



LLŶR

LLŶR FLOATING OFFSHORE WIND PROJECT

Llŷr 1 Floating Offshore Wind Farm

Environmental Statement

Volume 4: Chapter 30 – Major Accidents and Disasters

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FLOVENTIS
ENERGY



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Acronyms and abbreviations

Acronym or abbreviation	Definition	Acronym or abbreviation	Definition
AIL	Abnormal Indivisible Loads	LMP	Lighting and Marking Plan
AIS	Autonomic Identification System	MARPOL	International Convention for the Prevention of Marine Pollution by Ships
ALARP	As Low As Reasonably Practicable	MCAA	Marine and Coastal Act 2009
ASLP	Aviation Lighting Scheme Plan	MCA	Maritime and Coastguard Agency
AONB	Area of Outstanding National Beauty	MCAA	Marine and Coastal Act 2009
ATBA	An Area to be Avoided	MCZ	Marine Conservation Zone
CAA	Civil Aviation Authority	MGN	Marine Guidance Note
CBRA	Cable Burial Risk Assessment	MNR	Marine Nature Reserve
CCA	Civil Contingencies Act	MPCP	Marine Pollution Contingency Plan
CDM	Construction Design and Management	MPS	Marine Policy Statement
CEMP	Construction Environmental Management Plan	NAVTEX	Notices to Mariners, Kingfisher Bulletins, Navigational Telex
COMAH	Control of Major Accident Hazards	NNR	National Nature Reserve
CSIP	Cable Specification and Installation Plan	NPS	National Policy Statement
CSM-RA	Common Safety Method on Risk Evaluation and Assessment	NRW	Natural Resources Wales
CTMP	Construction Traffic Management Plan	OfECC	Offshore Export Cable Corridor
EC	European Commission	OSPAR	Oslo and Paris Convention for the Protection of the Marine Environment of the North-East Atlantic
EIA	Environmental Impact Assessment	PDSA	Pre-Desk Study Risk Assessment
EPR	Environmental Permitting Regulations	PEMP	Project Environmental Management Plan (PEMP)
ERCoP	Emergency Response Cooperation Plan	PPE	Personal Protective Equipment
ES	Environmental Statement	SAC	Special Area of Conservation
ESCA	European Subsea Cables Association	SAR	Search and Rescue
EU	European Union	SOLAS	International Convention for the Safety of Life at Sea



Acronym or abbreviation	Definition	Acronym or abbreviation	Definition
HSC	Hazardous Substances Consents	SPZ	Source Protection Zone
HSE	Health and Safety Executive	SRA	Strategic Resource Area
HSWA	Health and Safety at Work Act	SWRF	South Wales Resilience Forum
ICPC	International Cable Protection Committee	SSSI	Site of Special Scientific Interest
IEMA	Institute of Environmental Management and Assessment	TSS	Traffic Separation Schemes
ISO	The International Standards Organization	UXO	Unexploded Ordnance
MA&D	Major Accidents and Disasters	WFD	Water Framework Directive
MAIB	Marine Accident Investigation Branch	WNMP	Welsh National Marine Plan
		WTG	Wind Turbine Generators

Glossary of project terms

Term	Definition
The Applicant	The developer of the Project, Llŷr Floating Wind Limited.
Array	All wind turbine generators, inter array cables, mooring lines, floating sub-structures and supporting subsea infrastructure within the Array Area, as defined, when considered collectively, excluding the offshore export cable(s).
Array Area	The area within which the wind turbine generators, inter array cables, mooring lines, floating sub-structures and supporting subsea infrastructure will be located.
As low as reasonably practicable (ALARP)	A description of a threshold at which the level of risk is compared against the time, money and effort associated with controlling it, which equates to the level at which a risk can reasonably be expected to be managed.
Disaster	An event, which may be natural or man-made, that has the potential to cause great damage or loss of life.
Floventis Energy	A joint venture company between Cierco Ltd and SBM Offshore Ltd of which Llŷr Floating Wind Limited is a wholly owned subsidiary.
Hazard	A non-malicious event that may cause harm.
Landfall	The location where the offshore export cable(s) from the Array Area, as defined, are brought onshore and connected to the onshore export cables (as defined) via the transition joint bays (TJB).
Llŷr 1	The proposed Project, for which the Applicant is applying for Section 36 and Marine Licence consents. Including all offshore and onshore infrastructure and activities, and all project phases.



Term	Definition
Major accident	An event that threatens immediate or delayed serious environmental damage to human health, welfare and/or the environment and requires the use of resources beyond those of the Applicant to manage.
Marine Licence	A licence required under the Marine and Coastal Access Act 2009 for marine works which is administered by Natural Resources Wales (NRW) Marine Licensing Team (MLT) on behalf of the Welsh Ministers.
Offshore Development Area	The footprint of the offshore infrastructure and associated temporary works, comprised of the Array Area and the Offshore Export Cable Corridor, as defined, that forms the offshore boundary for the S36 Consent and Marine Licence application.
Offshore Export Cable	The cable(s) that transmit electricity produced by the WTGs to landfall.
Offshore Export Cable Corridor (OfECC)	The area within which the offshore export cable circuit(s) will be located, from the Array Area to the Landfall.
Onshore Development Area	The footprint of the onshore infrastructure and associated temporary works, comprised of the Onshore Export Cable Corridor and the Onshore Substation, as defined, and including new access routes and visibility splays, that forms the onshore boundary for the planning application.
Onshore Export Cable(s)	The cable(s) that transmit electricity from the landfall to the onshore substation.
Onshore Export Cable Corridor (OnECC)	The area within which the onshore export cable circuit(s) will be located.
proposed Project	All aspects of the Llŷr 1 development (i.e. the onshore and offshore components).
Onshore Substation	Located within the Onshore Development Area, converts high voltage generated electricity into low voltage electricity that can be used for the grid and domestic consumption.
Pathway	The route or mechanism by which a source can reach the receptor.
Receptor	The component of the environment that could be affected by a source.
Risk	The product of the likelihood (hereafter referred to as 'probability') that an impact may occur and magnitude of such impact.
Risk Event	A term used to collectively describe MA&D hazards and threats.
Section 36 consent	Consent to construct and operate an offshore generating station, under Section 36 (S.36) of the Electricity Act 1989. This includes deemed planning permission for onshore works.
Serious damage	Serious damage includes the potential loss of life or permanent injury and/or permanent or long-lasting damage to an environmental receptor which cannot be restored through minor clean-up and restoration efforts and requires the use of resources beyond those of SZC Co. or its contractors to manage.
Significant environmental effect	Loss of life, permanent injury or temporary/ permanent damage of an environmental receptor that cannot be restored through minor clean-up and restoration.
Source	The origin of a hazard.
Source-pathway-receptor linkage	For a risk to arise there must be a source, a receptor, and a pathway between the two.
Threat	Malicious attacks



Term	Definition
Vulnerability	The potential for harm because of a risk event.



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30. MAJOR ACCIDENTS AND DISASTERS

30.1 Introduction

1. Llŷr Floating Wind Limited (hereafter the Applicant) is proposing to develop the Llŷr 1 Floating Offshore Wind Farm (hereafter referred to as the proposed Project), located approximately 35 km off the coast of Pembrokeshire in the Celtic Sea.
2. The proposed Project is a test and demonstration wind farm development, comprising up to 10 wind turbine generators (WTGs) with a rating of between 14 MW and 19 MW per turbine. The proposed Project will make landfall at Freshwater West before connecting into Pembroke Dock power station and the national grid network.
3. The Applicant is seeking a Section 36 consent and Marine Licence for Llŷr 1, and this chapter forms part of the Environmental Statement (ES) which is submitted in support of those consent applications. This chapter describes the potential impacts and effects of the proposed Project on major accidents and disasters during the construction, operation and maintenance and decommissioning phases, and includes mitigation and good practice measures to reduce the impacts of the proposed Project on major accidents and disasters.
4. The following sections identify specific legislation, policy and guidance that is applicable to the assessment of major accidents and disasters. Further detail on the wider legislation, policy and guidance relevant to this ES is provided in **Chapter 02: Regulatory and Planning Policy Context**.
5. The assessment has been undertaken by AECOM. Further details of the proposed Project Team's competency are provided in **Appendix 1A: Statement of Competence**.

30.2 Pre-Application

6. Consultation with statutory and non-statutory organisations is a key element of the EIA process. Consultation with regards to major accidents and disasters has been undertaken to inform the approach to, and scope of, the assessment.
7. Stakeholders for the proposed Project include statutory consultees, landowners, local communities and other sea users. In addition to the statutory consultation process, there has been ongoing engagement with statutory and non-statutory consultees to steer the development of the proposed Project as detailed in **Consultation and Stakeholder Engagement**.

30.3 Major accidents and disasters

8. The topic of Major accidents and disasters (MA&D) was introduced within Environmental Impact Assessment (EIA) through EU directive 2014/52/EU. This resulted in an amendment to the following EIA Regulations in 2017, requiring EIA to consider how the proposed Project will be vulnerable to major accidents and disasters:
 - The Electricity Works (Environmental Impact Assessment) (England and Wales) Regulations 2017: and
 - The Marine Works (Environmental Impact Assessment) Regulations 2007, (for projects requiring a marine licence under the Marine and Coastal Act 2009 (MCAA)). This was amended by the Marine Works (Environmental Impact Assessment (Amendment) Regulations 2017.
9. MA&D assessment requires the EIA to assess both a project's potential to cause accidents and/or disasters and the vulnerability of the project to potential accidents and/or disasters.



These disasters may be natural (e.g. meteorological events) or man-made (e.g. hazardous materials incidents).

10. The objective of carrying out a MA&D assessment of the proposed Project is to identify appropriate precautionary actions to prevent or mitigate potentially significant risks associated with the proposed Project. Considering MA&D in EIA allows potential mitigation strategies to be identified and implemented in the installation phase and during the operation of the proposed Project to minimise the risk of major accidents or disasters occurring.
11. It is stated in the EU Directive 2014/52/EU that EIA reports must now include a description of the expected significant adverse effects of the proposed Project on the environment deriving from the vulnerability of the proposed Project to risks, major accidents and/or disasters. This chapter, and supporting appendix, comply with the requirement of this Directive.

30.4 Legislation Policy and Guidance

12. The following legislation, planning policy and guidance documents have been considered in the preparation of this report. **Table 30-1** summarises the legislation that is relevant to the MA&D assessment.

Table 30-1 Key legislation relevant to MA&D assessment

Legislation	Summary
Directive 2014/52/EU Assessment of the Effects of Certain Public and Private Projects on the Environment amending Directive 2011/92/EU on the Assessment of the Effects of Certain Public and Private Projects on the Environment ('EIA Directive')	The EIA Directive (Ref. 1.7) provides the framework for the environmental assessment of public and private projects. Article 14 of the Directive includes reference to <i>"a Community approach on the prevention of natural and man-made disasters"</i> , and a requirement for MA&D to be considered as part of the EIA process. Article 15 of the Directive identifies the requirement for projects to ensure a high level of protection of the environment and establishes the need for precautionary actions to be taken. It also states that <i>"it is important to consider their vulnerability (exposure and resilience) to major accidents and/or disasters, the risk of those accidents and/or disasters occurring and the implications for the likelihood of significant adverse effects on the environment"</i> .
Health and Safety at Work etc. Act 1974 (HSWA)	This legislation places general duties on employers, people in control of premises, manufacturers and employees.
Oslo and Paris Convention for the Protection of the Marine Environment of the North-East Atlantic (OSPAR)	OSPAR is the mechanism by which 15 governments and the EU co-operate to protect the marine environment of the North-East Atlantic. The annex on biodiversity and ecosystems was adopted in 1998 to cover non-polluting human activities that can adversely affect the marine environment.



Legislation	Summary
	To prevent suspended sediment affecting benthic habitats during the jet trenching phase of cable installation, the 'OSPAR Commission Guidelines on Best Environmental Practice' in Cable Laying and Operation will be adhered to. This includes measures to: minimise the number of export cables that require trenching; avoid sensitive benthic habitats as part of the route design; and coordinate trenching activity to avoid critical life stages of benthic species (such as reproductive events like spawning).
Espoo (Environmental Impact Assessment) Convention	The Espoo (EIA) Convention sets out the obligations of Parties to assess the environmental impact of certain activities at an early stage of planning. It also lays down the general obligation of signatory states to notify and consult each other on all major projects under consideration that are likely to result in a significant adverse environmental effect crossing boundaries.
International Convention for the Safety of Life at Sea (SOLAS), 1974 (as amended)	The International Convention for the Safety of Life at Sea (SOLAS) is an international treaty that sets out the minimum safety standards in construction, equipment and operation of merchant ships.
The Marine Works (Environmental Impact Assessment (Amendment) Regulations 2017	These regulations identify the requirement to consider MA&D within the EIA process.
The Electricity Works (Environmental Impact Assessment) (England and Wales) Regulations 2017:	
Marine and Coastal Access Act 2009	An Act requiring provisions be made in relation to: marine functions and activities; migratory and freshwater fish; the establishment of an English coastal walking route and of rights of access to land near the English coast; enabling Assembly measures for Welsh coastal recreational routes and rights of access to land near the Welsh coast; the roles of Natural England and the Countryside Council for Wales; works that are detrimental to navigation; amendments to the Harbours Act 1964; and for connected purposes.
Well-being of Future Generation (Wales) Act 2015	An Act of the National Assembly for Wales to make provision requiring public bodies to do things in pursuit of the economic, social, environmental and cultural well-being of Wales in a way that accords



Legislation	Summary
	with the sustainable development principle; to require public bodies to report on such action; to establish a Commissioner for Future Generations to advise and assist public bodies in doing things in accordance with this Act; to establish public services boards in local authority areas; to make provision requiring those boards to plan and take action in pursuit of economic, social, environmental and cultural well-being in their area; and for connected purposes.
The Developments of National Significance (Specified Criteria and Prescribed Secondary Consents) (Wales) (Amendment) Regulations 2016	The Developments of National Significance (Specified Criteria and Prescribed Secondary Consents) (Wales) Regulations 2016 specify the thresholds and criteria for the types of development that qualify as DNS and for which consent must be sought directly from the Welsh Ministers under section 62D of the Town and Country Planning Act 1990.
Civil Contingencies Act 2004	Whilst the Civil Contingencies Act 2004 (Contingency Planning) Regulations 2005 (referred to as 'the CCA') does not make any reference to EIA, it is noted that the Act and associated regulations establish a statutory framework of roles and responsibilities for those involved in emergency preparation and response at the local level. This includes emergency powers that might prove necessary to deal with the effects of serious emergencies. The CCA places a duty on local responders to have an accurate understanding of the risks they face in light of local circumstances and to prioritise actions through a risk assessment and emergency planning process. As such, similarities can be drawn from the requirements of the EIA regulations and the CCA in assessing and minimising risk.
Construction (Design and Management) (CDM) 2015 Regulations	These regulations place specific duties on clients, designers and contractors, so that health and safety is considered throughout the life of a construction project from its inception to its subsequent final demolition and removal.
Seveso III Directive	The Seveso III Directive addresses the consequences to the regulation of major accident hazard sites of the repeal of the Dangerous Substances Directive and Dangerous Preparations Directive (implemented in Great Britain as The Chemical (Hazardous Information



