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Morlais Project

Document MOR/RHDHV/DOC/0072: Outline Environmental Mitigation and Monitoring Plan

Outline of an Adaptive Management Approach to Environmental Mitigation and Monitoring during the Phased Deployment of the Morlais Project

Applicant: Menter Môn Morlais Limited

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GLOSSARY OF ABBREVIATIONS

ADD	Acoustic Deterrent Device
CEMP	Construction Environmental Management Plan
ECC	Export Cable Corridor
EMMP	Environmental Mitigation and Monitoring Plan
ES	Environmental Statement
HDD	Horizontal Directional Drilling
MDZ	Morlais Demonstration Zone
ML	Marine Licence
MW	Megawatt
ODA	Onshore Development Zone
RSPB	Royal Society for the Protection of Birds
TWAO	Transport and Works Act Order

1. INTRODUCTION

1. Menter Môn Morlais Limited ('the applicant', hereafter referred to as Menter Môn or the Applicant) is seeking consent via a Transport and Works Act Order (TWAO) and Marine Licence (ML) for the Morlais Project (hereafter 'the Project').
2. The Project is described in **Chapter 4, Project Description** of the Environmental Statement (ES), prepared to support consent applications for the Project. In summary, the Project consists of three distinct areas within which components of the Project will be installed, as follows:
 - The Morlais Demonstration Zone (MDZ), within which arrays of tidal devices will be deployed (deployment will be in a series of phases (see Section 1.3.1) up to a maximum installed capacity of 240 MW) and associated infrastructure such as foundations, array hubs, inter array cables, cable protection and other associated infrastructure, will be deployed.
 - The Export Cable Corridor (ECC), within which up to nine export cables and associated cable protection will be laid. The ECC also includes the intertidal area, where the export cables will make landfall via either horizontal directional drilling (HDD) or trenching.
 - The Onshore Development Area (ODA) shares the export cable landfall with the ECC, with export cables then passing to a landfall substation, and from there via an onshore cable route to a grid substation and connection to grid.
3. Construction of the Project is planned at the earliest in 2021 for onshore works and in 2023 for offshore works, with post deployment operation of tidal arrays expected to commence after 2024.
4. Menter Môn is committed to safeguarding the environment through the identification, avoidance and mitigation of potential adverse environmental impacts associated with the construction, operation and decommissioning of the Project.

1.1. PURPOSE OF THIS DOCUMENT

5. Menter Môn recognises that provision of an outline Environmental Mitigation and Monitoring Plan (EMMP) in support of the Environmental Statement (ES) submission and consent applications for the Project, adds value to the ES. The need for an EMMP is presented in Section 1.2 below.
6. This document is an outline EMMP demonstrating how the potential effects of the Project on marine mammals and diving birds can be mitigated, monitored and managed within the MDZ. This outline EMMP is one of a series of outline management plans which accompany the ES submission.
7. This outline EMMP will be developed into a detailed EMMP post consent, as follows:

- The Applicant will agree with Regulators the outline EMMP (this document) as the basis for development of a detailed EMMP, with amendment or addition if required.
 - The Applicant will agree and appoint an advisory group for the EMMP (as described in Section 3.1), with Regulator.
 - The advisory group on appointment will develop and agree a detailed EMMP, with detailed aims, objectives, indicators, monitoring questions (as described in Section 2) as well as appropriate data collection methods (as described in Section 4) for the tidal technologies deployed.
 - A schedule of tasks for development of the detailed EMMP and its implementation is described in Section 5.
8. This outline EMMP considers mitigation and monitoring during the deployment and operation of arrays of tidal devices in the MDZ and should be considered as the starting point for development and implementation of a detailed EMMP. It should be viewed alongside the accompanying outline Construction and Environmental Management Plan (CEMP), which lays the groundwork for environmental management during installation of the offshore components of the Project.
9. Significant effects on some species of marine mammal and diving seabird through collision with operational marine devices are predicted by the ES if the Project is deployed to maximum installed capacity.
10. As detailed in **Chapter 11, Marine Ornithology**, and **Chapter 12, Marine Mammals**, the main tools of assessment are predictive collision and encounter models provided by the Statutory Nature Conservation Bodies (SNCB) for this purpose. However, the models are derived from models originally developed to help predict the effects of wind turbines on flying bird species, and although they are believed to be highly precautionary (Furness *et al*, 2012), over estimating potential effects, the opportunity for their improvement and validation based on actual data has been limited to date.
11. A reason for the lack of data with which to validate predictive modelling is the limited deployment of tidal device arrays to date. Models cannot be validated with behaviour data for marine mammals or diving birds until such deployments occur. In the absence of behavioural data, the models make conservative assumptions which may significantly over estimate the significance of any effects. The EMMP will collect data to update the models, with the expected output of reducing the predicted significance of operational collision effects.
12. This outline EMMP anticipates a consent condition requiring the agreement and implementation of a detailed EMMP with regulators' agreement, post consent, and prior to deployment of any tidal devices by the Project.
13. The purpose of this outline EMMP is to show how implementation of a detailed EMMP would achieve the following:
- Mitigate potentially significant effects identified within the ES to allow deployment of tidal devices in compliance with the requirements of the Habitats Directive.

