BERWICK BANK WIND FARM

OFFSHORE ENVIRONMENTAL IMPACT ASSESSMENT

APPENDIX 22, ANNEX C: OUTLINE SCOUR PROTECTION MANAGEMENT PLAN

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CONTENTS

TABLES

FIGURES

1. INTRODUCTION

1.1. PURPOSE OF THIS DOCUMENT

1. This Scour Protection Management Plan (SPMP) has been prepared by RPS and Berwick Bank Wind Farm Limited (BBWFL), a wholly owned subsidiary of SSE Renewables (SSER) Limited hereafter referred to as 'the Applicant', to support the offshore Environmental Impact Assessment (EIA) Report for the Berwick Bank Wind Farm offshore infrastructure (hereafter referred to as 'the Proposed Development') (Figure 1.1).

2. The purpose of the SPMP is to outline the key principles of managing the protection of wind turbine and offshore substation platform (OSP)/Offshore convertor station platform foundations, offshore export cables and inter-array and interconnector cables, from the effects of scour and hazards (e.g. snagging of anchors), immediately following construction and during the operation and maintenance phase of the Proposed Development. Any protection laid as part of the Proposed Development has the potential to scour, which can be described as the movement of sediment that can erode the seabed around a fixed structure.

3. This SPMP has been developed taking into account feedback provided from consultees as part of the Berwick Bank Wind Farm Scoping Opinion (MS-LOT, 2022), where it was highlighted that management plans should be "adequate" to be used as mitigation measures where they are key to reducing impacts. Table 1.1 provides a summary of the issues raised by stakeholders in relation to scour protection.

4. This SPMP is a 'live' document and as such it will be further developed post-consent in consultation with regulatory bodies and stakeholders such as Marine Scotland Licencing Operations Team (MS-LOT), Marine Scotland Science (MSS) and NatureScot, once project design has been finalised.

Table 1.1: Issues Raised by Consultees in Relation to Scour Protection

Issues Raised	Stakeholder	Where Issues are Addressed
Scour and physical change must be fully addressed by the Developer in the EIA Report.	MS-LOT	Volume 2, chapter 7
Applicant should consider monitoring scour around the wind turbine foundations, in addition to the cable route.	MSS	Volume 2, chapter 7
Details of scour protection requirements for individual wind turbines, foundation types and for cables should be provided.	NatureScot	Volume 2, chapter 8
EIA and MPA assessment should consider impact of all cable laying, installation of scour protection and wind turbine foundations as a long term or permanent impact on ocean quahog *Arctica islandica*.	MSS	Volume 2, chapter 8 and MPA Assessment
Changes in prey availability should be considered in relation to direct impact of habitat loss/prey disturbance from the installation of foundations, cables, scour protection and the colonisation of hard structures.	NatureScot	HRA Report

1.2. BACKGROUND

5. The Proposed Development includes the following components:

- wind turbines;
- offshore substation platforms (OSPs)/Offshore convertor station platforms;
- inter-array cables;
- inter-connector cables; and
- offshore export cables.

6. A full description of the Proposed Development is provided in volume 1, chapter 3. However, the detailed and final design of the Proposed Development will be determined post-consent.

7. A geophysical survey of the Proposed Development area was completed between August and October 2019 and a geotechnical survey was completed in October 2020. There will be ongoing geotechnical and geophysical surveys as required throughout the pre-construction and operation and maintenance phases.

8. Bathymetry within the Proposed Development array area varies between 33.4 m and 68.5 m relative to Lowest Astronomical Tide (LAT), with an average depth of 51.7 m below LAT. The bathymetry along the Proposed Development export cable corridor varies between 20 m and 69 m below LAT.

9. The Offshore EIA Report has assumed a maximum design of all foundations having scour protection in order to provide a conservative assessment. Cable burial is expected to be possible across the majority of the Proposed Development export cable corridor, with the exception of cable crossing locations and where the offshore export cables punches out at sea landing on hard substrate. In order to provide a conservative and future-proofed assessment of effects, a contingency estimate for cable protection of 15% (of length of cables) is included in the assessment, should cable burial not be possible (where target burial depths are not met (e.g. due to unexpected hard substrate being encountered during the preconstruction surveys or cable burial activities)).

