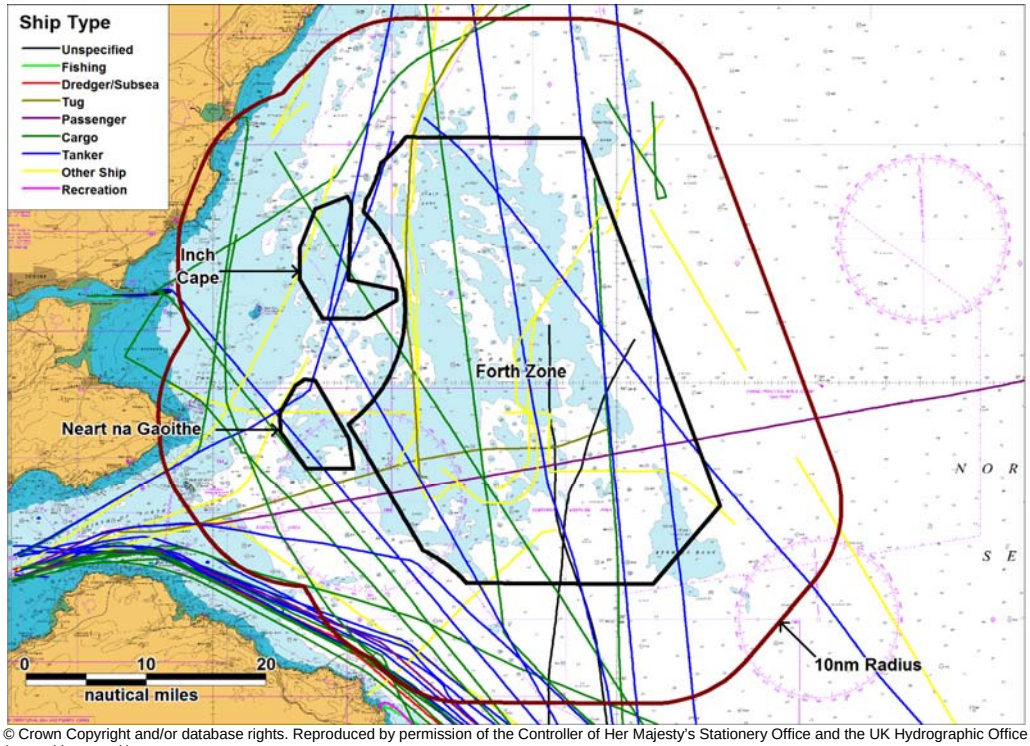

Figure 9.10 Typical 'Busy' Day – 14th June 2011

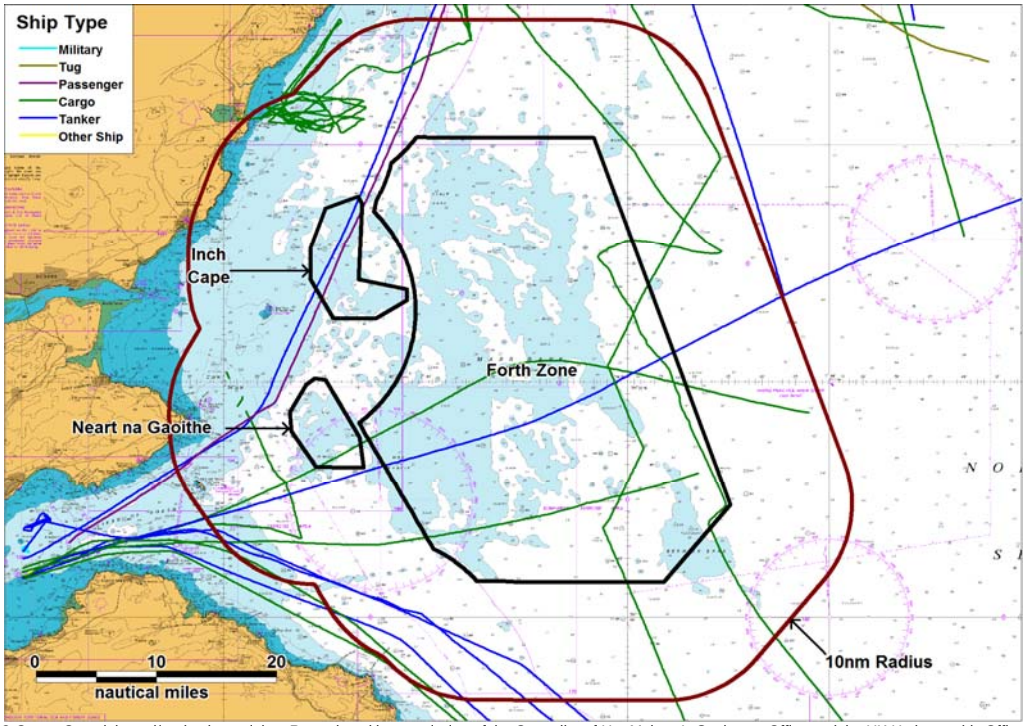

Figure 9.11 Typical 'Quiet' Day – 8th November 2010

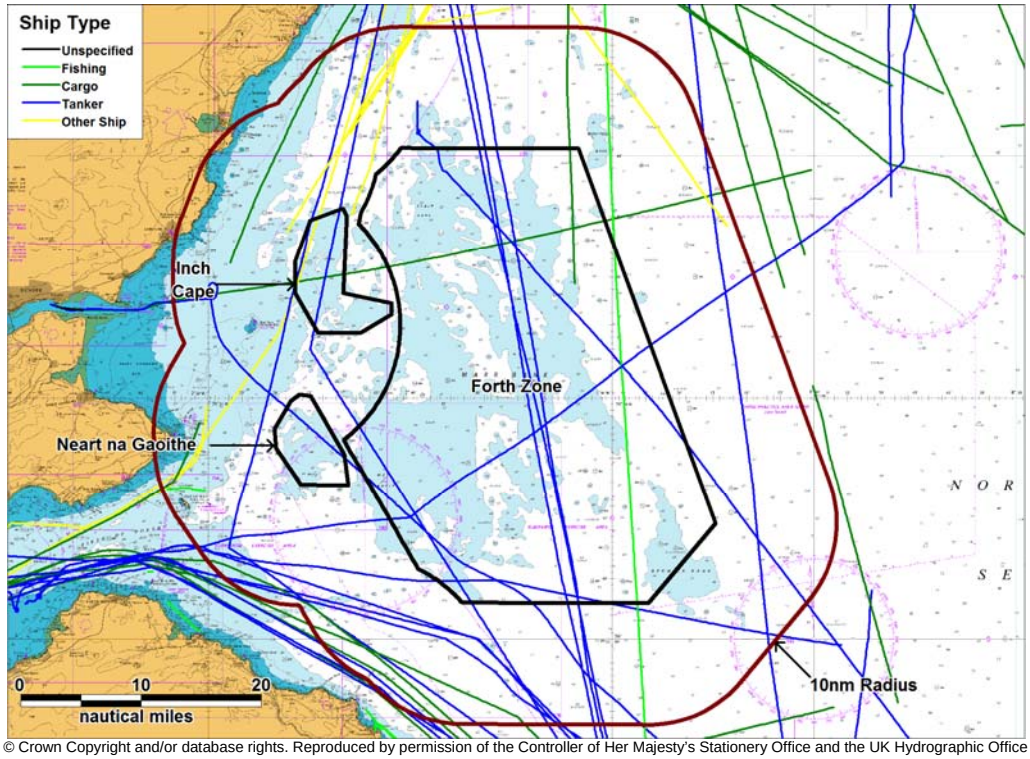

Figure 9.12 Typical Day (Mean) – 5th November 2010

The following sections analyse the main ship types passing through the region (tankers, cargo, other ships, fishing vessels and passenger/cruise ships).

9.2.1 Tankers

A plot of tankers relative to a 10nm buffer of the three developments in the outer Firth of Forth and Tay is presented in Figure 9.13.

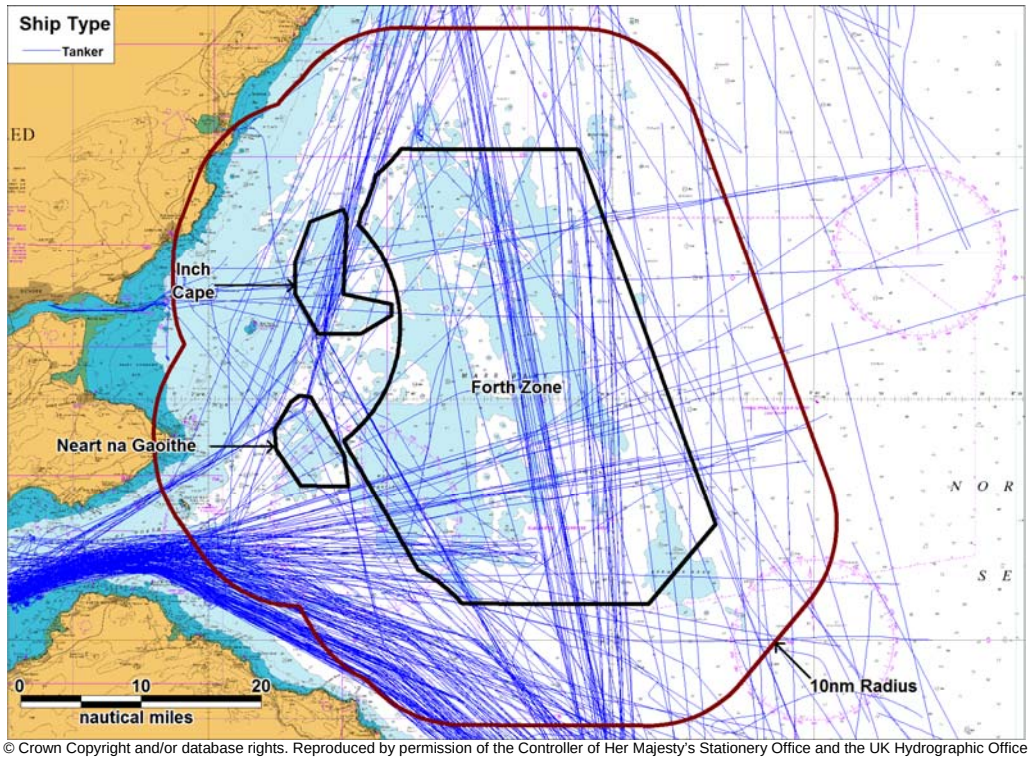

Figure 9.13 Plot of Tanker Tracks (28 Days)

There was an average of 14 tankers per day passing within 10nm of the three sites. Approximately 33% of traffic within 10nm was associated with the Firth of Forth ports (67% on the southern route, 7% on the northern route and 26% from the Scandinavian route).

Tankers are the main vessel type passing through the area which is characterised by vessels heading into the Firth of Forth (associated with the Braefoot Gas Terminal, Hound Point Oil Terminal and Grangemouth).

Oil tankers were generally recorded routeing from northern ports (i.e., Aberdeen, Peterhead and Inverness) to the Forth (Grangemouth) and Immingham. Chemical tankers were regularly routeing from the north (Aberdeen) to Immingham and Forth ports to Europe, with a number of vessels also headed to Dundee and Scandinavia. The majority of gas carriers were recorded headed between Grangemouth/Braefoot terminal and Eastern UK and European Ports. Two vessels were recorded headed north through the area, bound for Belfast and Dublin.

It is noted that BP operated three vessels during the period of data collection *Border Thistle* (now *Don Pancho*), *Border Tartan* (now *Don Gonzalo 1*) and *Boarder Heather* (now *Whitstar*). These vessels stopped operating under BP during February/March 2010. The oil products tanker *Whitstar* is now operated by John H Whitaker (Tankers) Ltd, and transits between north eastern UK and Scottish ports (for example Grangemouth, Scrabster and Wick).

9.2.2 Cargo Vessels

A plot of cargo vessels relative to a 10nm buffer of the three developments in the outer Firth of Forth and Tay is presented in Figure 9.14.

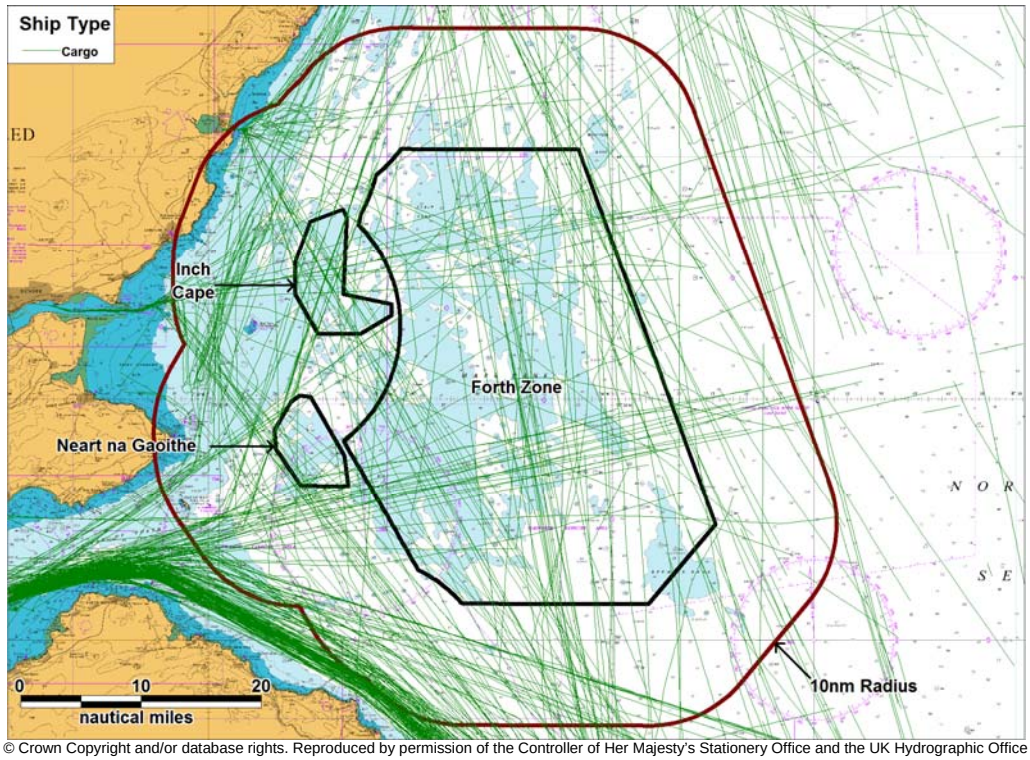

Figure 9.14 Plot of Cargo Vessel Tracks (28 Days)

There was an average of 18 cargo vessels per day passing within 10nm of the three developments. Approximately 33% of cargo vessels were headed in/out of the Forth, with the remaining vessels either passing through the area or headed to the Tay (Dundee or Perth) and Montrose.

9.2.3 Other Ships

A plot of other ships (mostly offshore support and fisheries protection vessels) relative to the three developments in the outer Firth of Forth and Tay is presented in Figure 9.15.

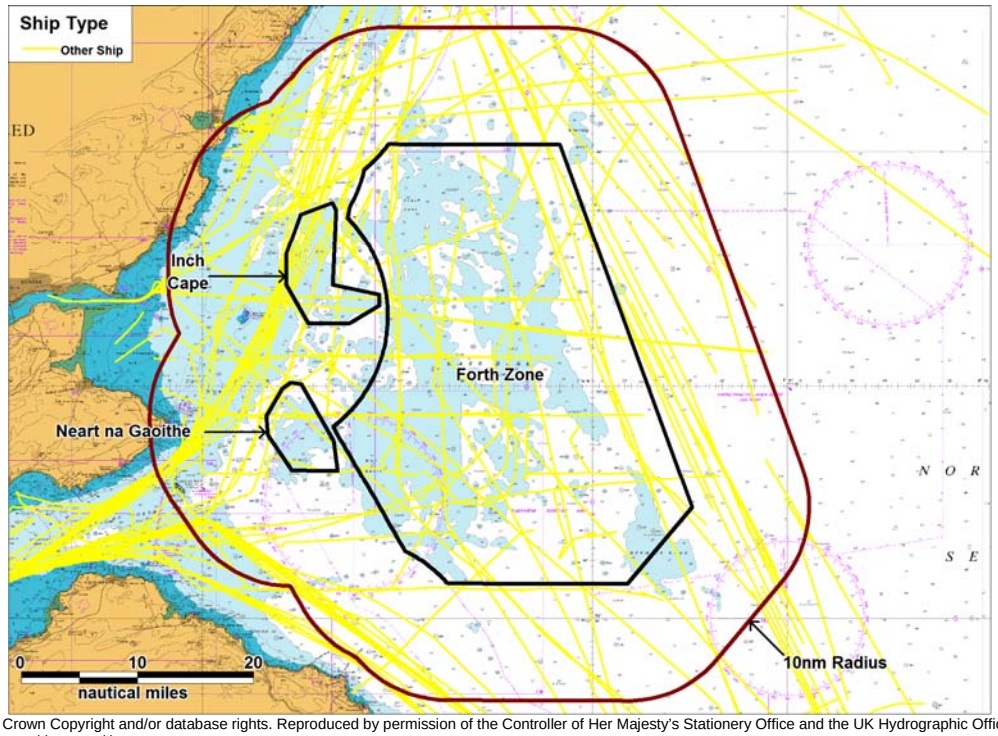

Figure 9.15 Plot of Other Vessels Tracks (28 Days)

There was an average of five other ships per day passing within 10nm of the three developments. It is noted that the majority of 'other' vessels within 10nm of the areas are made up of fisheries protection and research vessels as well oil and gas related vessels.

9.2.4 Fishing Vessels

A plot of fishing vessels recorded relative to a 10nm buffer of the three developments in the outer Firth of Forth and Tay is presented in Figure 9.16. It is noted that fishing activity can be seasonal and fishing vessels <45m may not carry AIS.

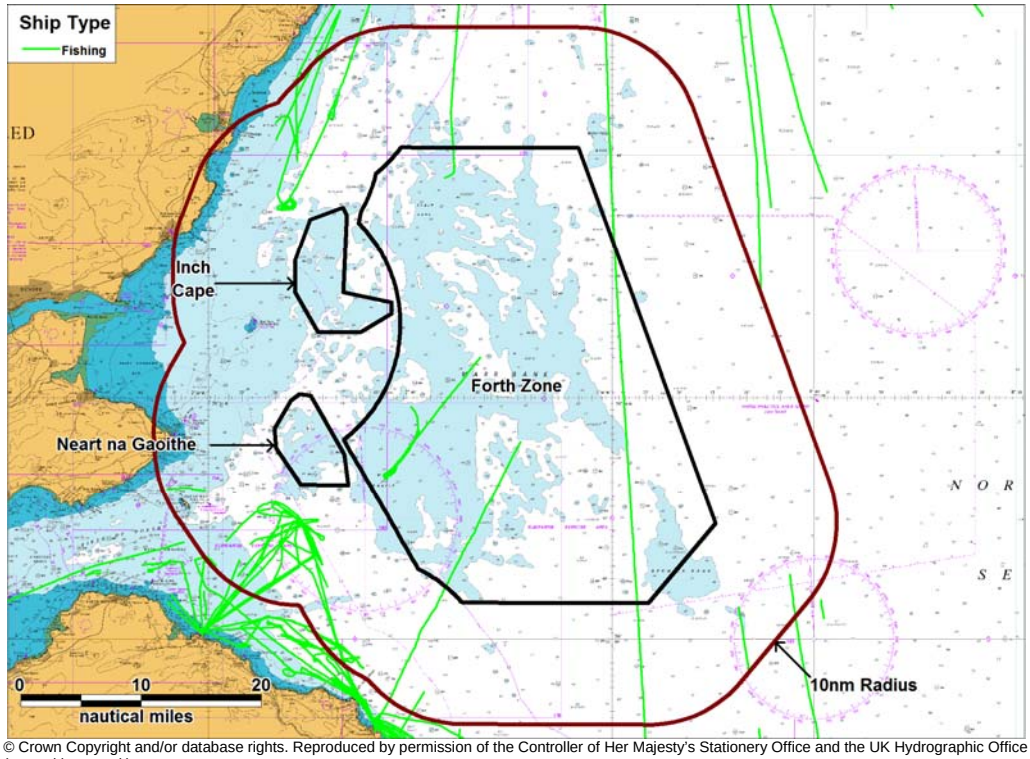

Figure 9.16 Plot of Fishing Vessels Tracks (28 Days)

There was an average of less than 2 to 3 fishing vessel per day passing within 10nm of the three areas.

Further information on fishing vessel activity can be found in Section 8.

9.2.5 Ferries / Cruise Liners

A plot of ferries and cruise liners recorded relative to the three developments in the outer Firth of Forth and Tay is presented in Figure 9.17.

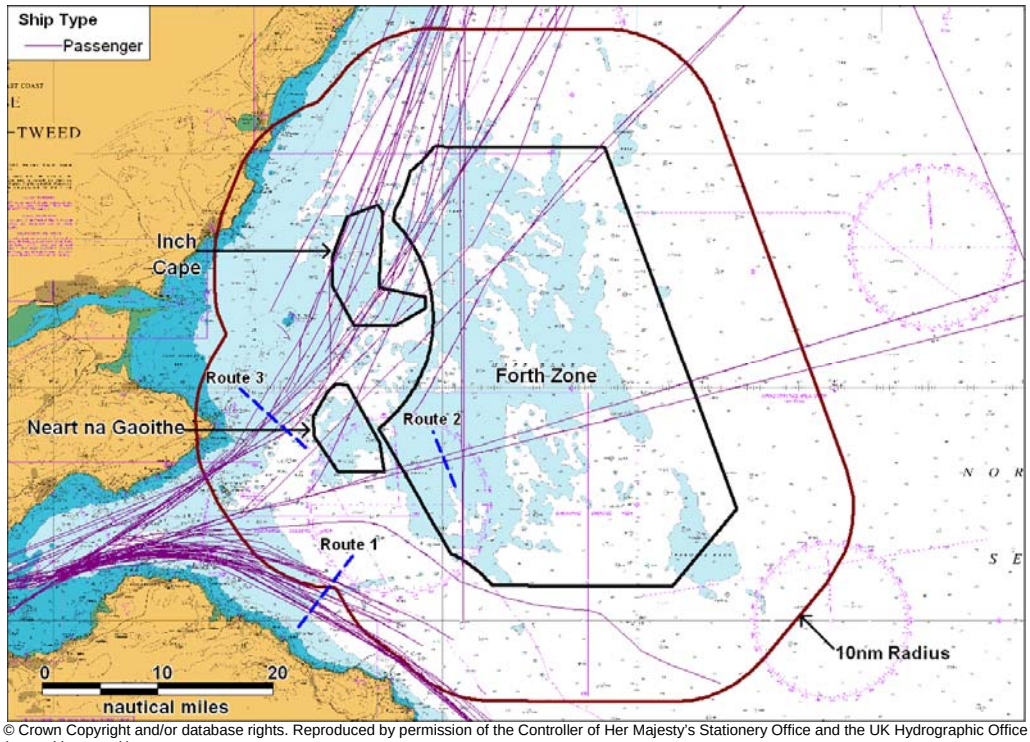

Figure 9.17 Plot of Ferries/Cruise Vessel Tracks (28 Days)

There was an average of just over 1 to 2 passenger / cruise vessel per day passing within 10nm of the three areas during the 28 days. It is noted that cruise vessel activity (Route 2 and 3) is generally seasonal and all cruise vessels were recorded during June 2011 (14 days).

The Norfolkline passenger ferry between Rosyth and Zeebrugge (Route 1) was taken over by DFDS Seaways in July 2010, and operated as a Ro-Ro only freight service after December 2010. DFDS has withdrawn one of the vessels from this route leaving the *Tor Finlandia* operating three weekly sailings from May 2011. Passenger cruise vessels using this route were heading between Forth and English Channel ports (Dover and Le Havre).

Route 2 was used by passenger vessels heading to/from Scandinavia, i.e. cruises touring fjords on the western coastline of Norway including Geirangerfjorden.

Cruise vessels using Route 3 during the 28 day survey were mainly operating between Forth and ports of Aberdeen, Oban, Invergordon, Kirkwall and Lerwick.

It is also noted that during periods of adverse weather and high seas the Northlink passenger Ro-Ro ferry between Aberdeen and the Northern Isle can be re-routed into Rosyth due to the Port of Aberdeen been closed for high seas off the port approaches.

9.2.6 Anchored Vessels

A plot of anchored vessels recorded relative to the three developments in the outer Firth of Forth and Tay is presented in Figure 9.18. It is noted that the anchored vessels were extracted from the combined survey period from August 2009 to July 2011 using track speed and track type as no Navigational Status was available in the data provided to Anatec. Vessels anchored within the proposed development areas are labelled.

There is one charted anchorage area within 10nm of the developments, this is located 8.5nm WNW of Inch Cape in Lunan Bay (4nm south of Montrose). In addition, vessels anchor off Buddon Ness, approximately 2nm from the Tay Pilotage Station.

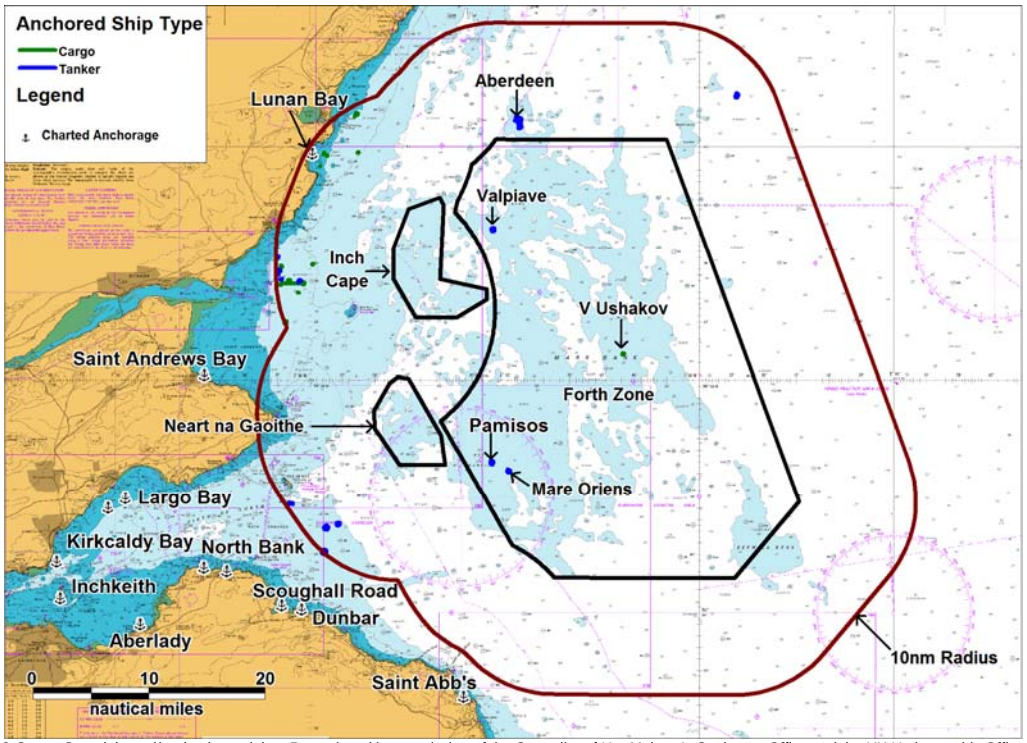

Figure 9.18 Plot of Anchored Vessel Tracks (August 2009 to July 2011) and Anchorage Areas

There were 27 different cargo vessels and 16 different tankers identified to be at anchor from the AIS track data within 10nm radius of the developments. There were three different tankers, *Valpiave*, *Pamisos* and *Mare Oriens* and one cargo vessel, *V Ushakov* recorded at anchor inside the Forth Zone while no vessel was at anchor inside either Inch Cape or Neart na Gaoithe.

Anchoring was also recorded east of the Forth Ports harbour limits and within 2nm of the Tay Pilotage Station.

Outside the 10nm radius of the developments there are a number of charted coastal anchorages which are mainly used by small/medium sized cargo vessels and coastal tankers (for example when waiting on orders or during adverse weather).

10 MCA TEMPLATE REVIEW

10.1 Introduction

The MCA produced the Shipping Route Template (Ref. iv) to provide indicative guidance on distances that should be established between historical shipping routes, IMO routeing measures and offshore wind farms to enable safe navigation.

Historical shipping routes should not be confused with IMO Traffic Routeing Measures (such as Deep Water Routes, Traffic Separation Scheme (TSS) and Areas to be Avoided) are charted traffic management measures which ships are required to comply with. There are no IMO routeing measures in close proximity to the Forth and Tay area.

The Shipping Route Template is based on the predicted impacts that turbines have on the performance of marine radar systems. The following section discusses the template then reviews the identified historical shipping lane boundaries passing through and close to the proposed development area.

10.2 MCA Shipping Route Template

The MCA's wind farm Shipping Route Template (Ref. iv), reproduced in Figure 10.1, indicates that turbines within 0.5nm of a historical shipping route are considered Very High Risk and therefore intolerable. Close scrutiny and potentially mitigation will then be needed between 0.5nm and 5nm to ensure risks are As Low As Reasonably Practicable (ALARP), particularly between 0.5nm and 2nm which is considered Medium to High Risk. Beyond 2nm is Low Risk although it is noted that an adjacent wind farm or Traffic Separation Scheme introduces cumulative effects which would then have to be scrutinised.

The MGN states that the Shipping Route Template is not a prescriptive tool but needs intelligent application to explore where the distance should be measured from, e.g., route centre, 90% traffic level, nearest ship, etc. The potential boundaries are illustrated in Figure 10.2.