Legislation	Summary
	<p>and Packaging for Supply) Regulations) and their replacement with European Regulation (EC) No 1272/2008 on classification, labelling and packaging of substances and mixtures implemented in Great Britain as the Classification, Labelling and Packaging of Chemicals Regulation.</p> <p>The Seveso III Directive does not fundamentally alter the regulatory regime laid out in Seveso II but does strengthen a number of areas such as public access to information and standards of inspections.</p>
<p>The Electricity (Offshore Generating Stations) (Safety Zones) (Application Procedures and Control of Access) (Amendment) (Wales) Regulations 2019</p>	<p>These Regulations apply in relation to any application to the Secretary of State for Business, Enterprise and Regulatory Reform seeking a declaration of a safety zone relating to an offshore renewable energy installation, under section 95(2) of the Energy Act 2004 (c.20) (“the 2004 Act”). In addition, they prescribe categories of vessels and activities permitted in such safety zones.</p>
<p>Lifting Operations and Lifting Equipment Regulations 1998</p>	<p>A set of regulations that aims to reduce the risk of injury from lifting equipment used in the workplace.</p>
<p>Control of Substances Hazardous to Health Regulations 2002</p>	<p>States general requirements imposed upon employers to protect employees and other persons from the hazards of substances used at work.</p>
<p>The Management of Health and Safety at Work Regulations 1999</p>	<p>This legislation places health and safety duties on employers and employees that extend beyond those included within the CDM Regulations.</p>
<p>The Workplace (Health, Safety and Welfare) Regulations 1992</p>	<p>This legislation covers a wide range of basic health, safety and welfare issues and applies to most workplaces (except those involving construction work on construction sites).</p>
<p>Personal Protective Equipment at Work Regulations 1992</p>	<p>This instrument seeks to ensure that, where risks cannot be controlled by other means, relevant PPE should be appropriately identified and put into use.</p>
<p>Environmental Permitting (England and Wales) Regulations (EPR) 2016</p>	<p>Regulations that relate to the permitting of certain industrial processes for the purposes of pollution control.</p>
<p>Planning (Hazardous Substances) (Wales) Regulations 2015</p>	<p>These Regulations consolidate, with amendments, the Planning (Hazardous Substances) Regulations 1992 (S.I. 1992/656) and subsequent amending instruments insofar as they apply to Wales. They also</p>



Legislation	Summary
	include provision relating to the period for determination of procedure under sections 20 and 21 of the Planning (Hazardous Substances) Act 1990 (“the PHSA”). These Regulations also implement the land-use aspects of Directive 2012/18/EU of the European Parliament and the Council on the control of major accident hazards involving dangerous substances (O.J. No. L 197, 24.7.2012, p. 1) (the “Seveso III Directive”). That Directive amends and repeals Council Directive 96/82/EC. To fully implement those requirements, parts of Regulations 24 and 26 of the Planning (Hazardous Substances) Regulations 2015 (S.I. 2015/627) apply to Wales. They apply to the extent that they relate to non-devolved infrastructure planning matters. The non-planning aspects of the Seveso III Directive are implemented through The Control of Major-Accident Hazards Regulations 2015 (S.I. 2015/483).
International Regulations for Preventing Collisions at Sea 1972 (COLREGS)	These regulations set out traffic separation measures to prevent collisions between two or more vessels.
Shipboard oil pollution emergency plans (SOPEP)	A set of guidelines provided under MARPOL to prevent oil pollution occurring at sea.

13. **Table 30-2** summarises relevant planning policies that have been reviewed as part of this MA&D assessment.

Table 30-2 Key policy

Policy	Summary
The UK Marine Policy Statement (MPS)	This policy statement is the framework for preparing Marine Plans and taking decisions affecting the marine environment. It was prepared and adopted for the purposes of section 44 of the Marine and Coastal Access Act 2009.
Welsh National Marine Plan (WNMP)	The Welsh Government published and adopted the first WNMP in November 2019 (Welsh Government, 2019c). Since adoption, the WNMP must be adhered to and relevant public authorities, such as Local Planning Authorities and PEDW must consider it when making decisions regarding the Welsh marine area. The WNMP covers Welsh inshore and offshore waters and seeks to ensure marine resources are used in a sustainable way



Policy	Summary
	<p>in line with the high-level marine objectives over its 20-year lifespan. The WNMP sets out policies to achieve this, including both general and sector specific policies.</p> <p>Welsh Government has committed to developing an environmental evidence base for the Welsh marine area, which in turn will help inform marine planning into the future.</p> <p>The first WNMP identifies that Strategic Resource Areas (SRA) should be developed for certain sector activities, such as aggregates and aquaculture. The WNMP states that <i>“SRA are a tool to improve the management of marine activities, space and resources, helping to support the management of sector-sector interactions”</i>. It is understood that SRA will be developed and implemented through Marine Planning Notices to support the WNMP (Welsh Government, 2020b) which could include floating offshore wind.</p>

14. Beyond the principles set out within Institute of Environmental Management and Assessment’s (IEMA) primer on MA&D there is no specific guidance available that outlines a standardised assessment methodology to undertaking MA&D assessments within EIA (IEMA, 2020). However, the assessment has been developed with consideration of the guidance documents outlined in **Table 30-3**.

Table 30-3 Key guidance documents

Guidance	Summary
<p>Chapter 4 of the Cabinet Office’s Emergency Preparedness guidance on part 1 of the Civil Contingencies Act (CCA) 2004 (the ‘CCA risk assessment framework’);</p>	<p>Provides an overview of the risk assessment process as governed by the CCA. Consideration has been given to how the assessment criteria presented within the guidance aligns with the EIA process.</p>
<p>EU Guidance on the preparation of the Environmental Impact Assessment Report (European Commission, 2017)</p>	<p>The preparation of the EIA report guidance aims to help developers and consultants alike prepare good quality environmental impact assessment reports and to guide competent authorities and other interested parties as they review the reports. It focuses on ensuring that the best possible information is made available during decision-making.</p>



Guidance	Summary
European Commission's Overview of Natural and Man-made Disaster Risks the European Union May Face, 2017	The aim of the overview is to capture the trends in the ever-evolving disaster risk landscape, discuss the major drivers shaping it, take a closer look at 12 selected disaster risks of particular relevance for Europe and to assess the implications of developments in disaster risks for risk management.
The International Convention for the Prevention of Marine Pollution by Ships (MARPOL Convention) 73/78	An international convention aimed at preventing pollution from ships due to operational or accidental causes. The convention ensures that shipping remains the least environmentally damaging mode of transport and that the marine environment is preserved by the elimination of pollution by all harmful substances discharged from ships.
International Cable Protection Committee (ICPC) recommendations, October 2017	An International Cable Protection Committee Ltd ("ICPC") Recommendation ("Recommendation") implies a consensus of those substantially concerned with its scope and provisions. A Recommendation is intended as a guide to aid cable owners and other seabed users in promoting the highest goals of reliability and safety in the submarine cable environment.
European Subsea Cables Association (ESCA) recommendations	Provides guidance on the considerations that should be given by all Stakeholders in the development of projects requiring proximity agreements between offshore wind farm projects and subsea cable projects in UK Waters. The Guidelines address installation and maintenance constraints related to wind farm structures, associated cables and other submarine cables where such structures and submarine cables will occupy proximate areas of seabed.
Reducing Risks, Protecting People: HSE's decision making process, 1999	This document describes HSE's decision-making process. It makes transparent the protocols and procedures we follow to ensure that the process of decision-making, including risk assessment and risk management, is perceived as valid.
The International Standards Organization's ISO 31000:2018 Risk Management – Guidelines. 2018	Provides guidelines on managing risk faced by organizations. The application of these guidelines can be customized to any organization and its context. ISO 31000:2018 provides a common approach to managing any type of risk and is not industry or sector specific.



Guidance	Summary
Convention on the International Regulations for Preventing Collisions at Sea 1972	Guidelines which outline navigation rules to be followed by vessels at sea to prevent collisions.
Regulatory Expectations for Emergency Response Arrangements for the Offshore Renewable Energy Industry (MCA & HSE, 2019)	HSE and MCA are the relevant authorities for health and safety at offshore renewable energy developments. Jointly they require renewable energy developments to have arrangements for evacuation, escape, recovery and rescue to prevent and reduce harm to persons working at those developments. This document sets out principles to be adopted to ensure compliance with relevant legislation.

30.5 Approach to Assessment

30.5.1. Overview

15. The methodology for the MA&D assessment has been separated into 4 stages:

- Stage 1: Identification of hazards and threats;
- Stage 2: Screening of hazards and threats (including the identification of the reasonably foreseeable worst-case environmental consequence);
- Stage 3: Identification of mitigation; and
- Stage 4: Identification of residual risks and their relative significance.

30.5.2. Stage 1

16. During stage 1 a risk record was developed to identify reasonably foreseeable MA&D hazards and threats to be considered as part of the EIA. To avoid duplication of risk assessments, existing and planned risk assessments, impact assessments and other studies were used to identify hazards and threats that may arise due to the proposed Project. For example, hazards related to marine navigation are considered within the navigational risk assessment presented within **Chapter 25: Shipping and Navigation** and only key, relevant elements of this are summarised within the MA&D assessment.

17. A long list of identified reasonably foreseeable MA&D hazards and threats was prepared. Consideration is given to new MA&D hazards of threats that are introduced because of the installation of the proposed Project. Consideration has been the following MA&D event types:

- MA&D resulting from the vulnerability of the proposed Project to natural disasters during the installation, operation and decommissioning of the proposed Project;
- MA&D resulting from vulnerability of the proposed Project to major accidents from on-site sources (including MA&D risk introduced by the proposed Project) during the installation, operation and decommissioning of the proposed Project; and
- MA&D resulting from vulnerability of the proposed Project to major accidents from off-site sources during the installation, operation and decommissioning of the proposed Project.



18. All MA&D hazards and threats were collated into an Environmental Risk Record (see **Appendix 30A: Environmental Risk Record**). This record acts as an evidence base of all the identified hazards and threats relevant to the MA&D assessment.

30.5.3. Stage 2

19. Following the completion of the Environmental Risk Record (**Appendix 30A: Environmental Risk Record**) each hazard and threat has then been reviewed to determine whether a source-pathway-receptor linkage exists to any of the identified environmental receptors. Hazards and threats with no linkages were screened out from the further assessment.
20. For each hazard or threat with a linkage pathway, the reasonably foreseeable worst-case environmental consequence (i.e. the likely significant effect) was identified and categorised based on the 'impact magnitude' (Section 30.5.7) and in some cases the 'duration'. These reasonably foreseeable worst-case consequences of hazards and threats were then screened against the definition of 'serious damage' to remove those which are not considered to fall within the scope of a MA&D (see **Appendix 30A: Environmental Risk Record**). In addition, those hazards and threats considered to result in reasonably foreseeable worst-case consequences with wholly reversible and short-term durations were also not considered to constitute a MA&D, in accordance with IEMA guidance (see **Appendix 30A: Environmental Risk Record**).

30.5.4. Stage 3

21. As part of stage 3 of the assessment, primary and tertiary mitigation measures that are either embedded within design, required for compliance with legislation, other regulatory regimes, or represent standard practice, and reduce the risk of MA&D hazards and threats were identified and recorded in **Appendix 30A: Environmental Risk Record**. These mitigation measures include controls that may reduce the probability of a risk or prevent the reasonably foreseeable worst-case consequence of a hazard or threat occurring.
22. Following the consideration of primary and tertiary mitigation, the probability of the hazard or threat occurring was determined based on the probability criteria (see Section 30.5.7). The identified probability was then combined with the impact magnitude identified at stage 2 to determine risks that are considered acceptable (or tolerable). This process used the criteria set out in **Section 30.5.7**. The aim of the MA&D assessment is to identify sufficient mitigation to avoid significant risks. Consequently, an iterative approach was adopted by which further mitigation measures (secondary mitigation) is specified as and where required. For example, if a risk event has been managed appropriately in terms of safety of staff, but the actions taken to manage this risk do not adequately mitigate the potential for long-term or irreversible harm to an environmental resource and/or receptor, secondary mitigation might be required.

30.5.5. Stage 4

23. Following the consideration of all mitigation proposed, a residual level of risk (post-additional mitigation) was assigned as part of stage 4 of the assessment. A record of how each risk is assessed has been maintained in the Environmental Risk Record (**Appendix 30A: Environmental Risk Record**).

30.5.6. Assumptions and limitations

24. The following limitations are relevant to this assessment.
 - No modelling or detailed calculations have been undertaken but a qualitative assessment approach has been adopted.



- Where information is not available (such as historical evidence on the probability and the environmental consequence of an event), professional judgement has been used to reach a conclusion. Each hazard or threat has been considered on an individual basis.
- Where a hazard or threat has the potential to result in chain reaction, this has been clearly identified within the Environmental Risk Record (Appendix 30A: Environmental Risk Record) to identify where an assessment of the additional hazard or threat that could occur can be found.
- No surveys beyond those undertaken to inform other EIA topics have been completed to establish the baseline for the MA&D assessment.

30.5.7. *Assessment Criteria*

25. The MA&D assessment criteria is based upon the risk assessment process, which considers the consequences and probability of a risk event occurring. Reference has been made to the guidance provided as part of the civil contingencies act to develop a proposed Project-specific assessment criteria. The assessment has followed the principles as set out in the IEMA primer on the assessment of MA&D in EIA.
26. The impact magnitude is determined based on a reasonably foreseeable worst-case scenario of the event in the absence of mitigation. The probability of the hazard/threat occurring is determined whilst considering proposed mitigation measures. This is because mitigation would reduce the probability of the maximum severity of harm, duration, consequence and frequency of a hazard/threat occurring.
27. In line with the assessment criteria set out in the CCA Guidelines, relevant receptor groups relevant to the MA&D assessment are categorised as:
 - health;
 - social;
 - economic; and
 - environment.

Impact Magnitude

28. The categories, descriptions and criteria used in the MA&D assessment for determining the impact magnitude of a hazard or threat are set out in **Table 30-4** and **Table 30-5**. Any risk events where a negligible impact magnitude is identified for the reasonably foreseeable worst case consequence are scoped out of this MA&D assessment.

