Optimised Seagreen Project Consequences Assessment

(Appendix 12G)

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1 Introduction

This Appendix to the EIA Report Chapter 12 (Shipping and Navigation), provides an assessment of the potential consequences of a collision or allision incident associated with the optimised Seagreen Project in terms of fatalities and oil spill.

The optimised Seagreen Project has also been assessed using risk evaluation criteria and comparison with historical accident data in UK waters[1].

Allision and collision modelling was previously undertaken in 2012; however Seagreen Wind Energy Limited (Seagreen) are undertaking an Environmental Impact Assessment (EIA) to support an application to Marine Scotland for additional consents for an optimised design (the optimised Seagreen project), based on fewer, larger, higher capacity wind turbines that have become available, since the 2014 consent decision and the inclusion of monopiles as a foundation option. This design optimisation requires the re-assessment and re-modelling of the Project with updated parameters.

The assessment undertaken within this Appendix to the EIA Report (Chapter 12 (Shipping and Navigation)), is primarily based on the results of the allision and collision modelling undertaken for the optimised Seagreen Project within the NRA Addendum (Appendix 12A . Sections 9, 10 and 11 of Appendix 12A (NRA Addendum) can be viewed for further discussion on the methodology used and assumptions made within the modelling assessment.

2 Risk Evaluation Criteria

2.1 Risk to People

With regard to the assessment of risk to people two measures are considered, namely;

- Individual risk; and
- Societal risk

2.1.1 Individual Risk (per Year)

This measure considers whether the risk from an accident to a particular individual changes significantly due to the presence of the wind farm structures. Individual risk considers not only the frequency of the accident and the consequence (likelihood of death), but also the individual’s fractional exposure to that risk, i.e. the probability of the individual of being in the given location at the time of the accident.

The purpose of estimating the individual risk is to ensure that individuals, who may be affected by the presence of the wind farm structures, are not exposed to excessive risks. This is achieved by considering the significance of the change in individual risk resulting from the presence of the wind farm relative to the background individual risk levels.

[1] In this technical note, UK waters are defined as the UK Exclusive Economic Zone (EEZ) and UK territorial waters means within the 12nm limit.

Annual individual risk levels to crew (the annual fatality risk of an average crew member) for different vessel types are presented in Figure 2.1 (Ref. ii). The figure also highlights the upper and lower bounds for risk acceptance criteria as suggested in IMO Maritime Safety Committee (MSC) 72/16 (Ref. ii). The annual individual risk level to crew falls within the As Low As Reasonably Practicable (ALARP) region for each of the vessel types presented.

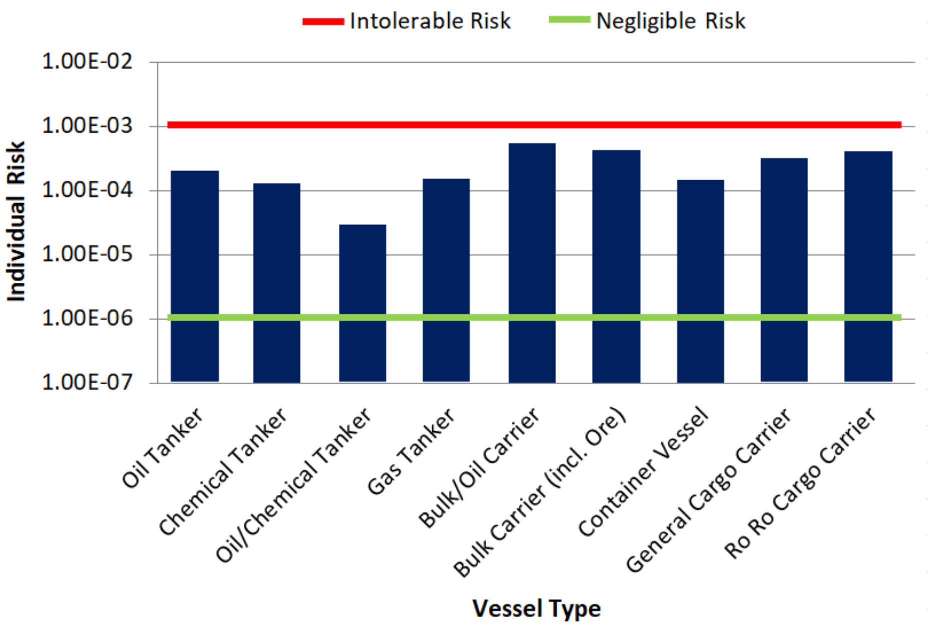

Figure 2.1 Individual Risk Levels and Acceptance Criteria per Vessel Type

Typical bounds defining the ALARP regions for decision making within shipping are presented in Table 2.1.

Table 2.1 Individual Risk ALARP Criteria

Individual	Lower Bound for ALARP	Upper Bound for ALARP
To crew member	10^{-6}	10^{-3}
To passenger	10^{-6}	10^{-4}
Third party	10^{-6}	10^{-4}
New vessel target	10^{-6}	Above values reduced by one order of magnitude

On a UK basis, the MCA website presents individual risks for various UK industries, based on HSE data for 1987 to 1991 (Ref. iv). The risks for different industries are presented in Figure 2.2.

The individual risk for sea transport of 2.9×10-4 per year is consistent with the worldwide data presented in Figure 2.1, whilst the individual risk for sea fishing of 1.2×10-3 per year is the highest across all of the industries listed.

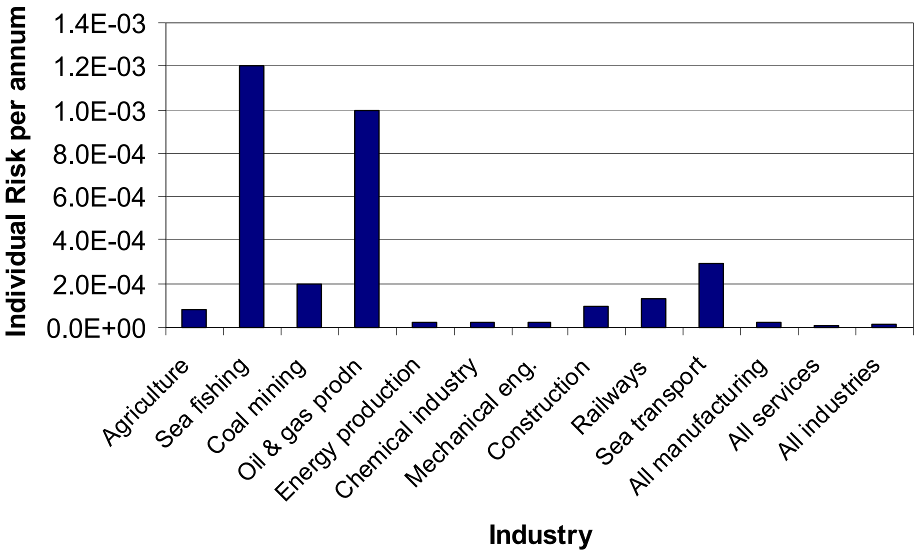

Figure 2.2 Individual Risk per Year for various UK Industries

2.1.2 Societal Risk

Societal risk is used to estimate risks of accidents affecting many persons, e.g. catastrophes, and acknowledging risk averse or neutral attitudes. Societal risk includes the risk to every person, even if a person is only exposed on one brief occasion to that risk. For assessing the risk to a large number of affected people, societal risk is desirable because individual risk is insufficient in evaluating risks imposed on large numbers of people.

Within this assessment societal risk (navigational based) can be assessed for the optimised Seagreen Project, giving account to the change in risk associated with each accident scenario, caused by the introduction of the wind farm structures. Societal risk may be expressed as:

- Annual fatality rate where frequency and fatality are combined into a convenient one-dimensional measure of societal risk. This is also known as Potential Loss of Life (PLL); and
- FN-diagrams showing explicitly the relationship between the cumulative frequency of an accident and the number of fatalities in a multi-dimensional diagram.

When assessing societal risk this study focuses on PLL, which takes into account the number of people likely to be involved in an incident (which is higher for certain vessel types), and assesses the significance of the change in risk, compared to background risk levels for the UK.

2.2 Risk to Environment

For risk to the environment, the key criteria considered in terms of the impact of the optimised Seagreen Project is the potential amount of oil spilled from the vessel involved in an incident.

It is recognised there will be other potential pollution, e.g. hazardous containerised cargoes; however oil is considered the most likely pollutant and the extent of predicted oil spills will provide an indication of the significance of pollution risk, due to the optimised Seagreen Project, compared to background pollution risk levels for the UK.

3 Marine Accident Investigation Branch (MAIB) Incident Analysis

3.1 All Incidents

All UK-flagged commercial vessels are required to report accidents to the MAIB. Non-UK flagged vessels do not have to report unless they are in a UK port or are within 12 nm territorial waters and carrying passengers to a UK port. There are no requirements for non-commercial recreational craft to report accidents to the MAIB; however a significant proportion of these incidents are reported to and investigated by the MAIB.

The MCA, harbour authorities and inland waterway authorities also have a duty to report accidents to MAIB. Therefore, whilst there may be a degree of under-reporting of accidents with minor consequences, those resulting in more serious consequences, such as fatalities, are likely to be reported.

