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White Cross Offshore Windfarm Environmental Statement

Chapter 10: Benthic and Intertidal Ecology

Document Code:	FLO-WHI-REP-0016-10	
Contractor Document Number:	PC2978-RHD-ZZ-XX-RP-Z-0401	
Version Number:	00	
Date:	*09/08/2023*	
Prepared by:	KH	*Electronic Signature*
Checked by:	PP	*Electronic Signature*
Owned by:	PT	*Electronic Signature*
Approved by Client:	OG	*Electronic Signature*

Version Number	Reason for Issue / Major Changes	Date of Change
00	For Issue	09/08/2023

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Appendices

Appendix 10.A: Marine Conservation Zone Assessment

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Glossary of Acronyms

Acronym	Definition
AfL	Agreement for Lease
BEIS	Department for Business, Energy and Industrial Strategy
BGS	British Geological Society
BTO	British Trust for Ornithology
CEA	Cumulative Effect Assessment
CIEEM	Chartered Institute of Ecology and Environmental Management
Defra	Department for Environment, Food and Rural Affairs
EEA	European Economic Area
EIA	Environmental Impact Assessment
EMF	Electromagnetic Frequency
ES	Environmental Statement
EU	European Union
EUNIS	European Nature Information System
FEPA	Food and Environmental Protection Act
IEMA	Institute of Environmental Management and Assessment
INNS	Invasive Non-Native Species
IPC	Infrastructure Planning Commission
JNCC	Joint Nature Conservancy Council
km	Kilometre
LPA	Local Planning Authority
m	Metre
MARPOL	International Convention for the Prevention of Pollution from Ships
MCZ	Marine Conservation Zone
MHWS	Mean High Water Springs
MLWS	Mean Low Water Springs
MMO	Marine Management Organisation
MPS	Marine Policy Statement
MW	Megawatts
NDC	North Devon Council
NG	National Grid
NPL	National Physical Laboratory
NPS	National Policy Statement
NSIP	Nationally Significant Infrastructure Projects
ODPM	Office of the Deputy Prime Minister
OFTO	Offshore Transmission Owner (OFTO)
PEMP	Project Environmental Management Plan
PDE	Project Design Envelope

Acronym	Definition
PSA	Particle Size Analysis
RIAA	Report to Inform an Appropriate Assessment
SAC	Special Area of Conservation
SMRU	Sea Mammal Research Unit
SSSI	Site of Special Scientific Interest
UK	United Kingdom
WCOWL	White Cross Offshore Windfarm Limited
WTG	Wind Turbine Generator

Glossary of Terminology

Defined Term	Description
Agreement for Lease	An Agreement for Lease (AfL) is a non-binding agreement between a landlord and prospective tenant to grant and/or to accept a lease in the future. The AfL only gives the option to investigate a site for potential development. There is no obligation on the developer to execute a lease if they do not wish to.
Applicant	White Cross Offshore Windfarm Limited.
Cumulative effects	The effect of the Project taken together with similar effects from a number of different projects, on the same single receptor/resource. Cumulative Effects are those that result from changes caused by other past, present or reasonably foreseeable actions together with the Project.
Department for Business, Energy and Industrial Strategy (BEIS)	Government department that is responsible for business, industrial strategy, science and innovation and energy and climate change policy and consent under Section 36 of the Electricity Act.
Environmental Impact Assessment (EIA)	Assessment of the potential impact of the proposed Project on the physical, biological and human environment during construction, operation and decommissioning.
Export Cable Corridor	The area in which the export cables will be laid, either from the Offshore Substation or the inter-array cable junction box (if no offshore substation), to the NG Onshore Substation comprising both the Offshore Export Cable Corridor and Onshore Export Cable Corridor.
Generation Assets	The infrastructure of the Project related to the generation of electricity within the windfarm site, including wind turbine generators, substructures, mooring lines, seabed anchors and inter-array cables.
Landfall	Where the offshore export cables come ashore.
Mean high water springs	The average tidal height throughout the year of two successive high waters during those periods of 24 hours when the range of the tide is at its greatest.
Mean low water springs	The average tidal height throughout a year of two successive low waters during those periods of 24 hours when the range of the tide is at its greatest.

Defined Term	Description
Mitigation	Mitigation measures have been proposed where the assessment identifies that an aspect of the development is likely to give rise to significant environmental impacts, and discussed with the relevant authorities and stakeholders in order to avoid, prevent or reduce impacts to acceptable levels. For the purposes of the EIA, two types of mitigation are defined: • Embedded mitigation: consisting of mitigation measures that are identified and adopted as part of the evolution of the project design, and form part of the project design that is assessed in the EIA • Additional mitigation: consisting of mitigation measures that are identified during the EIA process specifically to reduce or eliminate any predicted significant effects. Additional mitigation is therefore subsequently adopted by OWL as the EIA process progresses.
Offshore Development Area	The Windfarm Site (including wind turbine generators, substructures, mooring lines, seabed anchors, inter-array cables and Offshore Substation Platform (as applicable)) and Offshore Export Cable Corridor to MHWS at the Landfall. This encompasses the part of the project that is the focus of this application and Environmental Statement and the parts of the project consented under Section 36 of the Electricity Act and the Marine and Coastal Access Act 2009.
Offshore Export Cables	The cables which bring electricity from the Offshore Substation Platform or the inter-array cables junction box to the Landfall.
Offshore Export Cable Corridor	The proposed offshore area in which the export cables will be laid, from Offshore Substation Platform or the inter-array cable junction box to the Landfall.
the Offshore Project	The Offshore Project for the offshore Section 36 and Marine Licence application includes all elements offshore of MHWS. This includes the infrastructure within the windfarm site (e.g. wind turbine generators, substructures, mooring lines, seabed anchors, inter-array cables and Offshore Substation Platform (as applicable)) and all infrastructure associated with the export cable route and landfall (down to MLWS) including the cables and associated cable protection (if required).
Offshore Substation Platform	A fixed structure located within the Windfarm Site, containing electrical equipment to aggregate the power from the wind turbines and convert it into a more suitable form for export to shore.
Onshore Development Area	The onshore area above MLWS including the underground onshore export cables connecting to the White Cross Onshore Substation and onward to the NG grid connection point at East Yelland. The onshore development area will form part of a separate Planning application to the Local Planning Authority (LPA) under the Town and Country Planning Act 1990.
Onshore Export Cables	The cables which bring electricity from MLWS at the Landfall to the White Cross Onshore Substation and onward to the NG grid connection point at East Yelland.

Defined Term	Description
Onshore Export Cable Corridor	The proposed onshore area in which the export cables will be laid, from MLWS at the Landfall to the White Cross Onshore Substation and onward to the NG grid connection point at East Yelland.
the Onshore Project	The Onshore Project for the onshore TCPA application includes all elements onshore of MLWS. This includes the infrastructure associated with the offshore export cable (from MLWS), landfall, onshore export cable and associated infrastructure and new onshore substation (if required).
White Cross Offshore Windfarm Ltd	White Cross Offshore Windfarm Ltd (WCOWL) is a joint venture between Cobra Instalaciones Servicios, S.A., and Flotation Energy Ltd.
the Project	the Project is a proposed floating offshore windfarm called White Cross located in the Celtic Sea with a capacity of up to 100MW. It encompasses the project as a whole, i.e. all onshore and offshore infrastructure and activities associated with the Project.
Project Design Envelope	A description of the range of possible elements that make up the Project design options under consideration. The Project Design Envelope, or 'Rochdale Envelope' is used to define the Project for Environmental Impact Assessment (EIA) purposes when the exact parameters are not yet known but a bounded range of parameters are known for each key project aspect.
Transition joint bay	Underground structures at the Landfall that house the joints between the offshore export cables and the onshore export cables.
White Cross Offshore Windfarm	Up to 100MW capacity offshore windfarm including associated onshore and offshore infrastructure.
White Cross Onshore Substation	A new substation built specifically for the White Cross project. It is required to ensure electrical power produced by the offshore windfarm is compliant with NG electrical requirements at the grid connection point at East Yelland.
Windfarm Site	The area within which the wind turbines, Offshore Substation Platform and inter-array cables will be present.

10. Benthic and Intertidal Ecology

10.1 Introduction

1. This chapter of the Environmental Statement (ES) presents the potential impacts on benthic and intertidal ecology of the White Cross Offshore Windfarm Project (the Onshore Project). Specifically, it considers impacts landward of Mean Low Water Springs (MLWS) during its construction, operation and maintenance, and decommissioning phases.

2. The ES has been finalised with due consideration of pre-application consultation to date (see **Chapter 7: Consultation**) and the ES will accompany the application to North Devon Council (NDC) for planning permission under the Town and Country Planning Act 1990.

3. The elements of the White Cross Offshore Windfarm Project seaward of Mean High Water Springs (MHWS) ('the Offshore Project') are subject to a separate application for consent under Section 36 of the Electricity Act 1989, and for Marine Licences under the Marine and Coastal Access Act 2009. These applications are supported by a separate ES covering all potential impacts seaward of MHWS.

4. This assessment has been undertaken with specific reference to the relevant policy, legislation and guidance, which are summarised in **Section 10.2** of this chapter. Further information on the international, national and local planning policy and legislation relevant to the Onshore Project is provided in **Chapter 3: Policy and Legislative Context**.

5. Details of the methodology used for the Environmental Impact Assessment (EIA) and Cumulative Effect Assessment (CEA), are presented in **Section 10.3** of this chapter and **Chapter 6: EIA Methodology**.

6. This assessment has been informed by impacts assessed in benthic and intertidal ecology and impacts assessed in this chapter informs the following linked ES chapters:

   - Chapter 8: Marine and Coastal Processes
   - Chapter 9: Marine Water and Sediment Quality.

7. Inter-relationships with these chapters is further described in **Section 10.10**.

8. Additional information to support the benthic and intertidal ecology assessment includes Marine Conservation Zone Assessment undertaken for the Project a whole **(Appendix 10.A)** and an Intertidal Survey Report **(Appendix 10.B).**

9. This ES chapter:

- Presents the existing environmental baseline established from desk studies, and consultation
- Presents the potential environmental effects on benthic and intertidal ecology arising from the Onshore Project, based on the information gathered and the analysis and assessments undertaken
- Identifies any assumptions and limitations encountered in compiling the environmental information
- Highlights any necessary monitoring and/or mitigation measures which could prevent, minimise, reduce or offset the possible environmental effects identified in the EIA process.

10.2 Policy, Legislation and Guidance

10. **Chapter 3: Policy and Legislative Context** describes the wider policy and legislative context for the Onshore Project. The principal policy and legislation used to inform the assessment of potential impacts on benthic and intertidal ecology for the Onshore Project are outlined in this section.

10.2.1 National Policy Statement

11. The assessment of potential impacts upon benthic and intertidal ecology has been made with specific reference to the relevant National Policy Statement (NPS). NPSs are statutory documents which set out the government's policy on specific types of Nationally Significant Infrastructure Projects (NSIPs) and are published in accordance with the Planning Act 2008.

12. Although the Onshore Project is not an NSIP, it is recognised that due to its size of up to 100MW and its location in English waters, certain NPS are considered relevant to the Onshore Project. Therefore, to align with the approach to the assessment of the Onshore Project, certain NPS are will also be considered as part of the Onshore Project.

13. Those relevant to benthic and intertidal ecology are set out within the overarching NPS for Energy (EN-1) and NPS for Renewable Energy Infrastructure (EN-3), which are summarised in **Table 10.1**.

14. It is noted that the NPS for Energy (EN-1), and the NPS for Renewable Energy Infrastructure (EN-3) are in the process of being revised. Draft versions were published for consultation in September 2021 (Department for Business Energy

and Industrial Strategy (BEIS), (2021a), and BEIS, (2021b). A review of these draft versions has been undertaken in the context of this ES chapter.

15. **Table 10.1** includes a section for the draft version of NPS (EN-1, and EN-3) in which relevant additional NPS requirements not presented within the current NPS (EN-1, and EN-3) have been included. A reference to the requirement's location within the draft NPS and to where within this ES chapter or wider ES it has been addressed has also been provided.

16. Minor wording changes within the draft version which do not materially influence the NPS (EN-1 and EN-3) requirements have not been reflected in **Table 10.1**.

Table 10.1 Summary of NPS EN-1, EN-3 and EN-5 provisions relevant to benthic and intertidal ecology

Summary	How and where this is considered in the ES
An assessment of the effects of installing cable across the intertidal zone should include information, where relevant, about: ▪ Any alternative Landfall sites that have been considered by the applicant during the design phase and an explanation for the final choice ▪ Any alternative cable installation methods that have been considered by the applicant during the design phase and an explanation for the final choice ▪ Potential loss of habitat ▪ 4.Disturbance during cable installation and removal (decommissioning) ▪ Increased suspended sediment loads in the intertidal zone during installation ▪ Predicted rates at which the intertidal zone might recover from temporary effects. **- NPS EN-3, Section 2.6.81**.	There will be no impact on the intertidal zone due to the use of trenchless techniques as embedded mitigation (**Section 10.6.1**).
Applicants are expected to have regard to guidance issued in respect of Food and Environmental Protection Act (FEPA) [now Marine Licence] requirements. **- NPS EN-3 Section 2.6.83**.	Other relevant guidance, including in respect to the Marine Licence, is outlined further below in this section.
Construction and decommissioning methods should be designed appropriately to minimise effects on subtidal habitats, taking into account other constraints. Mitigation measures which the Infrastructure Planning Commission (IPC) (now the Planning Inspectorate) should expect the applicants to have considered may include: ▪ Surveying and micrositing of the export cable route to avoid adverse effects on sensitive habitat and biogenic reefs	Mitigation measures embedded in the Onshore Project design are outlined after each Impact in **Sections 10.5, 10.6** and **10.7**.

Summary	How and where this is considered in the ES
▪ Burying cables at a sufficient depth, taking into account other constraints, to allow the seabed to recover to its natural state ▪ The use of anti-fouling paint might be minimised on subtidal surfaces, to encourage species colonisation on the structures. **- NPS EN-3 Section 2.6.119**.	

17. The Marine Policy Statement (MPS) (HM Government, 2011; discussed further in **Chapter 3: Policy and Legislative Context**) adopted by all UK administrations in March 2011 provides the policy framework for the preparation of marine plans and establishes how decisions affecting the marine area should be made in order to enable sustainable development.

18. The MPS provides a high-level approach to marine planning and general principles for decision making that contribute to the NPS objectives. It also sets out the framework for environmental, social and economic considerations that need to be taken into account in marine planning. The high-level objective 'Living within environmental limits' covers points relevant to benthic and intertidal ecology, and requires that:

    - Biodiversity is protected, conserved and where appropriate recovered and loss has been halted
    - Healthy marine and coastal habitats occur across their natural range and are able to support strong, biodiverse biological communities and the functioning of healthy, resilient and adaptable marine ecosystems
    - Our oceans support viable populations of representative, rare, vulnerable, and valued species.

19. The MPS is also the framework for preparing individual Marine Plans and taking decisions affecting the marine environment. England currently has nine marine plans of which the plans most relevant to the Onshore Project is the South West Inshore and South West Offshore Marine Plan (HM Government, 2021). This contains the four objectives stated below, which are of relevance to marine and intertidal benthic ecology, as they cover policies and commitments on the wider ecosystem set out in the MPS:

    - Objective 4: 'Marine businesses are acting in a way which respects environmental limits and is socially responsible. This is rewarded in the marketplace.'

- Objective 11: 'Biodiversity is protected, conserved and, where appropriate, recovered, and loss has been halted.'
- Objective 12: 'Healthy marine and coastal habitats occur across their natural range and are able to support strong, biodiverse biological communities and the functioning of healthy, resilient and adaptable marine ecosystems.'
- Objective 13: 'Our oceans support viable populations of representative, rare, vulnerable, and valued species.'

