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Chapter 16: Major Accidents and Disasters

Array EIA Report

2024

Revision	Comments	Author	Checker	Approver
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Approval for Issue		
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16. MAJOR ACCIDENTS AND DISASTERS

16.1. INTRODUCTION

1. This chapter of the Array Environmental Impact Assessment (EIA) Report presents the assessment of the likely significant effects (LSE[1]) (as per the EIA Regulations) on the environment of the Ossian Array which is the subject of this application (hereafter referred to as "the Array") on the vulnerability of the Array to the risks of major accidents and disasters. Specifically, this chapter considers the potential impacts of the Array during the construction, operation and maintenance, and decommissioning phases.

2. The following technical chapters also inform the assessment presented in this chapter:

   - volume 2, chapter 12: Commercial Fisheries;
   - volume 2, chapter 13: Shipping and Navigation;
   - volume 2, chapter 14: Aviation, Military, and Communications;
   - volume 2, chapter 15: Infrastructure and Other Users; and
   - volume 2, chapter 17: Climatic Effects.

3. Volume 1, chapter 3 has also informed section 16.3 to provide an overview of unexploded ordnance (UXO) in proximity to the Array.

4. The structure of the major accidents and disasters Array EIA Report chapter deviates from the structure of other chapters included within the Array EIA Report as the assessment is guided by the Institute of Environmental Management and Assessment (IEMA) 'Major Accidents and Disasters in EIA: A Primer' guidance (IEMA, 2020). In accordance with this guidance:

   - a 'Major Accident' is an event that threatens immediate or delayed serious environmental effects to human health, welfare and/or the environment and requires the use of resources beyond those that of the client or its appointed representatives (i.e. contractors) to manage. For example, effects that cause a fatality, multiple fatalities or permanent injury, or widespread irreversible harm or damage. Major accidents can be caused by disasters resulting from both man-made and natural hazards;
   - a 'Disaster' is a man-made/external hazard (such as an act of terrorism) or a natural hazard (such as an earthquake) with the potential to cause an event or situation that meets the definition of a major accident as described above; and
   - a 'Significant Environmental Effect' is defined as major accident and/or disaster that could include the loss of life, permanent injury and temporary or permanent destruction of an environmental receptor which cannot be restored through minor clean-up and restoration.

5. There are two main areas of vulnerability for the Array. These are:

   - internal project risks: relating to the Array's potential to cause a major accident and/or disaster; and
   - external project risks: relating to the vulnerability of the Array to a potential major accident and/or disaster.

6. These risks have been identified for the Array and have been assessed within this chapter. The chapter identifies the processes and measures which will be implemented to prevent a major accident and/or disaster and to mitigate the significance of effects arising from risks identified. In certain instances, risks identified have been assessed elsewhere within this Array EIA Report, and where this is the case, these assessments are signposted.

16.2. PURPOSE OF THE CHAPTER

7. The Array EIA Report provides the Scottish Ministers, statutory and non-statutory stakeholders with adequate information to determine the LSE[1] of the Array on the receiving environment. This is further outlined in volume 1, chapter 1.

8. The purpose of this major accidents and disasters Array EIA Report chapter is to:

   - present the existing environmental baseline established from desktop studies, site-specific surveys and consultation with stakeholders;
   - identify any assumptions and limitations encountered in compiling the environmental information;
   - present the LSE[1] deriving from the vulnerability of the Array to risks of major accidents and disasters, based on the information gathered and the analysis and assessments undertaken; and
   - highlight any necessary monitoring and/or mitigation measures which are recommended to prevent, minimise, reduce or offset the likely significant adverse environmental effects of the Array on major accidents and disasters.

16.3. STUDY AREA

9. The Array will be located off the east coast of Scotland, approximately 80 km south-east of Aberdeen from the nearest point and comprising an area of approximately 859 km^2. Further information about the Array and its location are detailed in volume 1, chapter 3. The major accidents and disasters study area (Zone of Influence (ZoI)) for the Array encompasses the potential hazards that may be of relevance to:

   - the Array (i.e. the area in which the wind turbines, Offshore Substation Platforms (OSPs), inter-array cables and interconnector cables will be located); and
   - a wider, regional area (north-east Scotland).

10. Consideration has also been given to the United Kingdom (UK) as a whole to identify any national hazards which may be of relevance to the Array.

16.4. POLICY AND LEGISLATIVE CONTEXT

11. Volume 1, chapter 2 of the Array EIA Report presents the policy and legislation of relevance to renewable energy infrastructure. Policy and legislation specifically in relation to major accidents and disasters are as follows, and detailed further in Table 16.1 and Table 16.2:

    - The Marine Works (EIA) (Scotland) Regulations 2017 (HM Government, 2017);
    - Health and Safety at Work etc. Act 1974 (HSWA) and Regulations made Thereunder (HM Government, 1974);
    - Construction (Design and Management) (CDM) 2015 Regulations (HM Government, 2015a);
    - Control of Major Accident Hazards (COMAH) Regulations 2015 (HM Government, 2015b);
    - Scotland's National Marine Plan (NMP) (Marine Scotland, 2015);
    - UK Marine Policy Statement (MPS) (HM Government, 2011); and
    - National Planning Framework (NPF 4) (Scottish Government, 2023a).

Table 16.1: Summary of Legislation Relevant to Major Accidents and Disasters

Summary of Relevant Legislation	How and Where Considered in the Array EIA Report
The Marine Works (EIA) (Scotland) Regulations 2017	
The EIA Regulations require that the expected significant effects arising from the vulnerability of the project to major accidents or disasters are considered in the decision-making process for that project. Regulation 5 (2) outlines receptors that "*the EIA must identify, describe and assess in an appropriate manner, in light of each individual case, the direct and indirect significant effects of the proposed development*" and this includes major accidents and disasters. Regulation 5 (4) outlines the requirement to "*include the relevant, the expected significant effects arising from the vulnerability of the proposed development to major accidents or disasters that are relevant to the development."* The EIA Regulations also detail that a description of the expected significant adverse effects of the development on the environment deriving from the vulnerability of the development to risks of major accidents and/or disasters which are relevant to the project concerned. Relevant information available and obtained through risk assessments pursuant to European Union (EU) legislation such as Directive 2012/18/EU of the European Parliament and of the Council or Council Directive 2009/71/Euratom or UK environmental assessments may be used for this purpose provided that the requirements of this Directive are met. Where appropriate, this description should include measures envisaged to prevent or mitigate the significant adverse effects of such events on the environment and details of the preparedness for and proposed response to such emergencies.	This chapter contains a high level description of the types of potential major accident and disaster which could occur and the processes which ensure these are reduced to As Low as Reasonably Practicable (ALARP) in section 16.10.
Health and Safety at Work etc. Act 1974 (HSWA) and Regulations Made Thereunder	
The HSWA is the primary legislation instrument covering workplace health and safety in the UK. The Act establishes various obligations to ensure, so far as is reasonably practicable, that persons are not exposed to risks to their health and safety whilst at work. Several regulations made under the Act (e.g. The Major Accident Control Regulations) place general duties on employers to assess risks and to implement controls. The overriding principle is that foreseeable risks to persons shall be reduced so far as is reasonably practicable and that adequate evidence shall be produced to demonstrate that this has been done.	In section 16.8 of this chapter it is demonstrated that the Array has suitable designed in measures and processes in place to reduce risks to persons to ALARP and complies with good risk management practice in terms of major events.
Construction (Design and Management) (CDM) 2015 Regulations	
The CDM Regulations place specific duties on clients, designers, contractors and workers, so that health and safety is considered throughout the life of a construction project from its inception to its subsequent final demolition and removal. Under the CDM Regulations, designers must avoid foreseeable risks so far as reasonably practicable by eliminating hazards from the construction, cleaning, maintenance, and proposed use and demolition of a structure; reducing risks from any remaining hazard; and giving collective safety measures priority over individual measures.	The designed in measures explained in section 16.8 of this chapter demonstrate how the Array will achieve the requirements and implementation of the CDM Regulations, which include management of construction risk to ALARP.
COMAH Regulations 2015	
The COMAH Regulations aim to prevent and mitigate the effects of major accidents involving dangerous substances which can cause serious damage/harm to people and/or the environment. COMAH treats risks to the environment as seriously as those to people.	The baseline relevant to natural hazards and the climate system is discussed in section 16.7, including where the nearest COMAH site to the Array is located.

