Environmental Impact Assessment Report
Volume 4: Outline Project Environmental Monitoring Programme

MarramWind Offshore Wind Farm

December 2025

MarramWind

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Contents

1. Introduction

1.1 Overview

1.1.1.1 This Outline Project Environmental Monitoring Programme (PEMP) has been produced along with the Environmental Impact Assessment (EIA) Report and aims to set out a proportionate framework for monitoring baseline conditions, predicted likely significant effects and other key impacts on relevant environmental receptors.

1.1.1.2 This Outline PEMP relates to M-049 of **Volume 3, Appendix 5.2: Commitments Register**.

1.2 Project background

1.2.1.1 MarramWind Offshore Wind Farm (hereafter referred to as 'the Project') is wholly owned by Scottish Power Renewables UK Limited (SPR). MarramWind Limited, a subsidiary of SPR, is the Applicant for the Project.

1.2.1.2 The Project is a proposed floating wind farm located in the North Sea, with a grid connection capacity of up to 3 gigawatts. The location of the Project is determined by the Option Agreement Area (OAA), which is the spatial boundary of the Northeast 7 (NE7) Plan Option within which the electricity generating infrastructure will be located. The NE7 Plan Option is located north-east of Rattray Head on the Aberdeenshire coast in north-east Scotland, approximately 75 kilometres (km) at its nearest point to shore and 110km at its furthest point. An Option to Lease Agreement for the Project within the NE7 Plan Option was signed in April 2022.

1.2.1.3 A summary of the Project is provided in **Volume 1, Chapter 1: Introduction** and a comprehensive description of the Project is provided in **Volume 1, Chapter 4: Project Description** of the EIA Report.

1.2.1.4 This Outline PEMP relates to the offshore components of the Project only. The Project's offshore infrastructure, located seaward of Mean High Water Springs (MHWS), includes the following:

- wind turbine generators (WTGs), including floating units (platforms and station keeping system);
- array cables;
- subsea distribution centres;
- subsea substations;
- offshore substations;
- reactive compensation platform(s) (if required); and
- offshore export cables to connect the offshore infrastructure to the landfall(s).

1.2.1.5 The EIA Report accompanies applications for offshore consents, licences and permissions for the Project to Marine Directorate - Licensing Operations Team (MD-LOT) under Section 36 (s.36) of the Electricity Act 1989, the Marine (Scotland) Act 2010 and the Marine and Coastal Access Act 2009, for the offshore infrastructure seaward of MHWS.

1.2.1.6 The EIA Report also accompanies an application to Aberdeenshire Council for planning permission in principle consent under The Town and Country Planning (Scotland) Act 1997, for the onshore infrastructure landward Mean Low Water Springs (MLWS).

1.2.1.7 There are four sets of EIA regulations applicable to the Project: the Electricity Works (EIA) (Scotland) Regulations 2017 for offshore generating stations requiring s.36 consent; the Marine Works (EIA) (Scotland) Regulations 2017 and the Marine Works (EIA) Regulations 2007 for marine licence applications within Scottish territorial waters (0-12 nautical miles) and offshore waters (12-200 nautical miles) respectively; and the Town and Country Planning (EIA) (Scotland) Regulations 2017 for planning applications submitted to Aberdeenshire Council for onshore infrastructure located landward of MLWS.

1.3 Purpose of the Outline Project Environmental Monitoring Programme

1.3.1.1 The Outline PEMP will form the basis of the Final PEMP. The Final PEMP will be finalised and approved post-consent and approved as part of condition discharge prior to construction and reviewed before the O&M and decommissioning stages by Scottish Ministers in accordance with s.36 and associated marine licences.

1.3.1.2 The purpose of the Final PEMP is to detail the proposed environmental monitoring throughout the lifespan of the Project. This Outline PEMP has been produced in order to set out a proportionate framework for monitoring baseline conditions, predicted likely significant effects and other key impacts on relevant environmental receptors. This Outline PEMP has been submitted with the EIA Report and will be used as a basis for further discussions post-consent.

1.3.1.3 The Outline PEMP provides a framework further discussion post-consent with Scottish Ministers and the relevant Statutory Nature Conservation bodies to agree the exact detail (timings, methodologies, etc.) of the monitoring that is required. Due to the long lead in time for the development of offshore wind farms, it is not desirable or effective to provide final detailed method statements prior to being granted consent.

1.3.1.4 The Final PEMP shall state the legislative requirements, current standards of practice and best practice measures that define the standard of construction, O&M and decommissioning practice adhered to by the Contractors. However, adhering to the Final PEMP does not absolve the Applicant, Contractors or Subcontractors from complying with legislation and bylaws relevant to their construction, O&M and decommissioning activities.

1.4 Legislation and guidance

1.4.1.1 The Outline PEMP has been developed with reference to the following key legislation and guidance:

- Department for Energy Security & Net Zero (DESNZ) Overarching National Policy Statement for Energy (EN-1) (DESNZ, 2023);
- Monitoring guidance for marine benthic habitats (Noble-James *et al.,* 2018);
- Centre for Environment, Fisheries and Aquaculture (Cefas) Guidelines for data acquisition to support marine environmental assessments of offshore renewable projects (Cefas, 2012);
- Introduction to Environmental Impact Assessment (Glasson *et al*., 2011);
- Scottish Natural Heritage guidance on survey and monitoring in relation to marine renewables deployment in Scotland (Saunders *et al.*, 2011); and
- The Convention for the Protection of the Marine Environment of the North-East Atlantic (OSPAR) Co-ordinated environmental monitoring programme assessment manual for contaminant in sediment and biota (OSPAR, 2008).

1.5 Implementation of the Final Project Environmental Monitoring Programme

1.5.1.1 The Final PEMP approved by Scottish Ministers will be incorporated into the contracts for Principal Contractors responsible for the works. All parties involved, including Principal Contractors, Subcontractors and their suppliers, must comply with the relevant provisions of the detailed Final PEMP. They are obligated to provide documentation outlining how they will guarantee both the implementation and monitoring of the Final PEMP requirements.