WIND FARM: "SHIPPING ROUTE" Template

Distance in miles (nm) of Turbine Boundary from Shipping Route	Factors	Risk	Tolerability
< 0.25nm (500m)	500m inter-turbine spacing = small craft only recommended	**VERY HIGH**	**INTOLERABLE**
0.25nm (500m)	X band radar interference	**VERY HIGH**	
0.45nm (800m)	Vessels may generate multiple echoes on shore based radars	**VERY HIGH**	
			TOLERABLE IF ALARP (As Low As Reasonably Practicable)*
0.5nm (926m)	Mariners' high traffic density domain	**HIGH**	
0.8nm (1481m)	Mariners' ship domain	**HIGH**	
1 nm (1852m)	Minimum distance to parallel boundary of TSS	**MEDIUM**	
1.5nm (2778m)	S band radar interference ARPA affected	**MEDIUM**	* Descriptions of ALARP can be found in a) Great Britain Health and Safety Executive (2001) Reducing risks protecting people b) IMO (2002) MSC Circ 1023 dated 5th April 2002 Formal Safety Assessment c) IMO (2007) MSC 83-21-INF2 Consolidated guidelines for Formal Safety Assessment
2 nm (3704m)	Compliance with COLREGS becomes less challenging	**MEDIUM**	
>2nm > (3704m)	But not near TSS	**LOW**	
3.5nm (6482m)	Minimum separation distance between turbines opposite sides of a route	**LOW**	
5nm (9260m)	Adjacent wind farm introduces cumulative effect Distance from TSS entry/exit	**VERY LOW**	**BROADLY ACCEPTABLE**
10nm (18520m)	No other wind farms	**VERY LOW**	

Figure 10.1 Wind Farm "Shipping Route" Template (Ref. iv)

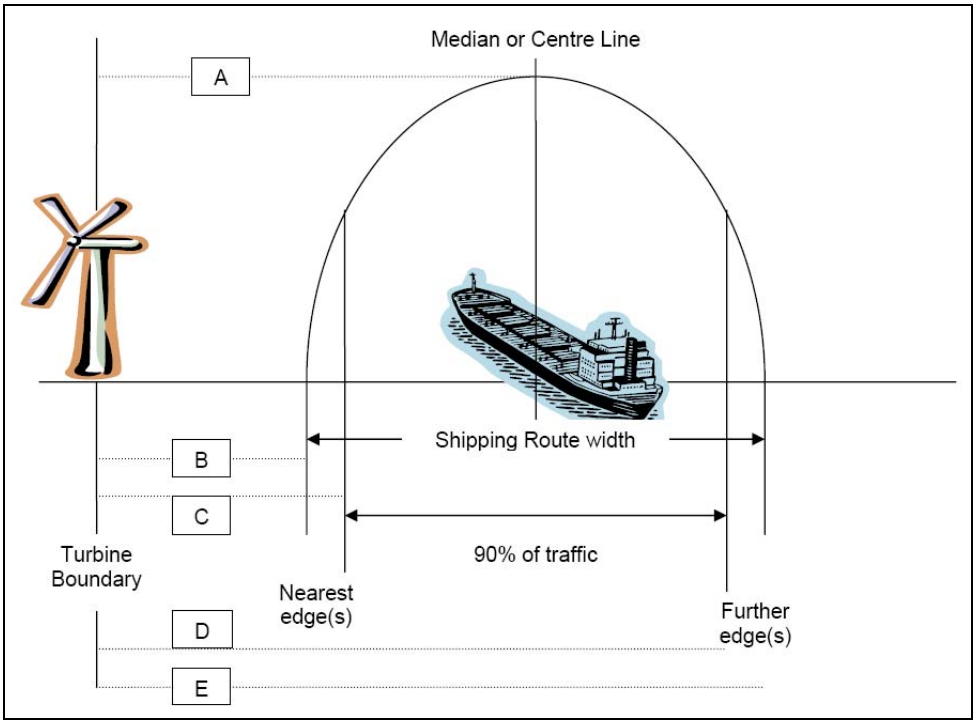

Figure 10.2 Interactive Boundaries (require Interpretative Flexibility, Ref iv), where:

A = Turbine boundary to the shipping route median or centre line
B = Turbine boundary to nearest shipping route edge
C = Turbine boundary to nearest shipping 90% traffic level*
D = Turbine boundary to further shipping 90% traffic level*
E = Turbine boundary to further shipping route edge
(* = or another % to be determined)

10.3 Current Shipping Lanes (90%)

The main 90% shipping lanes passing through and close to the region have been identified based on the AIS shipping data. The tracks following each lane have been identified and their lateral distribution analysed to define the 90% traffic level.

The 90% lane boundaries are presented in Figure 10.3. Lanes are shaded according to their approximate daily traffic levels.

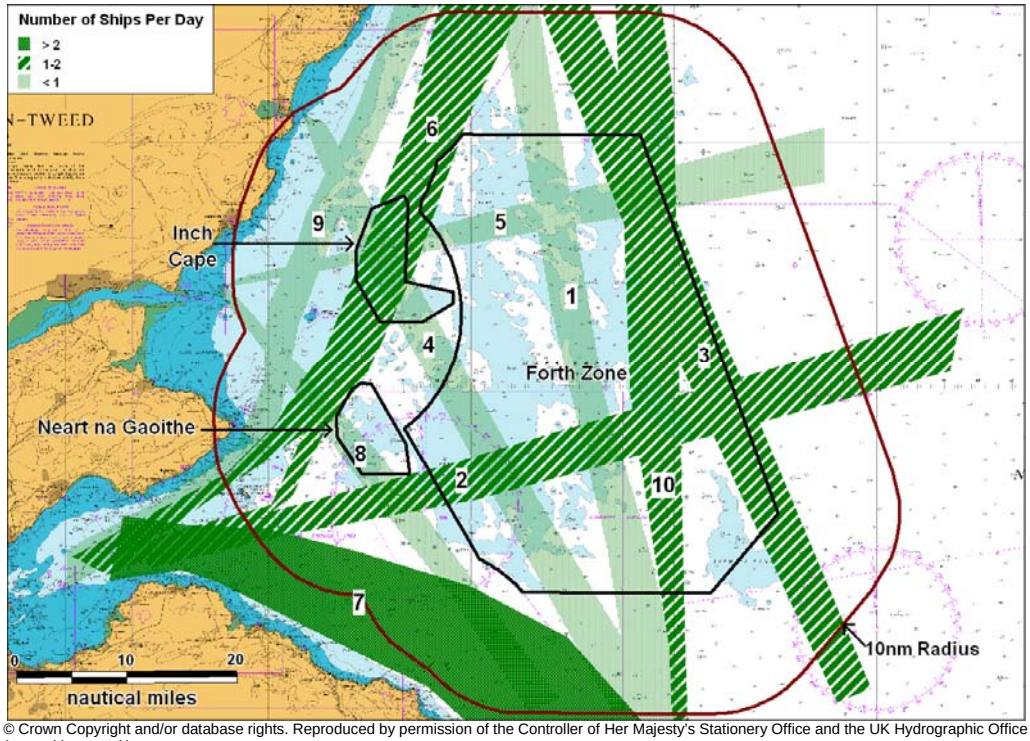

Figure 10.3 90% Shipping Lanes (shaded according to Ships per Day)

A brief description of the lanes is presented below. The traffic volumes on the lanes vary considerably from an average of less than one vessel per day up to about seven per day.

- Route 1 is used by medium sized tankers, cargo vessels and offshore support vessels heading between east coast ports in the UK (e.g., Aberdeen, Immingham and Tees / Tyne).

- Route 2 is used by traffic routeing between the Forth and northern European / Baltic Sea ports.

- Route 3 is used by cargo vessels and offshore support vessels headed north to Aberdeen or south to various ports such as Immingham and Antwerp.

- Route 4 is used mainly by small/medium sized cargo vessels headed to/from Montrose.

- Route 5 is used by east-west traffic between the Tay (mainly Dundee) and either North Sea offshore platforms or northern European / Baltic Sea ports.

- Route 6 is used by coastal traffic between the Forth and ports to the north, in particular, Aberdeen. (Route 9 is a slightly quieter alternative route, closer to shore.)

- Route 7 is a busy route used by merchant traffic between the Forth (mainly Grangemouth and Leith) and ports to the south, such as Rotterdam, Antwerp and Amsterdam.

- Route 8 is used mainly by coastal traffic heading between the Tay and ports to the south, such as Tees / Tyne.

- Route 9 is used mainly by coastal traffic heading between the Forth and ports to the north, such as Inverness and Aberdeen.

- Route 10 is used by medium sized cargo vessels and tankers headed north, in particular to Invergordon, Peterhead and Inverness or south, (mainly to Immingham).

A plot of the lane boundaries buffered by the key template distances of 0.5nm and 2nm is presented in Figure 10.4.

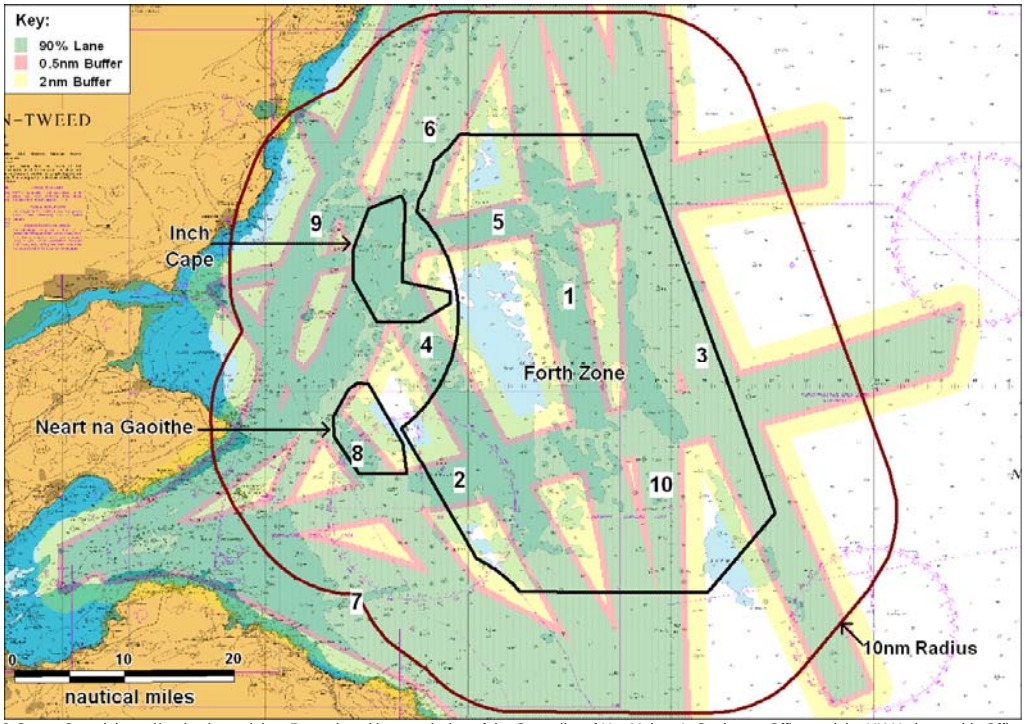

Figure 10.4 90% Shipping Lanes (shaded according to Ships per Day)

11 DETAILED AIS ANALYSIS

11.1 Introduction

The following section presents a detailed analysis of the outer Firth of Forth and Tay wind farm developments relative to the main shipping lanes derived from the 28 days of AIS data (14 days from November 2010 and 14 days from June 2011). The shipping tracks on each route is characterised based on the following:

- Ship Type;
- Destination;
- Ship Size (length and draught); and
- Ship Speed.

11.2 Route 1

A plot of the shipping on Route 1 is presented in Figure 11.1.

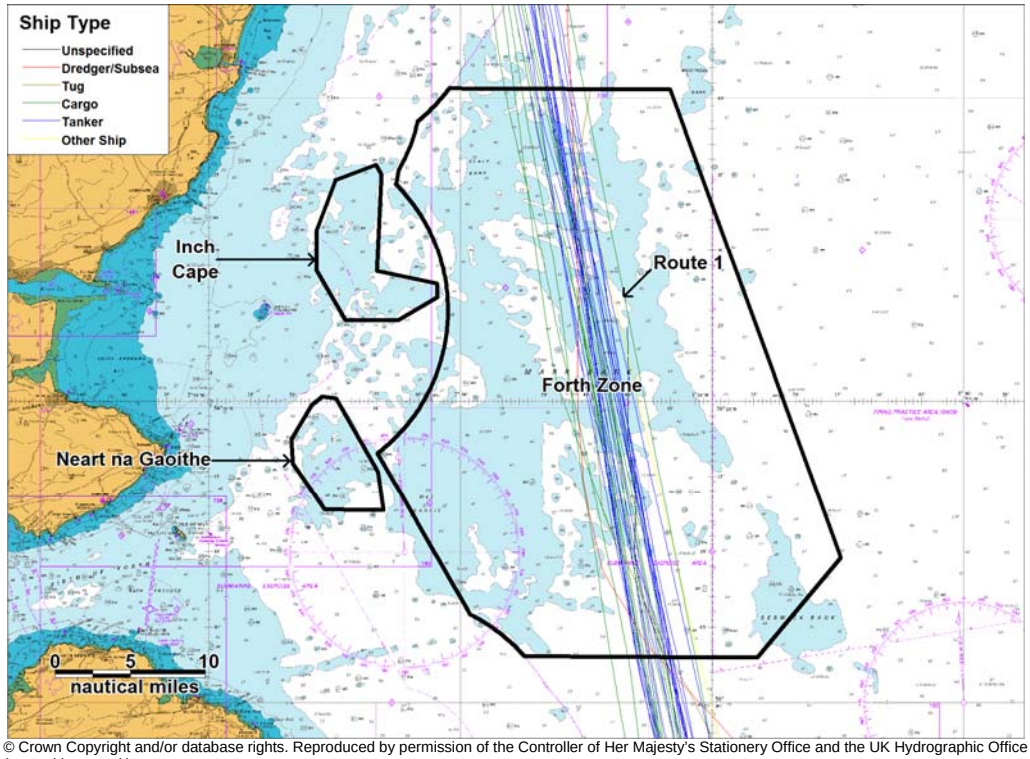

Figure 11.1 Route 1 Shipping Lane with extracted AIS Tracks by Type (28 Days)

Route 1 is used by an average of just over 1 vessel per day. A description of the traffic on this route is given in the following subsections.

Ship Type:

The largest categories of vessels types recorded included tankers (54%), cargo vessels (35%), various offshore support vessels including tugs and dredger/subsea ops vessels (9%).

Destination:

Traffic is heading between east coast ports in the UK (e.g., Aberdeen, Immingham and Teesport).

11.2.1 Ship Size (Length & Draught)

The size of vessels (length and draught) recorded on Route 1 is presented in Figure 11.2 and Figure 11.3.

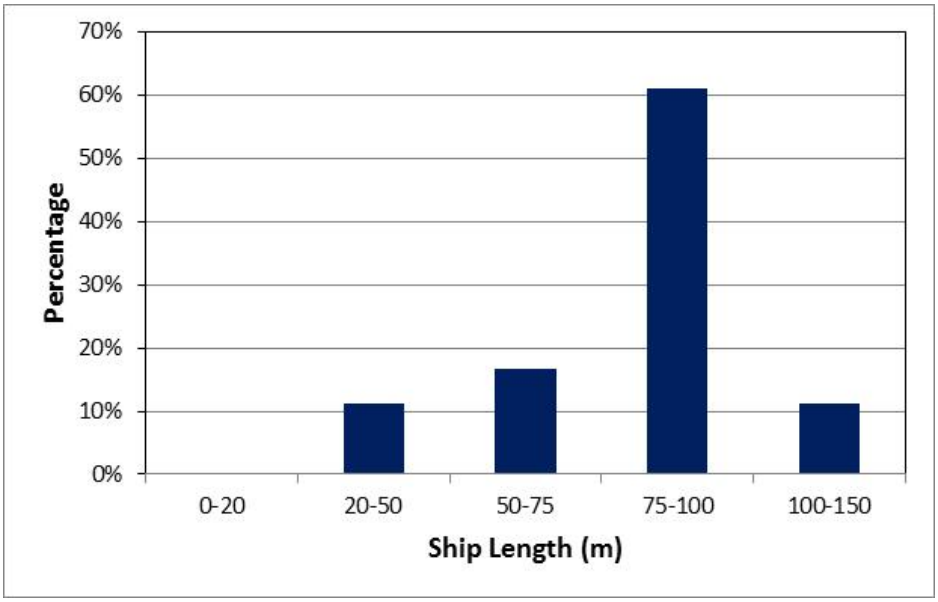

Figure 11.2 Route 1 Ship Length

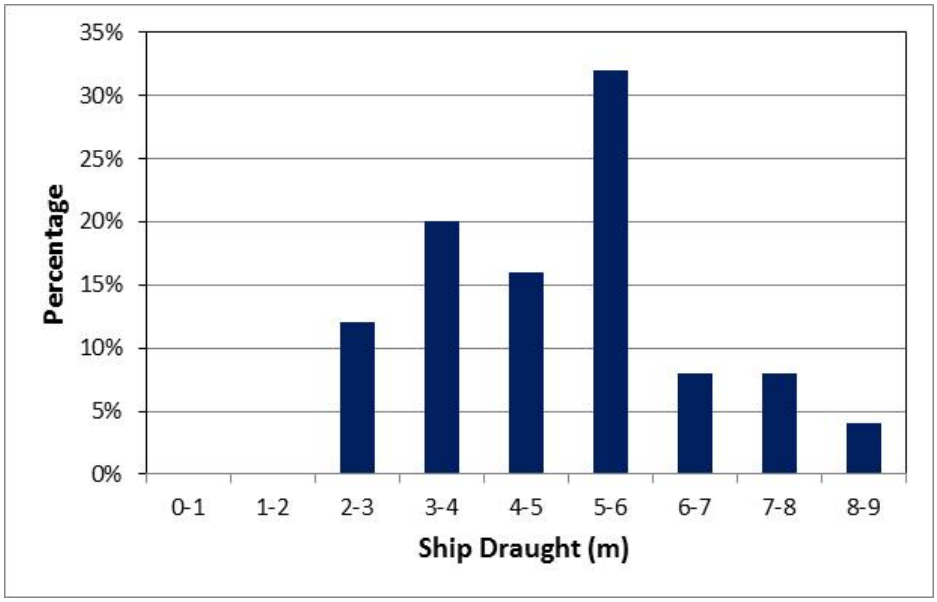

Figure 11.3 Route 1 Reported Ship Draught

The average ship length on Route 1 was 78.5m, with a draught of 4.8m.

The largest vessel recorded on this route during the 28 day survey period was the container ship *Bruarfoss* at 126.6m in length and draught of 7.48m bound for Immingham. A library image of this vessel is presented in Figure 11.4.

Figure 11.4 Library Image of *Bruarfoss*

11.2.2 Ship Speed

The average speed of vessels recorded on Route 1 is presented in Figure 11.5.

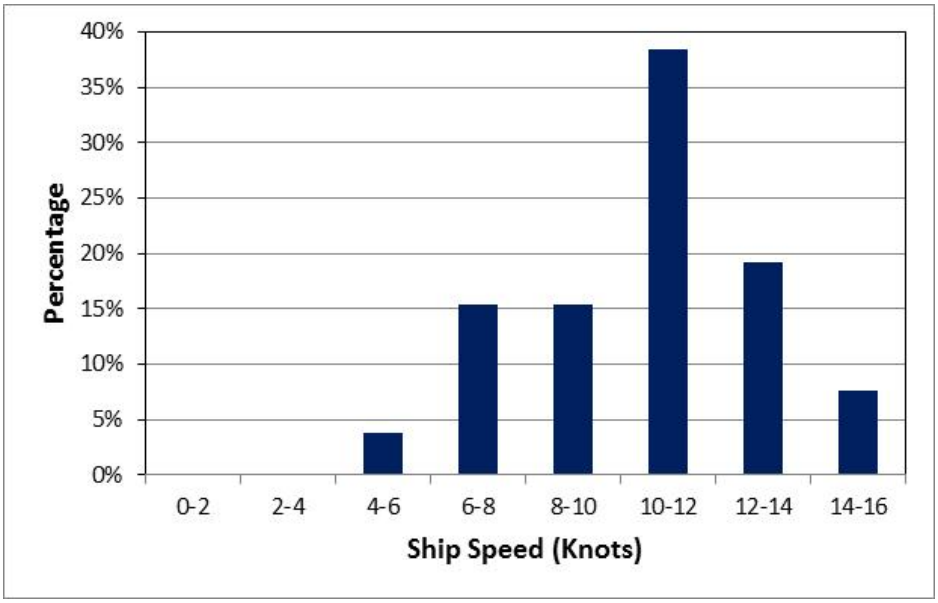

Figure 11.5 Route 1 Average Ship Speed

The average speed of vessels on this route was 9.6 Knots.

11.3 Route 2

A plot of the shipping on Route 2 is presented in Figure 11.6.

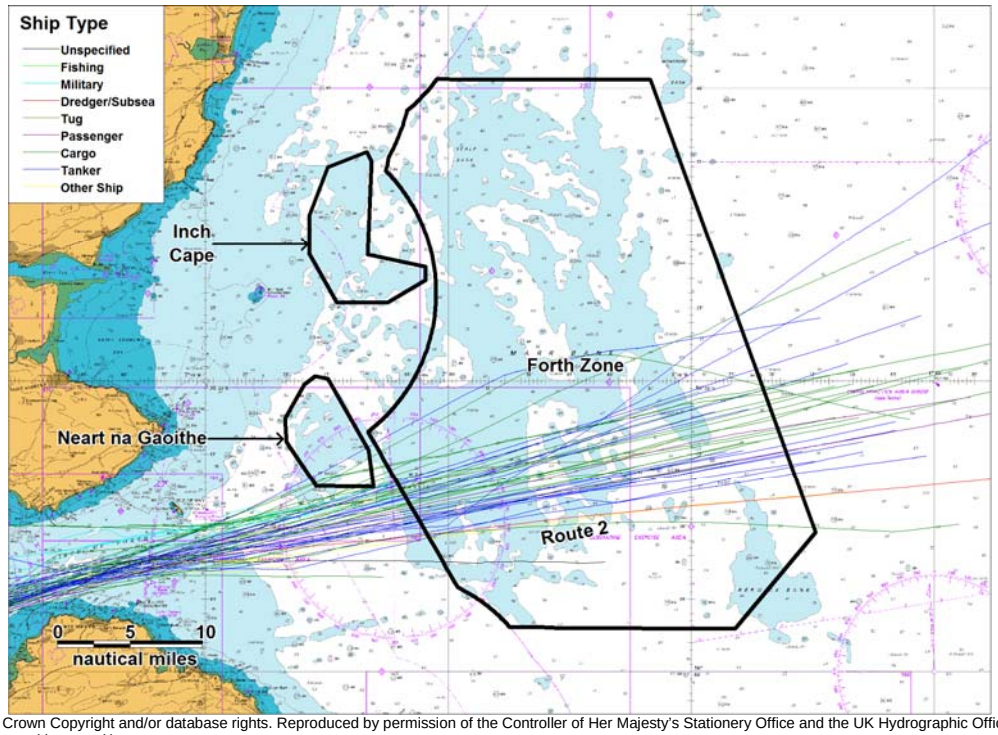

Figure 11.6 Route 2 Shipping Lane with extracted AIS Tracks by Type (28 Days)

Route 2 is used by an average of just over one vessel per day. A description of the traffic on this route is given below.

Ship Type:

The largest categories of vessels types recorded included cargo vessels (42%), tankers (38%), other ships (6%), military vessels (4%) and passenger vessels (4%).

Destination:

Traffic is heading between Forth ports (Leith, Grangemouth, Hound Point, Rosyth and Breafoot Bay) and northern European / Baltic Sea ports.

11.3.1 Ship Size (Length & Draught)

The size of vessels (length and draught) recorded on Route 2 is presented in Figure 11.7 and Figure 11.8.

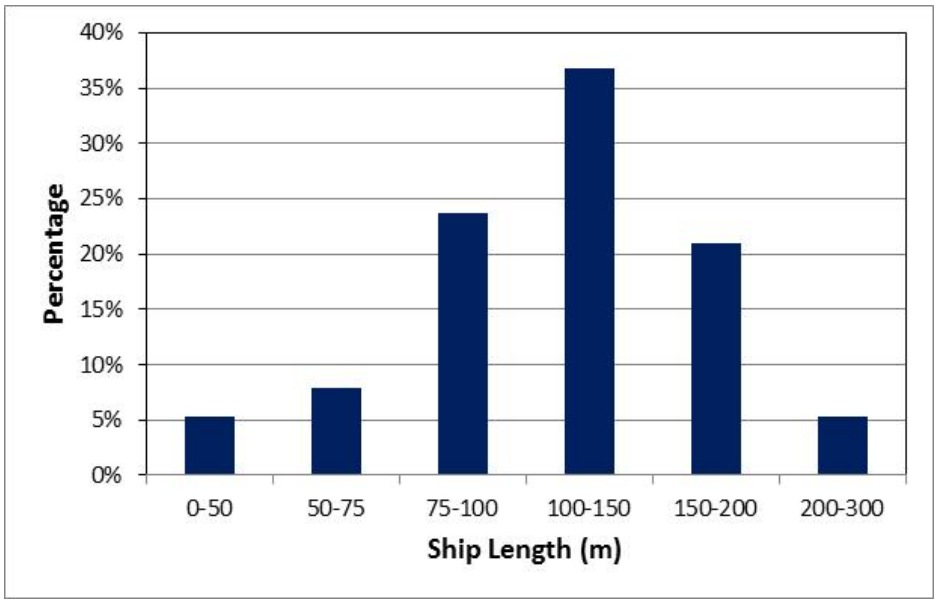

Figure 11.7 Route 2 Ship Length

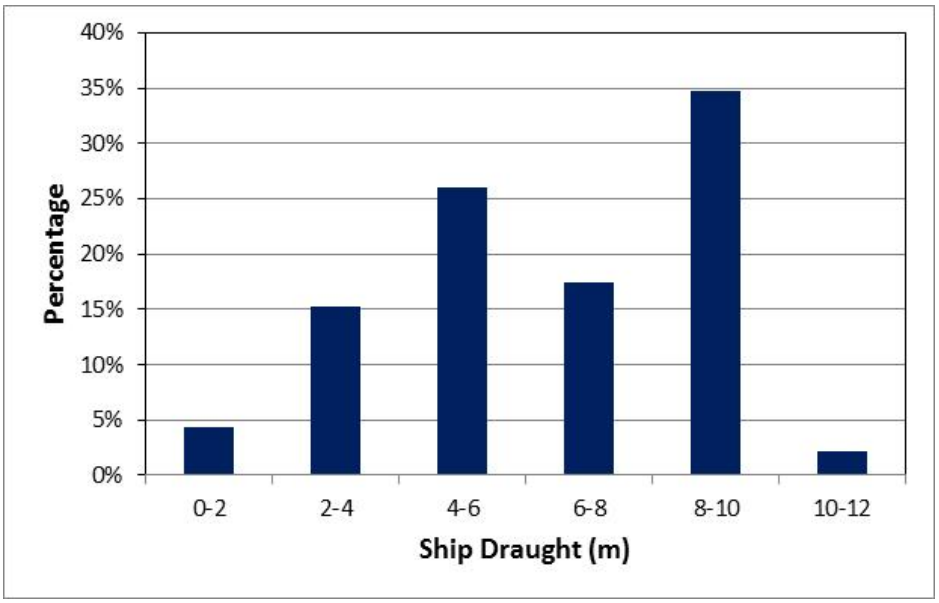

Figure 11.8 Route 2 Reported Ship Draught

The average ship length on Route 2 was 126m, with a draught of 6.1m.

The largest vessel recorded on this route during the 28 day survey period was the passenger vessel *Costa Magica* at 271.3m in length and draught of 8.3m bound for Le Havre, France.

A library image of this vessel is presented below.

Figure 11.9 Library Image of *Costa Magica*

11.3.2 Ship Speed

The average speed of vessels recorded on Route 2 is presented in Figure 11.10.

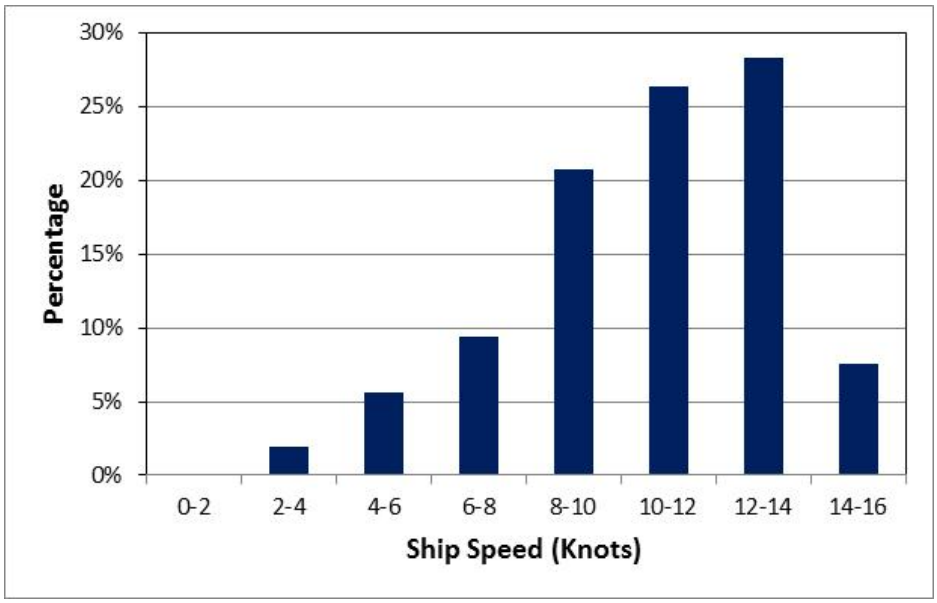

Figure 11.10 Route 2 Average Ship Speed

The average speed of vessels on this route was 10.5 Knots.

11.4 Route 3

A plot of the shipping on Route 3 is presented in Figure 11.11.

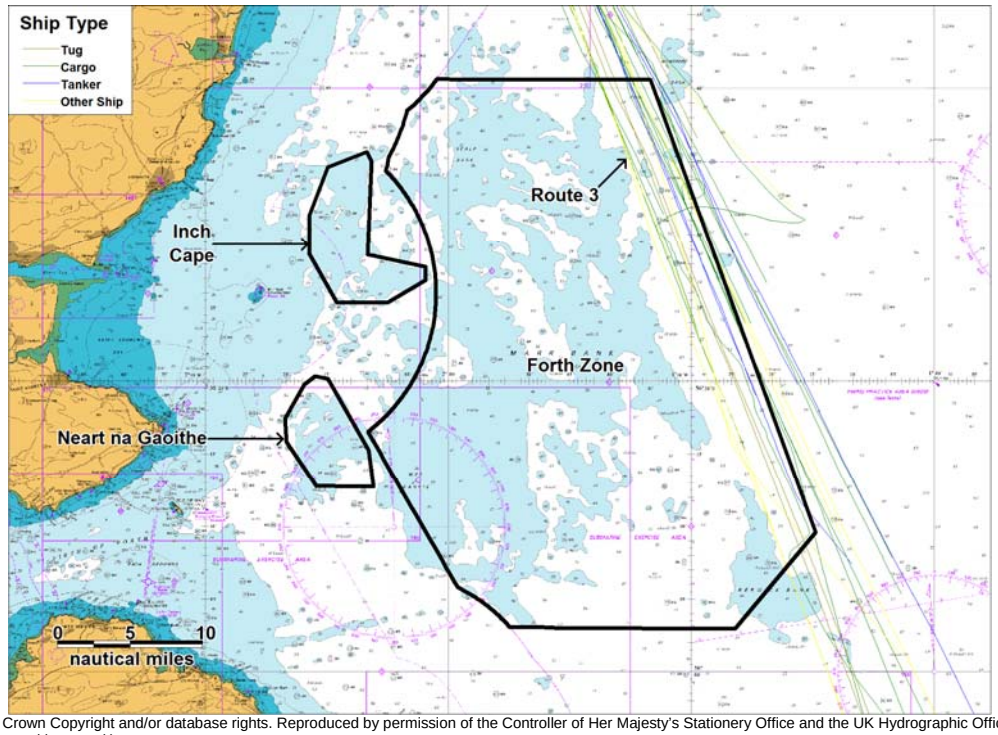

Figure 11.11 Route 3 Shipping Lane with extracted AIS Tracks by Type (28 Days)

Route 3 is used by an average of just under one vessel per day. A description of the traffic on this route is given below.