Table 16.2: Summary of National Policy Relevant to Major Accidents and Disasters

Summary of Relevant Policy	How and Where Considered in the Array EIA Report
Scotland's National Marine Plan (NMP)	
Sets out strategic policies for the sustainable development of Scotland's marine resources and is compatible with the UK National Policy Statement (NPS) and existing Marine Plans across the UK.	The NMP is relevant to the Array as it addresses the potential for interactions between renewable energy development and other marine users. It also sets several minimum requirements including: • achieving a sustainable marine economy; • ensuring a strong, healthy and just society; • living within environmental limits; • promoting good governance; and • using sound science responsibility. Interactions between the Array and other marine users is addressed in section 16.7 of this chapter, which provides an overview of the details in volume 2, chapter 15 of the Array EIA Report.
UK Marine Policy Statement (MPS)	
Provides a framework for marine spatial planning, specifically for the preparation of Marine Plans and to ensure that marine resources are used in a sustainable way.	The MPS confirms that all public authorities, in examining and determining applications for all energy infrastructure, the relevant marine policy statement must be followed, and the following must be considered: • the national level of need for energy infrastructure; • the positive wider environmental, societal and economic benefits of low carbon electricity generation; • that renewable energy resources can only be exploited where the resource exists and where economically feasible; and • the potential for inward investment on energy related manufacturing and deployment activity and employment opportunities and regeneration of local national economies, supporting the objective of developing the UK's low carbon manufacturing capability. The MPS also confirms that the level of assessment undertaken for any project should be proportionate to the scale and potential impact of the project, as well as the sensitivity of the environment concerned and in accordance with the EIA Directive, where applicable. This chapter considers the potential vulnerability to and of the Array to cause or be impacted by major accidents and/or disasters in 16.10.
National Planning Framework (NPF 4)	
Adopted in 2023, this long-term strategy expresses plans for development, and investment, in infrastructure to meet the 2045 net zero targets.	Considers potential impacts from renewable energy along with mitigation measures. When considering potential benefits and adverse effects, decision makers should also consider any cumulative impacts of the proposals with other projects and activities. The mitigation measures in place have been extracted from the relevant chapters and are detailed in section 16.9 of this chapter. No assessment of the cumulative effects has taken place as it was concluded that the Array would not reasonably lead to any major accidents and/or disasters.

16.5. CONSULTATION

12. Table 16.3 presents a summary of the key issues raised in the Ossian Array Scoping Opinion (Marine Directorate – Licensing and Operations Team (MD-LOT), 2023) along with how these have these have been considered in the development of this major accidents and disasters Array EIA Report chapter. Further detail is presented within volume 1, chapter 5.

13. To avoid duplication, key issues raised during consultation activities that are relevant to specific topics, such as commercial fisheries, shipping and navigation and aviation, military and communications are included in the relevant EIA Report chapters (volume 2, chapters 12, 13 and 14, respectively).

Table 16.3: Summary of Issues Raised During Scoping Opinion Representations Relevant to Major Accidents and Disasters

Date	Consultee and Type of Consultation	Issue(s) Raised	Response to Issue Raised and/or Where Considered in this Chapter
Scoping Opinion			
June 2023	Maritime and Coastguard Agency (MCA) Scoping Representation (April 2023)	*"Any additional navigational safety and/or Search and Rescue (SAR) requirements, as per Marine Guidance Note (MGN) 654 Annex 5, will be agreed at the approval stage. Particular consideration will need to be given to the implications of the site size and location on SAR resources and Emergency Response Co-operation Plan (ERCoP)".*	Engagement with the MCA will continue in development of the ERCoP. Details are presented in Table 16.4 of this chapter.
June 2023	MD-LOT	MD-LOT request for *"the Array EIA Report to include a description and assessment of the likely significant effects deriving from the vulnerability of the Array to major accidents and disasters."*	This chapter has been developed as per feedback received as part of the Scoping Opinion for the Array to include a description and assessment of the LSE[1] deriving from the vulnerability of the Array's susceptibility to potential major accidents and disasters. This assessment is summarised in Table 16.7.
June 2023	MD-LOT	Scottish Ministers request for *"the appropriate guidance, including the IEMA 'Major Accidents and Disasters in EIA: A Primer' to present the likelihood of an occurrence and the Array's susceptibility to potential major accidents and hazards."*	This chapter has been developed as per IEMA guidance 'Major Accidents and Disasters in EIA: A Primer'' (IEMA, 2020).
June 2023	MD-LOT	Scottish Ministers advise that *"existing sources of risk assessment or other relevant studies should be used to establish the baseline rather than further data collection."*	The baseline in this chapter is established from the information detailed in the Array EIA Report chapters listed in paragraph 14.
June 2023	MD-LOT	Scottish Ministers request that *"the assessment must detail how significance has been defined and detail the inclusions and exclusions within the assessment. Any mitigation measures that will be employed to prevent, reduce or control significant effects should be included in the Array EIA Report. "*	This chapter has been developed as per IEMA guidance 'Major Accidents and Disasters in EIA: A Primer' (IEMA, 2020), therefore differing from other chapters in this Array EIA Report. However, this chapter presents an approach to assessment in line with relevant guidance including the consideration of designed in measures to reduce and/or control risk (see section 16.9). Significant environmental effects have been assessed in section 16.10.

16.6. METHODOLOGY TO INFORM BASELINE

16.6.1. DESKTOP STUDY

14. The baseline relevant to major accidents and disasters is based on a summary of the information collected through a detailed desktop review of existing studies and datasets for the following chapters:

- volume 2, chapter 12: Commercial Fisheries;
- volume 2, chapter 13: Shipping and Navigation;
- volume 2, chapter 14: Aviation, Military, Communications;
- volume 2, chapter 15: Infrastructure and Other Users; and
- volume 2, chapter 17: Climatic Effects.

15. The designed in mitigation measures are summarised in Table 16.4. A detailed overview of the desktop sources is presented in each of the above chapters and relevant technical reports, with a summary being provided in this chapter.

16.6.2. SITE-SPECIFIC SURVEYS

16. No site-specific surveys have been undertaken to inform the EIA for major accidents and disasters. This is because receptor information and data related to the topic can be readily collected through desktop study and consultation with relevant stakeholders, and is currently available due to suitable data throughout the north-east Scotland region.

17. Whilst no site-specific surveys were undertaken for this chapter, the two 14-day vessel traffic surveys that were completed for shipping and navigation (discussed in volume 2, chapter 13) obtained information on vessel traffic in the vicinity of the Array and has been used to inform the major accidents and disasters chapter.

16.7. BASELINE ENVIRONMENT

16.7.1. OVERVIEW OF BASELINE ENVIRONMENT

18. In line with the IEMA Guidance and the advice provided as part of the Ossian Array Scoping Opinion (IEMA, 2020; MD-LOT, 2023), the baseline environment herein is informed by existing sources of information, in order to identify the hazards of relevance to the Array and inform this major accidents and disasters chapter, rather than collecting survey data (as is typically the case for other EIA receptor topics).

19. The following sections provide a summary of the baseline environment relevant to major accidents and disasters. It is noted that the study areas for these different baseline topics differ as they relate to different receptors with varying ranges for which impacts must be considered. However, notwithstanding these differences all relevant study areas are appropriate for this assessment.

Unexploded ordnance

20. This section provides an overview of UXO in proximity to the Array, as described in volume 1, chapter 3.

21. The possibility exists for UXO originating from World War I or World War II to be encountered during the construction or installation of the Array. Due to the health and safety risks posed by UXO and potential interactions with installed infrastructure and vessel activities, it is necessary for UXO to be surveyed and managed carefully before the construction phase and installation of any offshore infrastructure commences.

22. If UXOs cannot be avoided or relocated, the preferred method for UXO clearance is the use of a low order technique with a single donor charge of 0.25 kg Net Explosive Quantity (NEQ) for each clearance event. Up to 0.5 kg NEQ clearance shots will be required for neutralisation of residual explosive material at each location, conducted by a specialist contractor in advance of any construction or installation activity. Up to two detonations will be conducted within a 24 hour period, with clearance only taking place during daylight hours. The Applicant has assumed that up to 15 UXOs may require clearance using these low order techniques, such as deflagration, based upon existing knowledge from Seagreen 1 Offshore Wind Farm. Despite this, a risk remains that some clearance events may be required to use high order detonation.

23. Advice and guidance on UXO clearance within the Array is provided in volume 2, chapter 10.

Commercial fisheries

24. This section provides an overview of the commercial fisheries in proximity to the Array, as described in volume 2, chapter 12.