Table 30-4 Impact magnitude category

Impact Magnitude Category	Impact Magnitude Description
4	Catastrophic
3	Severe
2	Moderate
1	Minor
0	Negligible



Table 30-5 Impact magnitude scoring categories

Level	Descriptor	Categories of Impact	Description of impact
0	Negligible	Health	<ul style="list-style-type: none"> • Insignificant number of injuries or impact on health
		Social	<ul style="list-style-type: none"> • Insignificant number of persons displaced and personal support required • Insignificant disruption to community services, including transport services and infrastructure
		Economic	<ul style="list-style-type: none"> • Insignificant impact on local economy
		Environment	<ul style="list-style-type: none"> • Insignificant impact on environment
1	Minor	Health	<ul style="list-style-type: none"> • Small number of people affected, no fatalities, and small number of minor injuries with first aid treatment
		Social	<ul style="list-style-type: none"> • Minor damage to properties • Minor displacement of a small number of people <24 hours and minor personal support required • Minor localised disruption to community services or infrastructure
		Economic	<ul style="list-style-type: none"> • Negligible impact on local economy and cost easily absorbed
		Environment	<ul style="list-style-type: none"> • Minor impact on the environment with no lasting effects
2	Moderate	Health	<ul style="list-style-type: none"> • Moderate number of fatalities with some casualties requiring hospitalisation and medical treatment and activation of MAJAX, the automated intelligent alert notification system, procedures in one or more hospitals
		Social	<ul style="list-style-type: none"> • Damage that is confined to a specific location, or to a number of locations, but requires additional resources • Localised displacement of >100 people for 1-3 days • Localised disruption to infrastructure and community services
		Economic	<ul style="list-style-type: none"> • Limited impact on local economy with some short-term loss of production, with possible additional clean-up costs
		Environment	<ul style="list-style-type: none"> • Limited impact on environment with short-term or long-term effects



Level	Descriptor	Categories of Impact	Description of impact
3	Severe	Health	<ul style="list-style-type: none"> Significant number of people in affected area impacted with multiple fatalities, multiple serious or extensive injuries, significant hospitalisation and activation of MAJAX procedures across a number of hospitals
		Social	<ul style="list-style-type: none"> Significant damage that requires support for local responders with external resources 100 to 500 people in danger and displaced for longer than 1 week. Local responders require external resources to deliver personal support Significant impact on, and possible breakdown of, delivery of some local community services
		Economic	<ul style="list-style-type: none"> Significant impact on local economy with medium-term loss of production Significant extra clean-up and recovery costs
		Environment	<ul style="list-style-type: none"> Significant impact on environment with medium-to long-term effects
4	Catastrophic	Health	<ul style="list-style-type: none"> Very large numbers of people in affected area(s) impacted with significant numbers of fatalities, large number of people requiring hospitalisation with serious injuries with longer-term effects
		Social	<ul style="list-style-type: none"> Extensive damage to properties and built up environment in affected area requiring major demolition General and widespread displacement of more than 500 people for prolonged duration and extensive personal support required Serious damage to infrastructure causing significant disruption to, or loss of, key services for prolonged period. Community unable to function without significant support
		Economic	<ul style="list-style-type: none"> Serious impact on local and regional economy with some long-term, potentially permanent, loss of production with some structural change Extensive clean-up and recovery costs.
		Environment	<ul style="list-style-type: none"> Serious long term impact on environment and/or permanent damage



Probability

29. The probability of a risk event occurring has been assessed in accordance with the definitions presented in **Table 30-6**, which are derived from the CCA.

Table 30-6 Probability criteria

Probability Category	Description of Frequency	Ranking
5	Probable > 1 in 2 chance over 5 years	Very high
4	Possible Greater than > 1 in 20 chance over 5 years	High
3	Unlikely > 1 in 200 chance over 5 years	Medium
2	Rare > 1 in 2,000 chance over 5 years	Low
1	Negligible > 1 in 20,000 chance over 5 years	Very low

30.

Classification of risk

31. Tolerability of a risk is identified by considering the impact magnitude of a risk event and probability of the worst case environmental consequence occurring. The criteria used to classify the level of risk associated with each risk event are presented in **Table 30-7** and is supported by **Table 30-8**.

Table 30-7 Risk evaluation criteria matrix

Probability Category	5	0	5	10	15	20
	4	0	4	8	12	16
	3	0	3	6	9	12
	2	0	2	4	6	8
	1	0	1	2	3	4
		0	1	2	3	4
Impact Magnitude Category						



Table 30-8 Level of risk

Score (Impact Magnitude x Probability)	Level of risk
12-20	Critical
6-11	High
3-5	Medium
1-2	Low
0	None perceived

Stakeholder Engagement and Consultation

32. EIA scoping report was submitted in April 2022 to Natural Resource Wales and a scoping opinion received on 5th July 2022. In the scoping opinion there were no comments on the approach to the assessment of MA&D for the proposed project.
33. No specific consultation has been undertaken with any stakeholders beyond that within the scoping report.

30.6 Baseline

34. This section presents a description of the baseline environmental characteristics within a 5km Study Area¹. The baseline relevant to this topic comprises:
 - a description of potential natural hazards that may impact the proposed Project within the Onshore and Offshore Development Areas;
 - existing major accident hazard sources that may impact the proposed Project within the Onshore and Offshore Development Areas;
 - other relevant risk events identified within the UK National Risk Register and South Wales Resilience Forum Community Risk Register²; and
 - sensitive environmental receptors within the Study Area at risk of MA&D hazards associated with the proposed Project.

30.6.1. Natural Hazards

35. The following sections describe the existing natural hazards have been identified from the UK National Risk Register and the South Wales Resilience Forum (SWRF) Community Risk Register, and have been considered as part of the 'long list' of hazards.

Meteorological Hazards

36. Meteorological hazards include:
 - flooding;

¹ It should be noted that the Study Area for all risk events is not 5km. 5km is the maximum Study Area used within the assessment, and has been referenced here to ensure that all relevant resources and receptors are identified.

² It should be noted that not all risk events identified within the UK National Risk Register and the SWRF Community Risk Register are considered within this assessment. Where it is considered that the proposed Project is not vulnerable to a risk, for example 'Widespread prison rioting', the corresponding risk event has been scoped out of the assessment prior to the screening exercise.



- storms and gales;
- drought;
- heatwave;
- cold and snow; and
- events of reduced visibility (e.g., dust storms, fog or volcanic ash).

37. Further information on each of these hazards is provided below.

Flooding

38. The onshore aspect of the proposed Project is at risk of coastal flooding. Coastal flooding can be caused by high tides and storm surges, occurring because of sea-water inundation where defences fail at a single location or by the backing up of freshwater that cannot drain to the sea due to high tides.
39. There is no offshore risk associated with flooding.
40. The SWRF Community Risk Register lists both Coastal and Fluvial flooding to be of very high risk in the area. A summary of flood risk is presented within **Chapter 10: Water Environment**.

Storms and gales

41. Storms and gales can have wide-ranging impacts including fallen trees, storm surges, and flooding. The State of the UK Climate 2021 Report shows that five named storms affected the UK in 2021. The SWRF Community Risk Register considers the risk of storms in south Wales to be high.

Drought

42. Droughts occur when rainfall is insufficient to maintain adequate water levels. Droughts will differ in terms of their severity, location and duration. There is no immediate risk to public water supplies, however prolonged dry weather could lead to more serious future shortages. A drought was declared in south Wales as recently as 2022, with the frequency of droughts expected to increase with climate change. The SWRF Community Risk Register considers the risk of drought in south Wales to be medium.
43. There is no offshore risk associated with drought.

Heatwave

44. Heatwave conditions, when temperatures remain abnormally high for a prolonged period, can prove fatal, particularly among at risk groups, and increase pressure on public services. 2022 was the joint warmest summer on record, with heatwaves occurring each month, most notably in July. The frequency of heatwaves is considered likely to increase with climate change. The SWRF Community Risk Register considers the risk of heatwaves in south Wales to be high.

Cold and Snow

45. Winter conditions in south Wales are generally mild, with only occasional periods of snow and ice. Temperatures can remain below freezing throughout the daytime, with these temperatures being strongly influenced by the surrounding sea surface. In southern Wales the number of days per year within which snow falls is generally 10 or less. When heavy snow does occur, rural areas can be cut off, roads and public transport networks shut off and public services suspended. The SWRF Community Risk Register considers the risk of low temperatures and heavy snow in south Wales to be high.



Events of reduced visibility

46. Localised weather conditions, such as fog, and extreme events, such as volcanic activity, can result in periods of reduced visibility. The UK National Risk Register states that Icelandic volcanoes are of the most concern to the UK as they frequently erupt and prevailing winds are likely to blow ash and gas towards the UK.
47. Events of reduced visibility can result in disruption and increases the probability of other hazards, such as poor air quality, occurring. The SWRF Community Risk Register considers the risk from volcanic eruptions to south Wales to be high.

Geological Hazards

48. Geological hazards include:

- ground instability;
- seismic hazards;
- wildfires; and
- space weather.

49. Further information on each of these hazards is provided below.

Ground instability

50. The SWRF Community Risk Register states that earthquakes are not a risk that is applicable to south Wales. The British Geological Survey states that Snowdonia and south Wales are the area of the UK with the highest earthquake list. In February 2023 an earthquake of magnitude 3.7 occurred in south Wales, shaking properties causing minimal damage.

Wildfires

51. South Wales suffers more wildfires than any other area of the UK, with the forestry commission stating that the majority of these occur between March and May each year. These wildfires can cause widespread damage to the environment as well as posing risk to human health and built infrastructure. The SWRF Community Risk Register considers the risk from wildfires to south Wales to be medium.

Space weather

52. Space weather describes a series of phenomena originating from the Sun, including solar flares, coronal mass ejections resulting in geomagnetic storms and solar energetic particles associated with solar radiation storms. Space weather can cause loss/disruption of telecommunication systems, impacts on railway signalling systems, electricity blackouts and an increase in ionizing radiation exposure. The SWRF Community Risk Register considers severe space weather to pose a very high risk to south Wales.

30.6.2. *Additional risks*

Man Made

UXO risk

53. Unexploded Ordnance describes military weapons which have been armed for action, and have been buried, dropped, fired, or placed in a manner that constitutes a hazard. The ordnance remains unexploded by design or a malfunction.
54. Unexploded ordnance poses a range of risks from accidental explosions and serious injury to impacts on the surrounding environment and infrastructure.



Road traffic accidents, including local accident on motorways and major trunk roads (low risk)

55. Road traffic accidents can occur for numerous reasons, which may be linked to meteorological hazards, distracted or unsafe driving or human error. Such accidents can cause serious injury or death, damage the surrounding environment and also cause disruption to the local transport network.
56. The SWRF Community Risk Register considers road traffic accidents on motorways and major trunk roads to pose a medium to south Wales.

Civil unrest or protest

57. Most protests in the UK remain peaceful, however on rare occasions these events can escalate toward conflict. The conflict may result from long-standing issues or could be spontaneous in response to a single incident. Civil unrest and protest can have long term consequences on the economy, damage local infrastructure and cause injury to residents and response teams.

Fuel Supply

58. Issues with fuel supply may arise due to industrial action, insolvency, conventional attacks, cyber-attacks and meteorological hazards preventing the delivery of fuel. Fuel supply issues pose a risk to the construction and operation of the proposed project by preventing the delivery of supplies and impacting the proposed project ability to run smoothly.
59. The SWRF Community Risk Register considers fuel supply issues to pose a medium to south Wales.

Cyber-attack and digital data security

60. Cyber-attacks can involve the encrypting, stealing and destroying of data which critical infrastructures depends, they may result in the disruption to operational systems. Cyber attackers may target a variety of infrastructure such as gas, electricity, nuclear, fuel supply, health and social care, transport or telecommunications infrastructure.

Aviation accidents

61. The UK airspace is deemed to be amongst the safest in the world, however there is still potential for aviation accidents to occur. Aviation incidents could result in an airborne collision of aircraft, and if over an urban area, fatalities and casualties of passengers and crew on board as well as on the ground due to falling debris.
62. The SWRF Community Risk Register considers aviation accident over a semi-urban area to pose a low to south Wales.

Nautical accidents

63. There is a risk that nautical accidents could occur in UK waters off the coast of South Wales, these may involve collision of vessels and vessels sinking due to natural and man-made hazards. Nautical accidents have the potential to cause casualties and fatalities to those on board as well as causing lasting damage to the natural environment.

Bird Collision Risk

64. Due to the nature of the proposed Project, there is a risk of collision between birds and the wind turbine. This has the potential to cause catastrophic damage to the wind turbines and leading to death and injury or site personnel and well as to bird species.



Outbreak of disease

65. A disease outbreak could be caused by Influenza-type diseases, emerging infectious diseases, outbreak of exotic notifiable disease in animals or an outbreak of plant disease. An outbreak could result in large numbers of people falling ill and potentially a high number of fatalities.
66. The SWRF Community Risk Register considers that an influenza-type disease pandemic, or an emerging infectious disease, pose a very high risk, an outbreak of exotic notifiable disease in animals poses a medium risk, and an outbreak of plant disease poses a low risk to South Wales.

Poor air quality

67. Short-term poor air quality may occur due to weather conditions preventing pollution from dispersing. Air quality can also be worsened by ultraviolet light reacting with the air to generate ozone. Long term poor air quality is linked to motor vehicles, household combustion devices and industrial facilities across the UK. Poor air quality poses a significant risk to human health, including death from the exacerbation of respiratory or cardiovascular conditions.
68. The SWRF Community Risk Register considers poor air quality to pose a high risk to South Wales.

30.6.3. Existing major accident hazard sources

69. Existing major accident hazard sources include industrial sites (such as those operated under COMAH and Hazardous Substances Consents (HSC)), waste management sites, electricity, gas and fuel infrastructure. These may pose a risk of fire, explosion or an industrial accident, such as chemical release, airfields, as well as residual risk from unexploded ordnance (UXO).
70. According to the Pre-Desk Study Risk Assessment (PDSA) provided by Zetica UXO in **Annex 11A-B**, several defences were established within the within the Onshore Development Area; in addition, a number of strategic targets were located in the vicinity of the Onshore Development Areas. Although no readily available records have been found to indicate that the Onshore Development Areas were bombed, Zetica UXO recommends a detailed desk study to assess the hazard level.

