FIVE ESTUARIES OFFSHORE WIND FARM

VOLUME 9, REPORT 32: OFFSHORE IN-PRINCIPLE MONITORING PLAN – REVISION D (TRACKED)

Application Reference	EN010115
Application Document Number	9.32
Revision	E
Pursuant to	Deadline 7
Ecodoc Number	005023949-08
Date	March 2025

Revision	Date	Status/Reason for Issue	Originator	Checked	Approved
B	Oct 2024	Deadline 1	VE OWFL	VE OWFL	VE OWFL
C	Jan 25	Deadline 5	VE OWFL	VE OWFL	VE OWFL
D	Feb 25	Deadline 6	VE OWFL	VE OWFL	VE OWFL
E	Mar 25	Deadline 7	VE OWFL	VE OWFL	VE OWFL

CONTENTS

DEFINITION OF ACRONYMS

Term	Definition
AEoL	Adverse Effect on Integrity
AIS	Automatic Identification System
CSIP	Cable Specification and Installation Plan
DCO	Development Consent Order
dML	Deemed Marine Licence
EIA	Environmental Impact Assessment
ES	Environmental Statement
IPMP	In-Principles Monitoring Plan
MBES	Multi-Beam Echo Sounder
MHCLG	Ministry of Housing, Communities and Local Government
MMMP	Marine Mammal Mitigation Protocol
MMO	Marine Management Organisation
MWSQ	Marine Water and Sediment Quality
MW	Megawatts
NSIP	Nationally Significant Infrastructure Project
OOMP	Offshore Operations and Maintenance Plan
SoS	Secretary of State
SSS	Side-Scan Sonar
UXO	Unexploded Ordnance
VE	Five Estuaries Offshore Wind Farm
WSI	Written Scheme of Investigation
WTG	Wind Turbine Generator

GLOSSARY OF TERMS

Term	Definition
Development Consent Order	An order made under the Planning Act 2008 granting development consent for a Nationally Significant Infrastructure Project (NSIP) from the Secretary of State (SoS) for the Department for Energy Security and Net Zero (DESNZ)
Effect	Term used to express the consequence of an impact. The significance of an effect is determined by correlating the magnitude of the impact in question with the sensitivity of the receptor in question, in accordance with defined significance criteria.
Export Cable Corridor (ECC)	The area(s) where the export cables will be located. The ECC is the wider cable corridor within which the preferred cable route is located. The Onshore ECC is typically approximately 90m wide, however some areas require a wider corridor (such as where trenchless crossing may take place)
Impact	An impact to the receiving environment is defined as any change to its baseline condition, either adverse or beneficial, resulting from the activities associated with the construction, operation and maintenance, or decommissioning of the project.
Marine Guidance Note (MGN)	A system of guidance notes issued by the Maritime and Coastguard Agency (MCA) which provide significant advice relating to the improvement of the safety of shipping at sea, and to prevent or minimise pollution from shipping.
Order Limits	The extent of development including all works, access routes, TCCs, visibility splays and discharge points.
Outline plan	An early version of a management plan produced to secure principles, which the final approved management plan will adhere to.
Receptor	These are as defined in Regulation 5(2) of The Infrastructure Planning (Environmental Impact Assessment) Regulations 2017 and include population and human health, biodiversity, land, soil, water, air, climate, material assets, cultural heritage and landscape that may be at risk from exposure to pollutants which could potentially arise as a result of the Proposed Development.
Sound Exposure Level	Measure that considers both the received level of the sound and duration of exposure.
Sound Pressure Level	Measure of the average unweighted level of sound, usually a continuous noise source.
The Applicant	The company Five Estuaries Offshore Wind Farm Ltd.

1 THE PROJECT

1.1 BACKGROUND

1.1.1 Five Estuaries Offshore Wind Farm Ltd (VE OWFL or the Applicant) has submitted a DCO application (the Application) to the Planning Inspectorate on behalf of the Secretary of State, for a Development Consent Order for the Five Estuaries Offshore Wind Farm (herein referred to as VE).

1.1.2 VE is the proposed extension to the operational Galloper Offshore Wind Farm located 37 km off the coast of Suffolk and comprises both offshore and onshore infrastructure within the administrative area of Essex Country Council. VE will have an overall capacity of greater than 100 Megawatts (MW) and therefore constitutes a Nationally Significant Infrastructure Project (NSIP) under Section 15 (3) of the Planning Act 2008. Such projects require a Development Consent Order (DCO) to be granted by the relevant UK Secretary of State (SoS).

1.1.3 This Offshore In-Principle Monitoring Plan (IPMP) has been produced as part of the Application.

1.2 PURPOSE OF THE DOCUMENT

1.2.1 This Offshore In-Principle Monitoring Plan (IPMP) sets out the basis for delivering offshore monitoring measures for VE as expected to be required under the deemed Marine Licences (dMLs) – comprising Schedules 10 and 11 of the draft DCO (Document 3.1).