25. Pelagic trawl activity, whereby vessels track shoals of fish and deploy fishing gear to harvest a portion of that migrating shoal, is found to not occur within the Array. No pelagic trawl activity is visible in the commercial fisheries regional study area in 2019 and 2020.

26. Demersal otter trawls typically target gadoids, other groundfish, plaice *Pleuronectes platessa* and *Nephrops norvegicus* (also known as Norway lobster, Dublin Bay prawn, langoustine, and Nephrops). While activity is very limited within the Array it is seen consistently outside the Array, focused on grounds within the Devil's Hole, which is located approximately 18 km to the east of the Array. The Devil's Hole is a series of deep trenches that run north to south. Landings are primarily dominated by *Nephrops*, haddock *Melanogrammus aeglefinus* and mixed demersal fish species.

27. Beam trawl activity and demersal seine activity is found to be negligible across the Array with the latter having a notable area of activity to the west of the Array.

28. Creels or pots, used for the capture of lobster and crab, is predominantly undertaken in inshore areas. As the Array is approximately 80 km south-west of Aberdeen (closest shoreline from the nearest point), it is located in grounds that would typically be beyond the normal operational range of potting vessels.

29. Dredging activity is indicated to be negligible across the Array, with dredge grounds predominantly located to the west of the Array, further inshore between 6 nm to 12 nm of the coastline.

Shipping and navigation

30. This section provides an overview of the shipping and navigation activity in proximity to the Array, as described in volume 2, chapter 13.

31. This chapter provides a description of existing navigational features within a 10 nm buffer around the site boundary. Surveys of this area show that daily vessel numbers are within the range of four to 12 vessels per day during winter and five to 16 vessels per day during summer. The majority of traffic within the 10 nm shipping and navigation study area were observed to be comprised of oil and gas vessels in winter and cargo vessels in summer. Overall, oil and gas and cargo vessels were the most common vessel type, with minimal levels of fishing and recreational vessels.

32. A total of 11 main commercial routes were identified from 12 months of Automatic Identification System (AIS) data recorded during 2022 within the 10 nm shipping and navigation study area. The busiest of these routes was transited by various oil and gas vessels navigating to and from Aberdeen, with approximately 16 to 17 vessels per week. Routes between the Faroe Islands or Iceland and Rotterdam (ten vessels per week) and Immingham or Rotterdam to Glensanda (two to three vessels per week) were the next busiest. The remaining six routes were each utilised by one vessel or less per week on average).

Aviation, military, and communications

33. The Array will be situated within the Scottish Flight Information Region (FIR[2]) in an area of Class G uncontrolled airspace which is established from surface up to Flight Level (FL) 115 (approximately 11,500 ft). Above this Class G Airspace is Class C Controlled Airspace (CAS).

34. Within Class G and Class C airspace, the following Air Traffic Control (ATC) rules apply:

- Class G airspace – any aircraft can operate in this area of uncontrolled airspace without any mandatory requirement to be in communication with, or receive a radar service from, any ATC unit. Pilots of aircraft operating under Visual Flight Rules (VFR) in Class G airspace are ultimately responsible for seeing and avoiding other aircraft and obstructions; and
- Class C airspace – pilots require clearance to enter this airspace and they must comply with ATC instructions. Both Instrument Flight Rules (IFR) and VFR is permitted, and this airspace extends from FL 195 (19,500 ft) to FL 600 (60,000 ft).

35. An overview of the baseline presented in volume 2, chapter 14 is presented below:

- Civil aviation: Aberdeen International Airport is located approximately 292°/50 nm north-west of the Array. Radar Line of Sight (RLoS) analysis indicates that the Perwinnes Primary Surveillance Radar (PSR) will detect operational wind turbines at a maximum height of 399 m and Allanshill PSR will detect intermittently, operational wind turbines which are placed within the northern quarter of the Array.
- Military aviation: the nearest Air Defence Radar (ADR) systems are located at Remote Radar Head (RRH) Buchan in Aberdeenshire (316°/48 nm) and RRH Brizlee Wood in Northumberland (215°/80 nm). ADR systems are used to compile a Recognised Air Picture (RAP) to monitor the airspace in and around the UK to launch a response to any potential airborne threat. Ministry of Defence (MoD) Leuchars Station PSR is located approximately 245°/73 nm from the Array. Leuchars Station is responsible for navigational services to transitory military and civil aircraft operating within a 40 nm radius of the aerodrome, up to 9,500 ft. The Array is adjacent to Low Flying Areas (LFA) and, therefore, military low flying is likely to take place above and around the Array.
- Helicopter operations: the closest MCA SAR helicopter base to the Array is Inverness Airport, approximately 114 nm north-west of the Array. SAR operations often involve flying at low level. Helicopters supporting offshore oil and gas, in the northern North Sea, use Helicopter Main Route Indicators (HMRI), radiating from Aberdeen International Airport (the main support base) on a hub/spoke radial pattern. These HMRIs lie to the north of the Array; the closest being 4 nm to the north of the north-eastern boundary of the Array on a bearing of 21°. The Civil Aviation Authority (CAA) recommend within Civil Aviation Publication (CAP) 764 (CAA, 2016) that there should be no obstacles within 2 nm either side of the centreline of a HMRI, the Array is located outside of the CAA recommended obstacle free distance. Moreover, the CAA also recommend that dependent on radar low level coverage required and the type of radar service required, it may be necessary to maintain a greater buffer than 2 nm.
- Other radar and communications: the Array is located outside of the Met Office consultation zone, at approximately 95 km from the nearest Met Office radar at Hill of Dudwick, Aberdeenshire.

Offshore energy projects, offshore cables, pipelines, and subsea communications infrastructure

36. This section provides an overview of the offshore energy projects and offshore cables in proximity to the Array, as described volume 2, chapter 15.

37. The closest operational offshore wind farm project to the Array is Seagreen 1 Offshore Wind Farm, located approximately 51 km west of the Array. There are several offshore wind farms in the construction phase that, when completed, will be in proximity to the Array. The closest wind farm currently under construction is Seagreen 1A Project which is approximately 66 km west of the Array. Further details about the proximity and stage of other offshore wind farms in proximity to the Array can be found in Table 15.6 of volume 2, chapter 15.

38. The closest offshore cable is the Eastern Green Link (EGL) 2 cable, currently in planning, located approximately 23.7 km of the Array, along the west side of the Array.

39. The Firth of Forth supports oil and gas activities with Dundee and Aberdeen ports having deep-water berths and extensive landside project areas to accommodate the significant fabrication and refit projects for North Sea and Norwegian sector operations. There are three active hydrocarbon licence blocks within the site boundary of the Array - Block 27/3, Block 27/9 and Block 27/10. These blocks overlap the north-east of the site boundary of the Array and are all operated by North Sea Natural Resources Ltd (Licence number: P2321).

40. There are no oil and gas pipelines located within the Array. The closest pipeline, Catcher Gas Export Pipeline, is located approximately 48 km from the Array.

41. There are no wave and tidal projects, aggregate extraction sites, active disposal sites, or carbon capture, natural gas storage areas, active and disused subsea cables and pipelines identified within the boundary of the Array or within the broad infrastructure and other users study area (see volume 2, chapter 15).

Climatic effects

42. This section provides an overview of existing environmental baseline of the Array and any LSE[1] on and from climate change, as detailed in volume 2, chapter 17, volume 3, appendix 17.1 and volume 3, appendix 17.2.

43. The baseline consists of various subtidal habitats with the predominant being muddy sand, sand and slightly gravelly sand. These sediments are likely to contain stores of 'blue carbon', which is organic carbon that has been captured and stored through biological processes in the coastal and marine environment (Cunningham and Hunt, 2023).

44. The Array will likely contribute to the abatement of the amount of fossil fuel generation within the UK Grid (i.e. UK Grid carbon intensity). As such, the current baseline with regard to UK Grid-average emission factor for electricity generation, without the Array, is 252.97 $kgCO_2e/MWh$ (including well-to-tank but as-generated, i.e. excluding transmission and distribution losses) (Department for Energy Security and Net Zero (DESNZ) and Defra, 2023). Further information is presented in the Greenhouse Gas (GHG) technical report (volume 3, appendix 17.1).

45. Mean air temperature in the central North Sea (where the Array is located) range from the lows of 1°C in January to 16°C in July, with surface air temperatures exceeding sea surface temperatures during the spring and summer months and falling below sea surface temperatures during the autumn and winter months (Department for Business, Energy and Industrial Strategy (BEIS), 2022). Global air temperatures rose by 0.85°C between 1880 and 2012, and continue to rise (Intergovernmental Panel on Climate Change (IPCC), 2021).

