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Morlais Project

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

Outline 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

SUMMARY OF KEY CHANGES TO OUTLINE EMMP SINCE INITIAL SUBMISSION

Location	**Change**
Section 1.3.1	Potential scale of Phase 1 in terms of MW and numbers of devices.
Section 1.3.4	Consideration of proximity trigger points.
Table 1-1	Consideration of management actions associated with trigger points by species / species group.
Figure 2-1	Revised illustration of the proposed EMMP process, with greater detail regarding those parts of the process pre deployment, when scale of initial deployment is agreed.
Figure 2-2	Addition of illustration showing the proposed EMMP process for management of emergency incidents, such as marine mammal collision.
Section 2-1	Addition of proposed terms of reference for the operation of the EMMP.
Section 2.2	Further consideration of outline EMMP aims and objectives.
Section 3.2	Relationship between Regulator and Advisory Group.
Section 4	Further consideration of mitigation measures and monitoring methods proposed, including consideration of the capacity for real time monitoring and recorded monitoring, where appropriate.
Table 4-1	Revision of the suite of monitoring and mitigation measures identified a potentially available to the EMMP, to include consideration of real time monitoring applicability, and suitability for the monitoring of mitigation efficacy.
Appendix 1	Example consent conditions – demonstrating mechanism for enforcement of environmental management and monitoring used by UK regulators for tidal stream and offshore wind projects.
Appendix 2	Example terms of reference developed by developer with UK Regulators for the operation of an equivalent mechanism to the EMMP.
Throughout	Clarification of outline and detailed stages of the EMMP.

1. INTRODUCTION

1. This document is an Outline Environmental Mitigation and Monitoring Plan (OEMMP) for the Morlais Project. This document is provided pre-consent, and in an outline form, as a framework to guide the overall management of ecological mitigation proposed for the Project and to establish the principles for the development of a Detailed Environmental Mitigation and Monitoring Plan (DEMMP) which is to be submitted for approval to NRW prior to the deployment of any Phase of the project, or the repowering of any tidal devices. Compliance with the OEMMP and the requirement to obtain the approval of NRW to a DEMMP is secured by a condition on the Marine Licence.

2. Note that where EMMP is referred to without the prefix of Outline or Detailed it is referring to the overall Environmental Mitigation and Monitoring Plan as a whole.

3. 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').

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.

5. 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.

6. Device deployments will only be allowed at scales at which Regulators agree that the best available scientific understanding does not predict adverse impacts upon marine mammals or diving seabirds.

7. No device operation will be allowed until Regulators are satisfied that effective monitoring is in place that can directly inform the implementation of the EMMP, and inform the agreed aims, objectives and management questions set by the EMMP for the Project. Such requirements are expected to include the ability to detect marine mammal movements in proximity to deployed

devices, to differentiate between marine mammal groups (for examples seals and cetaceans), and to detect or infer that collisions have (or may have) occurred.

8. 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.

9. Deployment of tidal devices by the Project will subject to approval of the Regulators, following the process outlined and agreed in the OEMMP (this document) and successor documents.

1.1. PURPOSE OF THIS DOCUMENT

10. The need for an EMMP is presented in Section 1.2 below.

11. 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.

12. This document is a revision of the OEMMP which accompanied the ES on submission. This revision is part of a process of iterative development of the EMMP through clarification, agreement and revision of the plan, following consultation with Regulators .

13. This OEMMP demonstrates how the potential effects of the Project on marine mammals and diving birds can be mitigated, monitored and managed within the MDZ. This OEMMP is one of a series of outline management plans which accompanied the ES submission.

14. This OEMMP will continue to be refined with stakeholders and regulators' agreement prior to consent.

15. This OEMMP will be developed into a DEMMP post consent, as follows:

- Regulators will need to ensure that the EMMP is both deliverable and enforceable, so to ensure this they are expected to make the development and agreement of a DEMMP a condition of consent;
- The Applicant will use the OEMMP (this document) as the basis for development of a DEMMP post consent. That DEMMP will be a live document and will continue be developed, revised and adaptively managed throughout the life of The Project;
- The Applicant, in consultation with Regulators, will agree the appointment of an Advisory Group, with an Independent Chair, to advice the Applicant and Regulators during implementation of the EMMP (as described in Section 3 of this document);
- The Advisory Group will generate advice to the Applicant and Regulators during implementation of the EMMP regarding the level of deployment and mitigation that is appropriate to ensure no adverse effect on Natura 2000 site integrity;
- Regulators may choose to engage actively with the operation of the Advisory Group or to maintain an 'arms length' approach. Active engagement would reduce timeframes for communication and reporting, but would need to be done in a way that maintained

clear independence, perhaps through observer status. Examples from other projects where the Regulator has actively engaged are provided in Appendices 1 and 2.

- Any Regulators' involvement with the Advisory Group will be without prejudice to their regulatory role. In other words, Regulators will not be bound, in any way, to accept any advice or evidence presented;

- The Advisory Group will develop and agree a DEMMP, with Regulators. The DEMMP will include detailed aims, objectives, indicators, trigger points, environmental management questions (as described in Sections 2.2, 2.5, 2.6 and 2.7) 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 EMMP and its implementation is described in Section 5 of this document.

- The Applicant will identify tidal technology proposed for deployment, and that technology will be the subject of the EMMP implementation for Phase 1 of the Project.

- The DEMMP will be maintained as a 'live or living document' and will be regularly updated during the life of the Project.

16. This OEMMP considers appropriate mitigation and monitoring methods (both real time and recorded) for the collection of environmental management data during the deployment and operation of arrays of tidal devices in the MDZ. This document should be considered as the starting point for development and implementation of a DEMMP post consent. The OEMMP 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.

17. Significant effects on some species of marine mammal and diving seabird through collision with operational marine devices are currently predicted by the ES, if the Project was to be deployed to maximum installed capacity, without mitigation measures. The OEMMP proposes mitigating this potential impact through a phased deployment approach, described later.

18. 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.

19. 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 overestimate 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.

20. This OEMMP 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. A draft condition has been proposed separately by Menter Mon's legal advisors.

21. Consent conditions requiring post consent compliance with environmental management and monitoring and the establishment of Advisory Groups, or their equivalent, have been applied to several recent marine renewable projects in the UK. Examples of best practice consent conditions are provided for information in **Appendix 1**, with one example for tidal stream and one for offshore wind provided.

22. The purpose of this OEMMP is to show how implementation of a DEMMP 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.

23. Post deployment the DEMMP 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

24. The ES identified some potentially significant effects 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**)

25. 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**.

26. Diving bird species identified as being potentially affected are guillemot and razorbill, within local populations, which are associated with the South Stacks Nature Reserve, owned and managed

by RSPB. The assessment of collision risk with operational tidal turbines can be found in the ES **Chapter 11, Marine Ornithology**.

27. The Applicant is committed to working with Regulators and RSPB to develop an agreed DEMMP post consent and proposes following an adaptive management approach during the implementation of that DEMMP. This OEMMP will continue to evolve pre-consent, through technical discussions with regulators and RSPB. Work on the development of the DEMMP will commence as soon as possible after consent in 2021 and will involve the inclusion of details of the technology to be used in the first phase.

