SHIPPING AND NAVIGATION
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15 SHIPPING AND NAVIGATION

Maritime traffic surveys, covering a total of 16 weeks, identified that the majority of vessels operating in the vicinity of the Project were oil & gas industry vessels. An average of one fishing vessel every two days was tracked intersecting the turbine deployment area, and two recreational vessels were recorded passing through the turbine deployment area over the 16 week period. Potential impacts upon shipping and navigation associated with construction, installation, operation, maintenance and decommissioning of the Project have been assessed based on consultation, a Hazard Review Workshop involving a cross-section of local stakeholders, and quantitative risk modelling. The assessment identified a number of potential impacts, such as risk of collision with surface structures and fishing gear interaction with subsea equipment. By applying standard industry practice and additional project-specific mitigation measures identified during consultation and at the Hazard Review Workshop, all the residual risks are assessed to be either broadly acceptable or tolerable (ALARP). Further liaison with Regulators and stakeholders is planned to ensure the appropriate mitigation is effectively implemented. In particular, the plans for safety zones and/or fishing prohibition, either compulsory or advisory, will need to be agreed with DECC, the MCA and Marine Scotland pre-construction.

15.1 Introduction

This chapter assesses the effects of the Project on shipping and navigation. It summarises the work of the Navigation Risk Assessment (NRA) undertaken by Anatec Ltd. Table 15-1 provides a list of the supporting studies which relate to the shipping and navigation impact assessment. All supporting studies are provided on the accompanying CD.

Table 15-1 Supporting studies

<table>
<thead>
<tr>
<th>Details of study</th>
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<tbody>
<tr>
<td>Navigation Risk Assessment Hywind Scotland Pilot Park Project (Anatec, 2014a)</td>
</tr>
<tr>
<td>Preliminary Hazard Analysis Hywind Scotland Pilot Park Project (Anatec, 2013a)</td>
</tr>
<tr>
<td>Draft Emergency Response Cooperation Plan ( ERCoP)</td>
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To gain a better overall understanding of the baseline and potential impacts, consideration should also be given to the following Environmental Statement (ES) chapters:

> Physical environment (Chapter 8); and
> Commercial fisheries (Chapter 14).

The focus of this impact assessment is to assess potential impacts on shipping and navigation in the vicinity of the Project and adjacent waters. A 10 nm buffer surrounding the initial Exclusivity Area, hereafter referred to as the Pilot Park Study Area, was used for analysis of data. In addition to the Pilot Park Study Area, potential impacts were assessed for a 2 nm buffer surrounding the export cable, the Export Cable Study Area. Fishing vessel data were analysed within ICES sub-squares 43E8/1, 43E8/2, 44E8/3, 44E8/4.

A number of descriptive terms are used to characterise the predicted shipping and navigation impacts:

> Project area (see Figure 1-2 in the Introduction), which comprises:
  o Proposed offshore turbine deployment area: and
  o Export cable corridor and landfall.
> Pilot Park Study Area – Exclusivity Area plus 10 nm buffer.
> Export Cable Study Area – Export cable route plus a 2 nm buffer.

1 This area was revised as work on the Project progressed and a slightly modified Agreement for Lease (AfL) area awarded to Statoil but this does not significantly affect the findings of the shipping and navigation assessment.
15.2 Legislative context and relevant guidance

The EIA Regulations are the only legislation directly relevant to this assessment. However, there are a number of guidance documents available which provide further detail on the aspects of the shipping and navigation environment that should be assessed and how the assessment should be undertaken.

The primary guidance followed in the assessment is:

- Department of Energy and Climate Change (DECC) (in association with Maritime and Coastguard Agency (MCA)) Methodology for Assessing the Marine Navigational Safety Risks of Offshore Wind Farms (DECC, 2005); and

Other forms of guidance used in this assessment are listed below:

- MCA Marine Guidance Notice 372 (MGN 372 M+F) OREIs Guidance to Mariners Operating in the Vicinity of UK OREIs (MCA, 2008b);
- DECC Guidance Notes on Safety Zones, DECC (DECC, 2011a);
- International Association of Marine Aids (IALA) Recommendation O-139 On The Marking of Man-Made Offshore Structures, Edition 2, (IALA, 2013);
- International Maritime Organisation (IMO), Guidelines for Formal Safety Assessment (FSA) (IMO, 2002);
- Royal Yachting Association (RYA) – The RYA’s Position on Offshore Renewable Energy Developments: Paper 1 – Wind Energy (RYA, 2013); and

15.3 Scoping and consultation

The bullets below summarise the key issues raised in the Scoping Opinion relevant to the shipping and navigation assessment:

- MCA noted that the provision of mooring cables, and floating and unburied inter-array cables will require to be managed within the array. If a ‘zone of exclusivity’ was created to manage vessel activity, this would require discussion.
- MCA also stated that the towing of WTG Units to Buchan Deep will need to be addressed (Note: This is not covered by the NRA; a separate towage operation risk review is planned once the inshore assembly area has been selected).
- RYA noted that the Project area is hardly frequented by recreational vessels, but will be crossed occasionally by some vessels on passage between Scotland and Norway, and others crossing the North Sea forced to alter course due to adverse weather.
- RYA has recently revised its Position Paper on Wind Offshore Renewable Energy Installations to which reference should be made.
- NLB noted the turbines will be towed out and connected to the pre-installed moorings and cables. It may be necessary to mark and light the site, moorings and chains or any riser or pickup lines and cable connectors deployed prior to the turbines arriving on site.
- NLB stated that marking and lighting will be required for each of the phases of the Project; construction, operation and decommissioning, to give the best possible indication to the mariner of the nature of the works being carried out. NLB also require that Notice(s) to Mariners, radio navigation warnings and publications in appropriate bulletins be issued stating the nature and timescale of and works carried out.
- Aberdeen Harbour Trust were consulted and indicated they had no concerns regarding the Project.
Scottish Fishermen’s Federation (SFF) have been consulted from early in the EIA process and are supportive of the Project.

No other navigational comments or challenges were raised by any other organisations consulted, including Inshore Fisheries Groups and Marine Safety Forum.

Table 15-2 summarises all consultation activities carried out relevant to shipping and navigation.

<table>
<thead>
<tr>
<th>Date</th>
<th>Stakeholder</th>
<th>Consultation undertaken</th>
</tr>
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<tr>
<td>Ongoing</td>
<td>Scottish Fishermen’s Federation</td>
<td>The Project has held various meetings with SFF to discuss plans for the Project, the baseline data to be used to characterise fishing activity and potential issues.</td>
</tr>
<tr>
<td>July 2013</td>
<td>Peterhead Port Authority</td>
<td>Meeting with Peterhead Port Authority and a discussion regarding Peterhead Port’s role in the development and potential users of the area who could be affected.</td>
</tr>
<tr>
<td>July 2013</td>
<td>MCA</td>
<td>Meeting with MCA to discuss the scope of work for the NRA was discussed with the MCA including the various data sources planned to be used to characterise baseline traffic levels.</td>
</tr>
<tr>
<td>August 2013</td>
<td>NLB</td>
<td>Meeting with NLB to discuss the marking and lighting of the Project.</td>
</tr>
<tr>
<td>August 2013</td>
<td>RYA</td>
<td>Consultation meeting regarding recreational vessel activity in the area and potential impacts of the Project, including air clearance.</td>
</tr>
<tr>
<td>November 2013</td>
<td>MCA &amp; NLB</td>
<td>Meeting with MCA &amp; NLB to discuss safety zones and towing operations. Agreed that extended Automatic Identification System (AIS), longer term data sets, e.g., fishing satellite data and local consultation would form a robust baseline.</td>
</tr>
<tr>
<td>December 2013</td>
<td>Cruising Association</td>
<td>Email from Cruising Association confirming that air gap should be minimum 22m.</td>
</tr>
<tr>
<td>June 2014</td>
<td>DECC</td>
<td>Meeting with DECC. Consultation regarding possibilities with respect to the use of safety zones or other methods to create a fishing-free area to protect against risk to fishermen as well as damage to the Project.</td>
</tr>
<tr>
<td>Ongoing</td>
<td>MCA, NLB, UKHO, Cruising Association, Chamber of Shipping and SFF</td>
<td>Meetings to discuss potential for safety zones, area to be avoided or other method to protect against risk of collision and fishing interaction.</td>
</tr>
</tbody>
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15.4 Baseline description

15.4.1 Introduction

The main desk-based data sources used to identify the baseline navigational features and activity in the area of the Project are as follows:

- Maritime traffic survey data – 4 x 28 days shore-based (Anatec, 2014b).
  - 28 days summer 2013;
  - 28 days autumn 2013;
  - 28 days winter 2014; and
  - 28 days spring 2014.

- Raw vessel data from European Seabirds at Sea (ESAS) surveys (Natural Research (Projects) Ltd., 2014).
  - June 2013 to May 2014.

- 6 to 28 August 2013.

> Fishing data.

- Sightings data for 2008-2012 (Marine Scotland Compliance, 2013); and

> Maritime incident data from.

- Marine Accident Investigation Branch (MAIB) data for 2003-2012 (MAIB, 2013); and


> Offshore Renewables shapefiles (The Crown Estate (TCE), 2014a).

> Marine aggregate dredging data.

- Aggregate Dredging Licence and Active Areas shapefiles (TCE, 2014b); and
- British Marine Aggregate Producers Association (BMAPA) aggregates dredger transit routes (BMAPA, 2014).