46. Precipitation rates within the central North Sea follow a seasonal trend with April to June tending to be the driest months, and October to January being wetter. Thunderstorms are infrequent, and snow showers vary from approximately 10 to 12 days in the central North Sea (BEIS, 2022).

47. Within the climatic effects study area, wind speeds have been recorded up to 31.5 m/s during the 1979 to 2023 period, with winds predominantly from the south-west. Annual mean significant wave height ranges from 1.87 m to 2.05 m, with wave direction predominantly from the north and north-north-east. An easterly storm event occurred within the climatic effects study area during November 2022, with maximum significant wave height of 8.96 m (volume 3, appendix 7.1).

48. Mean sea level (MSL) is a crucial element of climate change related risks for offshore wind farms, as increased sea level has the potential to both increase water damage and corrosion of components above the water line at time of construction, and/or increase mooring line tension. MSL rise also has the potential to cause increased damage from storm surge. Global MSL rose by 0.2 m between 1901 and 2018, and continues to rise (IPCC, 2021).

49. Further information is presented in the Climate Change Risk Assessment (CCRA) technical report (volume 3, appendix 17.2).

16.7.2. FUTURE BASELINE SCENARIO

50. The EIA Regulations require that a "*a description of the relevant aspects of the current state of the environment (baseline scenario) and an outline of the likely evolution thereof without implementation of the project as far as natural changes from the baseline scenario can be assessed with reasonable effort, on the basis of the availability of environmental information and scientific knowledge*" is included within the Array EIA Report.

51. If the Array does not come forward, an assessment of the 'without development' future baseline conditions has also been carried out and is described within this section.

Commercial fisheries

52. Commercial fisheries patterns change and fluctuate based on a range of natural and management-controlled factors including:

- market demand;
- market prices;
- stock abundance;
- fisheries management;
- environmental management;
- improved efficiency and gear technology; and
- sustainability.

53. Following the withdrawal of the UK from the European Union (EU), the EU have agreed to a Trade and Cooperation Agreement (TCA). The TCA sets out fisheries rights and confirms that from 01 January 2021 and during a transition period until 30 June 2026, the UK and EU vessels will continue to access respective Exclusive Economic Zones (EEZs) (12 nm to 200 nm) to fish. In this period, EU vessels will also be able to fish in specified parts of UK waters between 6 nm and 12 nm.

54. Over the five-year transition period, 25% of the EU's fisheries quota in UK waters will be transferred to the UK; 15% in year one, most of this quota has already been transferred and distributed across the four nations of the UK. After the five-year transition there will be annual discussions on fisheries opportunities. Across the commercial fisheries regional study area, where UK fisheries primarily target non-quota shellfish species, it is expected that fleets are unlikely to be impacted by quota transfers. It is possible that UK vessels will seek to exploit additional quota-species opportunities, but vessels would need to access quota holdings.

55. Market changes have the potential to impact fishing activity in the commercial fisheries local and regional study areas; including the potential reestablishment of the historic 'small' haddock fishery. In terms of future baseline scenarios, it is therefore possible, for example, that the UK fleet will more heavily target haddock given the potential return of processing and market for this product.

56. Further information is presented in volume 2, chapter 12.

Shipping and navigation

57. For commercial vessels, potential future changes in traffic volumes are complex to predict, noting actual changes will be based on multiple factors including general market trends. Therefore, the Navigational Risk Assessment (NRA) (volume 3, appendix 13.1) has considered two independent scenarios of potential growth in commercial vessel movements of 10% and 20%. It is likely that commercial vessels will deviate to avoid any other future wind farm developments that are under construction or in operation. This is in line with vessel behaviours observed at other UK offshore wind farms including Seagreen 1 Offshore Wind Farm and Neart na Gaoithe Offshore Wind Farm.

58. It should also be considered that there may be an increase in vessels associated with offshore wind farm construction and operation as further future wind farm developments are developed. Furthermore, fluctuations in oil and gas vessel activity will depend on future development and/or decommissioning, which again is heavily dependent on market conditions and is therefore difficult to predict.

59. For commercial fishing and recreational vessel activity, there is similar uncertainty associated with long-term predictions given the limited reliable information on future trends upon which any firm assumptions can be made. Therefore, to ensure a conservative approach, 10% and 20% growth scenarios in commercial fishing vessel and recreational vessel movements have also been assumed in the NRA (volume 3, appendix 13.1).

60. Further information is presented in volume 2, chapter 13.

Aviation, military and communications

61. The North Sea Transition Authority (NSTA) Oil and Gas Authority (OGA) Annual Report and Accounts 2022-2023 (NSTA, 2023) reported a predicted decline in gas production and usage in following years. Oil and gas operators continue to find it difficult to predict production accurately as older fields mature and their reliability reduces. The Prime Minister's Office (PMO) and the DESNZ reported during July 2023 that the Prime Minister has committed to future oil and gas licensing rounds with two areas in the North Sea chosen as locations for carbon capture usage and storage clusters. The independent Climate Change Committee predicted around a quarter of the UK's energy demand will still be met by oil and gas when the UK reaches net zero in 2050, the Government states that it is taking steps to slow the rapid decline in domestic production of oil and gas, which will secure UK domestic energy supply and reduce reliance on hostile states.

62. At present there is an appraisal well, with permits scheduled to expire in January 2024, to the north-east of the Array. However, as old oil and gas fields are decommissioned it is considered that helicopter use to oil and gas platforms associated with these fields will eventually decline; however, as helicopter support to offshore wind increases it is expected that there may be increased aviation activity as new offshore areas are developed to support net zero targets.

63. Based on the timings of the development of the Array, the baseline environment for the aviation, military and communications assessment is not expected to change. The present airspace construct or usage, civil and military aviation, above and around the Array is not expected to change significantly.

64. Further information is presented in volume 2, chapter 14.

Offshore energy projects, offshore cables, pipelines and subsea communications infrastructure

65. Oil and gas are vital to Scotland and were responsible for nearly 90% of the country's primary energy in 2015. Although the sector is seen as a critical and integral component to the economy, support for oil and gas programs moving forward will be conditional on the sector's actions to facilitate sustainable energy transitions for the future (Scottish Government, 2021). Furthermore, a new leasing round called the Innovation and Targeted Oil and Gas (INTOG) leasing round, was opened in August 2022 to deliver a new round of offshore wind leases that aim to help decarbonise the production energy utilised on the oil and gas industry's platforms and infrastructure in the North Sea (Offshore Wind Scotland, 2023). Further details about the future baseline environment for oil and gas activity in the vicinity of the Array can be found in volume 2, chapter 15.

66. There is potential for significant growth in offshore wind energy within Scotland, with the Scottish Government setting out plans to increase offshore wind capacity by 11 GW of energy installed by 2030 (Scottish Government, 2023b). Scotland currently has 10.2 GW of projects at various stages of development. The floating wind projects awarded by the ScotWind leasing round and INTOG leasing round are expected to generate approximately 19.3 GW and 5.5 GW, respectively. The total generating capacity of all the awarded floating wind sites is therefore expected to be approximately 24.7 GW (Offshore Wind Scotland, 2023). The Array is one of 13 projects in the ScotWind leasing round based on floating technology (The Crown Estate, 2022). Notably, Morven and Bellrock Offshore Wind Farms will be located 6 km and 9 km from the Array, respectively, if they surpass the pre-planning stage.

67. The future baseline scenario for offshore cables, carbon capture storage, natural gas storage and underground coal gasification is subject to gradual change as new projects and/or sites are further identified.

68. Further information is presented in volume 2, chapter 15.

Climatic effects

69. The future baseline for major accidents and disasters will evolve along a number of factors over the Array lifecycle.

70. Climate change is predicted to lead to a number of changes including: an increase in peak rainfall intensities; wetter winters and drier warmer summers; and a rise in sea level. It is anticipated that there will be an increased frequency of lightning strikes and wind gusts. Climate change is expected to alter the prevalence of extreme weather conditions which could lead to a disaster during different project phases (e.g. increased wind gusts impacting the construction phase or increased lightning strike frequency increasing risks during the operation and maintenance phase).

71. The magnitude of changes brought about by climate change is uncertain, but UK climate projections (UK CP18) are available until the end of the 21st century. The anticipated impact of climate change on environmental conditions is considered in volume 2, chapter 17. The effects of climate change on anticipated weather conditions within the construction phase are anticipated to be minimal.