1.2.2 The IPMP is secured in multiple dML conditions in relation to pre-construction, construction and post-construction monitoring and requires that, for each phase, the Applicant *'submit a [phase] monitoring plan or plans for that stage in accordance with the outline offshore in principle monitoring plan for written approval by the MMO in consultation with the relevant statutory nature conservation body, which must include details of any proposed construction monitoring, including methodologies and timings, and a proposed format, content and timings for providing reports on the results.'*

1.2.3 The IPMP provides a framework for further discussions post consent with the Marine Management Organisation (MMO) and the relevant authorities to agree the exact detail (timings, methodologies etc.) of the monitoring that is required. Final detailed plans will be produced prior to the commencement of monitoring work and in line with the Conditions set out in the dMLs.

1.2.4 This plan puts forward outline proposals for monitoring for the following relevant topics assessed as part of the Environmental Statement (ES):

- Volume 6, Part 2, Chapter 2: Marine Geology, Oceanography and Physical Processes;
- Volume 6, Part 2, Chapter 3: Marine Water and Sediment Quality
- Volume 6, Part 2, Chapter 4: Offshore Ornithology;
- Volume 6, Part 2, Chapter 5: Benthic and Intertidal Ecology
- Volume 6, Part 2, Chapter 6: Fish and Shellfish Ecology;

- Volume 6, Part 2, Chapter 7: Marine Mammal Ecology;
- Volume 6, Part 2, Chapter 8: Commercial Fisheries;
- Volume 6, Part 2, Chapter 9: Shipping and Navigation; and
- Volume 6, Part 2, Chapter 11: Offshore archaeology and Cultural Heritage.

1.2.5 This IPMP outlines topic specific monitoring proposals in line with the residual impacts assessed in the ES (topics listed above). This Offshore IPMP sets out the approach to monitoring in line with the assessments carried out at the date of writing and the Applicant recognises that this is a first iteration and through ongoing discussions with stakeholders monitoring methodologies will be refined in future iterations of this IPMP. In addition, it is noted that the pre-construction and post-construction monitoring plans will be based on hypothesis or questions that validate impact predictions where appropriate and/or monitor the effectiveness of mitigation.

2 GENERAL GUIDING PRINCIPLES FOR THE PROPOSED MONITORING

2.1.1 The ES and supporting documentation details the steps the Applicant has taken to avoid or reduce significant impacts either through the iterative process of project design (e.g., the location of project boundaries) or by mitigation measures which will be applied during the construction, operation or decommissioning phases of the Project.

2.1.2 The guiding principles for monitoring which apply to the monitoring outlined in this document are as follows:

- All consent conditions, which would include those for monitoring, should be "necessary, relevant to planning and to the development to be permitted, enforceable, precise and reasonable in all other respects" as set out in Paragraph 56 of the National Planning Policy Framework and referred to as the 'six tests' (Ministry of Housing, Communities and Local Government (MHCLG) 2021).
- In line with good practice, monitoring must have a clear purpose in order to provide answers to specific questions where significant environmental impacts have been identified. As such, monitoring proposals should have an identified aim, end date and confirmed outputs, which provide, as far as possible, statistically robust data sets, as applicable to the hypothesis being tested.
- Monitoring should be targeted towards significant evidence gaps or uncertainties, which are relevant to the project and can be realistically delivered by project level monitoring, as well as those receptors considered to be the most sensitive to project specific impacts including those of conservation, ecological and/or economic importance. The presence of a significant impact should not, on its own, necessarily lead to a requirement for monitoring.
- Proposals for monitoring should be based, where relevant, on best practice and the latest environmental data associated with post-consent monitoring of offshore wind farms.
- The scope and design of all monitoring work should be finalised and agreed following review of the results of any preceding survey and/or monitoring work (i.e., an adaptive approach), including those surveys conducted in support of the environmental impact assessment (EIA). This includes the potential for future survey requirements to be adapted based on the results of the monitoring outlined in this document. Where it has been agreed that there are no significant impacts, monitoring need not be conditioned through the dMLs or detailed in this document.

2.1.3 This document specifically focusses on monitoring the wind farm array areas and export cable corridor (ECC) area. Monitoring associated with Habitats Regulations Assessment compensatory measures (with or without prejudice), which would be located remotely from the project, are detailed in a series of separate implementation and monitoring plans as detailed below:

- Volume 5, Report 5.2: Outline Benthic Implementation and Monitoring Plan
- Volume 5, Report 5.6: Lesser Black Backed Gull Implementation and Monitoring Plan
- Volume 5, Report 5.7: Kittiwake Implementation and Monitoring Plan
- Volume 5, Report 5.8: Guillemot and Razorbill Implementation and Monitoring Plan.

3 VE RESIDUAL IMPACTS

3.1.1 The EIA predicts the residual impacts taking into account:

- Linkages using the source > pathway > receptor model;
- Mitigation;
- Sensitivity to the effect;
- Magnitude of the effect; and
- Ecological/economic importance.

3.1.2 The significance of the residual effect should not in its own right necessarily lead to a requirement for monitoring. Monitoring should be targeted to significant evidence gaps or uncertainty, which are relevant to the project and can be realistically addressed.