1.3. KEY PRINCIPLES UNDERPINNING THE EMMP

1.3.1. Phased Deployment of Arrays of Tidal Devices

28. The Project will install arrays of tidal devices up to a potential maximum installed capacity of 240 MW.

29. 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.

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

- **Phase 1**: Will be installed at a capacity (MW) at which no significant impact is predicted on marine mammals or diving birds using the MDZ. This commitment ensures an initial level of mitigation in place at the start of the EMMP through the limitation of the scale of the development.

  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, and associate population modelling, which is in turn dependent upon:

  - The type of Tidal Energy Converters (TECs) to be installed in the array.
  - The physical characteristics of the location of the array.

  Supplementary information provided to the Regulators in support of the Project's application for consent includes "Marine Mammals Additional Collision Risk Modelling MOR/RHDHV/DOC/0118". That document details the outputs of modelling of several exemplar tidal stream technologies that fall within the PDE of the Project. The level of impact which is considered to have no significant effect by NRWA is defined therein in terms of less than 0.7 bottle nosed dolphin collision per year of operation, with between 5 and 28 devices potentially installed, and between 6 and 12 MW of capacity installed. These values will vary (ie could be higher or lower) depending upon the characteristics of the technology actually used, and possible changes to the models, used as the science behind them develops further; The key point is that whatever is deployed must predict an impact of less than 0.7BND per annum.

- **Phase 2**: If the results of monitoring of the first phase of deployment indicate that the next phase of deployment could begin without an adverse effect on marine mammals or birds, then the next phase of deployment would be authorised for deployment.

  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**: If the results of monitoring of the second phase of deployment indicate that the next phase of deployment could begin without an adverse effect on marine mammals or birds, and then the next phase of deployment would be authorised for deployment. If the monitoring and mitigation requirements are still required these would continue. Note it is the Applicant's intention to remove monitoring and mitigation requirements as soon as it is possible to do so.
- An example of the next commercial level of deployment of 100 MW is suggested in the ES; followed by
- **Phase 4**: As for Phase 3, Deployment to the maximum installed capacity of 240 MW.

31. 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 process of 'repowering' allows for the ongoing development of tidal technology over time. A repowering event would also be subject to consideration under the EMMP.

1.3.2. Adaptive Management

32. 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).

33. The primary precautionary mitigation proposed under the 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.

34. 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 EMMP are provided later, in Section 2.1.

35. If monitoring data indicate that an agreed trigger point for mitigation or other management actions has been reached, then mitigation measures may be applied to deployed devices to mitigate potential risks to marine mammals or diving birds. The effect of such mitigation will be

monitored and the outcomes may then inform decisions regarding the aims and objectives of the EMMP, and future mitigation.

1.3.3. Mitigation

36. Deployment of any phase of the Project will be at, or below, a magnitude (defined in MW, numbers and types of technology) at which the Regulator agrees that no significant adverse effect on Natura 2000 site integrity is predicted by best available science. Note that this is currently considered by NRWA to be at a level lower than 0.7 predicted collisions with bottlenose dolphin per annum.

37. The Regulator will control the Applicant's implementation of the EMMP, with the ability to require the Applicant to modify both the scale of deployment and the nature of monitoring and mitigation.

38. All mitigation measures proposed for deployment will be reviewed in light of current technical and scientific understanding prior to agreement by the Advisory Group, with final approval by the Regulator, prior to deployment.

39. A series of potential mitigation measures will be agreed pre deployment and will form a tiered hierarchy of mitigation available to the Advisory Group for agreement with the Regulator. Examples of what such a hierarchy of mitigation could include are:

- Tier 1 – deployment of tidal devices at magnitude (MW) below levels of predicted effect (using best available data);
- Tier 2 – active deterrence - deployment of mitigation measures (such as acoustic deterrents for mammals or visual deterrents for seabirds) around operating tidal devices, and monitoring of their efficacy;
- Tier 3 – The slowing or other modification of the operation of installed tidal devices to reduce predicted risk identified by the Advisory Group;
- Tier 4 – The stopping or removal of tidal devices previously deployed by the Project.

1.3.4. Trigger points

40. Appropriate trigger points for the implementation of management measures and mitigation under the EMMP will be proposed by the Advisory Group and must be approved by Regulators prior to each phase of deployment.

41. Such trigger points could include the presence of marine mammals at varying degrees of proximity to a deployed array, or to the tidal devices within an array. With proximity a parameter for defining trigger points, the following trigger points could be appropriate:

- Wide field trigger point – monitoring detects marine mammals around, but not inside, the array;
- Medium field trigger point - monitoring detects marine mammals inside the array area;

- Near field trigger point – monitoring detects marine mammals within 10 m of an operational tidal device;
- Potential collision trigger point – monitoring detects marine mammals passing within less than 10 m of an operational device

42. A matrix illustrating an outline of how such trigger points may work for multiple receptors is provided in Table 1-1 below. Management actions associated with each trigger point are expected to vary by species or receptor group, and will ultimately be determined by the Regulator.

Table 1-1 Illustration of potential use of proximity trigger points

Trigger point	**Far field** (Wider study area outside array)	**Medium field** (Within array area but not approaching devices)	**Near field proximity** (Approaching device – for example, within 30M)	**Potential collision** (within 10m of device, collision assumed)
Species group				
Cetacean (bottle nosed dolphin)	Data form part of standard reporting. Consideration of monitoring questions relating to use of study area.	Activate active sonar	Active monitoring and rapid review of data. Deployment of acoustic deterrence	Cessation of operation. Emergency / incident procedure Review data to determine likelihood of collision and further management actions, procedure for re-starting operation.
Cetacean (harbour porpoise)	Data form part of standard reporting. Consideration of monitoring questions relating to use of study area.	Activate active sonar	Active monitoring and rapid review of data. Deployment of acoustic deterrence	Slowing of devices. Emergency / incident procedure Review data to determine likelihood of collision and further management actions, procedure for re-starting operation.
Cetacean (other)	Data form part of standard reporting. Consideration of monitoring questions	Activate active sonar	Active monitoring and rapid review of data. Deployment of acoustic deterrence	Slowing of devices. Emergency / incident procedure Review data to determine likelihood of collision and

Trigger point	Far field (Wider study area outside array)	Medium field (Within array area but not approaching devices)	Near field proximity (Approaching device – for example, within 30M)	Potential collision (within 10m of device, collision assumed)
Species group				
	relating to use of study area.			further management actions, procedure for re-starting operation.
Diving seabird (razorbill or guillemot)	Data form part of standard reporting. Consideration of monitoring questions relating to use of study area.	Data form part of standard reporting. Consideration of monitoring questions relating to use of study area.	Data form part of standard reporting. Consideration of monitoring questions relating to use of study area.	Data form part of standard reporting. Consideration of monitoring questions relating to use of study area.
Pinniped (grey or harbour seal)	Data form part of standard reporting. Consideration of monitoring questions relating to use of study area.	Data form part of standard reporting. Consideration of monitoring questions relating to use of study area.	Data form part of standard reporting. Consideration of monitoring questions relating to use of study area.	Review data to determine likelihood of collision and further management actions.