Only incidents occurring in UK waters have been considered within this assessment for which the MAIB data is most comprehensive. It is also noted that incidents occurring in ports/harbours and rivers/canals have been excluded since the causes and consequences may differ from an accident occurring offshore, which is the location of most relevance to the optimised Seagreen Project.

Taking into account these criteria, a total of 13,374 accidents, injuries and hazardous incidents were reported to the MAIB between 1994 and 2014 involving 15,212 vessels (some incidents such as collisions involved more than one vessel).

The locations[2] of incidents reported in the vicinity of the UK are presented in Figure 3.1, colour-coded by type. It can be seen that most incidents occurred in coastal waters.

[2] MAIB aim for 97% accuracy in reporting the locations of incidents.

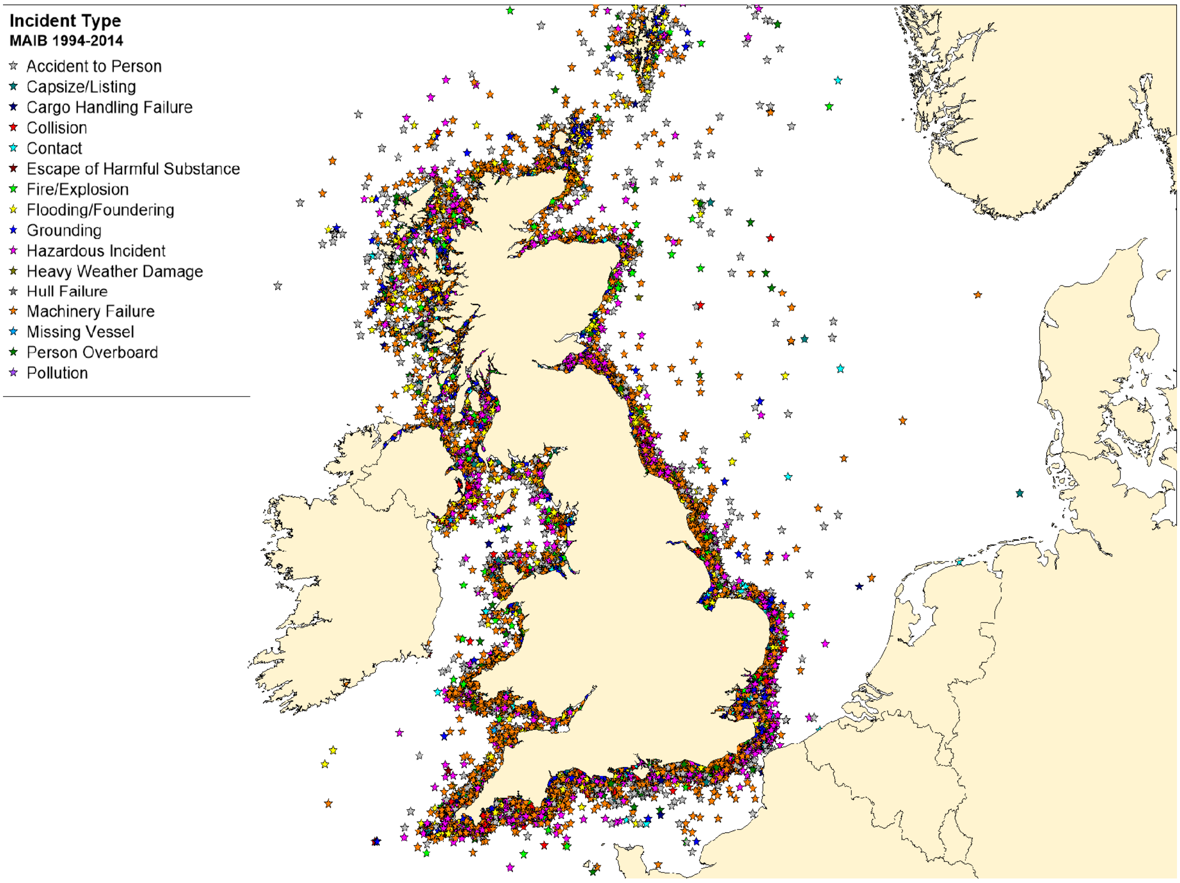

Figure 3.1 Incident Locations by Type within UK Waters (MAIB 1994-2014)

The distribution of incidents by year is presented in Figure 3.2.

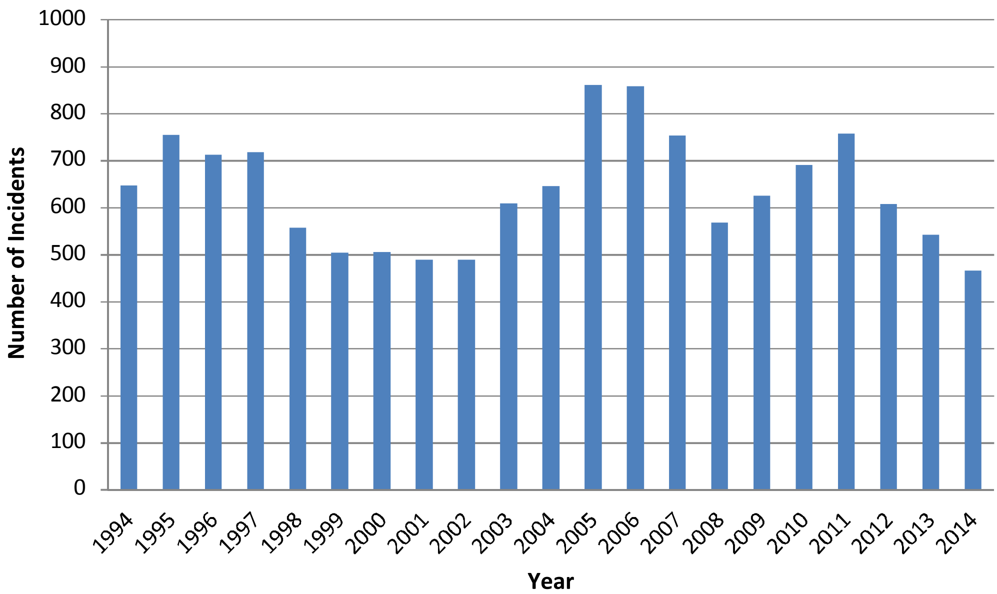

Figure 3.2 Incidents per Year within UK Waters (MAIB 1994-2014)

The average number of incidents per year was 637. There has generally been a fluctuating trend in incidents over the 21 year period.

The distribution of incidents by incident type is presented in Figure 3.3.

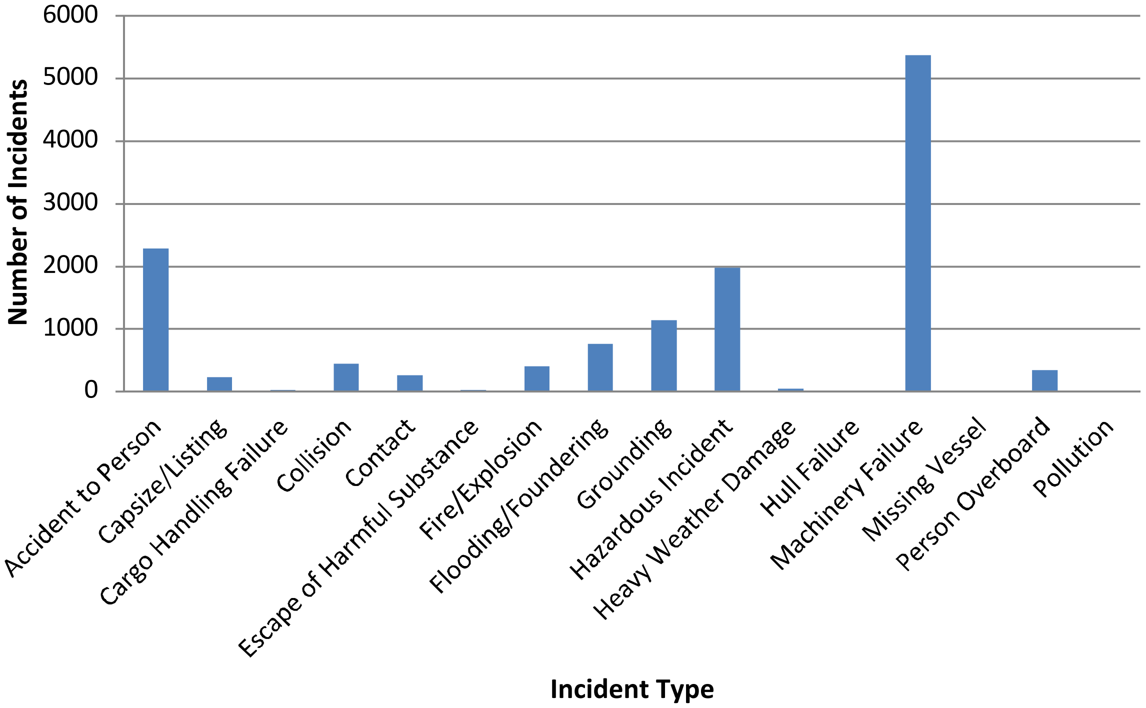

Figure 3.3 Incidents by Incident Type within UK Waters (MAIB 1994-2014)

The most common incident types were "Machinery Failure" (40%), "Accident to Person"[3] (17%) and "Hazardous Incident" (15%). "Collisions" and "Contacts" represented 3% and 2% of the total incidents, respectively.