3.1.3 For each receptor the residual effects and major areas of uncertainty as predicted within the DCO Order Limits are detailed. Only where moderate or major adverse effects are predicted for the topics listed in Section 1.2 or significant uncertainty remains in the assessment has monitoring been deemed necessary and required as part of the dML.

4 IN PRINCIPLE PROPOSAL FOR MONITORING

4.1.1 The following sections set out the in-principle proposals for monitoring in relation to those topics and/or receptor groups outlined in the Section 1.

4.1.2 Accepting that this IPMP represents the proposed approach to monitoring at the time of writing, it is recognised that the outcomes of future survey work could influence future monitoring requirements, methodologies, focus and effort for VE, as knowledge and understanding develops. For example, where appropriate, and in consultation with the MMO and its advisors, including the relevant Statutory Nature Conservation Body (SNCB) (e.g Natural England), these scopes may be refined to consider other relevant studies. An adaptive approach to monitoring is important to ensure that data collected can realistically and robustly contribute to the evidence base for offshore wind farm impacts. This IPMP will be the subject of ongoing consultation between The Applicant, the MMO and its advisers. This document sets out the monitoring commitments made in the ES and will be used as a basis for further discussions, in relation to monitoring, post consent.

4.2 ENGINEERING AND DESIGN RELATED MONITORING

4.2.1 In addition to the environmental survey and monitoring required under the dMLs, survey activities will also be undertaken for engineering and design purposes. Some of these will overlap with, or incorporate, dML monitoring and wherever possible the Applicant will look to combine surveys for monitoring purposes with those already being carried out for engineering purposes to optimise data collection and evidence.

4.2.2 Geophysical and geotechnical surveys will be carried out before construction works commence and the information from those surveys would allow the following to be identified:

- Debris;
- Boulders;
- Archaeological features;
- Unexploded Ordnance (UXO) presence;
- Seabed features;
- Sediment depth; and
- The specific nature of the seabed.

4.2.3 The geotechnical and geophysical surveys may comprise survey methods including but not limited to, multibeam sonar, sidescan sonar, sub-bottom profiling, cone penetration tests and vibrocoring. Where required, seabed sediments may also be subject to grab sampling for physical and biological analyses. In addition, buoys may be deployed to survey local meteorological conditions.

4.2.4 Other relevant Plans required under the dML with commitments to monitoring (linked to the surveys listed above) are:

- A Cable Specification and Installation Plan (CSIP) in accordance with the Outline CSIP (Volume 9, Report 12) submitted with this DCO application;

- An offshore operations and maintenance plan (OOMP) in accordance with the Outline OOMP (Volume 9, Report 17) submitted with this DCO application; and
- Marine written schemes of investigation (WSI) in accordance with the Outline Marine Written Schemes of Investigation (Volume 9, Report 19) submitted with this DCO application.

4.3 MARINE GEOLOGY, OCEANOGRAPHY AND PHYSICAL PROCESSES

CONCLUSIONS OF THE ENVIRONMENTAL STATEMENT

4.3.1 The impacts on marine geology, oceanography and physical processes during the construction, operation and decommissioning phases of VE (assessed in Volume 6, Part 2, Chapter 2: Marine Geology, Oceanography and Physical Processes) found that there will be effects of **negligible** to **minor adverse** on the physical processes environment. Measurable effects on seabed topography and seabed sediment type were assessed to be relatively localised in nature, including sandwave pre-sweeping, cable trenching and sediment deposition from plumes. Effects on regional scale patterns of currents and waves, and resulting sediment transport, including indirect effects on non-local sandwaves and sandbanks (e.g. more than 500 m from the works), were confidently assessed to be not measurable (within the range of ongoing natural variability in these features).

4.3.2 VE intend to survey the areas where construction will be carried out using appropriate geophysical surveys including high resolution bathymetric, multibeam echosounder (MBES) and side-scan sonar (SSS) surveys of the area(s) within the Order limits for engineering purposes (as set out in Section 4.2).

IN PRINCIPLE MONITORING PROPOSED

4.3.3 Geophysical and geotechnical survey data will be collected pre-construction to inform detailed engineering design and will inform pre-construction identification and mapping of features of importance in relation to archaeology and benthic ecology.

4.3.4 Post construction survey proposals will be informed by the final engineering design of the project and also by potential for significant scour around rock/cable protection and foundations; any need to for cable burial depth monitoring; and potential for impact on features of ecological (primarily benthic) and archaeological sensitivity.

PRE-CONSTRUCTION MONITORING / PROGRAMME

4.3.5 A pre-construction survey of the final array areas and a refined cable corridor survey will be carried out to provide full sea floor coverage swath-bathymetric and side-scan data for the area(s) within the DCO Order Limits in which it is proposed to carry out construction works. Scope of pre-construction surveys will be informed by relevant guidance for benthic monitoring (as discussed in Section 4.6) and the requirements of the agreed Archaeological Written Schemes of Investigation (as discussed in Section 4.11) as well as Marine Guidance Note 654 and the associated need for surveys to provide data to IHO S44ed5 Order 1a standard. The surveys will include the localised areas that are likely to be measurably affected by the works. The surveys will not include areas of seabed or bedforms outside of the order limits or where natural processes may be active, but no measurable change or difference to those processes are expected, as a result of the works.