> Marine Environmental High Risk Areas (MEHRA) (DfT, 2006).

> Admiralty Sailing Directions – North Sea (West) Pilot, NP 54 (United Kingdom Hydrographic Office (UKHO), 2009).

> UK Admiralty Charts:

- 1409_0 Buckie to Arbroath (UKHO, 2013);
- 1438_1 Approaches to Peterhead (UKHO, 2014a); and
- 1446_1 Approaches to Aberdeen (UKHO, 2014b).

### 15.4.2 Existing environment

The turbine deployment area is located mainly within Buchan Deep which is an area of deep water (95 m – 120 m) situated approximately 12 nm (approximately 25 km) east of Buchan Ness, near Peterhead, on the north east coast of Scotland. The nearest port is located at Peterhead, with the harbour limits 11 nm (approximately 20 km) to the west of the turbine deployment area. Aberdeen Port harbour limits are located 27 nm (approximately 50 km) south west.

There are no IMO Routeing Measures in the vicinity. No wrecks exist within the turbine deployment area. In terms of oil and gas installations, Licence Block 20/16 lies 10 nm (approximately 18 km) east of the turbine deployment area. It is licenced to Sendero Petroleum Limited. The closest offshore installation is within the Buzzard Oil and Gas Field operated by Nexen Petroleum at a distance of 22.3 nm (approximately 41 km) north east of the turbine deployment area.

The AFL area for the proposed European Offshore Wind Deployment Centre (EOWDC), situated in Aberdeen Bay, is located approximately 22.2 nm (approximately 41 km) south west of the turbine deployment area. The total area of the EOWDC AFL area is approximately 5.8 nm² (20 km²). It is planned to consist of 11 turbines with an installed capacity of up to 100 MW. It is currently being developed by Aberdeen Offshore Wind Farm Limited (AOWFL), a joint venture between Vattenfall and Aberdeen Renewable Energy Group (AREG). The consent application for the EOWDC has been granted approval and construction is planned to commence in 2015.
There are no aggregate dredging areas in the vicinity of the turbine deployment area. No BMAPA dredger routes transit in the vicinity.

The Forties Pipeline System crosses the AfL area running north east to south west between the Forties Oil Field and Port Errol at Cruden Bay. The BP CNS Fibre Optic Telecommunications Cable also runs the length of the pipeline route. Mariners are advised not to anchor or trawl in the vicinity of submarine cables and pipelines. Pipelines are not always buried. The Drums Links firing range, 21.2 nm (approximately 39 km) south west of the turbine deployment area, and Black Dog rifle range, 25.2 nm (approximately 46 km) south west, are located along the coast near to Aberdeen. No restrictions are placed on the right to transit the firing practice areas at any time. The firing practice areas are operated using a clear range procedure, i.e. exercises and firing only take place when the areas are considered to be clear of all shipping. Red flags and occasionally red lights are displayed from flagstaffs on the shore when firing takes place. A Managed Defence Area (MDA) used by the RAF is 9.9 nm (approximately 18 km) to the south west of the turbine deployment area at its nearest point.

Newburgh MEHRA, located approximately 16 nm (approximately 29 km) south west of the turbine deployment area, has underlying statutory designations on wildlife, landscape and geological grounds. There is a high concentration of seabirds and a range of fishing activities. The MEHRA lies between Aberdeen and Peterhead and traffic to and from both ports passes by. Kinnaird Head MEHRA, located approximately 17 nm (approximately 31 km) north west of the turbine deployment area, has underlying statutory designations on wildlife, landscape and geological grounds. There is a very high concentration of seabirds and a range of fishing and amenity / economic activity.

15.4.3 Metocean data

Wind, wave and tidal data for the Buchan Deep were used as input to the collision risk modelling process. This is presented in Chapter 8 (physical processes and sediment dynamics) of the ES and in the NRA.

15.4.4 Maritime traffic survey

This section presents analysis of the maritime traffic data for the Project, using a combination of AIS and visual observations. Data analysis was carried out within the Pilot Park Study Area and the turbine deployment area.

It was agreed at the meeting with the MCA and NLB in November 2013 that, given the observations from the Franklin survey vessel which showed all fishing vessels in the area were broadcasting on AIS, as well as consultation with SFF on the size of fishing vessels in the area, an extended AIS survey was appropriate to develop the baseline for the Project as opposed to carrying out a dedicated vessel-based survey. Sixteen weeks of AIS data were used (4 x 4 weeks), encompassing seasonal fluctuations in shipping activity and accounting for a range of tidal conditions. This exceeds the minimum of four weeks specified in MCA MGN 371.

Vessels within Pilot Park Study Area

Vessel types within the Pilot Park Study Area were analysed for the 16 weeks of data. Vessels working on behalf of the Project were excluded. The level of traffic was fairly regular over the periods, with an average of 50-56 unique vessels per day, slightly higher in summer / spring compared to autumn / winter. The vessel type distribution did not vary significantly during the four periods. The most common vessels in all periods were cargo vessels (40%-43%), followed by ‘other’ vessels (26%-30%).

Further research indicated that the majority of vessels broadcasting their type as cargo and ‘other’ on AIS were working for the offshore, oil & gas industry. Over the 16 week period, 63% of vessels tracked were offshore vessels. This includes supply vessels, Emergency Response and Rescue Vessels (ERRV), anchor handling tugs and fishing vessels working as guard vessels. A plot of the spring 2014 AIS track data with offshore vessels given a unique colour-coding is presented in Figure 15-1.

Passenger and Serco NorthLink ferries within Pilot Park Study Area

An average of one to two unique passenger vessels per day was recorded on AIS during the 16 weeks survey period. The majority of these (79%) were the Serco NorthLink passenger ferries Hrossey and Hjaltland operating the timetabled service between Aberdeen and the Northern Isles. The majority of the passenger vessels tracked passed to the west of the Pilot Park Study Area, including the NorthLink ferries. These vessels, Hrossey and Hjaltland, passed on average 7.8 nm (approximately 14 km) west of the turbine deployment area, with the closest...
passage being at 2.3 nm (approximately 4 km). Three passenger vessels transited through the turbine deployment area over the 16 weeks survey, all of which were passenger cruise ships. Serco NorthLink also operates two freight vessels, *Helliar* and *Hildasay*. These freight ferries normally passed 6-10 (approximately 11-18 km) nm to the west of the turbine deployment area. On one occasion, *Hildasay* was tracked passing at 0.9 nm (approximately 1 km) west.

**Vessels within Turbine Deployment Area**

Vessel types within the turbine deployment area were analysed for the 16 week survey period. There was an average of 3-4 unique vessels per day intersecting the turbine deployment area, with the maximum number of vessels per day ranging from 7 to 11. The vessel type distribution did not very significantly over the four periods; however, there were fewer fishing vessels in winter 2014 and more ‘other’ vessels in spring 2014 than in the other periods. The vast majority of ‘other’ vessels were offshore industry vessels. A plot of the AIS tracks for the most recent spring 2014 period, thematically mapped by vessel type, with offshore vessels separated into a discrete category is presented in Figure 15-2.

The average length of vessel (excluding unspecified) was 85 m. The longest vessel transiting the turbine deployment area was the 294 m long container vessel, *Duesseldorf Express*, en route to Halifax, Canada, on 8 February 2014. The average vessel draught (excluding unspecified) was 5.6 m. The deepest draught vessel transiting the turbine deployment area was the 17.1 m draught bulk carrier, *Australia Maru*, en route to Teesport on 22 November 2013.

The average courses of vessels were broadly east bound from Peterhead and Aberdeen, or west bound to Peterhead and Aberdeen. The north east Scotland ports of Peterhead (21%) and Aberdeen (18%) were the most common destinations (excluding unspecified). ‘Fishing’ was recorded as a destination by 4% of vessels. A number of vessels were transiting to offshore oil and gas installations in the North Sea (usually departing from Peterhead or Aberdeen). This included temporary, mobile installations such as the *Rowan Stavanger* and *Wilhunter* drilling rigs, as well as fixed, permanent installations such as those present at the Montrose, Brae and Ettrick fields. Ten percent of vessels did not specify a destination, the majority of which were fishing vessels.

**Visual observations**

Vessel traffic data were recorded as part of the ESAS survey work\(^2\) for the Project, to provide supplementary data on vessel activity. Visual observations of targets were recorded by surveyors onboard the *Eileen May* survey vessel. Survey diaries were used to manually log any vessels observed over the duration of the bird survey. Surveys undertaken on 17 days between June 2013 and April 2014 have been included in this assessment. A total of 133 hours was spent surveying in the vicinity, approximately eight hours per day. Surveys were never undertaken when the sea state was above 5 (rough), which is the limit for ESAS surveying.

A total of 15 vessels were tracked over the survey period, five trawlers, one military, one bulk carrier cargo, one passenger cruise liner, two yachts and five ‘other’ vessels. Four of the ‘other’ type vessels tracked were offshore supply / support vessels, and one was a survey vessel.

A manual traffic survey was also carried out from 6 to 28 August 2013, using visual observations of radar targets recorded on paper log sheets by the *Franklin* survey vessel during a geophysical survey of AFL area and export cable corridor. The objective was to record sightings of all vessels (including non-AIS, such as fishing and recreational craft). In addition to the position of the sighting, information on type and size was recorded. A total of 23 vessel sightings were recorded in proximity to the Project. The most common vessel type was fishing vessel (92%). The remaining 8% were survey vessels tracked travelling to Aberdeen.