The distribution of incidents by vessel type is presented in Figure 3.4.

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[3] Where the incident is an accident to a vessel, e.g., collision or machinery failure, it would be reported under the vessel accident category.

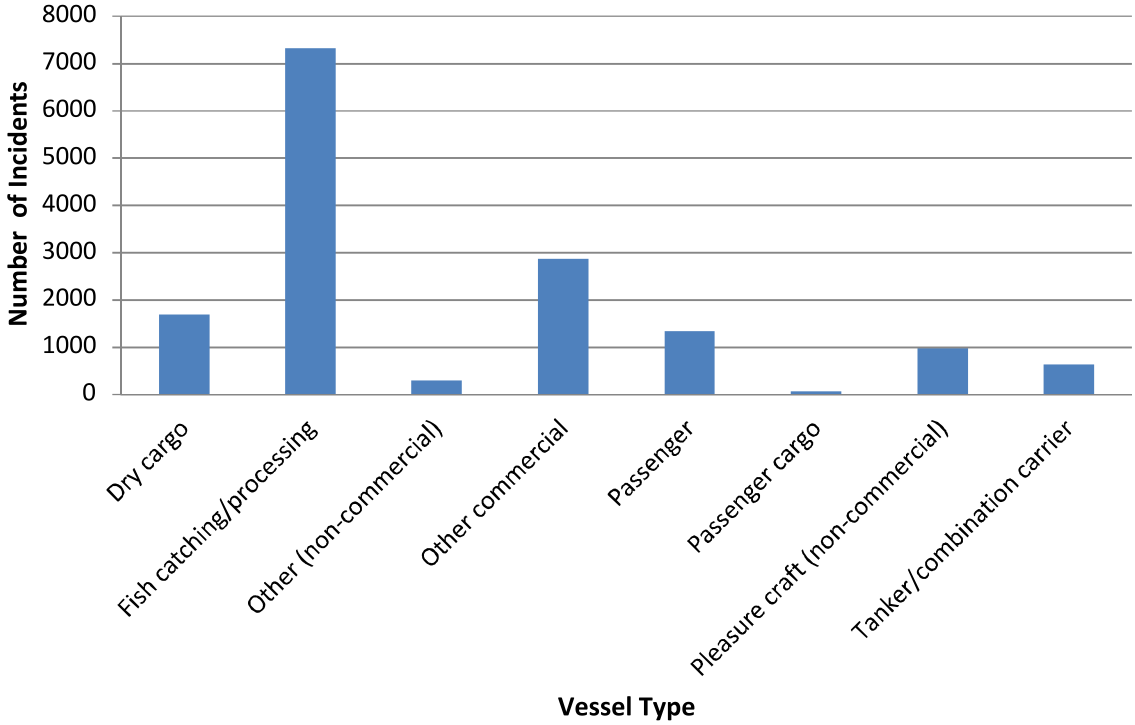

Figure 3.4 Incidents by Vessel Type within UK Waters (MAIB 1994-2014)

The most common vessel types involved in incidents were fishing vessels (48%), other commercial vessels (17%) (which include offshore industry vessels, tugs, workboats and pilot vessels) and dry cargo vessels (11%).

The total number of fatalities reported in the MAIB incidents from 1994 to 2014 was 428, giving an average of 20 fatalities per year.

The distribution of fatalities in UK waters by vessel type and person category (namely crew, passenger and other) is presented in Figure 3.5.

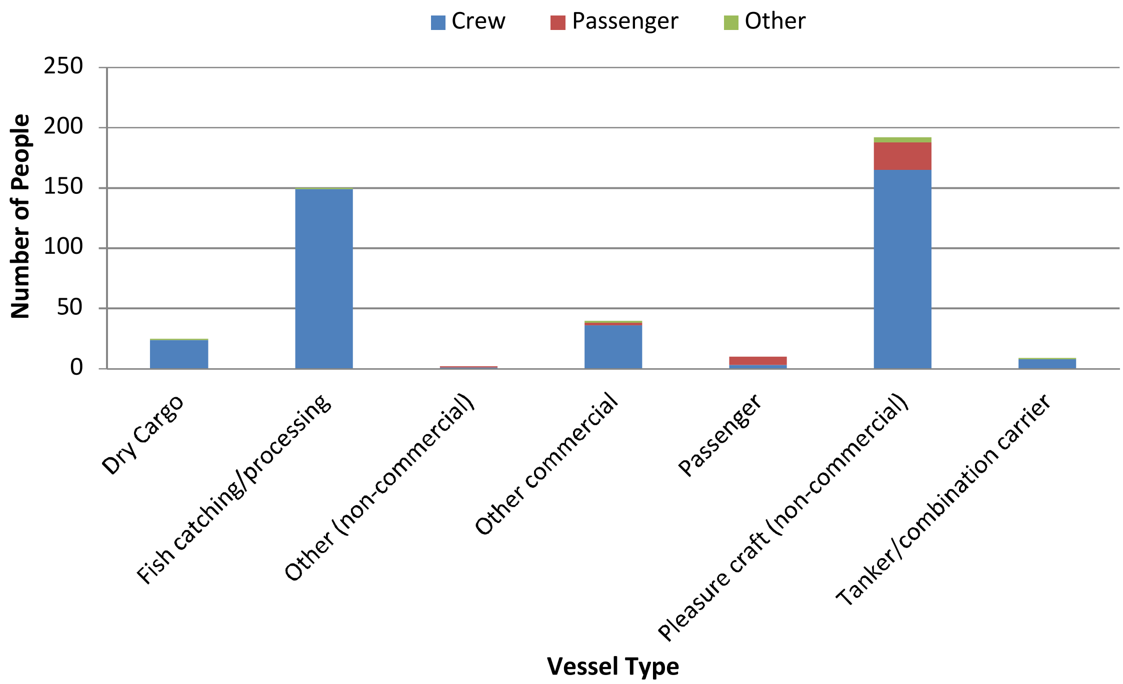

Figure 3.5 Fatalities by Vessel Type for Incidents within UK Waters (MAIB 1994-2014)

It can be seen that the majority of fatalities occurred to crew members of pleasure craft and fishing vessels.

3.2 Collision Incidents

MAIB define a collision incident as when "a vessel hits another vessel that is floating freely, or is anchored (as opposed to being tied up alongside)."

A total of 447 collision incidents were reported to MAIB in UK waters (excluding ports, etc.) between 1st January 1994 and 31st December 2014 involving 889 vessels (in a small number of cases the other vessel involved was not logged).

The locations of collision incidents reported in the vicinity of the UK are presented in Figure 3.6.