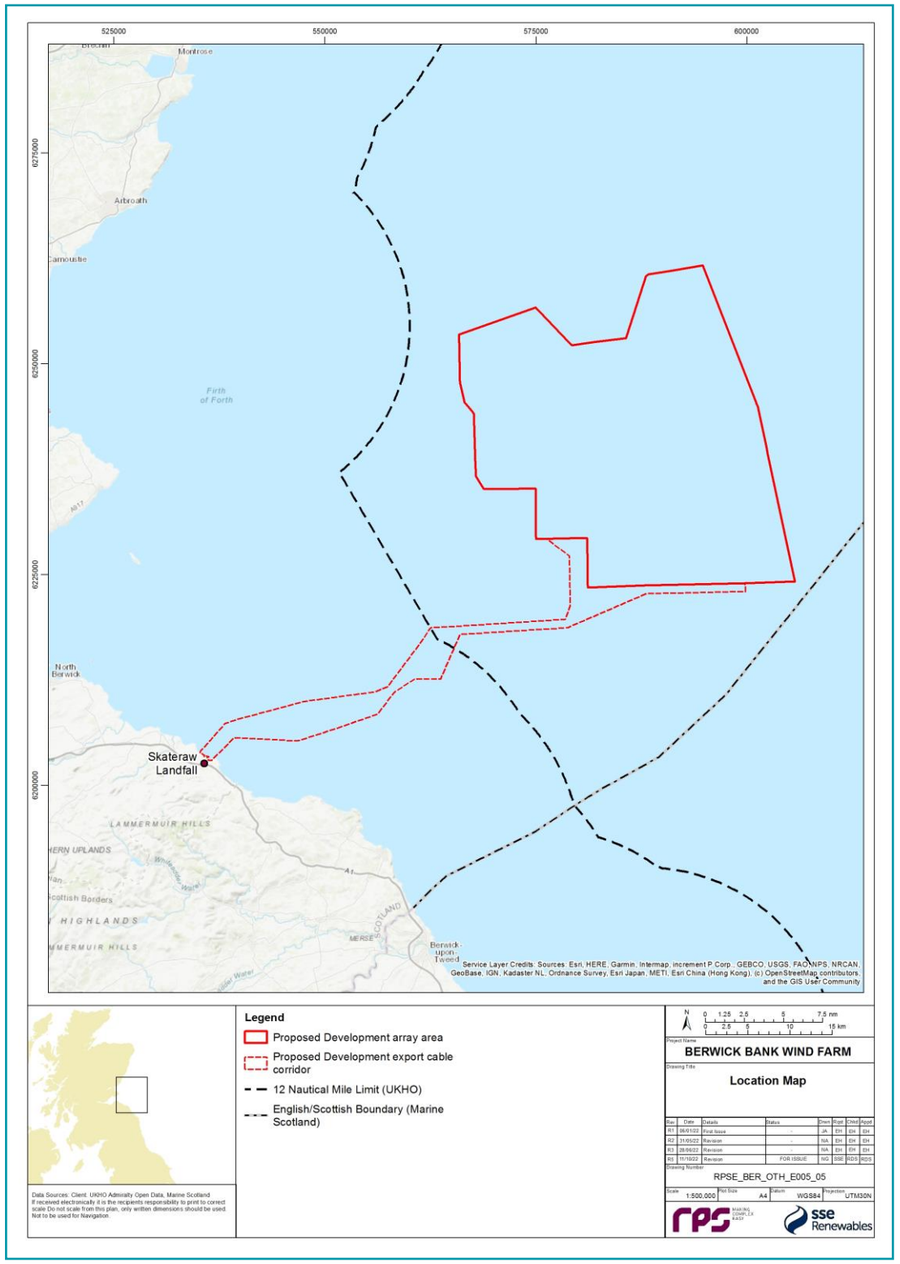

Figure 1.1: Location of the Proposed Development

2. FOUNDATION SCOUR PROTECTION

10. Physical processes at the Proposed Development will influence the effects of scour upon wind turbine and OSP/Offshore convertor station platform foundations and cables. Therefore, depending on metocean conditions, scour and cable protection may be required around offshore infrastructure to protect against currents and waves that may cause erosion of the seabed.