10.2.2 Guidance

20. In demonstrating adherence to industry good practice, this chapter has been compiled in accordance with the following relevant standards and guidance:

- Cefas (2004) Offshore Wind Farms: Guidance Note for Environmental Impact Assessment in Respect of FEPA and CPA requirements: Version 2
- Cefas (2010) Strategic Review of Offshore Wind Farm Monitoring Data Associated with FEPA licence conditions, with input from the Food and Environment Research Agency (FERA) and the Sea Mammal Research Unit (SMRU)
- Marine Management Organisation (MMO) (2014) Review of Post-Consent Offshore Wind Farm Monitoring Data Associated with Licence Conditions, with input from the British Trust for Ornithology (BTO), National Physical Laboratory (NPL) and the SMRU
- Office of the Deputy Prime Minister (ODPM) (2001) Guidance on Environmental Impact Assessment in Relation to Dredging Applications
- Defra (2005) Nature Conservation Guidance on Offshore Windfarm Development. A guidance note on the implications of the EC Wild Birds and Habitats Directives for developers undertaking offshore windfarm developments. Version R1.9. 13.

21. The principal guidance documents used to inform the baseline characterisation and the assessment of impacts are as follows:

- Cefas (2012) Guidelines for data acquisition to support marine environmental assessments of offshore renewable energy projects
- Wyn & Brazier (2001); Joint Nature Conservation Committee (JNCC) Marine Monitoring Handbook
- Ware and Kenny (2011) Guidance for the Conduct of Benthic Studies at Marine Aggregate Extraction Sites

- Chartered Institute of Ecology and Environmental Management (CIEEM) (2010) Guidelines for Ecological Impact Assessment in Britain and Ireland – Marine and Coastal
- Chartered Institute of Ecology and Environmental Management (CIEEM) (2016) Guidelines for Ecological Impact Assessment in the UK and Ireland: Terrestrial, Freshwater and Coastal, 2nd Edition2
- The British Standards Institution (2015) Environmental impact assessment for offshore renewable energy projects – Guide. PD 6900:2015.
- IEMA. (2016) Environmental Impact Assessment. Guide to Delivering Quality Development.

10.3 Assessment Methodology

10.3.1 Study Area

22. Details of the location of the Onshore Project and the onshore elements are set out within **Chapter 5: Project Description.**

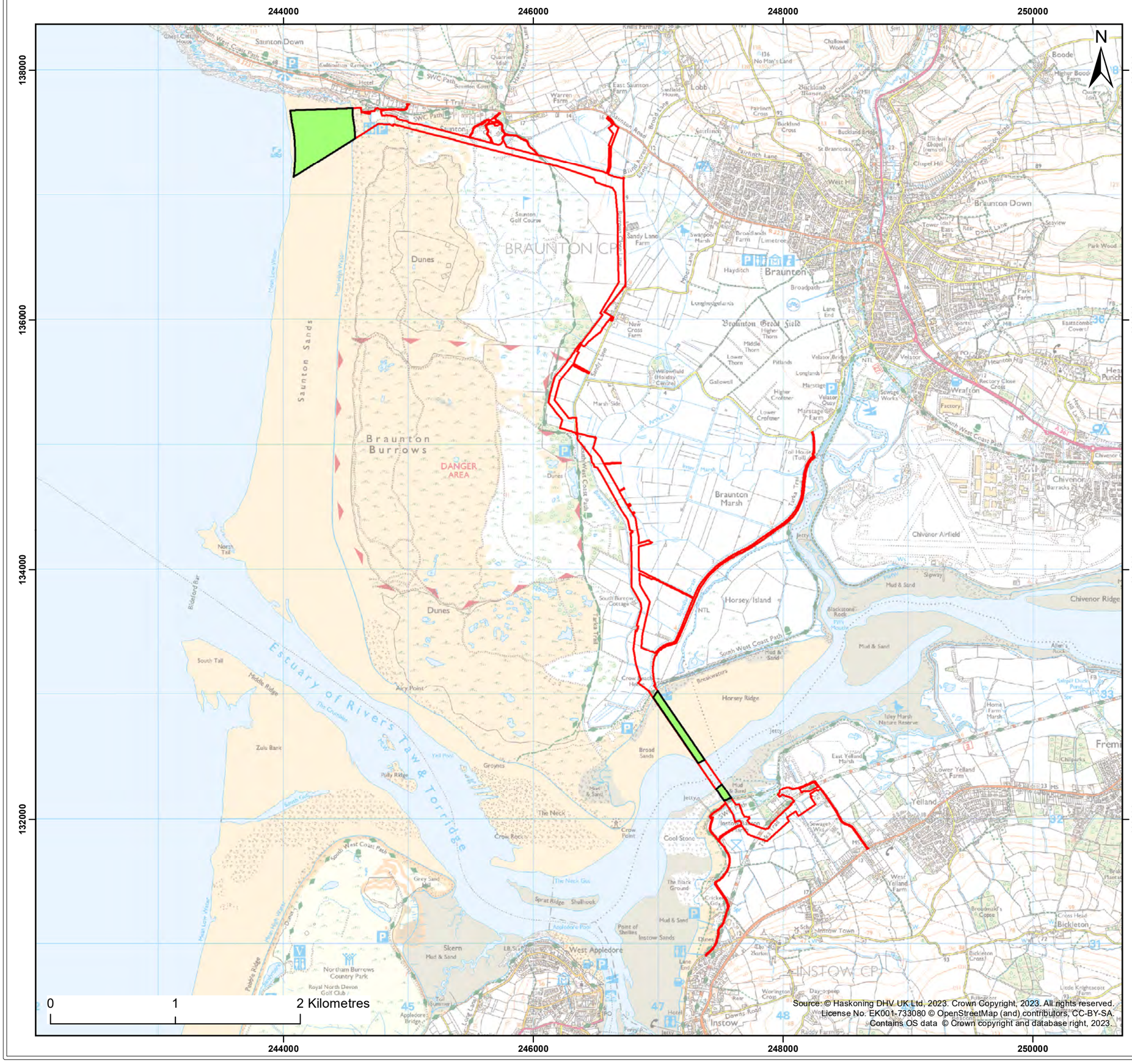
23. The benthic and intertidal ecology study area is defined by the distance over which impacts on benthic and intertidal ecology from all the onshore project elements (i.e. activities landward of MLWS) may occur. Additionally, the location of any receptors that may be affected by potential impacts are considered.

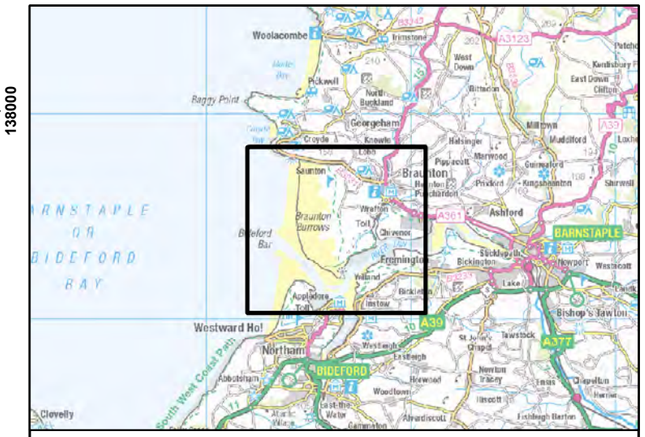
24. The Study Area for benthic and intertidal ecology encompasses a 10km buffer around the Landfall and the Export Cable Corridor down to MLWS.

25. This has been established using professional judgement and is based upon the study area used in **Chapter 8: Marine and Coastal Processes** which equates to the range of potential indirect effects from the Onshore Project. This is shown in **Figure 10.1**.

10.3.2 Approach to Assessment

26. **Chapter 6: EIA Methodology** provides a summary of the general impact assessment methodology applied to the Onshore Project. The following sections outline the methodology used to assess the potential effects on benthic and intertidal ecology.





Legend:

- Onshore Development Area
- Benthic and Intertidal Ecology Study Area

Client: Offshore Wind Ltd.	Project: White Cross Offshore Windfarm

Title: Benthic and Intertidal Ecology Study Area

Figure:	Drawing No:
10.1	PC2978-RHD-ZZ-XX-DR-Z-0656

Revision:	Date:	Drawn:	Checked:	Size:	Scale:
P01	07/07/2023	AB	KH	A3	1:30,000

Co-ordinate system: British National Grid

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27. The assessment approach uses the 'source-pathway-receptor' model. The model identifies likely environmental effects on benthic and intertidal ecology receptors resulting from the proposed construction, operation and maintenance, and decommissioning of the Onshore Project infrastructure. This process provides an easy to follow assessment route between impact sources and potentially sensitive receptors, ensuring a transparent impact assessment. The parameters of this model are defined as follows:

    - Source – the origin of a potential impact (noting that one source may have several pathways and receptors) e.g. an activity such as cable installation and a resultant effect such as re-suspension of sediments
    - Pathway – the means by which the effect of the activity could impact a receptor e.g. for the example above, re-suspended sediment could settle and smother the sea bed
    - Receptor – the element of the receiving environment that is impacted e.g. for the above example, bird prey species living on or in the sea bed are unavailable to foraging birds.

28. For each impact, the assessment identifies receptors sensitive to that impact and implements a systematic approach to understanding the impact pathways and the level of effect on given receptors. The following key terms have been used in this assessment:

    - Impact – used to describe a change via the Onshore Project
    - Receptor – used to define the environment being exposed to the Impact
    - Effect – the consequence of an Impact combining with a Receptor, defined in terms of Significance (exact significance dependant on magnitude of impact and the sensitivity of the receptor)
    - Adverse effect – an alteration of the existing environment with negative implications for the affected receptor
    - Beneficial effect – an alteration of the existing environment with positive implications for the affected receptor
    - Mitigation – measures incorporated as part of the project design in order to either avoid or reduce adverse effects, or to enhance beneficial effects
    - Residual effect – the effects remaining once all mitigation measures have been taken into consideration.

10.3.2.1 Definitions of magnitude of impact

29. For each of the impacts assessed in this ES, a magnitude has been assigned. In doing so the spatial extent, duration, frequency and reversibility of the impact

from the construction, operation and maintenance, or decommissioning phase of the Onshore Project have been considered, where applicable.

30. The terms used to define magnitude of impact are outlined in **Table 10.2**.

Table 10.2 Definition of terms relating to magnitude of an impact

Magnitude	Definition
High	Fundamental, permanent/irreversible changes, over the whole receptor, and/or fundamental alteration to key characteristics or features of the particular receptor's character or distinctiveness.
Medium	Considerable, permanent/irreversible changes, over the majority of the receptor, and/or discernible alteration to key characteristics or features of the particular receptor's character or distinctiveness.
Low	Discernible, short term/temporary (events over part of the project duration) change, over a minority of the receptor, and/or limited but discernible alteration to key characteristics or features of the particular receptor's character or distinctiveness.
Negligible	Discernible, short term/temporary (events over part of the project duration) change, or barely discernible change for any length of time, over a small area of the receptor, and/or slight alteration to key characteristics or features of the particular receptor' s character or distinctiveness.

31. Where the assessment identifies that there is no loss or alteration of characteristics, features or elements, or no observable impact in either direction upon a given receptor or group of receptors from an Impact, for example due to implication of embedded mitigation or through an assessment of the potential pathway, then the assessment for that Impact upon those receptor(s) will by **No Change**.

32. Impacts assessed as **No Change** have no potential for a significance of effect and therefore are not assessed further.

10.3.2.2 Definitions of receptor sensitivity/value

33. Identification of potential sensitive receptors is undertaken using available literature and the Marine Evidence Based Sensitivity Assessment (MarESA) method (MarESA, 2022) to determine sensitivity of benthic species and habitats (biotopes) using data from the Marine Life Information Network (MarLIN) (Tyler-Walters et al., 2018). This approach measures sensitivity of biotopes using available research on their resistance and resilience to different impacts:

- Resistance: the likelihood of damage (termed intolerance or resistance) due to a pressure
- Resilience: the rate of (or time taken for) recovery (termed recoverability, or resilience) once the pressure has abated or been removed.

34. The MarESA assessment of sensitivity is guided by the presence of key structural or functional species/assemblages and/or those that characterise the biotope groups. Physical and chemical characteristics are also considered where they structure the community. MarESA has been used in order to determine sensitivity of specific biotopes and dominant macrofauna recorded during the site-specific benthic characterisation surveys.

35. For the purpose of this assessment, 'tolerance' has been used in place of 'resistance' and 'recoverability' has been used in place of 'resilience'. This terminology is in line with the Natural England (2022) best practice advice for evidence and data standards and the definitions are provided by MarESA.

Table 10.3 Resistance and resilience scale definitions

Level Resistance (Tolerance)	Description
None	Key functional, structural, characterising species severely decline and/or physicochemical parameters are also affected e.g., removal of habitats causing a change in habitats type. A severe decline/reduction relates to the loss of 75% of the extent, density or abundance of the selected species or habitat component e.g., loss of 75% substratum (where this can be sensibly applied).
Low	Significant mortality of key and characterising species with some effects on the physicochemical character of habitat. A significant decline/reduction relates to the loss of 25-75% of the extent, density, or abundance of the selected species or habitat component e.g., loss of 25-75% of the substratum.
Medium	Some mortality of species (can be significant where these are not keystone structural/functional and characterising species) without change to habitats relates to the loss <25% of the species or habitat component.
High	No significant effects on the physicochemical character of habitat and no effect on population viability of key/characterising species but may affect feeding, respiration and reproduction rates.

Level Resilience (Recovery)	Description
Very Low	Negligible or prolonged recovery possible; at least 25 years to recover structure and function.
Low	Full recovery within 10-25 years.
Medium	Full recovery within 2-10 years.
High	Full recovery within 2 years.

36. MarESA uses a matrix approach using both recovery and resilience to determine sensitivity. The sensitivity matrix used in this assessment, based on MarESA, is presented in **Table 10.3**.

37. MarESA sensitivities are not available at the habitat level (European Nature Information System (EUNIS) (level 3). However, the confidence in the data at the habitat level is higher than at the biotope level (EUNIS level 5). Therefore, where sensitivity at the habitat level is assessed, it is based on the worst-case sensitivity of biotopes identified within the habitat.

Table 10.4 Sensitivity matrix

		Resistance (Recovery)			
		None	**Low**	**Medium**	**High**
Resilience (Tolerance)	High	High	High	Medium	Low
	Medium	High	High	Medium	Low
	Low	Medium	Medium	Medium	Low
	Negligible	Medium	Low	Low	Negligible

38. In addition, the 'value' of the receptor forms an important element within the assessment, for instance if the receptor is a protected species or habitat. It is important to understand that high value and high sensitivity are not necessarily linked within a particular effect. A receptor could be of high value (e.g., Annex I habitat) but have a low or negligible physical/ecological sensitivity to an impact. Similarly, low value does not equate to low sensitivity and is judged on a receptor-by-receptor basis. The value will be considered, where relevant, as a modifier for the sensitivity assigned to the receptor, based on expert judgement. **Table 10.5** states the definitions of value levels for benthic and intertidal ecology.

Table 10.5 Definition of value for benthic and intertidal ecology receptors

Value	Definition
High	Habitats (and species) protected under international law (e.g., Annex I habitats within a Special Area of Conservation (SAC) boundary).
Medium	Habitats protected under national law (e.g., Annex I habitats within an Marine Conservation Zone (MCZ) boundary). Species/habitat that may be rare or threatened in the UK.
Low	Habitats or species that provide prey items for other species of conservation value.
Negligible	Habitats and species which are not protected under conservation legislation and are not considered to be particularly important or rare.

10.3.2.3 Significance of effect

39. The potential significance of effect for a given impact, is a function of the sensitivity of the receptor and the magnitude of the impact (see **Chapter 6 EIA Methodology** for further details). A matrix is used (**Table 10.6**) as a framework to determine the significance of an effect. Definitions of each level of significance are provided in **Table 10.7**. Effects may be deemed as being either positive (beneficial) or negative (adverse).