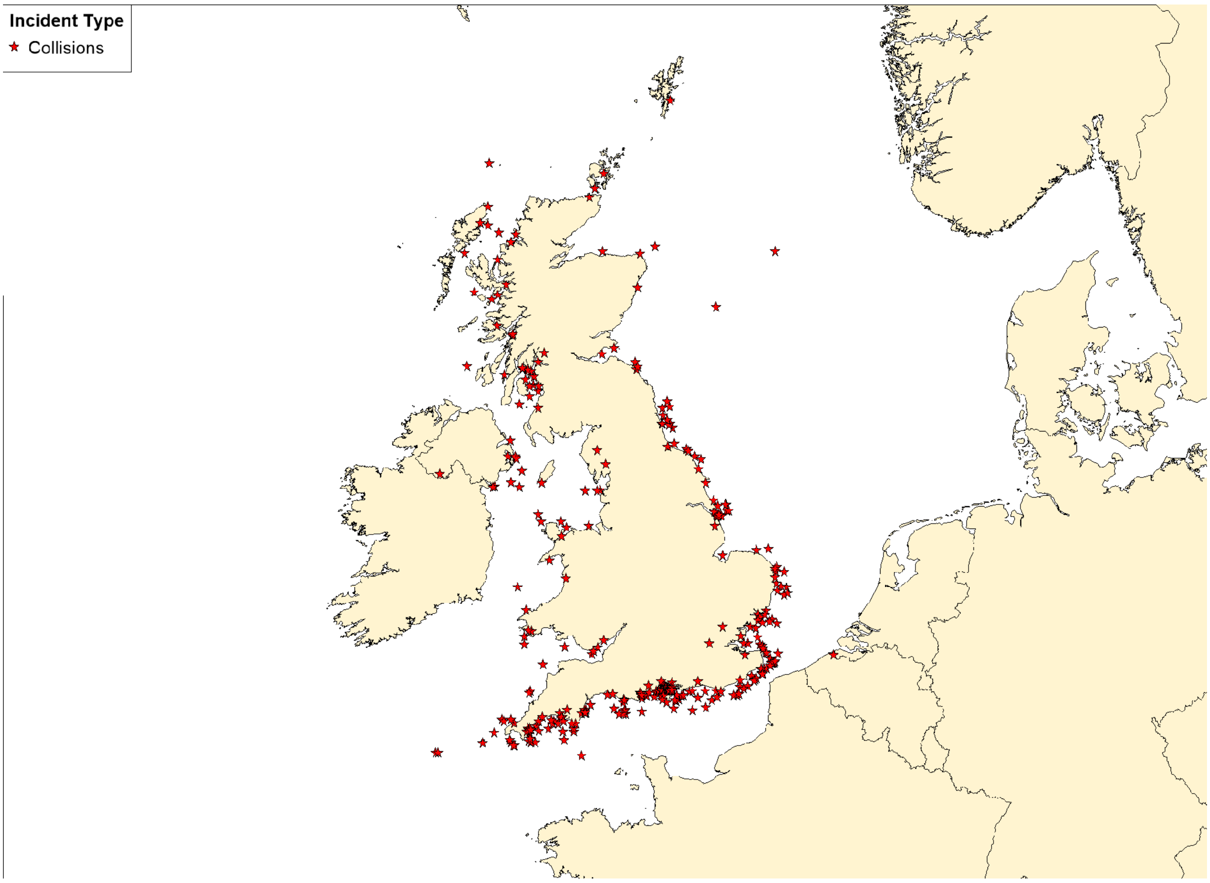

Figure 3.6 Collision Incident Locations within UK Waters (MAIB 1994-2014)

The number of vessels involved in a collision incident by year is presented in Figure 3.7.

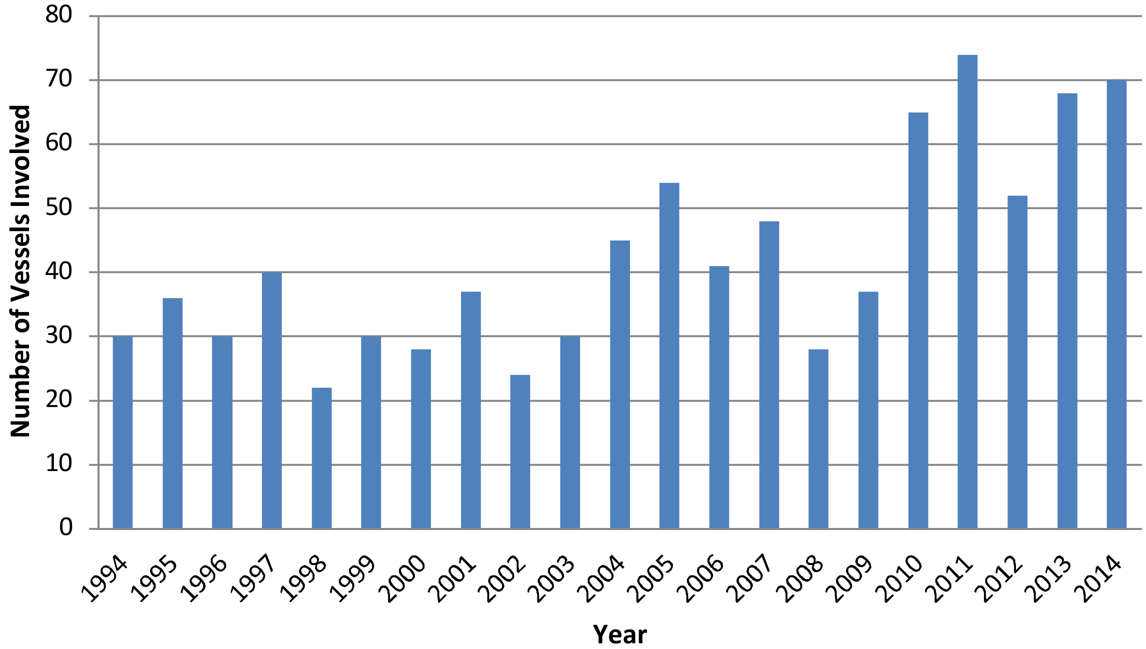

Figure 3.7 Collision Incidents per Year within UK Waters (MAIB 1994-2014)

The average number of vessels involved in a collision per year was 42. There has been an overall increasing trend in collisions over the study period, which may be due to better reporting of less serious incidents in recent years.

The distribution of collision incidents by vessel type is presented in Figure 3.8.

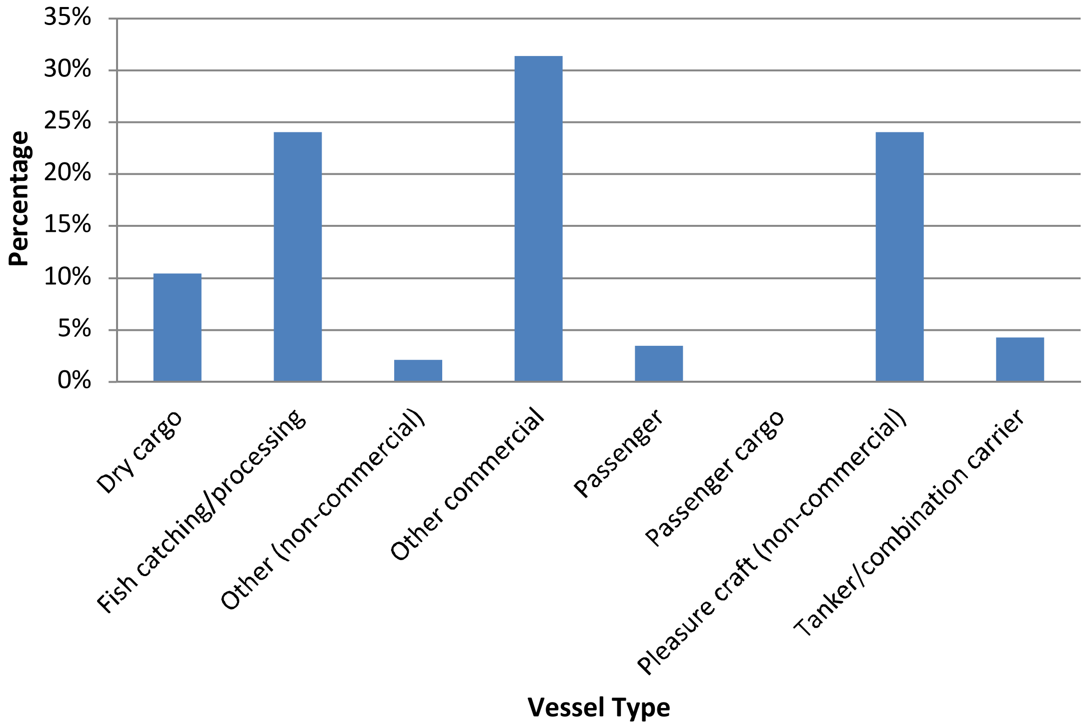

Figure 3.8 Collision Incidents by Vessel Type within UK Waters (MAIB 1994-2014)

The most common vessel types involved in collision incidents were other commercial vessels (31%), fishing vessels (24%), non-commercial pleasure craft (24%) and dry cargo vessels (10%).

The total number of fatalities reported in MAIB collision incidents within UK waters between 1994 and 2014 when excluding incidents occurring in ports and harbours was four. Details of each of these fatal incidents reported by the MAIB are presented in Table 3.1.

Table 3.1 Fatal Collision Incidents (MAIB 1994-2014)

Date	Description	Fatalities
October 2001	A dry cargo vessel and a chemical tanker collided in the south-west traffic lane of the Dover Strait TSS to the south-east of Hastings. Although the weather and visibility were good, both watchkeepers were too late to take effective avoiding action. The collision resulted in the sinking of the dry cargo vessel from which five out of six crew members were rescued.	1

Date	Description	Fatalities
August 2002	Two speedboats collided resulting in one fatality and one injury. The visibility was good and the weather was calm. Police were called to the scene and both drivers were arrested.	1
July 2005	A collision between two powerboats near Castle Point, St. Mawes resulted in the death of one of the helmsmen. The incident occurred during the night with both vessels unlit whilst transiting through the area. Both helmsmen had consumed alcohol prior to the incident which is suspected to have caused reduced peripheral vision, deterioration of judgment and slower reaction times from both helmsmen, resulting in the collision.	1
August 2010	An Italian registered Ro Ro passenger ferry collided with a UK registered fishing vessel around four miles off St Abb's Head. As a result of the collision, the fishing vessel sank. The skipper was recovered from the sea but, despite an extensive search by the rescue services and a large number of local fishing vessels, the remaining crew member was lost.	1

3.3 Contact Incidents

MAIB define a contact incident as when “a vessel hits an object that is immobile and is not subject to the collision regulations e.g. buoy, post, dock (too hard), etc. Also, another ship if it is tied up alongside. Also floating logs, containers etc.”

A total of 262 contact incidents were reported to MAIB in UK waters (excluding ports, etc.) between 1994 and 2014 involving 294 vessels. (A small number of contact incidents involved a moving vessel contacting a stationary vessel).

The locations of contact incidents reported in the vicinity of the UK are presented in Figure 3.9.