- Provide a framework for monitoring of the potentially significant effects identified within the ES in order to validate or revise the assessments made in the ES.
 - Use of monitoring outputs to inform management of the Project and the phased deployment of arrays of tidal devices.
 - Identification of further management and corrective measures, for incorporation into the EMMP, if required.
14. Post deployment the EMMP will be regularly updated, in consultation with regulators and stakeholders through the mechanism of an advisory group for the Project. Any updates, changes or revisions will be based upon review and evaluation of the results of monitoring.

1.2. THE NEED FOR AN EMMP

15. Potentially significant effects of the Project upon some marine mammal and diving seabird species, through collision with operational and repowered tidal devices (as identified within the ES (**Chapter 11, Marine Ornithology** and **Chapter 12, Marine Mammals**)) have been identified.
16. The marine mammal species identified as potentially significantly affected by operation of tidal devices is bottlenose dolphin (BND), although a number of other species are also present and could also be affected. All marine mammals are European Protected Species (EPS) and therefore protected under the Habitats Directive. Further, the BND recorded within the MDZ area are also a feature of a number of Special Areas of Conservation (SAC) designated under the Habitats Directive. The assessment of collision risk with operational tidal turbines can be found in the ES **Chapter 12, Marine Mammals**.
17. Diving bird species identified as being potentially affected are the diving birds guillemot and razorbill, with local population, which are not associated with internationally designated sites. The assessment of collision risk with operational tidal turbines can be found in the ES **Chapter 11, Marine Ornithology**.
18. Menter Môn is committed to working with regulators to develop a detailed EMMP post consent and proposes following an adaptive management approach during the implementation of that detailed EMMP. Work on the development of the detailed EMMP will commence as soon as possible after consent in 2021.

1.3. KEY PRINCIPLES UNDERPINNING THE EMMP

1.3.1. Phased Deployment of Arrays of Tidal Devices

19. The Project will install arrays of tidal devices up to a potential maximum installed capacity of 240 MW.
20. Build out to the Project's maximum installed capacity will be through a series of phases, with the number and scale of each phase of deployment linked to the outcomes of the EMMP. The

implementation of mitigation, monitoring and management measures will be agreed with regulators and overseen by an independent advisory group.

21. Indicative examples of potential phases of deployment are outlined below:

- **Phase 1:** Installed capacity (MW) at which no significant impact is predicted. This commitment ensures an initial level of mitigation in place at the start of the EMMP.

The scale of the Phase 1 deployment (MW) will be determined by the outcome of modelling of potential collision and encounter risk for marine mammals and diving birds, which is in dependent upon:

- The type of Tidal Energy Converters (TECs) to be installed in the array.
- The physical characteristics of the location of the array.
- **Phase 2:** If the results of monitoring of the first phase of deployment do not indicate a significant effect on marine mammals, and then the next phase of deployment would begin.

An example of a commercial level of deployment for a second phase of deployment is suggested in the ES, **Chapter 25, Socio-economics, Tourism and Recreation**, as 40 MW;

- **Phase 3:** An example of the next commercial level of deployment of 100 MW is suggested in the ES; followed by
- **Phase 4:** Deployment to the maximum installed capacity of 240 MW.

22. During the life of the Project, several repowering events are predicted, during which up to half of the installed capacity (MW) may be replaced. This prediction allows for the ongoing development of tidal technology over time.

1.3.2. Adaptive Management

23. An adaptive management approach will be taken to implementation of the EMMP, with adaptive management for the purposed of the EMMP described as:

“An iterative process where uncertainty regarding environmental effects is progressively reduced, through managed; science led monitoring. In areas of environmental sensitivity, it may be necessary to put in place short-term precautionary mitigation measures, to reduce potential for effects to a level considered acceptable to regulators and stakeholders.” Derived from Savidge *et al* (2014).