Table 10.6 Significance of an effect - resulting from each combination of receptor sensitivity and the magnitude of the impact upon it

		Negative Magnitude				Beneficial Magnitude			
		High	Medium	Low	Negligible	Negligible	Low	Medium	High
Sensitivity	High	Major	Major	Moderate	Minor	Minor	Moderate	Major	Major
	Medium	Major	Moderate	Minor	Minor	Minor	Minor	Moderate	Major
	Low	Moderate	Minor	Minor	Negligible	Negligible	Minor	Minor	Moderate
	Negligible	Minor	Negligible	Negligible	Negligible	Negligible	Negligible	Negligible	Minor

40. In all cases, the evaluation of receptor sensitivity, impact magnitude and significance of effect has been informed by professional judgement and is underpinned by narrative to explain the conclusions reached.

Table 10.7 Example definitions of effect significance

Magnitude	Definition
High	A significant, very large or large change in receptor condition, both adverse or beneficial, which are likely to be important considerations at a national or population level because they contribute to achieving national, objectives or could result in exceedance of statutory objectives and/or breaches of legislation.
Medium	A noticeable and significant change in receptor condition, which are likely to be important considerations at a regional level.
Low	Small change in receptor condition, which may be raised as localised issues but are unlikely to be important in the decision making process.
Negligible	No discernible change in receptor condition.
No change	No impact, therefore, no change in receptor condition.

41. Potential effects are described, followed by a statement of whether the effect is significant in terms of the EIA regulations. Potential effects identified within the assessment as major or moderate are regarded as significant in terms of the EIA regulations. Whilst minor effects (or below) are not significant in EIA terms in their own right, it is important to distinguish these, as they may contribute to significant effects cumulatively or through interactions.

42. Following initial assessment, if the effect does not require additional mitigation (or none is possible), the residual effect will remain the same. If, however, additional mitigation is proposed, there will be an assessment of the post-mitigation residual effect.

10.3.3 Worst-Case Scenario

43. In accordance with the assessment approach to the 'Rochdale Envelope' set out in **Chapter 6: EIA Methodology**, the impact assessment for benthic and intertidal ecology has been undertaken based on a realistic worst-case scenario of predicted impacts. The Project Design Envelope for the Project is detailed in **Chapter 5: Project Description**.

44. Using the project design envelope approach means that receptor-specific potential effects draw on the options from within the wider envelope that represent the most realistic worst-case-scenario. It is also worth noting that under this approach the combination of project options constituting the realistic worst-case scenario may differ from one receptor to another and from one effect to another.

45. The realistic worst-case scenario (having the most impact) for each individual impact is derived from the Project Design Envelope (PDE) to ensure that all other design scenarios will have less or the same impact.

46. **Table 10.8** presents the realistic worst-case scenario elements considered for the assessment of benthic and intertidal ecology.

Table 10.8 Definition of realistic worst-case scenario details relevant to the assessment of impacts in relation to benthic and intertidal ecology

Impact	Realistic worst-case scenario	Rationale
Construction		
Temporary habitat loss / physical disturbance	Two export cables would be buried in a trench across the northern end of Saunton Sands and into the subtidal. The trench dimensions across the beach would be 0.5m wide and 700m long, = 700m^2 (total plan area for two cables). The cable trench would be at least 1.2m deep, = 840m^3 (volume for two cables).	
Increased suspended sediments and deposition		
Re-mobilisation of contaminated sediments		
Operation and Maintenance		
Electromagnetic fields (EMF)	The cable trench would be at a minimum 1.2m deep.	
Decommissioning		

Impact	Realistic worst-case scenario	Rationale
Temporary habitat loss / physical disturbance	The decommissioning policy for the Onshore Project infrastructure is not yet defined. However, the following infrastructure, relevant to the benthic and intertidal ecology is likely be removed, reused, or recycled where practicable: • Export Cables.	The detail and scope of the decommissioning works will be determined by the relevant legislation and guidance at the time. Decommissioning arrangements will be detailed in a Decommissioning Plan, which will be drawn up and agreed with the relevant consenting body/stakeholder prior to decommissioning. For the purposes of the worst-case scenario, it is anticipated that the impacts will be comparable to those identified for the construction phase.

10.3.4 Summary of Mitigation

47. This section outlines the mitigation relevant to the benthic and intertidal ecology assessment, which has been incorporated into the design of the Onshore Project. Further information is detailed in **Chapter 5: Project Description**.

10.3.4.1 Embedded Mitigation

48. The embedded mitigation measures are those defined in the Institute of Environmental Management and Assessment (IEMA) guidance as either primary or tertiary mitigation. Those measures relevant to the benthic and intertidal ecology assessment are summarised in **Table 10.9**.

49. As these measures have been embedded the assessment of effects is undertaken on the basis that these forms of mitigation will definitely be delivered. Therefore, any effects that might have arisen without these forms of mitigation do not need to be identified as 'potential effects', as there should be no potential for them to arise.

Table 10.9 Embedded mitigation measures relevant to the benthic and intertidal ecology assessment

Component/Activity/Impact	Mitigation embedded into the design of the Onshore Project
Landfall (down to MLWS)	Trenchless technology will be used to avoid intertidal completely or open trenching designed to avoid impacts. One of the main uncertainties in the Landfall construction methodology is the depth to which the cables should be buried across the beach. At the Landfall (down to MLWS), the beach sand overlies bedrock, but the depth to the bedrock is not known. It is important to define the depth of burial, so that over the design lifetime of the cables (minimum 25 year), the risk of exposure is reduced if beach levels lower (potentially because of sea-level rise) into the future. A Cable Burial Risk Assessment will be completed to accurately define the preferred burial depth to mitigate future exposure.
Cable corridor crossing of Taw-Torridge Estuary Site of Special Scientific Interest (SSSI)	Trenchless techniques will be used. As the entry and exit areas for the trenchless technique used to cross the estuary are above Mean High-Water Springs (MHWS), no benthic or intertidal ecology receptors will be impacted.

Component/Activity/Impact	Mitigation embedded into the design of the Onshore Project
Project Environmental Management Plan (PEMP)	This will be agreed prior to the start of construction which will include biosecurity measures following relevant regulations and guidance such as: • The Environmental Damage (Prevention and Remediation (England) Regulations 2015, which set out a polluter pays principle where the operators who cause a risk of significant damage or cause significant damage to land, water or biodiversity will have the responsibility to prevent damage occurring, or if the damage does occur will have the duty to reinstate the environment to the original condition. • The International Convention for the Control and Management of Ships' Ballast Water and Sediments (BWM Convention), which provide global regulations to control the transfer of potentially invasive species

50. No additional mitigation measures are proposed.

10.3.5 Baseline Data Sources

10.3.5.1 Desktop Study

51. A desk study was undertaken to obtain information on benthic and intertidal ecology. Data were acquired within the study area through a detailed desktop review of existing studies and datasets. Agreement was reached with all consultees that the data collected and the sources used to define the baseline characterisation for benthic and intertidal ecology are fit for the purpose of the EIA (ETG 1 meeting 05/05/2022).

52. The sources of information presented in **Table 10.10** were consulted to inform the benthic and intertidal ecology assessment.

Table 10.10 Data sources used to inform the benthic and intertidal ecology assessment

Source	Summary
Marine Information Network (MarLIN)	Provides sensitivity and distribution information for receptors
EMODnet's EUSeaMAP (2021)	Seabed habitat mapping
Natural England's Designated Sites Viewer	Provides mapping of locations and features of designated sites
MMO's South West Inshore and Offshore Marine Plans	Provides broadscale information on benthic features of the region

10.3.5.2 Site Specific Survey

53. To inform the EIA, site-specific surveys were undertaken, as agreed with the statutory consultees. A summary of surveys is outlined in **Table 10.11**.

54. Four areas (Saunton Sands north and south, Crow Point and East Yelland) were selected for intertidal surveys conducted in May 2022 (**Appendix 10.B**). Five transects, running from the lower littoral to the high intertidal zone were followed within each intertidal survey area. Sediment samples were collected in order to separate infauna specimens from the substrate using a 1mm sieve. The collected infauna were identified prior to being released. In addition, 4-5 representative substrate samples per survey area were collected for laboratory particle size analysis.

Table 10.11 Summary of site-specific survey data

Survey name and year	Summary
White Cross Wind Farm Intertidal Survey (EcoLogic Consultant Ecologist LLP, 2022 – **Appendix 10.B)**	Sediment and habitat characterisation Coastal and estuarine extents of the Offshore Export Cable within the intertidal zone

10.3.6 Scope

55. Upon consideration of the baseline environment, the project description outlined in **Chapter 5: Project Description**, and Scoping Opinion (Case reference: EIA/2022/00002), potential impacts upon benthic and intertidal ecology have been scoped in or out. These impacts are outlined, together with a justification for why they are or are not considered further, in **Table 10.12** and **Table 10.13** respectively. In scoping potential impacts in or out reference is made to the embedded mitigation measures outlined above in **Table 10.9**.

Table 10.12 Summary of impacts scoped in relating to benthic and intertidal ecology

Potential Impact	Justification
Temporary habitat loss / physical disturbance	Potential for direct disturbance by construction and installation activities
Increased suspended sediments and deposition	Installation activities may cause an increase of suspended sediment concentrations in the water column.
Re-mobilisation of contaminated sediments	Sediment disturbance could lead to the mobilisation of contaminants (if present) that could be harmful to intertidal habitats and species.
EMF	Not enough evidence at scoping to suggest that underwater noise would not be an issue to benthic communities

Table 10.13 Summary of impacts scoped out relating to benthic and intertidal ecology

Potential Impact	Justification
Transboundary impacts	Effects on benthic and intertidal ecology are likely to be restricted to the study area and immediate surrounding area
Operational Impacts	
Permanent habitat loss / long term habitat loss during construction and decommissioning	Where disturbed sediments are subsequently covered with infrastructure, habitat loss is long term or permanent. The cables within the intertidal area will be buried and therefore will not have a permanent impact.
Increased suspended sediments and deposition	The cables within the intertidal area will be buried and therefore will not have a permanent impact.
Re-mobilisation of contaminated sediments	

10.3.7 Consultation

56. Consultation has been a key part of the development of the Onshore Project. Consultation regarding benthic and intertidal ecology has been conducted throughout the EIA. An overview of the project consultation process is presented within **Chapter 7: Consultation**.

57. A summary of the key issues raised during consultation specific to benthic and intertidal ecology is outlined below in **Table 10.14**, together with how these issues have been considered in the production of this ES.

Table 10.14 Consultation responses

Consultee	Date, Document, Forum	Comment	Where addressed in the ES
Natural England	05/05/2022	"The X-links interconnector project with Landfall (down to MLWS) at Cornborough should be included in the scoping report for cumulative and in-combination effects"	Cumulative effects assessment in **Section 10.8**
		"There could be changes in sediments transport in the Operations and Maintenance period resulting for hydrodynamic changes from the cable corridor and turbine sites, which could affect the various sensitive features of the site (e.g., Pink sea fan and sediment/sand habitats). We recommend this is therefore screened in."	Included in **Offshore Section 36 Application- Chapter 10: Benthic and Intertidal Ecology**
		"Lundy MCZ is within the potential zone of influence but is not included in the table of MCZs for screening of impacts on protected feature. If this site has been considered but screened out from further assessment, then an explanation should be included."	Included in **Offshore Section 36 Application- Chapter 10: Benthic and Intertidal Ecology** and in it's MCZ Assessment (**Appendix 10.A**)

Consultee	Date, Document, Forum	Comment	Where addressed in the ES
MMO/Cefas	30/05/2022	The Applicant states "Sediment disturbance could lead to the mobilisation of contaminants (if present) that could be harmful to benthic habitats and species. This will be assessed in the EIA based on the results of sediment sampling which will be collected within the Onshore Project Boundary and offshore corridor and the results will be reported within the Marine Water and Sediment EIA. If the sediment sample results show no contaminated sediment, or if contamination levels are below relevant thresholds such as CEFAS Action Levels then it is proposed this impact is scoped out of the EIA." The MMO requires this to be scoped in to assess the impacts if contaminants present.	Included in **Section 10.5.3**
		Paragraph 280 suggests scoping out Invasive non-native species (INNS) based on mitigation measures outlined in paragraph 271 and the presence of other hard substrates in the area that could also act as stepping-stones for the spread of INNS. However, the Proposed Development has the potential to introduce hard substrate in an area further offshore to the other hard substrates and may provide the initial stepping-stone needed for INNS to spread to the natural areas of hard substrate. The MMO therefore considers this impact should be scoped in.	Included in **Offshore Section 36 Application- Chapter 10: Benthic and Intertidal Ecology**
		The MMO considers that the remobilisation of contaminated sediment should be screened in and included in the ES.	Included in **Section 10.5.3**
		The MMO considers that there is not enough evidence at this stage to suggest that underwater noise would not be an issue to benthic communities and as research into the effects of underwater noise in relation to benthic and intertidal ecology is ongoing (paragraph 270) the MMO therefore considers that this should be screened into the ES.	Included in **Offshore Section 36 Application- Chapter 10: Benthic and Intertidal Ecology**
		Paragraph 279 suggests scoping out Electromagnetic Fields (EMF) due to lack of	Included in

Consultee	Date, Document, Forum	Comment	Where addressed in the ES
		evidence in the literature suggesting EMF would result in an impact to benthic and intertidal ecology. However, at this stage of the project the MMO recommends scoping EMF in due to uncertainties of this impact at this moment in time (see Hutchinson *et al.*, 2020). The MMO recommend this additional literature should be reviewed in relation to EMF. The MMO considers that the topic "EMF – operation" for benthic communities should be scoped into the ES.	**Section 10.6.1**
		The Applicant outlines in paragraph 281 of the Scoping Report that it is anticipated that the decommissioning impacts would be similar in nature to those of construction, although the magnitude of effect is likely to be lower. As the impacts are anticipated to be the same as the construction phase or lower it is proposed the same impacts that have been scoped out of the construction phase will also be scoped out of the decommissioning phase. The MMO is overall content with this approach, however, it is noted that the EIA requires more impacts to be scoped in during the construction phase than the ES Scoping Report outlined, and therefore more impacts will be scoped in during the decommissioning phase accordingly.	Included in **Offshore Section 36 Application- Chapter 10: Benthic and Intertidal Ecology**
		The Applicant states that "As the effects on benthic and intertidal ecology are likely to be restricted to the project boundaries and immediate surrounding area, transboundary effects are proposed to be scoped out for this topic…" The MMO agrees that this matter can be scoped out of the ES.	**Table 10.13**
		The MMO notes that the impact of maintenance activities during construction also needs to be considered e.g. removal of marine growth, and whether this has the potential to affect seabed communities.	Included in **Offshore Section 36 Application- Chapter 10: Benthic and Intertidal Ecology**

Consultee	Date, Document, Forum	Comment	Where addressed in the ES
		The MMO notes that the information on the undesignated habitats and species is not yet sufficient. Section 2.4.5 states that a review of EMOD net's EUSeaMAP has been undertaken for both intertidal and subtidal habitats. However, a map of these habitats has not been presented in the report, nor have any details of the species present. The MMO therefore requests a map to be included showing the distribution of habitats according to EUSeaMAP, along with details, of the habitats and characterising species present, in an accompanying table. The map should also include the location of any historical surveys undertaken within the AfL, if available.	**Figure 10.2** which also includes habitat / biotope maps informed by the benthic survey
		The MMO notes that paragraph 282 concerning cumulative effects is currently very brief. The MMO would expect this section to detail further information on the other activities (including a map), that may interact with this project and have a cumulative effect on the benthic habitats and species, not limited to designated habitats and species.	Included in **Section 10.8**
		Paragraph 129 describes that installation of the offshore cable is typically undertaken by ploughing, jetting, trenching or post-lay burial depending on the soil conditions along the cable route. Please note that these methods have the potential for contaminant release and therefore, the Applicant may need to take samples to inform the impact assessment. the applicant should engage with the MMO and provide a map of where these methods are to be carried out, to allow sampling advice to be provided.	Included in **Figure 10.2** of **Offshore Section 36 Application-Chapter 10: Benthic and Intertidal Ecology**
		Marine - Pink Sea Fan is mentioned as a designated feature of two MCZs (Bideford to Foreland Point and Hartland Point to Tintagel) but it is also a protected species in its own right Schedule 5 of the Wildlife & Countryside Act. The ES should assess the impact of all phases of the proposal on Pink Sea Fans found outside protected areas on subtidal reef habitat. Although listed as nationally scarce, Pink Sea Fan are believed to be common locally in Devon and Cornish waters.	Included in **Section 10.4.3** of **Offshore Section 36 Application-Chapter 10: Benthic and Intertidal Ecology**

10.4 Existing Environment

58. This section describes the existing environment in relation to benthic and intertidal ecology associated with the White Cross study area. It has been informed by a review of the sources listed in **Table 10.10**.