11. The process for developing the scour protection design will follow the below steps:

- design of Scour protection
  - Pre-construction surveys to inform concept design
  - Front-End Engineering Design (FEED) design studies;
  - Full Invitation to Tender (ITT) to produce detailed design of scour protection;
- completion of pre-installation surveys (e.g. geophysical surveys), to inform preparation of the SPMP.
- production of detailed SPMP for submission and approval by MS-LOT prior to construction;
- post installation surveys to confirm scour protection installation; and
- Survey of assets including scour protection will be undertaken periodically during the Operation and Maintenance phase of the project. The timing and frequency will be determined post construction and will be informed/modified periodically as informed by previous asset surveys

12. Scour protection material is likely to be installed at wind turbine foundations and offshore cables if required, during the construction phase, to mitigate the effects of scour, to minimise the release of suspended sediments, and the potential for seabed level changes in the vicinity of the wind turbine foundations.

13. The maximum design scenario for scour protection required at the Proposed Development is provided in volume 1, chapter 3 (Table 3.6) and volume 2, chapters 7, 8 and 9. These assumptions are summarised below:

- piled jacket foundation (wind turbine): covering an area of 2,280 m^2 per foundation;
- jacket foundation with suction caissons (wind turbine): covering an area of 10,984 m^2 per foundation;
- piled jacket foundation (OSP/Offshore converter station platform): covering an area of 4,825 m^2 per foundation; and
- jacket foundation with suction caissons (OSP/Offshore converter station platform): covering an area of 11,146 m^2 per foundation.

14. As detailed in volume 1, chapter 3 (Table 3.6), the most frequently used scour protection method is rock placement. However, there is potential for other methods to be used, including concrete mattresses, artificial fronds or other novel solutions.

15. The final quantities and extent of scour protection will be dependent on current speed, sediment type and the foundation details, thus final quantities will be determined post construction. However, Table 2.1 provides the maximum design scenario for scour protection likely to be required, based on the information provided in volume 1, chapter 3.

Table 2.1: Maximum Design Scenario for Scour Protection

Foundation	Scour Protection Area per Foundation (m^2)	Scour Protection Volume per Foundation (m^3)	Total Scour Protection Volume for

			Wind Farm (m^3)
Piled Jacket Foundation (Wind Turbine)	2,280	4,560	816,240
Jacket Foundation with Suction Caissons (Wind Turbine)	10,984	21,967	4,503,286
Piled Jacket Foundation (OSP/Offshore converter station platform)	4,825	9,651	56,247
Jacket Foundation with Suction Caissons (OSP/Offshore converter station platform)	11,146	22,291	126,912
Total			5,502,685

3. CABLE PROTECTION

3.1. UNBURIED CABLES

16. Cable protection will be required due to cable crossings and substrate type, the type of cable protection used will be dependent on several factors such as seabed conditions, seabed sedimentology and naturally occurring physical processes. For the purposes of this section, the term unburied cables also includes buried cables where required target burial depths are not met.

17. The process for developing the cable protection design will follow the below steps:

- design of cable protection:
  - pre-construction surveys to inform concept design;
  - FEED design studies;
  - production of a cable burial risk assessment (CBRA)
  - full ITT to produce detailed design of cable protection including types and locations
- production of detailed SPMP (or Cable Burial and Protection as appropriate) for submission and approval by MS-LOT prior to construction which will detail locations, quantities, types of cable protection;
- post-installation surveys (e.g. cable burial surveys) to check target burial depths have been met/cable protection is installed to adequately protect assets and installation in line with approved plan; and
- survey of assets including cable burial depths and integrity of cable protection will be undertaken periodically during the Operational and Maintenance phase of the project. The timing and frequency will be determined post construction and will be informed/modified periodically as informed by previous asset surveys and updated to the CBRA. Further remediation works including reburials and repairs may also be required.

18. The cable installation methodology and requirements for cable protection will be finalised post-consent based on the process outlined above. Nonetheless, volume 1, chapter 3 provides the maximum design for cable protection required at the Proposed Development, which is summarised in Table 3.1. These values have been used in the assessment of impacts as part of the Offshore EIA Report.