4.3.6 The specification, timing and programme of any surveys shall be submitted to the MMO for written approval at least six months prior to the commencement of any survey works, unless otherwise agreed.

4.3.7 A single post-construction survey will be carried out within the agreed array and cable corridor survey areas using full sea floor coverage swath-bathymetric surveys undertaken to International Hydrographic Organization (IHO) Order 1A standard and side scan sonar surveys around appropriate sub-samples of adjacent infrastructure to assess any changes in seabed topography. For this purpose, the survey contractor will, prior to the first such survey, submit a desk-based assessment (which takes account of all factors which influence scour) to identify the sample of adjacent turbines with greatest potential for scour. The survey will be used to substantiate the desk-based assessment: further surveys may be required if there are significant differences between the modelled scour and recorded scour. The number of turbine locations subject to monitoring will be confirmed following the completion of detailed design studies and in consultation with the MMO and relevant SNCBs.

4.3.8 The survey will also include selected areas subject to pre-sweeping of sandwaves or other bedforms as part of construction.

4.3.9 With regards to the cable landfall area, although the project is not intending to collect project specific monitoring in relation to intertidal elevation change, it is acknowledged that The Anglian Coastal Monitoring Programme (a continuous and long-running programme extending back to 1987) collect data, along with the Environment Agency who collect and publish LiDAR data in this region. These survey data will be used to monitor elevation change at the landfall, where required.

4.4 MARINE WATER AND SEDIMENT QUALITY

CONCLUSIONS OF THE ENVIRONMENTAL STATEMENT

4.4.1 The impacts on marine water and sediment quality during the construction, operation and decommissioning phases of VE (assessed in Volume 6, Part 2, Chapter 3: Marine Water and Sediment Quality) found that there is no residual impact.

IN PRINCIPLE MONITORING PROPOSED

4.4.2 No monitoring or independent surveys are proposed in relation to Marine Water and Sediment quality on the basis of no residual impact being assessed within the ES.

4.5 OFFSHORE ORNITHOLOGY

CONCLUSIONS OF THE ENVIRONMENTAL STATEMENT

4.5.1 The impacts on offshore ornithology during the construction, operation and decommissioning phases of VE (assessed in Volume 6, Part 2, Chapter 4: Offshore Ornithology) found that there will be impacts of no greater than **minor** adverse significance on offshore ornithology.

4.5.2 The Report to Inform Appropriate Assessment (RIAA) (Volume 5, Report 4) that has been submitted with this DCO application sets out that there is potential for Adverse Effect on Integrity (AEoI) for Lesser Black Backed Gulls (LBBG) from the Alde Ore Estuary SPA. Details of the proposed compensation measures and associated monitoring for these measures are set out in Volume 5, Report 5.3: LBBG Compensation: Evidence, Site Selection and Roadmap and Volume 5, Report 5.6: LBBG Implementation and Monitoring (IMP) Plans and are not covered in the IPMP.

4.5.3 Additionally, whilst the Applicant maintains there will be no AEoI, without prejudice derogation cases for Guillemot/ Razorbill and Kittiwake have also been submitted with the DCO Application. As above, details of these measures and associated monitoring are set out in 5.5.5 Guillemot and Razorbill - Evidence, Site Selection and Roadmap - Revision C [REP5-019], 5.5.8 Guillemot and Razorbill Implementation and Monitoring Plans - Revision C [REP5-025], 5.5.4 Kittiwake - Evidence, Site Selection and Roadmap - Revision C [Rep5-017] and 5.5.7 Kittiwake Implementation and Monitoring Plans - Revision C [REP5-023].

IN PRINCIPLE MONITORING PROPOSED

4.5.4 The Applicant believes there is greater value in focusing monitoring on the compensatory measures that are implemented for the project (and as set out the relevant IMPs outlined above) as significant effects from Five Estuaries (alone or cumulatively with other projects) in line with EIA regulations are not predicted.

4.5.5 This is because previously traditional pre and post-construction surveys have not conclusively confirmed the ES impact predictions, significantly furthered the evidence base, or reduced the levels of precaution in assessments, on the impacts of offshore wind farms on birds. It should also be noted that various factors of precaution are factored into impact assessments to account for uncertainty, plus it is widely acknowledged that wider strategic monitoring is required across multiple projects to have the power to detect any impacts upon species.

4.5.6 With this in mind, and noting the principles set out in Section 2, further monitoring is not proposed, beyond which is proposed for potential compensatory measures.

4.6 BENTHIC AND INTERTIDAL ECOLOGY

CONCLUSIONS OF THE ENVIRONMENTAL STATEMENT

4.6.1 The impacts on benthic and intertidal ecology during the construction, operation and decommissioning phases of VE (assessed in Volume 6, Part 2, Chapter 5: Benthic and Intertidal Ecology) found that there will be impacts of **negligible** to **minor adverse** significance on benthic ecology.