10.4.1 Sediment Type

59. A summary of the sediment types at the Landfall is given in this section. Seabed sediment type distribution is described in full in **Chapter 9: Marine Water and Sediment Quality**.

60. The Offshore Export Cable will make Landfall at a location along the west coast of Devon between Westward Ho! and Saunton Down. The coast in this area is dominated by the mouth of Taw-Torridge Estuary and its associated intertidal areas as well as spit and dune systems. The northern shore includes the extensive dune system of Braunton Burrows fronted by a wide sand beach which extends southwards approximately 5km from the headland of Saunton Down into the mouth of the Taw-Torridge Estuary. A review of EMODnet's EUSeaMAP (2023) broadscale predictive habitat map shows that the intertidal, infralittoral and shallow circalittoral area of the area of search is predominantly sand, with small areas of mud and sandy mud or muddy sand.

61. Sediment particle size analysis taken from samples collected at Saunton Sand North (Landfall) support the EMODnet seabed characterisation described above.

Table 10.15 Sediment Particle Size Analysis

Survey area	Sample point	Clay (less than 0.002mm)	Silt (0.002 - 0.05mm diam)	Very fine Sand (0.05 - 0.10 mm)	Fine Sand (0.10 - 0.25mm)	Medium Sand (0.25 - 0.50 mm)	Coarse Sand (0.50 - 1.00mm)	Very Coarse Sand (1.00 - 2.00 mm)
Saunton Sand North	265	0	11	38	39	4	6	2
	270	0	3	27	46	22	1	1
	272	0	8	39	26	24	2	1
	276	0	9	62	22	7	0	0
	278	0	26	46	24	4	0	0

62. Physical impacts on Taw-Torridge Estuary due to the Onshore Project will be avoided with the use of trenchless techniques.

63. A total of 19 sediment samples were collected during the intertidal surveys for further particle size analysis (PSA). The habitat in the northern area of Saunton Sands was largely dominated by fine sand with patches of small rocks (approx. 5 - 20cm) were scattered intermittently in areas of the upper littoral zone. The majority of the upper littoral zone of the Crow Point survey area, was sand which transitioned to mud. Beyond the channel, the exposed mud flats extended to the low tide water line. The littoral habitat at East Yelland transitioned from intertidal mud and sand in the eastern extent of the survey area to sand in the central area to rocky shore with underlying mud along the western extent.

64. To inform the baseline for sediment quality, 14 grab samples from the benthic surveys of the Windfarm Site and Offshore Export Cable Corridor route were sub-sampled for chemical analysis (**Offshore Project ES Chapter 10: Benthic and Intertidal Ecology Figure 10.2**). Analysis was undertaken for the following contaminants:

- Heavy metals (arsenic, mercury, cadmium, chromium, copper, nickel, lead and zinc)
- Organotins (tributyltin (TBT) and dibutyltin (DBT))
- PCBs
- PAHs.

65. The full data set is provided in the **Offshore Section 36 Application – Chapter 8: Marine Geology, Oceanography, and Physical Processes Appendix 8.B**. The data is presented in *Table 9.13* (metals) and *Table 9.14* and *Table 9.15* for PAHs within **Chapter 9: Marine Water and Sediment Quality**, highlighting stations 23 and 24 as sample locations closest to MLWS.

10.4.2 Faunal Communities

66. In the following sections, infauna (as sampled by grabs) is taken to mean species that live in, are partially buried within, or below the sediment. Epifauna is taken to mean species that live on the surface. Fish (including sandeels) and cephalopods (squid and cuttlefish) species have been removed from the benthic and epibenthic dataset as they are not considered to be benthic species. These data are incorporated into the **Offshore Section 36 Application – Chapter 11: Fish and Shellfish Ecology**.

67. Evidence of marine worms in the sandy sediment including breathing holes, sand trails and bore holes in mollusc shells scattered throughout the littoral zone. The northern-most transect undertaken within the Landfall area, was formed of rocky

shore. Species present in the rock pools included: *Lipophrys pholis*, Actinia equina, *Carcinus maenas, Littorina littorea, Patella sp., Semibalanus balanoides, Gibbula umbilcalis and Steromphala umbilicalis*. Seaweed species present in the rock pools included *Fucus serratus, Fucus vesiculosus, Ulva intestinalis and Corallina officinalis*.

68. No honeycomb worm *Sabellaria alveolata* were identified within any of the intertidal survey areas. However, there were several patches of honeycomb located along the rocky shore west of the north Saunton survey area. There were also no *S. alveolata* identified within or directly adjacent to the sites at Taw-Torridge Estuary. No biogenic reef habitat was observed across the offshore survey area despite individuals of Ross worm *Sabellaria spinulosa* being found in the grab samples. The tube aggregations observed at these stations were not deemed to meet the reef qualifying criteria (Gubbay, 2007).

10.4.3 Designated Sites

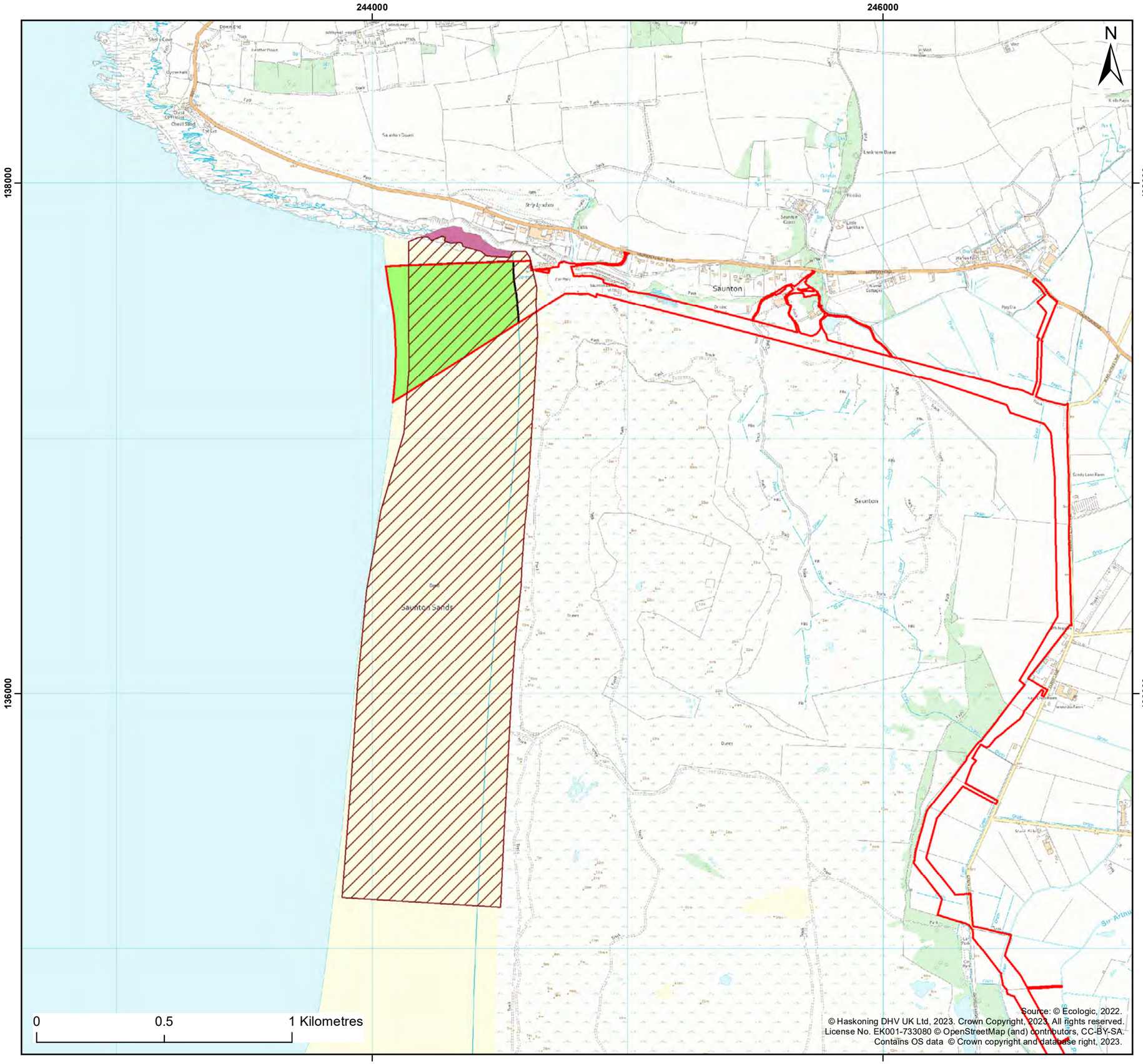
69. Designated sites relevant for benthic and intertidal species or habitats within 10km of the Windfarm Site and Offshore Export Cable Corridor and are shown in **Figure 10.3** and described in **Table 10.16**.

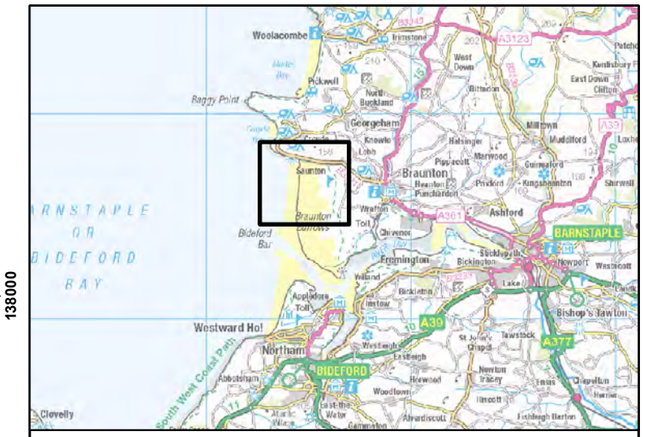
70. The SSSIs listed below were located within the original study area for the Offshore Export Cable:

- Westward Ho! Cliffs SSSI
- Mermaids Pool to Rowden Gut SSSI
- Barricane Beach SSSI
- Hobby to Peppercombe SSSI.

71. However, as they are designated for features of geological interest, rather than benthic or intertidal habitats/species, they have not been included in **Table 10.16** or assessed in this chapter. They have been considered within **Chapter 8: Marine and Coastal Processes**.

72. Braunton Burrows SSSI is one of the largest dune systems in Britain. The foreshore consists mainly of sandy flats, rich in lime from broken seashells, with some intertidal shingle grading to silt in the estuary, in a tidal range of 7m. The intertidal survey identified Intertidal Sand & Muddy Sand (A2.2) around the Landfall (down to MLWS) at Saunton Sands.





Legend:

- Onshore Development Area
- Benthic and Intertidal Ecology Study Area

Habitat

- High energy littoral rock
- Intertidal mudflats and sandflats (H1140)

Client: Offshore Wind Ltd.	Project: White Cross Offshore Windfarm

Title: Spatial Distribution of Habitat and Biotopes Identified Across the Survey Area Identified from Offshore Samples

Figure: 10.2	Drawing No: PC2978-RHD-ZZ-XX-DR-Z-0657

Revision:	Date:	Drawn:	Checked:	Size:	Scale:
P01	07/07/2023	AB	KH	A3	1:15,000

Co-ordinate system: British National Grid

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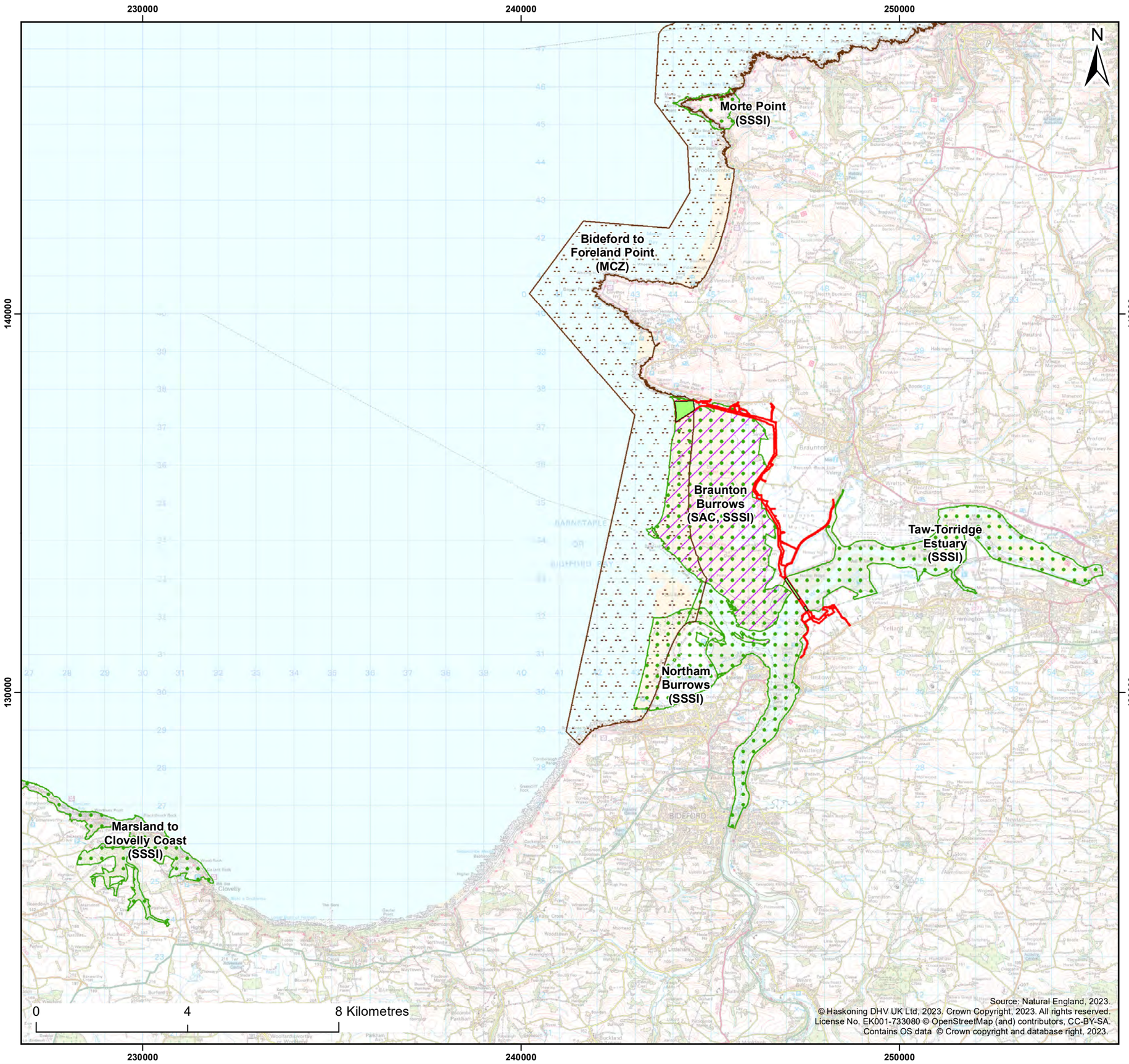

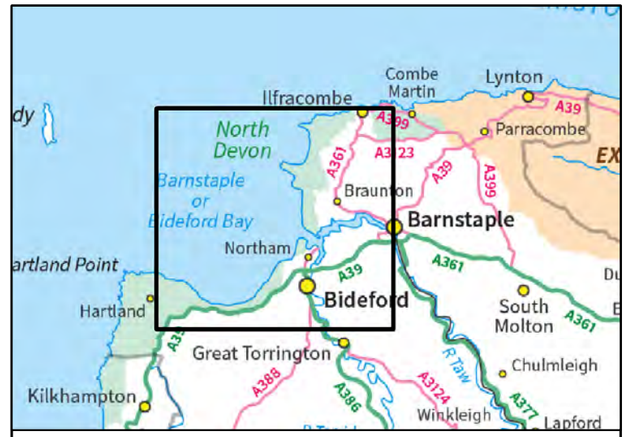

Legend:

- Onshore Development Area
- Benthic and Intertidal Ecology Study Area
- Special Areas of Conservation (SAC)
- Sites of Special Scientific Interest (SSSI)
- Marine Conservation Zones (MCZ)

Client: Offshore Wind Ltd.	Project: White Cross Offshore Windfarm

Title: Designated Sites with Features Relating to Benthic and Intertidal Ecology

Figure: 10.3 | Drawing No: PC2978-RHD-ZZ-XX-DR-Z-0658

Revision:	Date:	Drawn:	Checked:	Size:	Scale:
P01	07/07/2023	AB	KH	A3	1:100,000

Co-ordinate system: British National Grid

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73. It is adjacent to Taw-Torridge Estuary SSSI which has the following protected features:

- Low energy intertidal rock
- Intertidal coarse sediment
- Intertidal sand and muddy sand
- Coastal salt marsh and saline reedbed
- Subtidal sand.