Ship Type:

The largest categories of vessels types recorded included cargo vessels (50%), tankers (15%), and offshore vessels (35%).

Destination:

Traffic is heading between Aberdeen and south eastern UK ports, including those in the Humber.

11.4.1 Ship Size (Length & Draught)

The size of vessels (length and draught) recorded on Route 3 is presented in Figure 11.13 and Figure 11.14.

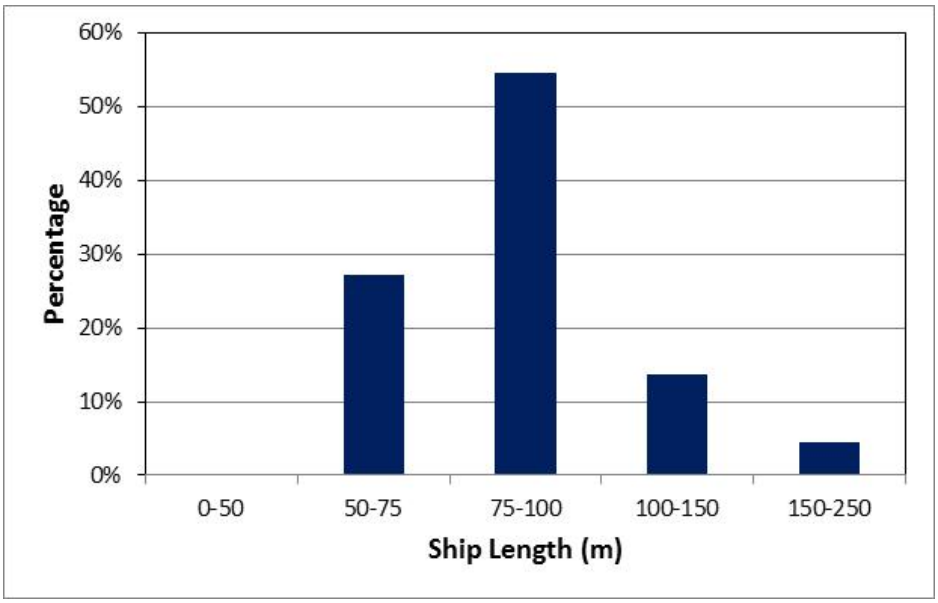

Figure 11.12 Route 3 Ship Length

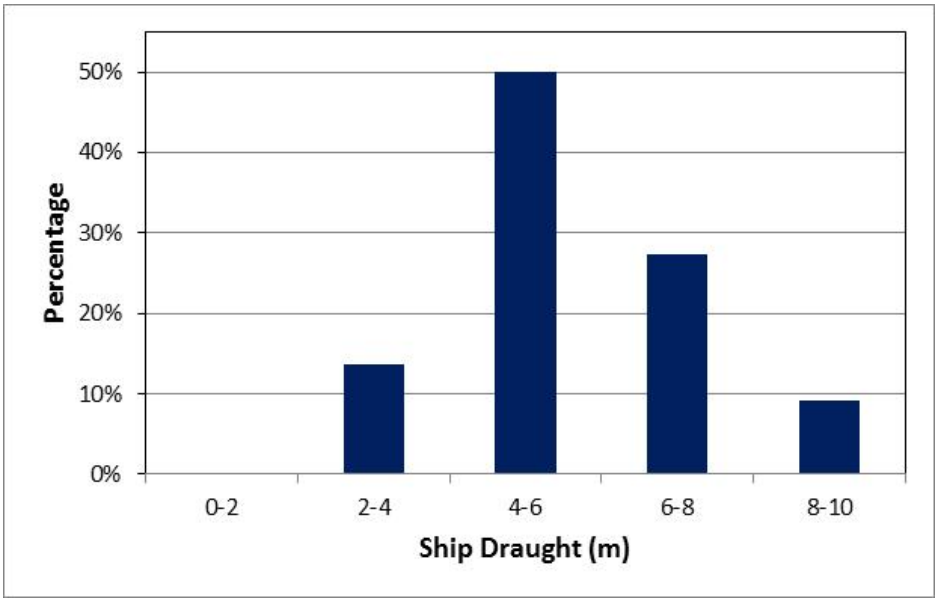

Figure 11.13 Route 3 Reported Ship Draught

The average ship length on Route 3 was 92.9m, with a draught of 5.5m.

The largest vessel recorded on this route during the 28 day survey period was the shuttle tanker *Aberdeen* 221m in length and draught of 8.5m, recorded heading towards Montrose.

A library image of this vessel is presented below.

Figure 11.14 Library Image of *Aberdeen*

11.4.2 Ship Speed

The average speed of vessels recorded on Route 3 is presented in Figure 11.15.

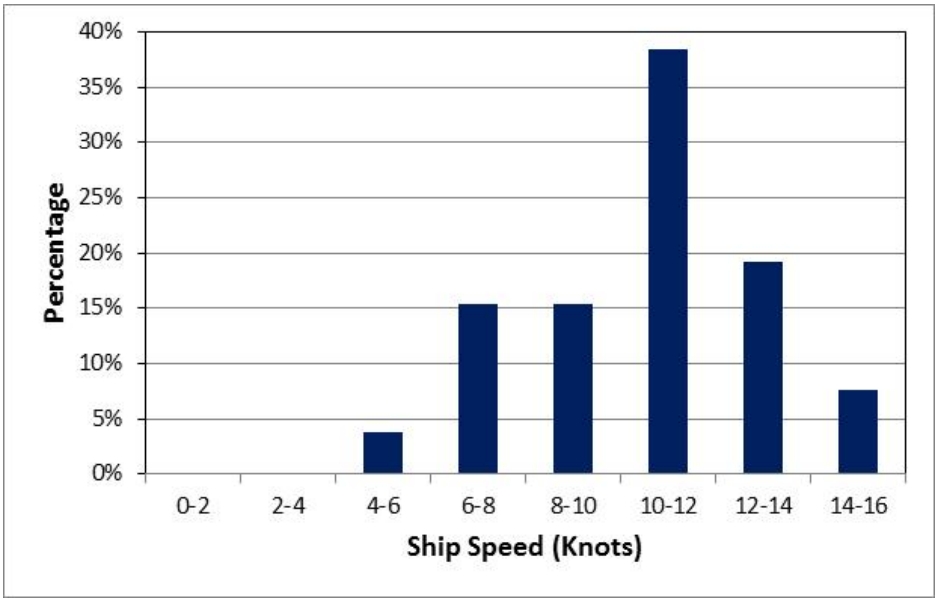

Figure 11.15 Route 3 Average Ship Speed

The average speed of vessels on this route was 10.4 Knots.

11.5 Route 4

A plot of the shipping on Route 4 is presented in Figure 11.16.

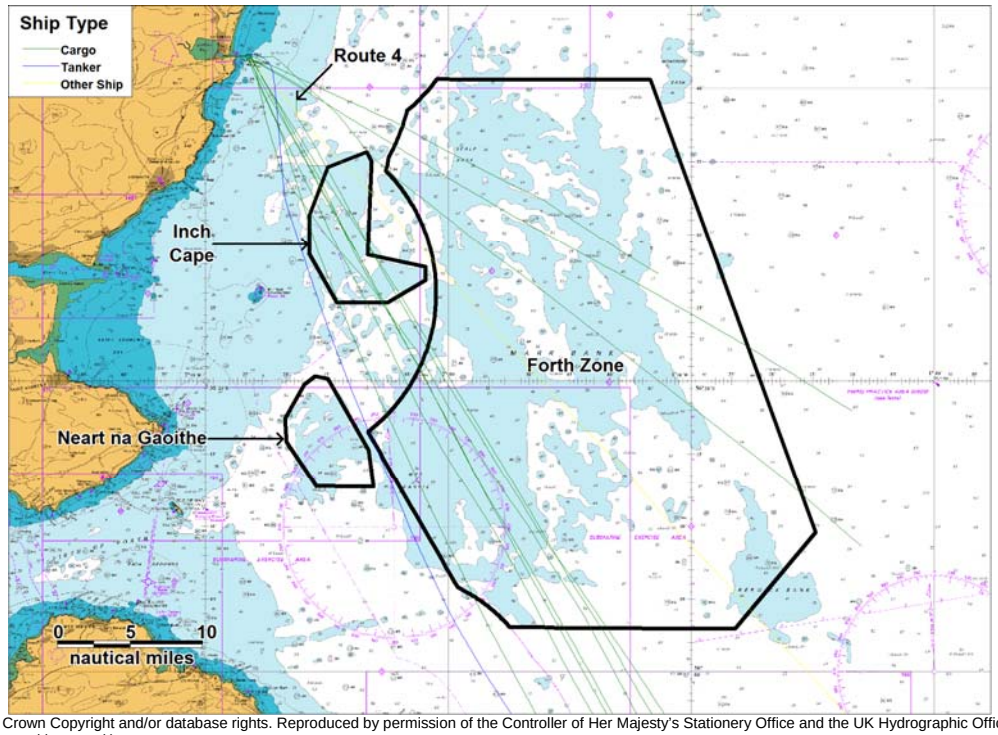

Figure 11.16 Route 4 Shipping Lane with extracted AIS Tracks by Type (28 Days)

Route 4 is used by an average of just under one vessel per day. A description of the traffic on this route is given below.

Ship Type:

The largest categories of vessels types recorded included cargo vessels (85%), tankers (8%) and offshore vessels (7%).

Destination:

Traffic is heading to Montrose or south to various ports such as Immingham and Brunsbuttel, Germany.

11.5.1 Ship Size (Length & Draught)

The size of vessels (length and draught) recorded on Route 4 is presented in Figure 11.17 and Figure 11.18.

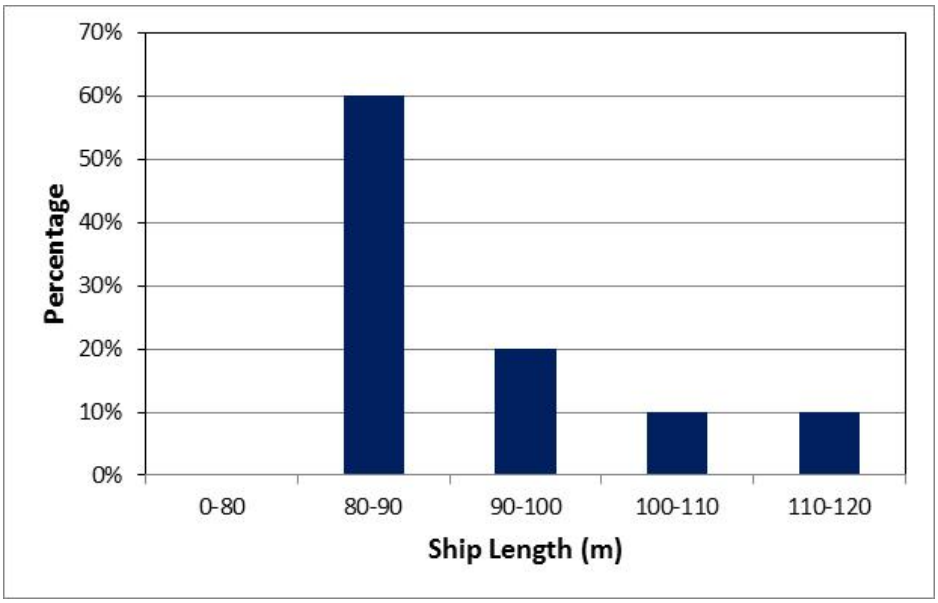

Figure 11.17 Route 4 Ship Length

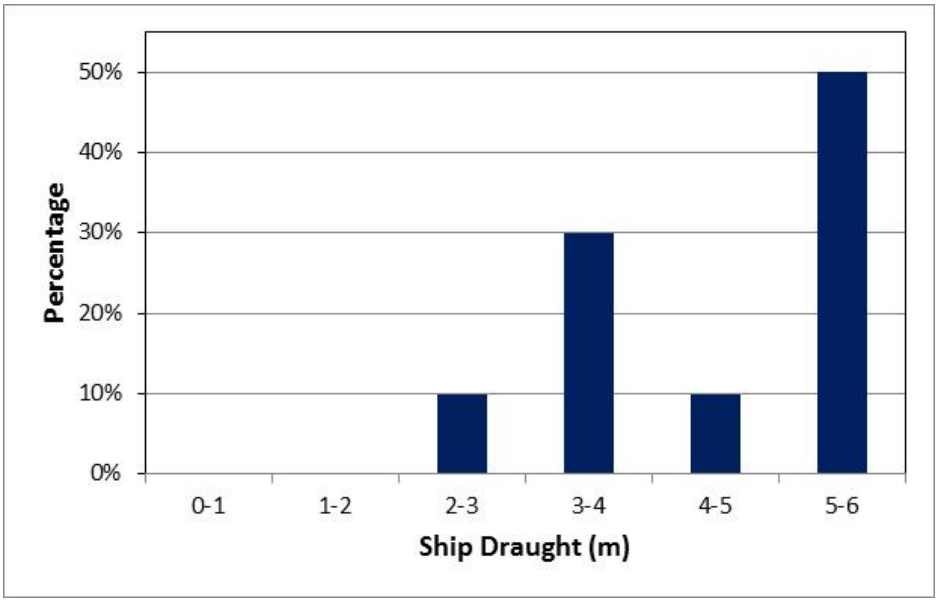

Figure 11.18 Route 4 Reported Ship Draught

The average ship length on Route 4 was 91.2m, with a draught of 4.4m.

The largest vessel recorded on this route during the 28 day survey period was the general cargo ship *Sormovskiy 3049*, 119.2m in length and draught of 4.3m, recorded heading to Montrose.

A library image of this vessel is presented below.

Figure 11.19 Library Image of *Sormovskiy 3049*

11.5.2 Ship Speed

The average speed of vessels recorded on Route 4 is presented in Figure 11.20.

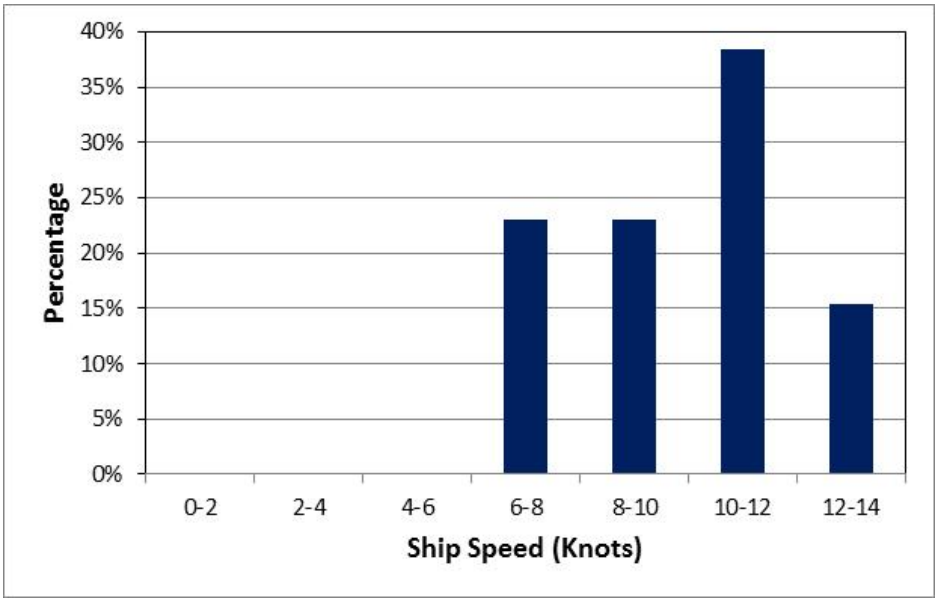

Figure 11.20 Route 4 Average Ship Speed

The average speed of vessels on this route was 9.9 Knots.

11.6 Route 5

A plot of the shipping on Route 5 is presented in Figure 11.21.

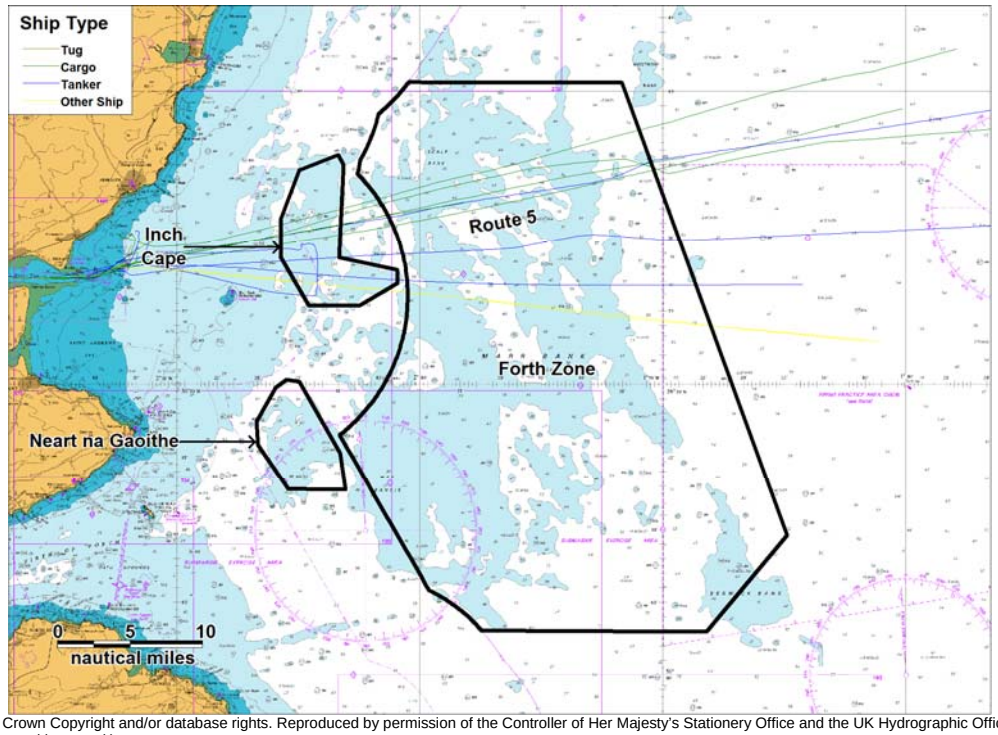

Figure 11.21 Route 5 Shipping Lane with extracted AIS Tracks by Type (28 Days)

Route 5 is used by an average of just under one vessel per day. A description of the traffic on this route is given below.

Ship Type:

The largest categories of vessels types recorded included cargo vessels (39%), tankers (39%) and offshore (search and rescue, tugs and drilling rigs) (23%).

Destination:

Heading to the Tay (mainly Dundee) and outbound to North Sea offshore platforms and northern European ports (i.e., Forties Oil Field and Sweden).

11.6.1 Ship Size (Length & Draught)

The size of vessels (length and draught) recorded on Route 5 is presented in Figure 11.22 and Figure 11.23.

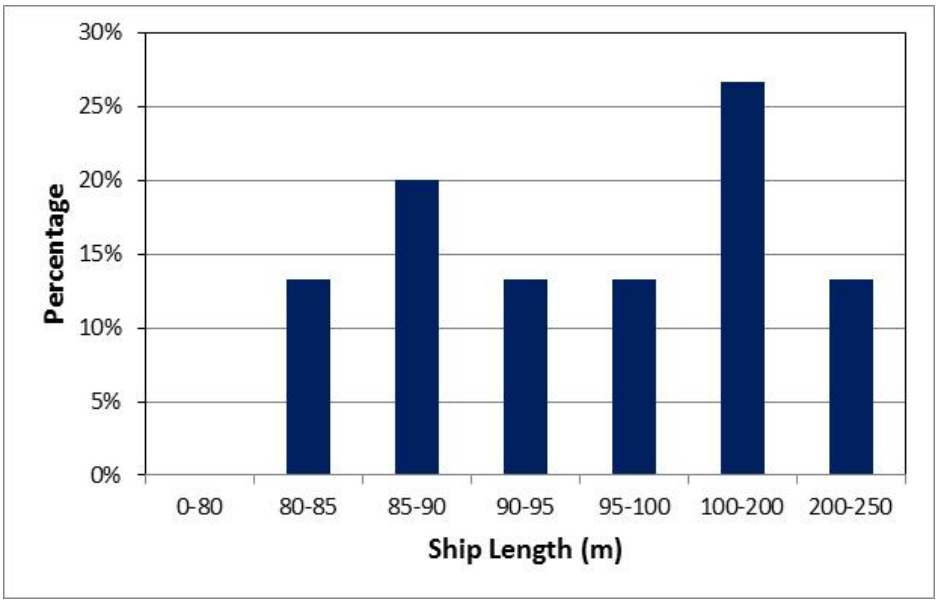

Figure 11.22 Route 5 Ship Length

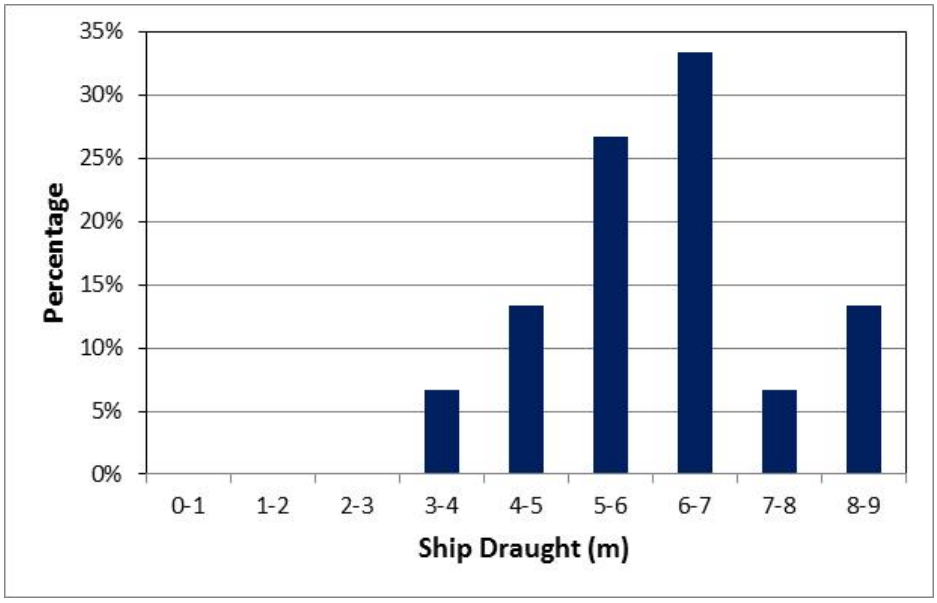

Figure 11.23 Route 5 Reported Ship Draught

The average ship length on Route 5 was 116.7m, with a draught of 6.0m.

The largest vessels recorded on this route during the 28 day survey period were the crude oil tanker *Overseas Cathy*, 250.17m in length and draught of 8.3m, recorded heading to Tallin, Estonia.

A library image of this vessel is presented below.

Figure 11.24 Library Image of *Overseas Cathy*

11.6.2 Ship Speed

The average speed of vessels recorded on Route 5 is presented in Figure 11.25.

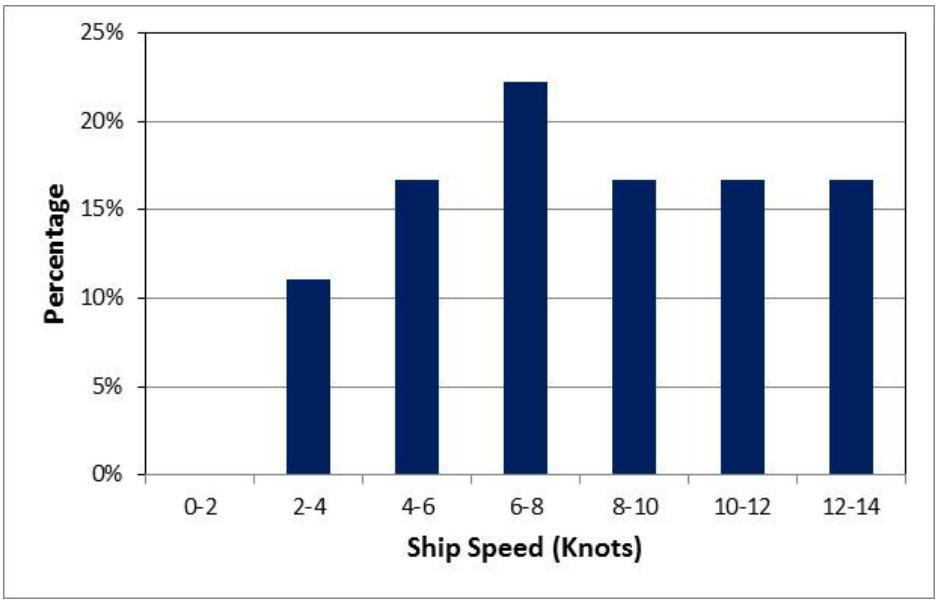

Figure 11.25 Route 5 Average Ship Speed

The average speed of vessels on this route was 8.3 Knots.

11.7 Route 6

A plot of the shipping on Route 6 is presented in Figure 11.26.

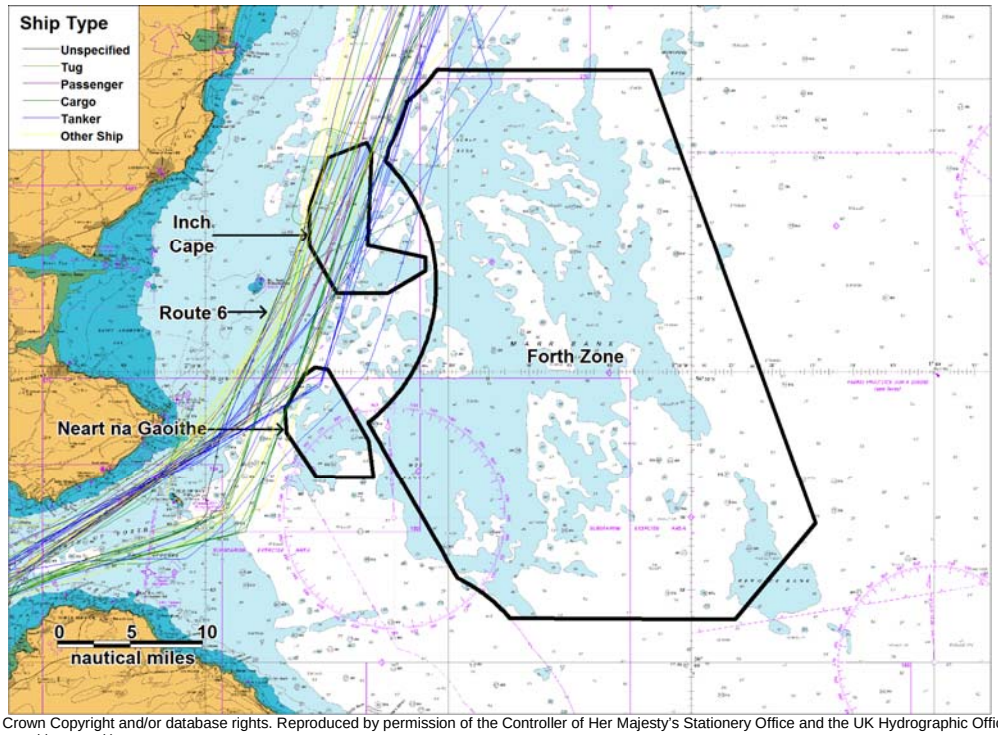

Figure 11.26 Route 6 Shipping Lane with extracted AIS Tracks by Type (28 Days)

Route 6 is used by an average of just under two vessels per day. A description of the traffic on this route is given below.

Ship Type:

The largest categories of vessels types recorded included cargo vessels (30%), other ships/tugs (mainly offshore support and fisheries protection) (27%), tankers (25%), passenger vessels (11%), tugs (4%) and unspecified vessels (2%).

Destination:

Traffic is mainly heading between the Forth and ports to the north, including Aberdeen, Inverness, Kirkwall and Peterhead.

11.7.1 Ship Size (Length & Draught)

The size of vessels (length and draught) recorded on Route 6 is presented in Figure 11.27 and Figure 11.28.

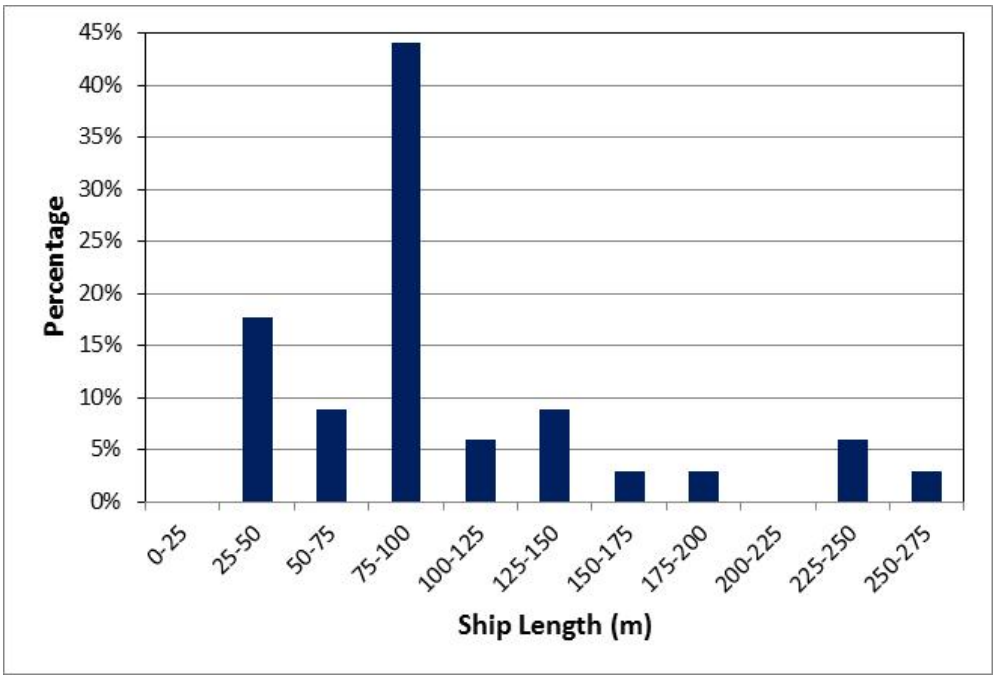

Figure 11.27 Route 6 Ship Length

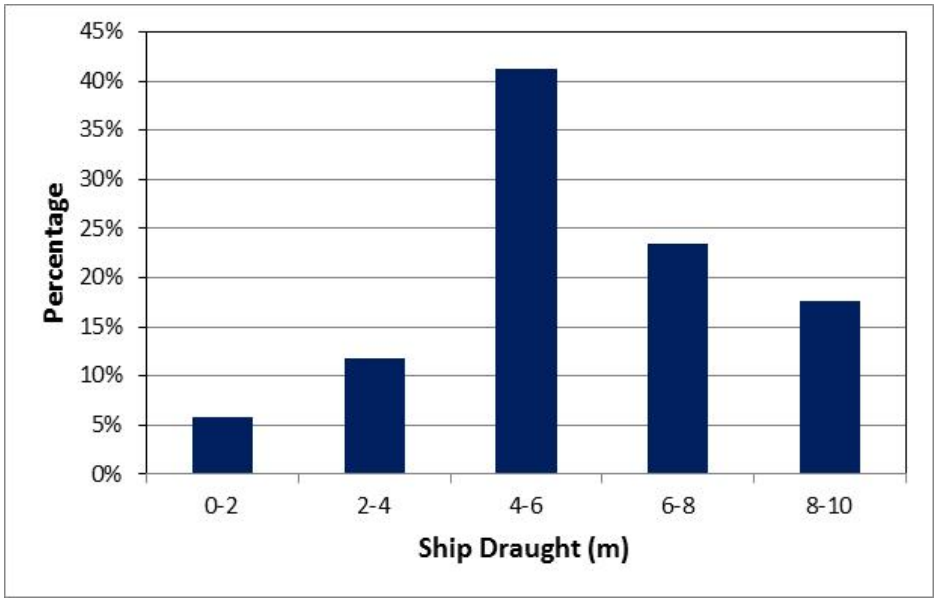

Figure 11.28 Route 6 Reported Ship Draught

The average ship length on Route 6 was 102.1m, with a draught of 5.3m.