Industrial Sites

71. The UK National Risk Register describes hazards associated with existing industrial sites that can include fires, explosions, chemical and biological contamination, and dam breaches. The SWRF Community Risk Register has assigned the following risk categories for hazards associated with industrial sites that are of local relevance:
 - Fire of explosion at a range of industrial sites (medium risk): including at a
 - gas terminal (medium risk);
 - onshore ethylene gas pipeline (low risk);
 - oil refinery (medium risk);
 - onshore fuel pipeline (low risk);
 - high-pressure gas pipeline (medium risk).
 - Major reservoir dam failure/collapse (medium risk);
 - Large toxic chemical release (medium risk);
 - Radiation exposure from:



- accidental exposure to radioactive material from incorrectly handled stolen sources (low risk);
- foreign nuclear accident affecting the UK (medium risk).
- Contamination events from off site sources, including:
 - biological substance release during an unrelated work activity or industrial process (medium risk);
 - biological substance release from facility where pathogens are handled deliberately (low risk);
 - major Contamination incident with widespread implications for the food chain (high risk).

72. The proximity of industrial sites identified as potential sources of hazards is shown in **Table 30-9**.

Table 30-9 Existing industrial sites identified as a potential hazard source

Site name	Distance from the proposed Onshore Development Areas
Pembroke Refinery (COMAH (Upper Tier))	Located approximately 1.3km north west.
Pembroke Power Station	Located immediately adjacent to the north.
Sewage works	Adjacent to the north-east of the Onshore Development Areas.
Solar Farms	Within and adjacent to the Onshore Development Areas
Dairy Farm	250m south-west
Slurry bed	250m north-east
Refuse heaps	120m south-east
Disused gun emplacement	50m north-west
Unspecified tanks	Adjacent to the north of the Onshore Development Areas.
High pressure oil pipeline (on-site)	Within Onshore Development Areas.

Utilities

73. The UK National Risk Register and SWRF Community Risk Register recognise risk from the loss and failure of existing utilities and systems. Such failures would lead to disruption to essential services, economic damage and potential damage to property and in extreme cases fatalities. SWRF Community Risk Register has identified the following risk levels associated with the loss or failure of utilities:

- National electricity transmissions network (Very High).
- Regional electricity transmission network (High).
- Gas supply (Medium).
- Water supply infrastructure (Medium).
- Telecommunications network (Medium).
- Failure of financial systems (Medium).

30.6.4. Sensitive Environmental Receptors

74. The proposed Project will consist of an offshore array, cables and associated onshore elements such as substations and control buildings. **Table 30-10** summarises the sensitive environmental receptors within the Study Area associated with the proposed Project.



75. Further information on the receptors identified below can be found in the relevant chapters of the ES, including:

- **Chapter 8: Ecology and Biodiversity;**
- **Chapter 9: Historic Environment and Cultural Heritage;**
- **Chapter 10: Water Environment;**
- **Chapter 11: Geology and Hydrogeology;**
- **Chapter 16: Socio-economics, Recreation and Tourism;**
- **Chapter 18: Marine Water and Sediment Quality;**
- **Chapter 19: Benthic Ecology;**
- **Chapter 20: Fish and Shellfish Ecology;**
- **Chapter 21: Marine Mammals;**
- **Chapter 22: Marine Ornithology;**
- **Chapter 24: Marine Archaeology;**
- **Chapter 25: Shipping and Navigation;**
- **Chapter 26: Commercial Fisheries; and**
- **Chapter 28: Other Sea Users.**



Table 30-10 Sensitive environmental receptors

Receptor Type	Description	Reference
Onshore Aspect		
Population	Proposed Project Wind Farm workers and site Visitors. Users of recreational resources within 5km of the Onshore proposed Project Boundary. Settlements within 5km of the Onshore proposed Project Boundary including: Angle, Rhoscrowther, Newton, Wallaston Green and Axton Hill.	Chapter 11: Geology and Hydrogeology
Groundwater Receptors	Bedrock geology is classified as a 'Principal' aquifer with superficial geology classified as a 'Secondary A', aquifer.	Chapter 11: Geology and Hydrogeology
Designated Sites	The Onshore proposed Project Boundary passes through the following statutory designated site: Castlemartin Coast Special Protection Area (SPA), Pembrokeshire Marine Special Area of Conservation (SAC), Limestone Coast of South Wales SAC and several Sites of special Scientific Interest (SSSIs): 'Angle Peninsula Coast' SSSI, 'Milford Haven, Waterway' SSSI, 'Broomhill Burrows' SSSI, 'Dale and South Marloes Coast' SSSI and 'Gweunydd Somerton Meadows' SSSI.	Chapter 8: Ecology and Biodiversity
Built environment	There are a large number of built heritage assets within 5km of the Onshore proposed Project Boundary. These include over 75 listed buildings and approximately 40 scheduled monuments. No World Heritage Site are located within 5km of the Onshore proposed Project Boundary.	Chapter 9: Historic Environment and Cultural Heritage
Critical infrastructure	Pembroke Dock Police Station, Pennar Fire Station, South Pembrokeshire Hospital, Pembrokeshire Solar Farms, Dairy Farming, existing utilities, B4320.	Chapter 11: Geology and Hydrogeology
Offshore Aspect		
Population	Proposed Project Windfarm works and site visitors. Recreation and commercial users.	Chapter 11: Geology and Hydrogeology Chapter 25:



Receptor Type	Description	Reference
		Shipping and Navigation; Chapter 26: Commercial Fisheries; and Chapter 28: Other Sea Users
Designated Sites	The Array Area and Offshore proposed Project Boundaries intersect with the following designated sites: Skomer Marine Conservation Zone (MCZ); Castlemartin Coast SPA; Skomer, Skokholm and the Seas off Pembrokeshire SPA; Pembrokeshire Marine SAC; Limestone Coast of South West Wales SAC; West Wales Marine SSSI; Bristol Channel Approaches SAC; Arfordir Penrhyn Angle/ Angle Peninsula Coast SSSI; Broomhill Burrows SSSI; Castlemartin Range SSSI; and Milford Haven Waterway SSSI.	Chapter 8: Ecology and Biodiversity; Chapter 17: Physical Processes; Chapter 18: Marine Water and Sediment Quality; and Chapter 19: Benthic Ecology.
Marine receptors	The offshore cabling and array areas will be in the Celtic Sea area of the Atlantic Ocean.	Chapter 17: Physical Processes; Chapter 18: Marine Water and Sediment Quality; and



Receptor Type	Description	Reference
		Chapter 19: Benthic Ecology.
Marine Historic Environment	<p>There are a number of cultural heritage assets identified within the vicinity of the Proposed Project. Those which have been identified as being potentially impacted by the Proposed Project are:</p> <ul style="list-style-type: none"> • A known wreck site (CA6 / CA1025); and • Two geophysical anomalies with medium archaeological potential. 	Chapter 24: Marine Archaeology and Cultural Heritage
Marine Navigation	<p>There are three Traffic Separation Schemes (TSSs) in the vicinity of the proposed Project, namely:</p> <ul style="list-style-type: none"> • TSS Off Smalls, located approximately 21 nm to the northwest of the Array Area; • TSS Off Land’s End, located approximately 60 nm to the southwest of the Array Area; and • TSS West of Scilly Isles, located approximately 87 nm to the southwest of the Array Area. <p>There are five operational subsea telecommunications cables within 10 nm of the Array Area, whilst the Green Link Interconnector is at the pre-construction phase.</p> <p>There is a single charted aid to navigation located within 10 nm of the Array Area, a pair of flashing yellow buoys approximately 8 nm to the northeast.</p> <p>There is one anchorage area in the vicinity of the Array Area – the anchorage off the east coast of Lundy Island, approximately 31 nm southeast of the Array Area. An Area to be Avoided (ATBA) is located approximately 18 nm to the north of the Array Area.</p> <p>A total of nine incidents were recorded by the Marine Accident Investigation Branch (MAIB) within the Study Area between 2012 and 2021, which corresponds to an average of one incident per year. No incidents occurred within the Array Area during the 10-year period.</p>	Chapter 25: Shipping and Navigation



30.7 Embedded and Good Practice Measures

76. Several primary mitigation measures have been identified through the iterative EIA process and have been incorporated into the design and installation planning of the proposed Project. Tertiary mitigation measures are legal requirements or are standard practices that would be implemented as part of the proposed Project. A summary of primary and tertiary measures relevant to the MA&D assessment is presented below.
77. The detailed list of all mitigation incorporated into the proposed Project is outlined in the Outline Construction Environmental Management Plan (CEMP) (**Appendix 4A: Outline CEMP**).

30.7.1. Primary Mitigation

78. Primary mitigation is often referred to as ‘embedded mitigation’ and includes modifications to the location or design of the proposed Project made during the pre-application phase that are an inherent part of the proposed Project.
79. As set out within **Chapter 4: Description of the proposed Project**, key features that would mitigate MA&D risks that are embedded within the design include the following:

- **Wind turbines.**

- The proposed wind turbines will operate within a set wind speed range, having both a minimum wind speed at which they start generating electricity, and a maximum wind speed at which turbines cannot generate and operate instead in a standby mode. The minimum cut in wind speed is 3 metres per second (m/s) and a maximum cut out wind speed is 28 m/s .
- Each wind turbine will have a minimum clearance between sea level and the lowest position of the blade of 22 m.
- The proposed Project will be designed and constructed to satisfy the safety requirements of the MCA as well as the marking, lighting, and fog-horn specifications of the Civil Aviation Authority (CAA), Trinity House and the MCA. The use of Autonomic Identification System (AIS) Aid to Navigation will be discussed post consent with Trinity House.
- The WTGs shall have red blade tips and high contrast markings (dots or stripes) placed at 10 m intervals on both sides of the blades to provide helicopter pilots with a hover-reference point. The final WTG lighting and marking arrangements will be discussed and agreed with relevant stakeholders (such as the Ministry of Defence and Maritime and Coastguard Agency) prior to construction and set out within the Lighting and Marking Plan (LMP), if required as a condition of consent. The Licence Holder must submit an Aviation Lighting Scheme Plan (ALSP). This plan should confirm lighting requirements necessary for both civil and military aviation safety and detail how they will be implemented for the lifetime of the proposed Project.
- The minimum distance between turbines (centre to centre) will be 1 km, with a minimum distance of 830 m between the blade tips.

- **Mooring system.**

- Two types of mooring systems are under consideration: tensioned (or Tension Leg Platform) or catenary spread mooring. Further details of these mooring systems are provided in Section 4.4.2.2 of **Chapter 4: Description of the Proposed Project**.

- **Anchorage.**

- Anchorage will be required to fix the mooring systems to the seabed. The selected anchor solution will depend on the mooring configuration, seabed conditions and



the required holding capacity and will likely be a combination of drag embedment, driven piles, drilled piles and suction pile anchors. Further details of the proposed anchorage is provided in Section 4.4.2.3 of **Chapter 4: Description of the Proposed Project**.

- **Floating platforms**
 - Navigational lighting will also be used on the floating platforms including flashing marine lanterns and fog lighting.
- **Sandwave Levelling**
 - To facilitate the construction of the proposed Project, it will also be necessary to level out areas of sandwaves identified on the seabed. Geotechnical and geophysical survey data collected post consent will define the need for sandwave levelling, and it is anticipated following analysis of this survey data that the extent of sandwave levelling will reduce compared to this worst case scenario.
- **Scour and Cable Protection**
 - The estimated cable burial for the proposed Project is 73% with up to 27% potentially requiring cable protection.
 - Additional cable protection measures may be considered for specific localised areas, as appropriate, including IAC touch down locations and cable crossing locations for offshore export cables. The final choice of cable protection solution will be made post-consent in the detailed design phase, considering foundation type, geotechnical data, meteorological and oceanographic conditions, foundation type and maintenance strategy. A Cable Burial Risk Assessment (CBRA) will be produced post-consent which will detail the minimum burial depths of the offshore export cables throughout the offshore export cable routes, and indicative proposed locations where the target depth of burial may not be achievable and external protection is expected to be required. The CBRA will also detail which type of cable protection measure would be located at which locations.
 - There may also be a requirement to install scour protection post installation for some anchor solutions to prevent the structure from being undermined by sediment processes and seabed erosion. The amount of scour protection required for anchorage will vary depending on the foundation type selected, however, for the purposes of assessment it is assumed that up to 310 m² scour protection will be required at each anchor location. There will be a total of up to 80 anchors, and therefore up to 24,800 m³ of scour protection across all anchors is assessed as a worst case.
- **Shipping and Navigation**
 - The offshore array will be marked with appropriate navigational buoys to indicate the presence of the proposed Project, once operational.
- **Onshore Cabling**
 - The target depth of burial will be 1 m (dependent on ground conditions) and minimum depth of cover will be 0.9 m.
- **Drainage**
 - A pre-construction drainage plan ('Drainage Strategy') will be developed and implemented to minimise water within the trench and ensure ongoing drainage of surrounding land. Where water enters the trenches during installation, this will be



pumped via the appropriate means to remove sediment, before being discharged into local ditches or drains via temporary interceptor drains.

80. Primary mitigation relevant to MA&D assessment is drawn from other assessments and is summarised below.

- Embedded mitigation surrounding marine risks is outlined in **Chapter 18: Marine Water and Sediment Quality**. Some of the relevant mitigation measures outlined in this chapter include:
 - effective communication vessels in the area throughout all stages of the proposed Project (pre lay surveys, installation, maintenance, and operation) using Notices to Mariners, Kingfisher Bulletins, Navigational Telex (NAVTEX), and NAVAREA warnings;
 - 500 m safety distances around installation vessels; and
 - the presence of guard vessel around the installation area perimeter.
- Further embedded mitigation including route clearance activities, the use of marine vessels and pollution prevention controls are outlined in **Chapter 18: Marine Water and Sediment Quality**. This includes the preparation of Pollution Prevention Management Plan (PPMP) and Water Quality and Pollution Management Plan.
- **Chapter 28: Other Sea Users** outlines embedded mitigation incorporated into the proposed Project design to avoid/reduce any likely significant effects. This is outlined in the chapter and included mitigation relating to cable siting and routing, landfall installation, proposed Project vessel requirements, safety legislation and notification.

30.7.2. Tertiary Mitigation

81. Tertiary mitigation would be required regardless of any EIA assessment, being imposed, for example, as a result of legislative requirements and/or standard sectoral practices.

Installation

82. As identified in **Chapter 4: Description of the Proposed Project**, the following surveys will be undertaken pre-installation of the turbines and cables:

- **Geophysical and geotechnical surveys** will be carried out prior to construction across the Array Area and in the OfECC, to gather further information on debris, boulders, presence of seabed features and sediment depth, etc.
- **Unexploded Ordnance (UXO) survey** will be conducted across the array area and the OfECC. These surveys will use a magnetometer to identify potential obstructions relating to maritime UXO. The likely number of UXO and detection methods will be confirmed from the UXO survey prior to the installation of offshore infrastructure.
- **Route clearance activities, which may include a pre-lay grapnel run, boulder clearance and pre-sweeping of sand waves**. Depending on a review of site data along the export cable route, a pre-lay grapnel run will be undertaken by a fishing vessel (or similar) to confirm the complete clearance of any abandoned fishing equipment or other debris. Where boulders are present within the cable route, dedicated boulder grab equipment will be used to move larger boulders (more than 30 cm) approximately 15 m perpendicular to the cable route. The boulders would be relocated within the Offshore Cable corridor Boundary and no boulders will be removed from the seabed during this operation. The exact procedure which will be followed for boulder relocation and clearance is to be agreed with NRW post consent. Pre-sweeping of sand waves is usually required in order to level the seabed;



- **Aquatic pre-installation activities.** Mitigation procedures pre cable installation that may include re location of wildlife, electro fishing by qualified specialists or watering sensitive aquatic vegetation.