72. The future baseline GHG emissions for existing land use (seabed) without the Array are expected to remain similar to that of the existing baseline environment. The future baseline for electricity generation that would be displaced by the Array depends broadly on future energy and climate policy in the UK and more specifically, on the demand for operation of the Array compared to other generation sources available. This, in turn, is influenced by commercial factors and National Grid's needs. Further details can be found in the GHG technical report (volume 3, appendix 17.2).

73. In the next decade to two decades, within the operating lifetime of the Array, anthropogenic climatic changes are expected to become more apparent. It is expected that sea surface temperatures will continue to increase in the 21st century, with global mean sea surface temperatures predicted to increase by approximately 2.9°C by 2100 under Representative Concentration Pathway (RCP) 8.5[1]. Sea temperatures in Northern Europe (including the North Sea) are predicted to rise at a greater rate than the global average, with temperatures predicted to increase by approximately 3.4°C under RCP8.5 in the same time period. Ocean acidification is anticipated to increase, with a fall in surface pH by 0.4 units by 2100 under RCP8.5 (IPCC, 2021).

74. Average sea level rise around the UK is expected to increase by 1 m by 2100, though a lesser rise is anticipated in the north of the UK. The east coast of Scotland can expect to see an average sea level rise of approximately 0.5 m to 0.6 m by 2100 (Palmer *et al*, 2018). The average wave height is predicted to decrease around much of the UK at a factor of about 10% to 20% over the 21st century, with average wave heights in the central North Sea predicted to reduce by 0.5 m. However, owing to variation between different models, confidence in projected sea wave height changes is low (Jaroszweski *et al*., 2021). Further information has been presented within the climate change risk assessment technical report (volume 3, appendix 17.1).

75. Further information is presented in volume 2, chapter 17.

16.7.3. DATA LIMITATIONS

76. The data sources used in this chapter are based on the existing studies, datasets and limitations presented within the chapters listed in paragraph 14.

77. The data presented are the most up to date publicly available information which can be obtained from the applicable data sources cited in the relevant chapters. The data are therefore limited by what is available and by what has been made available, at the time of writing the Array EIA Report. It is considered that the data employed in the assessment are robust and sufficient for the purposes of the assessment of effected presented.

16.8. METHODOLOGY FOR ASSESSMENT OF EFFECTS

16.8.1. OVERVIEW

78. The major accidents and disasters assessment of effects has followed the methodology set out in the following guidance:

- Major Accidents and Disasters in EIA: A Primer (IEMA, 2020).

79. This methodology directed the assessment to focus on low likelihood but potentially high consequence events such as major spill, explosion, fire, etc. Minor incidents, including spills and sediment loss, are addressed in the Array EIA Report in the relevant topic chapters and this chapter therefore focuses on major events only.

80. The methodology followed three steps: screening, scoping and assessment. The screening stage aimed to identify whether a development is vulnerable to major accidents and/or disasters and to consider whether a development could lead to a significant effect. The scoping stage determined in more detail whether there is potential for significant effects to arise as a result of a major accident and/or disaster associated with a development. The assessment stage provided further understanding of the likelihood of a risk event occurring and identified the requirement for further mitigation.

81. In addition, the major accidents and/or disasters assessment of effects has considered the legislative framework as defined by the HSWA 1974 and its relevant statutory provisions, although it should be noted that under UK's health and safety legislation, Health and Safety Executive (HSE) does not have a role in examining risk or hazard assessments unless the circumstances are covered by specific regulations.

16.9. MEASURES ADOPTED AS PART OF THE ARRAY

82. As part of the Array design process, a number of designed in measures have been proposed to reduce the potential for impacts within the following chapters (outlined in Table 16.4):

- volume 2, chapter 12: Commercial Fisheries;
- volume 2, chapter 13: Shipping and Navigation;
- volume 2, chapter 14: Aviation, Military, Communications;
- volume 2, chapter 15: Infrastructure and Other Users; and
- volume 2, chapter 17: Climate Effects.

83. As there is a commitment to implementing these measures described within each chapter listed above, they are considered inherently part of the design of the Array and have therefore been considered in the assessment presented in 16.10. These measures are considered standard industry practice for this type of development.

[1] The RCP scenarios describe different climatic futures, all of which are considered possible depending on the volume of GHGs emitted. These provide the basis for future assessments of climate change and possible response strategies, thereby giving a low to high range in potential global GHG reduction initiatives and resulting rate of climatic effects over a given period. Refer to volume 3, appendix 17.2 for more information on RCP scenarios.

Table 16.4: Designed In Measures Adopted as Part of the Array

Relevant Chapter(s)	Designed In Measures Adopted as Part of the Array	Justification
Volume 2, chapter 12	Development of, and adherence to an Environmental Management Plan (EMP)	To ensure adequate environmental controls are in place across the project to manage and mitigate any potential risk to the environment. Measures will cover all aspects of environmental management including environmental awareness training, auditing, environmental reporting and waste management. It is anticipated that the Marine Pollution Contingency Plan (MPCP) and Invasive and Non-Native Species Management Plan (INNSMP) will be appendices to the overarching EMP (volume 4, appendix 21).
Volume 2, chapter 12	Fisheries liaison	Appointment of a Fisheries Liaison Officer (FLO) and use of Offshore FLOs (OFLO) as required to enable ongoing liaison with fishing fleets to be maintained. Adherence to appropriate guidance with regards to fisheries liaison and mitigation procedures in the event of interactions between the proposed development and fishing activities, (i.e. Fisheries Liaison with Offshore Wind and Wet Renewables Group (FLOWW) guidance). An appropriate fisheries liaison strategy will be implemented to reduce the risk of any major accidents or disasters resulting from fisheries interactions.
Volume 2, chapter 12, 13 and 17	Completion of, and adherence to a Cable Burial Risk Assessment (CBRA)	The CBRA will consider relevant activities in the vicinity of inter-array and interconnector cables and confirm appropriate means of protection taking account of the final inter-array and interconnector cable. The CBRA will identify the appropriate target burial depth to ensure the cable remain buried, or appropriately protected, where target burial depths cannot be achieved, for the duration of Ossian, to minimise the risk of interaction with other sea users or cable exposure.
Volume 2, chapter 12, 13 and 15	Apply for and implement safety zones during major construction and operation and maintenance activities	Application for safety zones up to 500 m around structures where vessels are undertaking construction work during construction and periods of major operation and maintenance and 50 m around partially completed or completed but not yet fully commissioned surface piercing structures during construction. Advisory temporary safe passing distances to be promulgated to mariners, including fishermen, around installation/maintenance vessels actively engaged in works.
Volume 2, chapter 12 and 13	The development of, and adherence to, a Cable Plan (CaP) confirming final cable arrangements are in accordance with this EIA	Preparation and implementation of a Cable Plan including a refined cable route and layout, final cable laying approach and confirmation of target burial depths with reference to a CBRA. The CaP will confirm adherence to relevant good practice and health and safety requirements to ensure safe and efficient operations during cable installation. Appropriate cable burial depths will ensure cables are adequately protected and do not pose a risk to other sea users.
Volume 2, chapter 12, 13 and 17	Development of, and adherence to, an Operation and Maintenance Programme (OMP)	Preparation and implementation of a robust OMP to maintain the integrity of Ossian infrastructure and ensure safe and efficient operations.
Volume 2, chapter 12 and 13	Appropriate marking of structures on UK Hydrographic Office (UKHO) Admiralty Charts and other electronic charts as appropriate	Ensure the appropriate marking of structures on UKHO Admiralty Charts to maximise the awareness of the Array allowing vessels to plan their passage in advance.
Volume 2, chapter 12	Development of, and adherence to, a Fisheries Management and Mitigation Strategy (FMMS)	The FMMS will set out the means of ongoing fisheries liaison through construction and operation and maintenance phases of the Ossian and detail any mitigation measures of relevance to commercial fisheries to be put in place (volume 4, appendix 23). The FMMS will ensure safe coexistence as far as practicable and where safe to do so and reduce any risk of interaction with fish vessels and gear.
Volume 2, chapter 12 and 13	Development of, and adherence to an Navigational Safety and Vessel Management Plan (NSVMP)	The NSVMP will confirm the types and numbers of vessels that will be engaged in activities associated with the Array, and consider vessel coordination including indicative transit route planning (Marine Coordination) (volume 4, appendix 24). All contractors undertaking works to be contractually obliged to ensure compliance with standard offshore policies, including those that prohibit the discarding of objects or materials overboard and that require the rapid recovery of accidentally dropped objects where feasible. Development and issue of a Code of Conduct to all project vessel operators to advise on how to avoid impacts on marine megafauna and interference with fishing activities. Compliance of all project vessels with maritime regulations as adopted by the relevant flag state including the Convention on the International Regulations for Preventing Collisions at Sea (COLREGs) (International Maritime Organization (IMO), 1974a) and the International Convention for the Safety of Life at Sea (SOLAS) (IMO, 1974b).
Volume 2, chapter 12, 13 and 14	Development of, and adherence to a Lighting and Marking Plan (LMP)	The LMP will confirm compliance with legal requirements with regards to shipping, navigation and aviation marking and lighting (volume 4, appendix 26). Navigational aids and marine charting so that other marine users are made aware of the location of the Array. Consideration of MGN 654 with respect to wind turbine design and construction, so that recognised safe standards are met with regards to navigational safety and emergency response (search and rescue, salvage and towing, counter pollution). Adherence with the provisions of the COLREGs for all contracted vessels, including the display of appropriate lights and shapes such as when vessels are restricted in their ability to manoeuvre.