2. THE ENVIRONMENTAL MITIGATION AND MONITORING PLAN PROCESS

2.1. OUTLINE TERMS OF REFERENCE OF THE EMMP

51. Terms of reference will be agreed by the Advisory Group before deployment and could be agreed pre consent with the Regulator. Suggested outline terms of reference are provided, italicised in the box below, for discussion.

The Morlais Project has developed and is implementing an Environmental Mitigation Monitoring Plan (EMMP) to comply with the conditions of the (ML & TWAO in full here – full ref) issued by Natural Resources Wales (NRW) and the Planning Inspectorate (Wales) (PINS) for the Morlais Project in North Wales, implemented by Menter Mon / Morlais Tidal Energy Limited in Holy Island, Anglesey, North Wales. Menter Mon recognises that the delivery of a sound and effective EMMP is critical to the success of Morlais and has established an Advisory Group consisting of the core organisations responsible for the delivery of the EMMP and regulation of the project, which will oversee and control the implementation of the EMMP. The Advisory Group will bring together scientific advisors, regulators and regulators, under an Independent Chair, with the purpose of providing independent advice to regulators and competent authorities on the appropriate implementation of the EMMP.

Members of the Advisory Group share the common goal of safeguarding the marine environment from any potential significant environmental impact that might be caused by The Morlais Project. They will do this as follows:

- *Identifying, assessing and managing accordingly any effects before they cause adverse impact; and*
- *Providing scientific support to the Regulators by managing an environmental monitoring and mitigation program designed to ensure that the phased installation and operation of Morlais is undertaken in such a way which it causes no significant adverse effect on European Protected Species which are features of Natura 2000 sites.*

The EMMP will encompass monitoring and mitigation of effects on marine mammal and also on local seabird colonies from within the South Stacks RSPB reserve, which lies close to Morlais.

52. A Further example of terms of reference for a tidal array project is provided in **Appendix 2.**

2.2. OUTLINE AIMS AND OBJECTIVES OF THE EMMP

53. Aims for the EMMP will be agreed by the Advisory Group and Regulator before deployment (with aims discussed in detail during development of the EMMP before consent). Suggested examples for aims of the group are suggested below:

- 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.

54. The objectives of the EMMP will be agreed by the Advisory Group and Regulator, 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.

55. 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 for both marine mammals and seabirds can be revised upwards, allowing further phases of tidal device deployment.

56. If uncertainty remains regarding avoidance behaviour, corrective measures, including mitigation, may be required to improve the ability of marine mammals and diving birds to avoid the deployed tidal devices.

2.3. EMMP PROCESS

57. A schematic summarising 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. A proposed schedule and indicative detailed a programme for completion of EMMP tasks is also provided in Table 5-1.

2.3.1. Pre-consent

58. An Advisory Group and Independent Chair will be agreed by the Applicant and the Regulator;

59. The Advisory Group will agree the aims and objectives, of the EMMP and Terms of Reference for Regulators' approval.

60. The Advisory Group will review monitoring questions for and agree appropriate methods of monitoring

2.3.2. Post consent

61. The Applicant will identify the developer and technology proposed for the first phase deployment of the project and the Advisory Group will then review the technology against the consented Project Design Envelope (PDE).

62. If the technology falls within the PDE, then its parameters will be modelled using the most appropriate versions of encounter rate and collision risk models for marine mammals and diving birds.

63. The detailed arrangement, type and positioning of monitoring technology will be agreed.

64. After Advisory Group review of modelling outputs and Regulators' approval, 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.

2.3.3. Phase 1 deployment

65. During build out of Phase 1, monitoring works will focus on collection of data to inform assessment of the agreed monitoring questions.

66. The efficacy of monitoring measures will be demonstrated prior to operation of the turbines. The results of monitoring will be reviewed on a regular basis throughout deployment, with detailed outputs reviewed by the Advisory Group on a quarterly and annual basis and associated reporting to the Regulator.

67. At each quarterly review the Advisory Group will consider:

- Whether the monitoring works being undertaken are generating data that can answer the EMMP monitoring questions agreed by the Advisory Group (see Section 2.6); and
- If any data collected that suggest that a change in the current tier of applied mitigation should be considered.

If the answer to either question is positive, then the Advisory Group will advise the Regulator as to the changes required and the Regulator will instruct the Applicant appropriately.

68. On completion of Phase 1 deployment there will be a Gate Review by the advisory group. The Advisory Group will review the results to date and recommend the next stage of the EMMP ot the Regulator. 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 any identified potential for collision and continue monitoring for a defined period of Phase 1 deployment, to address specified questions raised by the Advisory Group.
- Interrogation of monitoring data to determine efficacy of mitigation measures deployed.
- 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.

2.3.4. Phase 2 deployment onwards

69. During deployment of the second phase monitoring and reporting works will continue.

70. On achievement of Phase 2 of deployment a Gate Review will be undertaken by the Advisory Group. At this review stage, the appropriateness of deployment beyond Phase 2 will be determined by the Regulator.

71. The process will be repeated with further gate reviews for Phase 3 and Phase 4 deployment, if and as required.

2.4. EMMP COMPLIANCE

72. The establishment of the EMMP and compliance of the Applicant with its agreed measures will be secured through consent conditions applied under both Transport and Works Act Order (establishing the requirement for an EMMP) and the Marine Licence (establishing the requirement for an EMMP and as a mechanism to allow management and revision of the EMMP).

73. Compliance of Tenants of the Applicant to the requirements of the EMMP will be secured by the Applicant through application of appropriate terms in the subleasing arrangements of each.

74. NRW as the Regulator will control the scale and pace of deployment of phases of the Project, through the EMMP mechanism, with the ability to require cessation of operations and / or removal of technology if monitoring measures indicate potential for adverse effects on integrity of Natura 2000 site(s).

2.5. TRIGGER POINTS

75. A schematic outlining the processes anticipated if an incident is identified or an appropriate trigger point is breached / reached during the approach to gate review is provided in Plate 2-2, below.