83. In addition, the following documents submitted with the ES incorporate measures that mitigate MA&D risk:

Management Plans

84. A Project Environmental Management Plan (PEMP) is proposed to ensure that the potential for any contaminant release is strictly controlled. All Project vessels shall comply with the International Regulations for Preventing Collisions at Sea (IMO, 1972) and regulations relating to International Convention for the Prevention of Pollution from Ships (the MARPOL Convention 73/78) (IMO,2021) with the aim of preventing and minimising pollution from ships. All vessels shall have a contingency plan for marine oil pollution (Shipboard Oil Pollution Emergency Plan). A PEMP will be secured as a condition of the Marine Licence.

85. Best practice vessel handling protocols will be adopted to minimise the potential for any impact on marine wildlife, including marine mammal receptors. For example, the Codes of Conduct provided by the WiSe Scheme, Scottish Marine Wildlife Watching Code and / or Best Practice for Watching Marine Wildlife will be adopted, as to be discussed and agreed with NRW (A) and Joint Nature Conservation Committee. These will be set out within a Vessel Management Plan.

86. A Decommissioning Plan will be agreed with NRW at the relevant time prior to the start of offshore decommissioning.

Outline Construction Environmental Management Plan (CEMP)

87. The purpose of a CEMP is to specify the overarching principles and detailed measures to minimise and mitigate the effects of the installation activities associated with the proposed Project. It will also ensure that installation activities cause minimum disruption to residents and members of the public by achieving a safe and secure working environment. More specifically, the CEMP aims to:

- ensure that relevant mitigation measures set out in the technical reports as submitted in support of the planning application are implemented during all installation activities;
- consider relevant planning policies; and
- ensure that relevant legislation, Government and industry standards, and installation industry codes of practice and best practice standards are complied with.

88. On confirmation of Principal Contractor, the OCEMP will be updated to reflect specific proposed installation methods and the document reviewed and agreed with NRW, Pembrokeshire County Council and Pembrokeshire Coast National Park Authority before installation works begin. The CEMP will therefore evolve and is subject to refinement, amendment, and expansion as necessary.

89. The OCEMP sets out the minimum standards to be adopted when constructing the proposed Project and includes:

- a summary of the description of the proposed Project;
- a description of the main activities;
- an outline of the waste management procedures to be adopted;



- the responsibilities for managing, implementing and monitoring the CEMP;
- environmental training to be provided;
- communication, including external reporting and community relations; and
- a description of the potential environmental impacts and required measures for avoiding or minimising these impacts.

90. **Appendix 4C: Post Consent Environmental Management Plan Log** provides details of the Environmental Management Plans that are to be prepared post consent. These plans related to installation and operation. Whilst not repeated in full, those of relevance to this assessment include:

- Construction Method Statement;
- Pollution Prevention Management Plan;
- Water Management Plan;
- Construction Traffic Management Plan (CTMP);
- Detailed Drainage Management Plan;
- Operational Environmental Management Plan;
- Decommissioning Environmental Management Plan;
- PEMP;
- Emergency Response Cooperation Plan (ERCoP);
- Marine Mammal Mitigation Plan;
- Vessel Management Plan;
- Lighting and Marking Management Plan;
- Cable Specification and Installation Plan (CSIP);
- Cable Burial Risk Assessment;
- Shipboard Oil Pollution Emergency Plans;
- Project (Array) Layout Plan'
- Marine Pollution Contingency Plan (MPCP);
- Water Quality and Pollution Management Plan; and
- Fisheries Liaison and Co-existence Plan.

Construction Traffic Management Plan

91. Prior to installation, a CTMP will be prepared to provide details of access junctions, routing plans, and safety measures identifies the traffic management measures required to support the proposed Project. The measures that will be identified will relate to:

- traffic management;
- access;
- installation traffic movements;
- road signage; and



- cable crossings.

92. The following measures have been identified within **Chapter 13: Traffic and Transport** of the ES.

- There will be signage erected on the C3101 near the junction with Goldborough Road; on Goldborough Road; on the unclassified road that provides access to the onshore substation and on the B4319 to Freshwater Bay. This will highlight the potential for drivers to meet installation traffic.
- From the C3101 to the onshore substation there will be temporary speed limits implemented.
- Details of proposed Abnormal Indivisible Loads (AIlLs) and proposed routing arrangements.
- When transporting abnormal loads Pembrokeshire County Council will be contacted to provide advance warning of the intention to use identified routes.
- Consultations with the police will be undertaken to agree the most appropriate times for abnormal load deliveries to the onshore substation and help to identify any specific route sections that may require police assistance.
- Prior to any installation activities route plans will be distributed to contractors to make sure vehicles stay on proposed access routes.
- There will be escorts for the movement of abnormal loads to help manage the interaction with general traffic and mitigate any impact.
- Within the vicinity of the substation a 15 mph speed limit will be implemented;
- To reduce the amount of mud and debris distributed from the site wheel washing facilities will be provided.
- When accessing and leaving the onshore substation workers will be encouraged to share vehicles.

Shipping and Navigation

93. Measures relating to the management of Shipping and Navigation risks are described in full detail within **Table 25-13 of Chapter 25: Shipping and Navigation** and are not repeated within this chapter. In summary these include:

- The application of safety zones;
- Cable burial risk assessment;
- Carting of infrastructure;
- Compliance with MGN 654 (including an ERCoP);
- Compliance with floating foundation guidance;
- Fishing Liaison (including a Fisheries Liaison and Co-existence Plan);
- Guard Vessels;
- Lighting and Marking (including a Lighting and Marking Management Plan);
- Marine coordination for project vessels;
- Pollution planning;



- Project vessel compliance with international marine regulations;
- Promulgation of information; and
- A Marine Pollution Contingency Plan (MPCP).

Health and safety

94. The contractor(s) would be responsible for setting out how health and safety matters are managed, risks are identified and reduced in accordance with the current best practices and legal requirements. The Health and Safety Plan would provide and focus on the health and safety of the contractor(s) staff and workforce and ensure the health and safety of any visitors to the Onshore and Offshore Development Areas and their compounds and members of the general public in the vicinity of any activities.

Operation

Emergency Preparedness

95. The Applicant will ensure compliance with Marine Guidance Note (MGN) 654 and its annexes, where applicable, including completion of a Search and Rescue (SAR) checklist and submission of an ERCoP to the MCA post consent.

Shipping and Navigation

96. The following measures are relevant to the operation of the proposed Project:

- Charting of infrastructure;
- Guard vessel(s);
- Lighting and marking;
- Promulgation of information; and
- Traffic monitoring.

30.8 Appraisal of Potential Impacts

30.8.1. Stages 1 and 2: Identification and screening of risk events

97. The Environmental Risk Record (**Appendix 30A: Environmental Risk Record**) presents an assessment of the risk events associated with the Installation and operation of the proposed Project. For each risk event it establishes the hazard source, pathway, receptor and reasonably foreseeable worst-case consequence of an event as well as the area which may be impacted, the degree of harm and duration of any impact. Where it is considered that the risk event does not have the potential to result in serious damage it is not considered further within the MA&D appraisal. The Environmental Risk Record also identifies the proposed mitigation to minimise the tolerability consequence, probability and significance of risk of each risk event to determine residual risks.
98. Following the completion of the hazard screening the following MA&D hazard sources were screened-out. Justification is provided below to support these decisions. All other hazard sources identified (as set in Section 30.6) were carried forward for further assessment and are considered in **Tables 30-11** and **Table 30-12**:
- Installation:
 - Drought;
 - Heatwaves;



- Reduced visibility, e.g. due to volcanic ash, dust, sand or fog;
 - Space weather (e.g. geomagnetic storms, radiation storms and solar flares);
 - Extreme humidity condition (high and low);
 - Loss or failure of gas supply;
 - Bird Collision Risk;
 - Fire at neighbouring site;
 - Contamination or release of hazardous substances by off-site sources;
 - Civil unrest or protest;
 - Animal health – notifiable disease;
 - Loss or failure of gas supply;
 - Poor air quality; and
 - Influx of British Nationals.
- Operation
 - Drought;
 - Heatwaves;
 - Reduced visibility, e.g. due to volcanic ash, dust, sand or fog;
 - Ground instability hazards, e.g. landslides, ground collapse and sinkholes;
 - Space weather (e.g. geomagnetic storms, radiation storms and solar flares);
 - Loss or failure of gas supply;
 - Bird Collision Risk;
 - Fire at neighbouring site;
 - Contamination or release of hazardous substances by off-site sources;
 - Impacts on road safety caused by the operational traffic of the proposed Project;
 - Civil unrest or protest;
 - Loss or failure of gas supply;
 - Loss or failure of water supply;
 - Local fuel supply failure
 - Poor air quality;
 - Failure of the financial system; and
 - Influx of British Nationals.

Installation Risk Assessment

99. A summary of the installation phase assessment is provided within **Table 30-11**. Further details of the risk assessment can be found in **Appendix 30A: Environmental Risk Record**.



Table 30-11 Assessment of MA&D risks during Installation (note table only shows risk IDs screened into assessment – full risk record can be found in **Appendix 30A: Environmental Risk Record**)

ID	Hazard/Threat	Risk Event	Reasonably Foreseeable Worst-Case Consequence (unmitigated)	Summary of Primary and Tertiary Mitigation	Level of Risk
I1	Flooding from rivers, surface water, groundwater reservoirs and sewers	Periods of heavy or extreme rainfall resulting in the flooding of the Onshore Development Area and surrounding areas Proposed Project affecting drainage pathways	On site: Damage to Installation equipment and risk of injury to Installation personnel due to flooding. Off-site: Damage to and evaluation of affected properties, ecological sites and heritage assets due to flooding as a result of the proposed Project; Damage to crops.	<p>Drainage Strategy: A pre-Installation drainage plan will be developed and implemented to minimise water within the trench and ensure ongoing drainage of surrounding land. Where water enters the trenches during installation, this will be pumped via the appropriate means, (including measures to remove sediment where relevant) before being discharged into local ditches or drains via temporary interceptor drains. A Detailed Drainage Management Strategy will be prepared post consent.</p> <p>Flood Risk Assessments and Flood risk emergency plan: identifies the requirement to signing-up to EA advance flood warning systems, identification of access and emergency evacuation routes and/ or safe refugia</p>	Medium (not significant)
I2	Coastal flooding	Coastal flooding as a result of a storm event or tsunami or breach of flood defences resulting in the flooding of the Installation and surrounding areas.	On site: Collapse and subsidence of ground can lead to damage to equipment and death or injury. Off-site: Damage to property and risk of injury to general public; Physical damage to sensitive environmental receptors.		Medium (not significant)



ID	Hazard/Threat	Risk Event	Reasonably Foreseeable Worst-Case Consequence (unmitigated)	Summary of Primary and Tertiary Mitigation	Level of Risk
				<p>for personnel in the event of a flood event.</p> <p>Outline Construction Environmental Management Plan (OCEMP): States an Emergency Response Plan will be developed by the Principal Contractor and will detail the procedures for responding to incidents and emergencies on site, and any reporting. It also sets out the requirement for monitoring the weather forecast</p> <p>Compliance with relevant Health and Safety Legislation</p>	
I3	Storms and gales	Strong winds resulting in the potential movement of debris across the Onshore and Offshore Development Areas.	<p>Onshore On site: Damage to Installation equipment and risk of injury or death of Installation personnel. Off-site: Damage to property and risk of injury to general public</p> <p>Offshore On-site:</p>	<p>OCEMP: States an Emergency Response Plan will be developed by the Principal Contractor and will detail the procedures for responding to incidents and emergencies on site, and any reporting. It also sets out the requirement for monitoring the weather forecast.</p>	Medium (not significant)



ID	Hazard/Threat	Risk Event	Reasonably Foreseeable Worst-Case Consequence (unmitigated)	Summary of Primary and Tertiary Mitigation	Level of Risk
			Damage to Installation equipment and risk of injury or death of Installation personnel. Off-site: Damage to offsite users and risk of injury	Compliance with relevant Health and Safety Legislation	
16	Cold and snow	Extreme cold weather including snowfall impacting the Onshore and Offshore Development Areas	Risk to the health of Installation workers due to directly experiencing freezing temperatures and/ or being more vulnerable to other hazards as a consequence (for example being more prone to slips and falls on icy surfaces, reduced visibility and mobility/ dexterity due to precipitation and additional clothing, vehicles losing traction and/ or control of direction of travel, hidden hazards beneath snow, falling snow from roofs etc.) Failure of Installation machinery.	OCEMP: Sets out the requirements for monitoring the weather forecast. Compliance with relevant Health and Safety Legislation	Low (not significant)
17	Lightning and electrical storms	Working in proximity to tall equipment that may be more prone to being struck by lightning (e.g. cranes)	Damage to Installation equipment (including loss of communications, data stores, telemetry systems or control/ maintenance/ safety mechanisms, each of which could have knock-on implications in terms of other consequences) and risk of injury or death of Installation personnel.		Medium (not significant)



ID	Hazard/Threat	Risk Event	Reasonably Foreseeable Worst-Case Consequence (unmitigated)	Summary of Primary and Tertiary Mitigation	Level of Risk
I9	Ground instability hazards, e.g. landslides, ground collapse and sinkholes	Unstable ground conditions, landslides, sinkholes following heavy rainfall	<p>On site: Collapse and subsidence of ground can lead to damage to equipment and death or injury;</p> <p>Off-site: Damage to property and risk of injury to general public; Physical damage to sensitive environmental receptors.</p>	<p>Ground Investigation: will be carried out prior to construction across the Array Area and in the OfECC, to gather further information on debris, boulders, presence of seabed features and sediment depth, etc.</p>	Medium (not significant)
I10	Seismic hazards such as earthquakes or tremors	Earthquakes, tremors resulting in physical damage	<p>Onshore On site: Collapse and subsidence of ground can lead to damage to equipment and death or injury Off-site: Damage to property and risk of injury to general public; Physical damage to sensitive environmental receptors.</p> <p>Offshore On site: Collapse and subsidence of ground can lead to damage to equipment and death or injury. Damage to Installation equipment (including loss of communications, data stores, telemetry systems or control/ maintenance/ safety mechanisms, each of which could</p>	<p>Geotechnical design: Design of foundations and selection of materials in-line with relevant standards, taking to account potential for ground movement or compaction.</p> <p>Compliance with relevant guidance and Legislation</p>	Medium (not significant)