Relevant Chapter(s)	Designed In Measures Adopted as Part of the Array	Justification
Volume 2, chapter 12	Installation of remote discrete condition monitoring equipment	Installation of appropriate system, such as sensors, cameras, dataloggers, etc. to ensure the safe and efficient operation of the Array infrastructure.
Volume 2, chapter 12	Completion of post-installation hydrographic surveys of the Array and periodic hydrographic surveys in accordance with the IHO Order 1a survey standard as per the MGN 654 requirements	Minimises the risks of underwater allision with cable protection, anchor or fishing gear interaction with subsea cables and interference with magnetic position fixing equipment. Damage, destruction or decay of cables notified to the MCA, Northern Lighthouse Board (NLB), Kingfisher and UKHO no later than 24 hours after discovered.
Volume 2, chapter 12	Compliance with MGN 654 and its annexes (in particular Search and Rescue (SAR) annex 5 and completion of a SAR checklist) where applicable	Ensures the final Array layout is suitable for SAR operations and that reductions in underkeel clearance are acceptable.
Volume 2, chapter 12	The development of, and adherence to, a Scour Protection Management Plan (SPMP)	There is the potential for scouring of seabed sediments to occur due to interactions between metocean regime (wave, sand and currents) and foundations or other seabed structures. This scouring can develop into depressions around the structure that if left unmanaged could comprise the integrity of structures. Therefore the use of scour protection around offshore structures and foundations will be employed, where required, to mitigate the risk of any accidents or disasters resulting from scour (volume 4, appendix 25).
Volume 2, chapter 13	Use of guard vessel(s) as required by risk assessment	Maximises awareness of temporary hazards, and ensures vessel presence where necessary to alert passing mariners to a hazard.
Volume 2, chapter 13, 14 and 17	Development of, and adherence to, a Development Specification and Layout Plan (DSLP) to confirm the final layout and design in consultation with the MCA and NLB	Ensures the final Array layout is suitable for both surface and air based (for SAR purposes) navigation and is compliant with MGN 654. Will also confirm adherence to key project design conditions including ensuring a safe underkeel clearance is maintained around mooring line arrangements.
Volume 2, chapter 13	Establishment of a Marine Coordinator and communication procedures to manage project vessel movements	Ensure project vessels are suitably managed to minimise the likelihood of involvement in incidents and ensure the safe operation during all phases of project development. Increases the ability to assist in the event of a third-party incident.
Volume 2, chapter 13	Minimum blade tip clearance height of 36 m above lowest astronomical tide (LAT)	This minimises the risk of blade allision particularly for sailing vessels with a mast and surpasses the requirements set by the Royal Yachting Association (RYA) policy (RYA, 2019) and MGN 654 (MCA, 2021)..
Volume 2, chapter 13	Construction Method Statement (CMS)	The CMS will confirm certain construction activities and how these will be managed. This will include plans on wet storage within the Array.
Volume 2, chapter 12 to 15	Promulgation of information through timely and efficient posting of Notices to Mariners (NtM), Kingfisher Bulletins and navigational warnings, as appropriate. Information will include but not be limited to vessel routes, timings and locations, safety zones and advisory safe passing distances as required	Maximises awareness of the Array allowing vessels to passage plan in advance.
Volume 2, chapter 13 and 17	Compliance with the Regulatory Expectations on Moorings for Floating Wind and Marine Devices (HSE and MCA, 2017)	Ensure that the final design is appropriately designed, constructed to an appropriate standard and structural integrity maintained during the operation and maintenance phase of the project.
Volume 2, chapter 13 and 17	All Array infrastructure will be subject to Third Party Verification (TPV)	Ensure that the final design is appropriately designed, constructed to an appropriate standard and structural integrity maintained during the operation and maintenance phase of the project.
Volume 2, chapter 14	Notification to the Defence Geographic Centre (DGC) and NATS	Information regarding construction will be passed to the DGC (at dvof@mod.gov.uk) at least 10 weeks in advance of the obstacle type(s) erection detailing position, height (tip of arc) and type of aviation lighting. Once reported, all will be included in the DGC Obstruction database and all that meet aviation chart inclusion criteria will be published for broader awareness. Appropriate information about the site construction and any associated lighting (where applicable), for example the height and temporary location of construction cranes, should be provided to NATS AIS (for promulgation in applicable aviation publications including the UK Integrated Aeronautical Information Package (IAIP)) (CAA, 2023a).
Volume 2, chapter 13 and 14	Development and implementation of an ERCoP	In line with MGN 654 (MCA, 2021) Annex 5 SAR requirements
Volume 2, chapter 15	Engagement with oil and gas operators	The Applicant will seek to engage early with oil and gas operators and, where possible and appropriate to do so, coordinate activities to facilitate coexistence.
Volume 2, chapter 17	Safety provisions within the wind turbine generator to include automatic shutdowns/lockdowns with to ensure turbines do not exceed maximum operational rotational speeds	Enable the Array to be resilient to future climate change, in particular from the risk of overheating from temperature changes and increased frequency and intensity of extreme weather.
Volume 2, chapter 17	The OSP electrical plant will be located within an internal structure. Appropriate cooling plant will be designed to account for a range of temperature conditions	Ensure appropriate, robust design and enable the OSP to be resilient to the known environmental conditions and potential future changes.
Volume 2, chapter 17	Application of anti-corrosion protective coatings, accounting for sea level rise	Enable the Array to be resilient to future climate change, in particular from the risk of increased sea temperatures, ocean acidification and sea level rise.
Volume 2, chapter 17	Completion of a UXO Risk Assessment and clearance to be undertaken in advance of construction activities	All UXO detonation will be subject to a risk assessment completed in accordance with relevant guidance including PUB C754 Assessment and management of UXO risk in the marine environment (Construction Industry Research and Information Association (CIRIA), 2015). The project is committed to using low order detonation techniques as far as technically feasible to reduce the risk to the environment and of any accidents relating to clearance activities.

16.10. ASSESSMENT

16.10.1. IDENTIFICATION AND SCREENING

84. Following the guidance outlined within the IEMA (2020) and given the location of the Array, the Array has a vulnerability to major accidents and/or disasters and therefore has been screened into assessment included in this Array EIA Report. Hazards have been scoped out if it is concluded that there is no potential vulnerability to and of the Array to cause or be impacted by major accidents and/or disasters. If the hazard is scoped out it is not considered further in this chapter (Table 16.5).

85. Although there are a significant number of designed in measures in place, a full assessment of the vulnerability of the Array to risks of major accidents and disasters have been undertaken with consideration given to the potential for the Array to result in a major accident or disaster.

16.10.2. SCOPING

86. The scoping stage determines whether there is potential for significant effects as a result of major accidents and/or disasters associated with a development considering the designed in measures.

87. During the scoping stage, consideration was given to whether accidents and/or disasters should be scoped in or out of the assessment stage for the Array. In line with the IEMA (2020) guidance, hazards which met the following criteria have not been taken forward to the risk assessment and have been scoped out:

- the Array is not vulnerable to the hazard, or will not cause the hazard;
- the hazard is unlikely to result in effects that cause a fatality, multiple fatalities, permanent injury, widespread of irreversible harm or damage i.e. would not result in a major accident and/or disaster;
- there is either no credible pathway or receptor in terms of EIA Regulations; and
- the accident involves a workplace hazard, which can only impact the workers undertaking the task such as falls from height or misuse of tools. This is considered to be an occupational health and safety incident which is managed through compliance with the Management of Health and Safety Work Regulations and not the intended purpose of EIA (see paragraph 89).