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\(^2\) The ESAS surveys took place over an area of 170.5 km\(^2\) and comprised the original Statoil Exclusivity Area buffered to 3 km.
Figure 15-1  Spring 2014 AIS data within Pilot Park Study Area (AIS data - Anatec, 2014)
Figure 15-2 Spring 2014 AIS data intersecting Turbine Deployment Area (AIS data - Anatec, 2014)
15.4.5 Fishing vessel activity

This section analyses the fishing vessel activity in the Pilot Park Study Area based on the maritime traffic survey, and the latest available surveillance data (satellite and sightings) within ICES sub-squares 43E8/1, 43E8/2, 44E8/3, 44E8/4. Consultation with SFF indicated that long-term satellite (VMS) data and seasonal AIS would be robust for identifying fishing activity in Buchan Deep, which is over 12 nm (approximately 22 km) offshore.

**Fishing survey data**

At the time of the 2013-14 AIS surveys, AIS carriage was mandatory for fishing vessels ≥ 18 m length under EU Directive. A proportion of smaller fishing vessels also carry AIS voluntarily but may not broadcast continuously. In addition to fishing, a number of fishing vessels were working as guard boats for the offshore industry, e.g., protecting pipelines or subsea installations. Guard vessels have been identified separately from other fishing vessels. Figure 15-3 presents a plot of the combined 16 weeks AIS tracks.

Overall, 892 fishing tracks were recorded within the Pilot Park Study Area during the combined 16 weeks AIS survey periods, an average of eight per day. Of these, 7% were identified to be engaged in guard duties for the oil & gas industry. An average of one fishing vessel every two days was tracked intersecting the turbine deployment area.

**Fishing surveillance data**

Fishing sightings data is collected by spotter planes and patrol vessels, with all fishing vessel activity logged provided the vessel can be identified. The data thematically mapped by gear type are presented in Figure 15-4.

No sightings were recorded within the turbine deployment area. Within the ICES sub-squares, demersal trawling accounted for approximately 70% of fishing activity. In terms of nationality, 96% of vessels were UK-registered. Approximately half the vessels sighted were steaming (transiting to / from fishing grounds), and half were engaged in fishing, i.e., gear deployed. Only 7% of vessels were below 15 m in length. These were mainly inshore vessels. The majority of vessels recorded in the vicinity of the Pilot Park Study Area were larger vessels of 15 m length and over.

Fishing satellite (VMS) data were analysed covering vessels 15 m length and over, with positions received every two hours when at sea. The data thematically mapped by speed are presented in Figure 15-5.

In terms of speeds, approximately 60% of vessel positions within the turbine deployment area were at speeds above 5 knots and hence likely to be steaming on passage through the turbine deployment area. The remaining 40% were travelling at speeds below 5 knots and hence may have been engaged in fishing.
Figure 15-3  Fishing vessel AIS data (16 weeks) within Pilot Park Study Area (AIS data - Anatec, 2014)
Figure 15-4  Fishing vessel sightings data (2008 - 2012) (Sightings data - Marine Scotland Compliance, 2013)
Figure 15-5  Fishing vessel satellite data (2011 - 2012) (Satellite data - Marine Management Organisation, 2013)
15.4.6 Recreational vessel activity

Recreational vessel activity in the vicinity of the Pilot Park Study Area is reviewed in this section, based on available desktop information and consultation with the RYA and Cruising Association.

**RYA coastal atlas data**

The latest RYA coastal atlas data indicates that the turbine deployment area does not fall within any racing or sailing areas. No cruising routes cross the turbine deployment area, as they all stay much closer to the shore. The nearest indicative route is 11 nm (approximately 20 km) to the west. In terms of facilities, the closest club is the Peterhead Sailing Club, 12 nm (approximately 22 km) west of the turbine deployment area, and the closest marina is Peterhead Bay marina.

**Recreational survey data**

A total of 12 recreational vessels were tracked on AIS during the summer 2013 and spring 2014 survey periods within the Pilot Park Study Area. No recreational vessels were recorded in the autumn 2013 or winter 2014 surveys. Figure 15-6 presents the recreational vessel tracks recorded during the surveys, within the Pilot Park Study Area. It is noted again that AIS carriage is not mandatory for recreational vessels although some carry it voluntarily, especially larger vessels on longer routes. However, it is expected that AIS represents only a small minority of recreational traffic.

Two recreational vessels, both small sailing vessels, were tracked transiting through the turbine deployment area. *Noa Noa II* transited east on 7 August 2013, and *Altair Af Skafte* travelled east-south east on 19 August 2013.

**Peterhead Bay marina**

Consultation with the marina manager from Peterhead Bay marina confirmed that there are several visits per year from Scandinavia which could pass in the vicinity of Buchan Deep, but the vast majority of their visitors are coming from other directions, e.g., north or south. Official records were not available but it is estimated that in the order of 20-30 yachts per year are transiting to or from a direction that could take them past Buchan Deep.

15.4.7 Export cable route review

Maritime traffic data, for the most recent 28 days of data from spring 2014, were analysed within the Export Cable Study Area. Vessels working on behalf of the Project were excluded.

**Vessel analysis**

A plot of the AIS tracks, thematically mapped by AIS type as broadcast on AIS, is presented in Figure 15-7.

An average of 64 unique vessels per day were recorded within the Export Cable Study Area, with the most common vessel types identified as cargo (33%), ‘other’ (28%) (mainly oil & gas), and fishing (27%).

**Fishing survey data**

An average of 16 unique fishing vessels per day were recorded within the Export Cable Study Area over the spring 2014 period. The majority of these appeared to be transiting vessels steaming on passage to or from Peterhead. However, it should be noted that AIS at the time was only mandatory for vessels ≥ 18 m in length and above which will not fully represent fishing activity in inshore waters by smaller vessels. The AIS shows some evidence of fishing between the 6 and 12 nm (approximately 11-22 km) fisheries limits (where only UK-based vessels and foreign vessels with historic fishing rights are permitted to fish).

Chapter 14 (commercial fisheries) presents more information on fishing activity in the Export Cable Study Area. The sightings data (all sizes) and satellite data (15 m length and above) for ICES Rectangles 43E8 and 44E8 encompasses the Export Cable Study Area. As with AIS, the satellite data does not represent smaller fishing vessels, covering only vessels over 15 m in length, with the majority travelling at steaming speed. The sightings data includes all vessels and indicates a mixture of fishing and steaming activity but is based on a limited number of overflights.
Figure 15-6  Recreational vessel AIS data (16 weeks) within Pilot Park study area (AIS data, Anatec 2014)
Figure 15-7  Spring 2014 AIS data within Export Cable Study Area (AIS data – Anatec, 2014)
15.4.8 Maritime incidents

Maritime incidents recorded by the MAIB (2003-2012) and RNLI (2001-2010) in the vicinity of the Project have been analysed (some were recorded by both sources). These were the latest available from the respective organisations.

A total of nine MAIB incidents were recorded within the Pilot Park Study Area, corresponding to an average of just under one per year. No incidents were noted within the turbine deployment area. The closest incident was recorded approximately 6.6 nm north-west of the turbine deployment area and involved a machinery failure on board a fishing trawler. The incident took place on 24 August 2007 while the vessel was on passage.

Nine RNLI incidents were recorded in the Pilot Park Study Area, averaging one per year. All incidents were responded to by the Peterhead RNLI station with one exception, which was responded to by Fraserburgh RNLI. This was the most northerly incident recorded within the Pilot Park Study Area. No incidents were recorded within the turbine deployment area, with one incident noted within the AFL area. This incident involved a large fishing vessel which suffered a machinery failure on 22 June 2001 and was responded to by Peterhead lifeboat.

15.4.9 Emergency response overview

A review of the assets in the area of the Project identified that the closest search and rescue (SAR) helicopter base is located at Lossiemouth, operated by the Royal Air Force (RAF), approximately 64 nm (approximately 118 km) west-north west of the turbine deployment area. This base has Sea King helicopters with a top speed of 125 knots and a radius of action up to 250 nm (approximately 463 km), which is well within the range of the Project area. Under new helicopter search and rescue plans, however, this base is due to close and be replaced with a new service by summer 2017. The Bristow Group will take over helicopter search and rescue operations, with a contract running for ten years from 2015. The closest helicopter base will be located at Inverness. Inverness is located approximately 86 nm (approximately 159 km) west of the boundary of the turbine deployment area. This base will operate two Sikorsky S-92s which have a maximum cruise speed of 151 knots and range of 539 nm (approximately 1,000 km). This will cover the Project.

The RNLI maintains a fleet of over 340 lifeboats of various types at 236 stations around the coast of the UK and Ireland. The nearest RNLI stations in the vicinity of the Project, and the ones that responded to the historical incidents in the vicinity, are at Peterhead and Fraserburgh. At each of these stations crew and lifeboats are available on a 24 hour basis throughout the year. The time for an all-weather lifeboat to reach the Project area would be approximately 45 minutes.

15.4.10 Data gaps and uncertainties

It is recognised that small vessel activity is variable and dependent on numerous factors including weather conditions, tides, seasonal factors, and in the case of fishing vessels, quotas and the migration of fish species. This variability has been taken into account as far as possible by using long-term desk-based research and consultation with local stakeholders to inform an up-to-date baseline.