24. The short-term precautionary mitigation proposed under this outline EMMP is the limitation of initial deployments to a level (MW) where no significant adverse effect as a result of collision with tidal devices is predicted.

25. The EMMP will then allow the operation of tidal devices and associated monitoring data to be collected that will inform review of the assessments of potential collision with tidal devices. The proposed aims and objectives of the outline EMMP are provided later, in Section 2.1.

2. THE ENVIRONMENTAL MITIGATION AND MONITORING PLAN PROCESS

2.1. OUTLINE AIMS AND OBJECTIVES OF THE EMMP

26. Aims for the EMMP will be agreed by an advisory group, however suggested examples of possible aims are to:
- Allow development of the Project to proceed without significant effects upon marine mammals and diving birds through collision with tidal devices;
 - Deliver mitigation and monitoring agreed with regulators as a licence and / or consent condition;
 - Provide a mechanism for the review of monitoring data, updating or validation of impact assessment findings, and agreement of appropriate management measures for the Project; and
 - Offer a forum for discussion and the provision of advice between regulators, the applicant and technical experts.
27. The objectives of the detailed EMMP will be agreed by an advisory group, however suggested examples of applicable objectives are to:
- Mitigate collision risks through the limitation of deployments of tidal devices to levels (MW) of deployment where no significant adverse effect as a result of collision with tidal devices is predicted;
 - Better understand the level of avoidance of operating tidal devices by marine mammals and diving birds allowing the collision and encounter modelling undertaken within the ES to be updated;
 - Better understanding 'natural' displacement of species from operational turbines as a result of the animals' perception of the presence of tidal devices through acoustic and other senses, in order to better understand environmental factors influencing avoidance; and
 - Demonstrate efficacy of potential corrective measures to improve avoidance by marine mammals and diving birds.
28. Updated modelling is expected to show that avoidance of operational tidal devices is much higher than assessed within the ES and that the level of deployment (MW) for which no significant effect is predicted can be revised upwards, allowing further phases of tidal device deployment.
29. If uncertainty remains regarding avoidance behaviour, corrective measures may be required to improve the ability of marine mammals and diving birds to avoid the deployed tidal devices.

2.2. EMMP PROCESS

30. A schematic outlining the proposed EMMP process is provided in **Plate 2-1** below and applies to both the initial phased deployments of the Project, and to later repowering events.
31. An advisory group will be agreed by the Applicant and Regulators and will in turn will agree the aims and objectives of the EMMP.
32. Initial deployment will be at an installed capacity below the level (MW) at which potential for significant collision effects on marine mammals or diving birds is predicted for the Phase 1 deployment technology.
33. Pre construction and during build out of the initial deployment, monitoring works will focus on collection of data to inform assessment of the agreed monitoring questions.
34. The results of monitoring will be reviewed on a regular basis throughout deployment, with reporting on a quarterly basis.
35. On completion of the initial deployment phase there will be a detailed Gate Review by the advisory group. The advisory group will review the results to date and recommend the next stage of the EMMP. Options may include:
 - Continue monitoring for a defined period of Phase 1 deployment, to address specified questions raised by the advisory group.
 - Deployment of deterrent measures to mitigate potential collision risk and continue monitoring for a defined period of Phase 1 deployment, to address specified questions raised by the advisory group.
 - Deployment of deterrent measures and continue deployment to next phase with monitoring to address specified questions raised by the advisory group.
 - Continue deployment to the next phase without mitigation. Ongoing and potentially revised monitoring and reporting.
36. During deployment to the second phase monitoring and reporting works will continue.
37. On achievement of Phase 2 of deployment a further Gate Review will be undertaken by the advisory group. At this review stage, the appropriateness of deployment beyond Phase 2 will be determined.
38. The process will be repeated with further gate reviews for Phase 3 and Phase 4 deployment, if required.