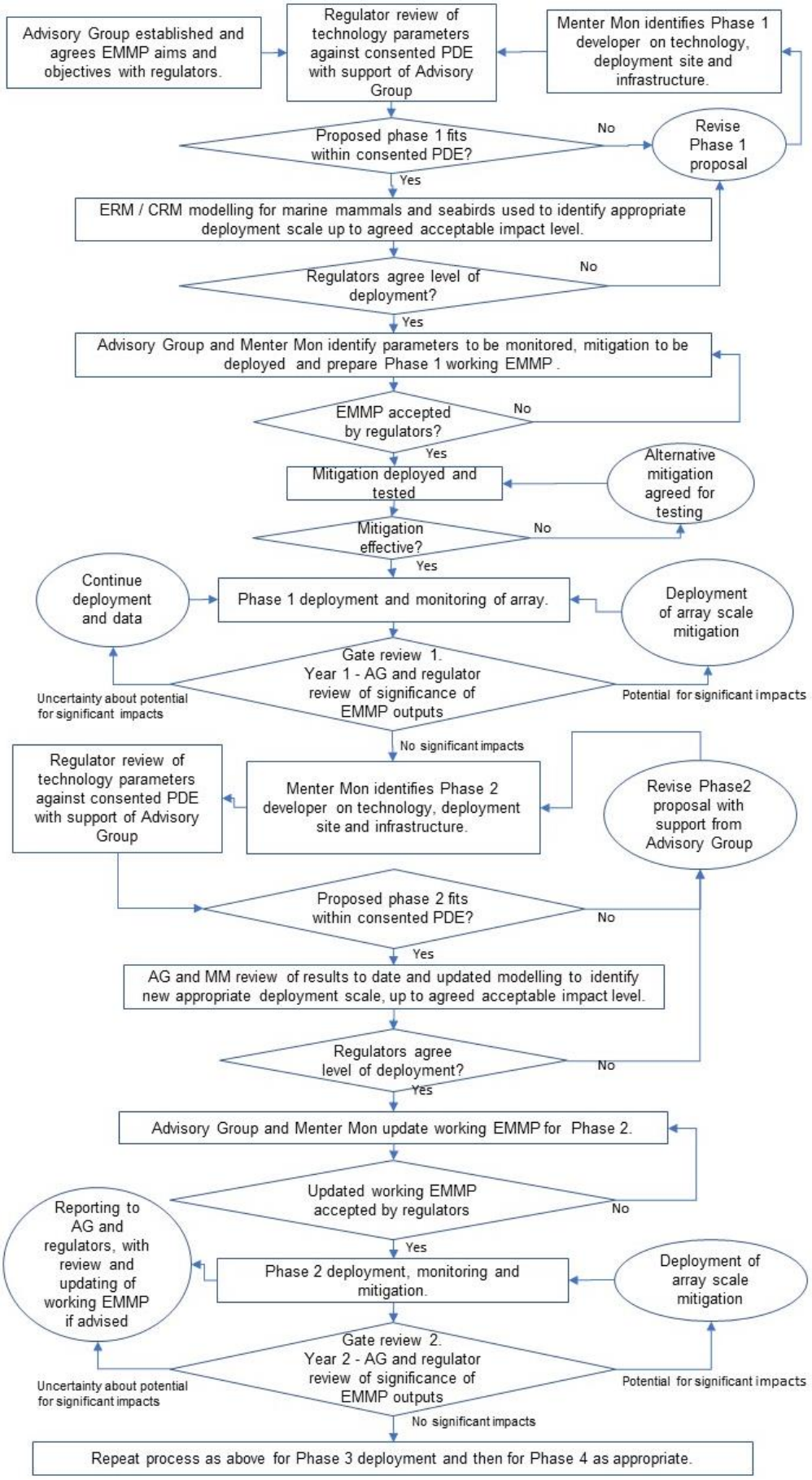

Plate 2-1 Illustration of EMMP process for initial deployment and repowering

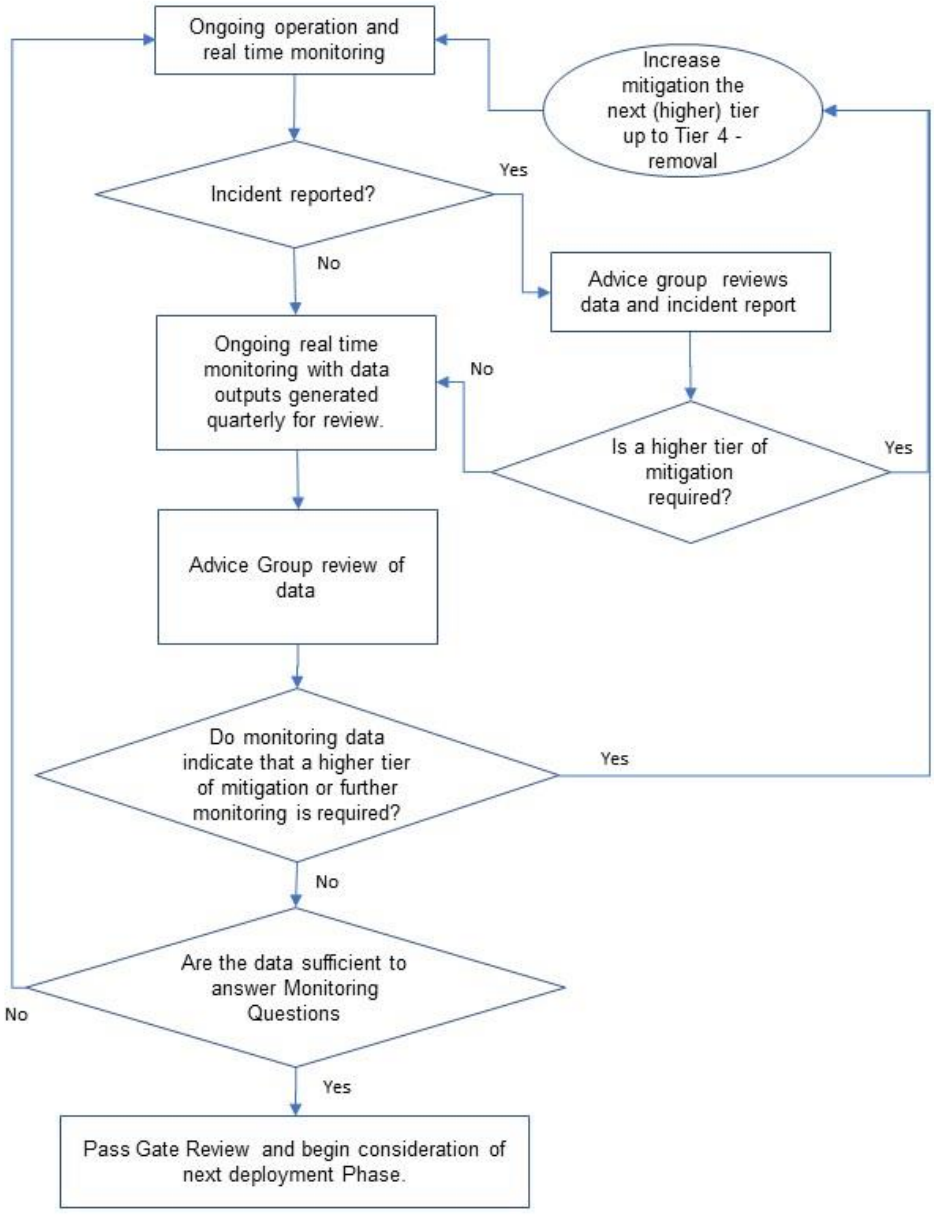

Plate 2-2 Illustration of incident management process

2.6. OUTLINE MONITORING INDICATORS

76. It is proposed that monitoring indicators and related monitoring questions (See Section 2.7, below) are agreed prior to consent, to allow post consent works to focus on appropriate monitoring methods.