It is also recognised that vessel activity in the Buchan Deep area could vary over the life of the Project. There are varying factors that could influence the nature and extent of fishing, recreational and oil & gas activity. For example, almost two-thirds of the traffic in the AIS surveys was oil & gas industry related. There is an expectation that numerous fields in the North Sea will be decommissioned in the next few decades which could temporarily increase traffic during the decommissioning work but then lead to a long-term reduction in support vessel traffic. A 10% net increase in all traffic was assumed over the life of the Project to account for this uncertainty.

15.5 Impact assessment

15.5.1 Overview

Following establishment of baseline conditions of the Project and surrounding areas, and an understanding of the Project activities it is possible to assess the potential impacts from the Project. The range of impacts that has been considered is based on impacts identified during the navigational PHA and any further potential impacts that have
been highlighted as the NRA has progressed. The impacts assessed are summarised below. It should be noted that not all impacts are relevant to all phases of the Project.

- Work vessel collision with other (third-party) vessel;
- Fishing interaction with midwater mooring lines, power cables and anchors;
- Powered vessel collision with WTG Unit;
- Fishing interaction with export cable;
- Drifting vessel collision with WTG Unit;
- Vessel anchor interaction with subsea equipment; and
- Vessel-to-vessel collision due to avoidance of site and/or work vessels;
- WTG Unit total loss of station.

Where impacts are relevant during multiple phases of the Project, they have been ranked under the phase where they are considered to be most significant. For example, work vessel activity will be most intense during construction and therefore the discussion is presented under this phase.

The assessment has been informed by a Hazard Review Workshop, which was carried out to identify and review the potential navigational hazards associated with the Project. Stakeholders representing the various types of vessel activity and emergency response organisations in the area were invited to ensure the review took into account local factors and benefitted from local knowledge and experience. Baseline data analysis and other consultation were also considered in the assessment. The ranking of risks associated with the various hazards was subsequently carried out based on the discussion at the Workshop and review of the baseline data and consultation. The ranking was carried out initially assuming basic (industry standard) mitigation and then secondly assuming enhanced (project-specific) mitigation suggested at the workshop (where practicable) to assess the residual risk. The rankings were circulated to attendees after the meeting for feedback.

In addition, selected hazards were subject to a separate process of quantitative collision risk modelling. All the quantified risk assessments were carried out using Anatec’s COLLRISK software which conforms to the DECC guidance. Base case modelling (based on current traffic levels) and future case modelling (based on a conservative 10% potential growth in shipping movements) have been undertaken. Full details of the approach taken are provided in the NRA (Anatec, 2014a).

15.5.2 Assessment criteria

The shipping and navigation impacts assessment methodology has been carried out in line with the IMO’s Formal Safety Assessment (FSA) process and the DECC / MCA Guidelines (see NRA for full details). It therefore does not necessarily follow the methodology set out in Chapter 6. Hazards (impacts) have been categorised using the frequency and consequence categories below. The categorisation was carried out based on the discussion at the Hazard Review Workshop involving local stakeholders, together with the baseline data analysis and other consultation.

### Table 15-3 Frequency bands for shipping and navigation

<table>
<thead>
<tr>
<th>Rank</th>
<th>Description</th>
<th>Definition</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Negligible</td>
<td>&lt; 1 occurrence per 10,000 years</td>
</tr>
<tr>
<td>2</td>
<td>Extremely Unlikely</td>
<td>1 per 100 to 10,000 years</td>
</tr>
<tr>
<td>3</td>
<td>Remote</td>
<td>1 per 10 to 100 years</td>
</tr>
<tr>
<td>4</td>
<td>Reasonably Probable</td>
<td>1 per 1 to 10 years</td>
</tr>
<tr>
<td>5</td>
<td>Frequent</td>
<td>Yearly</td>
</tr>
</tbody>
</table>
Table 15-4 Consequence bands for shipping and navigation

<table>
<thead>
<tr>
<th>Rank</th>
<th>Description</th>
<th>Definition</th>
<th>People</th>
<th>Environment</th>
<th>Property</th>
<th>Business</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Negligible</td>
<td>No injury</td>
<td>&lt;£10k</td>
<td>&lt;£10k</td>
<td>&lt;10k</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>Minor</td>
<td>Slight injury(s)</td>
<td>Tier 1: Local assistance required</td>
<td>£10k-£100k</td>
<td>£10k-£100k</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>Moderate</td>
<td>Multiple moderate or Single serious injury</td>
<td>Tier 2: Limited external assistance required</td>
<td>£100k-£1M</td>
<td>£100k-£1M Local publicity</td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>Serious</td>
<td>Serious injury or single fatality</td>
<td>Tier 2: Regional assistance required</td>
<td>£1M-£10M</td>
<td>£1M-£10M National publicity</td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>Major</td>
<td>More than 1 fatality</td>
<td>Tier 3: National assistance required</td>
<td>&gt;£10M</td>
<td>&gt;£10M International publicity</td>
<td></td>
</tr>
</tbody>
</table>

The consequence scores are averaged (for a single impact there could be a range of consequences) and multiplied by the frequency to obtain an overall ranking (or score) which determined the hazard's position within the risk matrix shown below in Table 15-5.

Table 15-5 Risk matrix for shipping and navigation

<table>
<thead>
<tr>
<th>Consequence</th>
<th>5</th>
<th>4</th>
<th>3</th>
<th>2</th>
<th>1</th>
</tr>
</thead>
<tbody>
<tr>
<td>Frequency</td>
<td>High</td>
<td>High</td>
<td>High</td>
<td>Moderate</td>
<td>Moderate</td>
</tr>
<tr>
<td>Consequence</td>
<td>5</td>
<td>4</td>
<td>3</td>
<td>2</td>
<td>1</td>
</tr>
<tr>
<td>Frequency</td>
<td>High</td>
<td>High</td>
<td>Moderate</td>
<td>Moderate</td>
<td>Low</td>
</tr>
<tr>
<td>Consequence</td>
<td>3</td>
<td>2</td>
<td>1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Frequency</td>
<td>Moderate</td>
<td>Low</td>
<td>Low</td>
<td>Low</td>
<td>Low</td>
</tr>
<tr>
<td>Consequence</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Frequency</td>
<td>Moderate</td>
<td>Low</td>
<td>Low</td>
<td>Low</td>
<td>Low</td>
</tr>
</tbody>
</table>

Where:

Broadly Acceptable Region (Low Risk) Generally regarded as acceptable and adequately controlled. None the less the law still requires further risk reductions if it is reasonably practicable. However, at these levels the opportunity for further risk reduction is much more limited.

Tolerable Region (Moderate Risk) Typical of the risks from activities which people are prepared to tolerate to secure benefits. There is however an expectation that such risks are properly assessed, appropriate control measures are in place, residual risks are as low as is reasonably practicable (ALARP) and that risks are periodically reviewed to see if further controls are appropriate.

Unacceptable Region (High Risk) Generally regarded as unacceptable whatever the level of benefit associated with the activity.

15.5.3 Design Envelope

This assessment considers the Project parameters which are predicted to result in the greatest impact. This approach ensures that impacts of a greater adverse significance would not arise should any other development scenario be taken forward in the final scheme design. With regards to the shipping and navigation assessment these are:

- Total turbine deployment area of 4.4 nm² (15 km²);
- The COLLRISK modelling that has been used to inform the risk assessment is based on 6 WTG Units with 15 m diameter turbines and a maximum spacing of 1,370 m;
- 3 anchors per WTG Unit with mooring lines a maximum of 1,200 m in length;
> Anchors and mooring system and potentially inter array cables present on the seabed for up to 18 months prior to turbine installation;

> 5 inter array cables, each a maximum of 3 km in length and touching down on the seabed 250 m from the turbine;

> Export cable 35 km long, which with protection (as required but not expected to be more than 2 km) may occupy a 6 m wide corridor on the seabed; and

> Operational period of 20 years.

The impacts from potential alternative development options are addressed in Section 15.8.

### 15.5.4 Mitigation measures

Standard industry practice which will be applied to minimise navigational impacts is presented below. These have been assumed as embedded mitigation in the initial rankings of each impact. Additional project specific (enhanced) mitigation measures identified during consultation and at the Hazard Review workshop is then presented specific to each impact and used to estimate the residual risk.