ID	Hazard/Threat	Risk Event	Reasonably Foreseeable Worst-Case Consequence (unmitigated)	Summary of Primary and Tertiary Mitigation	Level of Risk
			have knock-on implications in terms of other consequences) and risk of injury or death of Installation personnel. Damage to proposed Project Infrastructure Off-site: Physical damage to sensitive environmental receptors.		
I12	Wildfires	Wildfire spreading onto the Onshore Development Areas	<p>Onshore On site: Damage to Installation equipment and risk of injury or death of Installation personnel. Off site: Not applicable Physical damage to sensitive environmental receptors; Indirect effects on human health, property, heritage assets and wildlife due to smoke and ash deposition.</p> <p>Offshore On site: Damage to Installation equipment and risk of injury or death of installation personnel. Off site: Not applicable.</p>	OCEMP - set outs requirements for fire prevention and control within the 'Construction Site and Housekeeping' controls.	Medium (not significant)



ID	Hazard/Threat	Risk Event	Reasonably Foreseeable Worst-Case Consequence (unmitigated)	Summary of Primary and Tertiary Mitigation	Level of Risk
I14	Fire and/or explosion at the proposed Onshore and Offshore Development Areas	<p>Events/ circumstances such as:</p> <ul style="list-style-type: none"> cutting or drilling into unidentified utilities; release of ground gas as a result of Installation activities; fire/ explosion at a neighbouring site leading to a domino effect; unexploded ordnance (UXO); storage and handling of fuel or other flammable and combustible material; electrical faults and faulty wiring; hot work operations (e.g. welding, smouldering, grinding etc.); smoking; portable heaters; or temporary lighting/ lamps. 	<p><u>Onshore</u></p> <p>On site: Damage to Installation equipment and risk of injury or death of Installation personnel.</p> <p>Off site: Fire spreading from the proposed Project site to a neighbouring site resulting in damage to property and risk of injury or death to the general public; Physical damage to sensitive environmental receptors; Indirect effects on human health, property, heritage assets and wildlife due to smoke and ash deposition.</p> <p><u>Offshore</u></p> <p>On site: Damage to Installation equipment and risk of injury or death of Installation personnel.</p> <p>Off site: Physical damage to sensitive environmental receptors; Indirect effects on human health, property, heritage assets and wildlife due to smoke and ash deposition.</p>	<p>Design: Unexploded Ordnance (UXO) survey along the cable route (onshore and offshore) and turbine locations. These surveys will be used to identify potential obstructions relating to maritime UXO. The likely number of UXO and detection methods will be confirmed in a UXO survey prior to start of the seabed structures installation.</p>	Medium (not significant)



ID	Hazard/Threat	Risk Event	Reasonably Foreseeable Worst-Case Consequence (unmitigated)	Summary of Primary and Tertiary Mitigation	Level of Risk
I16	Unexploded Ordnance in the marine environment	Disturbance of unidentified UXO during the installation of marine infrastructure	<p>Offshore On site: Death or injury of Installation personnel. Mortality and potential mortal injury of fish species and marine mammals Off-site: Mortality and potential mortal injury of fish species and marine mammals</p>		Medium (not significant)
I17	Ground instability - collapse of deep excavations and stockpiles	Collapse of slopes during deep excavations and stockpiling	<p>Onshore On site: Collapse and subsidence of ground that can lead to damage to equipment and death or injury of Installation personnel. Off-site: Damage to property, agricultural land, heritage assets and risk of injury or death to the general public; Physical damage to sensitive environmental sites.</p> <p>Offshore On site: Damage to Installation equipment and risk of injury or death of Installation personnel. Off site: Physical damage to sensitive environmental receptors;</p>	<p>Design: will be carried out prior to construction across the Array Area and in the OfECC, to gather further information on debris, boulders, presence of seabed features and sediment depth, etc.</p> <p>Design: Anchorage will be required to fix the mooring systems to the seabed. The selected anchor solution will depend on the mooring configuration, seabed conditions and the required holding capacity and will likely be a combination of drag embedment, driven piles, drilled piles and suction pile anchors.</p>	Medium (not significant)



ID	Hazard/Threat	Risk Event	Reasonably Foreseeable Worst-Case Consequence (unmitigated)	Summary of Primary and Tertiary Mitigation	Level of Risk
				Compliance with relevant guidance and Legislation.	
I 18	Major leaks and spillages within the Onshore and Offshore Development Areas resulting in contamination or release of hazardous substances	Handling and storage of hazardous substances, i.e. chemicals and fuels; Loss of containment; Contaminated run-off from the proposed Project site; Creation of new drainage pathways to sensitive receptors; Pollution of the marine environment; Loss of/damage to equipment.	On site: Risk of contact with hazardous substances to Installation personnel Off-site: Risk of contact with hazardous substances by general public; Contamination of sensitive environmental receptors and agricultural land.	OCEMP: Appropriate measures to mitigate leaks and spills are included with in the OCEMP. The OCEMP also notes that a Pollution Prevention Management Plan, Water Management Plan and Water Quality and Pollution Management Plan would be prepared post consent. PEMP: is proposed to ensure that the potential for any contaminant release is strictly controlled. All proposed Project vessels shall comply with the International Regulations for Preventing Collisions at Sea (IMO, 1972) and regulations relating to International Convention for the Prevention of Pollution from Ships (the MARPOL Convention 73/78) (IMO,2021) with the aim of	Medium (not significant)



ID	Hazard/Threat	Risk Event	Reasonably Foreseeable Worst-Case Consequence (unmitigated)	Summary of Primary and Tertiary Mitigation	Level of Risk
				preventing and minimising pollution from ships. All vessels shall have a contingency plan for marine oil pollution (Shipboard Oil Pollution Emergency Plan).	
I20	Loss or failure of electricity transmission	<p>Unidentified utilities impacted by excavation, piling, cutting and drilling works.</p> <p>Damage to electricity transmission network from meteorological conditions or due to flooding impacting the proposed Project.</p>	<p>Onshore On site: Failure of equipment reliant on mains power. Disruption to Installation activity. Limited ability for an emergency response plan to be implemented, if reliant on mains power, and delay to emergency response. Limited ability to implement and effective safety, security and environmental management systems Off-site Disruption to properties Limited ability for an emergency response plan to be implemented, if reliant on mains power, and delay to emergency response.</p> <p>Offshore On site: Failure of equipment reliant on mains power. Disruption to Installation activity.</p>	<p>OCEMP – States an Emergency Response Plan will be developed by the Principal Contractor and will detail the procedures for responding to incidents and emergencies on site, and any reporting. . Utilities connections would be protected at all times during the Installation works. Inspection pits for buried utilities would be performed and clearances clearly demarcated on the proposed Project site. Critical services may require back up power supply or batteries.</p>	Low (not significant)



ID	Hazard/Threat	Risk Event	Reasonably Foreseeable Worst-Case Consequence (unmitigated)	Summary of Primary and Tertiary Mitigation	Level of Risk
			<p>Limited ability for an emergency response plan to be implemented, if reliant on mains power, and delay to emergency response.</p> <p>Limited ability to implement and effective safety, security and environmental management systems.</p> <p>Off-site</p> <p>Disruption to other vessels and users</p> <p>Limited ability for an emergency response plan to be implemented, if reliant on mains power, and delay to emergency response.</p>		
122	Loss or failure of water supply	<p>Unidentified utilities impacted by excavation, piling, cutting and drilling works.</p> <p>Damage to water supply network from meteorological conditions.</p>	<p>Onshore</p> <p>On site:</p> <p>Failure of equipment reliant on mains power.</p> <p>Disruption to Installation activity.</p> <p>Limited ability for an emergency response plan to be implemented, if reliant on mains power, and delay to emergency response.</p> <p>Limited ability to implement and effective safety, security and environmental management systems.</p> <p>Off-site</p>	<p>OCEMP –An Emergency Response Plan will be developed by the Principal Contractor and will detail the procedures for responding to incidents and emergencies on site, and any reporting. Utilities connections would be protected at all times during the Installation works.</p> <p>An ERCoP would be prepared post consent.</p>	Medium (not significant)



ID	Hazard/Threat	Risk Event	Reasonably Foreseeable Worst-Case Consequence (unmitigated)	Summary of Primary and Tertiary Mitigation	Level of Risk
			<p>Disruption to properties, other vessels and users</p> <p>Limited ability for an emergency response plan to be implemented, if reliant on mains power, and delay to emergency response.</p>		
123	Loss or failure of telecommunications	<p>Unidentified utilities impacted by excavation, piling, cutting and drilling works.</p> <p>Loss of telecommunications due to cyber-attack.</p> <p>Damage to electricity transmission or telecommunications networks from meteorological conditions.</p>	<p>On site:</p> <p>Failure of equipment reliant on mains power.</p> <p>Disruption to installation activity.</p> <p>Limited ability for an emergency response plan to be implemented, if reliant on mains power, and delay to emergency response.</p> <p>Limited ability to implement and effective safety, security and environmental management systems.</p> <p>Off-site</p> <p>Disruption to properties, other vessels and users</p> <p>Limited ability for an emergency response plan to be implemented, if reliant on mains power, and delay to emergency response.</p>	The ERCoP should consider the procedure to be followed in the event of the loss of communications for offshore areas.	Medium (not significant)
124	Emergency response activities implemented by the proposed Project	Retardant residues from firefighting activities draining into	Contamination and pollution of identified sensitive environmental receptors	OCEMP: States an Emergency Response Plan will be developed by the	Low (not significant)



ID	Hazard/Threat	Risk Event	Reasonably Foreseeable Worst-Case Consequence (unmitigated)	Summary of Primary and Tertiary Mitigation	Level of Risk
	impacting on sensitive receptors	environmentally sensitive areas and/or controlled waters.		Principal Contractor and will detail the procedures for responding to incidents and emergencies on site, and any reporting. An ERCoP would be prepared post consent.	
125	Absent or deficient safety and environmental management systems (e.g. inadequate planning, resource provision, procedures)	Increased risk of MA&D hazards described within this register.	As described within the register for all hazards relevant to the installation phase.	The installation contractor(s) would be required to have an accredited Environmental Management System. Llŷr Floating Wind Limited is contractually required by the Crown Estate to have an accredited integrated QHSE Management System An ERCoP would be prepared post consent. Compliance with relevant Legislation	Medium (not significant)
126	Marine Navigation	Risk of collision, disruption to activities and vessel grounding. Displacement of anchorages during	Onshore On-site: Loss of life or injury Collapse and subsidence of ground Off-site:	Measures relating to the management of Shipping and Navigation risks are described in full detail within Table 25-13 of Chapter 25:	Broadly Acceptable to Tolerable with Mitigation, (not significant)



ID	Hazard/Threat	Risk Event	Reasonably Foreseeable Worst-Case Consequence (unmitigated)	Summary of Primary and Tertiary Mitigation	Level of Risk
		installation impacting shipping industries;	Death/injury to shipping personnel Physical damage to sensitive environmental receptors. <u>Offshore</u> On-site: Loss of life or injury Contamination of the marine environment Off-site: Damage to shipping vessels; Death/injury to shipping personnel Physical damage to sensitive environmental receptors.	Shipping and Navigation and are not repeated within this chapter.	
127	Ground instability from subsea drilling/anchor installation	Unstable ground conditions under sea	<u>Offshore</u> On site: Collapse and subsidence of ground can lead to damage to equipment and death or injury; Off-site: Physical damage to sensitive environmental receptors.	Ground investigation - Additional ground investigation to confirm undersea ground conditions and ground related risks. Geotechnical design - design of earthworks and foundations and selection of materials in accordance with relevant standards, taking into account potential for ground movement and compaction, in order to minimise risk associated with drilling and anchor installation.	Medium (not significant)



ID	Hazard/Threat	Risk Event	Reasonably Foreseeable Worst-Case Consequence (unmitigated)	Summary of Primary and Tertiary Mitigation	Level of Risk
129	Collision of marine mammals with proposed Project vessels/cables	Risk of collision of equipment with marine mammals	<p>Offshore</p> <p>On site: Death or injury of installation personnel. Mortality and potential mortal injury of fish species and marine mammals</p> <p>Off-site: Mortality and potential mortal injury of fish species and marine mammals</p>	<p>Vessels and cables should avoid areas where there are likely to be large amounts of marine mammals e.g. feeding grounds, as part of their route.</p> <p>Vessel operators should be aware of the risk of marine mammal collision, and adhere to speed limits that may need to be put in place.</p> <p>Further details as provide in the Marine Mammal Mitigation Plan (MMMP).</p>	High (not significant)
130	Incident during installation works within the marine environment	Handling and storage of hazardous substances, i.e. chemicals and fuels. Loss of containment. Contaminated run-off from the Offshore Development Areas;	<p>Offshore</p> <p>Risk of contact with hazardous substances by general public. Contamination of marine environment</p>	<p>OCEMP: Appropriate measures to mitigate leaks and spills are included with in the OCEMP.</p> <p>An ERCOP, Marine Pollution Contingency Plan and Shipboard Oil Pollution Emergency Plans will also be prepared post consent to provide details of proposed mitigation measures.</p>	Medium (not significant)



ID	Hazard/Threat	Risk Event	Reasonably Foreseeable Worst-Case Consequence (unmitigated)	Summary of Primary and Tertiary Mitigation	Level of Risk
				Compliance with relevant Legislation.	
I31	Absent or deficient security provision (e.g. inadequate planning, resource provision, procedures)	Increased risk of vandalism/ crime/ terrorism	<p>On site: Death or risk of injury to installation personnel; Damage to installation equipment</p> <p>Off-site: Risk of long term injury of death of members of the public</p>	OCEMP: On-site security provision.	Medium (not significant)
I33	Explosion and structural collapse at neighbouring sites	Explosion and structural collapse at a neighbouring site impacting on the installation of the proposed Project or the operation of temporary associated developments	Falling debris or collapse of infrastructure within the neighbouring area resulting in damage to installation equipment and risk of injury of installation personnel	OCEMP: States an Emergency Response Plan will be developed by the Principal Contractor and will detail the procedures for responding to incidents and emergencies on site, and any reporting.	Medium (not significant)
I35	Vandalism/crime/terrorism leading to increased risk to the safety of members of public and site workers	Criminal damage/ vandalism; Theft; Terrorist acts; Unauthorised access to the Onshore and Offshore Development Areas Ionising radiation exposure from stolen goods.	<p>Onshore</p> <p>On site: Death or risk of injury to installation personnel; Damage to installation equipment.</p> <p>Off-site: Risk of injury or death to the general public.</p> <p>Offshore</p> <p>On site: Death or risk of injury to installation personnel;</p>	OCEMP: On-site security provision.	Medium (not significant)