4.6.2 The offshore ECC passes through 1.26 km^2 of the Margate & Long Sands Special Area of Conservation (M&LS SAC), overlapping with the tip of the most northerly of the 9 sandbanks identified within the SAC (Long Sands Head). The RIAA (Volume 5, Report 4) concludes that no AEoI is expected upon the M&LS SAC, however cognisant of previous decisions reached by the SoS on recent offshore wind farm Development Consent Order (DCO) determinations, the Applicant has developed potential 'without prejudice' compensation measures for this SAC in the event VE is required to provide compensation by the SoS. VE has prepared an outline Benthic Implementation and Monitoring Plan (Volume 5, Report 5.5.2) that details the outline proposals for monitoring of compensatory measures and this would be developed into a final plan upon decision.

4.6.3 As detailed on Section 4.3, the pre-construction geophysical survey will also provide data that will be used to help identify important benthic habitats (such as potential locations of *Sabellaria spinulosa* reef). In areas where potential *S. spinulosa* reef is identified from the review of geophysical data, drop down video (DDV) and/ or stills will be deployed to confirm presence, provide data on likely height of reef and additional information on potential reef extent. The DDV footage will also be analysed to determine if there are any other Section 41 NERC habitats present, such as peat and clay exposures with piddocks.

4.6.4 The outputs of geophysical data and subsequent DDV and/ or stills survey will undergo a reefiness assessment, as presented in Volume 6, Part 5, Annex 5.1: Main Array - Benthic Ecology Monitoring Report, with the aim of determining the presence of Annex I *S. spinulosa* reef.

4.6.5 Where Annex I habitat is identified and/ or the presence of other Section 41 NERC habitats are identified from the DDV, these will be avoided (by micro-siting) where practicable during the construction works.

4.6.6 However, it should be noted that *S. spinulosa* habitat was not recorded in reef form during the site specific surveys.

4.6.7 The requirement for post-construction benthic survey will be informed by the results of pre-construction surveys and the final engineering design of the project.

IN PRINCIPLE MONITORING PROPOSED

4.6.8 Monitoring proposed will determine if there are any biogenic or geogenic reef features identified within construction areas for VE following geophysical pre-construction surveys, as described above.

4.6.9 In addition, pre-construction monitoring in the Margate and Long Sands SAC will be carried out in line with the methods and principles detailed in Larsen *et al*,. (2019) - Sandwaves and megaripples at Race Bank (UK) Offshore Wind Farm. However, it should be noted that this study is focussed on the entire Race Bank Wind Farm. The ECC crosses only a small portion of the SAC (for circa 1.2 km with up to 900 m length of cable protection) and potential for significant effects is avoided via the mitigation set out in 9.13 Margate and Long Sands SAC – Benthic mitigation plan. If cable protection is installed in the SAC then post-construction monitoring in line with the principles of Larsen, *et al*, will also be carried out.

4.6.10 The scope for pre-construction monitoring surveys, including programmes and methodologies shall be submitted in accordance with the relevant dML to the MMO for written approval at least six months prior to the commencement.

POST-CONSTRUCTION MONITORING / PROGRAMME

4.6.11 If no biogenic or geogenic reef feature is identified during the pre-construction survey of the proposed works area no benthic post-construction monitoring will be required for biogenic or geogenic reef features.

4.6.12 If biogenic or geogenic reef feature is identified during the pre-construction survey which had the potential to be impacted by project infrastructure, a post-construction survey, specifically targeting that feature will be undertaken. For example, where a reef habitat was identified and it was possible to micro-site around it, post-construction monitoring would be planned to determine any change in the location, extent and composition of such feature using the same method as outlined above for the pre-construction monitoring. This would be targeted at and around the location of the reef pre-construction. Dependent on the number and extent of reefs identified, a sub-sample of locations will be targeted. The post-construction survey should be completed within two years of the cessation of construction activities. The results of this survey will be used to inform the timing of subsequent surveys, if required, in consultation with the MMO and NE. Based on initial surveys, no Annex I reef is present within the project redline boundary.

4.6.13 If cable protection is installed in the Margate and Long Sands SAC, post construction monitoring will be carried out in line with methods agreed in pre-construction monitoring in the first year following installation of cable protection. The surveys may include a number of bathymetric transects, perpendicular to the cable protection in the direction of the surrounding sand waves, to determine potential for build-up of sediment and /or the likely movement of sediment over the cable protection. All surface-laid infrastructure within the M&LS SAC will be monitored initially. The results of this survey will be used to inform the timing of subsequent surveys, if required, in consultation with the MMO and NE.

4.6.14 The aim of post-consent monitoring within the SAC, should any cable protection ultimately be installed, would be to determine the amount of sediment that is trapped as a result of the infrastructure being on the seabed and any observable effect to sediment levels behind the structure (in the direction of travel of local sand waves). The hypothesis would be that there is no significant difference due to the presence of the cable protection infrastructure.