<table>
<thead>
<tr>
<th>STANDARD INDUSTRY PRACTICE</th>
</tr>
</thead>
<tbody>
<tr>
<td>The impact assessment assumes standard industry practice will be applied to minimise the impacts. Standard mitigation measures are presented below.</td>
</tr>
<tr>
<td>&gt; Adverse Weather: There will be adverse weather working policies and procedures for periods of construction and maintenance;</td>
</tr>
<tr>
<td>&gt; Cable Protection: Appropriate cable protection to be installed along the cable route, informed by a BPI study which will be submitted to the MCA prior to installation;</td>
</tr>
<tr>
<td>&gt; Chart Marking: The Project will be depicted on Admiralty Charts produced by the UKHO;</td>
</tr>
<tr>
<td>&gt; Emergency Response Cooperation Plan: An ERCoP will be prepared for the Project following the template provided by the MCA in MGN 371. This will be submitted to the MCA for approval prior to construction;</td>
</tr>
<tr>
<td>&gt; Equipment and Training for Site Personnel: Site personnel will be suitably equipped and trained for work offshore including in fire fighting, first aid and offshore survival;</td>
</tr>
<tr>
<td>&gt; Fisheries Liaison: The FLOWW (Fishing Liaison with Offshore Wind and Wet Renewables Group) best practice guidance for fisheries liaison will be followed, including the establishment of a fishing liaison plan. An FLO has been appointed for the Project and will continue in this role during construction.</td>
</tr>
<tr>
<td>&gt; Guard Vessel during Construction: When there are work vessel(s) on site, one vessel will be nominated as a guard vessel with appropriate procedures for traffic monitoring and collision risk management;</td>
</tr>
<tr>
<td>&gt; Inspection and Maintenance: There will be appropriate inspection and maintenance procedures in place for all elements of the Project;</td>
</tr>
<tr>
<td>&gt; Kingfisher Charts and FishSAFE: Details of the Project will be included in updated Kingfisher fishermen’s awareness charts (paper and electronic) and on FishSAFE electronic safety devices which give and audible alarm when vessels are close to hazards;</td>
</tr>
<tr>
<td>&gt; Maritime Safety Information (MSI) Broadcasts: HM Coastguard will be informed of work at the site to allow them to issue MSI broadcasts as appropriate;</td>
</tr>
<tr>
<td>&gt; Marking and Lighting: The Project will be marked and lit according to NLB requirements;</td>
</tr>
</tbody>
</table>
| > Minimum Air Clearance: There will be a minimum air clearance of 22 m from sea level in all tidal states due to the floating nature of the turbines. This is designed to help minimise the risk of rotor blade / yacht mast
**STANDARD INDUSTRY PRACTICE**

interaction in accordance with MCA and RYA guidance;

- Notice to Mariners: Notices to Mariners will be issued prior to the start of construction and where necessary during work at the site;
- Safety Management System (SMS): Statoil will have in place an SMS throughout the project; and
- Safety Zones during Construction: Safety zones of 500 m radii will be applied to protect working vessels on the site during construction work.

### 15.6 Impacts during construction and installation

Work vessels will be required during construction and installation of the Project. One anchor handling vessel and one light subsea construction vessel will carry out anchor and mooring installation, one installation vessel and one crew transfer vessel will be required for the inter-array cable installation, and for the hook-up and mooring of WTG Units one light subsea construction vessel and two ocean going tugs will be used. Installation of the export cable will require one cable lay vessel and one trenching vessel. It is expected that installation of mooring lines and anchor chains will be carried out in 3Q 2016, followed by installation of the WTG Units in 2Q 2017.

#### 15.6.1 Work vessel collision with other vessel

The work vessels will have the potential to collide with other transiting vessels whilst operating at the Project or en route to / from the Project, during the construction and installation phase.

It is noted that a guard vessel will be used to mitigate risks and increase awareness of the Project when vessels are working at the Project site. In addition to this, construction safety zones are industry-standard to protect installation vessels and their personnel.

**Assessment of risk**

The risk was ranked based on discussion at the Hazard Review Workshop, review of baseline data, and stakeholder consultation. Consequence will depend on the vessels involved but will range from minor damage to sinking of vessels with potential fatalities, with the most likely outcome being ranked as serious. The frequency of a collision is considered to be remote due to standard mitigation measures that will be in place, including safety zones and Notices to Mariners. This gives an overall risk of moderate (tolerable) as summarised in the table below.

<table>
<thead>
<tr>
<th>Consequence</th>
<th>Frequency</th>
<th>Risk</th>
</tr>
</thead>
<tbody>
<tr>
<td>Serious</td>
<td>Remote</td>
<td>Moderate (tolerable)</td>
</tr>
</tbody>
</table>

**MITIGATION**

The above assessment assumes standard industry practice will be applied to minimise this impact. Additional project specific (enhanced) mitigation measures identified during consultation and at the Hazard Review workshop are presented below.

- AIS Traffic Monitoring: Live 24/7 shipping traffic monitoring on AIS by Statoil Marine in Bergen during the operational phase with procedures to follow in the event a vessel is identified to be heading on a potential collision course;
- AIS on Work Vessels: All vessels working at the site will broadcast on AIS;
- Lessons Learned: Experience and lessons learned from incidents, accidents and near-misses at other marine renewables projects will be taken into account. Statoil is a member of the G9 Offshore Wind Health and Safety Association, and is proactive in sharing incident data and lessons learned within the offshore wind industry. The
**MITIGATION**

- Project will also benefit from experience gained at the Hywind Demo Project in Norway which has been operational since 2009;
- Passage Plans for Construction Vessels: Passage plans will be developed for vessels routing between the Project and the onshore base;
- Sailing Directions and Almanacs: Details of the Project will be circulated to relevant organisations for inclusion in updated Sailing Directions and Almanacs;
- Safety Zones during Construction: Additional safety zones of up to 500 m radii will be applied for around each WTG Unit once installed until the construction phase at site has ended; and
- Targeted Circulation of Information: Information on the Project will be circulated directly to local ports, ship operators (including the Marine Safety Forum representing oil industry vessels), fishermen and recreational organisations (including relevant international organisations).

**Assessment of residual risk**

Based on applying the enhanced, project-specific mitigation measures, in addition to following standard industry practice, the consequences remain serious but the frequency is considered to reduce to extremely unlikely with an overall residual risk of moderate (tolerable) as summarised in the table below.

<table>
<thead>
<tr>
<th>Consequence</th>
<th>Frequency</th>
<th>Risk</th>
</tr>
</thead>
<tbody>
<tr>
<td>Serious</td>
<td>Extremely Unlikely</td>
<td>Moderate (tolerable)</td>
</tr>
</tbody>
</table>

**15.7 Impacts during operation and maintenance**

Impacts of the Project have been considered for the operation and maintenance phase of the Project.

**15.7.1 Powered vessel collision with WTG Unit**

During operation, there will be a risk of vessels colliding with the WTG Units. This impact was considered for three scenarios:

- Merchant vessel (e.g. oil & gas);
- Fishing vessel; and
- Recreational vessel.

Based on the merchant ship routeing identified for the area and the anticipated change in routeing due to the Project, and assuming effective mitigation in terms of making mariners aware of the site through Notices to Mariners, charts, lights and markings, etc., the frequency of an errant ship under power deviating from its route to the extent that it comes into proximity with the Project site is not considered to be a likely event. From consultation with the shipping industry, including the Marine Safety Forum which represents offshore industry vessel operators, it is assumed that merchant ships will not attempt to navigate between turbines due to the restricted sea room. The main risk of powered collision with a wind farm structure is from human error on the bridge of the ship, e.g., watchkeeper asleep, absent or distracted. The proximity to port should mean mariners are attentive to their vessel's position more than in open seas, although it was noted at the Hazard Review Workshop that outbound vessels leaving port will begin to stand down on the bridge, and the crew may be distracted by other tasks, such as paperwork. Inbound to Peterhead, there are likely to be "more eyes" on the bridge as the vessel prepares for arrival. This will vary for other destination / departure ports such as Aberdeen.

Fishing vessels when steaming on passage are also expected to avoid the turbine array but when fishing in the area they could be operating in proximity to turbines, if considered safe to do so by the Master.
Recreational collisions are considered to be low risk on the basis that the collision frequency will be low, due to the low levels of recreational traffic observed during the surveys and the consultation feedback which indicated low numbers of yachts crossing the North Sea in the vicinity of Buchan Deep.

### Assessment of risk – merchant shipping

The merchant vessel powered collision risk was ranked based on discussion at the Hazard Review Workshop, review of baseline data and stakeholder consultation. The consequence to people is considered moderate as these vessels are of a reasonable size to withstand a collision and some of the energy will be absorbed by the floating WTG Unit moving on its moorings. The frequency is considered remote when taking into account standard mitigation such as marking and lighting and chart depiction, resulting in an overall risk of moderate (tolerable) as summarised in the table below.

<table>
<thead>
<tr>
<th>Consequence</th>
<th>Frequency</th>
<th>Risk</th>
</tr>
</thead>
<tbody>
<tr>
<td>Moderate</td>
<td>Remote</td>
<td>Moderate (tolerable)</td>
</tr>
</tbody>
</table>

### Assessment of risk – fishing vessels

The fishing vessel powered collision risk was ranked based on discussion at the Hazard Review Workshop, review of baseline data and stakeholder consultation. The expected consequences to people were considered to be serious due to these being smaller vessels and hence more likely to suffer damage. The frequency is considered remote based on the levels of fishing vessels on passage in the area and standard mitigation such as marking and lighting. The overall risk was ranked as moderate (tolerable) as summarised in the table below.

<table>
<thead>
<tr>
<th>Consequence</th>
<th>Frequency</th>
<th>Risk</th>
</tr>
</thead>
<tbody>
<tr>
<td>Serious</td>
<td>Remote</td>
<td>Moderate (tolerable)</td>
</tr>
</tbody>
</table>

### Assessment of risk – recreational vessels

The recreational vessel collision risk was ranked based on discussion at the Hazard Review Workshop, review of baseline data and stakeholder consultation. The consequence to people is considered serious as these tend to be smaller vessels and hence more likely to suffer damage. Frequency is considered extremely unlikely due to the low number of yachts crossing the North Sea in the vicinity of Buchan Deep, and the minimum air clearance of 22 m as standard. The overall risk is ranked as moderate (tolerable) as summarised in the table below.