1.6 Scope of Outline Project Environmental Monitoring Programme

1.6.1.1 The Outline PEMP will cover the following:

- general guiding principles for the proposed monitoring;
- engineering related monitoring; and
- monitoring for the following relevant aspects and / or receptors:
  - marine geology, oceanography and physical processes;
  - marine water and sediment quality;
  - benthic, epibenthic and intertidal ecology;
  - marine mammals;
  - offshore and intertidal ornithology;
  - fish ecology;
  - commercial fisheries; and
  - marine archaeology and cultural heritage.

1.6.1.2 The rationale or basis for including the listed aspects and/or receptors in the Outline PEMP is provided in the relevant subsections of **Section 5**.

1.6.1.3 Monitoring for shipping and navigation is addressed in **Volume 4: Outline Vessel Management and Navigational Safety Plan**.

1.7 Other related implementation plans

1.7.1.1 The Final PEMP will be developed with consideration of the content and requirements of other relevant Implementation Plans. These are set out in **Table 1.1** below with details of the linkages.

Table 1.1 Other related implementation plans to the Final PEMP

Implementation plan	Linkage with PEMP
Cable Plan	The **Outline Cable Plan** provides details on cable specification, installation and cable protection, their interactions with the environment and safety consideration. The approach for analysis of geophysical data in the context of benthic habitats will help inform cable routing.

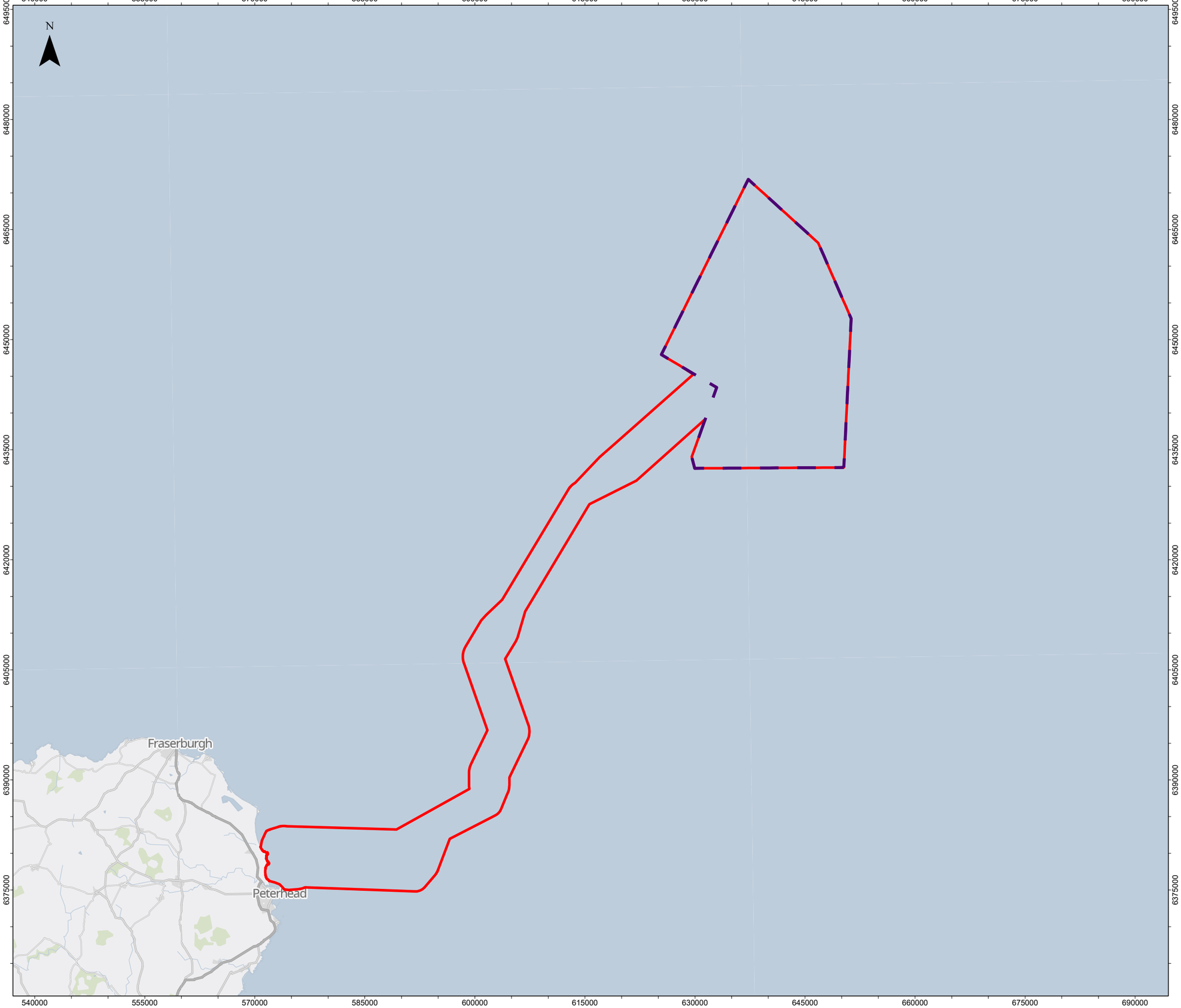
Implementation plan	Linkage with PEMP
Environmental Management Plan (EMP)	The **Environmental Management Plan** sets out the environmental management framework for the Project during construction and O&M. The EMP must be informed, so far as is reasonably practicable by the baseline surveys undertaken as part of the EIA Report and the PEMP.
Offshore Invasive Non-Native Species (INNS) Management Plan	The **Outline Offshore Invasive Non-Native Species Management Plan** sets out measures to avoid, reduce or remedy likely significant effects associated with INNS.
Outline Fisheries Mitigation, Monitoring and Communication Plan (FMMCP)	The **Outline Fisheries Mitigation, Monitoring and Communication Plan** provides monitoring requirements for commercial fisheries. The Outline FMMCP must, so far as reasonably practicable, be consistent with the PEMP.
Operational Maintenance Plan	The Offshore Operational Maintenance Plan will set out the programme for O&M of the Project. The Offshore Operational Maintenance Plan must, so far as is reasonably practicable, be consistent with the PEMP.
Piling Strategy	The **Outline Piling Strategy** includes details of mitigation and monitoring employed during pile driving as agreed with the Scottish Ministers.
Scour Protection Management Plan	The **Outline Scour Protection Management Plan** provides details on scour protection design, risk assessment and installation methodology.
Vessel Management and Navigation Safety Plan (VMNSP)	The VMNSP considers mitigations to disturbance or impact to marine mammals and birds. The VMNSP must, so far as reasonably practicable, be consistent with the PEMP. An Outline VMNSP is provided in the **Outline Vessel Management and Navigational Safety Plan**.
Written Scheme of Investigation (WSI) (Offshore)	The **Outline Written Scheme of Investigation (Offshore)** provides monitoring requirements for marine archaeology and cultural heritage. The WSI (Offshore) must, so far as reasonably practicable, be consistent with the PEMP.