74. The following designated features were originally scoped in due to the distances from the original area of search. However, following further survey work and selected Offshore Export Cable Corridor, these sites now sit outside the 10km buffer and therefore are beyond likely range of indirect effects of the Offshore Export Cable Corridor and associated works.

- Hartland Point to Tintagel MCZ
- Morte Platform MCZ
- North West of Lundy MCZ
- Tintagel-Marsland-Clovelly Coast SAC.

75. Features listed in **Table 10.16** which are not benthic or intertidal features are not considered in this chapter but are included in the relevant chapters of the full EIA. A MCZ Assessment was undertaken for the onshore Project and can be found in **Appendix 10.A**. The Report to Inform Appropriate Assessment (RIAA) can be found in **Appendix 6.A**.

10.4.4 Do Nothing Scenario

76. The Town and Country Planning (Environmental Impact Assessment) Regulations 2017 require that "an outline of the likely evolution thereof without implementation of the development as far as natural changes from the baseline scenario can be assessed with reasonable effort on the basis of the availability of environmental information and scientific knowledge" is included within the ES (EIA Regulations, Schedule 4, Paragraph 3). From the point of assessment, over the course of the development and operational lifetime of the Onshore Project (operational lifetime anticipated to be 50 years), long-term trends mean that the condition of the baseline environment is expected to evolve. This section provides a qualitative description of the evolution of the baseline environment, on the assumption that the Onshore Project is not constructed, using available information and scientific knowledge of benthic and intertidal ecology.

Table 10.16 Designated sites with benthic or intertidal designated features within a 10km radius of the Onshore Project Landfall and area of search

Designated site	Distance from the Onshore Project	Relevant designated features	Considered within this chapter
Marine Conservation Zones (MCZ)			
Bideford to Foreland Point	0km. Overlaps the selected route for the Offshore Export Cable Corridor	Fragile sponge & anthozoan communities on subtidal rocky habitats; *Sabellaria alveolata* reefs; pink sea-fan *Eunicella verrucosa*; spiny lobster; High energy circalittoral rock; High energy infralittoral rock; High energy intertidal rock; Intertidal coarse sediment; Intertidal mixed sediments; Intertidal sand and muddy sand; Intertidal underboulder communities; Littoral chalk communities Low energy infralittoral rock; Low energy intertidal rock; Moderate energy circalittoral rock; Moderate energy infralittoral rock; Moderate energy intertidal rock; Subtidal coarse sediment; Subtidal mixed sediments; Subtidal sand.	Impacts covered in MCZ Assessment.
Special Area of Conservation (SAC)			
Braunton Burrows	0km. Overlaps the selected route for the Offshore Export Cable Corridor	1140 Mudflats and sandflats not covered by seawater at low tide.	Impacts covered in **Appendix 6.A** Report to Inform an Appropriate Assessment (RIAA)
Sites of Special Scientific Interest (SSSI)			
Braunton Burrows	0km. Overlaps the selected route for the Offshore Export Cable Corridor	Intertidal sands	Covered in **Sections 10.5.1.** Indirect impacts relating to dunes habitat - **Chapter 8: Marine and Coastal Processes**
Taw-Torridge Estuary	0km. Overlaps the Taw Estuary Crossing (between MHWS on the northern edge to MHWS on the	The Taw-Torridge Estuary is of major importance for its overwintering and migratory populations of wading birds. In	Trenchless techniques will be used and will have no interaction with the bed of the estuary.

Designated site	Distance from the Onshore Project	Relevant designated features	Considered within this chapter
	southern edge)	addition, rare plants grow along its shores. The Estuary' s wide tidal range is reflected by the very large areas of mudflats and sandbanks present. Together with beaches and saltmarshes, the area provides a rich and varied source of food for many birds and other animals.	

77. The baseline conditions for benthic ecology are considered to be relatively stable within the Landfall and the wider area. The existing environment is influenced by the physical processes which exist within the Celtic Sea, including waves and tidal currents driving changes in sediment transport and then seabed morphology (see **Chapter 8: Marine Geology, Oceanography, and Physical Processes**). Long term established patterns may be affected by climate change driven sea-level rise, however this will have a reduced impact offshore compared to along the coastline. The South West Inshore and South West Offshore Marine Plan (HM Government, 2021) highlights the key threats of climate change (erosion, coastal squeeze) mostly relating to coastal habitats.

78. Warming sea temperatures and ocean acidification are likely to result in changes to the composition and geographical distribution of benthic communities, with a general north westerly shift (Hiddink et al., 2015) in the latitudinal ranges of many species.

10.5 Potential Impacts During Construction

79. The potential impacts during construction of the Onshore Project have been assessed for benthic and intertidal ecology. A description of the potential effect on benthic and intertidal communities caused by each identified impact is given in this section. Sensitivities of these communities have been determined for each of these impacts on the basis of expert judgement and reference to MarESA available from MarLIN.

80. The benthic and intertidal ecology assessment has key inter-relationships with marine physical processes, marine water and sediment quality, fish and shellfish ecology and offshore ornithology and these are considered where relevant throughout.

10.5.1 Impact 1: Temporary habitat loss / physical disturbance

81. Disturbance due to cable installation (either open cut trenching and trenchless technology at Landfall) can occur which will cause temporary habitat loss and physical disturbance to the seabed.

10.5.1.1 Magnitude of impact

82. Worst case trench dimensions for open trench at Landfall (down to MLWS) for two cables is calculated to be 270m^2. Note that if trenchless technique were used at Landfall (starting from MLWS), it is likely that Saunton Sands beach would be avoided entirely and there would be no impact on intertidal features.

83. The intertidal zone is a highly dynamic environment. It experiences drastic changes due to waves, currents, temperature fluctuations, salinity change, and sediment movements. The zone experiences two different states: one at low tide when it is exposed to the air and the other at high tide when it is submerged in seawater. These ever-changing conditions make it an extreme ecosystem that must support a diverse range of plants and animals that have adapted to thrive within its unique constraints.

10.5.1.2 Sensitivity of the receptor

84. The sensitivity of the biotope (A2.2) identified in the Landfall have been assessed in relation to the following MarESA pressures relevant to the construction phase temporary habitat loss / physical disturbance:

- Habitat structure changes –removal of substratum (extraction)
- Abrasion/disturbance of the surface of the substratum or seabed.

85. The sensitivity of identified habitats and biotopes to temporary habitat loss / disturbance pressures are summarised in **Table 10.17**.

Table 10.17 Habitat and biotope sensitivities to physical seabed disturbance / habitat removal pressures

Habitat / biotope	MarESA sensitivity rating	
	Habitat structure changes –removal of substratum (extraction)	Abrasion / disturbance
A2.231 Polychaetes in littoral fine sand	Medium	Low
*A2.231 used as proxy to A2.2 as the intertidal survey identified that Saunton Sands (north) was largely dominated by fine sand with evidence of polychaetes		

86. Although burrowing may provide some protection from damage by abrasion at the surface, a proportion of the habitats mentioned above will likely be damaged or removed. Significant impacts in population density would be expected if such physical disturbance were repeated at regular intervals. Furthermore, the nature of the soft sediment where they occur means that objects causing abrasion are likely to penetrate the surface and cause further damage to the characterizing species. Resistance is therefore assessed as **Low** and resilience as **Medium**, so sensitivity is assessed as **Medium**.

10.5.1.3 Significance of effect

87. As the resilience of the identified biotope is high and the habitat recorded in the Landfall area is representative of the wider Celtic Sea region, the impact magnitude is **negligible** when in context of the Landfall.

88. The return of Saunton Sands beach to its pre-construction state after cable installation, means that short-term changes arising from cable installation would not be significant.

89. Due to the **negligible** magnitude and **medium to low** sensitivity to each impact pathway for temporary physical disturbance, the effect is considered to be of **negligible adverse** significance.

10.5.1.3.1 Effect on SSSI

90. The return of the beach to its pre-construction state means that short-term changes arising from cable installation would not be significant. Hence, the overall significance of the effect under a worst case scenario is deemed **negligible adverse** for the Braunton Burrows SSSI.

10.5.2 Impact 2: Increased suspended sediments and deposition

91. The processes of mechanical excavation and backfilling using a land-based digger (most likely during low tide) could release fine sediment to the beach surface that was previously buried. This sediment could then be released into the water column, either on the subsequent high tide as the beach becomes submerged or during construction if conducted during high tide, resulting in a temporary and short-term increase in suspended sediment concentrations (SSC). Increased suspended sediments have the potential to affect benthic ecology receptors by blocking feeding apparatus as well as by smothering sessile species upon redeposition. **Chapter 8: Marine and Coastal Processes** provides details of changes to SSC and subsequent sediment deposition. Indicating that the worst case of open trenching for cable installation would displace a volume of 840m^3 of sediment assuming 0.5m-wide, 1.2m-deep excavations (for two cables). This activity would cause temporary increases in suspended sediment concentrations. Where the cable is buried (between MLWS and MHWS), the cables would be installed mainly in sand (or coarser). Therefore, dispersion of fine sediment from these areas would be very low. Any increases in SSC would be short in duration (lasting a maximum duration of five days) and, over time, the suspended sediment would be widely dispersed by tidal and wave action.

10.5.2.1 Magnitude of impact

92. **Chapter 8: Marine and Coastal Processes** describes the expected movement of sediment suspended during the construction phase for the above construction activities. Due to the short-term (lasting a maximum of five days) and highly temporary nature of the impact the magnitude is considered to be **negligible**.

10.5.2.2 Sensitivity of the receptor

93. The sensitivity of the biotope (A2.2) identified in the Landfall have been assessed in relation to MarESA pressures relevant to construction phase increased SSC and deposition. The relevant pressures are:

- Changes in suspended solids (water clarity)
- Smothering and siltation rate changes (light).

94. The pressure 'Smothering and siltation rate changes (light)' has been used to assess the significance of effect as the MarESA justification for light smothering and siltation is 'up to 5cm' and in **Chapter 8: Geology, Oceanography and Physical Processes** the worst-case level sediment smothering, and deposition is approximately <1mm.

95. The sensitivity of identified habitats and biotopes to increased suspended sediment pressures are summarised in **Table 10.18**.

Table 10.18 Increased SSC and deposition

Habitat / biotope	MarESA sensitivity rating	
	Smothering and siltation rate changes (light)	Changes in suspended solids (water clarity)
A2.231 Polychaetes in littoral fine sand	Not sensitive	Not sensitive
*A2.231 used as proxy to A2.2 as the intertidal survey identified that Saunton Sands (north) was largely dominated by fine sand with evidence of polychaetes		

10.5.2.3 Significance of effect

96. Due to the **negligible** magnitude and **not sensitive** sensitivity to each impact pathway for increased SSC, the effect is considered to be of **negligible adverse** significance.

10.5.3 Impact 3: Re-mobilisation of contaminated sediments

97. Sediment disturbance (resulting from activities described in Impact 1 & Impact 2) could lead to the mobilisation of contaminants that could be harmful to the benthos.

98. Contaminant concentrations close to the intertidal zone are less than defined levels of concern (**Chapter 9: Marine Water and Sediment Quality**).

99. Works at Landfall will be short term, lasting the duration of the cable installation only.

10.5.3.1 Magnitude of impact

100. Given that the seabed material is predominantly sand, sediments are not predicted to remain in suspension for long periods of time and as such the risk of contaminant mobilisation is limited.

101. The magnitude of the impact is predicted to be **negligible**.

10.5.3.2 Sensitivity of the receptor

102. 'Polychaetes in littoral fine sand' has not been assessed for exposure to contaminants on MarESA. Given that the Landfall coastline is open and not within a confined space, the biotopes would have limited exposure to contaminated sediments, and there is little evidence that the species characterising these biotopes are sensitive to this impact.

103. The sensitivity of the receptors is therefore considered to be **negligible**.

10.5.3.3 Significance of effect

104. Both the magnitude and sensitivity of the receptors to contaminants are considered to be **negligible**. Therefore, the effect is considered to be of **negligible adverse** significance.

10.5.4 Impact 4: Other Designated Sites

105. Impacts upon Braunton Burrows SSSI are covered in **Section 10.5.1.3.1**, this section considers the other designated sites relevant to the Landfall.

10.5.4.1 SAC

106. The full assessment can be found in the RIAA found in **Appendix 6.A**.

107. The intertidal area on the north side of the Taw-Torridge Estuary is comprised Annex 1 habitat 'Mudflats and sandflats not covered by seawater at low tide',

which is a qualifying feature of the Braunton Burrows SAC (assessed within **Chapter 16: Onshore Ecology and Ornithology)**.

10.5.4.2 MCZ

108. A full MCZ Assessment was undertaken for the Onshore Project and can be found in **Appendix 10.A**.

109. The MCZ Assessment concludes that the conservation objective to maintain and recover selected broadscale marine habitat features to favourable condition in the Bideford to Foreland Point MCZ will not be hindered by the construction phase of White Cross.

10.6 Potential Impacts During Operation and Maintenance

110. Cables at the Landfall (down to MLWS) will be buried at sufficient depth to have no effect on coastal processes during operation and maintenance. Sediment transport would continue as a natural phenomenon driven by waves, which would not be affected by the Onshore Project. There would therefore be no operational effects on intertidal habitats/biotopes and no effects on the Braunton Burrows SSSI in relation to Construction Impact 2 (**Section 10.5.2**) and Impact 3 (**Section 10.5.3**).

10.6.1 Impact 5: Electromagnetic fields (EMF)

111. There is potential for the Export Cables at Landfall to produce electromagnetic fields (EMFs) that interfere with the behaviour of benthic species. It is well known that EMF strength dissipates from submarine transmission cables rapidly, from 7.85µT at 0m, to 1.47µT at 4m, from the average windfarm inter-array cable buried 1m below the seabed (Normandeau et al., 2011). For perspective, the earth's magnetic field has an estimated background magnitude of 25-65µT (Hutchinson et al, 2020).

112. EMFs produced by offshore cables may be detected by some benthic species. Effects are likely to be highly localised, as EMFs are strongly attenuated and decrease as an inverse square of distance from the cable (Gill and Barlett, 2010). Several studies have shown that various benthic species do not react to EMF such as brown shrimp Crangon, common starfish *Asterias rubens* and polychaete worm *Nereis diversicolor* (Bochert & Zettler, 2006). Gibb et al. (2014) state there is no evidence of EMF impacting Ross worm *S. spinulosa*.

113. The cables will be buried across the extent of the beach (MLWS to MHWS) which will reduces the magnetic fields and is a suggested mitigation technique in NPS EN-3.

10.6.1.1 Magnitude of impact

114. The presence of increased EMF will be over the entirety of the operational phase. However, effects would be highly localised and restricted to the area around the Export Cable. Therefore, the magnitude of the interactions of EMF is considered **low**.