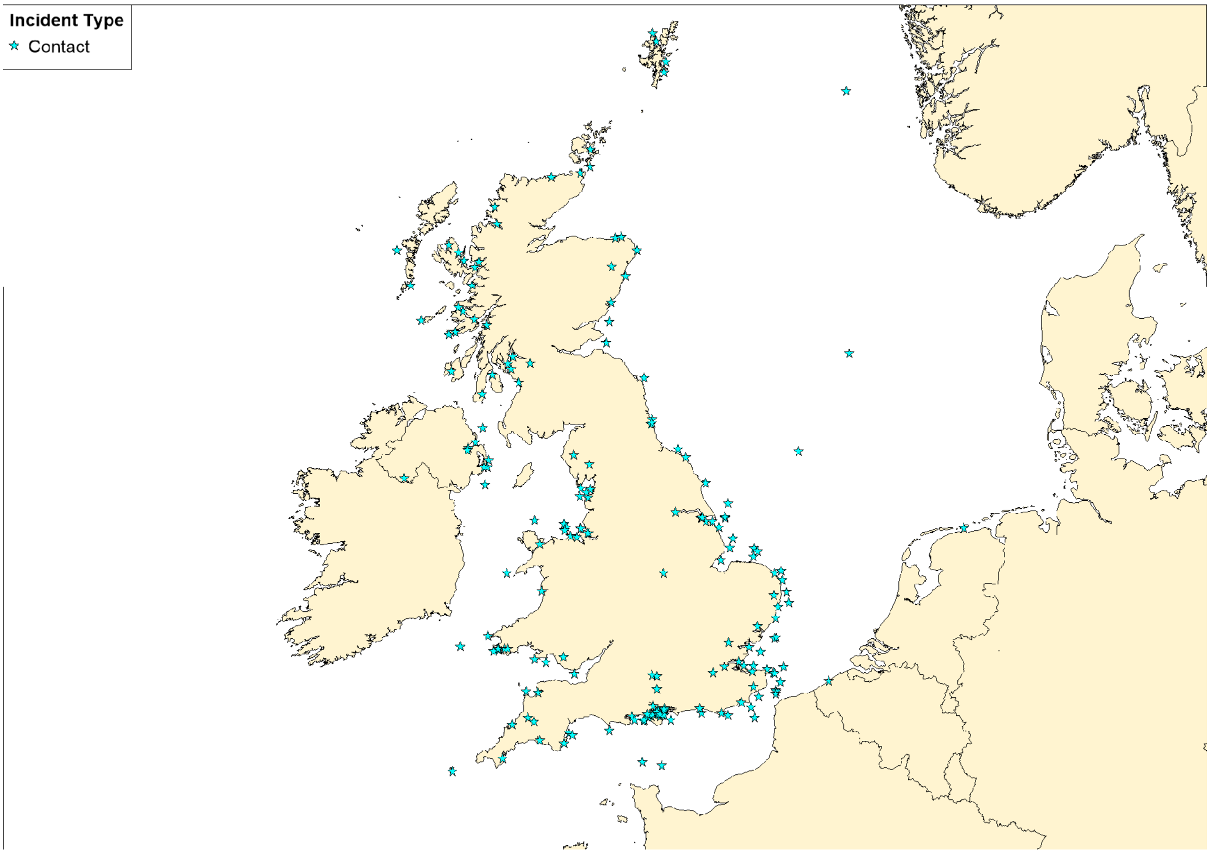

Figure 3.9 Contact Incident Locations within UK waters (MAIB 1994-2014)

The distribution of contact incidents by year is presented in Figure 3.10.

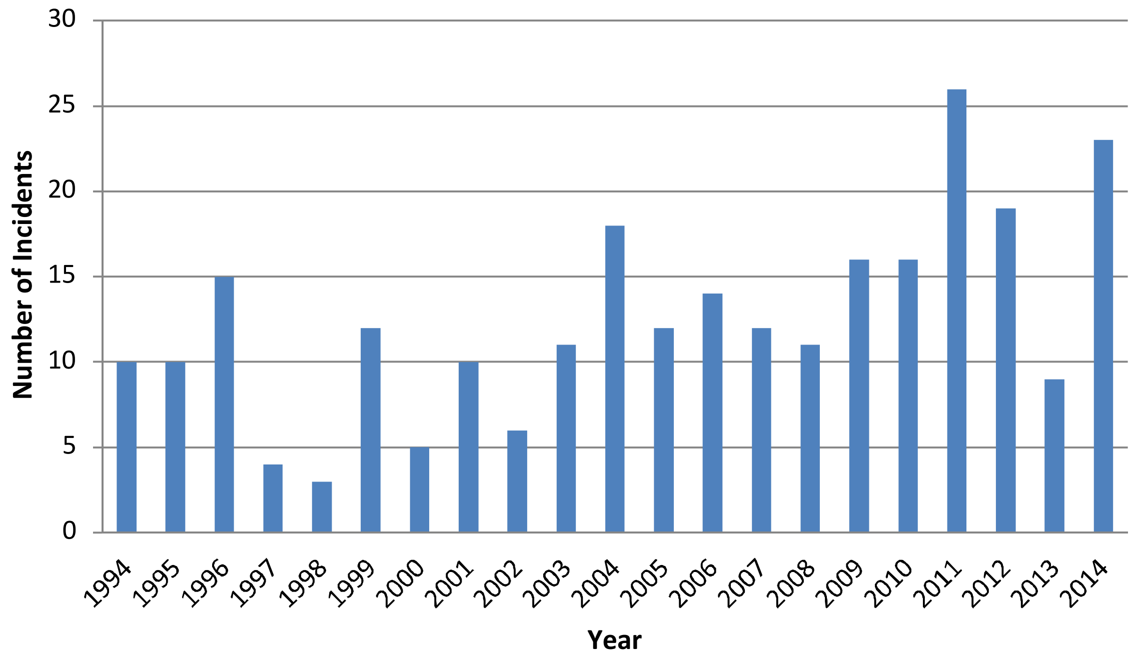

Figure 3.10 Contact Incidents per Year within UK Waters (MAIB 1994-2014)

The average number of contact incidents per year was 13. As with collision incidents there has been an increasing trend over the 21 year period, which may be due to improved reporting of less serious incidents in recent years.

The distribution of vessel types involved in contacts is presented in Figure 3.11.

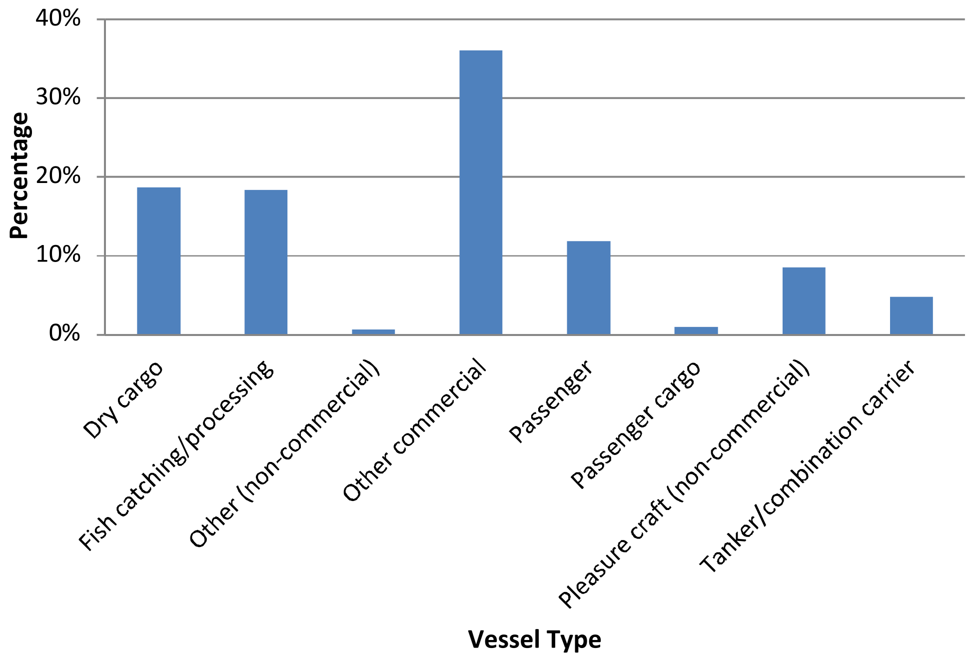

Figure 3.11 Contact Incidents by Vessel Type within UK Waters (MAIB 1994-2014)

The most common vessel types involved in contact incidents were other commercial vessels (36%), dry cargo vessels and fishing vessels (both 18%).

There were no fatalities reported in any of the MAIB contact incidents within UK waters between 1994 and 2014, when excluding incidents occurring in ports and harbours.

4 Fatality Risk

4.1 Introduction

This section uses the MAIB incident data along with information on average manning levels per vessel type to estimate the probability of fatality in a marine incident associated with the optimised Seagreen Project.

The optimised Seagreen Project is assessed to have the potential to affect the following incidents:

- Vessel to vessel collision;
- Powered vessel to structure allision;
- Drifting vessel to structure allision; and
- Fishing vessel to structure allision.