2. Description of the Project

2.1.1.1 The offshore infrastructure parameters for the Project are provided in **Table 2.1**. The offshore infrastructure for the Project will be within the Offshore Red Line Boundary (see **Figure 1**).

Table 2.1 Offshore infrastructure parameters

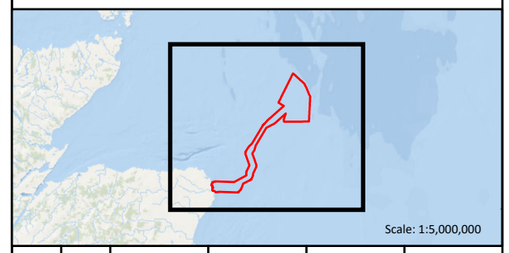
Component	Number / length / area
WTGs	126 to 225.
Maximum turbine power output	14 to 25 megawatts (MW).
Mooring lines	Maximum of eight mooring lines will be required per floating unit. The exact number will depend upon the preferred mooring design which is specific for each floating unit type.
Anchor type(s)	Anchors considered for the mooring system are drag embedment, driven piles and suction anchors.
Subsea distribution centres	45 (between five to eight array cables can be connected into one subsea distribution centre).
Subsea substations	Up to four.
Offshore cables (total combined length)	530km (total array cable length). 130km to 140km (total export cable length).
Offshore substation(s)	Up to four.
Reactive compensation platform (RCP)	Up to two.
WTG Floating units	One per WTG (for instance, 126 to 225).



Offshore Red Line Boundary

Option Agreement Area

0 10 20 Kilometres



REV	REV DATE	GIS CREATOR	GIS REVIEWER	TECHNICAL CHECKER	TECHNICAL APPROVER
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1	08/10/2025	LT	AMc	MR	LG

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DATUM	ETRS 89	PROJECTION	UTM Zone 30N
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PROJECT TITLE

MarramWind Offshore Wind Farm

DRAWING TITLE

Figure 1 Offshore Red Line Boundary

Environmental Impact Assessment Report
Volume 4 Outline Project Environmental Monitoring Programme

NOT TO BE USED FOR NAVIGATION

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MarramWind

3. General Guiding Principles for the Proposed Monitoring

3.1.1.1 Throughout the EIA Report and supporting application documentation, the Applicant has taken steps to avoid or reduce significant impacts either through the iterative process of Project design via 'primary' embedded environmental measures and additional 'tertiary' embedded environmental measures, which will be applied during the construction, O&M or decommissioning stages of the Project. Refer to **Volume 1, Chapter 5: Approach to the EIA** frow how these measures are defined.

3.1.1.2 The guiding principles that apply to the proposed monitoring outlined in this document are as follows:

- Proportionate monitoring measures for the scale, nature and location as stated Regulation 22 and 24 of the Electricity Works (Environmental Impact Assessment) (Scotland) Regulations 2017 and Marine Works (Environmental Impact Assessment) (Scotland) (Regulations 2017, respectively.
- All consent conditions, which would include those for monitoring, should be "*necessary, relevant to planning, relevant to the development to be consented, enforceable, precise and reasonable in all other respects*" (DESNZ, 2023).
- Collaboration amongst developers and sea users on co-existence / colocation opportunities, shared mitigation, compensation, and monitoring is encouraged by the government and industry as set out in Paragraph 2.8.48 of the National Policy Statement EN-1 (DESNZ, 2023).
- In line with good practice, monitoring must have a clear purpose in order to provide answers to specific questions where significant environmental impacts have been identified (for example, Cefas, 2012; Glasson *et al*., 2011; Noble-James *et al.,* 2018; OSPAR 2008; Saunders *et al.*, 2011). As such, monitoring proposals should have an identified end date and confirmed outputs, which provide statistically robust data sets, as applicable to the hypothesis being tested.
- Monitoring should be targeted to address significant evidence gaps or uncertainty, which are relevant to the Project and can be realistically filled, as well as those species or features considered to be the most sensitive to the Project's impacts including those of conservation, ecological and / or economic importance. Where there is potential for a significant environmental impact this should not, on its own, necessarily lead to the requirement for monitoring.
- Proposals for monitoring should be based, where relevant, on the good practice and outcomes of the latest review of environmental data associated with post-consent monitoring of licence conditions of offshore wind farms.
- The scope and design of all monitoring work should be finalised and agreed following review of the results of any preceding survey and / or monitoring work (for instance an adaptive approach), including those surveys conducted in support of the EIA. This includes the potential for survey requirements to be adapted based on the results of the monitoring outlined in this document.