ID	Hazard/Threat	Risk Event	Reasonably Foreseeable Worst-Case Consequence (unmitigated)	Summary of Primary and Tertiary Mitigation	Level of Risk
			Damage to installation equipment Off-site: Commercial and recreational vessels and users		
136	Road Traffic Accident on the wider traffic network	Traffic accident on the wider traffic network involving installation traffic Traffic accident on the wider network involving the carriage of high consequence dangerous goods associated with installation	Off-site: Death or injury of road users on installation personnel; Damage to properties; Risk of contact with hazardous substances by general public; Contamination of sensitive environmental receptors and agricultural land.	OCEMP: Prior to installation, a Construction Traffic Management Plan (CTMP) will be prepared to provide details of access junctions, routing plans, and safety measures identifies the traffic management measures required to support the proposed Project.	Medium (not significant)
138	Outbreak of disease (emerging infectious disease or pandemic influenza)	Disease outbreak or epidemics impacting installation workers.	Death or risk of injury to installation personnel.	No proposed Project-specific mitigation is identified. National and regional guidelines would be enforced on site as appropriate.	Medium (not significant)
140	Loss or failure of electricity transmission	Damage to electricity transmission network from other Projects or meteorological conditions impacting on service provision for proposed Project.	Failure of equipment reliant on mains power. Disruption to installation activity. Limited ability for an emergency response plan to be implemented, if reliant on mains power, and delay to emergency response. Limited ability to implement and effective safety, security and	OCEMP: States an Emergency Response Plan will be developed by the Principal Contractor and will detail the procedures for responding to incidents and emergencies on site, and any reporting.. Critical services	Low (not significant)



ID	Hazard/Threat	Risk Event	Reasonably Foreseeable Worst-Case Consequence (unmitigated)	Summary of Primary and Tertiary Mitigation	Level of Risk
			environmental management systems.	may require back up power supply or batteries.	
I42	Loss or failure of water supply	Damage to water supply network from other developments or meteorological conditions impacting on service provision for proposed Project.	Disruption to installation activity Limited ability for an emergency response plan to be implemented, if reliant on water supply, and delay to emergency response. Limited ability to implement and effective safety and environmental management systems.	OCEMP: States an Emergency Response Plan will be developed by the Principal Contractor and will detail the procedures for responding to incidents and emergencies on site, and any reporting.	Medium (not significant)
I43	Loss or failure of telecommunications (including navigation systems)	Damage to electricity transmission or navigation / telecommunications networks from other developments or meteorological conditions impacting on service provision for proposed Project.	Interruption of communications and services that may lead to other MA&D risks; Limited ability of an emergency response plan to be implemented and delay to emergency response. Limited ability to implement effective safety, security and environmental management systems		Medium (not significant)
I44	Food supply contamination	Pollution incident	Risk of harm to the health of installation personnel	No proposed Project-specific mitigation is identified. National guidelines would be enforced on site as appropriate.	Low (not significant)
I45	Local fuel supply failure	Risk of disruption to installation activities associated with	Disruption to installation processes dependent on fuel supply. Limit the ability to implement and effective safety, security and	Onshore proposed Project design - connection to mains power would be provided at the early stage of the	Low (not significant)



ID	Hazard/Threat	Risk Event	Reasonably Foreseeable Worst-Case Consequence (unmitigated)	Summary of Primary and Tertiary Mitigation	Level of Risk
		availability of installation workforce	environmental management systems Limited ability for an emergency response plan to be implemented, if reliant on fuel supply, and delay to emergency response.	installation programme. A Construction Method Statement would be prepared post consent. OCEMP: States an Emergency Response Plan will be developed by the Principal Contractor and will detail the procedures for responding to incidents and emergencies on site, and any reporting.. Critical services may require back up power supply or batteries.	
I47	Cyber-attack and digital data security	Security breach of the proposed Project site	Loss of sensitive information which can increase the probability of crime/ terrorism/ vandalism. Could limit the ability to implement and effective safety, security and environmental management systems	Procedures should be implemented for dealing with sensitive information. Any contractors working on the installation of the proposed Project will be required to comply with requirements for data security.	Medium (not significant)
I48	Aviation collision	Aircraft incident within the proposed Project site	Risk of death/injury to installation personnel.	Design: The proposed Project will be fitted with Ministry of Defence accredited aviation safety lighting, in accordance with the 2016 Air Navigation	Medium (not significant)



ID	Hazard/Threat	Risk Event	Reasonably Foreseeable Worst-Case Consequence (unmitigated)	Summary of Primary and Tertiary Mitigation	Level of Risk
				<p>Order (CAP393) (Appendix 32A: Mitigation Register). As a minimum, in terms of aviation lighting, it is planned for medium intensity (2000 Candela) steady red lighting to be positioned on the nacelle of each wind turbine.</p> <p>OCEMP: States an Emergency Response Plan will be developed by the Principal Contractor and will detail the procedures for responding to incidents and emergencies on site, and any reporting.</p> <p>An ERCoP would be prepared post consent.</p>	
149	Failure of financial system	Failure of the financial system resulting in a reduced public services	Limited ability of an emergency response plan to be implemented and delay to emergency response Increased response time or lack of available resources may lead to other MA&D risks	No proposed Project-specific mitigation is identified. National guidelines would be enforced on site as appropriate	Medium (not significant)
150	Impacts on the ability of an emergency response plan to be implemented	Full or partial obstruction to the operation of emergency services,	Access for emergency services to proposed Project site being restricted	OCEMP: Prior to installation, a Construction Traffic Management Plan (CTMP)	Medium (not significant)



ID	Hazard/Threat	Risk Event	Reasonably Foreseeable Worst-Case Consequence (unmitigated)	Summary of Primary and Tertiary Mitigation	Level of Risk
		<p>leading to a slow response time and increased number of deaths/ injuries or spread of contamination for risk events described for installation.</p>	<p>Installation works impeding or obstructing the response of emergency services for another site.</p> <p>Delivery of Abnormal Indivisible Loads (AIL) restricting the response of emergency services</p>	<p>will be prepared to provide details of access junctions, routing plans, and safety measures identifies the traffic management measures required to support the proposed Project.</p>	



29.8.1.2 Operational Risk Assessment

100. A summary of the operational phase assessment is provided within **Table 30-12**. Further details of the risk assessment can be found in **Appendix 30A: Environmental Risk Record**.



Table 30-12 Assessment of MA&D risk during operation

ID	Hazard/Threat	Risk Event	Reasonably Foreseeable Worst Case Consequence (unmitigated)	Summary of Primary and Tertiary Mitigation	Level of Risk
O1	Flooding from rivers, surface water, groundwater reservoirs and sewers	<p>Flooding of the proposed Project site and properties downstream</p> <p>Run-off from the proposed Project site</p>	<p>Onshore</p> <p>On site: Damage to infrastructure and risk of injury to operational personnel due to flooding;</p> <p>Off-site: Damage to and evacuation of affected properties due to flooding; Damage to crops; Physical damage to sensitive environmental receptors</p> <p>Offshore</p> <p>On site: Damage to infrastructure and risk of injury to operational personnel due to flooding;</p> <p>Off-site: Physical damage to sensitive environmental receptors</p>	No proposed Project-specific mitigation provided. National and local guidance would be followed during such an event.	Medium (not significant)
O2	Coastal flooding	Coastal flooding as a result of a storm event or tsunami or breach of flood defences resulting in the flooding of the main platform and surrounding areas	<p>On site: Collapse and subsidence of ground can lead to damage to equipment and death or injury;</p> <p>Off-site: Damage to property and risk of injury to general public; Physical damage to sensitive environmental receptors</p>	No proposed Project-specific mitigation provided. National and local guidance would be followed during such an event.	Medium (not significant)



ID	Hazard/Threat	Risk Event	Reasonably Foreseeable Worst Case Consequence (unmitigated)	Summary of Primary and Tertiary Mitigation	Level of Risk
O3	Storms and Gales	Strong winds resulting in the potential movement of debris across the proposed Project site.	<p>Onshore On site: Damage to infrastructure and risk of injury or death of operational personnel and road users</p> <p>Offshore On-site: Damage to installation equipment and risk of injury or death of installation personnel. Off-site: Damage to offsite users and risk of injury</p>	<p>Design: The proposed wind turbines will operate within a set wind speed range and have a minimum wind speed at which they start generating electricity, and a maximum wind speed at which cannot generate and operates in a standby mode.</p> <p>Design: Anchorage will be required to fix the mooring systems to the seabed. The selected anchor solution will depend on the mooring configuration, seabed conditions and the required holding capacity and will likely be a combination of drag embedment, driven piles, drilled piles and suction pile anchors.</p> <p>Design: Each wind turbine will have a minimum clearance between sea level and the lowest position of the blade of 22m.</p>	Low (not significant)



ID	Hazard/Threat	Risk Event	Reasonably Foreseeable Worst Case Consequence (unmitigated)	Summary of Primary and Tertiary Mitigation	Level of Risk
				Compliance with relevant Health and Safety Legislation.	
O6	Cold and snow	Extreme cold weather resulting in snow and ice on the proposed Project site	Risk to the health of operational personnel due to freezing temperatures	<p>No proposed Project-specific mitigation provided. Relevant health and safety legislation and any national or regional guidance would be adhered to.</p> <p>Compliance with relevant Health and Safety Legislation.</p>	Low (not significant)
O7	Lightning and Electrical Storms	Risk of cloud-to-ground lightning striking within the proposed Project site during operation and maintenance activities	Damage to infrastructure and risk of injury or death of operational personnel.	No proposed Project-specific mitigation provided. Relevant health and safety legislation would be adhered to.	Medium (not significant)
O10	Seismic hazards such as earthquakes or tremors	Earthquakes, tremors resulting in physical damage	<p><u>Onshore</u> On site: Collapse and subsidence of ground can lead to damage to equipment and risk of injury or death to operational personnel Off-site: Damage to property and risk of injury to general public; Physical damage to sensitive environmental receptors.</p> <p><u>Offshore</u> On site:</p>	Design: Anchorage will be required to fix the mooring systems to the seabed. The selected anchor solution will depend on the mooring configuration, seabed conditions and the required holding capacity and will likely be a combination of drag embedment, driven piles, drilled piles and suction pile anchors.	Medium (not significant)



ID	Hazard/Threat	Risk Event	Reasonably Foreseeable Worst Case Consequence (unmitigated)	Summary of Primary and Tertiary Mitigation	Level of Risk
			<p>Collapse and subsidence of ground can lead to damage to equipment and risk of injury or death to operational personnel</p> <p>Off-site: Damage to property and risk of injury to general public; Physical damage to sensitive environmental receptors.</p>	<p>Data collated by British Geological Survey and Musson and Sargeant (2007) demonstrate that the seismic hazard of the UK is considered to be very low.</p>	
O12	Wildfires	Wildfire spreading onto the proposed Project site (onshore only)	<p>On site: Damage to buildings and equipment and risk of injury or death of operational personnel; Indirect effects on human health, property, heritage assets and wildlife due to smoke and ash deposition.</p> <p>Off-site: Fire spreading from the proposed Project site to a neighbouring site resulting in damage to property and risk of injury or death to the general public; Physical damage to sensitive environmental receptors; Indirect effects on human health, property, heritage assets and wildlife due to smoke and ash deposition.</p>	<p>No proposed Project-specific mitigation provided. Relevant health and safety legislation and any national or regional guidance would be adhered to.</p>	Medium (not significant)
O14	Failure of Wind Turbine Infrastructure (including nacelle, blades and generators)	Pollution of the marine environment. Loss of/damage to equipment	<p>On site: Loss of/damage to machinery; Risk of injury or death the site personnel</p> <p>Off site:</p>	<p>An ERCoP would be prepared and submitted to the MCA post consent.</p>	Low (not significant)



ID	Hazard/Threat	Risk Event	Reasonably Foreseeable Worst Case Consequence (unmitigated)	Summary of Primary and Tertiary Mitigation	Level of Risk
O16	Marine Navigation	Risk of collision, disruption to activities and vessel grounding. Impact on primary surveillance Radars. Potential for subsea cables to interact with fishing gear and anchors. Failure of semi-submersible floating platform mooring system. Risk of collision of equipment with marine mammals. Rock protection causing reduction in keel clearance and increased risk of vessel grounding/collision	Damage to the marine environment On-site/ off-site Loss of life or injury; Loss/damage to machinery Contamination of the marine environment; Death or injury of installation personnel. Mortality and potential mortal injury of fish species and marine mammals; Mortality and potential mortal injury of fish species and marine mammals	The following measures are relevant to the operation of the Project: <ul style="list-style-type: none"> - Charting of infrastructure; - Guard vessel(s); - Lighting and marking (Including a Lighting and Marking Management Plan); - Promulgation of information; and - Traffic monitoring. 	TifALARP (not significant)
O17	Major leaks and spillages at the proposed Project site resulting in contamination or release of hazardous substances	Handling and storage of hazardous substances, i.e. chemicals and fuels. Loss of containment. Contaminated run-off from the proposed Project site. Creation of new drainage pathways to sensitive receptors.	On site: Risk of contact with hazardous substances to operational personnel Off-site: Risk of contact with hazardous substances by general public; Contamination of sensitive environmental receptors and agricultural land.	An ERCoP would be prepared and submitted to the MCA post consent. PEMP: A PEMP is proposed to ensure that the potential for any contaminant release is strictly controlled. All Project vessels shall comply with the International Regulations for Preventing Collisions at Sea	Medium (not significant)



ID	Hazard/Threat	Risk Event	Reasonably Foreseeable Worst Case Consequence (unmitigated)	Summary of Primary and Tertiary Mitigation	Level of Risk
		Pollution of the marine environment. Loss of/damage to equipment.		(IMO, 1972) and regulations relating to International Convention for the Prevention of Pollution from Ships (the MARPOL Convention 73/78) (IMO,2021) with the aim of preventing and minimising pollution from ships. All vessels shall have a contingency plan for marine oil pollution (Shipboard Oil Pollution Emergency Plan). An ERCoP would be prepared and submitted to the MCA post consent.	
O18	Loss or failure of telecommunications	Cyber Attack. Damage to electricity transmission or telecommunications networks from meteorological conditions.	On site: Disruption to operation Interruption of communications and services which may lead to other MA&D risks; Limited ability of an emergency response plan to be implemented and delay to emergency response Limited ability to implement effective safety, security and environmental management systems.	The ERCoP should consider the procedure to be followed in the event of the loss of communications.	Medium (not significant)
O19	Emergency response activities implemented on the proposed Project site	Water from fire extinguishing draining into environmentally sensitive	Off-site: Contamination and pollution of identified sensitive environmental receptors	An ERCoP would be prepared and submitted to the MCA post consent.	Low (not significant)