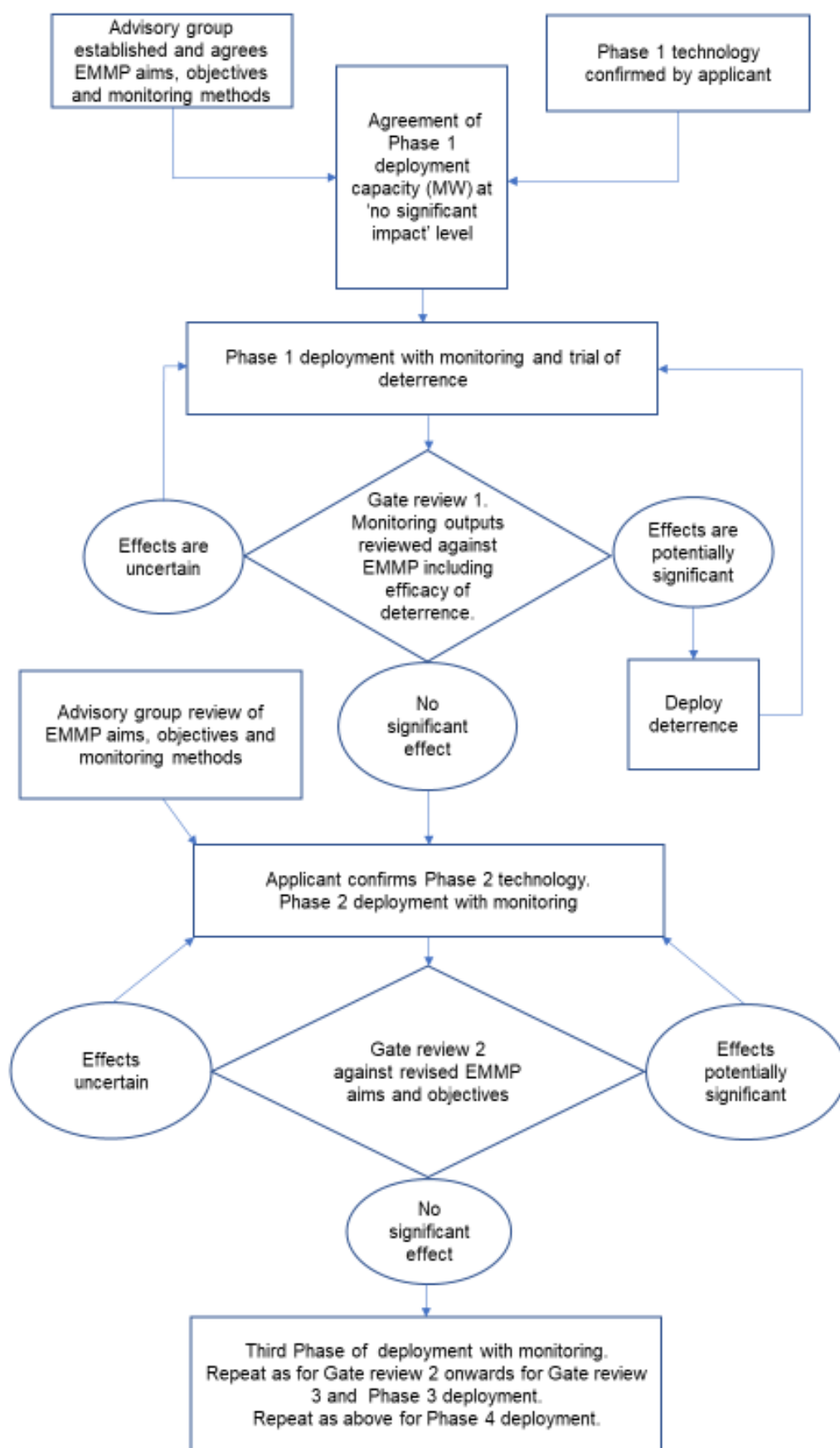


Plate 2-1 Illustration of EMMP process for initial deployment and repowering

2.3. OUTLINE MONITORING INDICATORS

39. Indicators for the EMMP will be agreed by an advisory group, however suggested examples of indicators are outlined in **Table 2-1** below.

Table 2-1 Outline Monitoring Indicators

Indicator	Applicable Monitoring Subject(s)	Metric(s) to be measured
Change in use of tidal device deployment area pre and post installation	Marine Mammals Diving Birds	Time spent in device deployment area and in wider MDZ Activities / behaviour undertaken in device deployment area and in wider MDZ.
Avoidance of tidal devices or of deterrent devices ¹	Marine Mammals Diving Birds	Changes to swimming / diving directions in a way correlated to presence of tidal devices or of deterrent devices.
Collision with tidal devices	Marine mammals	Clear direct collision between animal and device, supported by tracking of animal spatially and temporally before and after collision.
Local population effects	Diving Birds	Changes to local colony numbers over time, potentially indicating changes to mortality or breeding success.

2.4. OUTLINE MONITORING QUESTIONS

40. Monitoring questions to be addressed by the EMMP will be agreed by the advisory group. Monitoring questions that could be derived from monitoring indicators are outlined in **Table 2-2** below.
41. Review of the agreed monitoring questions will help the advisory group agree appropriate management measures, and in particular the appropriate scale (MW) of the next phase of deployment for the Project.