Of these incidents, only vessel to vessel collisions match the MAIB definition of collisions and hence the fatality analysis presented in Section 3.2 is considered to be directly applicable to these types of incidents.

The other scenarios of powered vessel to structure allision, drifting vessel to structure allision and fishing vessel to structure allision are technically contacts, since they involve a vessel striking an immobile object in the form of a wind turbine or substation. From Section 3.3 it can be seen that none of the 262 contact incidents reported by MAIB between 1994 and 2014 resulted in fatalities.

However, as the mechanics involved in a vessel contacting a wind turbine may differ in severity from hitting, for example, a buoy, quayside or moored vessel, the MAIB collision fatality risk rate has also been conservatively applied for these incidents.

4.2 Fatality Probability

Four of the 447 collision incidents reported by the MAIB in UK waters between 1994 and 2014 resulted in one or more fatalities. This gives a 0.89% probability that a collision incident will lead to a fatal accident.

To assess the fatality risk for personnel onboard a vessel, either crew, passenger or other, the number of persons involved in the incidents needs to be estimated. From analysis of the MAIB incident data, the average commercial passenger vessel had approximately 193 people on board (POB) (total of crew and passengers). For commercial cargo / freight vessels there was an average of approximately 14 POB. For fishing vessels the average POB was approximately 3.3 and for pleasure craft the average POB was approximately 6.4.

It is recognised that these numbers can be substantially higher or lower on an individual vessel basis, depending upon size, subtype, etc., but applying reasonable averages is considered sufficient for this analysis.

By using the average number of persons carried onboard, with the vessel type information involved in collision incidents reported by the MAIB (see Figure 3.8); an estimated 12,966 personnel are calculated as onboard the vessels involved in the collision incidents.

Based on four fatalities, the overall fatality probability in a collision for any individual onboard is approximately 3.1×10-4 per collision.

It is considered inappropriate to apply this rate uniformly, as the statistics indicate that the fatality probability associated with smaller craft is higher. Therefore the fatality probability has been subdivided into three categories of vessel, as presented in Table 4.1.

Table 4.1 Fatality Probability per Collision per Vessel Category (1994-2014)

Vessel Category	Sub Categories	Fatalities	People Involved	Fatality Probability
Commercial	Dry cargo, passenger, tanker, etc.	1	9,718	1.0×10^{-4}
Fishing	Trawler, Potter, Dredger, etc.	1	708	1.4×10^{-3}
Pleasure Craft	Yacht, small commercial motor vessel, etc.	2	2,540	7.9×10^{-4}

It can be seen that the risk is approximately one order of magnitude higher for people onboard small craft compared to larger commercial vessels.

4.3 Fatality Risk due to the Optimised Seagreen Project

The base case and future case annual collision frequency levels without and with the optimised Seagreen Project are summarised in Table 4.2. The "base case" is as per the terminology of the Formal Safety Assessment (FSA) (Ref. iii) and describes the scenario whereby marine traffic levels remain at the current baseline level. The future case presents the scenario whereby current baseline traffic is increased by 10%.

Table 4.2 Summary of Annual Collision Frequency Results

Collision/Allision Scenario	Base Case			Future Case		
	Without	**With**	**Change**	**Without**	**With**	**Change**
Vessel to vessel collision	3.73×10^{-4}	4.90×10^{-4}	1.17×10^{-4}	4.37×10^{-4}	5.72×10^{-4}	1.35×10^{-4}
Powered vessel to structure allision	--	7.02×10^{-4}	7.02×10^{-4}	--	7.67×10^{-4}	7.67×10^{-4}
Drifting vessel to structure allision	--	1.73×10^{-4}	1.73×10^{-4}	--	1.91×10^{-4}	1.91×10^{-4}
Fishing vessel to structure allision	--	5.76×10^{-2}	5.76×10^{-2}	--	6.34×10^{-2}	6.34×10^{-2}
Total	3.73×10^{-4}	5.90×10^{-2}	5.86×10^{-2}	4.37×10^{-4}	6.49×10^{-2}	6.45×10^{-2}

Table 4.3 presents the estimated average number of POB for the local vessels operating in the area of the optimised Seagreen Project.

Table 4.3 Vessel Types, Incidents and Average Number of POB

Vessel Type	Collision/Allision Incidents	Average Number of POB
Cargo/freight	▪ Vessel to vessel collision; ▪ Powered vessel to structure allision; and ▪ Drifting vessel to structure allision.	15
Tanker	▪ Vessel to vessel collision; ▪ Powered vessel to structure allision; and ▪ Drifting vessel to structure allision.	20
Passenger	▪ Vessel to vessel collision; ▪ Powered vessel to structure allision; and ▪ Drifting vessel to structure allision.	1,800
Fishing vessel	▪ Vessel to vessel collision; and ▪ Fishing vessel to structure allision	3

Vessel Type	Collision/Allision Incidents	Average Number of POB
Recreational vessel	▪ Vessel to vessel collision.	4

From the detailed results of the collision and allision frequency modelling, the distribution of the predicted change in annual collision and allision frequency by vessel type, due to the optimised Seagreen Project, for the base and future cases are presented in Figure 4.1. Following this, Figure 4.2 presents the results, while excluding fishing vessels, to provide clarity over the other vessel type results.

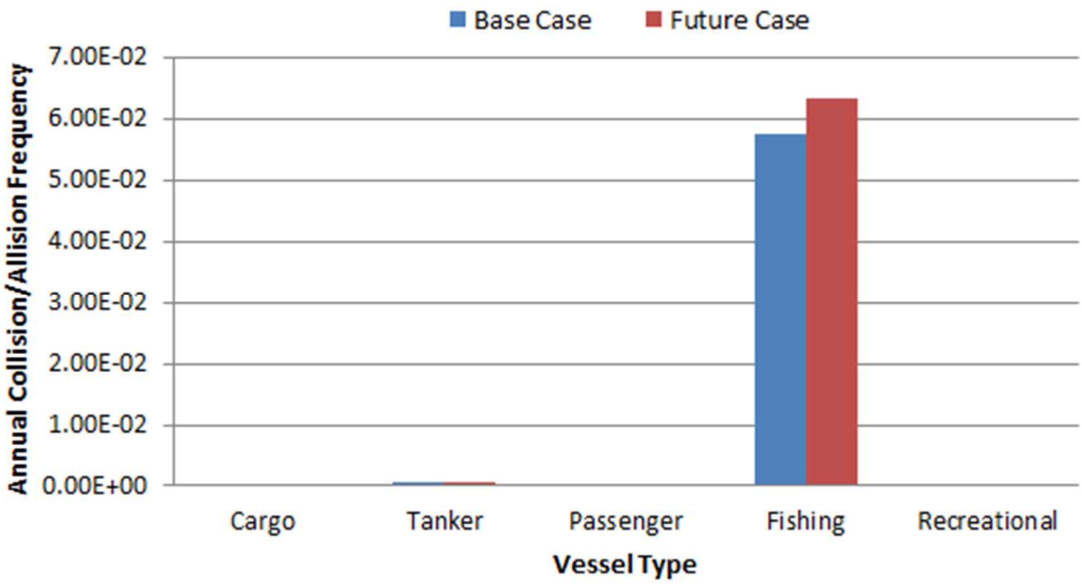

Figure 4.1 Change in Annual Collision and Allision Frequency by Vessel Type

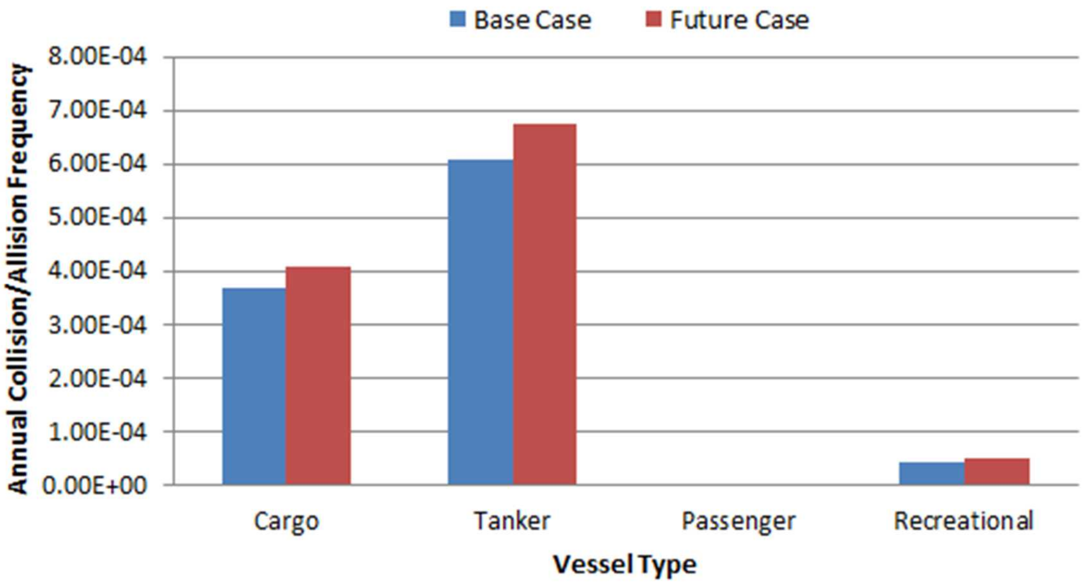

Figure 4.2 Change in Annual Collision and Allision Frequency by Vessel Type (Excluding Fishing Vessels)

It can be seen that the significant majority of the allision/collision risk is to fishing vessels. As is discussed in Appendix 12A (NRA Addendum), this was due to the assumption that levels of fishing traffic within the optimised Seagreen Project will remain consistent post wind farm, which leads to a high estimated fishing vessel to structure allision frequency. This is considered a conservative approach. Given that there will be no restrictions on fishing in or transit through the optimised Seagreen Project during the operational phase (and hence the decision to fish or transit within the wind farm structures will be at the digression of the vessel's master), the conservative approach was considered appropriate.