4. The Project's Impacts

4.1.1.1 The EIA predicts the residual impacts to receptors taking into account:

- linkages using the source > pathway > receptor model;
- embedded environmental measures;
- magnitude of the impact;
- receptor sensitivity to the impact; and
- ecological / economical importance / value of the receptor.

4.1.1.2 For each receptor, the residual effects and major areas of uncertainty as predicted within the EIA Report are detailed.

5. The Project's Monitoring Proposals

5.1 Overview

5.1.1.1 The following Sections set out the monitoring proposals in relation to each of the relevant aspects and / or receptor groups covered in the EIA Report; the **Nature Conservation Marine Protected Area Assessment (NCMPA Assessment)**; and the **Report to Inform Appropriate Assessment (RIAA)**.

5.1.1.2 While accepting that this Outline PEMP represents the best approach to monitoring available at the time of writing, it is recognised that the outcomes of future survey work could influence future monitoring requirements, methodologies, focus and effort for Project, as knowledge and understanding develops. For example, where appropriate, and in consultation with MD-LOT and its advisors, these scopes may be refined to consider other relevant studies carried out by neighbouring projects. This is a key principle for an adaptive approach to monitoring and will be the subject of ongoing consultation between the Applicant, MD-LOT and its advisors, as discussed under guiding principles (see **Section 3**).

5.2 Engineering related monitoring

5.2.1.1 In addition to any environmental surveys and monitoring as required, additional studies will be undertaken for engineering purposes. Some of these will overlap and wherever possible the Applicant will look to combine surveys for monitoring purposes with those already being carried out for engineering purposes. These may include, but are not limited to:

- pre-construction geophysical survey;
- geotechnical survey;
- unexploded ordnance (UXO) survey;
- remotely operated vehicle survey;
- cable burial survey; and
- monitoring the condition of infrastructure.

5.2.1.2 Other relevant Plans with commitments to monitoring (linked to those listed in **Table 1.1**) are:

- a Scour Protect Management Plan (see **Volume 4: Outline Scour Protection Management Plan**) for monitoring of scour and protection measures (M-028);
- a Cable Plan (see **Volume 4: Outline Cable Plan**) for cable specification, installation and monitoring (M-029); and
- a Piling Strategy (see **Volume 4: Outline Piling Strategy**) for piling specification and measures (M-105).

5.3 Marine geology, oceanography and physical processes

5.3.1 Conclusions of the Environmental Impact Assessment Report

5.3.1.1 No significant effects have been identified in relation to potential effects of the Project on marine geology, oceanography and physical processes from construction, O&M and decommissioning of the Project.

5.3.2 Proposed monitoring

5.3.2.1 No monitoring is considered in relation to marine geology, oceanography and physical processes.

5.4 Marine water and sediment quality

5.4.1 Conclusions of the Environmental Impact Assessment Report

5.4.1.1 No significant effects have been identified in relation to potential effects of the Project on marine water and sediment quality from construction, O&M and decommissioning of the Project.

5.4.2 Proposed monitoring

5.4.2.1 There are no specific monitoring requirements in relation to marine water and sediment quality in addition to the implementation plans listed in **Table 1.1** and engineering related monitoring described in **Section 5.2**.

5.5 Benthic, epibenthic and intertidal ecology

5.5.1 Conclusions of the Environmental Impact Assessment Report

5.5.1.1 No likely significant residual effects have been predicted for subtidal or intertidal benthic and epibenthic ecology receptors as a result of Project related activities, after consideration of embedded environmental measures.

5.5.2 Conclusions of the Marine Protected Area Assessment

5.5.2.1 A **NCMPA Assessment** has been submitted within the Project's application, which concluded there is no potential for the Project activities to hinder the conservation objectives of the NCMPAs.

5.5.3 Proposed monitoring

5.5.3.1 Pre-construction surveys would be undertaken in advance of any cable and foundation installation works. The methodology for pre-construction surveys would be agreed with the Marine Mammal Observer (MMO) and NatureScot.

5.5.3.2 Should seabed features and obstacles (for example, Annex I reef) be identified in the proposed infrastructure and cable route locations during the pre-construction surveys, micro siting would be undertaken where possible, to minimise potential impacts.

5.5.3.3 There are no additional specific monitoring requirements in relation to benthic ecology receptors in addition to the implementation plans listed in **Table 1.1** and engineering related monitoring described in **Section 5.2**.

5.5.3.4 No monitoring is considered in relation to benthic features of NCMPAs.

5.6 Marine mammals

5.6.1 Conclusions of the Environmental Impact Assessment Report

5.6.1.1 The EIA Report assessed potential impact pathways of the Project, both alone and cumulatively with other plans and projects, on marine mammal receptors (**Volume 1, Chapter 11: Marine Mammals** and **Volume 1, Chapter 33: Cumulative Effects Assessment**). A total of 23 potential effects were assessed in the Project alone assessment (Sections 11.9 to 11.11 of **Volume 1, Chapter 11**) and five effects assessed in the cumulative assessment (Section 33.5.5 within **Volume 1, Chapter 33**). The marine mammal receptors considered included harbour porpoise, Atlantic white-sided dolphin, bottlenose dolphin, short-beaked common dolphin, Risso's dolphin, white-beaked dolphin, humpback whale, minke whale, harbour seal, and grey seal. Impacts were evaluated across the construction, O&M, and decommissioning stages of the Project.

5.6.1.2 During construction, 11 impact pathways were identified including, auditory injury and disturbance from underwater noise (for example, pre-construction surveys, piling, UXO clearance, and other construction activities), disturbance from increased vessel activity, indirect effects on prey availability, and vessel collision risk. For the O&M stage, seven impacts were assessed, including electromagnetic fields (EMF) from subsea cables, vessel collision risk, disturbance from vessel activity, long-term effects of offshore structures (for instance, barrier effects from structures and from underwater noise emitted from floating structures or mooring systems), entanglement in lines and cables, and indirect prey-related impacts. Finally, during decommissioning, five impact pathways were identified, including auditory injury or disturbance from underwater noise caused by decommissioning activities (for example, anchor pile removal) and vessel traffic, vessel collision risk, and indirect effects on prey availability.