Table 2-2 Outline Monitoring Questions

Monitoring question	Applicable Monitoring Subject(s)	Purpose of question
Do receptors use the tidal device deployment areas in the same of similar ways pre and post deployment?	Marine Mammals Diving birds	Evidence of area scale avoidance that may enable revision of modelling of collision and encounter risk and therefore revise collision effect significance.

¹ Deterrent devices could include acoustic deterrent devices (ADDs) for marine mammals or visual deterrents for diving birds.

Monitoring question	Applicable Monitoring Subject(s)	Purpose of question
If there is a change to use of the deployment area, is it considered ecologically significant by the advisory group	Marine Mammals Diving Birds	If avoidance is occurring, could it potentially have an adverse effect on the ecology of the monitoring subjects? For example, might avoidance lead to reduced food availability or increased energy use at a scale that would have an ecological effect?
Is there near field avoidance of devices?	Marine Mammals Diving Birds	Evidence of device scale avoidance that may enable revision of modelling of collision and encounter risk and therefore revise collision effect significance.
Is there evidence of collision?	Marine Mammals Diving Birds	Evidence of collision would require corrective measures to be applied, for example approaches to improve avoidance such as use of acoustic or visual deterrents. Revision to modelling of encounter and collision risk may be required.
Can the next phase of deployment take place?	Marine Mammals Diving Birds	Gate check by the advisory group for the scale of deployment of the next phase of the Project.
Does the monitoring and mitigation plan need to be reviewed and updated?	Marine Mammals Diving Birds	Are the monitoring methods still appropriate or can they be removed or revised?

3. EMMP ROLES AND RESPONSIBILITIES

42. This section of the outline EMMP details roles, responsibilities and lines of communication during phased deployment of the Project.

3.1. OWNERSHIP OF THE EMMP

43. The Applicant will have responsibility for ensuring the EMMP is implemented.
44. The Applicant may appoint an appropriate secretariat to manage the EMMP.
45. The environment lead within the applicant's 'Project Team' will manage, revise and report on the outputs of the EMMP to Regulators.

3.2. ADVISORY GROUP

46. The Applicant recognises that an effective EMMP will be critical to the success of the Project. For this reason, it is proposed that an advisory group for the Project is established, consisting of core organisations responsible for the delivery and regulation of Morlais.
47. With agreement by regulators the advisory group will provide oversight of the EMMP, providing a forum for the agreement of monitoring works, provision of technical information, and the development of practical and regulatory advice to both the applicant and the regulator.
48. The group would be organised under an independent chairman, appointed by the Applicant, with agreement of the other members of the group. This would be a person with experience of environmental consenting and monitoring works, with a level of technical expertise and an understanding of tidal energy.
49. The Morlais advisory group will be supported by a secretariat, appointed by the Applicant, which will undertake the day to day management of the EMMP.
50. Membership of the advisory group in outline is anticipated as:
- Independent Chair – independent advisor and arbiter;
 - The Applicant;
 - Deploying tenant(s);
 - Natural Resources Wales (NRW) – as regulator and Competent Authority;
 - Welsh Government – as regulator and Competent Authority;
 - Marine mammal advisors – academic expertise;
 - Ornithology advisors – academic expertise;
 - Royal Society for the Protection of Birds (RSPB) – advocate for diving bird interests and as manager of South Stack Reserve, the location of seabird colonies to be monitored.

3.3. GOVERNANCE

51. The regulators as Competent Authorities under the Habitats Directive have the legal responsibility for all decisions made by the advisory group.

3.4. EMERGENCY RESPONSE

52. Agreement of an appropriate protocol for the management of 'incidents' identified through the monitoring works will be agreed by the advisory group. It is anticipated that such a protocol would follow a similar approach to that used for oil spill response or other environmental incident management. Examples are available from previous tidal deployments such as Strangford Lough and would be reviewed for appropriateness and potential lessons learned.

4. OUTLINE APPROACH TO MITIGATION AND MONITORING METHODS

4.1. MITIGATION

Mitigation will take several forms during implementation of the EMMP, allowing potential significant impacts on marine mammals and diving birds to be managed. The anticipated routes to mitigation within the EMMP are summarised below.

4.1.1. Mitigation through Phased Deployment

53. Initial stage of deployment will be limited at a level where no significant impacts on sensitive receptors are predicted.

4.1.2. Mitigation as a Result of Tidal Array Characteristics

54. 'Natural' or 'passive' deterrence and displacement of species from operational turbines as a result of animals' perception of presence of the array through acoustic and other senses, and their subsequent avoidance of tidal devices or the tidal array deployment area.