10.6.1.2 Sensitivity of the receptor

115. The sensitivity of biotopes identified at Landfall have been assessed in relation to the MarESA pressure relevant to the impact of EMF.

116. There is a lack of evidence as to the impacts of EMF on benthic species with studies with relevance to the benthos focused on crustaceans (e.g. Boles and Lohmann, 2003 - Spiny lobster; Hutchinson et al., 2020 - American lobster; Scott et al., 2018 - Edible crab). There is a real need for further research so understanding can be complete for how EMF impacts the behavioural, physiological and biological aspects of the benthos. The biotopes identified at Landfall (A2.231) has MarESA sensitivity of 'Not Relevant' to the impact of EMF. 'Not Relevant' is recorded where the evidence suggests that there is no direct interaction between the pressure and biotope or characteristic species within. Therefore, the sensitivity of biotopes and species to EMF is considered to be **negligible**.

10.6.1.3 Significance of effect

117. Due to the **negligible** sensitivity of biotopes present, and the **low** magnitude of effect, the overall significance of effect from interactions of EMF is **negligible**.

10.6.2 Temporary habitat loss / Physical disturbance

118. There is potential for ongoing physical disturbance of the seabed during the operational phase from maintenance activity such as cable repairs or reburial. In general, the impacts from planned maintenance should be temporary, localised and smaller in scale than during construction.

119. However, as stated above, cables at Landfall (landward of MHWS) will be buried at sufficient depth to have no effect on coastal processes during operation and maintenance. Sediment transport would continue as a natural phenomenon driven by waves, which would not be affected by the Onshore Project. There would

therefore be no operational effects on intertidal habitats and no effects on the Braunton Burrows SSSI.

10.6.2.1 Magnitude of impact

120. Due to the episodic, temporary and relatively localised nature of the impact and common distribution of the receptors across the wider region, temporary physical disturbance is considered to be of **negligible** magnitude.

10.6.2.2 Sensitivity of the receptor

121. The sensitivity of the biotope (A2.2) identified in the Landfall have been assessed in relation to the following MarESA pressures relevant to the construction phase temporary habitat loss / physical disturbance:

- Habitat structure changes –removal of substratum (extraction)
- Abrasion/disturbance of the surface of the substratum or seabed.

122. As per Section 10.5.1 the sensitivity of the biotopes is medium to low.

10.6.2.3 Significance of effect

123. Due to the **negligible** magnitude and medium to low sensitivity of identified biotopes to each impact pathway for temporary physical disturbance, the effect is considered to be of **negligible** adverse significance.

10.7 Potential impacts During Decommissioning

124. No decision has been made regarding the final decommissioning policy for the Onshore Project as it is recognised that industry best practice, rules and legislation change over time.

125. The anticipated decommissioning activities are outlined in **Section 10.3.3**. The potential impacts of the decommissioning of the Onshore Project have been assessed for benthic and intertidal ecology on the assumption that decommissioning methods will be similar or of a lesser scale than those deployed for construction. The types of impact would be comparable to those identified for the construction phase:

126. Construction:

- Impact 1: Temporary habitat loss / physical disturbance
- Impact 2: Increased suspended sediments and deposition
- Impact 3: Re-mobilisation of contaminated sediments
- Impact 4: Other Designated Sites.

127. Operation:

- Impact 5: Electromagnetic fields (EMF).

128. The magnitude of impacts would be comparable to or less than those identified for the construction phase. Accordingly, given the construction phase assessments concluded "no effect" or "negligible adverse effect" for benthic and intertidal receptors, it is anticipated that the same would be valid for the decommissioning phase regardless of the final decommissioning methodologies.

10.8 Potential Cumulative Effects

129. The approach to cumulative effect assessment (CEA) is set out in **Chapter 6: EIA Methodology**. Only projects which are reasonably well described and sufficiently advanced to provide information on which to base a meaningful and robust assessment have been included in the CEA. Projects which are sufficiently implemented during the site characterisation for the Onshore Project have been considered as part of the baseline for the EIA. Where possible the Applicant has sought to agree with stakeholders the use of as-built project parameter information (if available) as opposed to consented parameters to reduce over-precaution in the cumulative assessment. The scope of the CEA was therefore be established on a topic-by-topic basis with the relevant consultees.

130. The cumulative effect assessment for benthic and intertidal ecology was undertaken in two stages. The first stage was to consider the potential for the effects assessed as part of the project to lead to cumulative effects in conjunction with other projects. The first stage of the assessment is detailed in **Table 10.19**.

Table 10.19 Potential cumulative impacts considered for benthic and intertidal ecology

Impact	Potential for cumulative effect	Rationale
Construction		
Impact 1: Temporary habitat loss / physical disturbance	No	No pathway for effects of habitat loss/physical disturbance to spatially or temporally cause cumulative effects Landfall (from MHWS to MLWS) construction expected to take five days and then cables will be buried at sufficient depth with no overlap with other project boundaries.

Impact	Potential for cumulative effect	Rationale
Impact 2: Increased suspended sediments and deposition	No	Landfall (from MHWS to MLWS) construction expected to take five days and then cables will be buried at sufficient depth with no overlap with other project boundaries.
Impact 3: Re-mobilisation of contaminated sediments	No	
Impact 4: Other Designated Sites	No	Landfall (from MHWS to MLWS) construction expected to take five days and then cables will be buried at sufficient depth with no overlap with other project boundaries. Cumulative impact for SACs and MCZs are assessed in **Chapter 16: Onshore Ecology and Ornithology** and **Appendix 10.A**, respectively.
Operation		
Impact 5: Electromagnetic fields (EMF)	No	Landfall (from MHWS to MLWS) construction expected to take five days and then cables will be buried at sufficient depth with no overlap with other project boundaries.

131. Only potential impacts assessed in **Section 10.5, Section 10.6** and **Section 10.7** as negligible or above are included in the CEA (i.e. those assessed as 'no impact' are not taken forward as there is no potential for them to contribute to a cumulative impact).

132. The second stage of the CEA is to evaluate the projects considered for the CEA to determine whether a cumulative effect is likely to arise. The list of considered projects (identified in **Chapter 6: EIA Methodology**) and their anticipated potential for cumulative effects are summarised in **Table 10.20**.

Table 10.20 Projects considered in the cumulative effect assessment on benthic and intertidal ecology

Project	Status	Distance from Onshore Development Area (km)	Included in the CEA?	Rationale
White Cross Offshore Project	Consent application submitted	0	No	All intertidal construction activities are assessed within this Chapter. The White Cross Offshore Project will not have a cumulative effect as they are the same activity. Cumulative effects with the cable crossing across the Taw and Torridge estuary are not anticipated as this will be undertaken using trenchless technology.

133. It is noted that the first project listed is the Section 36 consent application for the offshore elements of the White Cross OWF which are a separate element to the onshore Town and Country Planning Application for which this ES is prepared. The White Cross Onshore Project will not have a cumulative effect on benthic and intertidal ecology as they are a continuation of the same construction activity above MHWS. As stated in **Section 10.5**, the habitat assessed will return to the original condition after the construction period is over. Cumulative effects with the cable crossing across the Taw and Torridge estuary are not anticipated as this will be undertaken using trenchless technology.

134. The specific combined project elements are assessed cumulatively first and then cumulatively with all other projects.

10.9 Potential Transboundary Impacts

135. The Scoping Report identified that there was no potential for significant transboundary effects regarding benthic and intertidal ecology from the Onshore Project upon the interests of other EEA States and this is not discussed further.

10.10 Inter-relationships

136. Inter-relationship impacts are covered as part of the assessment and consider impacts from the construction, operation or decommissioning of the Onshore Project on the same receptor (or group). A description of the process to identify and assess these effects is presented in **Chapter 6: EIA Methodology**. The potential inter-relationship effects that could arise in relation to benthic and intertidal ecology include both:

- **Project lifetime effects:** Effects arising throughout more than one phase of the Onshore Project (construction, operation, and decommissioning) to interact to potentially create a more significant effect on a receptor than if just one phase were assessed in isolation
- **Receptor led effects:** Assessment of the scope for all relevant effects to interact, spatially and temporally, to create inter-related effects on a receptor (or group). Receptor-led effects might be short term, temporary or transient effects, or incorporate longer term effects.

137. Table 10.21 serves as a signposting for inter-relationships.

Table 10.21 Benthic and intertidal ecology Inter-relationships

Topic and description	Related chapter	Where addressed in this Chapter	Rationale
Construction & Operation			
Impact 1: Temporary habitat loss/physical disturbance	**Chapter 8: Marine and Coastal Processes**	**Section 10.5.1**	Habitat loss through temporary alteration of the seabed could potentially disturb the form and function of the seabed (e.g., sand waves).
Impact 2: Increased suspended sediments and deposition	**Chapter 8: Marine and Coastal Processes** **Chapter 9: Marine Water and Sediment Quality**	**Section 10.5.2**	Changes in suspended sediment concentrations are assessed in **Chapter 8: Marine Geology, Oceanography and Physical Processes**. Changes in suspended sediment concentrations and associated sediment deposition could have

Topic and description	Related chapter	Where addressed in this Chapter	Rationale
			potential impacts on benthic habitats and species.
Impact 3: Re-mobilisation of contaminated sediments	**Chapter 9: Marine Water and Sediment Quality**	**Section 10.5.3**	**Chapter 9: Marine Water and Sediment Quality** provides an assessment of the potential for contaminants to be present in the study area. Re-mobilisation of contaminated sediments and associated deposition could have potential impacts on benthic habitats and species.
Decommissioning			
Inter- relationships for impacts during the decommissioning phase will be the same as those outlined above for the construction phase.			

10.11 Interactions

138. The impacts identified and assessed in this chapter have the potential to interact with each other, which could give rise to synergistic impacts as a result of that interaction. The areas of interaction between impacts are presented in **Table 10.22** and **Table 10.23**, along with an indication as to whether the interaction may give rise to synergistic impacts. This provides a screening tool for which impacts have the potential to interact.

139. **Table 10.24** then provides an assessment for each receptor (or receptor group) related to these impacts in two ways. Firstly, the impacts are considered within a development phase (i.e. construction, operation, maintenance or decommissioning) to see if, for example, multiple construction impacts could combine. Secondly, a lifetime assessment is undertaken which considers the potential for impacts to affect receptors across development phases. The significance of each individual impact is determined by the sensitivity of the receptor and the magnitude of effect; the sensitivity is constant whereas the magnitude may differ. Therefore, when considering the potential for impacts to be additive it is the magnitude of effect which is important – the magnitudes of the different effects are combined upon the same sensitivity receptor.

10.12 Summary

140. This chapter has investigated the potential effects on benthic and intertidal ecology receptors arising from the Onshore Project. The range of potential impacts and associated effects considered has been informed by the Scoping Opinion, consultation, and agreed through ETG Meetings, as well as reference to existing policy and guidance. The impacts considered include those brought about directly as well as indirectly.

141. The benthic and intertidal study area at Landfall along the west coast of Devon between Westward Ho! and Saunton Down. The coast in this area is dominated by the mouth of Taw-Torridge Estuary and its associated intertidal areas as well as spit and dune systems. Seabed sediments are dominated by sand with small areas of mud and sandy mud or muddy sand. Benthic communities corresponding to these sediment types were recorded, consistent with typical communities found in the Celtic Sea.

Table 10.22 Interaction between impacts during construction

Construction	Impact 1: Temporary habitat loss/physical disturbance	Impact 2: Increased suspended sediment concentrations	Impact 3: Remobilisation of contaminated sediments
Impact 1: Temporary habitat loss/physical disturbance		Yes	Yes
Impact 2: Increased suspended sediment concentrations	Yes		Yes
Impact 3: Remobilisation of contaminated sediments	Yes	Yes	

Table 10.23 Interaction between impacts during decommissioning

Decommissioning	Impact 1: Temporary habitat loss/physical disturbance	Impact 2: Increased suspended sediment concentrations	Impact 3: Remobilisation of contaminated sediments
Impact 1: Temporary habitat loss/physical disturbance		Yes	Yes
Impact 2: Increased suspended sediment concentrations	Yes		Yes
Impact 3: Remobilisation of contaminated sediments	Yes	Yes	

Table 10.24 Potential interactions between impacts on benthic and intertidal ecology

Highest level significance					
Receptor	**Construction**	**Operation and Maintenance**	**Decommissioning**	**Phase Assessment**	**Lifetime Assessment**
Benthic habitats and biotopes	Negligible	Negligible	Negligible	No greater than individually assessed impacts: ▪ Temporary increased suspended sediment concentrations increase the potential for remobilisation of contaminated sediments ▪ However, all potential effects are non-significant (minor adverse or less) and localised in nature. The majority of effects are also temporary in nature. Together, these factors limit the potential for different impacts to interact within each phase ▪ As a result, none of the potential interactions identified with respect to benthic ecology are expected to result in a synergistic or greater significance of effect than those already assessed.	No greater than individually assessed impacts: ▪ As with the phase assessment, all potential effects are non-significant and localised in nature, limiting the potential for different impacts to interact across the different phases ▪ Effects from construction and decommissioning are temporary in nature, limiting their potential to result in a synergistic or greater impact with those considered in other phases.

142. **Table 10.25** presents a summary of the impacts assessed within this ES chapter, any commitments made, and mitigation required and the residual effects. No significant effects on benthic and intertidal ecology were identified, with all effects assessed as of **negligible** residual effect.

143. The assessment of cumulative impacts from the Onshore Project and other developments and activities concluded that with sufficient public information concluded that due to the distance of all the projects assessed, any additive impacts across the region will be small scale and localised with no pathway for cumulative effects on benthic ecology.

Table 10.25 Summary of potential impacts for benthic and intertidal ecology during construction, operation, maintenance and decommissioning of the Onshore Project

Potential impact	Receptor	Sensitivity	Magnitude	Significance	Mitigation measure	Residual effect
Construction						
Impact 1: Temporary habitat loss/physical disturbance	Benthic habitats and species within the benthic ecology study area.	Low to Medium	Negligible	Negligible	None	None
Impact 2: Increased suspended sediment concentrations		Not sensitive to Low	Negligible	Negligible	None	None
Impact 3: Remobilisation of contaminated sediments		Low	Negligible	Not significant	None	None
Impact 4: Other Designated Sites		Negligible	Negligible	Negligible	None	None
Operation and Maintenance						
Impact 5: EMF	Benthic habitats and species within the benthic ecology study area.	Negligible	Low	Negligible	Cable burial	None
Decommissioning						
Impact 1: Temporary habitat loss/physical disturbance	Benthic habitats and species within the benthic ecology study area	Low to Medium	Negligible	Negligible	None	None

Potential impact	Receptor	Sensitivity	Magnitude	Significance	Mitigation measure	Residual effect
Impact 2: Increased suspended sediment concentrations		Not sensitive to Low	Negligible	Negligible	None	None
Impact 3: Remobilisation of contaminated sediments		Low	Negligible	Not significant	None	None
Cumulative						
None						

10.13 References

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WHITE CROSS

White Cross Offshore Windfarm Environmental Statement

Chapter 10: Benthic and Intertidal Ecology

Appendix 10.A: Marine Conservation Zone Assessment

Document Code:	FLO-WHI-REP—0016-10	
Contractor Document Number:	PC2978-RHD-ZZ-XX-RP-Z-0401	
Version Number:	00	
Date:	*Issue Date 09/08/2023*	
Prepared by:	*PP*	*Electronic Signature*
Checked by:	*GK*	*Electronic Signature*
Owned by:	*CB*	*Electronic Signature*
Approved by Client :	*AP*	*Electronic Signature*

Version Number	Reason for Issue / Major Changes	Date of Change
00	For issue	09/08/2023