77. 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

Ref.	Indicator	Applicable Monitoring Subject(s)	Metric(s) to be measured
I1	Change in use of tidal device array deployment area pre and post installation	• Marine Mammals • Diving Birds • Mitigation Efficacy	Time spent in device array deployment area. Activities / behaviour undertaken in device deployment area. Variations during tidal state and operation / non-operation of deterrent devices.
I2	Changes in use of the wider MDZ outside the array deployment area	• Marine Mammals • Diving Birds • Mitigation Efficacy	Time spent outside of the array deployment area, when compared to array area. Variations during tidal state and operation / non-operation of deterrent devices.
I3	Avoidance of individual tidal devices (near field avoidance)	• Marine Mammals • Diving Birds • Mitigation Efficacy	Sudden changes in swimming / diving direction around an operational device. Variations during tidal state and operation / non-operation of deterrent devices.
I4	Avoidance of array of tidal devices (far field avoidance)	• Marine Mammals • Diving Birds • Mitigation Efficacy	Gradual changes to swimming / diving directions in a way correlated to presence of an array of tidal devices. Variations during tidal state and operation / non-operation of deterrent devices.
I5	Avoidance of deterrent devices[1]	• Marine Mammals • Diving Birds • Mitigation Efficacy	Changes to swimming / diving directions in a way correlated to presence of operational deterrent devices. Variations in avoidance during deterrent operation compared to non-operation periods, and across a range of tidal states.
I6	Collision with tidal devices	• Marine mammals • Diving Birds	Clear direct collision between animal and device, supported by tracking of animal spatially and temporally before and after collision.

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

Ref.	Indicator	Applicable Monitoring Subject(s)	Metric(s) to be measured
I7	Local population effects	• Diving Birds	Changes to local colony numbers over time, potentially indicating changes to mortality or breeding success.
I8	Acoustic environment	• Marine mammals • Mitigation Efficacy	Monitoring of underwater noise environment during operation of devices. Variation of underwater noise across tidal states, during the operation / non-operation of tidal devices and during the operation / non-operation of acoustic deterrents.

2.7. OUTLINE MONITORING QUESTIONS

78. Monitoring questions to be addressed by the EMMP will be agreed by the advisory group. Outline monitoring questions that could be derived from monitoring indicators detailed earlier in this document are outlined in **Table 2-2** below.

79. 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

Ref.	Monitoring question	Applicable Monitoring Subject(s)	Purpose of question
Q1	Do receptors use the tidal device array deployment areas in the same of similar ways pre and post deployment?	• Marine Mammals • Diving birds • Mitigation efficacy	Evidence of array scale avoidance that may enable revision of modelling of collision and encounter risk and therefore revise collision effect significance.
Q2	Do receptors use the MDZ in the same or similar ways pre and post deployment?	• Marine Mammals • Diving Birds • Mitigation Efficacy	Evidence of MDZ scale avoidance that may: • Enable revision of modelling of collision and encounter risk and therefore revise collision effect significance; • Q3Allow consideration of potential exclusion.
Q3	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?
Q4	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.
Q5	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.
Q6	Is there evidence that tidal state may influence avoidance behaviours for devices and for acoustic deterrents?	• Marine Mammals • Diving Birds	Revision to modelling of encounter and collision risk may be required. Inform decisions regarding use of acoustic deterrents.
Q7	Do deterrents work?	• Marine Mammals • Diving Birds • Mitigation Efficacy	Inform decisions regarding their use as mitigation.
Q8	Is the underwater noise environment during operation of devices and acoustic deterrents as predicted in modelling?	• Marine Mammals • Mitigation Efficacy	Inform assessment of behaviour of animals and responses to operational tidal devices and acoustic deterrents. Review predicted efficacy of acoustic devices.
Q9	Can the next phase of deployment take place?	• Marine Mammals • Diving Birds • Mitigation Efficacy	Gate check by the advisory group for the scale of deployment of the next phase of the Project.
Q10	Does the monitoring and mitigation plan need to be reviewed and updated?	• Marine Mammals • Diving Birds • Mitigation Efficacy	Are the monitoring methods still appropriate or can they be removed or revised?

3. EMMP ROLES AND RESPONSIBILITIES

80. This section of the OEMMP details roles, responsibilities and lines of communication during phased deployment of the Project.

3.1. OWNERSHIP OF THE EMMP

81. The Applicant will have responsibility for ensuring the EMMP is implemented.

82. The Applicant may appoint an appropriate secretariat to manage the EMMP.

83. The environment lead within the Applicant's 'Project Team' will manage, revise and report on the outputs of the EMMP to Regulators.

3.2. ROLE OF THE REGULATORS IN THE ADVISORY GROUP

84. Two consenting bodies are involved in the consent of the Project, Natural Resources Wales (NRW) Licensing and Welsh Government through the Planning Inspectorate (PINS Wales).

85. It is anticipated that enforcement of the EMMP and other marine management measures will be through conditions placed on the Marine Licence, with NRW Licensing as the regulator. PINS Wales would play no further role in the EMMP.

86. NRW Licensing will have the ability to curtail operation of the project in response to adverse environmental impacts reported to it through the EMMP.

87. Regulators have played an active role within Advisory Groups for other equivalent projects such as the MeyGen tiday array (Terms of Reference for MeyGen are provided in Appendix 2), SeaGen Strangford Lough, and several offshore windfarms, with associated benefits for communication and speed of response. However, for the Project, NRW Licensing has suggested that they may play a more 'arms length' role, awaiting advice provided, and then providing responses and advice after deliberation.

88. NRW Licensing would engage with the Applicant during the establishment of the Advisory Group, but after that maintain an 'arms length' approach.

3.3. APPOINTMENT AND ROLE OF THE ADVISORY GROUP

89. The Advisory Group will have an Independent Chair, appointed by the Applicant, with agreement of the Regulators. The Independent Chair will be a person with experience of environmental consenting and monitoring works, with a level of technical expertise and an understanding of tidal energy.

90. The role of the Advisory Group, under the stewardship of its Independent Chair, will be to advise the Applicant and the Regulators regarding the implementation of the EMMP.

91. The Regulators engagement with the Advisory Group will be without prejudice to their regulatory role, and they will be under no obligation to accept or act upon advice.

92. 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.

93. 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.

94. 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.

95. Membership of the advisory group in outline is anticipated as:

- Independent Chair – independent advisor to the Applicant and Regulators / Competent Authorities and arbiter of discussions;
- The Applicant;
- Deploying tenant(s) may be included by invitation on an ad hoc basis;
- Natural Resources Wales Advisory – as technical experts (marine mammals and diving birds)
- 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.
- Environmental Clerk of Works (ECoW) for marine works– appointed by the Applicant, with responsibility for overseeing implementation of EMMP and other management plans post consent.

3.4. GOVERNANCE

96. The appointment of an Independent Chair of the Advisory Group will be subject to the agreement of the Regulators.

97. Decisions made under the EMMP will require agreement of the Regulator before they can be implemented.

98. The Regulators will have control of the scale of deployment and mitigation required for any phase of the Project. This ‘gate keeping’ role will enable them to ensure that that deployment scales and mitigation are appropriate to ensuring that no adverse effect on integrity occurs, while, taking into account the provision of any detailed EMMP for that deployment and previous deployments.