The largest vessel recorded on this route during the 28 day survey period was the crude oil tanker *Penelop* 253.5m in length and draught of 8.6m, recorded heading to Hound Point.

A library image of *Penelop* is presented below.

Figure 11.29 Library Image of *Penelop*

11.7.2 Ship Speed

The average speed of vessels recorded on Route 6 is presented in Figure 11.30.

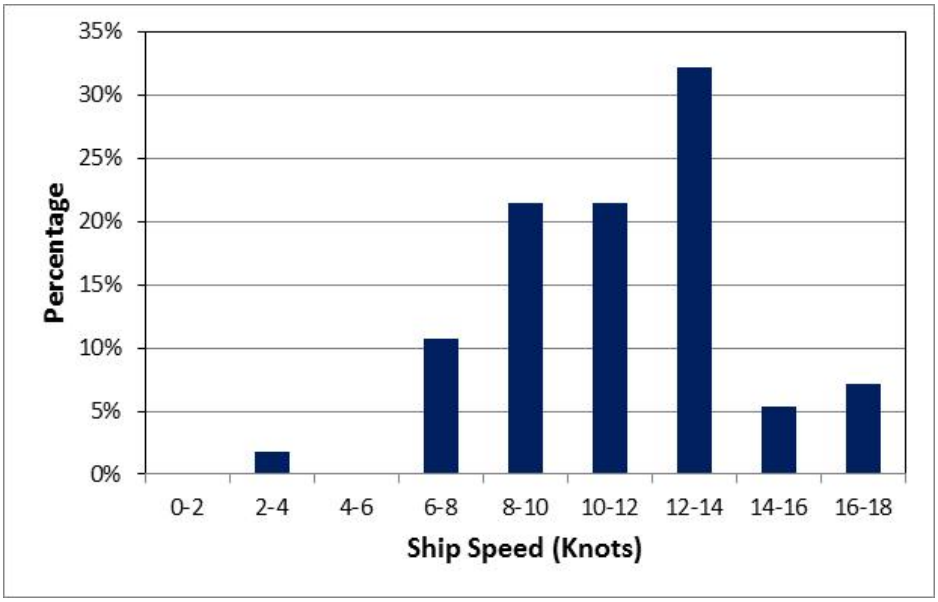

Figure 11.30 Route 6 Average Ship Speed

The average speed of vessels on this route was 11.2 Knots.

11.8 Route 7

A plot of the shipping on Route 7 is presented in Figure 11.31.

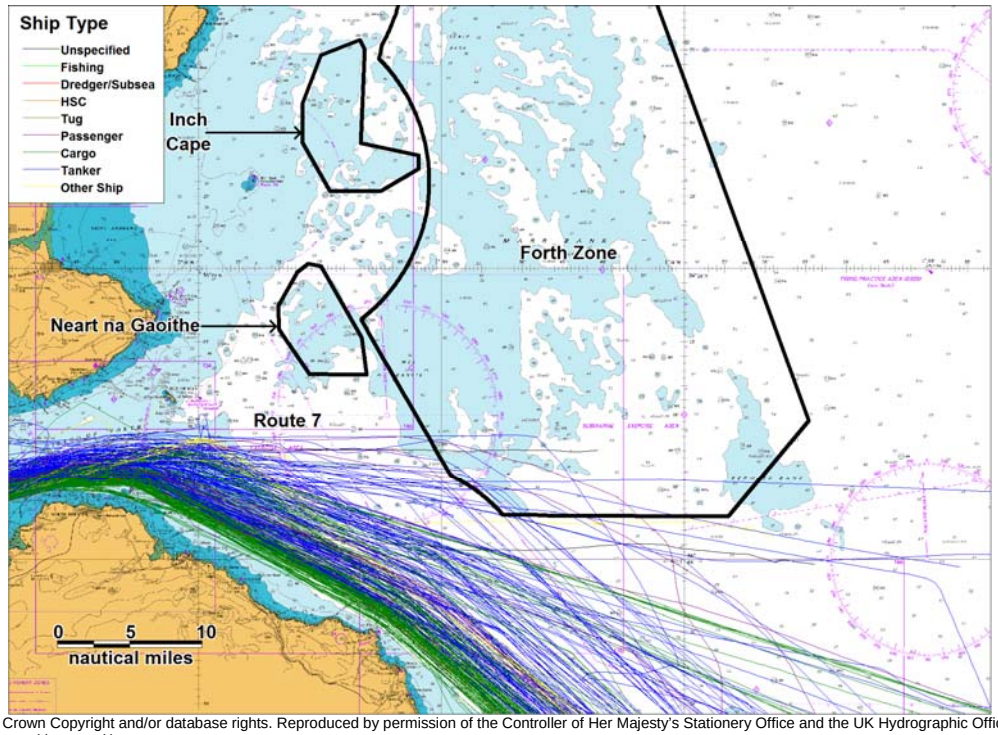

Figure 11.31 Route 7 Shipping Lane with extracted AIS Tracks by Type (28 Days)

Route 7 is used by an average of 13 vessels per day. A description of the traffic on this route is given below.

Ship Type:

The largest categories of vessels types recorded included cargo vessels (44%), tankers (41%), passenger vessels (5%) and other vessels (military/law enforcement and offshore) (5%).

Destination:

Traffic is mainly heading between (mainly Grangemouth and Leith) and ports to the south, such as Rotterdam, Antwerp, Zeebrugge and Amsterdam.

11.8.1 Ship Size (Length & Draught)

The size of vessels (length and draught) recorded on Route 7 is presented in Figure 11.32 and Figure 11.33.

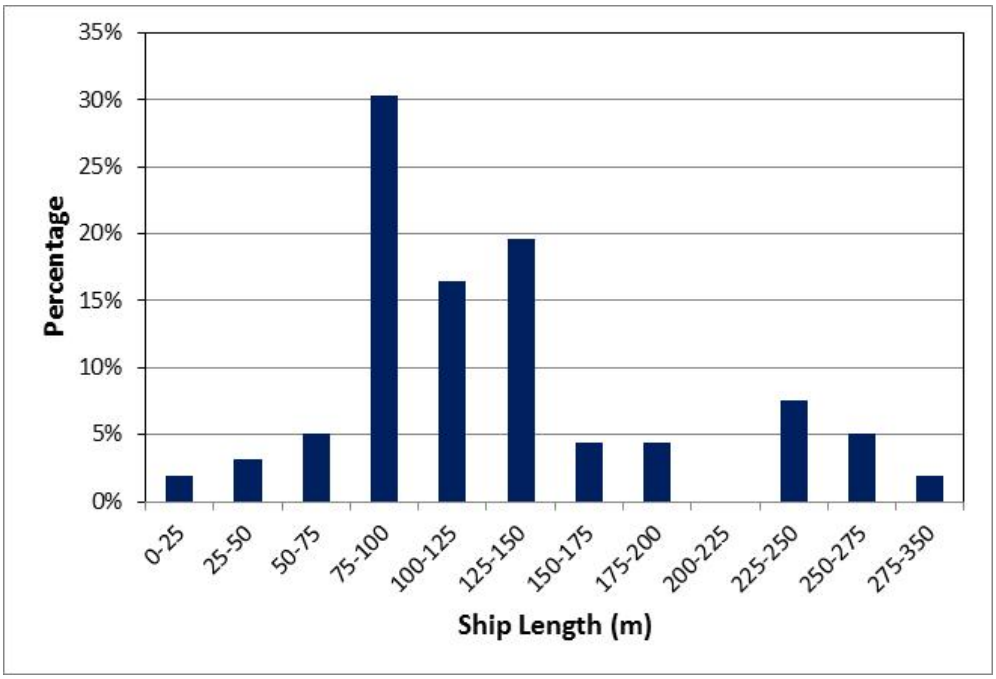

Figure 11.32 Route 7 Ship Length

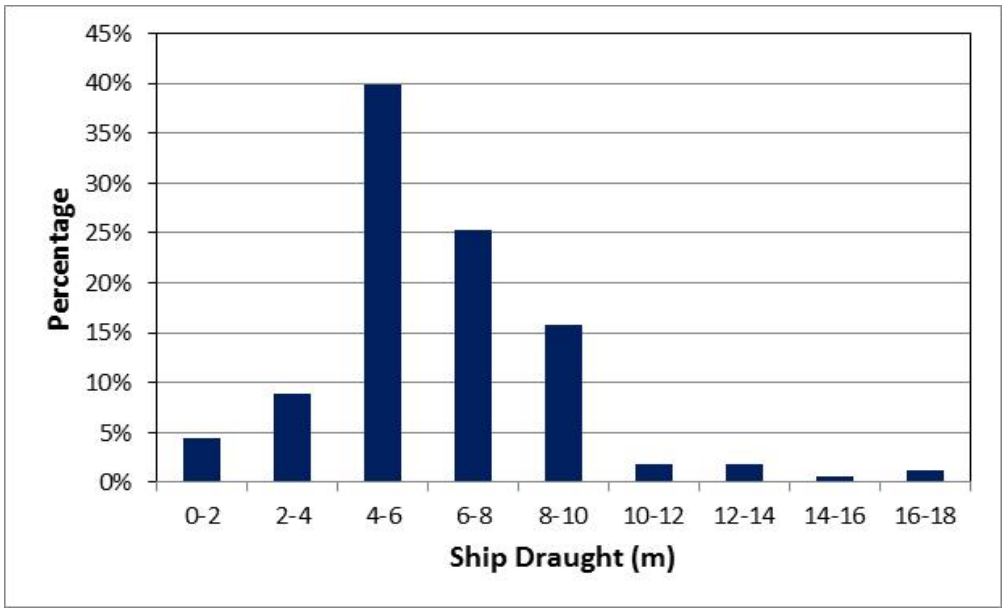

Figure 11.33 Route 7 Reported Ship Draught

The average ship length on Route 7 was 129.3m, with a draught of 6.1m.

The largest vessel recorded on this route during the 28 day survey period was the crude oil tanker *Genmar Hercules* 332m in length and draught of 11.3m, recorded heading to Hound Point. A library image of *Genmar Hercules* is presented in Figure 11.34.

There were also larger passenger vessels travelling on the route during the 28 day period. The largest recorded was the *Crown Princess*, 288.6m in length and draught of 8.7m, heading towards Invergordon.

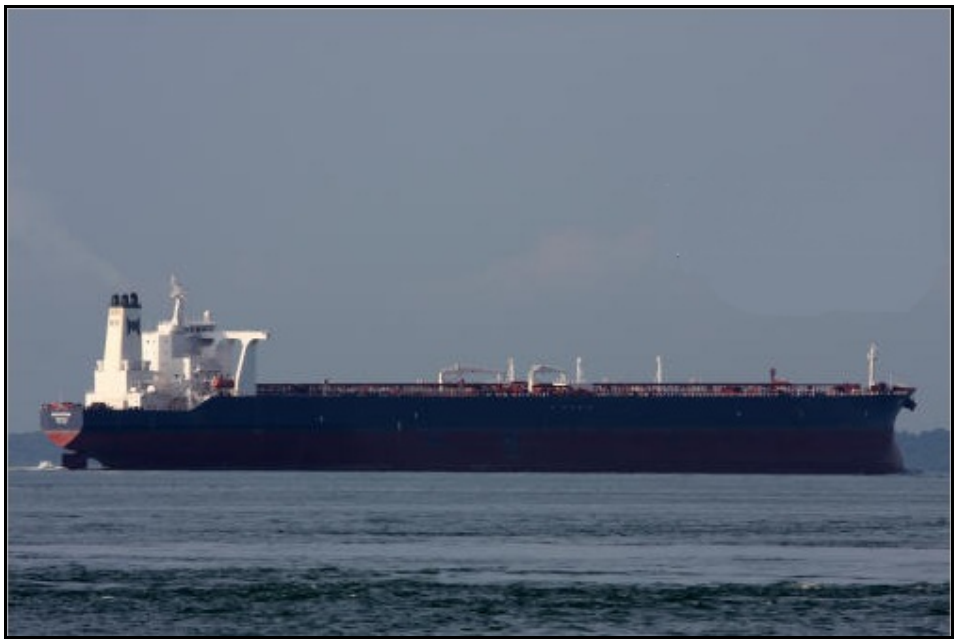

Figure 11.34 Library Image of *Genmar Hercules*

11.8.2 Ship Speed

The average speed of vessels recorded on Route 7 is presented in Figure 11.35.

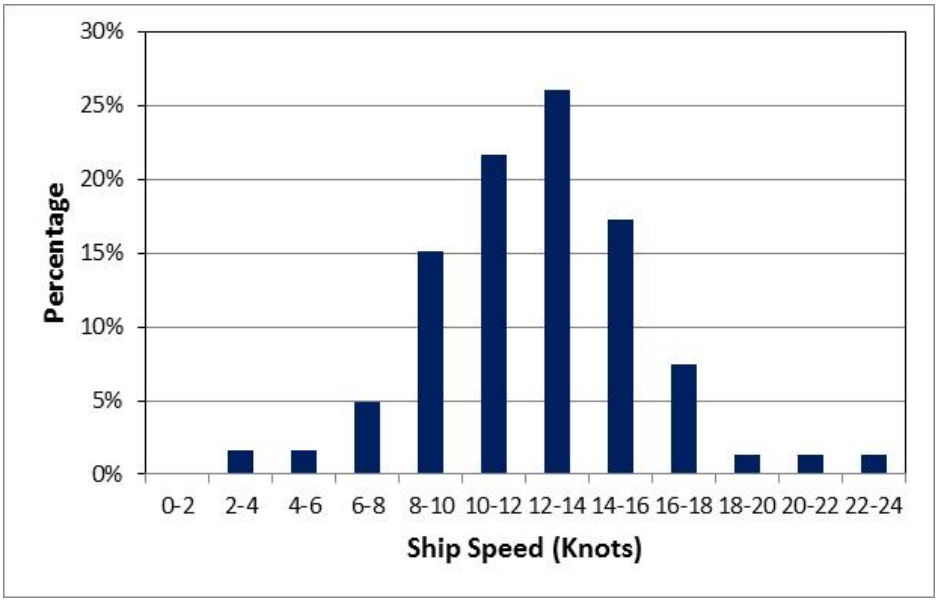

Figure 11.35 Route 7 Average Ship Speed

The average speed of vessels on this route was 12.3 Knots.

11.9 Route 8

A plot of the shipping on Route 8 is presented in Figure 11.36.

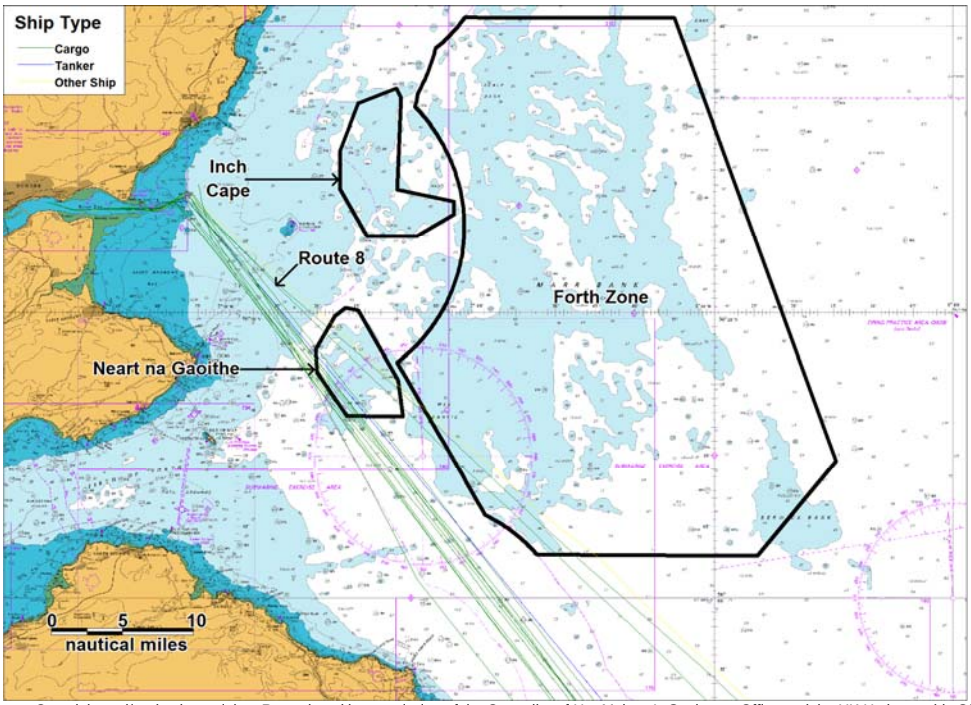

Figure 11.36 Route 8 Shipping Lane with extracted AIS Tracks by Type (28 Days)

Route 8 is used by an average of just under one vessel per day. A description of the traffic on this route is given below.

Ship Type:

The largest categories of vessels types recorded included cargo vessels (87%), tankers (7%) and other ships (offshore support/tugs) (6%).

Destination:

Traffic is heading between the Tay and ports to the south, such as Amsterdam, Immingham and Antwerp.

11.9.1 Ship Size (Length & Draught)

The size of vessels (length and draught) recorded on Route 8 is presented in Figure 11.37 and Figure 11.38.

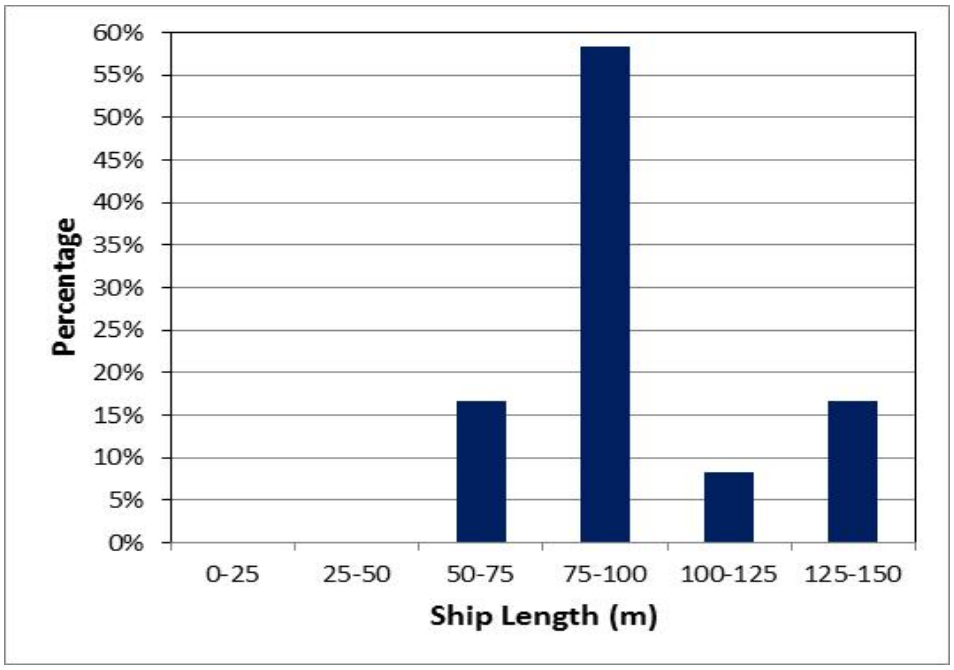

Figure 11.37 Route 8 Ship Length

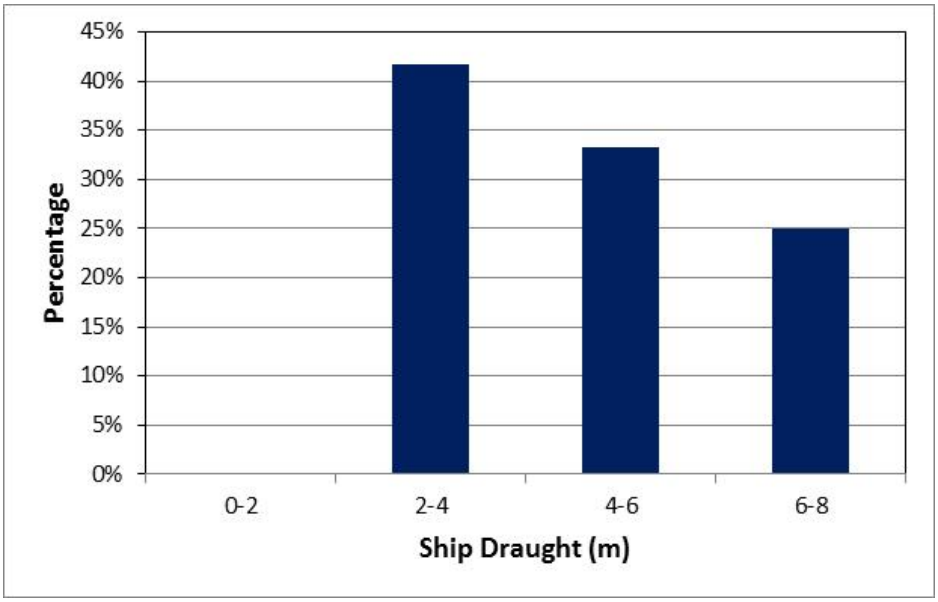

Figure 11.38 Route 8 Reported Ship Draught

The average ship length on Route 8 was 93.4m, with a draught of 4.7m.

The largest vessel recorded on this route during the 28 day survey period was the general cargo ship *Markborg* 134.55m in length and draught of 7.12m. A library image of *Markborg* is presented below.

Figure 11.39 Library Image of *Markborg*

11.9.2 Ship Speed

The average speed of vessels recorded on Route 8 is presented in Figure 11.40.

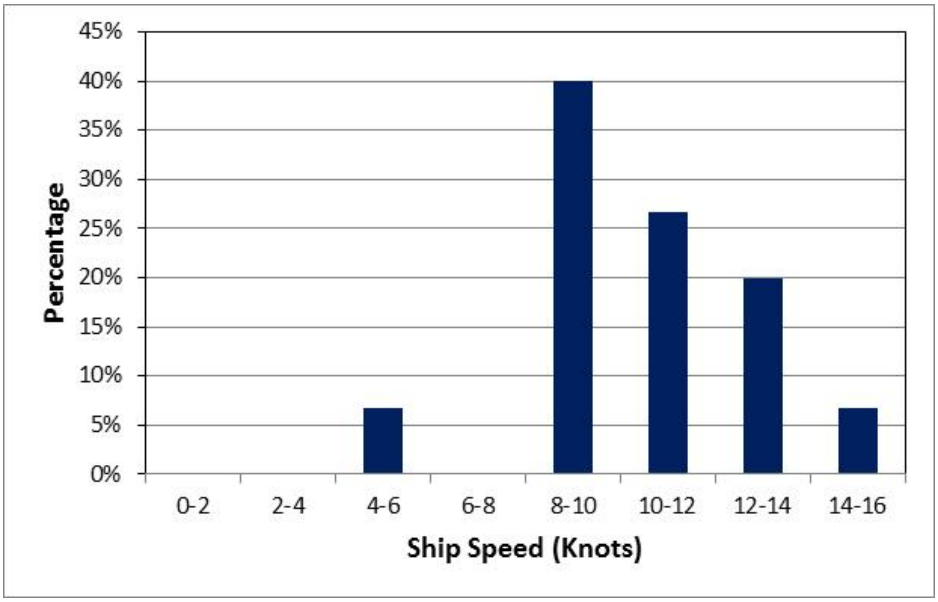

Figure 11.40 Route 8 Average Ship Speed

The average speed of vessels on this route was 10.4 Knots.

11.10 Route 9

A plot of the shipping on Route 9 is presented in Figure 11.41. It is noted that Route 9 is the coastal alternative to Route 6, with three vessels (*Forth Sentinel, Scot Isles* and *Ayr*) recorded taking both routes during the 28 days of surveying.

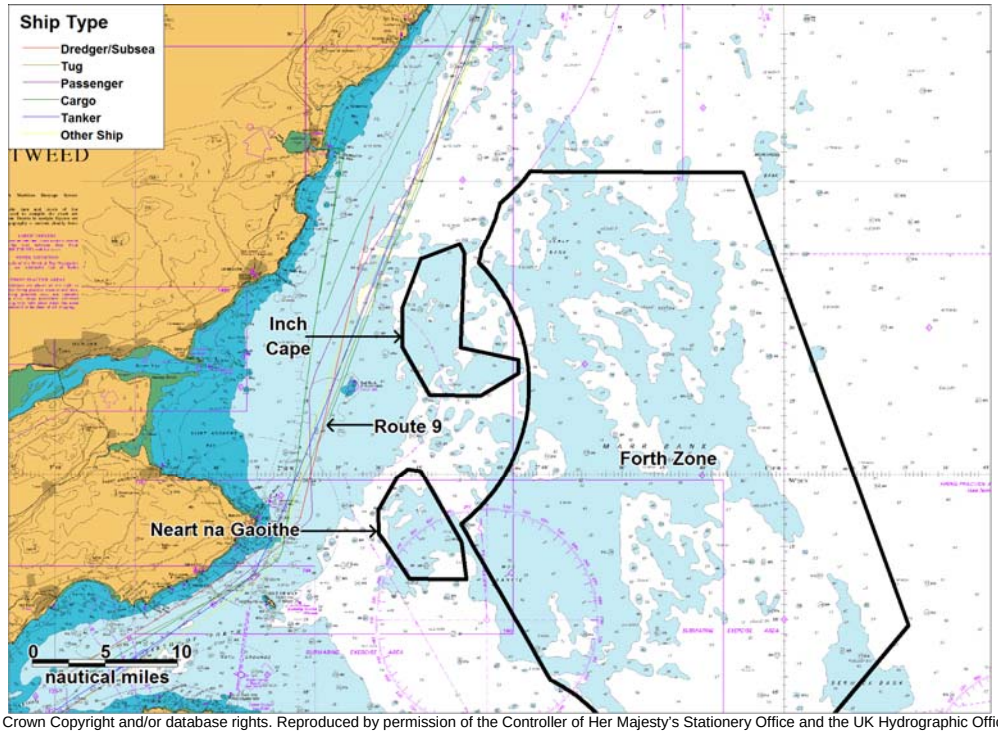

Figure 11.41 Route 9 Shipping Lane with extracted AIS Tracks by Type (28 Days)

Route 9 is used by an average of under one vessel every two days. As noted in Section 9.2.1 of this report three tankers operated by BP used this route during part of the combined data collection (pre March 2010), however these vessels have now been sold.

James Whitaker now operates *Whitstar* which was identified from more recent survey data from 2011 routeing on Route 10 between the Humber and northern Scottish ports including Invergordon, Wick and Scrabster. In addition, James Fisher Everard vessels *Shannon Fisher* and *Thames Fisher* were also recorded using Route 9 on a number of occasions during the combined period of data collection.

A description of the traffic on this route is given in the following subsections.

Ship Type:

The largest categories of vessels types recorded included vessels (40%), tugs (20%), passenger vessels (10%), tankers (10%), dredger/subsea vessels (10%) and other ships (10%).

Destination:

Traffic is mainly heading between the Forth and ports to the north, such as Inverness and Aberdeen.

11.10.1Ship Size (Length & Draught)

The size of vessels (length and draught) recorded on Route 9 is presented in Figure 11.42 and Figure 11.43.

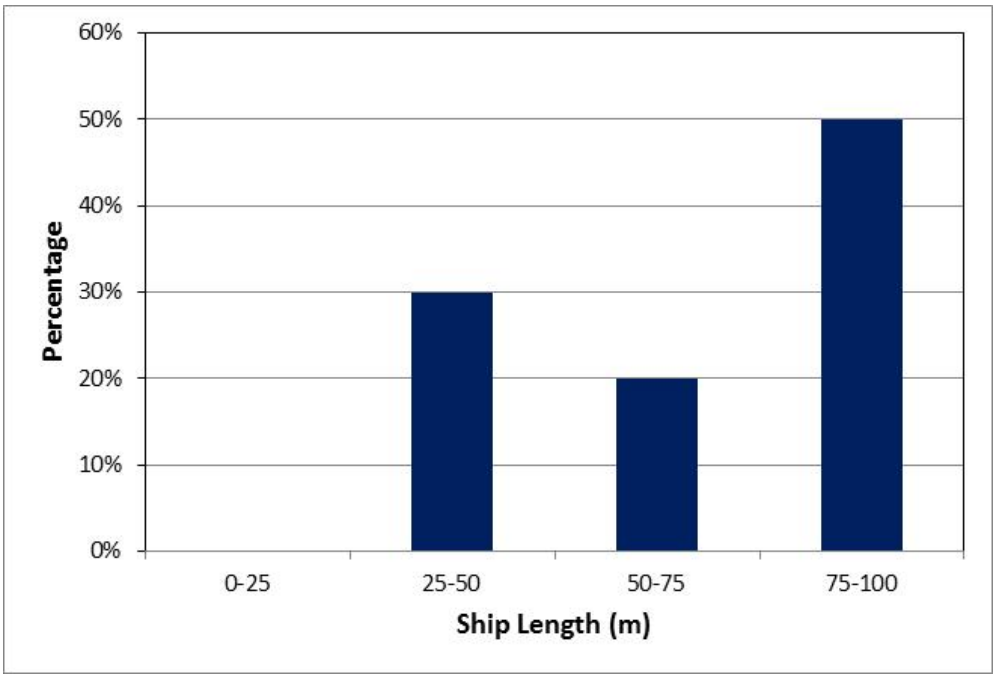

Figure 11.42 Route 9 Ship Length

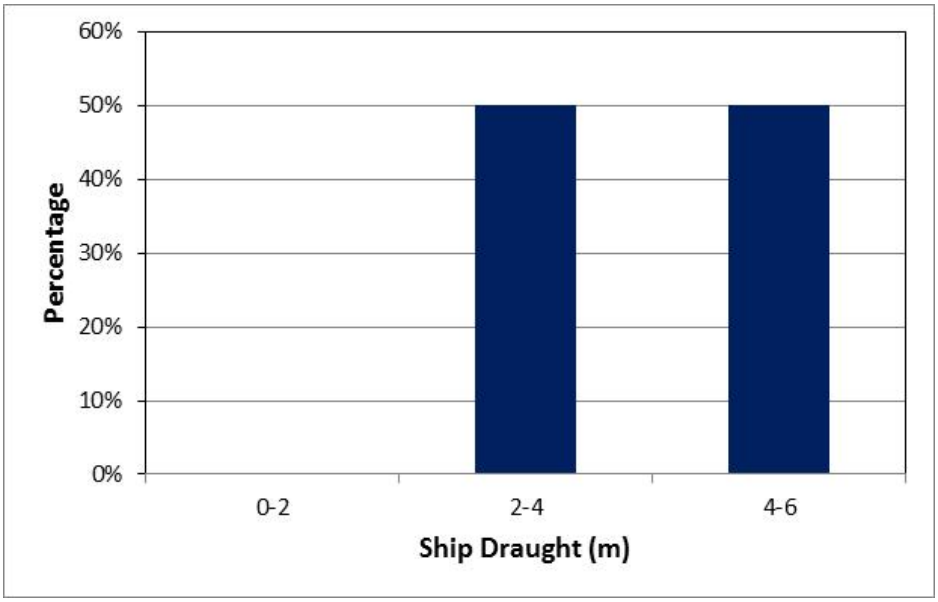

Figure 11.43 Route 9 Reported Ship Draught

The average ship length on Route 9 was 67.3m, with a draught of 3.9m.