<table>
<thead>
<tr>
<th>Consequence</th>
<th>Frequency</th>
<th>Risk</th>
</tr>
</thead>
<tbody>
<tr>
<td>Serious</td>
<td>Extremely Unlikely</td>
<td>Moderate (tolerable)</td>
</tr>
</tbody>
</table>

### MITIGATION

The above assessment assumes standard industry practice will be applied to minimise this impact. Additional project specific (enhanced) mitigation measures identified during consultation and at the Hazard Review workshop are presented below.

- **AIS Traffic Monitoring:** Live 24/7 shipping traffic monitoring on AIS by Statoil Marine in Bergen during the operational phase with procedures to follow in the event a vessel is identified to be heading on a potential collision course;
- **Lessons Learned:** Experience and lessons learned from incidents, accidents and near-misses at other marine renewables projects will be taken into account. Statoil is a member of the G9 Offshore Wind Health and Safety Association, and is proactive in sharing incident data and lessons learned within the offshore wind industry. The Project will also benefit from experience gained at the Hywind Demo Project in Norway which has been operational since 2009;
- **Operational Safety Zones:** Further consultation will be carried out with the MCA and DECC regarding safety...
MITIGATION

zones, or other methods of protecting against collision and fishing gear interaction during the operational phase. The agreed strategy, whether mandatory or advisory, will be implemented and notified to UKHO for suitable depiction on Admiralty charts;

> Sailing Directions and Almanacs: Details of the Project will be circulated to relevant organisations for inclusion in updated Sailing Directions and Almanacs; and

> Targeted Circulation of Information: Information on the Project will be circulated directly to local ports, ship operators (including the Marine Safety Forum representing oil industry vessels), fishermen and recreational organisations (including relevant international organisations).

Assessment of residual risk - merchant vessels

Based on applying the enhanced, project-specific mitigation measures, in addition to standard industry practice, the consequence to people of a merchant vessel collision remains ranked as moderate but the frequency reduces to extremely unlikely giving an overall residual risk of moderate (tolerable) as summarised in the table below.

<table>
<thead>
<tr>
<th>Consequence</th>
<th>Frequency</th>
<th>Risk</th>
</tr>
</thead>
<tbody>
<tr>
<td>Moderate</td>
<td>Extremely Unlikely</td>
<td>Low (broadly acceptable)</td>
</tr>
</tbody>
</table>

Assessment of residual risk - fishing vessels

Based on applying the enhanced, project-specific mitigation measures, in addition to standard industry practice, the expected consequence to people of a fishing vessel collision remains serious but the frequency reduces to extremely unlikely with an overall residual risk of moderate (tolerable) as summarised in the table below.

<table>
<thead>
<tr>
<th>Consequence</th>
<th>Frequency</th>
<th>Risk</th>
</tr>
</thead>
<tbody>
<tr>
<td>Serious</td>
<td>Extremely Unlikely</td>
<td>Moderate (tolerable)</td>
</tr>
</tbody>
</table>

Assessment of residual risk – recreational vessels

Although the enhanced measures will assist in mitigating the risk to recreational vessels, the consequence to people and frequency remain within the same bands as before. Therefore, the residual risk remains moderate (tolerable) as summarised in the table below.

<table>
<thead>
<tr>
<th>Consequence</th>
<th>Frequency</th>
<th>Risk</th>
</tr>
</thead>
<tbody>
<tr>
<td>Serious</td>
<td>Extremely Unlikely</td>
<td>Moderate (tolerable)</td>
</tr>
</tbody>
</table>

In addition to the semi-quantitative risk rankings following the Hazard Review workshop, the frequency of a powered merchant vessel collision with a WTG Unit was also separately assessed using the COLLRISK software. This was based on the ship routeing identified for the area and the anticipated change in routeing due to the Project, and assuming effective mitigation in terms of Notices to Mariners, charts, lighting and marking, etc. The model predicted a frequency of a powered merchant vessel collision with a WTG Unit to be approximately 1 in 8,580 years (base case traffic) and 1 in 7,800 years (future case traffic). Both are within the ‘Extremely Unlikely’ frequency category, which is aligned with the ranking from the workshop based on enhanced mitigation.

The frequency of a fishing vessel collision with a WTG Unit was also assessed using the COLLRISK software, which is calibrated using fishing vessel activity data along with offshore installation operating experience in the UK and the experience of collisions between fishing vessels and offshore installations. The frequency of a fishing vessel collision with a WTG Unit was predicted to be approximately 1 in 3,400 years (base case) and 1 in 3,090 years (future case). This aligns with the frequency ranking of extremely unlikely.

There is a lack of robust data to model recreational vessel collisions therefore only the risk matrix approach was applied.
15.7.2 Drifting vessel collision with WTG Unit

The risk of a vessel losing power and drifting into a WTG Unit was ranked following the workshop using the risk matrix approach. This took into account the extent of vessel activity in the area and the historical incidents that have been recorded in the area. It was noted that there is good (though variable) prospect of towing vessel availability in this area to recover a drifting vessel due to oil & gas activity, and also good holding ground for anchoring vessels.

Assessment of risk

The drifting collision risk was ranked based on discussion at the Hazard Review Workshop, review of baseline data and stakeholder consultation. The consequence is considered serious as there is a chance of injury or fatality even though these tend to be lower energy impacts. The frequency is considered extremely unlikely as historically there has not been a drifting collision with an offshore installation on the UKCS, despite several blackouts occurring each year. Vessels have either been able to repair themselves on time or receive external assistance. The overall risk is moderate (tolerable) as summarised in the table below.

<table>
<thead>
<tr>
<th>Consequence</th>
<th>Frequency</th>
<th>Risk</th>
</tr>
</thead>
<tbody>
<tr>
<td>Serious</td>
<td>Extremely Unlikely</td>
<td>Moderate (tolerable)</td>
</tr>
</tbody>
</table>

MITIGATION

The above assessment assumes standard industry practice will be applied to minimise this impact. Additional project specific (enhanced) mitigation measures identified during consultation and at the Hazard Review workshop are presented below.

- **AIS Traffic Monitoring**: Live 24/7 shipping traffic monitoring on AIS by Statoil Marine in Bergen during the operational phase with procedures to follow in the event a vessel is identified to be heading on a potential collision course.
- **Lessons Learned**: Experience and lessons learned from incidents, accidents and near-misses at other marine renewables projects will be taken into account. Statoil is a member of the G9 Offshore Wind Health and Safety Association, and is proactive in sharing incident data and lessons learned within the offshore wind industry. The Project will also benefit from experience gained at the Hywind Demo Project in Norway which has been operational since 2009; and
- **Towing Vessel Availability**: The Project is located in an area of above average towing vessel activity due to the oil and gas industry bases at Peterhead and Aberdeen. This will be given consideration within the ERCoP to ensure benefit is obtained in the event of a drifting scenario.

Assessment of residual risk

Based on applying the enhanced, project-specific mitigation measures, in addition to standard industry practice, the expected consequence is considered to reduce to moderate due to there being increased potential for a timely response and despatch of a suitable towing vessel to recover the drifting vessel. The frequency remains extremely unlikely with an overall residual risk of low (broadly acceptable) as summarised in the table below.

<table>
<thead>
<tr>
<th>Consequence</th>
<th>Frequency</th>
<th>Risk</th>
</tr>
</thead>
<tbody>
<tr>
<td>Moderate</td>
<td>Extremely Unlikely</td>
<td>Low (broadly acceptable)</td>
</tr>
</tbody>
</table>

Separate to the risk ranking based on the workshop, Anatec’s COLLRISK software was used to model the drifting vessel risk. This is based on the premise that propulsion on a vessel must fail before a vessel will drift. The model takes account of the type and size of the vessel, number of engines and average time to repair in different conditions. Different weather and tidal states are simulated and the worst case result selected.
The exposure times for a drifting scenario are based on the ship-hours spent in proximity to the Project, estimated based on the traffic levels and speeds. The exposure is divided by vessel type and size to ensure these factors, which are based on analysis of historical accident data have been shown to influence accident rates, are taken into account within the modelling.

Using this information, the annual drifting ship collision frequency with the WTG Units was estimated to be approximately 1 in 106,700 years (base case) and 1 in 97,020 years (future case). This is an order of magnitude lower than the frequency ranking based on the workshop.

**15.7.3 Vessel-to-vessel collision due to avoidance of site or work vessels**

Vessels will have to re-route around the WTG Units which will alter the rate of encounters and therefore potential vessel-to-vessel collision. The risk of a vessel-to-vessel collision was ranked following the workshop.

### Assessment of risk

The vessel-to-vessel collision risk was ranked based on discussion at the Hazard Review Workshop, review of baseline data and stakeholder consultation. The consequence will depend on the vessels involved but on average is expected to be serious. The frequency is considered remote due to the WTG Units occupying a small footprint area and therefore not causing a great deal of displacement of existing routes. The overall risk is moderate (tolerable) as summarised in the table below.

<table>
<thead>
<tr>
<th>Consequence</th>
<th>Frequency</th>
<th>Risk</th>
</tr>
</thead>
<tbody>
<tr>
<td>Serious</td>
<td>Remote</td>
<td>Moderate (tolerable)</td>
</tr>
</tbody>
</table>

### MITIGATION

The above assessment assumes standard industry practice will be applied to minimise this impact. Additional project specific (enhanced) mitigation measures identified during consultation and at the Hazard Review workshop are presented below.