3.5. MEETINGS AND REPORTING

99. An outline schedule for the initial stages of development and implementation of the EMMP is provided in Table 5–1.

100. It is proposed that technical reports detailing the outcomes of monitoring will be reported for review on a quarterly basis, closely followed by quarterly ‘meetings’ (face to face or via tele / video conference) of the Advisory Group to discuss monitoring outputs in light of agreed EMMP aims, objectives and monitoring questions.

101. Between quarterly reports, short briefing notes will be sent to Advisory Group members with a summary of monitoring outputs in the preceding month.

102. If a significant emergency event or incident occurs, then an ad hoc ‘meeting’ of the Advisory Group will be held as soon as possible.

103. Measures and procedures relating to Emergency Response are detailed below.

3.6. EMERGENCY RESPONSE

104. Agreement of an appropriate protocol for the management of 'incidents' identified through monitoring will be agreed by the Advisory Group.

105. It is anticipated that an incident management protocol would follow a similar approach to that used for oil spill response or other major environmental incident (for example flood risk) management. Examples are available from previous tidal deployments such as SeaGen, Strangford Lough, as well as other industrial sectors and would be reviewed for appropriateness and potential lessons learned.

106. A communications or incident tree for rapid transmission of important information will be agreed by the Advisory Group. This will involve identification of key contacts within the organisations represented within the Advisory Group.

4. OUTLINE APPROACH TO MITIGATION AND MONITORING METHODS

4.1. MITIGATION

107. 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

108. 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

109. '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. Mitigation through Corrective Measures – Active Deterrence

110. Potential use of acoustic deterrent devices (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.

4.1.4. Mitigation through Corrective Measures – Moderation of Operation

111. The slowing or other modification of the operation of installed tidal devices to reduce predicted risk identified of collision.

4.1.5. Mitigation through Corrective Measures – Stopping or Removal of Devices

112. The temporary or permanent stopping or removal of deployed tidal devices.

4.2. MONITORING

4.2.1. Monitoring methods

113. The use of appropriate and effective monitoring methods based on review of available research and wider expertise will be agreed by the Advisory Group and Regulator prior to their deployment.

114. The Advisory Group will identify and agree appropriate monitoring and mitigation methods prior to deployment for approval by the Regulator. However, suggested methods are detailed below in outline at this stage, but subject to revision as methods and technologies improve.

115. Monitoring methods considered will be appropriate to monitoring of species behaviour and therefore for monitoring efficacy of mitigation.

116. 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.

117. 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.

118. The efficacy of monitoring methods will be demonstrated prior to operation of the turbines.

119. All of the monitoring methods proposed for consideration are described in monitoring literature, and their use is considered to realistic, effective, sufficient and deliverable, with their use depending upon the monitoring question to which they are addressed.

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	Related references to Tables 2-1 and 2-2
Passive acoustic monitoring (PAM)	Marine mammals (cetaceans)	Approach: Seabed mounted, moored or floating arrays of hydrophones. Data type: Sound files with directional	▪ Deployed in array around device array and in wider study area. ▪ Tracking of movement of animals and behaviour in real time, or through	Change in use of tidal device deployment area pre and post installation. Avoidance of tidal devices or	Considered for EMMP. PAM has been deployed at a number of marine renewable energy sites to date. PAM has shown its effectiveness	I1 I2 I4 I5 I8 Q1 Q2 Q6 Q7

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	Related references to Tables 2-1 and 2-2
		and sound level components. Interpretation by human operators and / or acoustic modelling, including spatial location of sound sources.	review of stored data. ▪ 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. ▪ Efficacy of mitigation measures	of deterrent devices.	in alerting monitoring programmes to the presence of cetaceans in a monitored area. PAM has the potential for automation and reduced costs. Local expertise in the use of PAM exists within SEACAMS. PAM has been deployed within the MDZ as part of SEACAMS	Q8
Active sonar	Marine Mammals	<u>Approach:</u> Seabed mounted, device mounted or moored directional sonar. Active sonar activated by PAM. Data can be stored for later analysis or analysed live. <u>Data type:</u>	▪ Used from seabed mounted platforms or device mounted. ▪ Tracking of movement of animals and behaviour in real time, or through review of stored data. ▪ Tracking of avoidance. ▪ Trigger mechanism	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. Active sonar has been deployed at a number of tidal energy sites to date. The ability of active sonar to track marine mammals, and potentially seabirds, swimming or diving close to tidal devices has been	I3 I6 Q1 Q4 Q5 Q6

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	Related references to Tables 2-1 and 2-2
		Visual files, which can be interpreted by a human operator, or by mathematical algorithm.	for mitigation measures such as ADD. ▪ Efficacy of mitigation measures		demonstrated both at operational sites and experimentally.	
Surface infra-red / visual spectrum camera	Marine mammals (surface) and Diving Birds (surface)	Approach: Surface mounted moored platform or device. Data type: Visual files for interpretation by human operator	▪ Used from a surface platform, potentially ▪ Presence / absence on surface only. ▪ Tracking night and day. ▪ Efficacy of mitigation measures	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	I1 I2 I4 I5 Q1 Q2
Underwater camera	Marine Mammals and Diving Birds	Approach: Seabed, device or platform mounted. Data type: Visual files for interpretation by human operator.	▪ Tracking in day and during good visibility periods. ▪ Tracking of movement of animals and behaviour in real time, or through review of stored data. ▪ Seabed based monitoring platform viewing one device. ▪ Device mounted monitoring 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.	I3 I6 Q4 Q5 Q6
Vantage point (VP) surveys	Marine mammals (surface)	Approach: Human observation	▪ Presence and absence of	Change in use of tidal device	Not considered for EMMP.	I1 I2

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	Related references to Tables 2-1 and 2-2
	and diving birds (surface)	from nearby cliffs. Data: Manual record of behaviour	animals in real time. ▪ Numbers and behaviour of animals at study area. ▪ Proximity to shore and elevation of VP important. Limited to surface information. ▪ Efficacy of mitigation measures	deployment 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.	I4 Q1 Q2 Q6 Q7
Colony counts	Diving Birds	Approach: Human observation or long distance photography. Data: Manual record of numbers / photographic data	▪ Numbers of animals active within colonies of interest. ▪ Colony health and viability	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.	I7
GPS enabled tagging with additional sensors (e.g. depth and accelerometer)	Diving Birds	Approach: Annual capture and tagging of a portion of the colony studies. Data: Time referenced data showing location, height, depth,	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.	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 depths and durations.	I1 I2 I3 I4 Q1 Q2 Q7

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	Related references to Tables 2-1 and 2-2
		speed and acceleration.		Collision with tidal devices. Local population effects.		
Acoustic Deterrent Devices	Marine mammals	Approach: 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.	I5 Q6
Visual deterrent	Diving birds	Approach: 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 diving birds 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.	I5 Q6

120. 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.

121. This OEMMP will be considered alongside a detailed review of monitoring and mitigation for marine mammals (19_MOR-RHDHV-DOC-0119), which details some of the methods and techniques currently being considered for monitoring of, and mitigation of impacts on, marine mammals. It is proposed that a similar review will also be undertaken of options for monitoring of, and mitigation of impacts upon, diving seabirds.