ID	Hazard/Threat	Risk Event	Reasonably Foreseeable Worst Case Consequence (unmitigated)	Summary of Primary and Tertiary Mitigation	Level of Risk
	impacting on sensitive receptors	areas and/ or controlled waters			
O20	Absent or deficient safety/ environmental management systems (e.g. inadequate planning, resource provision, procedures)	Increased risk of MA&D hazards described within the register.	As described within the register for all hazards relevant to the operation phase.	<p>The Applicant will have an accredited Environmental Management System for the duration of the operation of the proposed Project.</p> <p>All vessels will operate in adherence with Marine Pollution (MARPOL) requirements. Accordance with this will help to ensure that the potential for release of pollutants is minimised during operation and maintenance.</p>	Medium (not significant)
O21	Absent or deficient security provision (e.g. inadequate planning, resource provision, procedures)	Increased risk of vandalism/ crime/ terrorism	<p>On site: Risk of long term injury or death of operational personnel Damage to infrastructure</p> <p>Off-site: Risk of long term injury of death of members of the public</p>	<p>Onshore - The substation will also be complemented with security infrastructure such as 2.4 m high, galvanised steel panelised fencing, CCTV, motion sensor lighting as well as security alarms.</p> <p>Offshore - Use of operational and maintenance safety zones. 500 m safety zones will be</p>	Medium (not significant)



ID	Hazard/Threat	Risk Event	Reasonably Foreseeable Worst Case Consequence (unmitigated)	Summary of Primary and Tertiary Mitigation	Level of Risk
				applied for during major maintenance.	
O23	Explosion and structural collapse at neighbouring sites	Explosion and structural collapse at a neighbouring site impacting on the operation of the proposed Project.	Falling debris or collapse of infrastructure within the neighbouring area resulting in damage to equipment and risk of injury of personnel.	An ERCoP would be prepared and submitted to the MCA post consent. . Compliance with relevant Health and Safety Legislation.	Low (not significant)
O26	Vandalism/crime/terrorism leading to increased risk to the safety of members of public and site workers	Criminal damage/vandalism. Theft. Terrorist acts. Unauthorised vehicles accessing the proposed Project site. Direct Vehicle Impact; Ionising radiation risk radiation exposure from stolen goods.	On site: Death or risk of injury to operational personnel Damage to infrastructure Off-site: Death or risk of injury to members of the general public	An ERCoP would be prepared and submitted to the MCA post consent. .	Medium (not significant)
O28	Animal health – notifiable disease	Disease outbreak or epidemics impacting the workers.	Death or risk of injury to operational personnel.	No proposed Project-specific mitigation provided. Relevant health and safety legislation and any national or regional guidance would be adhered to.	Medium (not significant)
O29	Outbreak of disease (emerging infectious disease or pandemic influenza)	Disease outbreak impacting the movement of operational workers and materials.	Restricted access to site impacting on operations which may lead to other hazards	No proposed Project-specific mitigation provided. Relevant health and safety legislation and any national or regional	Medium (not significant)



ID	Hazard/Threat	Risk Event	Reasonably Foreseeable Worst Case Consequence (unmitigated)	Summary of Primary and Tertiary Mitigation	Level of Risk
				guidance would be adhered to.	
O30	Loss or failure of electricity transmission	<p>Power shortage in the wider electricity transmission network.</p> <p>Damage to electricity transmission network by other development or meteorological conditions impacting on the service provision for proposed Project.</p>	<p>Failure of equipment reliant on mains power.</p> <p>Limited ability for an emergency response plan to be implemented, if reliant on mains power, and delay to emergency response.</p> <p>Limited ability to implement an effective safety, security and environmental management systems</p>	No project specific mitigation provided. Relevant health and safety legislation and any national or regional guidance would be adhered to.	Low (not significant)
O33	Loss or failure of telecommunications	<p>Power shortage in the wider electricity transmission network.</p> <p>Damage to electricity transmission or telecommunications networks by other development or meteorological conditions.</p>	<p>On site:</p> <p>Interruption of communications and services which may lead to other MA&D risks;</p> <p>Limited ability of an emergency response plan to be implemented and delay to emergency response</p> <p>Limited ability to implement effective safety, security and environmental management systems</p>	The ERCoP should consider the procedure to be followed in the event of the loss of communications.	Medium (not significant)
O34	Food supply contamination	Pollution incident	Death or risk of injury to operational personnel.	No proposed Project-specific mitigation provided. Relevant national or regional guidance would be adhered to.	Low (not significant)
O37	Cyber-attack and digital data security	Hackers	On site:	Procedures should be implemented for dealing with sensitive information. Any	Medium (not significant)



ID	Hazard/Threat	Risk Event	Reasonably Foreseeable Worst Case Consequence (unmitigated)	Summary of Primary and Tertiary Mitigation	Level of Risk
		Security breach of at the operational site	Loss of sensitive information which can increase the probability of crime/ terrorism/ vandalism; Could limit the ability to implement and effective safety, security and environmental management systems	contractors working on the installation of the project will be required to comply with requirements for data security.	
040	Limiting the ability of an emergency response plan to be implemented	Access for emergency services to the proposed Project site being restricted or disruption to public services Impacts on the ability of an emergency response plan to be implemented Delivery of Abnormal Indivisible Loads (AIL) restricting the response of emergency services	On-site/ Off-site Insufficient access to emergency services, leading to a slow response time and increased number of deaths/ injuries or spread of contamination.	An ERCoP would be prepared and submitted to the MCA post consent..	Medium (not significant)



29.8.1.3 Decommissioning

101. Given the broadly similar nature of decommissioning activities when compared to construction activities, the main consequences of vessel displacement during the decommissioning phase are equivalent to that highlighted for the installation phase therefore risks would remain as described in **Table 30-11**. A Decommissioning Plan will be agreed with NRW at the relevant time prior to the start of offshore decommissioning. It is considered that this plan will include reference to legislative requirements at the time of decommissioning and will include similar measures to that within the Outline CEMP to minimise environmental impacts.

29.8.1.4 Inter-relationship effects

102. The MA&D assessment has inherently considered inter-relationship effects with other topics being assessed as part of the EIA which have the potential to lead to a risk event or to affect identified receptors. However, as MA&D are extreme and rare events, they are unlikely to combine with the normal effects of installation or operation described within **Volume 2,3** or **4** of the ES.

30.9 Additional Mitigation and Enhancement Measures

103. No further mitigation has been identified during the MA&D assessment.

30.10 Residual Effects and Conclusions

104. This section summarises the residual significant MA&D risks of the proposed Project following the implementation of mitigation.



Table 30-13 Summary of residual effects

Receptor	Description of impact	Mitigation / enhancement measure	Residual effect after mitigation
Construction			
<p>On site</p> <ul style="list-style-type: none"> • Construction personnel and Proposed Project infrastructure • Sensitive environmental receptors <p>Off-site</p> <p>Properties</p> <ul style="list-style-type: none"> • General Public • Sensitive environmental receptors 	<p>Vulnerability of the Proposed Project to Natural disaster hazards:</p> <ul style="list-style-type: none"> • Flooding from rivers, surface water, groundwater reservoirs and sewers; • Coastal flooding; • Storms and Gales; • Drought; • Heatwave; • Cold and Snow; • Lighting and Electrical Storms; • Reduced visibility, e.g. due to volcanic ash, dust, sand or fog; • Ground instability hazards, e.g. landslides, ground collapse and sinkholes; • Seismic hazards such as earthquakes or tremors; • Space weather (e.g. geomagnetic storms, radiation storms and solar flares); • Wildfires; and • Extreme humidity condition (high and low). 	<p>Drainage Strategy:</p> <ul style="list-style-type: none"> • Flood Risk Assessments and Flood risk emergency plan; • Implementation of the OCEMP; • Compliance with relevant Health and Safety Legislation; • Ground Investigation; and • Geotechnical design. 	<p>None Perceived to Medium (not significant)</p>
	<p>Vulnerability of the Proposed Project to Major Accident hazards and other hazards/ threats:</p> <ul style="list-style-type: none"> • Fire and/or explosion at the development site ; • Unexploded Ordnance in the marine environment; 	<p>Proposed Project Design as set out within Chapter 4: Description of the proposed Project;</p> <ul style="list-style-type: none"> • UXO survey; 	<p>None Perceived to Medium (not significant)</p>



Receptor	Description of impact	Mitigation / enhancement measure	Residual effect after mitigation
	<ul style="list-style-type: none"> • Ground instability - collapse of deep excavations and stockpiles; • Major leaks and spillages at the development site resulting in contamination or release of hazardous substances; • Loss or failure of electricity transmission; • Loss or failure of gas supply; • Loss or failure of water supply; • Loss or failure of telecommunications; • Emergency response activities implemented by the Project impacting on sensitive receptors; • Absent or deficient safety and environmental management systems (e.g. inadequate planning, resource provision, procedures) • Marine Navigation; • Ground instability from subsea drilling/anchor installation; • Bird Collision Risk; • Collision of marine mammals with project vessels/cables; • Installation within the marine environment; • Absent or deficient security provision (e.g. inadequate planning, resource provision, procedures) • Fire at a neighbouring site; • Explosion and structural collapse at neighbouring sites; 	<ul style="list-style-type: none"> • Compliance with relevant Health and Safety Legislation; • Implementation of measures within the OCEMP; • Implementation of a PEMP; • Implementation of a ERCoP; • The application of safety zones; • Cable burial risk assessment; • Carting of infrastructure; • Compliance with MGN 654 (Including the ERCoP); • Compliance with floating foundation guidance; • Fishing Liaison (including a Fisheries Liaison and Co-existence Plan); • Guard Vessels; • Lighting and Marking (including a Lighting and Marking Management Plan); • Marine coordination for project vessels; • Pollution planning; • Project vessel compliance with international marine regulations; • Promulgation of information; • A Marine Pollution Contingency Plan (MPCP); • Marine Mammal Mitigation Plan; • Shipboard Oil Pollution Emergency Plans; and • Implementation of a CTMP. 	



Receptor	Description of impact	Mitigation / enhancement measure	Residual effect after mitigation
	<ul style="list-style-type: none"> • Contamination or release of hazardous substances by off-site sources; • Vandalism/crime/terrorism leading to increased risk to the safety of members of public and site workers; • Road Traffic Accident on the wider traffic network; • Civil unrest or protest; • Outbreak of disease (emerging infectious disease or pandemic influenza); • Animal health – notifiable disease; • Loss or failure of electricity transmission; • Loss or failure of gas supply; • Loss or failure of water supply; • Loss or failure of telecommunications (including navigation systems); • Food supply contamination; • Local fuel supply failure; • Poor air quality; • Cyber-attack and digital data security; • Aviation collision; • Failure of financial system; • Influx of British Nationals; and • Impacts on the ability of an emergency response plan to be implemented. 		



Receptor	Description of impact	Mitigation / enhancement measure	Residual effect after mitigation
Operation			
<p>On site</p> <ul style="list-style-type: none"> • Construction personnel and Proposed Project infrastructure • Sensitive environmental receptors <p>Off-site</p> <ul style="list-style-type: none"> • Properties • General Public • Sensitive environmental receptors 	<p>Vulnerability of the Proposed Project to Natural disaster hazards:</p> <ul style="list-style-type: none"> • Flooding from rivers, surface water, groundwater reservoirs and sewers; • Coastal flooding; • Storms and Gales; • Drought; • Heatwave; • Cold and snow; • Lightning and Electrical Storms; • Reduced visibility, e.g. due to volcanic ash, dust, sand or fog; • Ground instability hazards, e.g. landslides, ground collapse and sinkholes; • Seismic hazards such as earthquakes or tremors; • Space weather (e.g. geomagnetic storms, radiation storms and solar flares); • Wildfires; and • Extreme humidity conditions (high and low). 	<ul style="list-style-type: none"> • Project design as set out within Chapter 4: Description of the proposed Project; • Compliance with relevant Health and Safety Legislation as detailed in Table 30-1. 	<p>None Perceived to Medium (not significant)</p>
	<p>Vulnerability of the Proposed Project to Major Accident hazards and other hazards/ threats:</p> <ul style="list-style-type: none"> • Failure of Wind Turbine Infrastructure (including nacelle, blade and generators); • Bird Collision Risk; • Marine Navigation; 	<ul style="list-style-type: none"> • Project design as set out within Chapter 4: Description of the proposed Project; • Compliance with relevant Health and Safety Legislation as detailed in Table 30-1; • Charting of infrastructure; • Guard vessel(s); 	<p>None Perceived to Medium (not significant)</p>



Receptor	Description of impact	Mitigation / enhancement measure	Residual effect after mitigation
	<ul style="list-style-type: none"> • Major leaks and spillages at the development site resulting in contamination or release of hazardous substances; • Loss or failure of telecommunications; • Emergency response activities implemented on the development site impacting on sensitive receptors; • Absent or deficient safety/ environmental management systems (e.g. inadequate planning, resource provision, procedures); • Absent or deficient security provision (e.g. inadequate planning, resource provision, procedures); • Fire at a neighbouring site; • Explosion and structural collapse at neighbouring sites; • Contamination or release of hazardous substances by off-site sources; • Impacts on road safety caused by the operational traffic of the proposed development; • Vandalism/crime/terrorism leading to increased risk to the safety of members of public and site workers; • Civil unrest or protest; • Outbreak of disease (emerging infectious disease or pandemic influenza); • Animal health – notifiable disease; • Loss or failure of electricity transmission; • Loss or failure of gas supply; 	<ul style="list-style-type: none"> • Lighting and marking (Including a Lighting and Marking Management Plan); • Promulgation of information; • Traffic monitoring; • Implementation of a ERCoP; • Implementation of a PEMP; • All vessels shall have a contingency plan for marine oil pollution (Shipboard Oil Pollution Emergency Plan); • The Applicant would have an Environmental Management System for the duration of the operation of the proposed Project; • All vessels will operate in adherence with Marine Pollution (MARPOL) requirements. Accordance with this will help to ensure that the potential for release of pollutants is minimised during operation and maintenance; and • Procedures should be implemented for dealing with sensitive information. Any contractors working on the maintenance of the project will be required to comply with requirements for data security. 	



Receptor	Description of impact	Mitigation / enhancement measure	Residual effect after mitigation
	<ul style="list-style-type: none"> • Loss or failure of water supply; • Loss or failure of telecommunications; • Food supply contamination; • Local fuel supply failure; • Poor air quality; • Cyber-attack and digital data security; • Failure of financial system; • Influx of British Nationals; and • Limiting the ability of an emergency response plan to be implemented. 		



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