88. Under IEMA (2020) guidance, other sources of information were used to identify potential hazards on a regional and national scale. These documents were as follows:

- National Risk Register (HM Government, 2023); and
- Community Risk Register (North Scotland) (Regional Resilience Partnership (RRP), 2022).

89. In line with the IEMA guidance (IEMA, 2020), standalone risk assessments for major accidents and disasters have not been undertaken as existing public sources of data are available to inform the baseline. The sources used are detailed in each of the chapters summarised below. As detailed in paragraph 87, work hazards are exempt from the scope of this assessment as these hazards are managed through relevant HSE legislation.

90. Table 16.5 outlines the scoping of the vulnerability of the Array to the baseline anthropogenic sources of hazards which have potential for significant adverse effects.

91. In addition to the existing baseline procedures, the Array will introduce additional pressures that may give rise to the potential for accidents to impact on the receiving environment, these are listed in Table 16.6. As before, each pressure is assessed individually and scoped in/out of further assessment and a justification for scoping is provided.

92. The Array includes designed in measures adopted as part of the Array that will reduce the potential for any accidents during construction, operation and maintenance and decommissioning. These are outlined in Table 16.6.

Table 16.5: Scoping of Vulnerability of the Array to Existing Major Accidents and Disasters

Source of Hazard	Phase[2]			Scoped Out	Justification
	C	O	D		
Collision risk – Shipping and Navigation	✓	✓	✓	×	Potential for collision risk from existing shipping and navigation receptors impacting on the construction, operation and decommissioning of the Array (volume 2, chapter 13).
Collision risk - Aviation	×	✓	×	×	Potential for collision risk from existing aviation receptors in the area impacting on the operation and maintenance of the Array (volume 2, chapter 14).
Snagging risk – Commercial Fisheries	✓	✓	✓	×	Potential for snagging risk from existing commercial fisheries receptors impacting on the construction, operation and maintenance and decommissioning of the Array (volume 2, chapter 12).
Risk of accident – Oil and Gas	✓	✓	✓	×	Potential for major accident or disaster related to oil and gas infrastructure to significantly impact on the construction, operation and maintenance or decommissioning of the Array as physical overlap is identified with three active hydrocarbon blocks (volume 2, chapter 15).
Risk of accident – Cables and pipelines	×	×	×	✓	No potential identified for a major accident or disaster related to cables and pipelines to significantly impact on the construction, operation and maintenance or decommissioning of the Array as no physical overlap is identified, resulting in no impact pathway (volume 2, chapter 15) and therefore this impact has been scoped out.
Risk of accident – COMAH establishments	×	×	×	✓	The nearest COMAH site is Schlumberger Oilfield UK Limited which is located approximately 80.5 km north-west of the Array and hence due to the separation distance there is negligible potential for this site to impact the Array or vice versa and the hazard has been scoped out.
Temperature changes	×	×	×	✓	The predicted rate of change in ambient and extreme temperatures within the North Sea over the 35 year lifetime of the Array is not significant for infrastructure such as wind turbines and OSPs. These structures are designed to withstand wider temperature ranges in all European climates and as such potential temperature changes does not pose a significant risk of hazard or accident to the Array and therefore has been scoped out. (volume 2, chapter 17).
Precipitation changes	×	×	×	✓	Given the location of the Array, the predicted changes in precipitation have no potential for a significant hazard or accident to the Array and therefore has been scoped out (volume 2, chapter 17).
Sea level rise and storm surge	×	×	×	✓	The platform heights for both wind turbines and OSPs have been designed at heights well above the worst-case wave height and/or storm surge to protect personnel. In this regard, the projected sea level rise will have negligible impact on the Array and therefore has been scoped out (volume 2, chapter 17).

[2] C = Construction, O = Operation and maintenance, D = Decommissioning

Source of Hazard	Phase[2] C	O	D	Scoped Out	Justification
Extreme weather	×	×	×	✓	Extreme weather events such as strong winds will require a temporary shutdown of the turbines impacting on the generation capacity of the Array. However, the structural design of the foundations and wind turbines compiles with the relevant standards for offshore installations in Northern Europe and there is no significant risk of hazard or accident to the Array and therefore has been scoped out (volume 2, chapter 17). Due to the floating nature of the Array, the likeliness of loss of wind turbine in extreme weather conditions must be considered and mitigation measures put in place. Developers are required to arrange Third Party Verification (TPV) of the mooring systems to an independent and competent person/body. Considering that for a total loss of wind turbine to occur, all six moorings in place per foundation would be required to fail, the potential for loss of wind turbine is considered to represent a low frequency event. There have been no reports to date of loss of wind turbines from floating UK offshore wind farms.

93. In addition to the existing baseline procedures, the Array will introduce additional pressures that may give rise to the potential for accidents to impact on the receiving environment, these are listed in Table 16.6. As before, each pressure is assessed individually and scoped in/out of further assessment and a justification for scoping is provided.

94. The Array includes designed in measures adopted as part of the Array that will reduce the potential for any accidents during construction, operation and maintenance and decommissioning. These are outlined in Table 16.6.

Table 16.6: Scoping of Vulnerability of the Array to Cause Major Accidents and Disasters

Source of Hazard	Phase[3] C	O	D	Scoped Out	Justification
Collision risk – Shipping and Navigation	✓	✓	✓	×	The Array comprises of an area approximately 859 km^2 and is located approximately 80 km south-east of Aberdeen. There will be a series of vessels required for all stages of the Array, therefore there is potential for collision/allision involving said vessels (volume 2, chapter 13). Over the site preparation and construction phase up to 7,902 vessel return trips may be required comprised of survey vessels, boulder clearance vessels, Geotech survey vessels, sand wave clearance vessels, UXO clearance vessels, installation vessels, cargo barges, support vessels, tug/anchor handlers, cable installation vessels, guard vessels, crew transfer vessels (CTVs), trenching support vessels, Pre Lay Grapnel Run (PLGR) vessels, rock dumping vessels and dive support vessels (DSVs). During the 35-year operation and maintenance phase up to 508 vessel return trips may be required comprised of CTVs, tug/anchor handlers, jack-up vessels, cable repair vessels, Construction Support Vessels (CSVs) and DSVs. Wherever possible, routine maintenance will be undertaken while the wind turbine is *in-situ* (i.e. at the Array), however, on occasion wind turbines may need to be removed from the Array and towed to an operation and maintenance port facility for any major component replacements, or similar. The decommissioning sequence will generally be the reverse of the construction sequence and involve similar types and numbers of vessels and equipment.
Collision risk - Aviation	×	✓	×	×	Potential for collision risk from existing aviation in the area impacting on the construction, operation and decommissioning of the Array (volume 2, chapter 14).
UXO	✓	×	×	×	UXO within the Array has the potential, if detonated, to cause significant adverse impact to human health and existing assets in the area such as the Array infrastructure and/or third party property (volume 2, chapter 10).
Pollution of the marine environment (vessels)	✓	✓	✓	×	During all stages of the development of the Array there is potential for pollution of the marine environment resulting from vessels associated with the Array (volume 2, chapter 13). During the operational and maintenance phase of the Array, there may be up to 508 vessel round trips per year which, as with the construction and decommissioning phase, will contain fuels/oils/lubricants that pose a risk to the marine environment in the event of a major spill (volume 2, chapter 13).
Pollution of the marine environment (structures)	×	✓	×	✓	Accidental pollution is effectively managed by implementation of a Marine Pollution Contingency Plan (MPCP) and an Environmental Management Plan (EMP) (volume 4, appendix 21). This has been scoped out of the assessment (volume 2, chapter 8 and 9).
Fire at wind turbine/OSPs	✓	✓	✓	×	During all stages of the development of the Array there is potential for fire at wind turbine or the OSPs. Fires could be caused by electrical system faults, explosions, lightning strikes and therefore must be considered in this assessment.
Snagging risk – Commercial Fisheries	✓	✓	✓	×	Potential of snagging risk (damage or loss of fishing gear) to existing commercial fisheries in the area impacting from the operation of the Array (volume 2, chapter 12).

16.10.3. ASSESSMENT

95. Following the guidance outlined within IEMA (2020) all scoped in risk events have been assessed, both in terms of the Array potential vulnerability to existing major accident and/or disasters and in terms of its potential to cause accidents/disasters. Multidiscipline impacts, designed in measures and the potential requirement of additional mitigation measures are considered in assessing whether each potential risk event is being managed to an acceptable level.

96. Table 16.7 details the assessment of vulnerability of and potential for the Array to be impacted or cause major accidents and/or disasters.