4.2.2. Monitoring of mitigation

122. Several of the monitoring questions proposed in this OEMMP (See Table 2-2) and potential monitoring methods identified to address those questions (See Table 4-1) are appropriate to monitoring the efficacy of mitigation measures, if they are applied.

5. OUTLINE SCHEDULE OF EMMP TASKS

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

124. Throughout the process detailed in Table 5-1 from item 10 onwards, the Advisory Group will undertake detailed review of monitoring data on a quarterly basis or as required by trigger or emergency events.

Table 5-1 EMMP Outline Post Consent Schedule of Tasks

Item No.	Project Stage	Task	Task component	Organisational responsibility	Time period
1	Pre-consent	Agreement of OEMMP approach	▪ Memorandum of understanding with Regulators ▪ Terms of reference	▪ Menter Môn (MM) ▪ Regulators	Ongoing to June 2021
2	Pre-consent	Establish Morlais EMMP Advisory Group	▪ Appoint Independent Chair and group members ▪ Appoint technical advisors	▪ MM ▪ Regulators	Ongoing to June 2021
3	Pre-consent	Procurement of support	▪ Appointment of secretariat ▪ Appointment of technical contractors	▪ MM ▪ Advisory Group	Ongoing to June 2021
4	Pre-consent	Agree OEMMP framework	▪ Aims ▪ Objectives ▪ Monitoring questions ▪ Methods	▪ MM ▪ Advisory Group	Ongoing to June 2021
5	Post consent & pre-construction	Identify phase 1 Technology and no impact installed capacity. Incorporate into DEMMP	▪ Collision and encounter modelling	▪ Advisory Group ▪ MM ▪ Tenant	August 2021 to October 2021
6	Post consent & pre-construction	Identify phase 1 array location. Incorporate into DEMMP	▪ Review of site data	▪ MM ▪ Tenant	August 2021 to October 2021

Item No.	Project Stage	Task	Task component	Organisational responsibility	Time period
7	Post consent & pre-construction	Procurement of monitoring services	▪ Equipment ▪ Installation Contractors ▪ Monitoring contractors	▪ MM ▪ Tenant	Nov 2021 to December 2022
8	Offshore infrastructure construction & pre-array deployment	Installation of offshore project infrastructure. Incorporate into DEMMP	▪ Export cables ▪ Cable protection ▪ Installation of monitoring equipment	▪ MM ▪ Advisory Group	January 2023 to December 2023
9	Offshore infrastructure construction & pre-array deployment	Implement DEMMP	▪ Commencement of monitoring works	▪ MM ▪ Advisory Group	Commence April 2023 - ongoing
10	Phase 1 Deployment	Installation and commissioning of first phase array Monitor for emergency trigger events. Implement DEMMP	▪ Inter-array cables ▪ Tidal devices	▪ Tenant	January 2024 to December 2024
11	Phase 1 Deployment	Monitor for emergency trigger events. Implement DEMMP.	▪ Gate review of monitoring works and advice to MM and Regulator	▪ Advisory Group	December 2025 – March 2026
12	Phase 2 Deployment	Installation and commissioning of second phase array. Implement DEMMP.	▪ Inter-array cables ▪ Tidal devices ▪ Installation of second phase monitoring equipment	▪ Tenant ▪ MM ▪ Advisory Group	March 2026 onwards
13	Phase 2 Deployment	Implement DEMMP.	▪ Gate review of monitoring works and advice to MM and Regulator	▪ Advisory Group	12 monthly after commencement of installation
14	Phase 3 Deployment	Repeat as for second phase			
15	Phase 4 Deployment.	Repeat as for third phase			

6. SUMMARY OF OUTLINE APPROACH

125. The OEMMP and DEMMP will be the responsibility of the Applicant, under the guidance of an independently chaired Advisory Group.

126. The Advisory Group will report and recommend and the Regulator will have final review and make final decision regarding the scale of deployment and type and use of mitigation.

127. 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.

128. Initial deployment of the Project will be at a level indicated by environmental assessment to have no significant environmental impact.

129. The EMMP will operate within a framework of agreed objectives and structured monitoring questions.

130. Monitoring works will begin before deployment to allow before and after comparison.

6.1. MARINE MAMMALS

131. 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; and
  - Avoidance behaviour.

132. 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.

133. 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.

134. The advisory group would agree on monitoring appropriate to following stages of deployment.

6.2. DIVING SEABIRDS

135. 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.

136. 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.

137. 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. APPENDIX 1. CONSENT CONDITION EXAMPLES

7.1. MEYGEN - TIDAL STREAM PROJECT - EXAMPLE CONSENT CONDITIONS

The MeyGen tidal stream array project is subject to the following two relevant consent conditions.

7.1.1. Environmental Monitoring Condition

"The Company must, no later than 3 months prior to the Commencement of the Development, submit a Project Environmental Monitoring Programme ("PEMP"), in writing, for the approval of the Scottish Ministers, in consultation with SNH and any other ecological, or such other advisors as required at the discretion of the Scottish Ministers. The PEMP must set out the measures of monitoring the environmental impacts of all stages of the Development, including the pre-construction, construction, and operational stages. The PEMP must be regularly reviewed by the Scottish Ministers, at timescales to be determined by the Scottish Ministers, in consultation with SNH and the Advisory Group referred to in condition 13 of this consent. Following such review the Scottish Ministers may, in consultation with SNH and the Advisory Group, require the Company to amend the PEMP and submit such an amended Programme to them, in writing, for their approval, in consultation with SNH and any other ecological, or such other advisors as required at the discretion of the Scottish Ministers." ……

7.1.2. Advisory Group condition

."The Scottish Ministers must, within 6 months of the date of the granting of the Section 36 consent, establish an Advisory Group to provide advice upon, and oversee, the EMP and the PEMP. Membership, terms of reference and functions of the Advisory Group are to be agreed by the Scottish Ministers in consultation with any such advisors at the discretion of the Scottish Ministers."

7.2. BEATRICE OFFSHORE WIND FARM – EXAMPLE CONSENT CONDITION

7.2.1. Advisory Group Condition

"The Company must participate in any Moray Firth Regional Advisory Group ("MFRAG") established by the Scottish Ministers for the purpose of advising the Scottish Ministers on research, monitoring and mitigation programmes for, but not limited to, ornithology, diadromous fish, marine mammals and commercial fish. Should a SSMEG be established (refer to condition 29), the responsibilities and obligations being delivered by the MFRAG will be subsumed by the SSMEG at a timescale to be determined by the Scottish Ministers."

"The Company must participate in any Scottish Strategic Marine Environment Group ("SSMEG") established by the Scottish Ministers for the purposes of advising the Scottish Ministers on research, monitoring and mitigation programmes for, but not limited to, ornithology, diadromous fish, marine mammals and commercial fish."

8. APPENDIX 2 ADVISORY GROUP TERMS OF REFERENCE EXAMPLE

Outline terms of reference for the Advisory Group for The Project are proposed in Section 2 of this OEMMP. A further example of terms of reference for MeyGen, as consented tidal array is also provided below.