- **AIS Traffic Monitoring**: Live 24/7 shipping traffic monitoring on AIS by Statoil Marine in Bergen during the operational phase with procedures to follow in the event a vessel is identified to be heading on a potential collision course;
- **Lessons Learned**: Experience and lessons learned from incidents, accidents and near-misses at other marine renewables projects will be taken into account. Statoil is a member of the G9 Offshore Wind Health and Safety Association, and is proactive in sharing incident data and lessons learned within the offshore wind industry. The Project will also benefit from experience gained at the Hywind Demo Project in Norway which has been operational since 2009;
- **Sailing Directions and Almanacs**: Details of the Project will be circulated to relevant organisations for inclusion in updated Sailing Directions and Almanacs; and
- **Targeted Circulation of Information**: Information on the Project will be circulated directly to local ports, ship operators (including the Marine Safety Forum representing oil industry vessels), fishermen and recreational organisations (including relevant international organisations)

### Assessment of residual risk

Based on applying the enhanced, project-specific mitigation measures, in addition to standard industry practice, the expected consequence remains serious but the frequency is reduced to extremely unlikely resulting in an overall residual risk of moderate (tolerable) as summarised in the table below.

<table>
<thead>
<tr>
<th>Consequence</th>
<th>Frequency</th>
<th>Risk</th>
</tr>
</thead>
<tbody>
<tr>
<td>Serious</td>
<td>Extremely Unlikely</td>
<td>Moderate (tolerable)</td>
</tr>
</tbody>
</table>
Separate to the risk ranking based on the workshop, Anatec’s COLLRISK software was used to model the risk of vessel-to-vessel collisions. Firstly, an assessment of actual vessel-to-vessel encounters was carried out by replaying at high-speed one week of AIS survey data from spring 2014 and identifying where vessels passed within one nautical mile, which was assumed as a nominal encounter distance. This information was used to help calibrate Anatec’s COLLRISK model and estimate the vessel-to-vessel collision risk before and after the wind farm is installed.

The assessment of actual vessel-to-vessel encounters, analysed within a 5 nm (approximately 9 km) radius of the turbine deployment area, showed a total of 34 encounters, an average of four to five per day. The highest number of encounters involved ‘other’ vessels (36%), followed by cargo vessels (31%) and fishing vessels (28%). When further classifying these vessels, it was noted that 66% of vessels were offshore industry vessels. None of the encounters were considered as hazardous as there is ample sea room in the area.

Anatec’s COLLRISK model was used to estimate the background (without the Project) and predicted (with the Project) collision risk within the Pilot Park Study Area. The background vessel-to-vessel collision risk level is in the order of 1 major collision in 51.2 years. It is emphasised the model is calibrated based on major incident data at sea which allows for benchmarking, but does not necessarily consider all incidents, such as minor bumps in port. When the WTG Units are installed, it is assumed vessels will re-route around the array. Based on vessel-to-vessel collision risk modelling of the revised routes, the overall collision risk was estimated to be 1 in 50.8 years. This is a small increase in collision frequency over the background risk, estimated at 1 additional collision in 6,500 years. The change in frequency estimated by COLLRISK is therefore aligned with the ‘Extremely Unlikely’ ranking based on the workshop approach assuming enhanced mitigation.

15.7.4 Fishing interaction with midwater mooring lines, power cables and anchors

Fishing vessel gear will have the potential to interact with midwater mooring lines, power cables and anchors at the Project.

Statoil have a preference to exclude fishing from the area of this subsea infrastructure for safety reasons (to protect mariners as well as the Project). Discussions have been held with the MCA and DECC regarding the potential for safety zones, an Area to be Avoided (ATBA) or a fishing prohibition area to achieve this. There is a mechanism to apply to DECC for up to 500 m operational safety zones but this is not standard, and the mooring lines and anchors will radiate beyond this distance from the turbines.

Fishermen and industry representatives at the workshop felt they could manage the risks themselves provided they were supplied with accurate information on the positions of the hazards on the seabed. There are effective means for circulating this information, such as FishSAFE, which is assumed as standard mitigation.

Given the potential consequences, which in the worst-case could be capsize of the vessel, personnel in the water and fatalities, others at the workshop were of the opinion that making it a ‘fishing-free’ area was essential.

<table>
<thead>
<tr>
<th>Assessment of risk</th>
</tr>
</thead>
<tbody>
<tr>
<td>The risk of fishing interaction was ranked based on discussion at the Hazard Review Workshop, review of baseline data and stakeholder consultation. Consequences could include capsize of the fishing vessel, personnel in the water and fatalities, with the average consequence expected to be serious. Frequency is considered reasonably probable with an overall risk of high (unacceptable) as summarised in the table below.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Consequence</th>
<th>Frequency</th>
<th>Risk</th>
</tr>
</thead>
<tbody>
<tr>
<td>Serious</td>
<td>Reasonably Probable</td>
<td>High (unacceptable)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>MITIGATION</th>
</tr>
</thead>
<tbody>
<tr>
<td>The above assessment assumes standard industry practice will be applied to minimise this impact. Additional project specific (enhanced) mitigation measures identified during consultation and at the Hazard Review workshop are presented below.</td>
</tr>
</tbody>
</table>
MITIGATION

- **AIS Traffic Monitoring**: Live 24/7 shipping traffic monitoring on AIS by Statoil Marine in Bergen during the operational phase with procedures to follow in the event a vessel is identified to be heading on a potential collision course;

- **Lessons Learned**: Experience and lessons learned from incidents, accidents and near-misses at other marine renewables projects will be taken into account. Statoil is a member of the G9 Offshore Wind Health and Safety Association, and is proactive in sharing incident data and lessons learned within the offshore wind industry. The Project will also benefit from experience gained at the Hywind Demo Project in Norway which has been operational since 2009;

- **Operational Safety Zones**: Further consultation will be carried out with the MCA and DECC regarding safety zones, or other methods of protecting against collision and fishing gear interaction during the operational phase. The agreed strategy, whether mandatory or advisory, will be implemented and notified to UKHO for suitable depiction on Admiralty charts;

- **Sailing Directions and Almanacs**: Details of the Project will be circulated to relevant organisations for inclusion in updated Sailing Directions and Almanacs; and

- **Targeted Circulation of Information**: Information on the Project will be circulated directly to local ports, ship operators (including the Marine Safety Forum representing oil industry vessels), fishermen and recreational organisations (including relevant international organisations).

### Assessment of residual risk

Based on applying the enhanced, project-specific mitigation measures, in addition to standard industry practice, the expected consequence remains serious but the frequency is considered to reduce to remote due to the planned measures (either advisory or compulsory) to be implemented to minimise interaction. The overall residual risk is moderate (tolerable) as summarised in the table below.

<table>
<thead>
<tr>
<th>Consequence</th>
<th>Frequency</th>
<th>Risk</th>
</tr>
</thead>
<tbody>
<tr>
<td>Serious</td>
<td>Remote</td>
<td>Moderate (tolerable)</td>
</tr>
</tbody>
</table>

#### 15.7.5 Fishing interaction with export cable

Fishing vessel gear will have the potential to interact with the export cable running from the turbine deployment area to the landfall point along the coast at Peterhead. The export cable will be installed prior to the WTG Units. Once established, appropriate mitigation is needed to ensure the export cable is suitably protected against the type of fishing (i.e., scallop and clam dredging) in the area. This may include trenching, burial and the use of rock dumping, depending on the nature of the seabed. This will be informed by a BPI study as part of the industry standard mitigation.
Assessment of risk

The risk of fishing interaction with the export cable was ranked based on discussion at the Hazard Review Workshop, review of baseline data and stakeholder consultation.

Potential consequences include loss or damage to fishing gear, risk of vessel capsize and associated fatalities. Other consequences are damage to the Project itself, including severe damage and possible breakage of the export cable, which may occur when a large fishing vessel’s gear snags on the cable. Breaking of the cable will impact on business and may require total replacement of the cable. The average consequence is ranked as serious. The frequency is considered remote based on the standard cable protection measures. The overall risk is moderate (tolerable) as summarised in the table below.

<table>
<thead>
<tr>
<th>Consequence</th>
<th>Frequency</th>
<th>Risk</th>
</tr>
</thead>
<tbody>
<tr>
<td>Serious</td>
<td>Remote</td>
<td>Moderate (tolerable)</td>
</tr>
</tbody>
</table>

MITIGATION

The above assessment assumes standard industry practice will be applied to minimise this impact. Additional project specific (enhanced) mitigation measures identified during consultation and at the Hazard Review workshop are presented below.

> AIS Traffic Monitoring: Live 24/7 shipping traffic monitoring on AIS by Statoil Marine in Bergen during the operational phase with procedures to follow in the event a vessel is identified to be heading on a potential collision course;

> Lessons Learned: Experience and lessons learned from incidents, accidents and near-misses at other marine renewables projects will be taken into account. Statoil is a member of the G9 Offshore Wind Health and Safety Association, and is proactive in sharing incident data and lessons learned within the offshore wind industry. The Project will also benefit from experience gained at the Hywind Demo Project in Norway which has been operational since 2009;

> Sailing Directions and Almanacs: Details of the Project will be circulated to relevant organisations for inclusion in updated Sailing Directions and Almanacs; and

> Targeted Circulation of Information: Information on the Project will be circulated directly to local ports, ship operators (including the Marine Safety Forum representing oil industry vessels), fishermen and recreational organisations (including relevant international organisations).