The largest vessel recorded on this route during the 28 day survey period was the general cargo ship *Scot Isles* 91.3m in length and draught of 4m, recorded heading to Inverness.

A library image of *Scot Isles* is presented below.

Figure 11.44 Library Image of *Scot Isles*

11.10.2Ship Speed

The average speed of vessels recorded on Route 9 is presented in Figure 11.45.

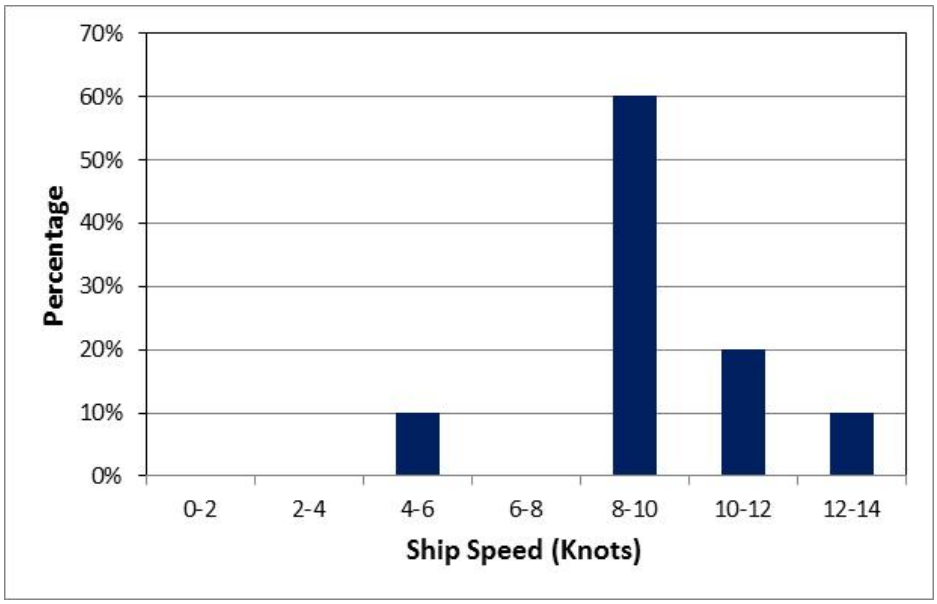

Figure 11.45 Route 9 Average Ship Speed

The average speed of vessels on this route was 9.5 Knots.

11.11 Route 10

A plot of the shipping on Route 10 is presented in Figure 11.46. It is noted that Route 10 is generally used by vessels by-passing Aberdeen; however in some cases northbound traffic may use Route 1 or 3 into Aberdeen and/or head north. Route 10 is also used by vessels travelling south to keep offshore of other routes heading to Aberdeen.

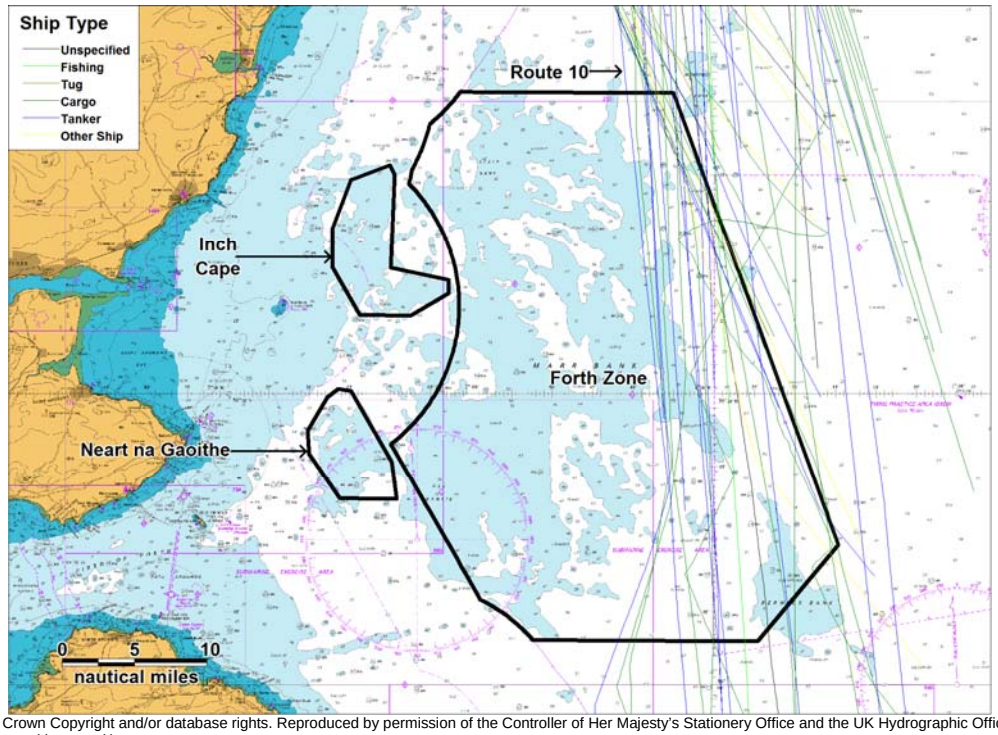

Figure 11.46 Route 10 Shipping Lane with extracted AIS Tracks by Type (28 Days)

Route 10 is used by an average of just under two vessels per day. A description of the traffic on this route is given below.

Ship Type

The largest categories of vessels types recorded included vessels (46%), tankers (33%) other ships (research, offshore support and tugs) (19%) and fishing (2%).

Destination:

Ships are heading between northern Scottish ports (i.e. Inverness, Aberdeen and Peterhead) and eastern English ports (i.e. Immingham, and Tees).

11.11.1Ship Size (Length & Draught)

The size of vessels (length and draught) recorded on Route 10 is presented in Figure 11.47 and Figure 11.48.

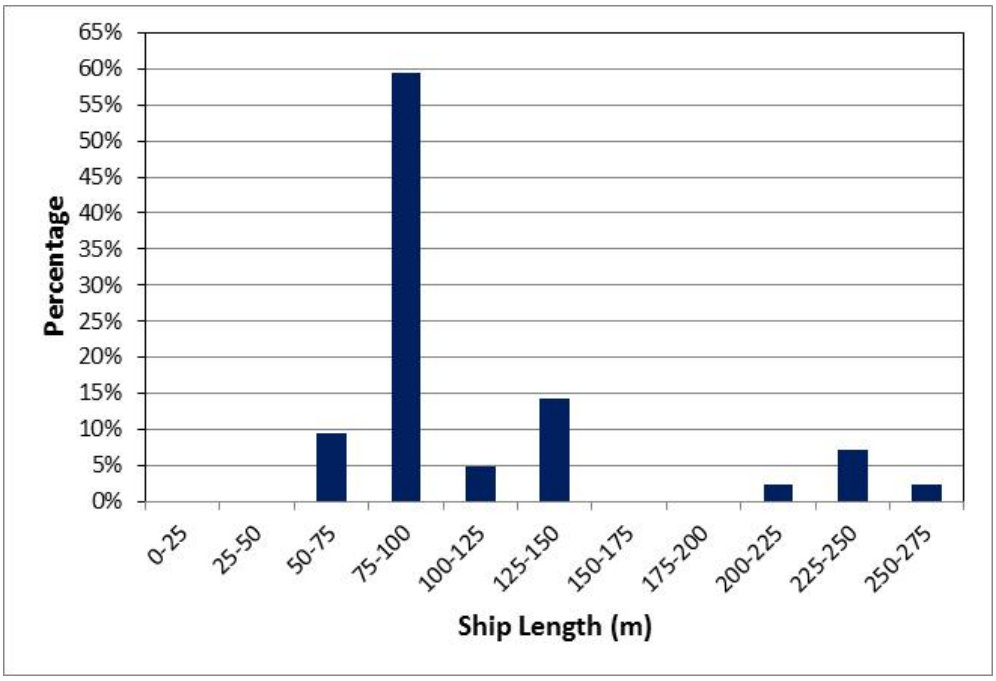

Figure 11.47 Route 10 Ship Length

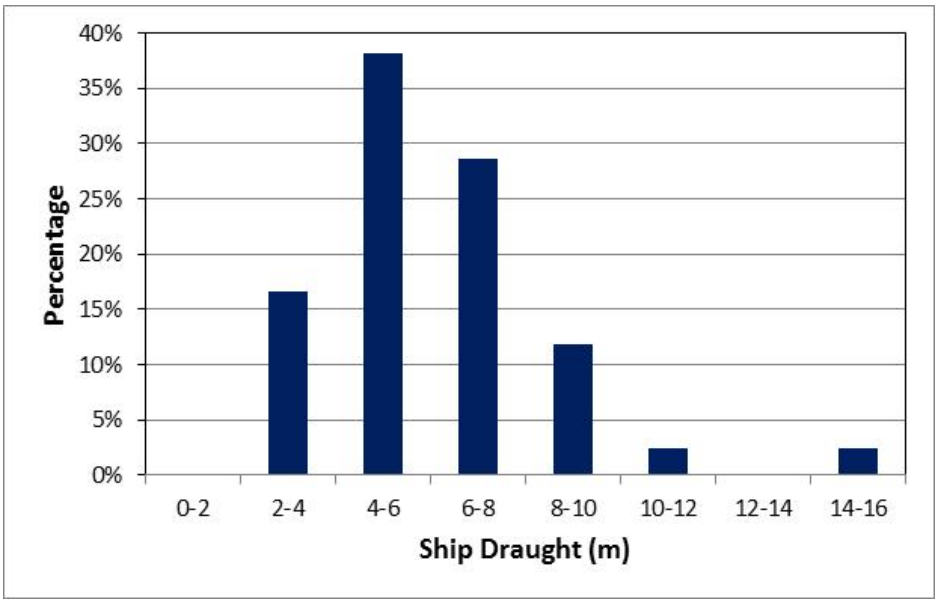

Figure 11.48 Route 10 Reported Ship Draught

The average ship length on Route 10 was 110.6m, with a draught of 6.0m.

The largest vessel recorded on this route during the 28 day survey period was the crude oil tanker *Maran Poseidon* 274.3m in length and draught of 15.5m, recorded heading to South Sabine, USA.

A library image of *Maran Poseidon* is presented below.

Figure 11.49 Library Image of *Maran Poseidon*

11.11.2Ship Speed

The average speed of vessels recorded on Route 10 is presented in Figure 11.50.

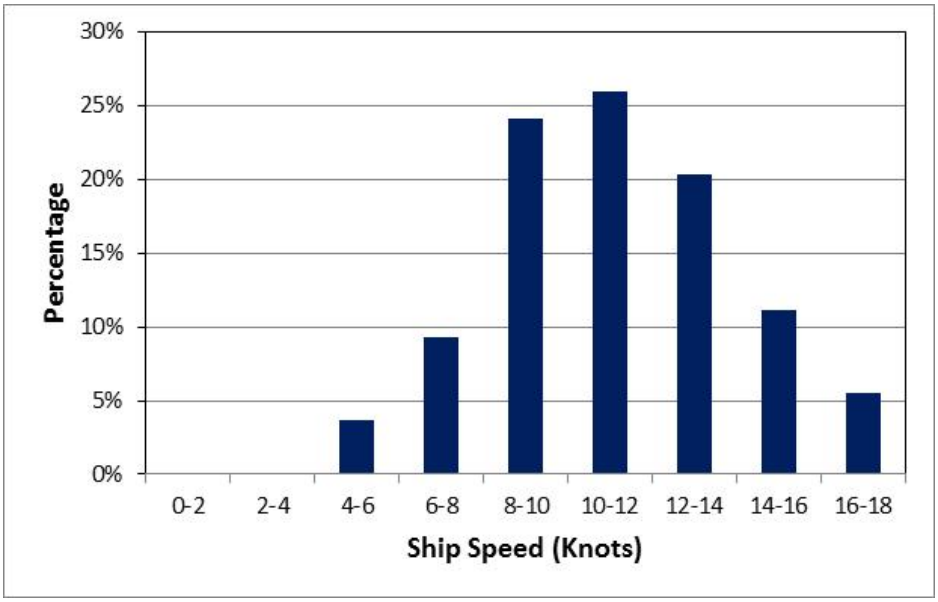

Figure 11.50 Route 10 Average Ship Speed

The average speed of vessels on this route was 11 Knots.

12 ALTERNATIVE ROUTEING

12.1 Introduction

The following section presents an analysis of alternative routeing options for the main shipping lanes identified relative to the outer Forth and Tay developments.

The main shipping lanes have been re-routed based on available sea room and Master Mariner experience (Ref. vi) and the lowest impact to the route.

12.2 Route 1 and Route 3

These routes are formed by traffic from Aberdeen to Tyne, Tees and the Humber.

12.2.1 Aberdeen to Tyne

The predicted routeing for Aberdeen – Tyne traffic (Route 1) is presented in Figure 12.1 and a detailed plot in Figure 12.2.

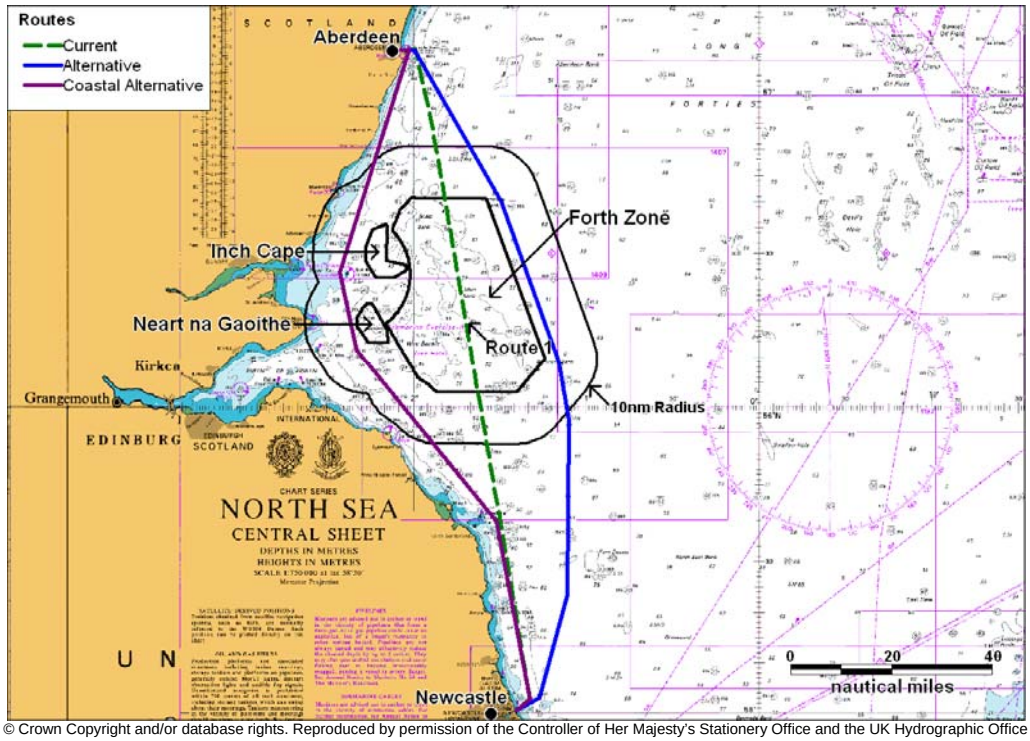

Figure 12.1 Overview Route 1 and Alternatives (Aberdeen – Tyne)

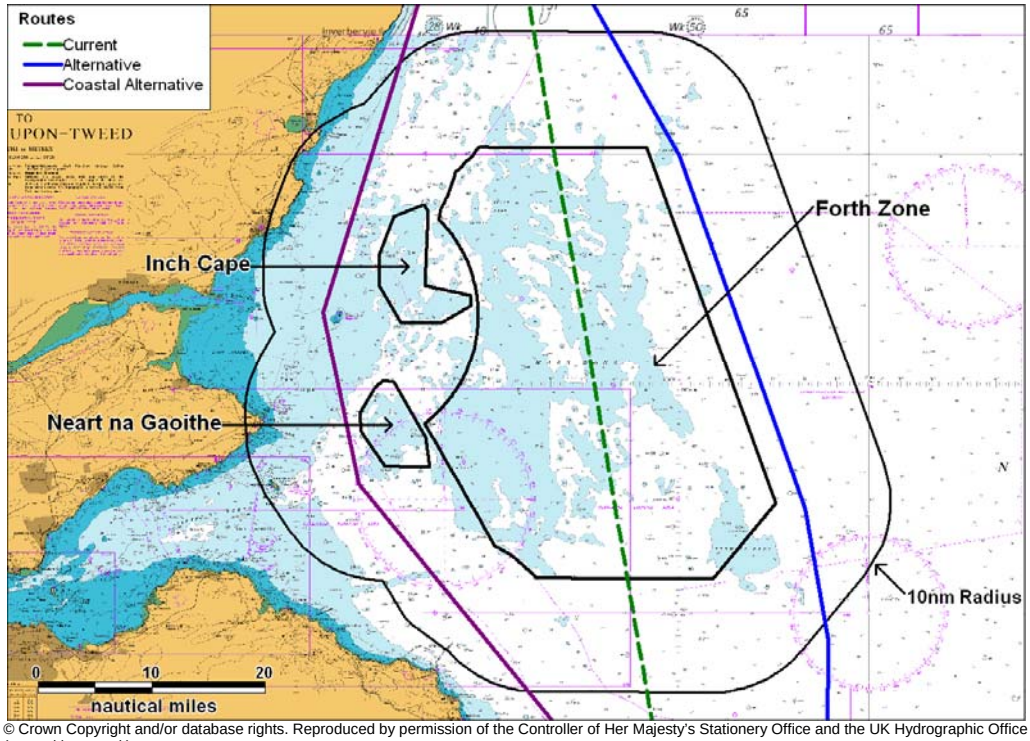

Figure 12.2 Detailed Route 1 Alternatives (Aberdeen – Tyne)

12.2.2 Aberdeen to Tees and Humber

The predicted routeing for Aberdeen – Tees and Humber is presented in Figure 12.3 and Figure 12.4.

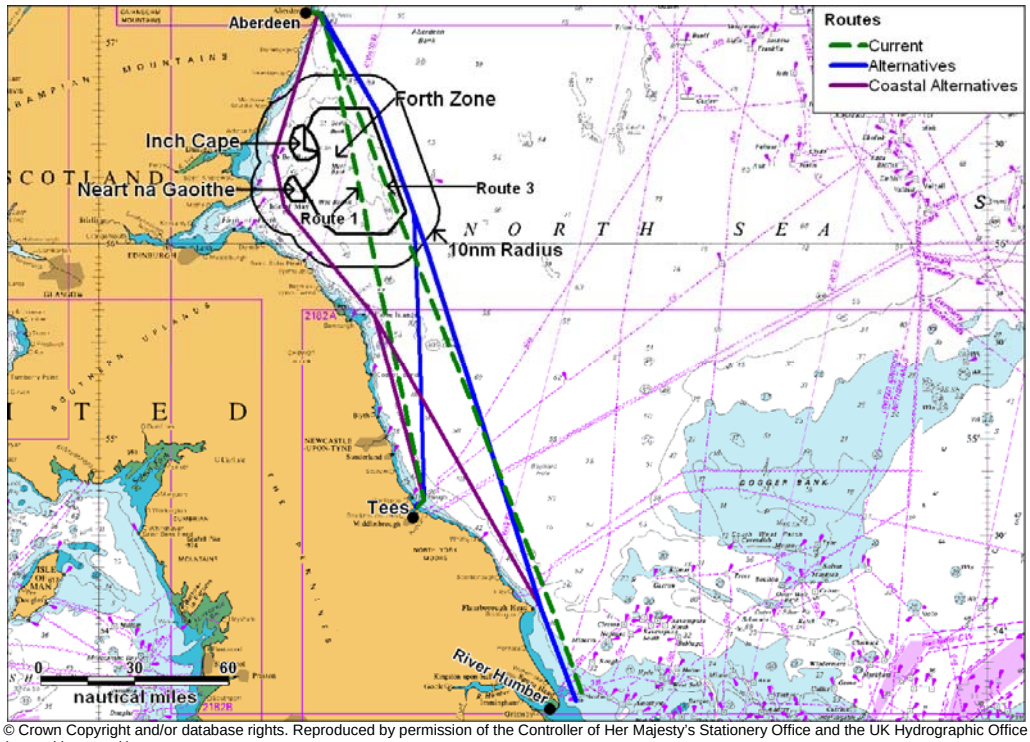

Figure 12.3 Overview Route 1 and Alternatives (Aberdeen – Tyne and Humber)

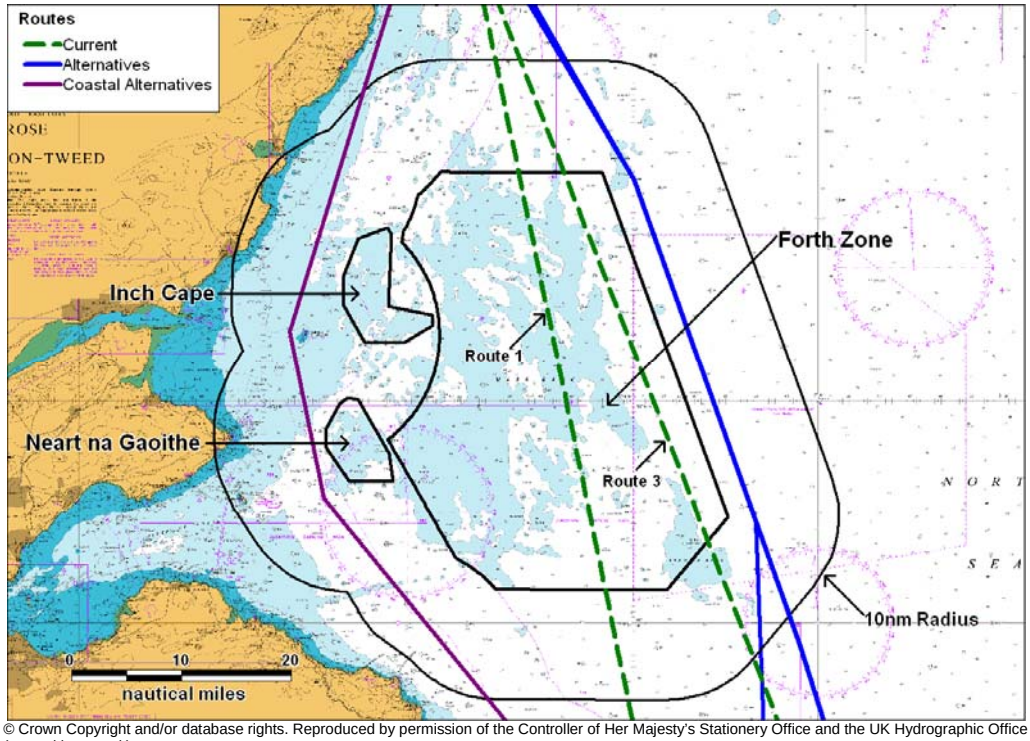

Figure 12.4 Detailed Route 1 and 3 Alternatives (Aberdeen – Tyne and Humber)

Table 12.1 provides a summary of the predicted future routeing options compared to the current mean routes. For reference the current route lengths are as follows:

Aberdeen / Tyne 134.7nm
Aberdeen / Tees 156.9nm
Aberdeen / Humber 228.6nm

Table 12.1 Summary of Routeing Options

	Overall Distance (nm)	**Difference in (nm)**	**Difference (%)**	**Change in Time for Average Speed Vessel (8.5 knots)**
Aberdeen / Tyne (East of sites)	141.1	+6.4	+4.8	+45mins
Aberdeen / Tyne (Coastal)	144	+9.3	+6.9	+1Hr 5mins
Aberdeen / Tees (East of sites)	160.3	+0.4	+0.3	+3mins
Aberdeen / Tees (Coastal)	167	+10.1	+6.0	+1Hr 11mins
Aberdeen / Humber (East of sites)	228.8	+0.2	+0.09	+1 to 2mins
Aberdeen / Humber (Coastal)	241.1	+12.5	+5.5	+1Hr 28mins

Key Points for Route 1 (and 3) Alternatives:

Traffic passing to the East of the developments en route between Aberdeen and Tees/Humber will be relatively unaffected by the proposed developments. Smaller craft wishing to use the inshore routes can continue to do so; however the coastal Route options may require larger deviations.

Similar conclusions are drawn for the Aberdeen/Tyne route, although shipping will experience a more significant increase in voyage distance and time. It is noted that this is a very low use route compared to the Aberdeen Tees/Humber routes.

12.3 Route 2

The current routeing for Route 2 is presented as an overview in Figure 12.5 and detailed plot in Figure 12.6.

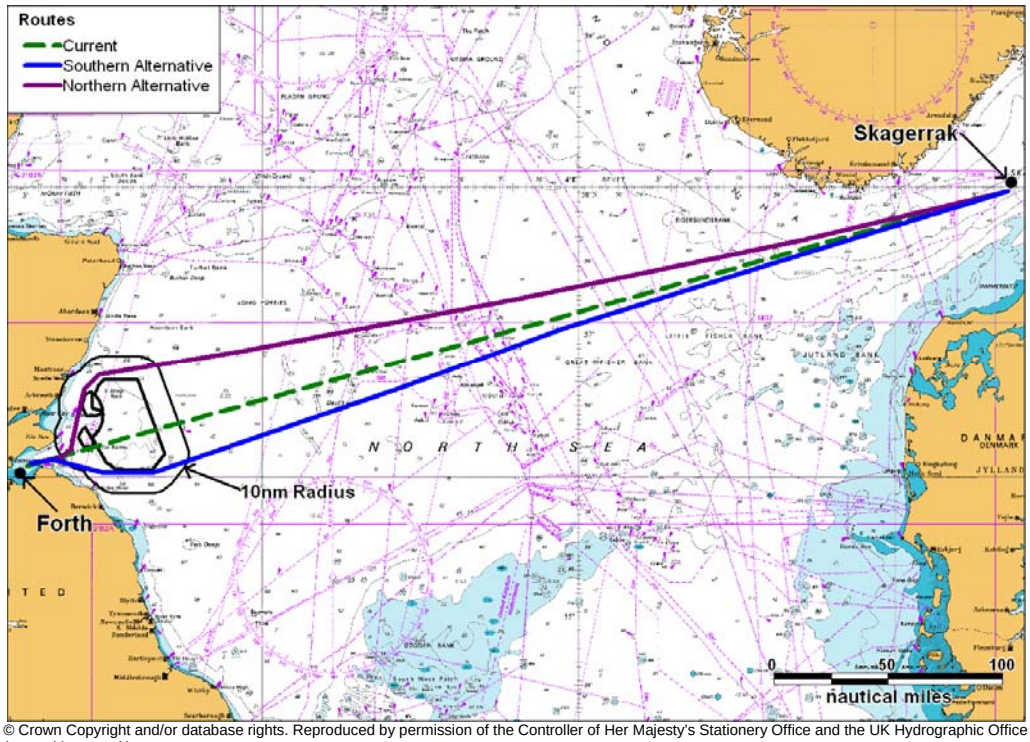

Figure 12.5 Overview Route 2 and Alternatives (Forth – Skagerrak)

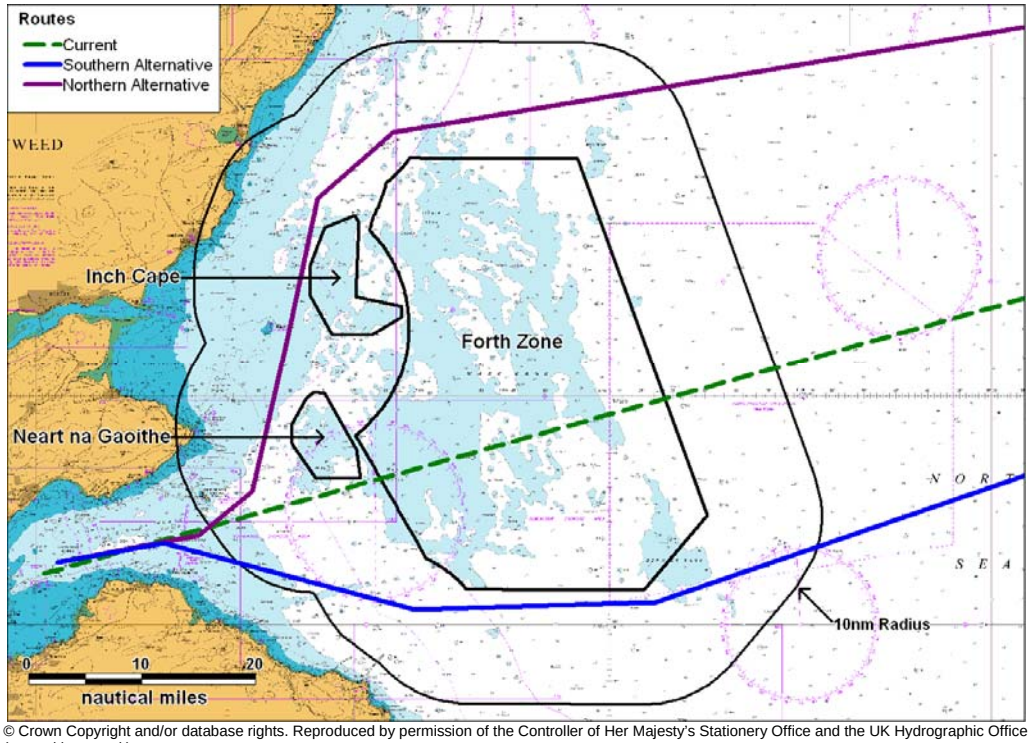

Figure 12.6 Detailed Route 2 Alternatives (Forth – Skagerrak)

At present this route is 421nm in length. Table 12.2 provides a summary of the predicted future routeing options compared to the current mean routes.