4.1.3. Corrective Measures – Active Deterrence

55. Potential use of acoustic (ADD) or visual deterrents to deter animals from any arrays deployed, if monitoring indicates that there may be an unacceptable level of collision risk at levels of deployment above the agreed 'no significant impact' level of deployment.

4.2. MONITORING

4.2.1. Monitoring methods

56. The advisory group will identify and agree appropriate monitoring and mitigation methods prior to deployment. However, suggested methods are detailed below in outline at this stage, but subject to revision as methods and technologies improve.
57. In order to address the monitoring questions identified for the Project, suitable monitoring methods will be agreed with regulators, and monitoring equipment suitable for the type of data collection and the characteristics of the MDZ will be identified.
58. A short review of potential monitoring methods for relevant indicators is outlined in **Table 4-1** below. The methods anticipated as being most appropriate to Morlais based on current understanding, are highlighted in blue.

Table 4-1 Review of Potential Monitoring Methods

Monitoring method	Receptor group targeted	Monitoring approach and data type	Uses for monitoring data	Outline EMMP indicator(s)	Rationale for consideration of method for EMMP
Passive acoustic monitoring (PAM)	Marine mammals (cetaceans)	<p><u>Approach:</u> Seabed mounted, moored or floating arrays of hydrophones.</p> <p><u>Data type:</u> Sound files with directional and sound level components. Interpretation by human operators and / or acoustic modelling, including spatial location of sound sources.</p>	<p>Data used to determine:</p> <ul style="list-style-type: none"> ▪ Presence / absence of animals within an array deployment area over time. ▪ Movement of animals through and within an area over time. ▪ Position of animals within an area over time ▪ Tracking of avoidance behaviour or other interaction. ▪ Trigger mechanism for mitigation measures. 	<p>Change in use of tidal device deployment area pre and post installation.</p> <p>Avoidance of tidal devices or of deterrent devices.</p>	<p>Considered for EMMP.</p> <p>PAM has been deployed at a number of marine renewable energy sites to date.</p> <p>PAM has shown its effectiveness in alerting monitoring programmes to the presence of cetaceans in a monitored area.</p> <p>PAM has the potential for automation and reduced costs.</p> <p>Local expertise in the use of PAM exists within SEACAMS.</p> <p>PAM has been deployed within the MDZ as part of SEACAMS</p>
Active sonar	Marine Mammals	<p><u>Approach:</u> Seabed mounted, device mounted or moored directional sonar.</p> <p>Active sonar activated by PAM.</p>	<p>Used from seabed mounted platforms as follows:</p> <ul style="list-style-type: none"> ▪ Tracking of movement of animals and behaviour in real time, or through 	<p>Change in use of tidal device deployment area pre and post installation</p> <p>Avoidance of tidal devices or of deterrent devices.</p>	<p>Considered for EMMP.</p> <p>Active sonar has been deployed at a number of tidal energy sites to date.</p> <p>The ability of active sonar to</p>

Monitoring method	Receptor group targeted	Monitoring approach and data type	Uses for monitoring data	Outline EMMP indicator(s)	Rationale for consideration of method for EMMP
		Data can be stored for later analysis or analysed live. <u>Data type:</u> Visual files, which can be interpreted by a human operator, or by mathematical algorithm.	review of stored data. ▪ Tracking of avoidance. ▪ Trigger mechanism for mitigation measures such as ADD.	Collision with tidal devices	track marine mammals, and potentially seabirds, swimming or diving close to tidal devices has been demonstrated both at operational sites and experimentally.
Surface infra-red / visual spectrum camera	Marine mammals (surface) and Diving Birds (surface)	<u>Approach:</u> Surface mounted moored platform or device. <u>Data type:</u> Visual files for interpretation by human operator	Used from a surface platform, potentially Presence / absence on surface only. Tracking night and day.	Change in use of tidal device deployment area pre and post installation	Not considered for EMMP. Limited to surface use. Clarity is required regarding efficacy of the technology over prolonged periods and as to the nature of the platforms required
Underwater camera	Marine Mammals and Diving Birds	<u>Approach:</u> Seabed, device or platform mounted. <u>Data type:</u> Visual files for interpretation by human operator.	Tracking in day and during good visibility periods. Seabed based monitoring platform viewing one device.	Change in use of tidal device deployment area pre and post installation Avoidance of tidal devices or of deterrent devices Collision with tidal devices	Not considered for EMMP. Underwater camera offers potential to monitor interaction between tidal devices and species in situ. However, the technology is dependent upon good visibility, which is not always present in the MDZ.
Vantage point (VP) surveys	Marine mammals (surface) and	<u>Approach:</u> Human observation	Presence and absence of animals in real time.	Change in use of tidal device deployment	Not considered for EMMP.