[3] C = Construction, O = Operation and maintenance, D = Decommissioning

Table 16.7: Assessment of Vulnerability of and Potential for the Array to be Impacted or Cause Accidents and/or Disasters

Risk Event	Source and/or Pathways	Receptor(s)	Source Document	Reasonable Worst Consequence if Event Did Occur	Are Cross Disciplinary Impacts Likely?	Designed in/Control Measures	Could this Reasonably[4] Lead to a Major Accident and/or Natural Disaster with Existing Control Measures in Place?	Is the Reasonable Worst Consequence Managed to an Acceptable Level with Existing Control Measures in Place?	If no, what Secondary Control Measures are Required to Reach an Acceptable Level?
Vulnerability of the Array to Existing Accidents/Disasters									
Collision and allision risk – Shipping and Navigation	Source: Other vessels Pathway: overlapping marine environment	Project vessels and infrastructure	Volume 2, chapter 13	Severe damage to vessel/s, personal injury, and loss of fuel/cargo inventory to marine environment	Yes – inventory loss could result in impact to various marine disciplines	As detailed in Table 16.4 (volume 2, chapter 14)	No	Yes	Not required
Collision risk - Aviation	Source: Low flying aircraft Pathway: airspace in project area	Project surface infrastructure	Volume 2, chapter 14	Severe damage to surface infrastructure e.g. wind turbines	No	As detailed in Table 16.4 (volume 2, chapter 14) ERCoP	No	Yes	Not required
Snagging risk – Commercial Fisheries	Source: Commercial fishing vessels Pathway: overlapping marine environment	Project subsea infrastructure	Volume 2, chapter 12	Severing of cable connection and/or damage to cable	No	As detailed in Table 16.4 (volume 2, chapter 14)	No	Yes	Not required
Risk of accident – Oil and Gas	Source: Hydrocarbon blocks Pathway: overlapping marine environment	Project infrastructure	Volume 2, chapter 15.	Severe damage to infrastructure e.g. explosions	No	As detailed in Table 16.4 (volume 2, chapter 15)	No	Yes	Not required
Potential for the Array to Cause Accidents/Disasters									
Collision and allision risk – Shipping and Navigation	Source: project vessels/infrastructure Pathway: overlapping marine environment	Other vessels	Volume 2, chapter 13	Severe damage to or loss of vessel and loss of fuel/cargo inventory to marine environment Loss of wind turbine during towing of wind turbine to port for maintenance	Yes – inventory loss could result in impact to various marine disciplines	As detailed in Table 16.4 (volume 2, chapter 13) ERCoP Procedures for the towing of substructures are considered in the NSVMP (volume 4, appendix 24)	No	Yes	Not required
Collision risk – Aviation	Source: low flying aircraft Pathway: airspace in project area	Other aircraft	Volume 2, chapter 14	Severe damage to or loss of aircraft and loss of fuel/cargo inventory to marine environment	Yes – inventory loss could result in impact to various marine disciplines	As detailed in Table 16.4 (volume 2, chapter 14) ERCoP	No	Yes	Not required

[4] The reasonable worst-case scenario anticipated, considering the likely severity and duration. A reasonable worst-case scenario is the worst plausible, not most likely, manifestation of the risk in question.

Risk Event	Source and/or Pathways	Receptor(s)	Source Document	Reasonable Worst Consequence if Event Did Occur	Are Cross Disciplinary Impacts Likely?	Designed in/Control Measures	Could this Reasonably[4] Lead to a Major Accident and/or Natural Disaster with Existing Control Measures in Place?	Is the Reasonable Worst Consequence Managed to an Acceptable Level with Existing Control Measures in Place?	If no, what Secondary Control Measures are Required to Reach an Acceptable Level?
UXO	Source: ordnance detonation Pathway: North Sea	Marine mammals, fish and shellfish, benthic ecology, human health, existing third party vessels and project vessels and infrastructure	Volume 2, chapter 10	Injury and disturbance to marine mammals, fish and shellfish and benthic ecology from elevated underwater noise during UXO detonation. Physical impact to third party vessels and property as well as the Array through uncontrolled explosions.	Yes – injury and disturbance to marine mammals, fish and shellfish and benthic ecology. Potential impact on human health. Potential impact on water quality in the event of any fuel/chemical loss and subsequent impact on biodiversity. Damage to material assets.	As detailed in Table 16.4 ERCoP	Yes, however several designed in measures are adopted as part of the Array to minimise the risk. There is a commitment to use low order deflagration for UXO clearance where technically possible. Further details can be found in table 10.20 of volume 2, chapter 10 and in appendix 22.	Yes	Not required
Pollution of the marine environment (vessels)	Source: project vessels Pathway: North Sea	Marine mammals, fish and shellfish and benthic ecology	Volume 2, chapter 13	Severe damage to vessel and loss of fuel or cargo inventory to marine environment	Yes – inventory loss could result in impact to various marine disciplines.	As detailed in Table 16.4 (volume 2, chapter 13), alongside adherence to the EMP and MPCP (volume 4, appendix 21). ERCoP	No	Yes	Not required
Fire at wind turbine/OSPs	Source: OSP Pathway: North Sea and atmosphere	Water and air quality	Volume 2, chapter 17 Array EIA Scoping Report (Ossian OWFL, 2023)	Short-term, localised impact to water quality Measurable atmospheric emissions	Yes – fire could result in impacts to air and water quality	All potential air quality impacts were scoped out of further assessment (Ossian OWFL, 2023) ERCoP	No	Yes	Not required
Snagging risk – Commercial Fisheries	Source: Array subsea infrastructure Pathway: overlapping marine environment	Commercial fishing vessels	Volume 2, chapter 12	Severe damage to or loss of fishing equipment and personal injury	No	As detailed in Table 16.4 (Commercial Fisheries)	No	Yes	Not required

16.11. CUMULATIVE, TRANSBOUNDARY AND INTER-RELATED EFFECTS ASSESSMENT

97. During the construction phase it is noted that there will be a need to tow floating substructures out of port. There may also be a need to tow floating substructures to and from the port during the operation and maintenance phase for maintenance purposes (noting this is only likely to be needed for major component replacement). McMorland *et al.* (2022) states that when towing substructures to shore for major maintenance, tide, wind speeds and changes in conditions between deep and shallow water must be considered to avoid a failed transfer. These parameters will be considered when drafting the NSVMP.

98. Feedback received at the Hazard Workshop, held on 31 August 2023, highlighted that good seamanship and watchkeeping in compliance with COLREGS were key mitigations against potential major accidents and disasters as a result of towed substructures. All vessels involved in towing procedures will be lit and marked as required under COLREGS as a design in measure (Table 16.4). Procedures for vessels towing substructures will also be considered in the NSVMP (volume 4, appendix 24). The potential for the loss of wind turbine, impacts associated with this chapter and mitigation measures have been assessed and detailed in volume 2, chapter 13 and volume 3, appendix 13.1.

99. In terms of the cumulative effects of towing substructures, it is predicted that standard mitigation will be in place across all other offshore wind farms within the vicinity of the Array. No other floating wind farms are currently in the vicinity of the Array (volume 2, chapter 15) and it is likely that any future floating wind farms in the vicinity of the Array will adopt similar mitigation measures to that of the Array in terms of towing substructures to and from ports. It is therefore very unlikely that multiple substructures will be towed at the same time in the vicinity of one another. Furthermore, there have been no reports to date of loss of wind turbines from floating UK offshore wind farms.

100. As it has been concluded that the Array will not reasonably lead to a major accident or disaster after consideration of the designed in measures adopted, no assessment of inter-related or transboundary effects has been undertaken.

16.12. CONCLUSION

101. Information on major accidents and disasters was collected through a desktop review of the following chapters to establish the baseline for UXO, commercial fisheries, shipping and navigation, aviation, military and communications, offshore energy projects, offshore cables and pipelines, carbon capture, natural gas storage and underground gasification, oil and gas and climatic effects:

- volume 2, chapter 12: Commercial Fisheries;
- volume 2, chapter 13: Shipping and Navigation;
- volume 2, chapter 14: Aviation, Military, Communications;
- volume 2, chapter 15: Infrastructure and Other Users; and
- volume 2, chapter 17: Climate Effects.

102. The scoping stage of the assessment identified all possible major accidents and/or disasters that could be caused by the Array and examined the vulnerability of the Array to major accidents and/or disasters (Table 16.7), It was found that all reasonable worst consequences will be managed to an acceptable level with existing control measures in place.

103. By extension, as no localised impacts are predicted there are no predicted significant transboundary effects associated with major accidents and hazards.

16.13. REFERENCES

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