Table 12.2 Summary of Routeing Options

	Overall Distance (nm)	Difference in (nm)	Difference (%)	Change in Time for Average Speed Vessel (11.9knots)
Forth / Skagerrak (South)	425	+4.1	+1	+21mins
Forth / Skagerrak (North)	433.7	+12.8	+3	+1Hr 5mins

Key Points for Route 2 Alternatives:

The southern route is shorter and is therefore likely to have lower commercial impact on vessels in terms of time and fuel costs. The northern route requires a slightly larger deviation and takes the vessels inshore of the sites, passing Bell Rock.

12.4 Route 4

The current mean route and predicted routeing for Route 4 is presented as an overview in Figure 12.7 and detailed plot in Figure 12.8. It is noted that two alternative routes are presented for Montrose – Holland traffic.

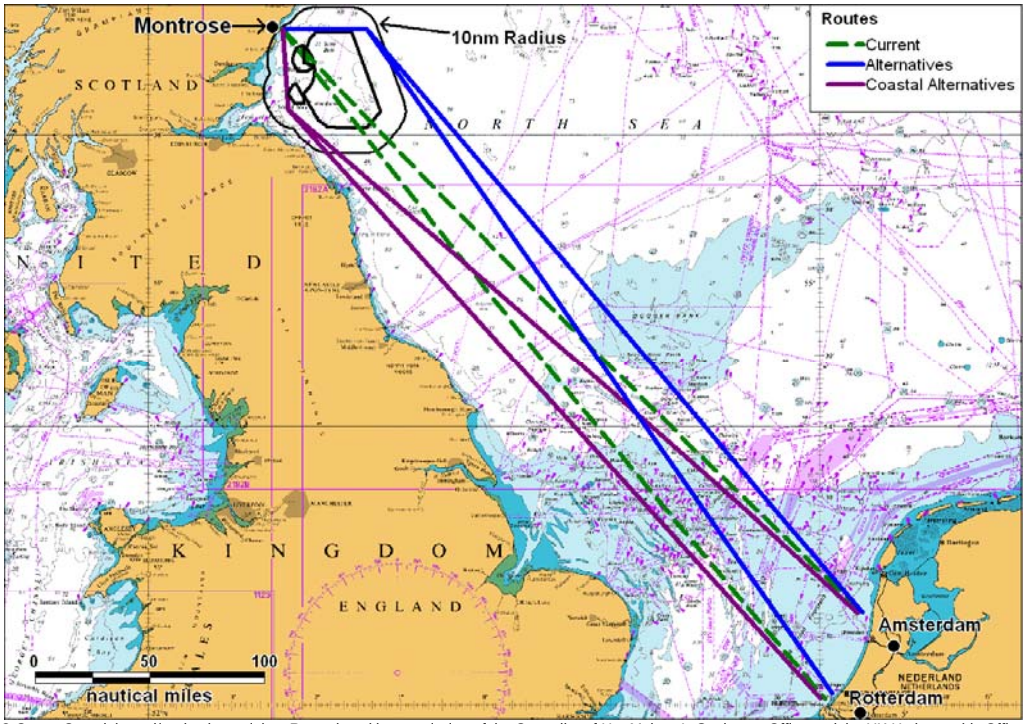

Figure 12.7 Overview Route 4 and Alternatives (Montrose – Amsterdam/Rotterdam)

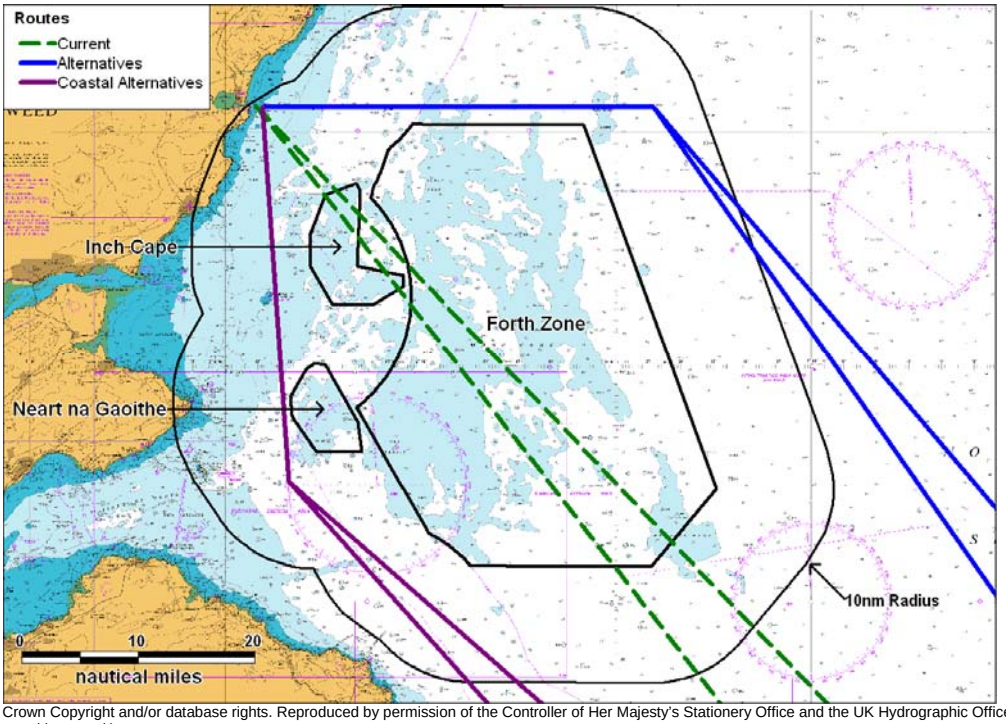

Figure 12.8 Detailed Route 4 Alternatives (Montrose – Amsterdam/Rotterdam)

The current distance of the route between Montrose and Amsterdam is 341nm and for vessels headed to Rotterdam is 360nm. The following table provides a summary of the predicted future routeing options compared to the current mean routes.

Table 12.3 Summary of Routeing Options

	Overall Distance (nm)	Difference in (nm)	Difference (%)	Change in Time for Average Speed Vessel (8.7knots)
Montrose / Amsterdam eastern option	349.9	+8.9	+2.6	+1Hr 1mins
Montrose / Amsterdam (Coastal)	348.7	+7.7	+2.3	+53mins
Montrose / Rotterdam Eastern option	371.5	+11.2	+3.1	+1Hr 17mins
Montrose / Rotterdam (Coastal)	365.1	+4.8	+1.3	+33mins

Key Points for Route 4 Alternatives:

Both alternative routes are very comparable, with the main factor influencing the choice being whether the Master has a preference for inshore routeing. It is noted that other offshore developments such as Hornsea and East Anglia and mainland European developments are likely to impact these routes.

12.5 Route 5

The current mean route and predicted routeing for Route(s) 5 is presented in Figure 12.9 to Figure 12.11.

12.5.1 Tay to Skagerrak

The first route presented is for vessels travelling from the Tay to the Skagerrak.

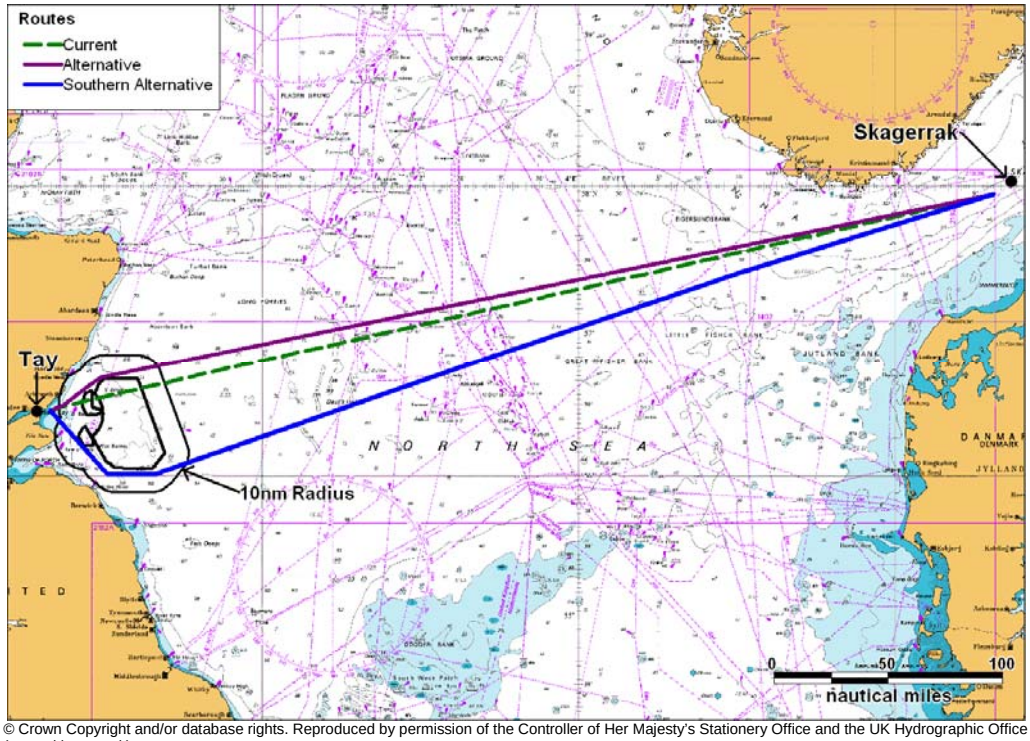

Figure 12.9 Overview Route 5 and Alternatives (Tay – Skagerrak)

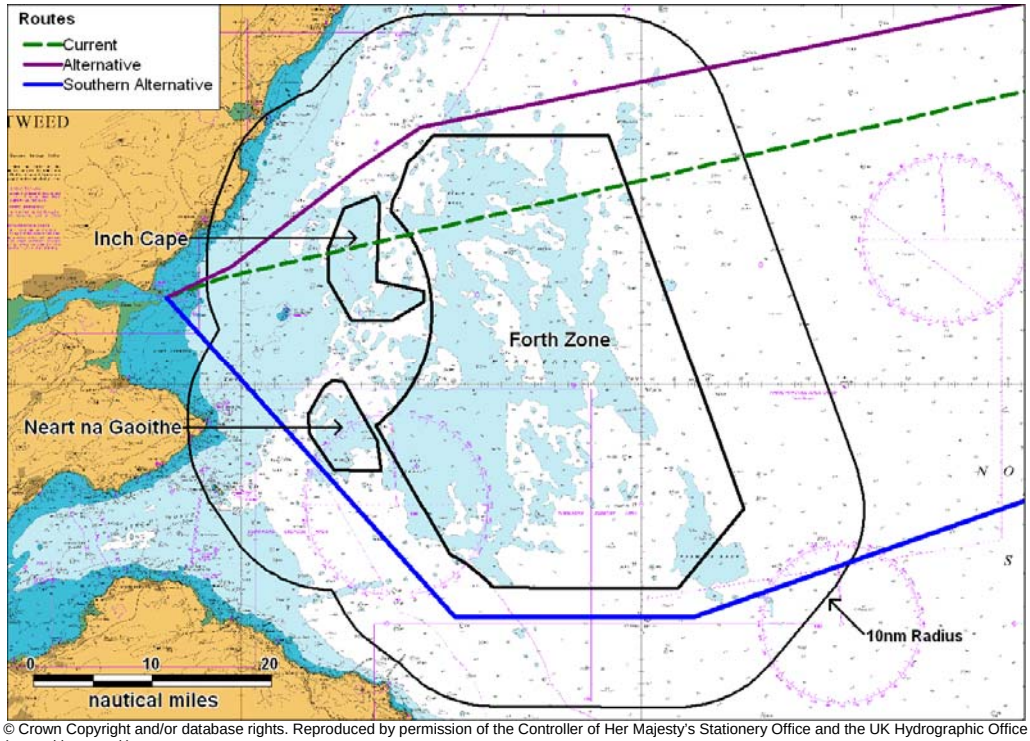

Figure 12.10 Detailed Route 5 Alternatives (Tay – Skagerrak)

12.5.2 Tay to Offshore Field (Franklin)

Vessels using Route 5 were also recorded heading to North Sea offshore platforms. Franklin Oil Field was used as the main destination for this study.

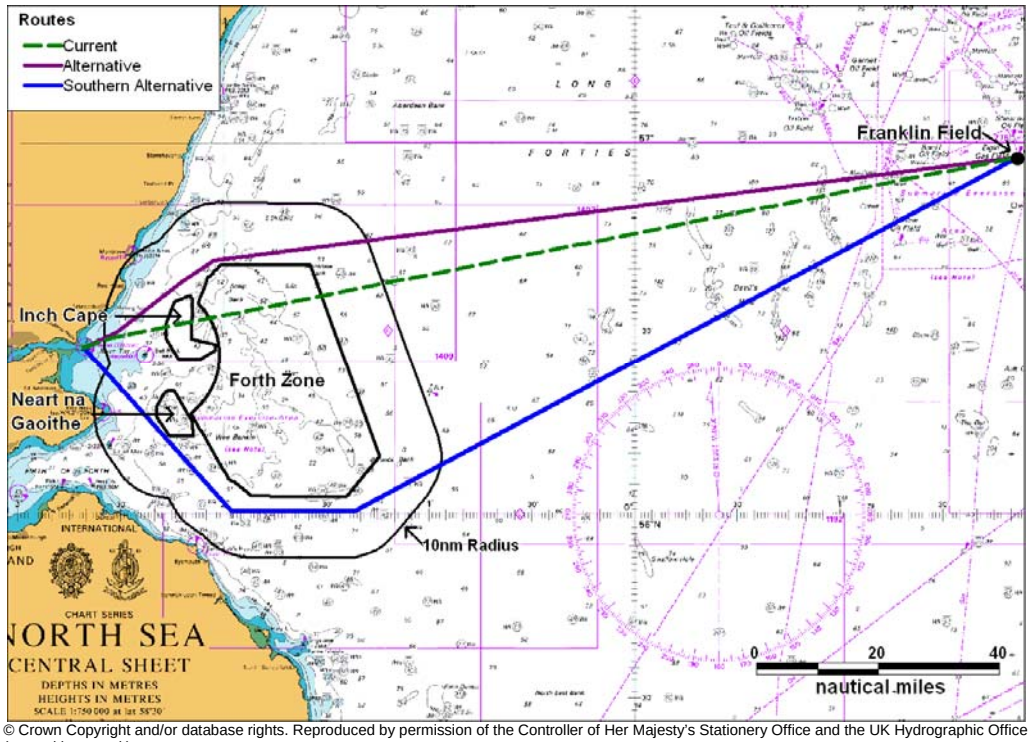

Figure 12.11 Route 5 and Alternatives (Tay – Franklin Field)

Table 12.4 provides a summary of the predicted future routeing options compared to the current mean route. For reference the current route lengths are as follows:

Tay / Skagerrak 398nm
Tay / Franklin Field 153nm

Table 12.4 Summary of Routeing Options

	Overall Distance (nm)	Difference in (nm)	Difference (%)	Change in Time for Average Speed Vessel (9.5knots)
Tay / Skagerrak (northern option)	398.8	+0.7	+0.2	+4mins
Tay / Skagerrak southern option	421.9	+23.8	+6	+2Hrs 30mins
Tay / Franklin Field (northern option)	155.3	+2	+1.3	+13mins
Tay / Franklin Field southern option	177.8	+24.5	+16	+2Hrs 34mins

Key Points for Route 5 Alternatives:

For both routes from the Tay to Skagerrak and Franklin Field the northern alternative requires less deviation from the current route. It is considered very unlikely that the southern route will be adopted following development of the three sites.

12.6 Route 6 and Route 9

The current mean route and predicted routeing for Route 6 and the coastal alternative (Route 9) is presented as an overview in Figure 12.12 and detailed plot in Figure 12.13.

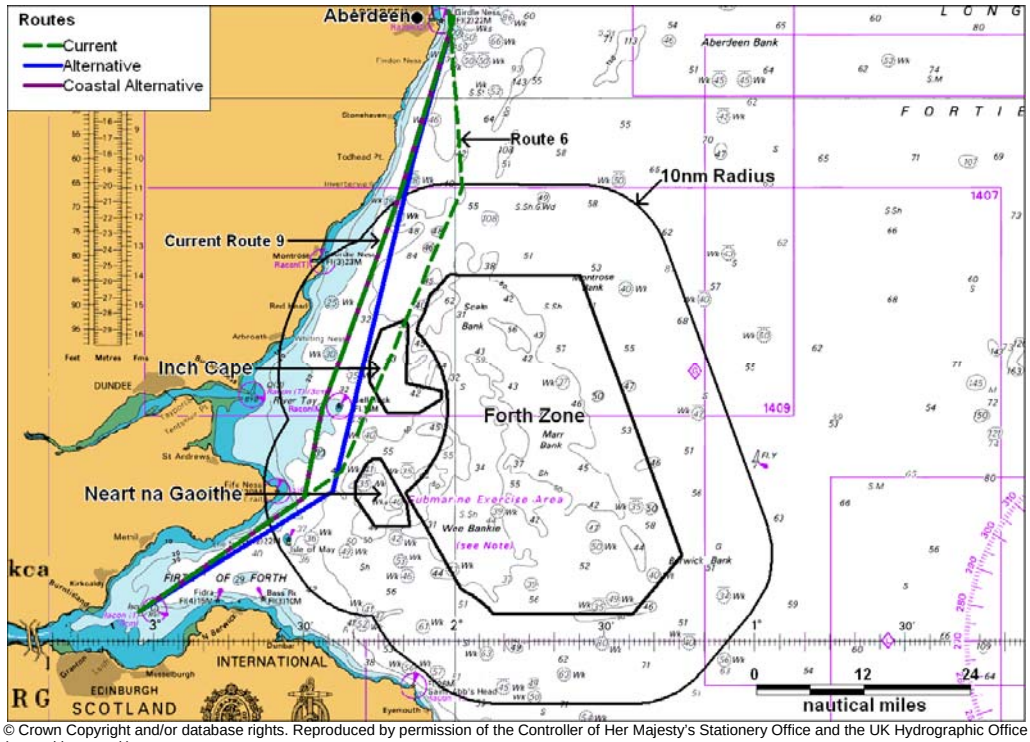

Figure 12.12 Overview Route 6 and 9 and Alternatives (Aberdeen – Forth)

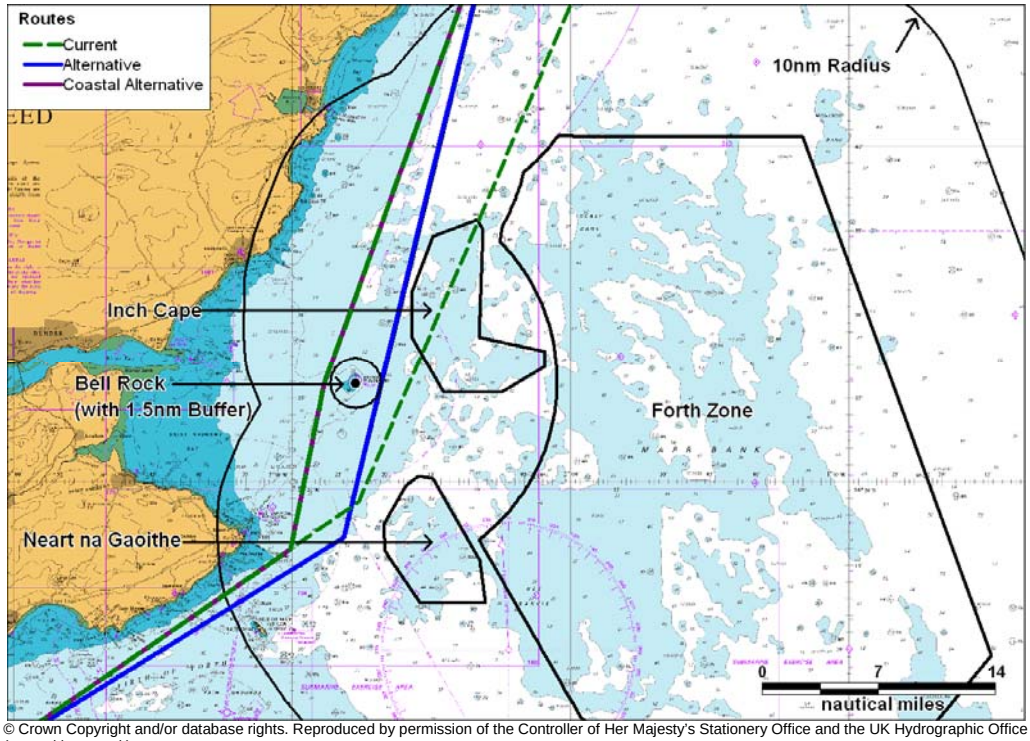

Figure 12.13 Detailed Route 6 (9) Alternatives (Aberdeen – Forth)

The current length of this route is 81.3nm. Table 12.5 provides a summary of the predicted future routeing options compared to the current mean route.

Table 12.5 Summary of Routeing Options

	Overall Distance (nm)	**Difference in (nm)**	**Difference (%)**	**Change in Time for Average Speed Vessel (10.9knots)**
Aberdeen / Forth east of Bell Rock (Route 6)	79.3	-2	-2.5	-11mins
Aberdeen / Forth west of Bell Rock (Route 9)	No Change	No Change	No Change	No Change

Key Points for Route 6 and 9 Options:

The routeing taken by vessels using Route 9 will be unaffected by the regional proposals. Vessels using Route 6 will migrate to the west taking vessels closer to Bell Rock. However, it should be noted that overall there could be a reduction in mileage for vessels using Route 6.

12.7 Route 7

The current mean route for Route 7 is not anticipated to change following development of the region. Figure 12.14 presents an overview of the route based on the most common destination (ports in Holland including Amsterdam and Rotterdam).

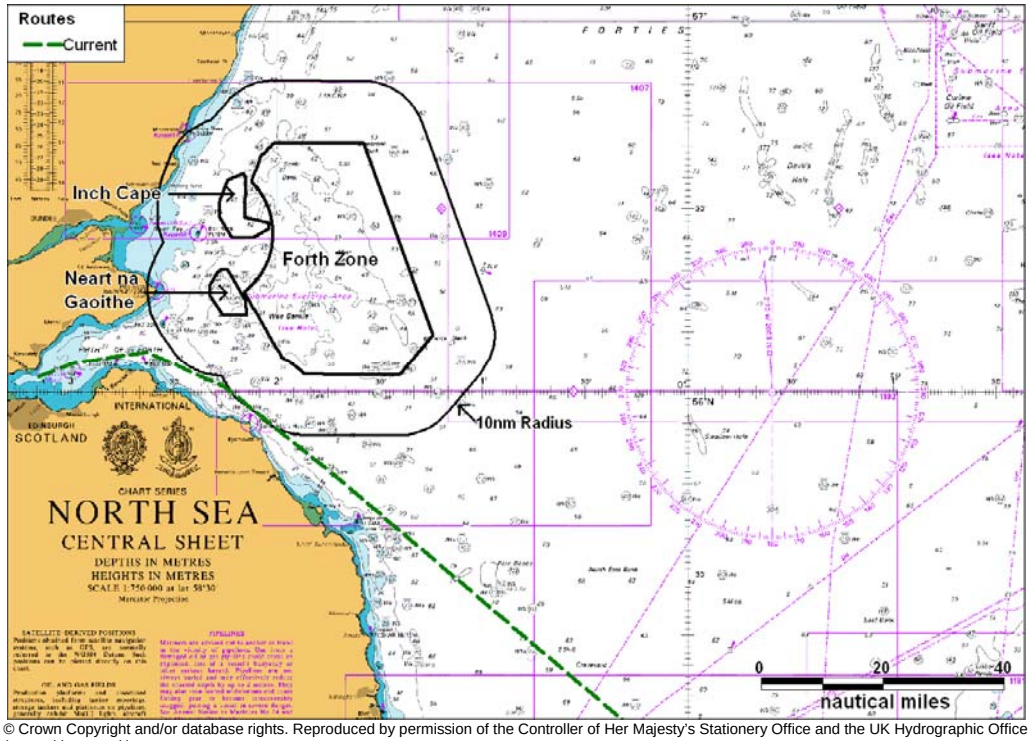

Figure 12.14 Overview Route 7 (Forth – Holland)

It can be observed that vessels will continue to route approximately 10nm from the Neart na Gaoithe and Forth Zone sites and therefore are likely to be unaffected by the regional proposals in the outer Forth.

As noted for Route 4 the other Round 3 offshore developments such as Hornsea and East Anglia and mainland European developments are likely to impact these routes.

12.8 Route 8

The current mean route and predicted routeing for Route 8 is presented as an overview in Figure 12.15 and detailed plot in Figure 12.16.

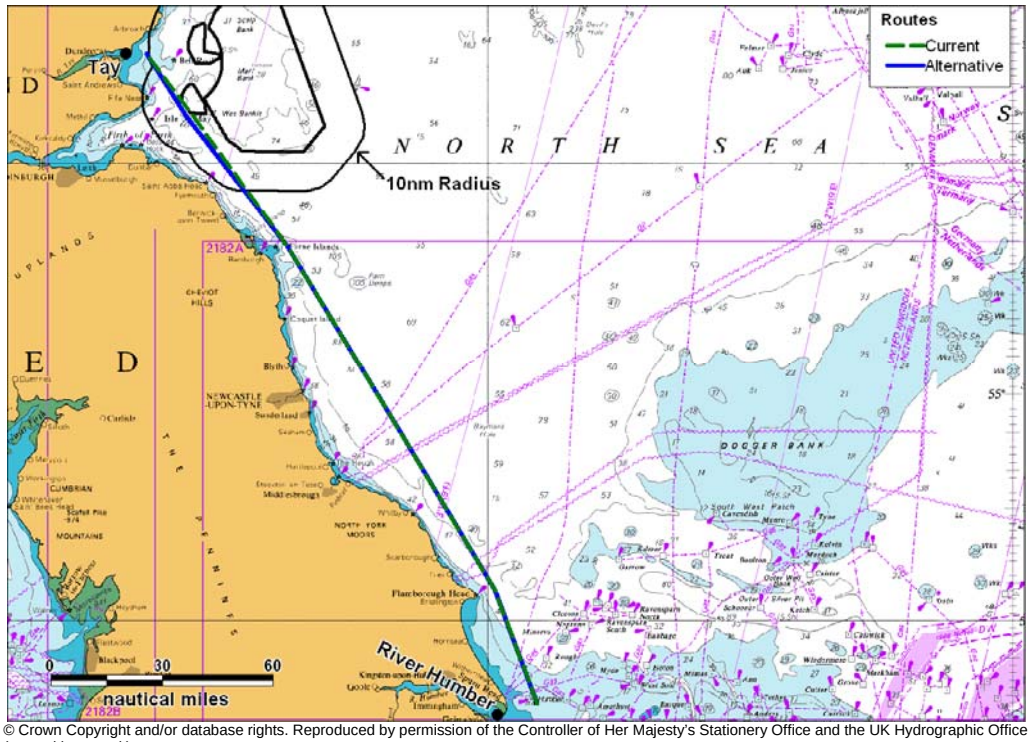

Figure 12.15 Overview Route 8 and Alternatives (Tay – Humber)

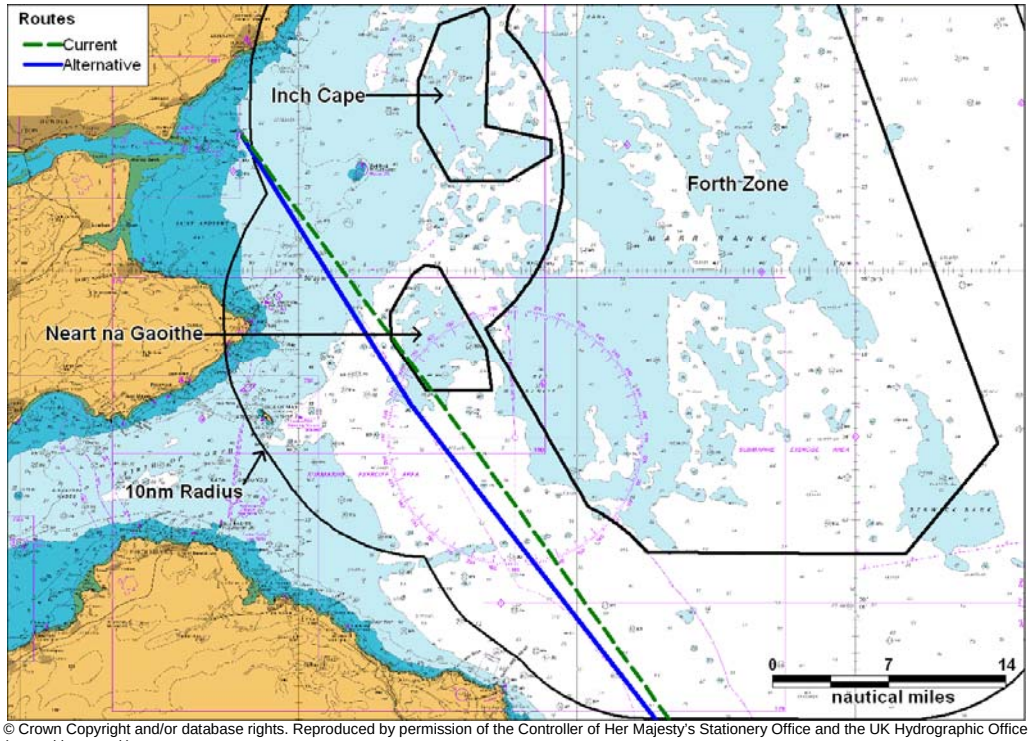

Figure 12.16 Detailed Route 8 Alternatives (Tay – Humber)

The current length of this route is 199.6nm. Table 12.6 provides a summary of the predicted future routeing options compared to the current mean route.

Table 12.6 Summary of Routeing Options

	Overall Distance (nm)	Difference in (nm)	Difference (%)	Change in Time for Average Speed Vessel (9.5knots)
Tay / Humber west of Inch Cape	199.7	~0.1	~0.05	+/-1min

Key Points for Route 8 Alternatives:

Vessels heading between the Tay and Humber are likely to route west of Neart na Gaoithe, with a negligible deviation from the original route.

12.9 Route 10

The current mean route and predicted routeing for Route 10 is presented as an overview in Figure 12.17 and detailed plot in Figure 12.18.