Monitoring method	Receptor group targeted	Monitoring approach and data type	Uses for monitoring data	Outline EMMP indicator(s)	Rationale for consideration of method for EMMP
	Seabirds (surface)	from nearby cliffs. <u>Data:</u> Manual record of behaviour	Numbers and behaviour of animals at study area. Proximity to shore and elevation of VP important. Limited to surface information.	area pre and post installation	VP surveys are limited to surface use only and required good visibility and so potential to record avoidance behaviour is limited. Use of VP would require the array location to be relatively close to shore to allow observation. Their use at distances more than 1km may be limited.
Colony counts	Diving Birds	<u>Approach:</u> Human observation or long distance photography. <u>Data:</u> Manual record of numbers / photographic data	Numbers of animals active within colonies of interest.	Local population effects	Considered for EMMP. Robust and basic measure of colony health over time. May require roped access skills given nature of the colony.
GPS tagging	Diving Birds	<u>Approach:</u> Annual capture and tagging of a portion of the colony studies. <u>Data:</u> Time referenced data showing location, height, depth, speed and acceleration.	Tracking of movement of animals and behaviour in real time, or through review of stored data. Potential to correlate between tagging data and active sonar / underwater camera data.	Change in use of tidal device deployment area pre and post installation. Avoidance of tidal devices or of deterrent devices. Collision with tidal devices.	Considered for EMMP. Method used for a number of seabird species in literature. Opportunity to track locations of feeding, and other relevant parameters such as dive

Monitoring method	Receptor group targeted	Monitoring approach and data type	Uses for monitoring data	Outline EMMP indicator(s)	Rationale for consideration of method for EMMP
				Local population effects.	depths and durations.
Acoustic Deterrent Devices	Marine mammals	<u>Approach:</u> Deployment of array around deployed devices.	Proposed mitigation measure for use within EMMP to mitigate collision risk for marine mammals by deterring mammals from proximity to active tidal devices.	Change in use of tidal device deployment area pre and post installation. Avoidance of tidal devices or of deterrent devices.	Considered for EMMP. Currently used to deter marine mammals from noisy operations around offshore windfarm construction.
Visual deterrent	Diving birds	<u>Approach:</u> Deployment of physical deterrent (coloured ribbons), or submerged strobe lights	Proposed mitigation measure for use within EMMP to mitigate collision risk for diving birds by deterring mammals from proximity to active tidal devices.	Avoidance of tidal devices or of deterrent devices.	Considered for EMMP Physical and strobe deterrents are used in multiple scenarios to deter bird species.

59. Not all the methods outlined in **Table 4-1** will be used in the EMMP, and new methods may become apparent. Decisions regarding appropriate methods will be made by the Applicant in consultation with the advisory group. Factors affecting those decisions may include:

- Effectiveness of the methods and equipment in collecting suitable data to address the monitoring questions;
- Suitability of the monitoring method to the MDZ, and to specific deployment location within the MDZ;
- Cost of equipment and its management, including data processing and reporting needs;
- Power and data recovery requirements;
- Robustness and reliability of monitoring equipment;
- Applicability of data collected to addressing monitoring questions; and
- Accessibility of equipment.

5. OUTLINE SCHEDULE OF EMMP TASKS

60. **Table 5-1** below, outlines an indicative schedule for post consent tasks under the EMMP from consent to completion of first phase deployment.