5.6.1.3 In conclusion, for all marine mammal receptors, the likely impacts across all stages of development were assessed as **Negligible** to **Minor** (**Not Significant**), which are not considered to be significant in EIA terms. Additional details are provided in **Volume 1, Chapter 11: Marine Mammals** of the EIA Report.

5.6.1.4 Further, there were no significant transboundary, inter-related (**Volume 1, Chapter 32: Inter-Related Effects**) or cumulative effects (**Volume 1, Chapter 33: Cumulative Effects Assessment**) identified in relation to the Project.

5.6.2 Conclusions of the Report to Inform Appropriate Assessment

5.6.2.1 The **Volume 4, Report to Inform Appropriate Assessment (RIAA)** assessed all relevant impact pathways of the Project, both alone and in-combination with other plans and projects, in relation to bottlenose dolphins, the qualifying feature of the Moray Firth Special Area of Conservation (SAC). All other marine mammal SACs were screened out of assessment due to a lack of connectivity with the Project.

5.6.2.2 For the Project alone assessment, potential effects from underwater noise (for example, piling, UXO clearance, and site investigation surveys), vessel disturbance, collision risk, entanglement, and prey availability were evaluated against the site's conservation objectives (see Section 5.1.1 of the **RIAA** for further detail). These impact pathways were

assessed for all stages of the Project with the exception of entanglement, which will be present during the O&M stage only.

5.6.2.3 For the Project in-combination assessment, only potential disturbance effects from underwater noise sources (for instance, piling, site investigation surveys, operational WTGs and cables, and vessels) were assessed as these effects may be added to by other plans and projects. These were assessed for the construction stage of the Project as this stage has the greatest potential for disturbance effects from underwater noise sources.

5.6.2.4 The **RIAA** concludes that the Project, alone and in-combination, will not result in an Adverse Effect on the Integrity of the Moray Firth SAC. The conservation objectives for bottlenose dolphins will continue to be met. Further detail is provided in the marine mammal sections (Sections 5.1, 6.1, 7.2, and 8.1) of the **RIAA**.

5.6.3 Conclusions of the Marine Protected Area Assessment

5.6.3.1 A **NCMPA Assessment** has been submitted within the Project's application, which concluded there is no potential for the Project activities to hinder the conservation objectives of the NCMPAs.

5.6.4 Proposed monitoring

5.6.4.1 The Applicant has committed to a range of embedded environmental measures as part of the Project design, to reduce the risk of impacts to marine mammals, and these embedded environmental measures include monitoring to ensure their effectiveness. The Developer shall ensure that all personnel adhere to the Scottish Marine Wildlife Watching Code (SMWWC), vessel management procedures (outlined within the M-039 of **Volume 3, Appendix 5.2**). The following documents have been submitted with the Application (**Volume 4**) to manage and mitigate the effects on marine animals:

- **Outline Marine Mammal Mitigation Protocol (MMMP)**;
- **Outline Piling Strategy**; and
- **Outline Vessel Management and Navigational Safety Plan (VMNSP)**.

5.6.4.2 Following consent, the Applicant will undertake a detailed review of existing data and knowledge gaps relating to the interactions between floating offshore wind technology and marine mammals. This review will evaluate the use of appropriate monitoring approaches, which will include the deployment of Passive Acoustic Monitoring (PAM) during different stages of development and collaborative strategic monitoring initiatives. The aim of this review will be to inform post-consent discussions with stakeholders on a potential proportionate marine mammal study. This is related to the commitment M-229 of **Volume 3, Appendix 5.2**.

5.6.4.3 In the event that a European Protected Species (EPS) Licence is applied for, all mitigation and monitoring conditions on the licence will be adhered to during all relevant stages of the Project to which the licence applies.

5.6.4.4 There is also the potential that UXO clearance is required as part of the Project. Should UXO be identified for clearance pre-construction, the Applicant will be notified immediately along with the relevant authorities. Any UXO clearance will be undertaken in accordance with the UXO MMMP, which includes monitoring and mitigation for marine mammals. Should UXO need to be cleared during operation and maintenance MD-LOT will be notified and a separate Marine Licence and EPS Licence will be applied for.

5.6.4.5 There are no further specific monitoring requirements in relation to marine mammal receptors in addition to the implementation plans listed in **Table 1.1** and within this Section.

5.6.4.6 No monitoring is considered in relation to marine mammal features of NCMPAs.

5.6.5 Reporting

5.6.5.1 As stipulated in the MMMP, a MMO report will be drafted after any UXO clearance, geophysical survey or pile driving campaign. Reports will summarise relevant activities, mitigation measures implemented to protect marine mammals, and any instances of non-compliance with the marine licence. These reports will attach completed MMO recording forms (for example, cover page, effort, operations and sightings) and copies of consents or licences related to the activity. These reports will be submitted to the regulator and copied to JNCC within the timeframe noted on the consent conditions.

5.6.5.2 In the event of a wildlife incident occurring as a result of activity associated with the Project (for example, injury to a marine mammal), the incident will be reported to the relevant person as soon as possible who will then follow up with the relevant regulatory authority (details of the reporting procedure will be provided in the Final PEMP, post-consent).

5.7 Offshore and intertidal ornithology

5.7.1 Conclusions of the Environmental Impact Assessment Report

5.7.1.1 A number of potential effect pathways on offshore and intertidal ornithology receptors were identified, as detailed in **Volume 1, Chapter 12: Offshore and Intertidal Ornithology**. The potential impacts being considered in this Outline PEMP relate to distributional responses and collision risk. As presented in **Volume 1, Chapter 12: Offshore and Intertidal Ornithology**, for the Project alone all potential effect pathways assessed were concluded as resulting effects of minor adverse significance at most, which is not significant in EIA terms.