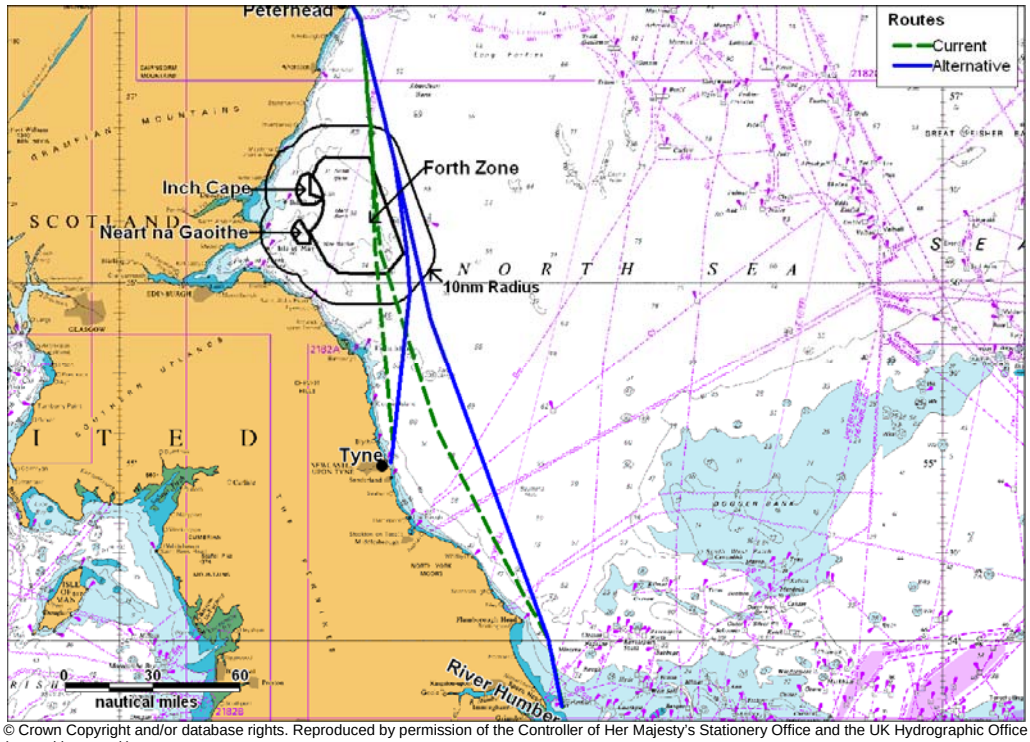

Figure 12.17 Overview Route 10 and Alternatives (Peterhead – Tyne/Humber)

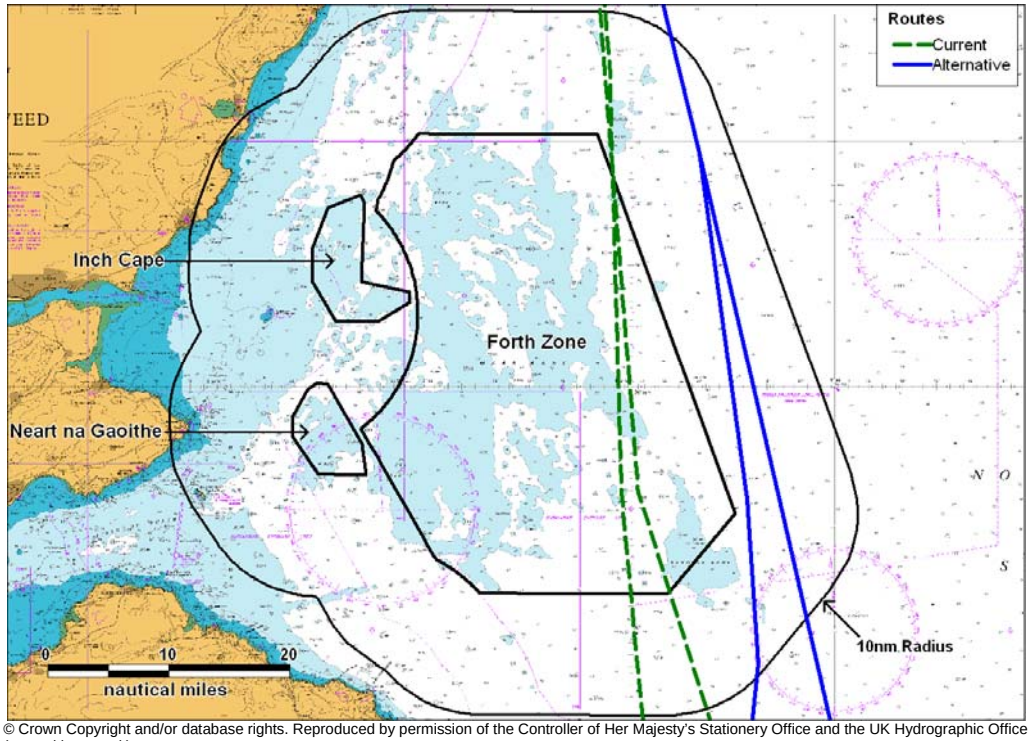

Figure 12.18 Detailed Route 10 Alternatives (Peterhead – Tyne/Humber)

Table 12.7 provides a summary of the predicted future routeing options compared to the current mean route. For reference the current route lengths are as follows:

Peterhead / Humber 246.6nm
Peterhead / Tyne 153nm

Table 12.7 Summary of Routeing Options

	Overall Distance (nm)	Difference in (nm)	Difference (%)	Change in Time for Average Speed Vessel (10knots)
Peterhead / Humber	243.2	-3.4	-1.4	-20min
Peterhead / Tyne	152.2	+15	+0.7	+7mins

Key points for Route 10 Alternatives:

Vessels heading between Peterhead and the Humber could marginally reduce voyage distance. Vessels heading between Peterhead and the Tyne require a small deviation when routeing east of the developments.

12.10 Overview of Revised Routeing Options

Routes 1/3 and 10
It is likely that shipping using Route 1, 3 and 10 will navigate east of the Round 3 Zone boundary on a combined route. The average ships per day on the combined route would be approximately 3 to 4. The impact on vessels using the eastern route would be low for the majority of vessels (i.e. < +7 minutes); however the small number of ships routeing between Aberdeen and Tyne could require an average 45 minute deviation. It is noted that the levels of shipping on this route are very low and that they were not tracked within the 28 days of survey data.

Route 2
It is likely that shipping using Route 2 will navigate south of Neart na Gaoithe and the Round 3 Zone, requiring an approximate 20 minute deviation from normal routeing.

Route 4
There are two alternative options to this route, coastal and east of the developments. Routes taken will be decided by the Master and will probably be most influenced by familiarity, ship size and weather conditions. Overall, approximately 30 to 80 minutes will be added to average voyage times.

Route 5
Shipping using Route 5 is likely to navigate north of Inch Cape and the Round 3 Zone. This would require a minor deviation from the current route with traffic bound for offshore platforms and the Skagerrak incurring approximately 4 to 13 minutes to the average voyage.

Route 6 and Route 9
Shipping using Route 6 will navigate west of Inch Cape and Neart na Gaoithe. As a portion of vessels on this route are over 100m in length and have deeper draughts (~6m), larger ships are likely to navigate east of Bell Rock and Isle of May. Smaller vessels are more likely to take the coastal route combining with traffic on Route 9. Where Routes 6 and 9 overlap, there will be an increase in the number of vessels on the route with just over two ships per day. The change in voyage time is negligible.

Route 7
Shipping using Route 7 is likely to unaffected by developments within the region as shipping currently passes the developments at a safe distance of approximately 10nm.

Route 8
Shipping using Route 8 is likely to navigate south of Neart na Gaoithe, requiring a minor deviation from the current route.

12.11 Revised Routeing Summary

Figure 12.19 conclusions presents a summary of the predicted 90 percentile routeing following development of the projects. Routes annotated with (a) in Figure 12.9 are secondary alternatives identified to main deviations that may be used by a small percentage of vessels, further information is provided in section 12 under the each specific route.

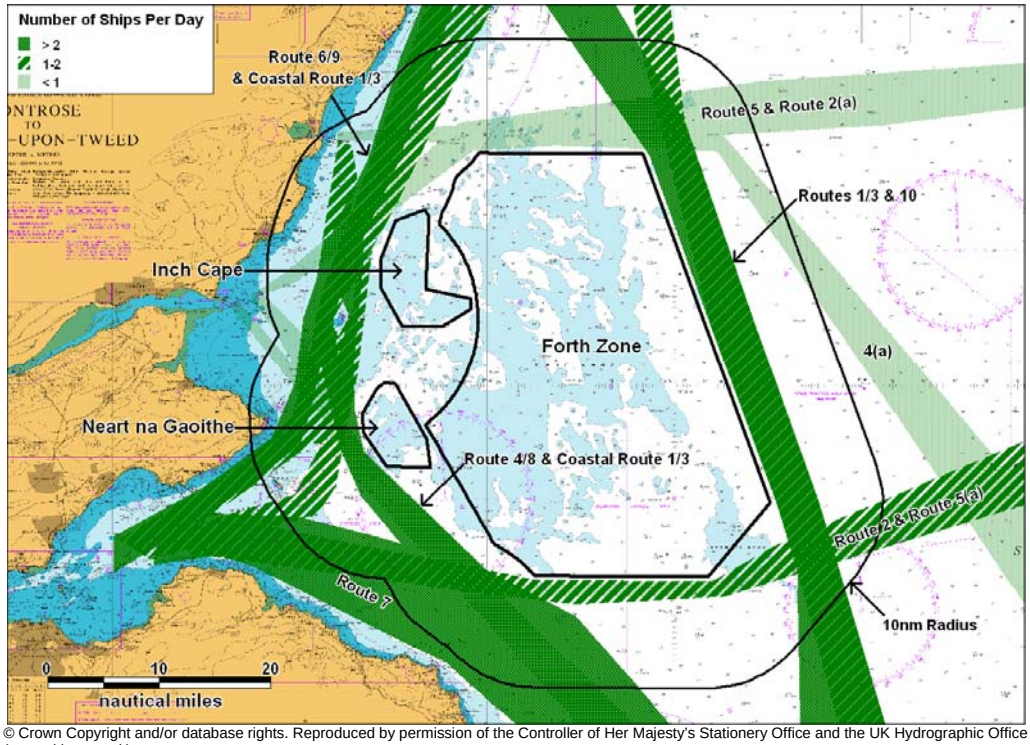

Figure 12.19 Overview of Anticipated Lanes following Development of the Region

The figure above presents the anticipated 90% lanes following full development of the region, this takes into account alternative routes such as Route 2(a) north of the developments (see section 12.3), Route 4(a) north (see section 12.4) and east of the developments and Route 5(a) (see section 12.5) south of the developments. The alternative routeing options may incur longer deviations around the regional developments; however routes could be taken based on weather conditions. Ultimately the choice of route taken will depend on the Masters on-board vessels.

In addition, as noted during consultation with Forth Ports (see Section 5.3), a lane between Neart na Gaoithe and the Forth Zone was suggested and this is presented above. However, it is likely that the large majority of vessels will elect to take the shipping route west of Neart na Gaoithe given increased sea room and the negligible deviation from the current route.

13 CHANGES IN SHIPPING

13.1 Introduction

This section presents an analysis and comparison between the current ship routeing against the ship track prediction results. Ship tracks were predicted based on the revised routeing presented in Section 12. The following scenarios are considered pre- and post- wind farm development:

- Shipping tracks;
- Ship density; and
- Ship-to-ship collision risk.

In general it is considered that vessels passing 2nm outside the three wind farm developments will not be directly impacted in terms of re-routeing. There is potential for an increase in ship-to-ship encounters in the areas where shipping has been displaced, however daily plots are presented to show that shipping levels are relatively low and the likelihood of a close encounter is considered to below

13.2 Pre-Development – Ship Tracks

Figure 13.1 presents a plot of the existing shipping tracks based on 28 days of AIS survey data covering seasonal fluctuations (14 days November 2010 and 14 days June 2011).

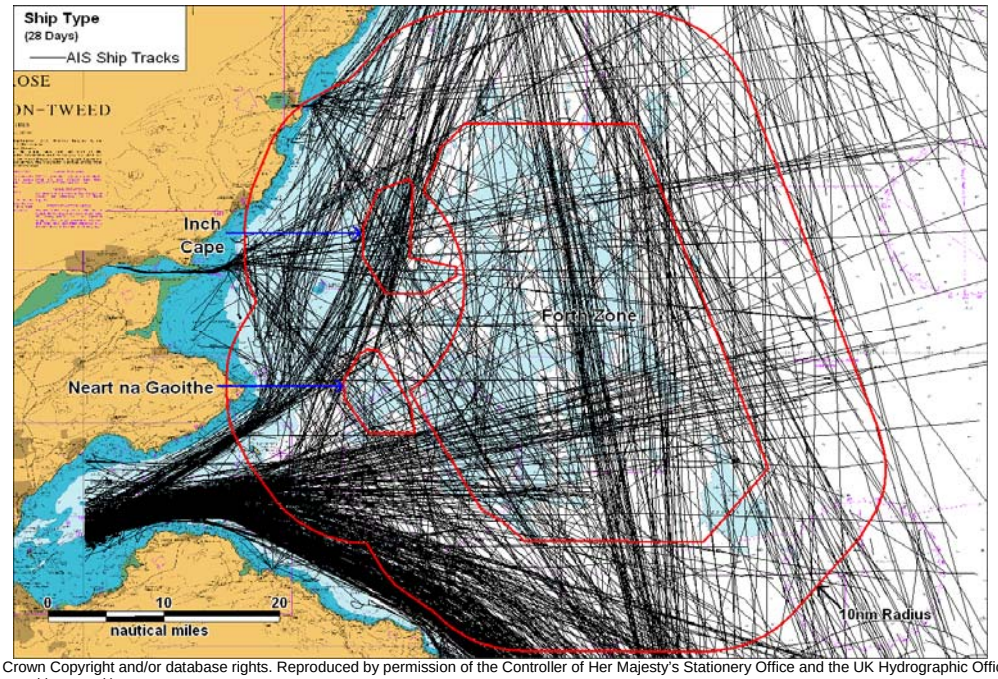

Figure 13.1 Overview of Current AIS Tracks by Ship Type (28 Days)

13.3 Pre-Development – Ship Density

To provide a better understanding of the shipping in the area, a shipping density grid was generated. The modelled ship density results for the regional study area were calculated using the ShipRoutes database, validated with the survey data collected from the FTOWDG coastal stations.

The variation in shipping density in the study area has been estimated using a grid of cells. The grid contained 8,875 cells with an average cell size of 1 kilometre (km) (north/south) x 1km (east/west). (Note: The cell width varies slightly from north to south.)

The grid used for the ship density model is presented in Figure 13.2 relative to the three developments.

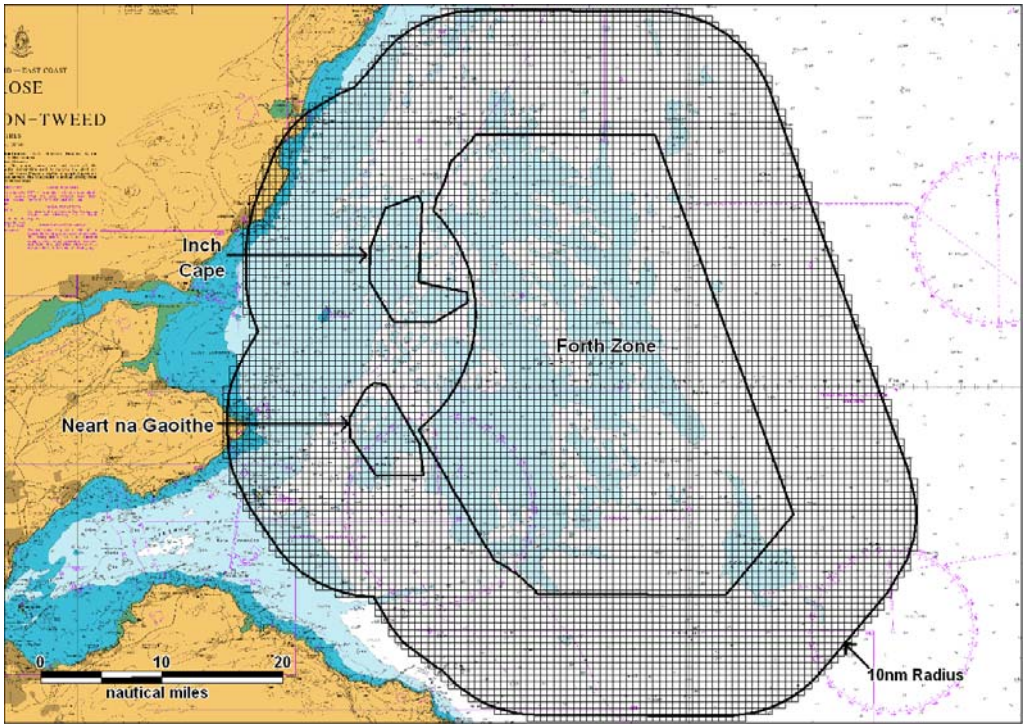

Figure 13.2 Grid (1km by 1km) Used for Shipping Analysis Relative to Developments

Anatec's ship density model was used to estimate the number of ships per year passing through each cell, taking into account seasonal variations. For illustrative purposes, the results were ranked and colour-coded according to relative shipping density (ships per year) within the region.

Cells with negligible traffic were ranked as 1 (lowest density). The remaining cells were ranked from 1 (lowest) to 5 (highest), with approximately one-fifth (20%) of the non-negligible cells within each of the five categories.

The rankings correspond to the following ranges:

1. 0 to 11.9 ships per year;
2. 12 to 24.9 ships per year;
3. 25 to 44.9 ships per year;
4. 45 to 79.9 ships per year; and
5. ≥ 80 ships per year.

It is stressed that these are relative rankings for the region and not representative of the UK as a whole. By way of comparison, an average cell (rank 3) of similar size in UK waters would have shipping density in the approximate range 50 to 200 ships per year, with top-ranked cells (rank 5) exceeding 600 ships per year, i.e., the outer Forth and Tay region has a lower than average ship density compared to the UK as a whole.

Figure 13.3 presents a plot of the ship density based on the current routeing through the region (no development within the three wind farms areas).

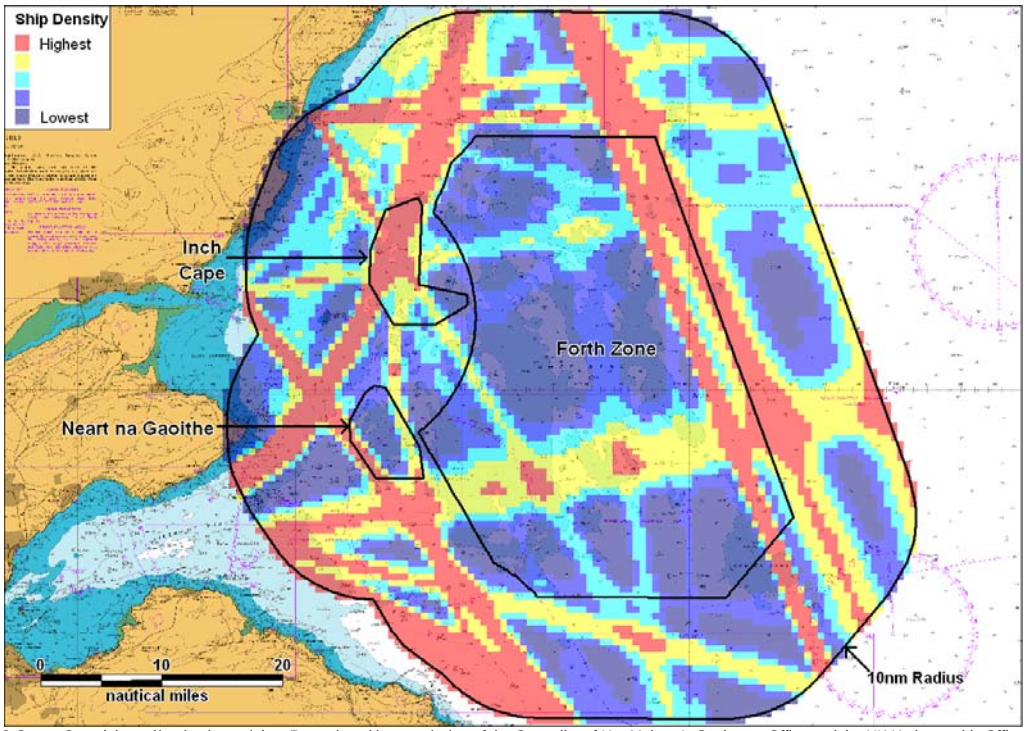

Figure 13.3 Overview of Current Ship Density (Pre-Wind Farm Development)

13.4 Pre-Development – Ship-to-Ship Collision Frequency

The ship-to-ship collision frequency for the outer Firth of Forth and Tay region was calculated using Anatec's COLLRISK model with the baseline ship density results as input (see Section 13.3). The main factors influencing the risk are the ship densities, speeds, courses, types and sizes, and visibility conditions for the area.

For illustrative purposes, the results per cell were colour-coded using the following ranges:

1. 0 to <0.01 ship-to-ship collisions per million years;
2. 0.01 to <0.02 ship-to-ship collisions per million years;
3. 0.02 to <0.08 ship-to-ship collisions per million years;
4. 0.08 to <0.3 ship-to-ship collisions per million years; and
5. ≥ 0.3 ship-to-ship collisions per million years.

Based on the model run for the study area, the baseline vessel-to-vessel collision risk level is in the order of one major collision within the study area in 116 years[1]. It is emphasised the model is calibrated based on major incidents at sea in UK waters which allows for benchmarking but does not cover all incidents, such as minor impacts, or incidents occurring within ports.

Figure 13.4 presents a plot of the current ship-to-ship collision frequency based on the current ship routeing and density as presented in Figure 13.3.

[1] Note that the models have been calibrated against 'serious' casualty data at sea. This excludes incidents in port, e.g., minor bumps during berthing. It also requires the incident to be of a defined degree of seriousness in terms of loss of life, environmental damage and/or financial impact. Non-serious casualties are estimated to be in the order of four times more frequent than serious casualties. Anatec's models are calibrated against serious casualties as this minimises the probability of under-reporting and provides a benchmark level when comparing the frequency of accidents in different parts of the World.

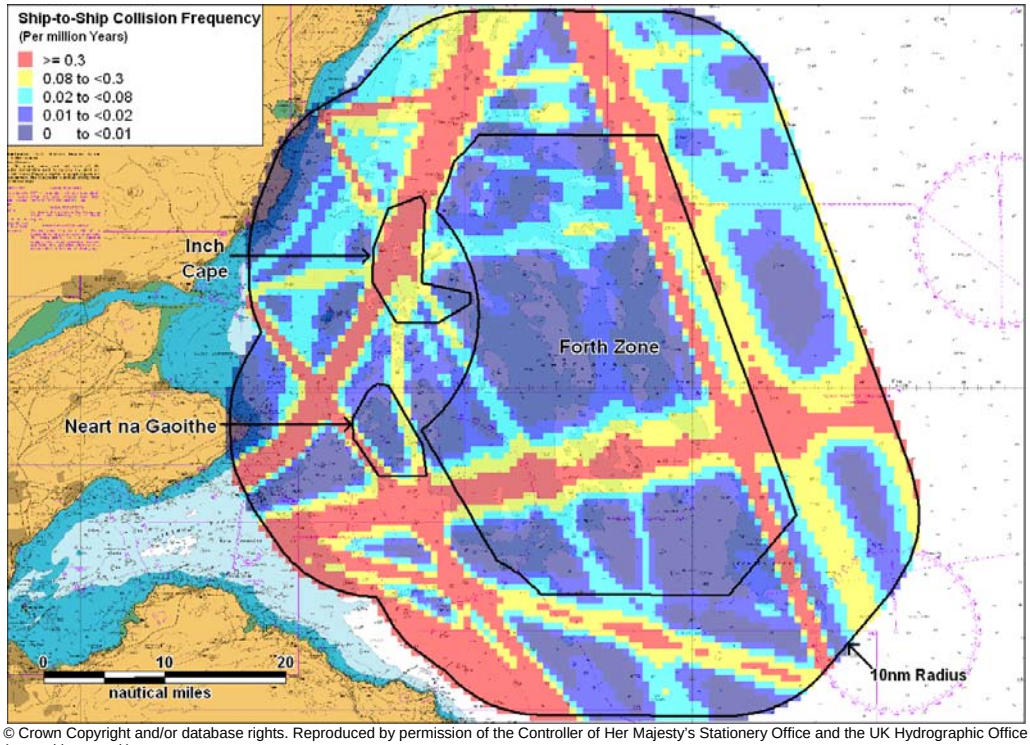

Figure 13.4 Overview of Ship-to-Ship Collision Frequency (Pre-Wind Farm Development)

As expected, the areas of highest ship-to-ship collision frequency are generally aligned with the areas where traffic is densest, including in and around the approaches to the Firth of Forth and where shipping lanes intersect.

The area of highest ship-to-ship collision frequency within 10nm of the proposed developments is approximately 3nm north of Saint Abb's Head on the route headed into the Firth of Forth from eastern UK ports and mainland Europe.

13.5 Post-Development – Simulated Ship Tracks

Figure 13.5 presents a plot of the existing shipping tracks (28 days AIS outside 2nm from 14 days in November 2010 and 14 days in June 2011) along with the predicted ship tracks based on 28 days of mean routeing.

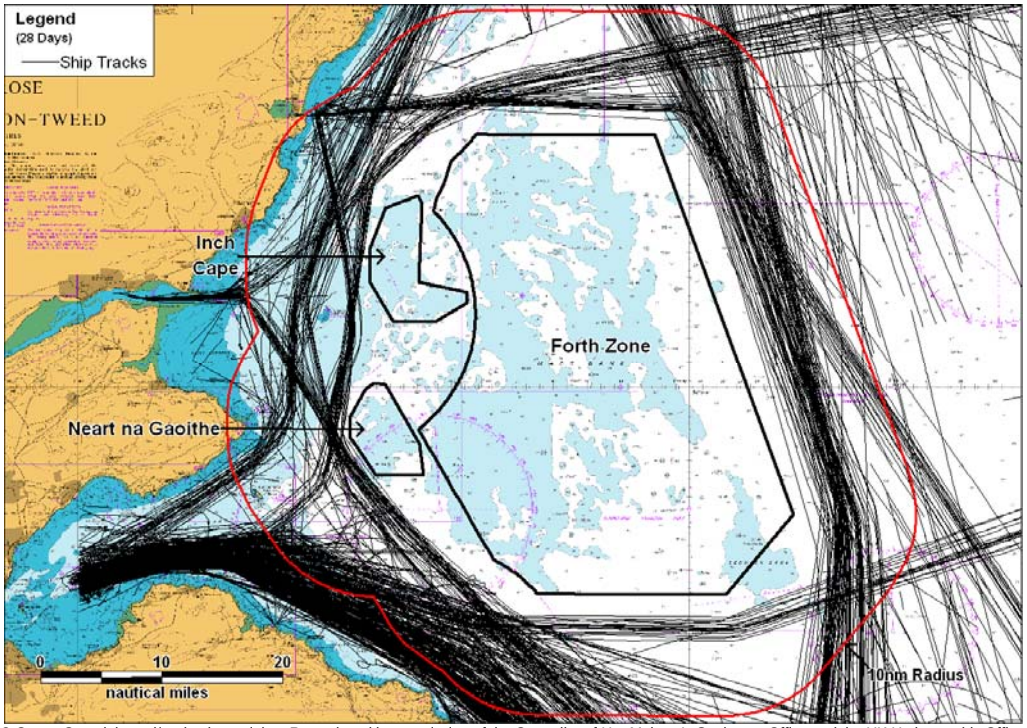

Figure 13.5 Overview of Anticipated Routes following Development of the Region (28 Days of Tracks)

Figure 13.6 to Figure 13.8 present three mean daily plots of the predicated ship tracks passing through the region to consider the likelihood of vessels encountering one another.