Combining the annual collision and allision frequency (Table 4.2), the estimated number of POB each vessel type (Table 4.3) and the estimated fatality probability for each vessel category (Table 4.1), the annual increase in PLL, due to the impact of the optimised Seagreen Project, for the base case is estimated to be 2.47×10-4. This equates to one additional fatality in 4,042 years. The annual increase in PLL due to the impact of the optimised Seagreen Project for the future case is estimated to be 2.72×10-4, which equates to one additional fatality in 3,674 years.

The estimated incremental increases in PLL, due to the optimised Seagreen Project, distributed by vessel type for the base and future cases, are presented in Figure 4.3. Following this, Figure 4.4 presents the results, while excluding fishing vessels, to provide clarity over the other vessel type results.

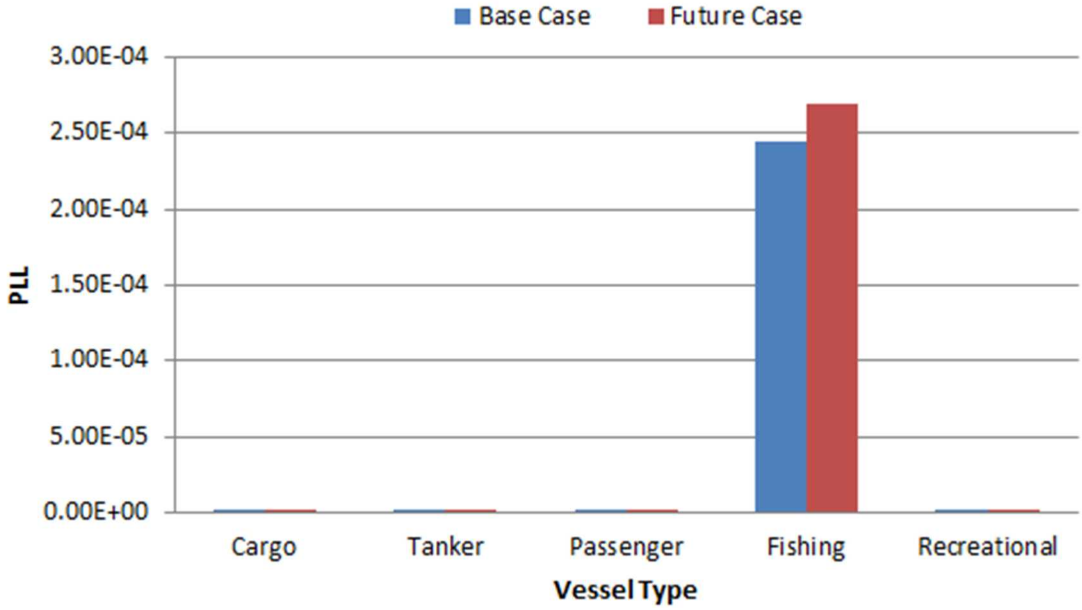

Figure 4.3 Estimated Change in Annual PLL by Vessel Type

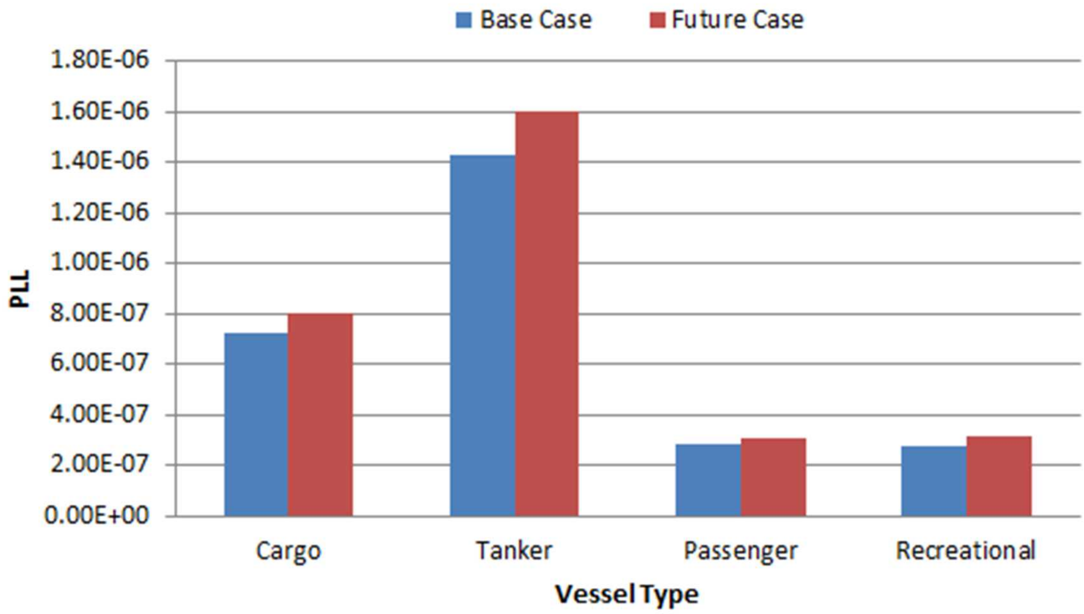

Figure 4.4 Estimated Change in Annual PLL by Vessel Type (Excluding Fishing Vessels)

It can be seen that the majority of change in PLL was associated with fishing vessels, which again is due to the assumption that there will not be a reduction in fishing vessel traffic within the optimised Seagreen Project during its operational life (whereas regular routed traffic is expect to deviate to avoid the structures).

PLL can be converted to individual risk, based on the average number of people exposed by vessel type. The results are presented in Figure 4.5 (this calculation assumes that the risk is shared between 10 vessels of each type, which is considered to be conservative based on the number of different vessels operating in the vicinity of the site).

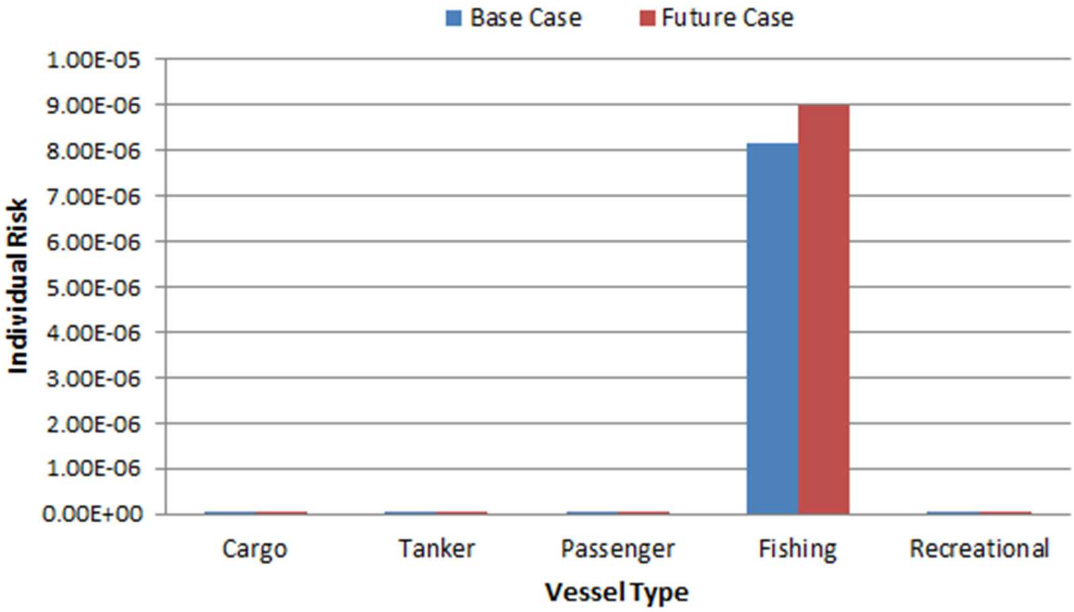

Figure 4.5 Estimated Change in Individual Risk by Vessel Type

It can be seen that the majority of change in individual risk was associated with fishing vessels, which again is due to the assumption that there will not be a reduction in fishing within the optimised Seagreen Project during its operational life (whereas regular routed traffic is expected to deviate to avoid the structures).

4.4 Significance of Increase in Fatality Risk

The overall increase in PLL estimated due to the optimised Seagreen Project is 2.47×10-4, which equates to one additional fatality in 4,042 years. In comparison to MAIB statistics, which indicate an average of 20 fatalities per year in UK territorial waters, this is a negligible change.