Table 5-1 EMMP Outline Post Consent Schedule of Tasks

Item No.	Project Stage	Task	Task component	Organisational responsibility	Time period
1	Pre construction and during onshore construction	Agreement of detailed EMMP approach, based on outline EMMP	<ul style="list-style-type: none"> Memorandum of understanding with regulators Terms of reference 	<ul style="list-style-type: none"> Menter Môn (MM) Regulators 	March 2021 to June 2021
2		Establish Morlais EMMP advisory group	<ul style="list-style-type: none"> Appoint chair Appoint advisors 	<ul style="list-style-type: none"> MM Regulators 	Apr 2021 to June 2021
3		Procurement of EMMP support	<ul style="list-style-type: none"> Appointment of secretariat Appointment of technical contractors 	<ul style="list-style-type: none"> MM advisory group 	March 2021 to June 2021
4		Agree EMMP	<ul style="list-style-type: none"> Aims Objectives Monitoring questions Methods 	<ul style="list-style-type: none"> MM advisory group 	June 2021 to October 2021
5		Identify phase 1 installed capacity	<ul style="list-style-type: none"> Collision and encounter modelling 	<ul style="list-style-type: none"> advisory group MM Tenant 	August 2021 to October 2021
6		Identify phase 1 array location	<ul style="list-style-type: none"> Review of site data 	<ul style="list-style-type: none"> MM Tenant 	August 2021 to October 2021
7		Procurement of monitoring services	<ul style="list-style-type: none"> Equipment Installation Contractors Monitoring contractors 	<ul style="list-style-type: none"> MM Tenant 	Nov 2021 to December 2022
8	Offshore infrastructure construction	Installation of offshore project infrastructure	<ul style="list-style-type: none"> Export cables Cable protection Installation of monitoring equipment 	<ul style="list-style-type: none"> MM advisory group 	January 2023 to December 2023
9		EMMP	<ul style="list-style-type: none"> Commencement of monitoring works 	<ul style="list-style-type: none"> MM advisory group 	Commence April 2023 - ongoing

Item No.	Project Stage	Task	Task component	Organisational responsibility	Time period
10	First Phase construction and operation	Installation and commissioning of first phase array	<ul style="list-style-type: none"> Inter-array cables Tidal devices 	<ul style="list-style-type: none"> Tenant 	January 2024 to December 2024
11		EMMP	<ul style="list-style-type: none"> Gate review of monitoring works and advice to MM and Regulator 	<ul style="list-style-type: none"> advisory group 	December 2025 – March 2026
12	Assumed second phase construction and operation	Installation and commissioning of second phase array	<ul style="list-style-type: none"> Inter-array cables Tidal devices Installation of second phase monitoring equipment 	<ul style="list-style-type: none"> Tenant MM advisory group 	March 2026 onwards
13		EMMP	<ul style="list-style-type: none"> Gate review of monitoring works and advice to MM and Regulator 	<ul style="list-style-type: none"> advisory group 	12 monthly after commencement of installation
14	Assumed Phase 3 construction and operation	Repeat as for second phase			
15	Assumed Phase 4 construction and operation	Repeat as for third phase			

6. SUMMARY OF OUTLINE APPROACH

61. The outline and detailed EMMP will be the responsibility of the Applicant, under the guidance of an independently chaired advisory group.
62. The EMMP will consider potential effects of operational tidal devices, deployed in a phased approach by the Project, on seabirds and marine mammals using the MDZ.
63. Initial deployment of the Project will be at a level indicated by environmental assessment to have no significant environmental impact.
64. The EMMP will operate within a framework of agreed objectives and structured monitoring questions.
65. Monitoring works will begin before deployment to allow before and after comparison.

6.1. MARINE MAMMALS

66. For marine mammals a number of methods will be used to monitor:
 - Use of the array area and approaches to the array area by marine mammals;
 - Behaviour of marine mammals adjacent to operational device(s) in the array, possibly including:
 - Proximity of approach to device;
 - Passage / non-passage through devices;
 - Evidence of collision;
 - Avoidance behaviour without mitigation;
 - Avoidance behaviour with mitigation.
67. The absence of evidence of collision and / or evidence of avoidance of the array or of devices within the array would be expected to lead to agreement for deployment of a further phase.
68. Evidence of collision, or non-avoidance would be expected to lead to consideration of use of mitigation such as ADD, and consideration of further monitoring before further deployment.
69. The advisory group would agree on monitoring appropriate to following stages of deployment.

6.2. DIVING SEABIRDS

70. For diving seabirds, a number of methods will be used to monitor:
 - Spatial use the array area and wider MDZ by diving birds;
 - Nature of diving in the array area, for example diving depth and duration;

- Relevant seabird colony surveillance, including colony counts.

71. Non-use of the array area by species being monitored during the first phase of deployment would be expected to lead to agreement that any pathway for effect on those species through collision did not exist.
72. Where diving birds use the array location, diving depth and duration data would allow refinement of collision models, while colony surveillance will allow for ongoing review of numbers during deployment and refinement of PVA, to inform advisory group review of potential effects of further deployment.

7. REFERENCES

Furness, R.W., Wade, H.M., Robbins, A.M.C., Masden, E.A., 2012. Assessing the sensitivity of seabird populations to adverse effects from tidal stream turbines and wave energy devices. *ICES Journal of Marine Science* 69, 1466–1479. <https://doi.org/10.1093/icesjms/fss131>

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