MEYGEN
THE TIDE OF CHANGE IN CAITHNESS

Terms of Reference for the Advisory Group for Phase 1 of the MeyGen Tidal Energy Project

Definitions

"**Advisory Group"** - MeyGen Tidal Energy Project Phase 1 Advisory Group

"EMP" – The Environmental Management Plan for the MeyGen Tidal Energy Project Phase 1

"PEMP" – The Project Environmental Monitoring Programme for the MeyGen Tidal Energy Project Phase 1

"Project" – Phase 1 of the MeyGen Tidal Energy Project

"Member" – those members selected and appointed to the Advisory Group by Scottish Ministers at the inception of the Advisory Group owing to their key role in the development of tidal energy/the Project and/or expertise in a key area of environmental research. All members are required to provide confirmation of their commitment to membership of the Advisory Group.

"Liaison Group"– those organisations who have a vested interest in the outputs of the Project and the Advisory Group but who are not required to advise the EMP and PEMP activities directly on a regular basis. Liaison group members are included on distribution lists for outputs, meeting minutes of the EMP, PEMP and Advisory Group.

"Consent" - consent under Section 36 of the Electricity Act 1989 granted to the Project by Scottish Ministers on the 18th September 2013 (application reference: 009/TIDE/MGIS1 – 6) [1].

Introduction

Under the conditions of the Consent the Project must include an Environmental Management Plan ("EMP") and Project Environmental Monitoring Programme ("PEMP") with an Advisory Group to provide advice upon and oversee the EMP and PEMP.

The outputs from the EMP and PEMP will be used to augment the development of the Project under Condition 2 of the Consent.

Although the remit of the Advisory Group covers both the EMP and PEMP, the main focus will be on monitoring and therefore the PEMP. The function of the PEMP as stated in the Consent is to ensure that appropriate and effective monitoring of the impacts of the Project is undertaken. It is also important to acknowledge that PEMP monitoring activities aim to quantify the environmental effects of the Project and that the outputs of these will determine whether subsequent stages of the Project can progress.

[1] http://www.scotland.gov.uk/Topics/marine/Licensing/marine/scoping/MeyGen/DecisionLetter

Advisory Group 11 March 2014 1

Objectives of the Advisory Group

- To facilitate compliance with Conditions 11, 12 and 13 of the Consent.
- Provide a cooperative base for reviewing and agreeing the scope of monitoring for the PEMP. To clearly identify elements of the monitoring programme which should be independently peer reviewed, disseminating the outcomes of any such reviews along with other elements of the PEMP and EMP.
- Provide a cooperative base for identifying and agreeing monitoring activities to be included in the PEMP to enable the discharge of Condition 12 of the Consent.
- Provide a cooperative base for steering and reviewing the delivery of monitoring for the PEMP.
- To ensure the monitoring activities are aligned with Scottish Government and academic research in marine renewables and other relevant areas.
- To review opportunities and proposals for additional monitoring/research activities associated with the MEYGEN development beyond the immediate requirements of Condition 12. To make recommendations regarding these opportunities and proposals and to assist in the management and coordination of the activities.
- Provide a cooperative base for reviewing monitoring outputs of the PEMP and communicating these to the Scottish Ministers.
- Undertake reviews of the PEMP monitoring outputs for incorporation into amendments of the EMP.
- Provide a cooperative base for reviewing and agreeing the scope of mitigation for EMP amendments focusing on but not necessarily limited to, marine mammals, birds and migratory fish.

Membership

Members include:

1. Chairperson: Professor Ian Bryden (University of the Highlands and Islands)
2. Secretariat: Ed Rollings (MeyGen Ltd.)
3. Representatives from:

- Marine Scotland Science (MSS)
- Marine Scotland Licensing Operations Team (MS-LOT)
- Marine Scotland Marine Planning and Policy (MS-MPP)

- Scottish Natural Heritage (SNH)
- MeyGen Ltd.
- The Crown Estate (TCE)

Members are, upon agreement with the other Advisory Group members, allowed to invite their advisors to join Advisory Group meetings in order to advise/provide input on a particular area of the EMP and/or PEMP. In addition, it may be necessary for the Group to invite other interested bodies to provide additional expertise on specific issues that may arise in relation to monitoring methodologies, data analysis and monitoring outcomes.

The Advisory Group will, as and when required, seek independent peer review of monitoring outputs.

Liaison Group includes representatives from:

- Royal Society for the Protection of Birds (RSPB)
- Whale and Dolphin Conservation (WDC)
- Association of Salmon Fishery Boards (ASFB)
- The Highland Council (THC)
- Orkney Islands Council (OIC)

Ways of Working

Reporting

The Advisory Group will report to Scottish Ministers.

Meeting frequency

The Advisory Group will meet at least four times in the first year and then review the frequency of and requirements for meetings in subsequent years.

Management of disputes

In the event of a dispute that cannot be collectively resolved through discussion by the Advisory Group, the chair can request that Scottish Ministers make a decision to resolve the issue.

Review of Advisory Group function

The function of the Advisory Group may change over time, after monitoring activities commence and results are reviewed. The Advisory Group's function will be reviewed on an annual basis or more frequently if members find this necessary.

Information Dissemination

Scottish Ministers will provide the Liaison Group with approved final versions of Advisory Group meeting minutes, terms of reference and initial discussion paper as well as other relevant documents as agreed by the Advisory Group.

Other key documents (e.g. approved PEMP) as agreed by the Advisory Group will be made publically available on Marine Scotland's website.

Information considered commercially sensitive by MeyGen (e.g. turbine design) will not be shared out with the Advisory Group.

Core Agenda

Pre meeting documents (agenda, previous meeting minutes, and reports) to be provided 2 weeks in advance of Advisory Group meetings to give enough time for review of material.

Document Location

Documents being drafted that require input from Advisory Group members will in general be held on MeyGen's SeaPlanner website. As well as this, documents may be distributed via email for comment as and when required.

9. APPENDIX 3. PHASED DEPLOYMENT – EXAMPLE

Table 9-1 below outlines an indicative deployment scenario for the Project. This example is for illustrative purposes only and does not form the basis for management or for any consent conditions.

Table 9-1 Indicative Phased Deployment Scenario and Timeframe

Project stage	Nature of activity	Indicative timeframe
Post consent and pre-deployment	• Installation of marine infrastructure • Installation of monitoring equipment • Baseline monitoring	January 2023 to December 2023
Phase 1 deployment and monitoring	• Small demonstration array. • C14MW installed capacity to date	January 2024 to March 2026
	• Gate review	March 2026
Phase 2 deployment and monitoring	• Early commercial scale • 40MW installed capacity to date (c14MW of first array plus 26MW of additional array, or addition to first array)	March 2026 to March 2028
	• Gate review	March 2028.
Phase 3 deployment and monitoring	• Commercial array • 100MW capacity to date (40MW of Phase 1 and 2 plus an additional 60MW)	March 2028 to March 2032
	• Gate review	March 2032

Project stage	Nature of activity	Indicative timeframe
Phase 4 deployment and monitoring	Commercial arrays to full installed capacity of 240MW	March 2032 to March 2036
	Project monitoring final report	March 2038

10. 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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