4.6.15 If required, the scope of post-construction monitoring surveys, including programmes and methodologies shall be submitted in accordance with the relevant dML conditions.

4.6.16 If significant impacts are observed, the potential requirement for further surveys will be agreed following review of the post-construction survey.

4.7 FISH AND SHELLFISH ECOLOGY

CONCLUSIONS OF THE ENVIRONMENTAL STATEMENT

4.7.1 The impacts on fish and shellfish ecology during the construction, operation and decommissioning phases of VE (assessed in Volume 6, Part 2, Chapter 6: Fish and Shellfish Ecology) found that there will be impacts of **negligible** to **minor adverse** significance with no residual impact on fish and shellfish ecology assessed.

IN PRINCIPLE MONITORING PROPOSED

4.7.2 No monitoring or independent surveys are proposed in relation to fish and shellfish ecology on the basis of no residual impact being assessed within the ES. However noise monitoring is proposed to validate, within reason, the assumptions made within Volume 6, Part 2, Chapter 6: Fish and Shellfish Ecology and Volume 6, Part 2, Chapter 7: Marine Mammal Ecology. The monitoring is to reduce the uncertainty for injury / disturbance to marine ecological receptors.

CONSTRUCTION MONITORING / PROGRAMME

4.7.3 Where piled foundations are to be employed during construction, underwater noise monitoring of the first four piles of each type of foundation will be undertaken to inform comparison against predictions for received levels and source levels that were made within the ES assessments to validate the conclusions made. The results of the initial noise measurements will be provided in writing to the MMO within nine weeks of the installation (unless otherwise agreed). The assessment of this report by the MMO will determine whether any further noise monitoring is required. This monitoring requirement is secured in Schedule 10 of the DCO (Generation Assets dML).

4.7.4 The monitoring locations will be selected from the first 12 foundations to be installed in order to provide for sites with differing seabed conditions (particularly water depths), whilst ensuring data are collected for the earliest pile installations for verification of predicted (modelled) noise levels. The Applicant proposes to target two foundation sites of ≤40 m water depth and two sites of ≥40 m depth from the initial 12 foundation locations.

4.7.5 Survey programmes and methodologies for the purposes of monitoring shall be submitted to the MMO at least six months prior to the commencement of any survey work, in accordance with the relevant dML conditions.

4.8 MARINE MAMMALS

CONCLUSIONS OF THE ENVIRONMENTAL STATEMENT

4.8.1 The impacts on marine mammals during the construction, operation and decommissioning phases of VE (assessed in Volume 6, Part 2, Chapter 7: Marine Mammal Ecology) found that all impacts are of **negligible** to **minor adverse** significance on marine mammals.

IN PRINCIPLE MONITORING PROPOSED

4.8.2 No monitoring or independent surveys are proposed in relation to marine mammals on the basis of no residual impact being assessed within the ES. In addition, previously standard, pre and post-construction aerial surveys have not conclusively confirmed the ES impact predictions or significantly furthered the evidence base on the impacts of offshore wind farms on marine mammals. It should also be noted that various factors of precaution are factored into impact assessments to account for this uncertainty. With this in mind, and noting the principles set out in Section 2, further monitoring is not proposed.

4.8.3 However, noise monitoring is proposed to validate, within reason, the assumptions made within Volume 6, Part 2, Chapter 7: Marine Mammal Ecology and Volume 6, Part 2, Chapter 6: Fish and Shellfish Ecology. The monitoring is to reduce the uncertainty for injury / disturbance to marine ecological receptors.

4.8.4 An outline MMMP (Volume 9, Report 14.1) for piling has been submitted with this DCO application. A Final MMMP for piling will be submitted six months prior to the construction commencement.

4.8.5 VE will consider the advice of the SNCBs regarding additional monitoring that may be required for marine mammals.

CONSTRUCTION MONITORING / PROGRAMME

4.8.6 In line with guidance set out in Good Practice Guide No.133: Underwater Noise Measurement (National Physical Laboratory, 2014) noise monitoring carried out will use hydrophones with full specifications and monitoring proposal detailing methodologies will be provided within further iterations of the Offshore IPMP. Such data collected will be recorded in a format that will allow analysis, conclusions and discussions using weighted metrics, such as sound exposure level and peak to peak pressure level.

4.8.7 Where piled foundations are to be employed during construction, underwater noise monitoring of the first four piles of each type of foundation will be undertaken to inform comparison against predictions for received levels and source levels that were made within the ES assessments to validate the conclusions made. The results of the initial noise measurements will be provided in writing to the MMO within nine weeks of the installation (unless otherwise agreed). The assessment of this report by the MMO will determine whether any further noise monitoring is required. This monitoring requirement is secured in Schedule 10 of the DCO (Generation Assets dML).

4.8.8 The monitoring locations will be selected from the first 12 foundations to be installed in order to provide for sites with differing seabed conditions (particularly water depths), whilst ensuring data are collected for the earliest pile installations for verification of predicted (modelled) noise levels.