5.7.1.2 Whilst the assessment for the Project alone did not predict any significant effects, the potential for a significant effect cumulatively could not be ruled out for distributional responses and collision risk effect pathways. It is also recognised that uncertainties exist relating to the highlighted effect pathways (details of these uncertainties are provided within **Volume 1, Chapter 12: Offshore and Intertidal Ornithology**). Examples of such uncertainties within the ornithological assessment process relate to flight heights, demographics, apportioning of populations from special protection areas, foraging ranges, displacement consequences and avoidance rates. In order to address these uncertainties, precautionary approaches have been taken to assessments with a range of parameters often used to account for these uncertainties.

5.7.1.3 This Outline PEMP contains details of the proposed monitoring approach to ornithological monitoring and associated justification for this approach. It is important to note that this Outline PEMP relates to EIA-related monitoring only. Any monitoring related to potential compensation is considered separately.

5.7.1.4 It should be noted that the Final PEMP, including but not limited to timings and detailed methodologies, will not be produced until closer to the time that the actual work will be undertaken (following detailed Project design). The Final PEMP will be updated in the post-consent stage to ensure it remains appropriate to the final design of the Project and the relevant uncertainties.

5.7.2 Conclusions of the Report to Inform Appropriate Assessment

5.7.2.1 The **RIAA** assessed all relevant impact pathways of the Project, both alone and in-combination with other plans and projects, in relation to qualifying features of a total 31 designated sites for offshore ornithology and the qualifying features of Buchan Ness to Collieston Coast and Ythan Estuary, Sands of Forvie and Meikle Loch Special Protection Areas (SPAs) for intertidal ornithology.

5.7.2.2 Offshore ornithology qualifying features were screened in due to the potential for likely significant effect (LSE) from the following pathways (for specified stages):

- direct temporary habitat loss (offshore export cable corridor) (construction and decommissioning);
- light pollution (OAA) (construction, O&M and decommissioning);
- distributional responses (OAA) (O&M);
- collision risk (OAA) (O&M); and
- entanglement with mooring lines (OAA) (O&M).

5.7.2.3 Intertidal ornithology qualifying features of Buchan Ness to Collieston Coast and Ythan Estuary, Sands of Forvie and Meikle Loch SPAs were screened in due to the potential for LSE from the following pathways (for specified stages):

- direct temporary disturbance and displacement (offshore export cable corridor and landfall) (construction and decommissioning).

5.7.2.4 For the Project alone, the potential for an Adverse Effect on Site Integrity (AEoSI) could not be ruled out for the guillemot feature of Buchan Ness to Collieston Coast SPA in relation to distributional response effects (OAA), though only when considering the upper limit of the guidance approach. This is due to PVA results predicting a reduction in growth which could not be ruled out as potentially effecting the long-term integrity of the feature. For all remaining assessments the potential for an AEoSI was confidently ruled out for the Project alone.

5.7.2.5 For the Project in-combination with other plans and projects, the potential for an AEoSI could not be ruled out for the guillemot feature of Buchan Ness to Collieston Coast SPA, Troup, Pennan and Lion's Heads SPA and Copinsay SPA in relation to distributional response effects (OAA). This is due to PVA results predicting a reduction in growth rate which could not be ruled out as potentially effecting the long-term integrity of the features. For all other Project assessments both alone and in-combination, the potential for an AEoSI was confidently ruled out.

5.7.2.6 In light of the potential for an AEoSI from either the Project alone or in-combination, the Project has proposed a package of compensatory measures within the derogation process under Steps 3 and 4 of HRA. Further details of the Project's derogation case is provided within **Derogation Case**.

5.7.3 Proposed monitoring

5.7.3.1 The Project has outlined two potential monitoring options for consideration, each focused on addressing areas of key uncertainty in relation to the potential effects of offshore wind farms. Both options respond to the overarching objective of monitoring and improving understanding of these effects. Each option includes a specific objective and focus area, which represent different approaches to achieving the overarching aim.

5.7.3.2 Although two options are presented, it is not the Project's intention to implement both. Rather, these are provided as points for further discussion with key stakeholders to aid agreement on what might be both proportional to the scale of the Project and beneficial monitoring for the Project to undertake.

5.7.3.3 **Table 5.1** outlines the Project's potential monitoring options relevant to offshore and intertidal ornithology.

Table 5.1 Monitoring proposed for offshore and intertidal ornithology

Likely significant effect	Receptor(s)	Stage	Reasons for monitoring	Monitoring proposal	Details
Distributional responses (OAA)	Focus on: kittiwake, guillemot, razorbill, puffin and gannet.	O&M	To monitor and improve understanding of the potential effects of offshore wind farms on key species, ensuring that monitoring is proportionate and scientifically robust.	**Option a: Project-led Monitoring** **Focus**: Site-specific understanding during post-breeding dispersal. **Specific Objective**: determine the usage of the Project area during the post-breeding dispersal period. **Monitoring approach:** abundance, distribution, and behavioural data to be collected, pre and post construction of the Project, focused only on the post breeding months (August to November). The aim of gathering this data would be to understand the site usage by key species during the period of peak abundance to aid context of the level of risk posed by the Project during such period. A suitable surveying frequency will be agreed to appropriately capture whether birds are using the Project area during important life cycle stages such as post breeding moults or simply transiting through the area to reach wintering grounds. **Limitations:** Undertaking project-led monitoring in a proportionate manner presents challenges due to environmental variability and the extensive survey effort required to achieve statistical confidence. Given these constraints, exploring post-consent monitoring through collaboration with other developers may offer opportunities to collect more scientifically robust and valuable data.	Scope of surveys and programmes and methodologies for the purposes of monitoring shall be submitted to MD-LOT for written approval at least six months prior to the commencement of any survey works.