Table 3.1: Maximum Design Scenario for Cable Protection

Type of Cable	Maximum Percentage of Cables that may	Length of Cable Protection (m)	Width of Cable Protection (m)	Height of Cable Protection (m)	Maximum Total Cable Protection Footprint	Maximum Total Cable Protection Volume for	Area for Wind Farm (m^2)	Wind Farm (m^3)
Inter-array Cables	15	183,750	20	3			2,572,500	7,717,500
Interconnector Cables	15	14,100	20	3			282,000	846,000
Offshore Export Cables	15	130,8000	20	3			2,616,000	7,848,000

19. In addition to this, the inter-array cables will leave the seabed cable trench to route into the J tube at the base of wind turbine foundation. Consequently there is a risk of scour at the point where the inter-array cables transition out of the seabed. Similarly, there is also a risk of scour at the points where the interconnector cables and offshore export cables transition into the OSP/Offshore convertor station J tubes.

3.2. CABLE CROSSINGS

20. Where offshore export cables and/or inter-array cables are required to cross an obstacle, such as another cable, cable crossing protection will be installed to protect the obstacle being crossed. There will be two layers of cable protection, one between the existing obstacle and the Proposed Development cable and a second one on top of the latter.

21. There will be up to 16 offshore export cable crossings and up to 78 inter-array cable crossings (volume 1, chapter 3). Where a cable crossing is for a third-party cable, this would require an agreed procedure between the cable owners, with the agreement being finalised post-consent, following any additional pre-construction marine surveys.

22. Based on the information given in volume 1, chapter 3, the maximum width and length of the cable protection at each offshore export cable crossing is 21 m and 40 m, respectively; and at each inter-array cable is 21 m and 30 m, respectively. The maximum height of the cable protection for both types of cable crossings is 3.5 m.

3.3. TYPES OF CABLE PROTECTION

23. Volume 1, chapter 3 provides a description of the types of cable protection being considered for the Proposed Development, which include the following cable protection systems:

- concrete mattressing;
- rock placement;
- rock bags;
- cast iron shells; and
- sleeving.

4. SCOUR AND CABLE PROTECTION ASSESSMENT IN OFFSHORE EIA REPORT CHAPTERS

24. The Offshore EIA Report has assessed the potential impacts relating to the presence of scour and cable protection during the operation and maintenance phase of the Proposed Development. These assessments have been carried out based on the maximum design relevant to a given potential impact, drawing specific details from volume 1, chapter 3.

25. Table 4.1 details where in the Offshore EIA Report these impacts have been considered.

Table 4.1: Impacts Relating to Scour and Cable Protection

Offshore EIA Chapter	Impacts Considered
Volume 2, chapter 7	Increased suspended sediment concentrations and associated deposition on physical features as a result of decommissioning of scour and cable protection. Changes in tidal currents, wave climate, littoral currents and sediment transport due to the presence of scour and cable protection.
Volume 2, chapter 8	Long term subtidal habitat loss due to the presence of scour protection. Colonisation of hard structures due to the presence of scour protection. Increased risk of introduction and spread of invasive non-native species due to the presence of scour and cable protection. Alteration of seabed habitats arising from effects of physical processes due to the presence of scour protection. Removal of hard substrates resulting in loss of colonising communities, as a result of the removal of scour protection.

5. SUMMARY

26. Details relating to scour and cable protection have been provided in volume 1, chapter 3 and potential impacts have been assessed in the relevant chapters of the Offshore EIA Report (Table 4.1). Some flexibility is required in terms of type and quantity of scour and cable protection during the pre-application phase, therefore the assessments have been carried out on a maximum design scenario basis.

27. Detailed requirements for scour and cable protection will be agreed post-consent as part of the final SPMP and CBRA which will be submitted to MS-LOT for approval prior to construction.

6. REFERENCES

Marine Scotland Licensing Operations Team (2022). *Scoping Opinion for Berwick Bank Wind Farm*. Available at: [scoping_opinion_8.pdf (marine.gov.scot)

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