4.8.9 The proposed hypothesis to be tested with the monitoring will be:

- H_1 – The installation of piled foundations at VE results in underwater noise levels that exceed the worst-case scenario predicted from the modelling undertaken to inform the ES assessment.
- H_0 – The installation of piled foundations at VE results in underwater noise levels that do not exceed the worst-case scenario predicted from the modelling undertaken to inform the ES assessment.

4.8.10 It is sometimes the case that the underwater noise modelling undertaken to inform the ES assessment is updated in the post-consent stage, to reflect refinement in project design. If this arises, then the following additional hypothesis will be tested through the monitoring:

- H_1 – The installation of piled foundations at VE results in underwater noise levels that exceed the worst-case scenario predicted from the modelling undertaken to inform the assessments in the post-consent stage.
- H_0 – The installation of piled foundations at VE results in underwater noise levels that do not exceed the worst-case scenario predicted from the modelling undertaken to inform the assessments in the post-consent stage.

4.8.11 The results of the initial noise measurements will be provided in writing to the MMO within nine weeks of the installation (unless otherwise agreed). The assessment of this report by the MMO will determine whether any further noise monitoring is required. If, in the reasonable opinion of the MMO in consultation with the statutory nature conservation body, the assessment shows impacts significantly in excess to those assessed in the ES (and/or subsequent assessments) and there has been a failure of the mitigations set out in the MMMP, all piling activity must cease until either contingency measures approved within the MMMP have been implemented or an update to the MMMP and further monitoring requirements have been agreed.

4.8.12 In addition to the above, requirements of the UK Marine Noise Registry will be adhered to where possible informed by survey works carried out for engineering surveys set out in Section 4.2.

4.8.13 Survey programmes and methodologies for the purposes of monitoring shall be submitted in accordance with the relevant dML conditions.

4.9 MIGRATORY BATS

OVERALL POSITION

4.9.1 Whilst the project maintains the position that there will not be a significant effect on migratory bats, the project recognises there is currently a lack of baseline data associated with migratory bats, therefore, to aid future decision making and to increase the evidence base only, the project is considering appropriate monitoring which provides useful and relevant additional data. The project will continue to engage with Natural England to seek ~~the best and mosta~~ reasonable and proportionate approach to potential monitoring.

POTENTIAL MONITORING OPTIONS

4.9.2 ~~Onshore monitoring, particularly along the coastline adjacent to the array site, at specific times of year when bats are known to migrate would provide an indication of the species of bat within the area and if those species are known to migrate. This onshore monitoring could be supplemented by regional offshore monitoring or additional collaboration with established conservation projects.~~Due to the current lack of data, a staged approach to monitoring is important to determine the most effective methods to gathering any data on migratory bats. As such, the project is proposing an initial gap analysis desk study. This gap analysis would collate existing studies and research on migratory bats at an appropriate geographical scale in relation to the project. This would focus on any offshore records within the region and any research already undertaken on bat movements and likely offshore behaviours.

4.9.3 Following the gap analysis, and depending on the conclusions, an appropriate monitoring approach would be determined, in collaboration with Natural England.

4.9.4 Without prejudicing the results of the analysis, the project believes one of the following monitoring approaches below could be effective at determining the presence of migratory bats:

- Onshore monitoring - Deployment of static acoustic bat detectors at strategic land based locations at specific times of year, such as the landfall site and during known migratory times. This would help ascertain what bat species are utilising the area and provide further context of bat movements within the area.
- Offshore regional monitoring – Depending on agreements with vessel owners, detectors could be placed on relevant vessels. This could occur during construction or during operations and maintenance activities. This would help determine presence or absence within the offshore environment but could also provide some directional data.
- Contributing to current studies – An appropriate research project or study could be contributed to by the project, for example the MOTUS network or work undertaken by the Bat Conservation Trust.

4.10 COMMERCIAL FISHERIES

CONCLUSIONS OF THE ENVIRONMENTAL STATEMENT

4.10.1 The impacts on commercial fisheries during the construction, operation and decommissioning phases of VE (assessed in Volume 6, Part 2, Chapter 12: Commercial Fisheries) found that all impacts are of **negligible** to **moderate adverse** significance on commercial fisheries. The impacts identified with moderate adverse impacts on the UK potting, fixed net and drift net, and hooked gear fleets during the construction phase of VE are reduced to **minor adverse** residual significance following application of mitigation within the Outline Fisheries Liaison and Co-existence Plan (FLCP).

IN PRINCIPLE MONITORING PROPOSED

4.10.2 No monitoring specific to commercial fisheries is considered necessary based on the impact assessment conclusions. However, it is acknowledged that the following existing monitoring commitments are expected to produce findings that are of interest to fisheries stakeholders:

- As described in Section 4.10 (Shipping and Navigation), vessel traffic monitoring by Automatic Identification System (AIS) will be undertaken during and post-construction. AIS monitoring will detect activity by all vessels over 15 m length and can be filtered to identify fishing vessels. It is understood that the majority of fishing vessels operating in the array areas (i.e. beyond the 12 nautical mile limit) will fall within this category. Gathered fishing vessel data can inform understanding of the resumption of fishing during the operational phase of VE. AIS data may be supplemented by other evidence as appropriate, such as Fisheries Liaison Officer records. A report on presenting the outcomes of this monitoring will be submitted to the MMO and findings shared with the VE Commercial Fisheries Working Group.
- As described in Section 6 of 9.12 Outline Cable Specification and Installation Plan (CSIP) [REP4-019], post-construction monitoring of cable burial will be undertaken. This will include an as-built post-construction bathymetric survey to confirm the precise location and depth of burial of VE cables. The findings of this survey will be shared with the VE Commercial Fisheries Working Group.