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Glossary of Acronyms

Acronym	Definition
AoO	Natural England's Advice on Operations
BSH	Broadscale Habitats
CEA	Cumulative Effects Assessment
Cefas	Centre for the Environment and Fisheries and Aquaculture Science
CEMP	Construction Environmental Management Plan
Defra	Department for Environment, Food and Rural Affairs
EIA	Environmental Impact Assessment
EMF	Electromagnetic Frequency
EPP	Evidence Plan Process
ES	Environmental Statement
ETG	Expert Topic Group
FEED	Front-End Engineering and Design
FOCI	Features of Conservation Importance
HDD	Horizontal Directional Drilling
INIS	Invasive Non-Indigenous Species
INNS	Invasive Non-Native Species
IUCN Red List	The International Union for Conservation of Nature's Red List of Threatened Species
km	Kilometre
Km2	Square kilometre
kV	Kilovolt
m	Metre
MAG	Single Magnetometer
MarESA	Marine Evidence based Sensitivity Assessment
MARPOL	International Convention for the Prevention of Pollution from Ships
MBES	Multibeam Echosounder
MCAA	Marine & Coastal Access Act
MCZ	Marine Conservation Zone
MCZA	Marine Conservation Zone Assessment
MEEB	Measures of Equivalent Environmental Benefit
MHWS	Mean High Water Springs
MLWS	Mean Low Water Springs
MMO	Marine Management Organisation
MW	Megawatts
NPS	National Policy Statement
OEL	Ocean Ecology Limited
OSP	Offshore Service Platform

Acronym	Definition
OWF	Offshore Windfarm
WCOWL	White Cross Offshore Windfarm Ltd
PAH	Polyaromatic Hydrocarbon
PCB	Polychlorinated Biphenyl
PINS	Planning Inspectorate
SAC	Special Area of Conservation
SACO	Supplementary Advice on Conservation Objectives
SBP	Sub-Bottom Profiler
SNCB	Statutory Nature Conservation Body
SSC	Suspended Sediment Concentrations
SSS	Side Scan Sonar
TBT	Tributyltin
UK	United Kingdom
UXO	Unexploded Ordnance
WTG	Wind Turbine Generator
ZoI	Zone of Influence

Glossary of Terminology

Defined Term	Description
Agreement for Lease	An Agreement for Lease (AfL) is a non-binding agreement between a landlord and prospective tenant to grant and/or to accept a lease in the future. The AfL only gives the option to investigate a site for potential development. There is no obligation on the developer to execute a lease if they do not wish to.
Applicant	Offshore Wind Limited
Cumulative effects	The effect of the Project taken together with similar effects from a number of different projects, on the same single receptor/resource. Cumulative impacts are those that result from changes caused by other past, present or reasonably foreseeable actions together with the Project.
Department for Business, Energy and Industrial Strategy (BEIS)	Government department that is responsible for business, industrial strategy, science and innovation and energy and climate change policy and consent under Section 36 of the Electricity Act.
Environmental Impact Assessment (EIA)	Assessment of the potential impact of the proposed Project on the physical, biological and human environment during construction, operation and decommissioning.
Export Cable Corridor	The area in which the export cables will be laid, either from the Offshore Substation or the inter-array cable junction box (if no offshore substation), to the NG Onshore Substation comprising both the Offshore Export Cable Corridor and Onshore Export Cable Corridor.
Generation Assets	The infrastructure of the Project related to the generation of electricity within the windfarm site, including wind turbine generators, substructures, mooring lines, seabed anchors and inter-array cables
Landfall	Where the Offshore Export Cables come ashore
Link boxes	Underground chambers or above ground cabinets next to the cable trench housing electrical earthing links
Mean high water springs	The average tidal height throughout the year of two successive high waters during those periods of 24 hours when the range of the tide is at its greatest.
Mean low water springs	The average tidal height throughout a year of two successive low waters during those periods of 24 hours when the range of the tide is at its greatest.

Defined Term	Description
Mitigation	Mitigation measures have been proposed where the assessment identifies that an aspect of the development is likely to give rise to significant environmental impacts, and discussed with the relevant authorities and stakeholders in order to avoid, prevent or reduce impacts to acceptable levels. For the purposes of the EIA, two types of mitigation are defined: Embedded mitigation: consisting of mitigation measures that are identified and adopted as part of the evolution of the project design, and form part of the project design that is assessed in the EIA Additional mitigation: consisting of mitigation measures that are identified during the EIA process specifically to reduce or eliminate any predicted significant effects. Additional mitigation is therefore subsequently adopted by OWL as the EIA process progresses.
Offshore Development Area	The Windfarm Site (including wind turbine generators, substructures, mooring lines, seabed anchors, inter-array cables and Offshore Substation Platform (as applicable)) and Offshore Export Cable Corridor to MHWS at the Landfall. This encompasses the part of the project that is the focus of this application and Environmental Statement and the parts of the project consented under Section 36 of the Electricity Act and the Marine and Coastal Access Act 2009
Offshore Export Cables	The cables which bring electricity from the Offshore Substation Platform or the inter-array cables junction box to the Landfall
Offshore Export Cable Corridor	The proposed offshore area in which the export cables will be laid, from Offshore Substation Platform or the inter-array cable junction box to the Landfall
the Offshore Project	The Offshore Project for the offshore Section 36 and Marine Licence application includes all elements offshore of MHWS. This includes the infrastructure within the windfarm site (e.g. wind turbine generators, substructures, mooring lines, seabed anchors, inter-array cables and Offshore Substation Platform (as applicable)) and all infrastructure associated with the export cable route and landfall (up to MHWS) including the cables and associated cable protection (if required).
Offshore Substation Platform	A fixed structure located within the Windfarm Site, containing electrical equipment to aggregate the power from the wind turbines and convert it into a more suitable form for export to shore
Onshore Development Area	The onshore area above MLWS including the underground onshore export cables connecting to the White Cross Onshore Substation and onward to the NG grid connection point at East Yelland. The onshore development area will form part of a separate Planning application to the Local Planning Authority (LPA) under the Town and Country Planning Act 1990.
Onshore Export Cables	The cables which bring electricity from MLWS at the Landfall to the White Cross Onshore Substation and onward to the NG grid connection point at East Yelland.
Onshore Export Cable Corridor	The proposed onshore area in which the export cables will be laid, from MLWS at the Landfall to the White Cross Onshore Substation and onward to the NG grid connection point at East Yelland.

Defined Term	Description
the Onshore Project	The Onshore Project for the onshore TCPA application includes all elements onshore of MLWS. This includes the infrastructure associated with the Offshore Export Cable (from MLWS), landfall, onshore export cable and associated infrastructure and new onshore substation (if required).
White Cross Offshore Windfarm Ltd	White Cross Offshore Windfarm Ltd (WCOWL) is a joint venture between Cobra Instalaciones Servicios, S.A., and Flotation Energy Ltd
the Project	the Project is a proposed floating offshore windfarm called White Cross located in the Celtic Sea with a capacity of up to 100MW. It encompasses the project as a whole, i.e. all onshore and offshore infrastructure and activities associated with the Project.
Project Design Envelope	A description of the range of possible elements that make up the Project design options under consideration. The Project Design Envelope, or 'Rochdale Envelope' is used to define the Project for Environmental Impact Assessment (EIA) purposes when the exact parameters are not yet known but a bounded range of parameters are known for each key project aspect.
Transition joint bay	Underground structures at the Landfall that house the joints between the Offshore Export Cables and the onshore export cables
White Cross Offshore Windfarm	Up to 100MW capacity offshore windfarm including associated onshore and offshore infrastructure
White Cross Onshore Substation	A new substation built specifically for the White Cross project. It is required to ensure electrical power produced by the offshore windfarm is compliant with NG electrical requirements at the grid connection point at East Yelland.
Windfarm Site	The area within which the wind turbines, Offshore Substation Platform and inter-array cables will be present

1. Introduction

1. The purpose of this Marine Conservation Zone Assessment (MCZA) Stage 1 Report is to provide information to determine whether the proposed White Cross Offshore Wind Farm (the Project) could potentially affect the features and conservation objectives of the Bideford to Foreland Point Marine Conservation Zone (MCZ), South West Approaches to Bristol Channel MCZ and Lundy MCZ.

2. The MCZA is a requirement of Section 126 of the Marine and Coastal Access Act (2009) (MCAA), which places specific duties on the regulating authority (i.e., the Marine Management Organisation (MMO) for Marine Licence applications) which require consideration of MCZs when determining consent applications. As such, the MMO have incorporated the need to include a MCZA into their decision-making processes, where any MCZ has the potential to be affected by a marine licensable activity.

3. This document is informed by guidance published by the MMO (2013) on how such assessments should be undertaken and by advice from the Statutory Nature Conservation Bodies (SNCBs) during consultation in the pre-application phase of the Project. The MCZA has been undertaken based on the description of projects provided within Section 37 of this report and **Chapter 5: Project Description** of the ES.

4. The structure of this MCZA is as follows:

   - **Section 1** (this section): Introduction to the document and the structure of the assessment
   - **Section 2**: Legislation, Policy and Guidance – this section provides the legislative context and details the policy and guidance given by number of governmental, statutory and industry bodies in relation to the MCZA process
   - **Section 3**: Overview of the MCZ assessment process – provides an overview of the MCZA process and the approach taken by the Applicant
   - **Section 4**: Consultation – provides a summary of the consultation undertaken with respect to the MCZA, including stakeholder comments and the Applicant's responses
   - **Section 5**: Screening Conclusions – this section summarises the screening process and outcomes that have been consulted on through the Evidence Plan Process (EPP). The screening report is provided in **Appendix A**
   - **Section 6:** Project Description – an outline of the Project is given with regard to the location of the project infrastructure and its construction, operation and maintenance and decommissioning
   - **Section 7**: MCZ Baseline – a description of the Bideford to Foreland Point, and Lundy MCZ, including the protected features and conservation objectives. A

description of the location of protected features in relation to the Project area, incorporating site-specific survey data

- **Section 8**: Stage 1 Assessment – this section provides the Stage 1 Assessment for the two MCZ's that have been screened into the assessment. An assessment of cumulative impacts with other plans and projects is also provided
- **Section 9**: Conclusion – a conclusion to the MCZA is provided with respect to the conservation objectives of each MCZ.

2. Legislation, Policy and Guidance

2.1 Marine & Coastal Access Act (MCAA) (2009)

5. The MCAA establishes a range of measures to manage the marine environment including establishing MCZs. The Marine Conservation Zone Project was established in 2008 by the Joint Nature Conservation Committee and Natural England to work with regional stakeholder led projects to identify and recommend MCZs to Government. The designation of MCZs is now complete.

6. Sections 125 and 126 of the MCAA place specific duties on the MMO relating to MCZs and Marine Licence decision making. This is because Section 126 applies where:

   - "(a) a public authority has the function of determining an application (whenever made) for authorisation of the doing of an act, and
   - (b) the act is capable of affecting (other than insignificantly)
     - (i) the protected features of an MCZ
     - (ii) any ecological or geomorphological process which the conservation of any protected feature of an MCZ is (wholly or in part) dependent."

7. Natural England has responsibility under the MCAA to give advice on how to further the conservation objectives for the MCZ, identify the activities that are capable of affecting the designated features and the processes which they are dependent upon.

2.2 Guidance

8. The MCZA gives consideration to the following guidance:

   - MMO (2013). Marine Conservation Zones and Marine Licensing guidance
   - Natural England (2016). Guidance on how to use Natural England's Conservation Advice Packages for Environmental Assessments (Draft)
   - Planning Inspectorate (PINS) (2019). Advice Note Seventeen: Cumulative effects assessment.

9. The approach to the assessment has also been informed by project-specific advice from Natural England and other stakeholders.

10. The detail of the assessment has been informed by the Advice on Operations (AoO) and Supplementary Advice on Conservation Objectives (SACO) for the MCZs screened in (Natural England, 2022a and 2022b).

3. Overview of MCZ Assessment Process

11. Guidance published by the MMO (2013) describes how MCZAs should be undertaken in the context of marine licensing decisions. To undertake its marine licensing function, the MMO has introduced a three-stage sequential assessment process for considering impacts on MCZs, in order for it to deliver its duties under Section 126 of the MCAA. Section 126 places specific duties on all public bodies in undertaking their licencing activities where they are capable of hindering the conservation objectives of an MCZ. The stages of MCZA are presented in **Sections 3.1** to **3.4** and are summarised in **Plate 3.1** (MMO, 2013)**.**

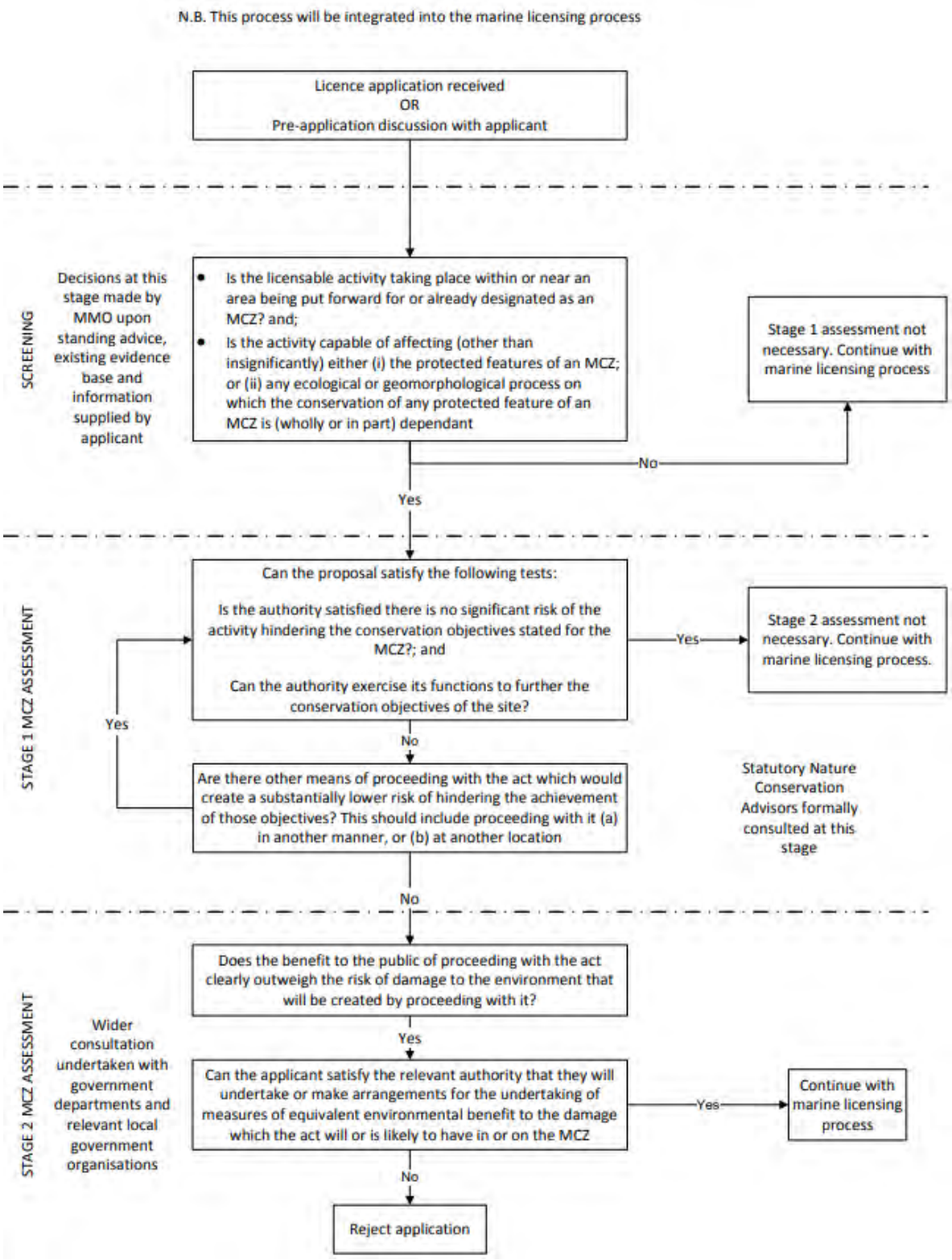
3.1 Screening (Appendix A)

12. The screening process is required to determine whether Section 126 of the MCAA should apply to the application. All applications go through an initial screening stage to determine whether:

    - the plan, project or activity is within or near to a MCZ
    - the plan, project or activity is capable of significantly affecting (i) the protected features of a MCZ, or (ii) any ecological or geomorphological processes on which the conservation of the features depends.