In terms of individual risk to people, the incremental increase for commercial vessels (approximately 1.20×10-8 for the base case) is negligible compared to the background risk level for the UK sea transport industry of 2.9×10-4 per year.

For fishing vessels, the change in individual risk attributed to the optimised Seagreen Project is higher than commercial vessels (approximately 8.16×10-6 for the base case), which is negligible compared to the background risk level for the UK sea fishing industry of 1.2×10-3 per year.

5 Pollution Risk

5.1 Historical Analysis

The pollution consequences of a collision in terms of oil spill depend upon the following:

- Spill probability (i.e. likelihood of outflow following an accident); and
- Spill size (amount of oil).

Two types of oil spill are considered in this assessment:

- Fuel oil spills from bunkers (all vessel types); and
- Cargo oil spills (laden tankers)

The research undertaken as part of the DfT's MEHRAs project (Ref.i) has been used to estimate the probability of a spill occurring, as it was comprehensive and based on worldwide marine spill data analysis.

From this research, the overall probability of a spill per accident was calculated based on historical accident data for each accident type as presented in Figure 5.1.

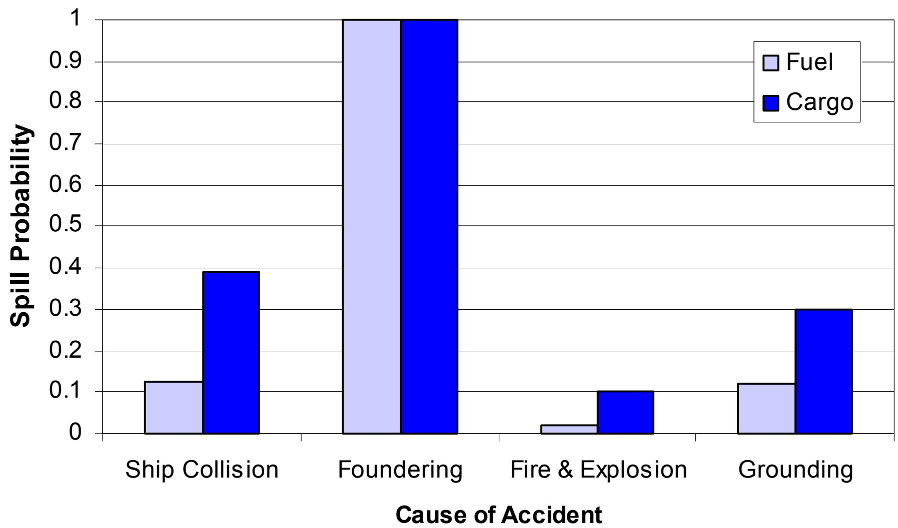

Figure 5.1 Probability of an Oil Spill Resulting from an Accident

Therefore, it was estimated that 13% of vessel collisions result in a fuel oil spill and 39% of collisions involving a laden tanker result in a cargo oil spill.

In the event of a bunker spill, the potential outflow of oil depends upon the bunker capacity of the vessel. Historical bunker spills from vessels have generally been limited to a size below 50% of the bunker capacity, and in most incidents much lower. For the types and sizes of vessels exposed to the optimised Seagreen Project, an average spill size of 100 tonnes of fuel oil is considered to be a conservative assumption. This assumption is based on historical oil spills and the high average is conservative due to a few large spills within UK waters for example the 1996 Sea Empress oil spill.

For cargo spills from laden tankers, the spill size can vary significantly. The International Tanker Owners Pollution Federation (ITOPF) reports the following spill size distribution for tanker collisions between 1974 and 2004:

- 31% of spills below seven tonnes;
- 52% of spills between seven and 700 tonnes; and
- 17% of spills greater than 700 tonnes.

For fishing vessel collisions, comprehensive statistical data is not available. Consequently it is conservatively assumed that 50% of all collisions involving fishing vessels will lead to oil spill with the quantity spilled being on average five tonnes. Similarly for recreational vessels, due to a lack of data, 50% of collisions are assumed to lead to a spill with an average size of one tonne.

5.2 Pollution Risk due to the Optimised Seagreen Project

Applying the above probabilities to the annual collision and allision frequency by vessel type presented in Figure 4.1 and the average spill size per vessel, the amount of oil spilled per year, due to the impact of the optimised Seagreen Project, is estimated to be 0.24 tonnes per year for the base case and 0.27 tonnes per year for the future case.

The estimated increase in tonnes of oil spilled distributed by vessel type for the base and future cases are presented in Figure 5.2.

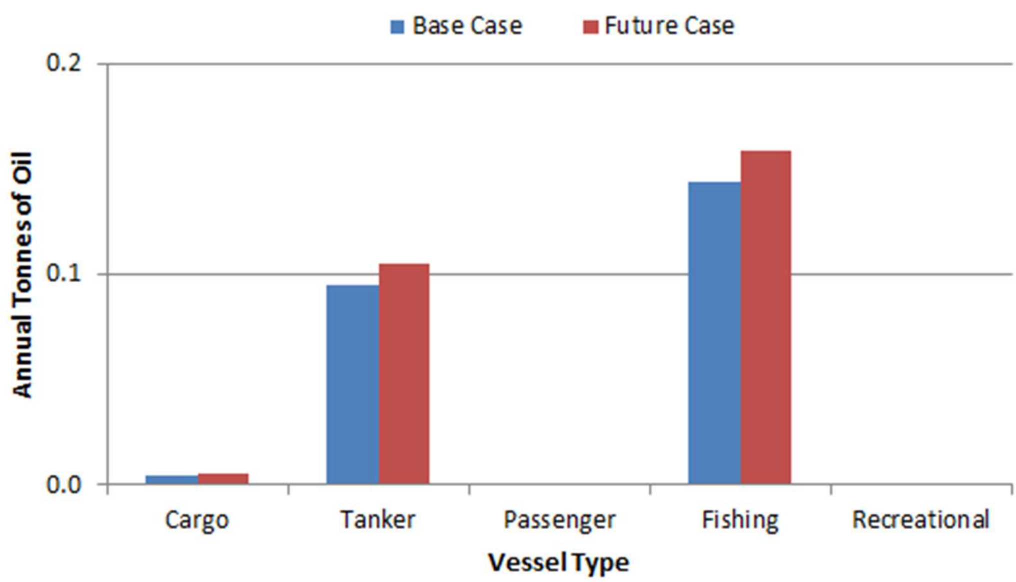

Figure 5.2 Estimated Change in Pollution by Vessel Type

It can be seen that fishing vessels and tankers, which were assessed to have the highest frequency of spill incidents, are the highest contributor.

5.3 Significance of Increase in Pollution Risk

To assess the significance of the increased pollution risk from marine vessels caused by the optimised Seagreen Project, historical oil spill data for the UK has been used as a benchmark.

From the MEHRAs research (Ref. i), the annual average tonnes of oil spilled in the waters around the British Isles due to marine accidents in the 10 year period from 1989 to 1998 were 16,111. This is based on a total of 146 reported oil pollution incidents of greater than one tonne (smaller spills are excluded as are incidents which occurred within port and harbour areas or as a result of operational errors or equipment failure). Commercial vessel spills accounted for approximately 99% of the total, while fishing vessel incidents accounted for less than 1%.

As previously stated, the amount of oil spilled per year due to the impact of the optimised Seagreen Project is estimated to be 0.24 tonnes per year for the base case and 0.27 tonnes per year for the future case. In both the base case and future case scenarios, this is an overall increase in annual pollution of 0.002% when compared to the historical average pollution quantities from marine accidents in UK waters (16,111 tonnes). Therefore the estimated increase in annual pollution due to the impact of the optimised Seagreen Project is negligible.

6 Conclusions

This appendix to the EIA Report (Chapter 12 (Shipping and Navigation)) has assessed the fatality and pollution risk associated with the optimised Seagreen Project. The quantitative risk assessment indicates that the collision and allision risk associated with fishing vessels is highest.

Overall, the impact of the optimised Seagreen Project on people and the environment is relatively low compared to the existing background risk levels in UK waters. However, it should be noted that this is the localised impact of a single project and there will be additional maritime risks associated with other offshore wind farm developments in and around the Firth of Forth and the UK as a whole.

Further discussion of mitigation measures and monitoring is provided in Section 13 of the NRA Addendum (Appendix 12A (NRA Addendum) and section 22.1 of the 2012 NRA (Appendix 12C (Project Alpha and Project Bravo 2012 NRA).

7 References

i. Department for Transport, Identification of Marine Environmental High Risk Areas (MEHRA's) in the UK, 2001.
ii. IMO Maritime Safety Committee, 74th Edition, Agenda Item 5 (MSC 74/5/X), Bulk Carrier Safety – Formal Safety Assessment, 2001.
iii. IMO, 2007. Consolidated Text of the Guidelines for FSA for use in the IMO rule-making Process. (MSC/ Circ. 2013-MEPC/ Circ.392). IMO, London.
iv. MCA "Safety Information – FSA, Statistical Data" web page.