4.10.3 These monitoring commitments of relevance to commercial fisheries are also identified in the Outline FLCP – Revision D. A complete version of the FLCP will be agreed prior to the start of construction. The FLCP will be produced in accordance with the Outline FLCP (Volume 9, Report 16) submitted with the DCO application.

4.11 SHIPPING AND NAVIGATION

CONCLUSIONS OF THE ENVIRONMENTAL STATEMENT

4.11.1 The impacts on shipping and navigation during the construction, operation and decommissioning phases of VE (assessed in Volume 6, Part 2, Chapter 9: Shipping and Navigation) found that all impacts range from **broadly acceptable** to **tolerable** with mitigation applied, project alone and cumulatively.

IN PRINCIPLE MONITORING PROPOSED

4.11.2 Construction monitoring shall include vessel traffic monitoring by Automatic Identification System (AIS), including the provision of reports on the results of that monitoring submitted to the MMO, Maritime and Coastguard Agency (MCA) and Trinity House. Reports will consider 28 days of AIS (not consecutively), taking account of seasonal variations in traffic patterns over the year. A report will be submitted annually throughout the construction phase.

4.11.3 Post-construction monitoring shall also include vessel traffic monitoring via AIS, including the provision of a report on the results of that monitoring submitted to the MMO, MCA and Trinity House. The report will again consider 28 days of AIS (not consecutively), taking account of seasonal variations in traffic patterns over the first three years following the commencement of commercial operation. A report will be submitted to the MMO, MCA and Trinity House following the end of the monitoring.

4.12 OFFSHORE ARCHAEOLOGY

CONCLUSIONS OF THE ENVIRONMENTAL STATEMENT

4.12.1 The impacts on offshore archaeology and cultural heritage during the construction, operation and decommissioning phases of VE (assessed in Volume 6, Part 2, Chapter 11: Offshore Archaeology and Cultural Heritage) found that the magnitude of impact on marine heritage receptors will be **negligible** (neutral) and the sensitivity (value) of the receptor **negligible** to **high**. The significance of effect was assessed as **minor** to **negligible** on the basis of applying mitigation or offsetting impacts in line with best practice which includes further interpretation / assessment of geophysical and geotechnical data post consent as outlined in the Outline Marine WSI (Volume 9, Report 19) produced with this DCO application.

IN PRINCIPLE MONITORING PROPOSED

4.12.2 Monitoring proposed for offshore archaeology and cultural heritage will be delivered in line with the final Agreed Marine WSI in accordance with the Outline Marine WSI (Volume 9, Report 19) produced with this DCO application and / or further activity specific method statements to be agreed with the MMO in consultation with Historic England.

4.12.3 Any offshore geophysical surveys (including UXO surveys), geotechnical surveys or ROV or diver investigations will be undertaken in line with the final Agreed Marine WSI in accordance with the Outline Marine WSI (Volume 9, Report 19) produced with this DCO, with survey specific archaeological method statements produced for review by Historic England as appropriate.

PRE-CONSTRUCTION MONITORING / PROGRAMME

4.12.4 Pre-construction surveys will be undertaken in line with the forthcoming final Agreed Marine WSI and associated method statements with the intention that features of potential archaeological significance are avoided by construction work in the means of identification and the implementation of archaeological exclusion zones.

4.12.5 Areas with geoarchaeological potential will be targeted during the geotechnical sampling campaigns in line with the forthcoming final Agreed Marine WSI and the results of the geoarchaeological assessment will be presented in staged geoarchaeological reports as appropriate.

POST- CONSTRUCTION MONITORING / PROGRAMME

4.12.6 A post-construction monitoring plan will be produced as per the requirements within the Outline Marine WSI (Volume 9, Report 19) and the forthcoming final Agreed Marine WSI. The post-construction monitoring plan will identify any areas or sites of high archaeological significance recommended for further investigation and outline how post-construction monitoring campaigns will collect, asses and report on changes to marine heritage receptors that may have occurred during the construction phase.

4.12.7 Specific requirements relating to monitoring during post-construction will be detailed in the forthcoming final Agreed Marine WSI.

FIVE ESTUARIES
OFFSHORE WIND FARM

PHONE 0333 880 5306
EMAIL fiveestuaries@rwe.com
WEBSITE www.fiveestuaries.co.uk
ADDRESS Five Estuaries Offshore Wind Farm Ltd
Windmill Hill Business Park
Whitehill Way, Swindon, SN5 6PB
COMPANY NO Registered in England and Wales
company number 12292474