Likely significant effect	Receptor(s)	Stage	Reasons for monitoring	Monitoring proposal	Details
Distributional responses and collision risk (OAA)	Focus on: kittiwake, guillemot, razorbill, puffin, gannet and great black-backed gull.	O&M	To monitor and improve understanding of the potential effects of offshore wind farms on key species, ensuring that monitoring is proportionate and scientifically robust.	**Option b: Collaborative Regional Monitoring** **Focus:** Contribution to wider strategic evidence base. **Specific Objective**: contribute to regional and strategic monitoring initiatives that improve understanding of offshore wind environmental effects, subject to the establishment of collaborative mechanisms. **Monitoring approach**: Engage and contribute to regional and strategic monitoring, which may include participation in regional surveys or contributions to new or existing tagging programmes, giving due consideration to the Scottish Marine Energy Research (ScotMER) programme, or any successor programme formed to facilitate these research interests, or any developer led regional groups. The Applicant will engage with MD-LOT, NatureScot, and other relevant key stakeholders to identify and contribute to targeted and proportionate regional or strategic monitoring to better understand the environmental effects of offshore wind taking account of known evidence gaps and Evidence Maps published through the ScotMER forum. **Limitations:** In order for this approach to be successful, appropriate mechanisms to enable collaboration would need to be established.	Scope of surveys and programmes and methodologies for the purposes of monitoring shall be submitted to MD-LOT for written approval at least six months prior to the commencement of any survey works.

5.8 Fish ecology

5.8.1 Conclusions of the Environmental Impact Assessment Report

5.8.1.1 No likely significant residual effects have been predicted for fish ecology receptors as a result of Project related activities, in consideration of embedded environmental measures.

5.8.1.2 Regular monitoring and maintenance of the Project infrastructure is expected to be sufficient to limit the potential for secondary entanglement of elasmobranchs, for which no likely significant residual effects have been predicted. Therefore, there is no requirement for additional monitoring for this risk.

5.8.2 Conclusions of the Marine Protected Area Assessment

5.8.2.1 A **NCMPA Assessment** has been submitted within the Project's application, which concluded there is no potential for the Project activities to hinder the conservation objectives of the NCMPAs.

5.8.3 Proposed monitoring

5.8.3.1 There are no specific monitoring requirements in relation to fish ecology receptors in addition to the implementation plans listed in **Table 1.1** and engineering related monitoring described in **Section 5.2**.

5.8.3.2 No monitoring is considered in relation to fish features of NCMPAs.

5.9 Commercial fisheries

5.9.1 Conclusions of the Environmental Impact Assessment Report

Overview

5.9.1.1 Residual significant effects have been identified in relation to potential effects of the Project on commercial fisheries from construction, O&M and decommissioning UK demersal otter trawl due to reduction in access to or exclusion from established fishing grounds.

5.9.1.2 No residual significant effects have been identified for any other receptors or any other impacts.

Cumulative effects

5.9.1.3 No significant cumulative effects have been identified in relation to potential effects of the Project on commercial fisheries from construction and decommissioning of the Project.

5.9.1.4 Residual significant cumulative effects have been identified in relation to potential effects of the Project on commercial fisheries from O&M of the Project:

- Cumulative impact 1: reduction in access to, or exclusion from established fishing grounds. Moderate adverse significance for demersal otter trawl, demersal seine, dredging, pelagic trawl and pelagic seine and minor adverse for all other receptors.
- Cumulative impact 2: displacement leading to gear conflict and increased fishing pressure on adjacent grounds. Moderate adverse significance for all receptors.

5.9.2 Proposed monitoring

5.9.2.1 Fisheries monitoring is proposed to ensure that variations in commercial fishing activity in response to the Project are effectively captured, understood, and managed over time. The inclusion of all commercial fisheries receptors is justified on the basis that fishing patterns are inherently dynamic, shaped by environmental, economic, and regulatory drivers. Monitoring across all receptor groups provides a comprehensive picture of potential impacts, including changes in effort distribution, landings, and access to fishing grounds. This approach allows verification of the assumptions made within the EIA, ensuring they remain valid as the Project progresses. It also supports the early identification of emerging issues such as displacement, exclusion, or gear conflict, thereby enabling timely and adaptive updates to the Outline FMMCP in consultation with regulators and stakeholders.

5.9.2.2 **Table 5.2** outlines the Project's proposed monitoring relevant to commercial fisheries.

Table 5.2 Monitoring proposed for commercial fisheries

Likely significant effect	Receptor(s)	Stage	Reasons for monitoring	Monitoring proposal	Details
Reduction in access to or exclusion from established fishing grounds	All commercial fisheries receptors.	Pre-construction, construction, post-construction (first three years O&M per phase).	To understand variations in commercial fisheries activity in response to project development; to inform updates to the Outline FMMCP.	Collate and analyse commercial fisheries landings and activity data, including MMO statistics, vessel monitoring system (VMS), port landings, guard vessel and Fisheries Liaison Officer (FLO) records, Marine Coordination Centre records, marine traffic surveys, and stakeholder consultation.	• monthly review of MMO landings data by port and ICES rectangle for key species (haddock, herring, mackerel, brown crab, lobster, scallop); • assess tonnage, first sale value, and inter-annual variation; • analyse VMS datasets (MMO annual releases) to track spatial / temporal fishing activity; • incorporate FLO, guard vessel records (where available); • engage with fishing industry via FLO for ground-truthing; • data collated quarterly and reported by project stage (post-consent, pre-construction, annually during construction, and five years post-construction); and • where changes in fishing activity are detected, trigger review and potential updates to the Outline FMMCP in consultation with regulators / stakeholders.