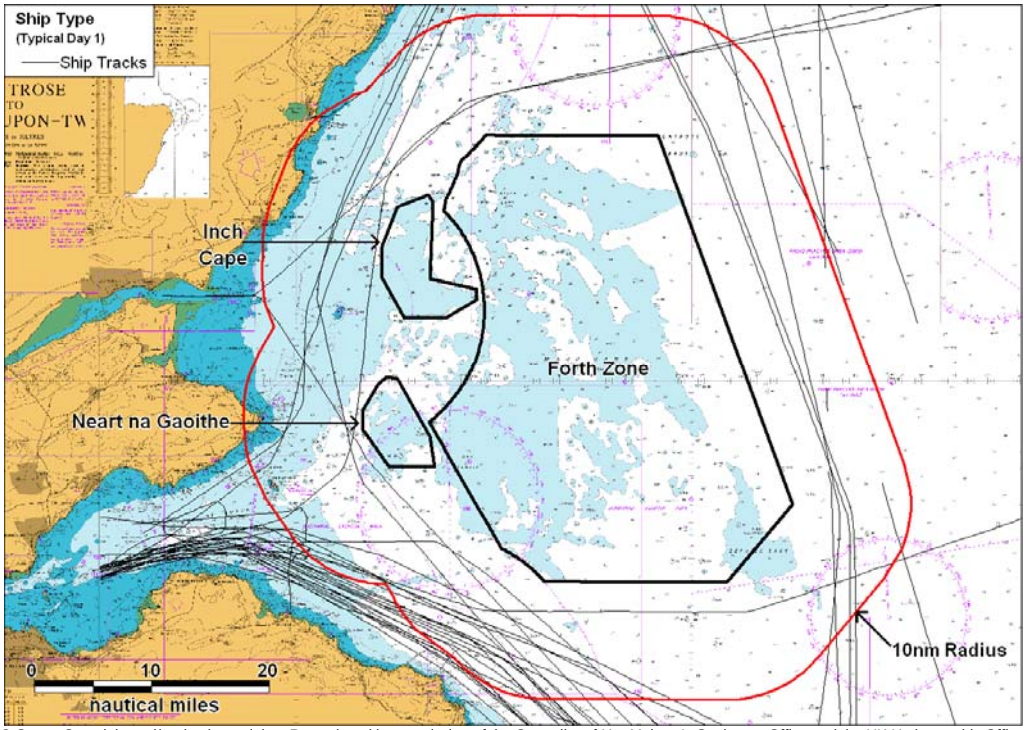

Figure 13.6 Day 1 – Predicted Ship Track Routeing

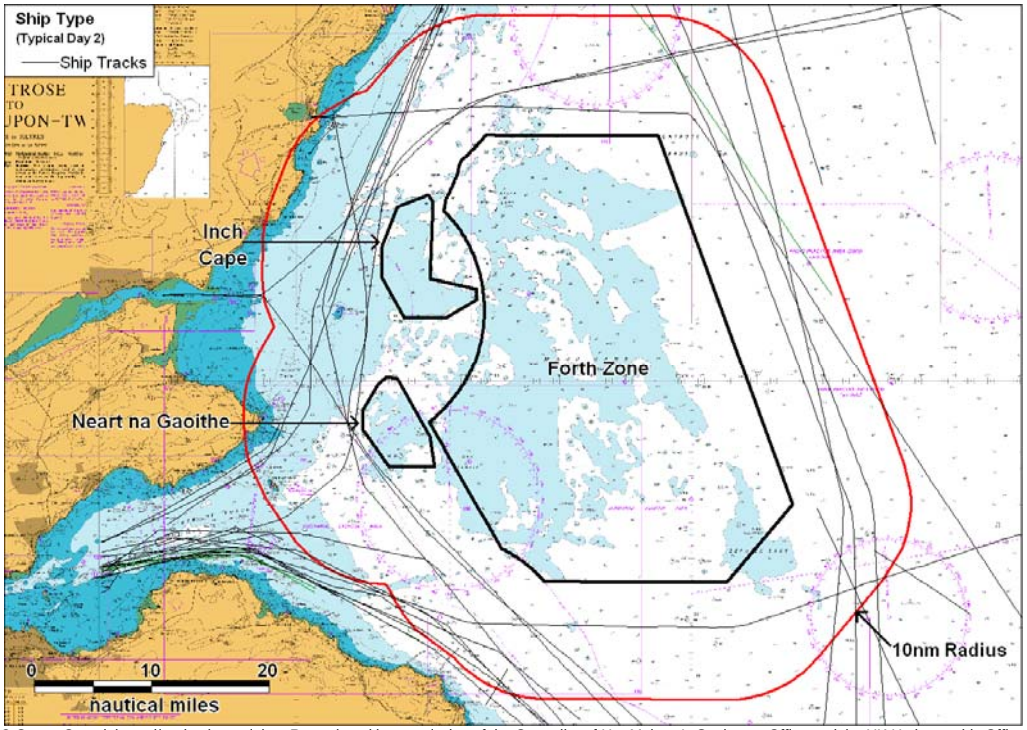

Figure 13.7 Day 2 – Predicted Ship Track Routeing

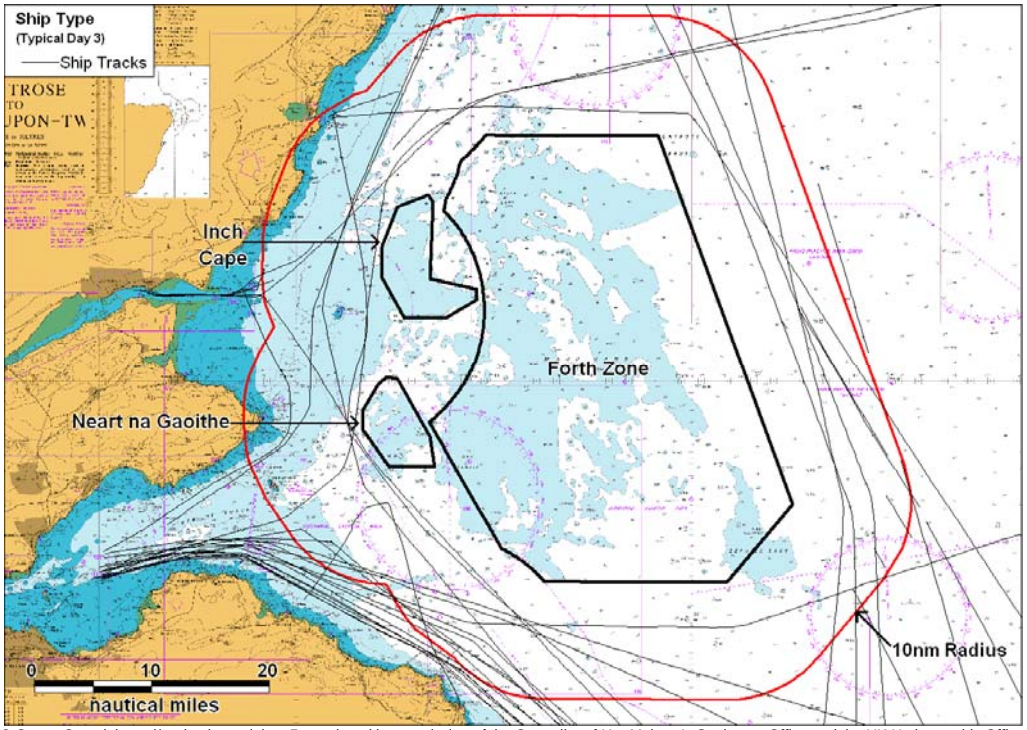

Figure 13.8 Day 3 – Predicted Ship Track Routeing

It can be observed that in terms of daily vessel routeing the increase in shipping levels on each route is relatively low and therefore the likelihood of a close encounter on any particular day is considered to be small.

13.6 Post-Development – Ship Density

Figure 13.9 presents a plot of the ship density based on the revised routeing through the region. It is noted that the same ranges are used as in the current (pre-development) ship density plot (Figure 13.3).

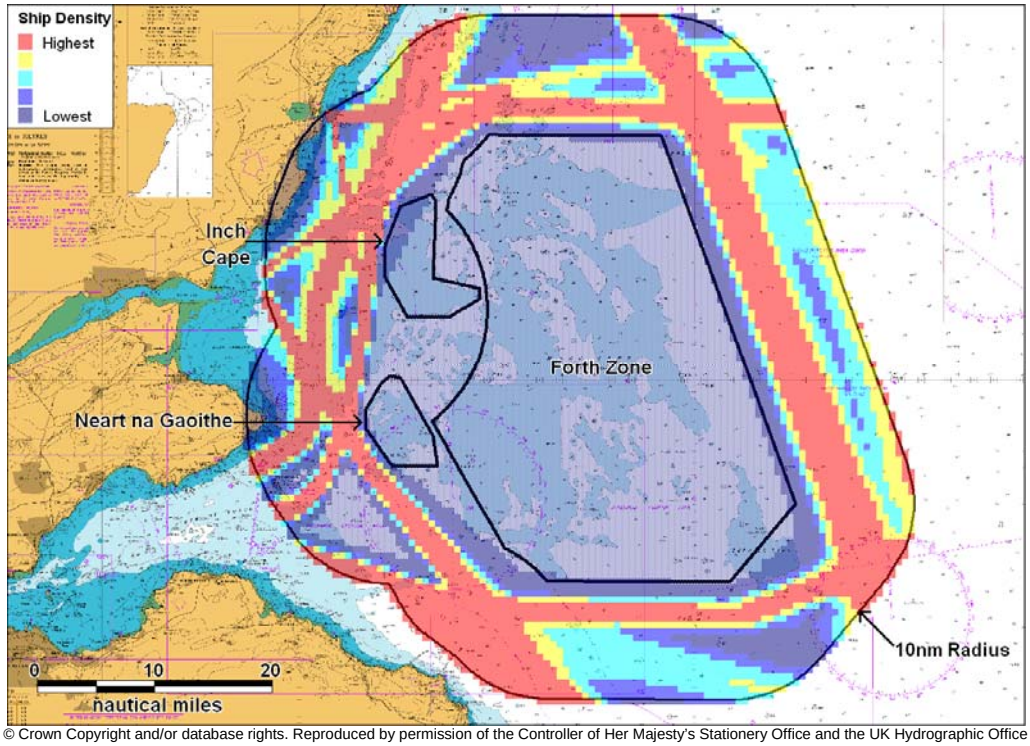

Figure 13.9 Overview of Revised Ship Density (Post-Wind Farm Development)

It can be observed that shipping density has increased on the coastal routes, east and west of Bell Rock and east of the Forth Round 3 Zone.

Figure 13.10 presents an overview of the relative change in ship density following re-routeing vessels around the three developments in the outer Firth of Forth and Tay.

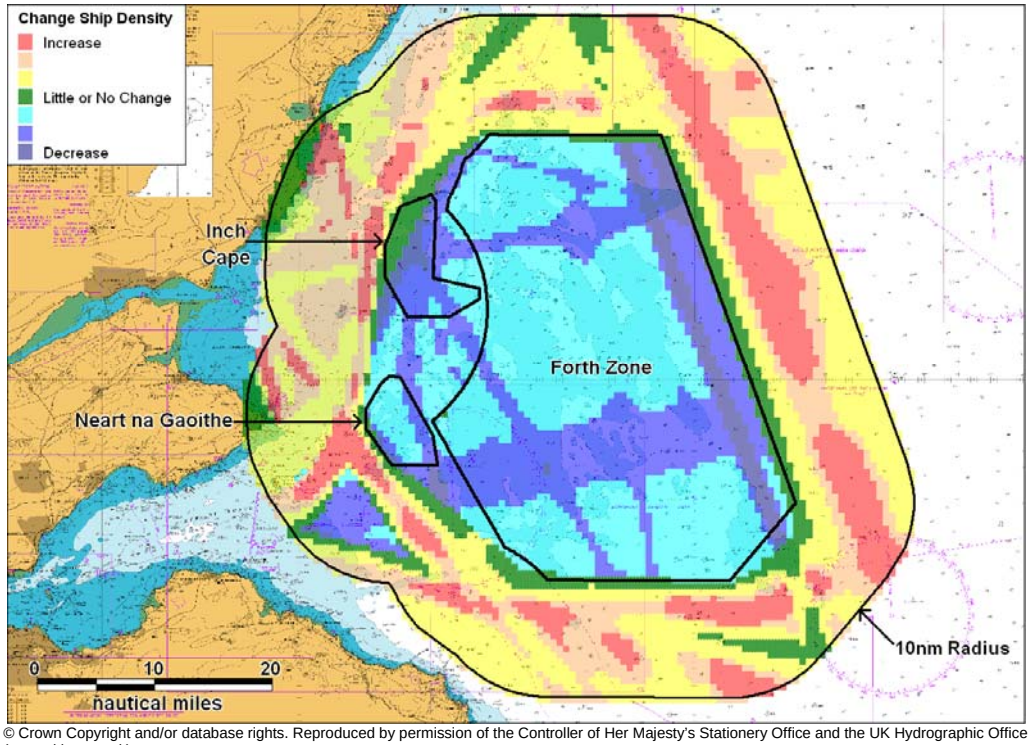

Figure 13.10 Overview of Change in Ship Density

Shipping that has re-routed east and west of the developments has increased the general ship density in the area, for example on the coastal routes east and west of Bell Rock and the offshore route east of the Forth Zone.

In addition, areas north, south and east of the developments have experienced an increase in ship density.

13.7 Post-Development – Ship-to-Ship Collision Frequency

Based on the COLLRISK model run for the study area, the future vessel-to-vessel collision risk level based on the revised routeing around the developments is in the order of one major collision within the study area in 122 years. Therefore, there is an overall negligible change to ship-to-ship collision frequency following shipping re-routeing around the developments. This can partly be attributed to a decrease in crossing routes, with routes following similar courses through the region, (i.e. north / south or east / west).

Figure 13.11 presents a plot of the predicted ship-to-ship collision frequency based on the revised ship routeing and density as presented in Figure 13.9. As noted in the post-development ship density section, the same ranges are used as in current ship-to-ship collision frequency plot (Figure 13.4).

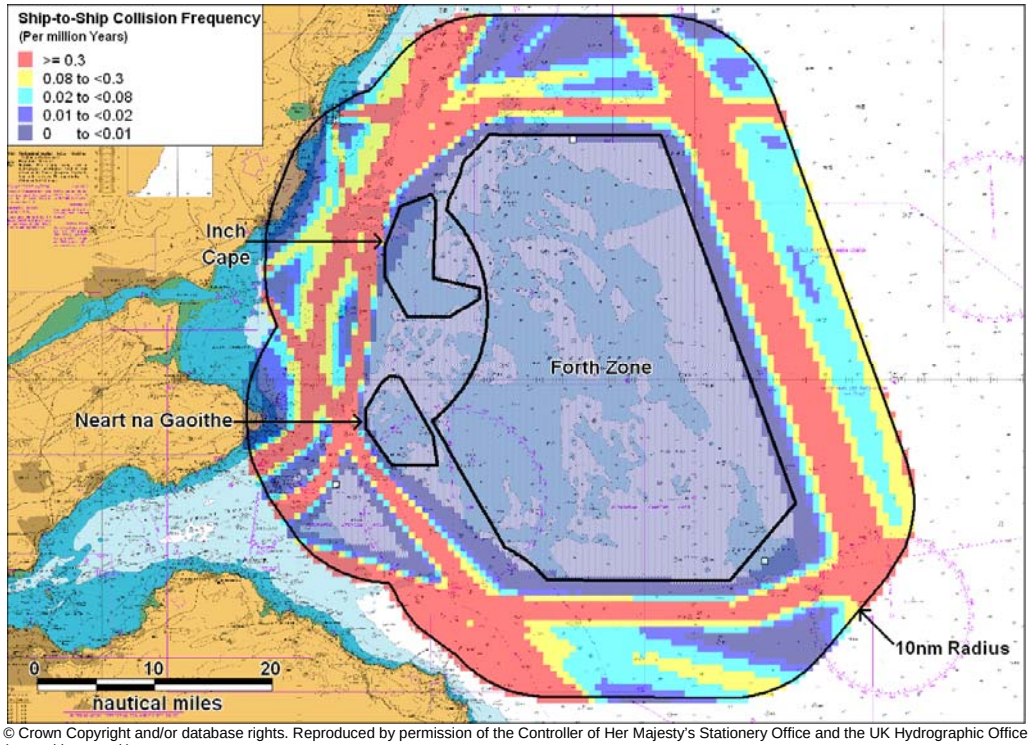

Figure 13.11 Overview of Ship-to-Ship Collision Frequency (Post-Wind Farm Development)

The areas of highest ship-to-ship collision frequency following development of the three wind farm areas are generally aligned with the areas where traffic will be re-routed, including the coastal route east and west of Bell Rock and shipping passing east of the Forth Zone.

It is noted that the area of highest ship-to-ship collision frequency following development of the three wind farms continues to be off Saint Abb's Head on the wide shipping route headed into the Firth of Forth.

Figure 13.12 presents the relative change in ship-to-ship collision frequency following re-routeing vessels around the three developments in the outer Firth of Forth and Tay region.

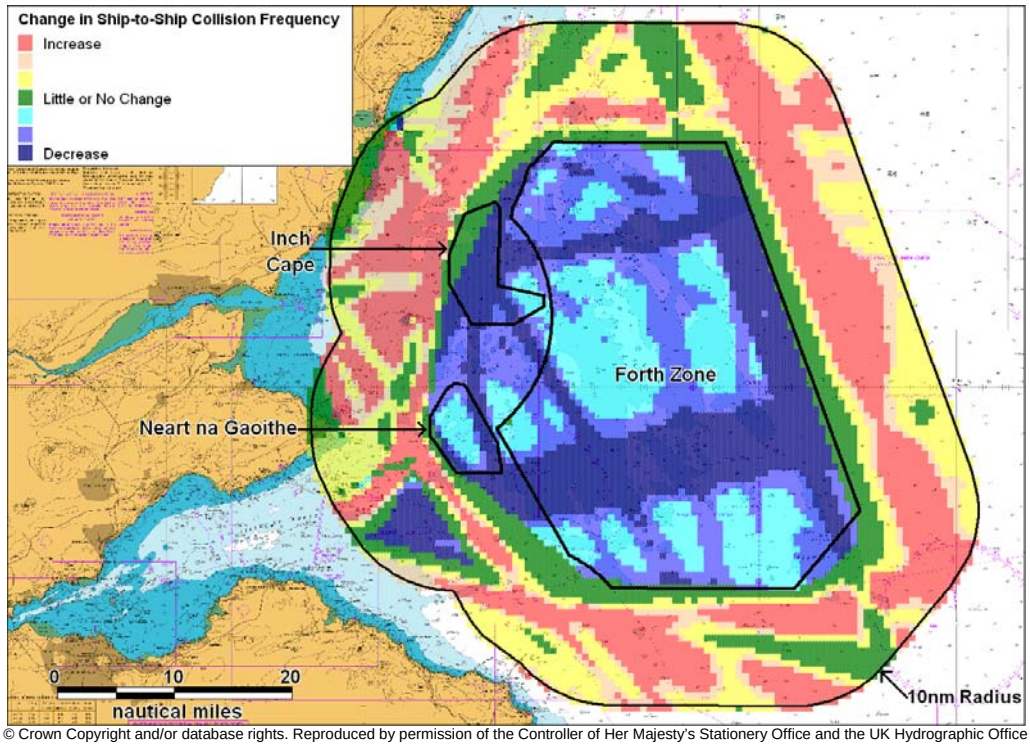

Figure 13.12 Overview of Change in Ship-to-Ship Collision Frequency

Shipping that has re-routed east and west of the developments has increased the relative ship-to-ship collision frequency in these areas.

It should be noted that in terms of the entire region there has been a negligible change in the overall collision frequency within 10nm of the three developments following re-routeing shipping.

14 CUMULATIVE IMPACTS

14.1 Offshore Renewables

By carrying out a regional study encompassing the three wind farm developments in the outer Firth of Forth and Tay a number of regional navigational cumulative issues have been encompassed within this shipping review.

However, further review is required to assess whether there is potential for a cumulative impact in a UK context with other wind farm developments which may impact on navigation.

Figure 14.1 presents a review of all Round 1 and 2 offshore wind farms, Round 3 Zones and STW sites.

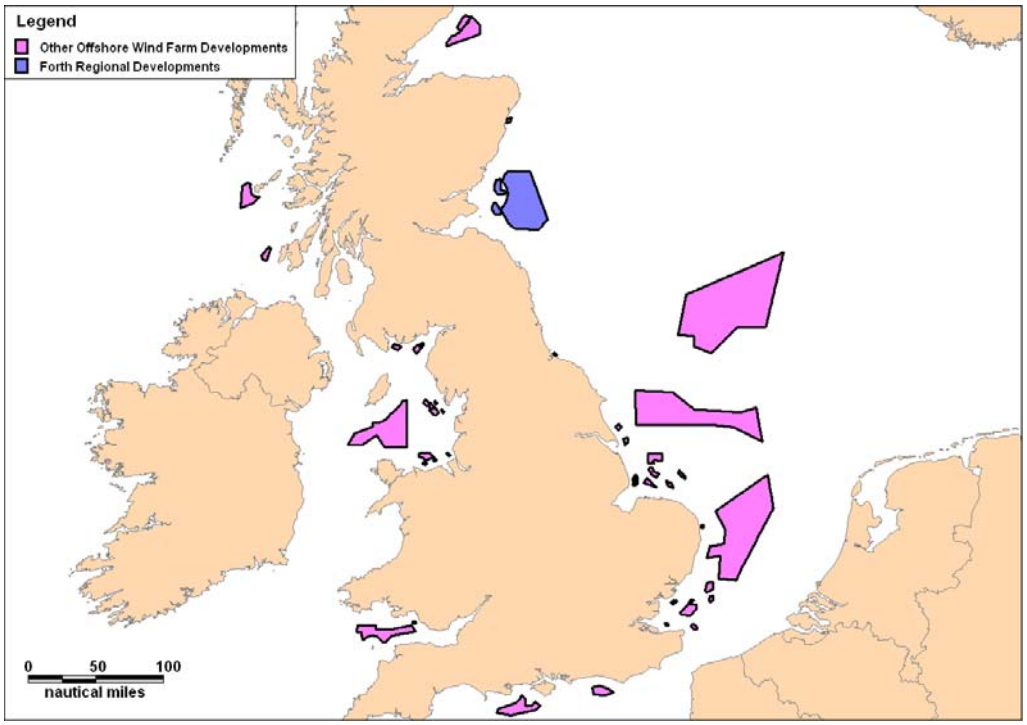

Figure 14.1 Overview of Wind Farm Sites in UK

It can be seen from Figure 14.1 that the proposed developments within the outer Firth of Forth and Tay are not in close proximity to any other developments. The nearest is the European Offshore Wind Farm Deployment Centre (EOWDC) located over 30nm to the north off Aberdeen, and no cumulative issues are expected along the north east coastline of Scotland.

In terms of a UK context and other Round 3 development zones, vessels heading to/from the Forth area and eastern UK ports (for example Humber and Thames) may be cumulatively impacted by zonal wind farm development within Dogger, Hornsea and East Anglian zones. The exact impact of these developments is uncertain at this time as the individual zonal development plans are unknown.

14.2 In-combination Impacts

As mentioned in Section 6.1 there are military practice and submarine exercise areas in the wider region, but these should not lead to any significant navigational impacts. In addition, there is on-going consultation with the Ministry of Defence (MOD) allowing stakeholder input at a high level prior to development of the three wind farm areas.

Consultation with Forth Ports (Section 5.3) identified that there are possible proposals for 3-4 biomass plants within the Firth of Forth and Tay region, which if constructed could bring in an increased number of large bulk carriers for the delivery of biomass fuel. It is not known at the time of writing (January 2012) where vessels will be routeing from so further consideration of this is not possible, however plants have been proposed at Leith, Rosyth, Grangemouth and Dundee and it is expected that up to 90% of the fuel deliveries could arrive by ship (Ref. ix).

15 MITIGATION MEASURES

As part of the consenting process a NRA will be required for each individual site. Integral to this is a hazard identification workshop which is carried out to review the risks associated with a development and to identify the appropriate mitigation measures.

For the level and type of risk determined during the impact assessment specific measures employed will have to be defined in consultation with the MCA Navigation Safety Branch and other relevant statutory stakeholders. Continued co-operation between the three wind farm developers will also be required to ensure that mitigation measures are consistent, do not contradict one another, and that an overall strategic approach is adopted for the development of the entire region. As detailed in the following paragraphs potential mitigations could include lighting and marking, site design and traffic control measures.

The wind farm and wind turbines will be designed to satisfy the design requirements of MGN 371 including specific requirements for emergency response in the event of a search and rescue (SAR), counter pollution or salvage operation in or around a wind farm. MGN 371 includes a number of factors that are required to mitigate risk.

Throughout the construction, operation and maintenance of the wind farms, Aids to Navigation will be provided in accordance with NLB requirements, which will comply with International Association of Lighthouse Authorities (IALA) standard O-139 on the Marking of Offshore Wind Farms (Ref. x). Additional markings may be agreed in consultation with NLB once a turbine layout has been selected. Aids to navigation could include:

- Additional lighting and marking outside of O-139 requirements
- RACONs
- AIS transponders
- Numbering of structures in grid pattern.
- Buoyage

Routeing measures and traffic control options are used to aid safe navigation in dense traffic or high risk sea areas. They include measures such as IMO routeing measures including Traffic Separation Schemes, Areas to be Avoided and Vessel Traffic Services (VTS). The IMO take a strategic approach to the creation of routeing measures and take into account not only offshore wind developments but other sea users which create cumulative issues. It is noted that IMO Routeing measures and VTS are not recognised as solutions for wind farm development and these measures would only be considered in line with the MCA recommendations.

16 ONGOING ASSESSMENT

On-going assessments and consultation will continue to be undertaken at a project and cumulative level. These will include use of indicative red line boundaries identifying potential development phases (1-3) within the Forth Zone.

16.1 Indicative Red Line Boundaries

Figure 16.1 shows the indicative red line boundaries that are currently being used as part of on-going assessments.

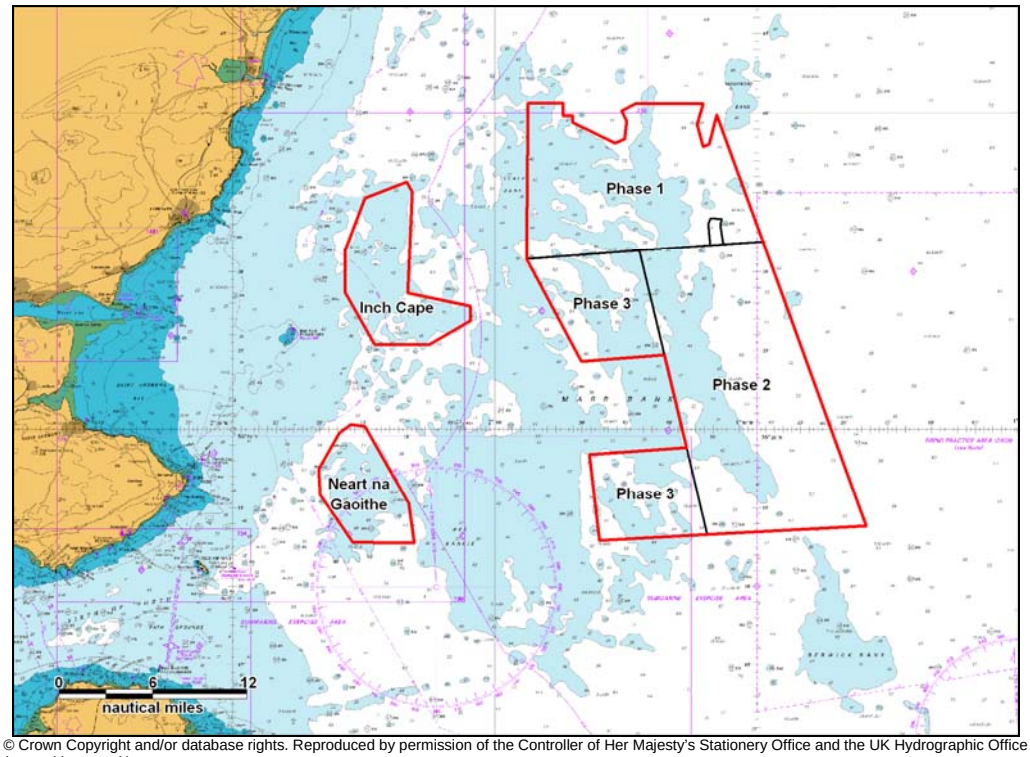

Figure 16.1 Indicative Red Line Boundary for Use in Future and Project Level Cumulative Assessments

These boundaries are current as of January 2012 and include full site capacity for NnG (450MW) and Inch Cape (1GW) and a 3.5 GW capacity layout for the Forth Zone.

It should be noted that the identification of these boundaries at this stage, and there use within the assessments, does not exclude the potential for any site modifications or future developments within the Forth Zone.

16.2 Future Updates

At this stage (January 2012) the re-routing analysis contained within Sections 12 and 13 will not be updated at a cumulative level to include the indicative red line boundaries.

However this report will be updated as consultations and assessments are undertaken on both project and cumulative levels throughout 2012. This will include the current indicative red line boundaries incorporating any changes in planned capacity and final site designs.

17 RESULTS DISCUSSION

This report has reviewed the regional navigational impact of the proposed Firth of Forth and Tay offshore wind farm developments. The main conclusions of this report are summarised below.

17.1 Recreational Craft

- In general there is limited recreational vessel activity outside the Firth of Forth and Tay and off coastal areas. Vessels using cruising routes further offshore may be impacted by structures, however with an assumed maximum blade clearance, vessels could pass between structures.

- The navigational impacts on recreational craft are likely to be low, with the main concerns being small vessels exiting the site into commercial shipping lanes and the potential for 'squeeze', where commercial vessels could be displaced in to recreational areas (and vice versa) increasing risk to both.

- Turbine alignment could also be an issue, if clear routes are not available for recreational craft to navigate between the turbines.

17.2 Fishing vessels

- Fishing activity was more apparent from the satellite data, with demersal trawling recorded off Dunbar and scallop dredging occurring off Arbroath to the north of the region. Vessels heading to/from fishing grounds and home ports may require small deviations of route, however smaller vessels could pass between structures.

- The navigational impacts on fishing vessels are likely to be low, with the main concern being small vessels exiting the site into commercial shipping lanes. Turbine alignment may also be an issue.

17.3 Commercial Vessels

- Each shipping route was assessed and where shipping could be impacted a best alternative route was identified through consultation and Mariner information.

- Based on Anatec's experience, the levels of shipping in this area are generally low and as a result any changes in risk are also likely to be low. Attention is placed around Bell Rock; however vessel numbers appear to be acceptable which is in line with feedback received from the main users in this area.

- Ship density and ship-to-ship collision models ran pre- and post-wind farm development showed that there will be an increase in ship density east and west of the developments; however the overall increase in ship-to-ship collision frequency following re-routeing vessels was negligible.

- Based on stakeholder feedback received to date the overall impact of the proposals on navigational safety are expected to be low provided a full NRA is carried out for each site to identify the main risks and associated mitigation measures. The MCA and Chamber of Shipping raised some concerns over the area around Bell Rock; however this was not evident from the feedback from the shipping companies.

- The requirement for re-routeing of vessels will often result in increased mileage to the users. The feedback did not raise this as a serious concern overall, but some did highlight this fact stating that re-routes would require some extra time, costs and fuel to be used.

- Assessment of additional mileage was not found to be excessive for the majority of routes, with the only impact on voyage distance/time for vessels using Route 4.

- Mitigation measures for each project should be identified and considered on a regional basis to ensure that there is a cumulative approach to the management and implementation of them.

- Adverse weather may further impact the alternative routes identified within this report. Further work should be undertaken on this at a project and cumulative level, when more information is available on site locations.

- Continued consultation is required throughout this process to ensure the views of stakeholders are fully considered within any work carried out.

17.4 Ports

- Forth Ports stated general concern regarding smaller vessels being pushed further offshore and the impact on them being further east and hence out in heavier weather. However, the feedback from the other stakeholders did not highlight this.

- Forth Ports felt the impact could be reduced by having a route through the middle of the Forth Zone between Neart na Gaoithe and Inch Cape for the deviated route from both Forth and Dundee. This point was also raised by the Chamber of Shipping.

- In general Forth Ports thought it best vessels went to the east as opposed to having a north/south channel through the Forth Zone.

17.5 Cumulative Issues

- In terms of the north east coast of Scotland, no cumulative issues are expected.

- However, in a UK context as more information becomes available on the proposals for the Dogger Bank, Hornsea and to an extent East Anglia Round 3 Zone, developments plans should be considered as part of the wider cumulative issues.

17.6 On-going Assessment

- On-going assessments and consultation will continue to be undertaken at a project and cumulative level. These will include use of indicative red line boundaries identifying potential development phases (1-3) within the Forth Zone.

- At this stage (January 2012) the re-routing analysis contained within Sections 12 and 13 will not be updated at a cumulative level to include the indicative red line boundaries.

- However this report will be updated as consultations and assessments are undertaken on both project and cumulative levels throughout 2012. This will include the current indicative red line boundaries incorporating any changes in planned capacity and final site designs.

18 References

i Marico Marine, Forth and Tay Offshore Wind Developers Group, Regional Cumulative Risk Assessment Methodology for Navigation and Shipping. Report Number 10UK747, May 2010.

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iv MCA MGN 371 Offshore Renewable Energy Installations (OREIs) - Guidance on UK Navigational Practice, Safety and Emergency Response Issues including 'Shipping Template', August 2008.

v MCA MGN 372 (M+F), Guidance to Mariners Operating in the Vicinity of UK OREIs, August 2008.

vi Regional Navigational Review of the proposed Windfarms in Scottish Territorial Waters and off the Firth of Forth – a Mariner's View. Richard May - May 2011.doc

vii RYA, Sharing the Wind, 2004.

viii UK Coastal Atlas of Recreational Boating; Recreational Cruising Routes, Sailing and Racing Areas around the UK Coast; Second Edition by RYA; Supported by Trinity House, 2008.

ix Forth Energy, Dundee Consent Application, Environmental Statement Volume 2. Main Text, August 2010.

x IALA Recommendation O-139 (2008), The Marking of Man-Made Offshore Structures, Edition 1: December 2008.