Assessment of residual risk

Based on applying the enhanced, project-specific mitigation measures, including targeted circulation of information to fishermen who use the area, the consequence remains serious, the frequency reduces to extremely unlikely with an overall residual risk of moderate (tolerable) as summarised in the table below.

<table>
<thead>
<tr>
<th>Consequence</th>
<th>Frequency</th>
<th>Risk</th>
</tr>
</thead>
<tbody>
<tr>
<td>Serious</td>
<td>Extremely Unlikely</td>
<td>Moderate (tolerable)</td>
</tr>
</tbody>
</table>

15.7.6 Vessel anchor interaction with subsea equipment

Third-party vessel anchors have the potential to interact with midwater mooring lines and power cables connected to the WTG Units and anchors at the turbine deployment area and with the export cable running from the turbine deployment area to the landfall point along the coast at Peterhead.

Anchoring is very unlikely in the deeper water of Buchan Deep, although it could take place by a transiting vessel in an emergency. Even then the vessel master should confirm there are no subsea obstructions prior to anchoring.
The Peterhead Harbour Master confirmed that vessels do not routinely anchor east of Peterhead, but there is occasional anchoring off the coast to the north and south. There have been no recent reports of dragged anchor incidents in the area so this is an uncommon event.

**Assessment of risk**

The risk of anchoring interaction was ranked based on discussion at the Hazard Review Workshop, review of baseline data and stakeholder consultation. Consequences are more likely to be financial than safety-related, with an expected average outcome of moderate. Frequency is ranked as remote due to there being very little anchoring occurring in the vicinity of the Project. The overall risk is moderate (tolerable) as summarised in the table below.

<table>
<thead>
<tr>
<th>Consequence</th>
<th>Frequency</th>
<th>Risk</th>
</tr>
</thead>
<tbody>
<tr>
<td>Moderate</td>
<td>Remote</td>
<td>Moderate (tolerable)</td>
</tr>
</tbody>
</table>

**MITIGATION**

The above assessment assumes standard industry practice will be applied to minimise this impact. Additional project specific (enhanced) mitigation measures identified during consultation and at the Hazard Review workshop are presented below.

- **AIS Traffic Monitoring**: Live 24/7 shipping traffic monitoring on AIS by Statoil Marine in Bergen during the operational phase with procedures to follow in the event a vessel is identified to be heading on a potential collision course;
- **Lessons Learned**: Experience and lessons learned from incidents, accidents and near-misses at other marine renewables projects will be taken into account. Statoil is a member of the G9 Offshore Wind Health and Safety Association, and is proactive in sharing incident data and lessons learned within the offshore wind industry. The Project will also benefit from experience gained at the Hywind Demo Project in Norway which has been operational since 2009;
- **Operational Safety Zones**: Further consultation will be carried out with the MCA and DECC regarding safety zones, or other methods of protecting against collision and fishing gear interaction during the operational phase. The agreed strategy, whether mandatory or advisory, will be implemented and notified to UKHO for suitable depiction on Admiralty charts;
- **Sailing Directions and Almanacs**: Details of the Project will be circulated to relevant organisations for inclusion in updated Sailing Directions and Almanacs;
- **Targeted Circulation of Information**: Information on the Project will be circulated directly to local ports, ship operators (including the Marine Safety Forum representing oil industry vessels), fishermen and recreational organisations (including relevant international organisations); and
- **Towing Vessel Availability**: The Project is located in an area of above average towing vessel activity due to the oil and gas industry bases at Peterhead and Aberdeen. This will be given consideration within the ERCoP to ensure benefit is obtained in the event of a drifting scenario.

**Assessment of residual risk**

Based on applying the enhanced, project-specific mitigation measures, in addition to standard industry practice, the expected consequence remains moderate but the frequency is considered to reduce to extremely unlikely with an overall residual risk of low (broadly acceptable) as summarised in the table below.

<table>
<thead>
<tr>
<th>Consequence</th>
<th>Frequency</th>
<th>Risk</th>
</tr>
</thead>
<tbody>
<tr>
<td>Moderate</td>
<td>Extremely Unlikely</td>
<td>Low (broadly acceptable)</td>
</tr>
</tbody>
</table>
15.7.7 WTG Unit total loss of station

This impact is that the mooring system fails causing the WTG Unit to completely lose station and drift, causing a navigational hazard. The mooring system is being designed to DNV codes as a redundant system. The system is designed to be stable in the event of single line failure leaving two of the three lines in place (in fact there will be less tension as load will be shared by two anchors). This would lead to an additional excursion of the WTG unit from its central location of approx. 600 m – 700 m. If this were to happen, an automatic alarm would sound and an emergency response would be initiated, e.g., vessel sent from Peterhead to investigate.

Assessment of risk

The risk of loss of station was ranked based on discussion at the Hazard Review Workshop, review of baseline data and stakeholder consultation. Consequences to people are expected to be very low, but they could potentially be high for the environment, as well as damage to property and business if the WTG Unit drifted towards the Forties pipeline (unlikely given the prevailing wind direction). The frequency is extremely unlikely based on the redundancy in the system and Statoil’s North Sea experience. The overall risk is ranked as low (broadly acceptable) as summarised in the table below.

<table>
<thead>
<tr>
<th>Consequence</th>
<th>Frequency</th>
<th>Risk</th>
</tr>
</thead>
<tbody>
<tr>
<td>Minor</td>
<td>Extremely Unlikely</td>
<td>Low (broadly acceptable)</td>
</tr>
</tbody>
</table>

MITIGATION

The above assessment assumes standard industry practice will be applied to minimise this impact. Additional project specific (enhanced) mitigation measures identified during consultation and at the Hazard Review workshop are presented below.

- Excursion Alarm: The positions of the WTG Units will be monitored with an automatic emergency alarm to notify excursion from the central location;
- Lessons Learned: Experience and lessons learned from incidents, accidents and near-misses at other marine renewables projects will be taken into account. Statoil is a member of the G9 Offshore Wind Health and Safety Association, and is proactive in sharing incident data and lessons learned within the offshore wind industry. The Project will also benefit from experience gained at the Hywind Demo Project in Norway which has been operational since 2009;
- Mooring System Integrity: Speciality study carried out to examine in detail the risk of mooring system failure leading to impairment of the BP Forties Pipeline; and
- Third Party Verification of Mooring System: Design and third party verification of the mooring system will be carried out by a competent organisation.
- Towing Vessel Availability: The Project is located in an area of above average towing vessel activity due to the oil and gas industry bases at Peterhead and Aberdeen. This will be given consideration within the ERCOP to ensure benefit is obtained in the event of a drifting scenario.

Assessment of residual risk

Based on applying the enhanced, project-specific mitigation measures, in addition to standard industry practice, the expected consequence remains minor, the frequency is considered to reduce to negligible with an overall residual risk of low (broadly acceptable) as summarised in the table below.

<table>
<thead>
<tr>
<th>Consequence</th>
<th>Frequency</th>
<th>Risk</th>
</tr>
</thead>
<tbody>
<tr>
<td>Minor</td>
<td>Negligible</td>
<td>Low (broadly acceptable)</td>
</tr>
</tbody>
</table>
15.8 Potential variances in environmental impacts (based on Design Envelope)

Consideration of the maximum potential impact has been undertaken throughout the NRA. The indicative WTG Unit layout used for this assessment is considered to be a realistic worst case as Statoil have indicated five turbines will be the maximum at Buchan Deep. Any minor changes to the layout are unlikely to be significant and would not materially alter the outcome of the assessment. It should also be noted that it is most likely that the inter array cables will be installed after the WTG Units therefore there will be less seabed infrastructure hazard during the construction phase of the Project.

15.9 Cumulative and in-combination impacts

HSL has in consultation with Marine Scotland and Aberdeenshire Council identified a list of other projects which together with the Project may result in potential cumulative or in-combination impacts. The list of these projects including details of their status at the time of the EIA and a map showing their location is provided in Chapter 6; Table 6-3 and Figure 6-1 respectively.

Cumulative impacts are impacts on shipping and navigation caused by planned and consented offshore wind farms. In-combination impacts are impacts on shipping and navigation as a result of offshore wind farms (and their associated activities) combined with impacts from other marine activities or users of the sea.

As all the projects identified are in excess of 10 nm from the Hywind Project it is anticipated that these will not have a cumulative or in-combination impact on shipping and navigation when considered with the Project. It is noted that a proportion of the vessels passing the Project also pass close to the EOWFL site in Aberdeen Bay. However, this site layout has been designed to avoid any significant impact on the main shipping routes to and from Aberdeen Harbour.

Future traffic considered in the collision risk modelling takes into account potential increases in traffic over the life of the development due to changes such as the Aberdeen Harbour Development, North Sea oil and gas decommissioning and temporary traffic for subsea cable installation and maintenance. It is recognised that making such future forecasts is uncertain therefore a conservative 10% increase was modelled. It is not considered that there will be any further in-combination impact on shipping and navigation when considered with the Project.

15.10 Monitoring

Vessel traffic will be monitored on AIS during construction and operation of the WTG Units to assess the effect the Project has on passing traffic.

15.11 References

Marine Scotland Compliance (2013). Fishing sightings GIS data.
TCE (2014b). Aggregate dredging licence and active areas GIS data.