Likely significant effect	Receptor(s)	Stage	Reasons for monitoring	Monitoring proposal	Details
Cumulative impact: Reduction in access to, or exclusion from established fishing grounds	All commercial fisheries receptors.	Pre-construction, construction, post-construction (first three years O&M).	To validate whether cumulative project activity contributes to reduced access / exclusion beyond individual project footprint.	Same as above (integrated monitoring of landings, VMS, and supplementary sources).	Analysis will examine trends across International Council for the Exploration of the Sea rectangles and ports to assess whether exclusion is cumulative with other marine activities.
Cumulative impact: Displacement leading to gear conflict and increased fishing pressure on adjacent grounds	All commercial fisheries receptors.	Pre-construction, construction, post-construction (first three years O&M).	To determine if fishing activity is being displaced into adjacent grounds, creating conflict and increased pressure.	Same as above, with additional emphasis on cross-referencing VMS patterns and FLO / industry feedback.	Trends in displaced effort will be assessed spatially and temporally; potential mitigation (for example, additional measures agreed via the Outline FMMCP) will be considered if monitoring identifies conflict or increased pressure.

5.10 Marine archaeology and cultural heritage

5.10.1 Conclusions of the Environmental Impact Assessment Report

Overview

5.10.1.1 Potential significant effects have been identified in relation to potential effects of the Project on currently unknown potential archaeological remains from construction and O&M of the Project.

Cumulative effects

5.10.1.2 No significant cumulative effects have been identified in relation to potential effects of the Project on marine archaeology and cultural heritage from construction, O&M and decommissioning of the Project.

5.10.2 Proposed monitoring

5.10.2.1 **Table 5.3** outlines the Project's proposed monitoring relevant to marine archaeology and cultural heritage.

Table 5.3 Monitoring proposed for marine archaeology and cultural heritage

Likely significant effect	Receptor(s)	Stage	Reasons for monitoring	Monitoring proposal	Details
Potential disturbance of wrecks or recovery of cultural material during intrusive operations on the seabed, within the footprint of the WTGs, array cables and offshore substation(s)	Cultural heritage and archaeology.	Construction	Engineering activities, input into related archaeological surveys and monitoring as agreed with the MD-LOT.	Use of existing surveys within the agreed Project OAA and offshore cable corridor survey areas to monitor Archaeological Exclusion Zones (AEZs), Temporary Exclusion Zones TEZs and new discoveries using full seabed coverage swath-bathymetric, Multibeam Echosounder (MBES) and Side Scan Sonar (SSS) surveys (to meet the requirements of International Hydrographic Organisation (IHO) Order 1a and Marine Guidance Note (MGN) 654 (M+F) and its Checklist).	Scope of surveys, programmes and methodologies for the purposes of monitoring are outlined within the agreed **Volume 4: Outline Written Scheme Investigation (Offshore)**.
Potential disturbance of wrecks or recovery of cultural material during intrusive operations on the seabed within the footprint of the offshore export cable corridor and RCPs					
Potential permanent loss or disturbance of paleoenvironmental and archaeological remains during construction within the OAA including WTG floating units (platforms and station keeping system) and array cables					

Likely significant effect	Receptor(s)	Stage	Reasons for monitoring	Monitoring proposal	Details
Potential permanent loss or disturbance of palaeoenvironmental and archaeological remains during construction within the offshore export cable corridor					
Potential harm from disturbance to historic assets in close proximity to the site arising from maintenance of the offshore export cables	Cultural heritage and archaeology.	O&M	Engineering activities, input into related archaeological surveys and monitoring as agreed with the MD-LOT.	Use of existing surveys within the agreed Project OAA and offshore cable corridor survey areas to monitor AEZs, TEZs and new discoveries using full seabed coverage swath-bathymetric, MBES and SSS surveys (to meet the requirements of IHO Order 1a and MGN 654 (M+F) and its Checklist).	Scope of surveys, programmes and methodologies for the purposes of monitoring are outlined within the agreed **Volume 4: Outline Written Scheme Investigation (Offshore)**.
Potential harm from disturbance to wrecks in close proximity to the site arising from altered seabed conditions, for example scour or differential deposition of sediments					

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7. Glossary and Abbreviations

7.1 Abbreviations

Acronym	Definition
AEoSI	Adverse Effect on Site Integrity
AEZ	Archaeological Exclusion Zone
CES	Crown Estate Scotland
EIA	Environmental Impact Assessment
EMP	Environmental Management Plan
FLO	Fisheries Liaison Officer
FMMCP	Fisheries Mitigation, Monitoring and Communication Plan
IHO	International Hydrographic Organisation
LSE	Likely Significant Effect
MBES	Multibeam Echosounder
MD-LOT	Marine Directorate – Licensing Operations Team
MGN	Marine Guidance Note
MHWS	Mean High Water Springs
MLWS	Mean Low Water Springs
MMO	Marine mammal observer
NCMPA	Nature Conservation Marine Protected Area
NE7	North East 7
O&M	Operation and maintenance
OAA	Option Agreement Area
RCP	Reactive compensation platform
RIAA	Report to Inform Appropriate Assessment
s.36	Section 36
SAC	Special Area of Conservation
SPA	Special Protection Area
SPR	ScottishPower Renewables

Acronym	Definition
SSS	Side Scan Sonar
TEZ	Temporary Exclusion Zone
UXO	Unexploded ordnance
VMNSP	Vessel Management and Navigation Safety Plan
VMS	Vessel Monitoring System
WSI	Written Scheme of Investigation
WTG	Wind Turbine Generator

7.2 Glossary of terms

Term	Definition
Adverse Effect on Site Integrity	A significant effect that is assessed as undermining a site's conservation objectives.
Likely Significant Effect	An effect to a European site that has the potential to undermine the conservation objectives.
MarramWind Limited ('the Applicant')	MarramWind Offshore Wind Farm (hereafter referred to as 'the Project') is wholly owned by ScottishPower Renewables UK Limited (SPR). MarramWind Limited, a subsidiary of SPR, is the Applicant for the Project.
ScottishPower Renewables UK Limited	Part of the Iberdrola group and 100% owner of the MarramWind Limited project.

MarramWind