13. Where it has been determined through screening that Section 126 applies, the application is assessed further to determine which subsections of Section 126 should apply through Stage 1 assessment and Stage 2 assessment. The MCZ Screening Report (**Appendix A**) was submitted alongside the Scoping Report (Royal HaskoningDHV, 2022) on 18th January 2022 and a Scoping Opinion was received 30th May 2022.

Plate 3.1 Flow chart summary of the MCZ Assessment process used by the MMO during Marine Licence determination (MMO, 2013)



3.2 Stage 1 Assessment

14. This Stage 1 Assessment will consider whether the conditions in Section126(6) of the MCAA can be met, to determine whether:

    - there is no significant risk of the activity hindering the achievement of the conservation objectives stated for the MCZ
    - the MMO can exercise its functions to further the conservation objectives stated for the MCZ (in accordance with s.125(2)(a)).

15. This Stage 1 Assessment considers the extent of the potential impact of the plan or project on the MCZ in more detail. The Stage 1 Assessment looks at whether the plan or project could potentially affect the conservation objectives for the site, that is, impact the site so that the features are no longer in favourable condition, or prevent the features from recovering to a favourable condition. If mitigation to reduce identified impacts cannot be secured, and there are no other alternative locations, then the Project will be considered under Stage 2 of the assessment process (see **Section 3.3**).

16. Within the Stage 1 Assessment "*hinder*" will be considered as any act that could, either alone or in combination:

    - in the case of a conservation objective of "maintain", increase the likelihood that the current status of a feature would go downwards (e.g. from favourable to degraded) either immediately or in the future (i.e. they would be placed on a downward trend) or
    - in the case of a conservation objective of "recover", decrease the likelihood that the current status of a feature could move upwards (e.g. from degraded to favourable) either immediately or in the future (i.e. they would be placed on a flat or downward trend).

17. In order to determine if there is 'no significant risk of the activity hindering the achievement of the conservation objectives stated for the MCZ' the MMO (2013) guidance states "*this should take into account the likelihood of an activity causing an effect, the magnitude of the effect should it occur, and the potential risk any such effect may cause on either the protected features of an MCZ or any ecological or geomorphological process on which the conservation of any protected feature of an MCZ is (wholly or in part) dependant*."

18. The Project approach to determining no significant risk of the activity enabling achievement of the conservation objectives is set out below.

3.2.1 Assessment of risk to conservation objectives

19. For each effect, a magnitude of impact has been considered in relation to the spatial extent, duration, frequency and reversibility of the effect considered (where applicable). In order to determine the sensitivity of the protected features of each MCZ considered in this assessment, Natural England's Advice on Operations (AoO) has been utilised. Natural England provides AoO for individual features, which are an indicator of the sensitivity of a given feature to a construction / operation and maintenance / decommissioning related pressure from marine development. For habitat features, this advice is drawn from the Marine Life Information Network's 'Marine Evidence based Sensitivity Assessment' (MarESA) sensitivity ratings (Tyler-Walters et al., 2018) for the typical component biotopes representative of those habitats. Where multiple biotopes are relevant to a given pressure, the highest sensitivity is taken as the worst-case.

3.2.2 Assessment against the conservation objectives

20. Following determination of impact magnitude and receptor sensitivity, the Stage 1 Assessment considers the risk that the Project could hinder the conservation objectives for the MCZ with consideration of Natural England's SACOs.

21. SACOs present attributes which are ecological characteristics or requirements of the designated species and habitats within a site. The listed attributes are considered to be those which best describe the site's ecological integrity and which, if safeguarded, will enable achievement of the Conservation Objectives. These attributes have a target which is either quantified or qualified depending on the available evidence (Natural England, 2022a and 2022b).

3.3 Stage 2 Assessment

22. Where it is required, the Stage 2 Assessment considers the socio-economic impact of the plan or project together with the risk of environmental damage. There are three parts to the Stage 2 Assessment process:

    - Assessment that there is no other means of proceeding which would create a substantially lower risk of hindering the conservation objectives
    - Does the public benefit in proceeding with the project clearly outweigh the risk of damage to the environment that will be created by proceeding with it?
    - If so, can the Applicant satisfy that they can secure, or undertake arrangements to secure, measures of equivalent environmental benefit (MEEB) for the damage the project will have on the MCZ features?

3.3.1 Measures of Equivalent Environmental Benefit

23. If Stage 1 identifies a significant risk of hindering the conservation objectives of the MCZs, an assessment of MEEB must also be included in the MCZA.

3.4 Cumulative Effects

24. The MCAA does not provide any legislative requirement for explicit consideration of cumulative effects on the protected features of MCZs. However, the MMO guidelines (MMO, 2013) state that the MMO considers that in order for the MMO to fully discharge its duties under section 69 (1) of the MCAA, cumulative effects must be considered.

25. Although the Project is not a Nationally Significant Infrastructure Project, PINS Advice Note Seventeen (PINS, 2019) provides guidance on plans and projects that should be considered in the Cumulative Effect Assessment (CEA) which is considered to be applicable. These plans and projects include:

- Projects that are under construction
- Permitted applications, not yet implemented
- Submitted applications not yet determined
- Projects on the PINS Program of Projects
- Developments identified in relevant Development Plans, with weight being given as they move closer to adoption and recognising that much information on any relevant proposals will be limited
- Sites identified in other policy documents as development reasonably likely to come forward.

26. Only projects which are reasonably well described and sufficiently advanced to provide information on which to base a meaningful and robust assessment are included as part of the baseline for the CEA.

27. Offshore cumulative impacts may come from interactions with the following activities and industries:

- Other offshore windfarms
- Other offshore renewable energy developments
- Aggregate extraction and dredging
- Licensed disposal sites
- Navigation and shipping
- Subsea cables and pipelines
- Potential port/harbour development
- Oil and gas activities
- Fisheries management areas.

28. Plans and projects that existed at the time of the relevant MCZ designation or the latest status reports, undertaken every 6 years, are considered to be part of the baseline environment.

29. The Project activities and associated pressures are reviewed to determine whether they are capable of significantly affecting MCZs when combined with equivalent activities and associated pressures from other plans and projects. The potential for project to act cumulatively on MCZs is considered in the context of the likely spatial and temporal extent of pressures.

4. Consultation

30. Consultation of relevance to the MCZA process has been undertaken with Statutory Nature Conservation Bodies (SNCBs) and other stakeholders through scoping and stakeholder engagement. Further details on the consultation that has been undertaken for the Project can be found in **Chapter 7: Consultation**.

4.1 Scoping

31. Consultation has been undertaken with the appropriate authorities and stakeholders as part of the scoping stage of the Environmental Impact Assessment (EIA) process. The Scoping Report (Royal HaskoningDHV, 2022) was submitted on 18th January 2022 and a Scoping Opinion was received 30th May 2022. Scoping established the potential impacts of the Project to be assessed by the EIA (and by association the MCZA).

4.2 Summary of relevant consultation responses

32. The consultation responses relevant to the MCZA which have been received to date are summarised in **Table 4.1**.

Table 4.1 Consultation responses

Consultee	Date/ Document	Comment	Response / where addressed in the MCZA
MMO	30/05/2022 EIA/2022/0 0002 Scoping Opinion	Marine - Pink Sea Fan is mentioned as a designated feature of two MCZs (Bideford to Foreland Point and Hartland Point to Tintagel) but it is also a protected species in its own right Schedule 5 of the Wildlife & Countryside Act. The ES should assess the impact of all phases of the proposal on Pink Sea Fans found outside protected areas on subtidal reef habitat. Although listed as nationally scarce, Pink Sea Fan are believed to be common locally in Devon and Cornish waters.	Included in Bideford to Foreland Point assessments in **Sections 7.1** and **8.1**. Impacts on Pink Sea Fans are considered within **Chapter 10: Benthic and Intertidal Ecology** of the ES.
MMO	30/05/2022 EIA/2022/0 0002 Scoping Opinion	Lundy MCZ is within the potential zone of influence but is not included in the table of MCZs for screening of impacts on protected features. If this site has been considered but screened out from further	A stage 1 assessment of Lundy MCZ is included, see **Section 8.3**.

Consultee	Date/ Document	Comment	Response / where addressed in the MCZA
		assessment then an explanation should be included.	

5. Screening Summary

33. The Screening process was undertaken in consultation with relevant stakeholders via the Evidence Plan Process (EPP) and associated Environmental Technical Group (ETG) meetings with technical stakeholders. The Marine Conservation Zone Assessment Screening Report is provided in **Appendix A**.

34. The following MCZs were originally screened in due to their proximity to the original area of search and potential for indirect effects upon them:

- Bideford to Foreland Point MCZ
- Hartland Point to Tintagel MCZ
- Morte Platform MCZ
- South West Approaches to Bristol Channel MCZ
- North West of Lundy MCZ.

35. Following the refinement of the area of search down to the selected Offshore Export Cable Corridor, Hartland Point to Tintagel MCZ, Morte Platform MCZ and North West of Lundy MCZ are now screened out as they are beyond the 10km considered to be the likely range of indirect effect from the Project. The range for potential indirect effect (i.e. from increased suspended sediment concentrations (SSCs) from construction activities) is based upon the study area for potential local effects on physical and sedimentary processes (defined as a tide-parallel 10km wide buffer around the Offshore Development Area) (see **Chapter 8: Marine and Coastal Processes**). These sites are shown in **Figure 5.1**.

36. In addition, following the consultation response from the MMO, Lundy MCZ, which was originally screened out, was screened in (see **Table 4.1)**. Therefore, for this MCZA Stage 1 Assessment the Bideford to Foreland Point MCZ, South West Approaches to Bristol Channel MCZ and Lundy MCZ are considered.

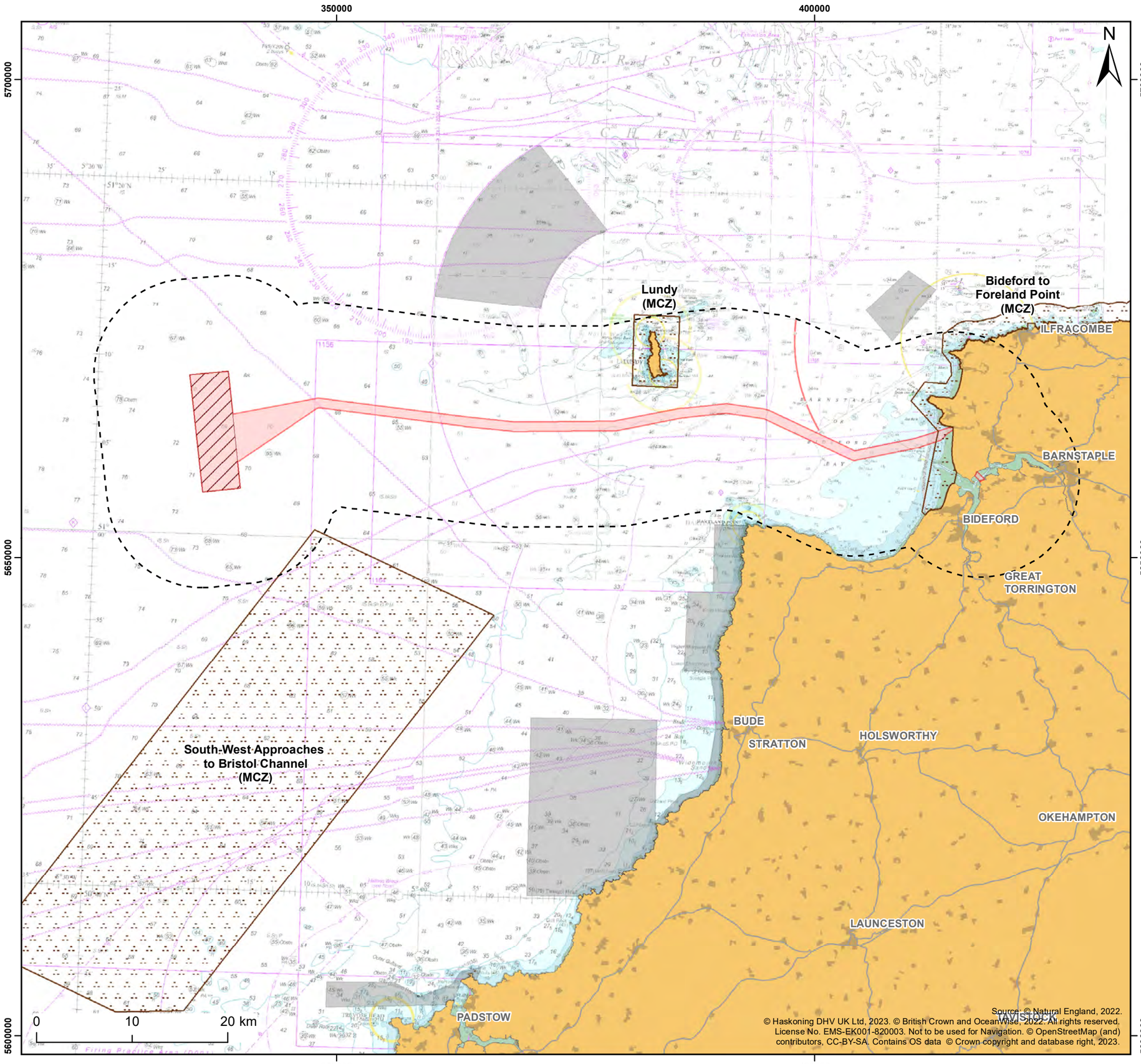
37. **Table 5.1** provides a summary of the impacts on the MCZs screened in for further consideration. Each of the impacts and corresponding pressures (derived from Natural England's AoO) identified during MCZA Screening process will be discussed individually within the Stage 1 Assessment.

38. Note that for Lundy MCZ given that the Offshore Development Area is 2km from the site boundary there is no pathway for direct impact, only indirect impact. Potential impacts are only likely from the Offshore Export Cable Corridor given that the Windfarm Site is greater than 10km from the MCZ. Upon review of the AoO the only impact screened in is underwater noise. Although contamination pathways are included in the AoO, given the absence of contaminants at levels of concern recorded within the Project Area (see **Section 8.1.1.3**) this was not considered further.

39. The Offshore Export Cable Corridor crosses the Bideford to Foreland Point MCZ potentially impacting both subtidal and intertidal habitats and therefore there are pathways for both direct and indirect impacts. Again, given its distance from the MCZ, there is no pathway for indirect impact from the Windfarm Site. Potential impacts will be solely from the Offshore Export Cables.

40. Permanent/long term habitat loss was precautionarily screened in for the Bideford to Foreland Point MCZ before commitments for Horizontal Directional Drilling (HDD) techniques with no cable protection at the exit were made. Under these new assumptions permanent/long term habitat loss have now been screened out of this assessment. Likewise colonisation of cable protection is also now screened out due to this commitment.

41. Effects on bedload sediment transport are considered to be more relevant to operation and so this impact is assessed for that phase for the Bideford to Foreland Point MCZ and the South West Approaches to Bristol Channel MCZ.



Legend:

- Windfarm Site
- Offshore Development Area
- Offshore Development Area 10km Buffer
- Marine Conservation Zones (MCZ) - Screened In
- Marine Conservation Zones (MCZ) - Screened Out

Client: Offshore Wind Ltd.	Project: White Cross Offshore Windfarm

Title: MCZ Screening

Figure: 5.1 | Drawing No: PC2978-RHD-ZZ-XX-DR-Z-0538

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P01	14/02/2023	AB	KH	A3	1:400,000

Co-ordinate system: WGS 1984 UTM Zone 30N

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Table 5.1 Summary of screening

Site	Features screened in	Source of Impact	Impacts screened in (alone and cumulatively)	Construction	Operation and Maintenance	Decommissioning
Bideford to Foreland Point MCZ	All	Direct and indirect effects of the Offshore Export Cable Corridor (export cables and associated works)	Temporary physical disturbance	✓	x	✓
			Permanent/long term habitat loss *(Originally screened in)*	x	x	x
			Increased SSC	✓	x	✓
			Re-mobilisation of contaminated sediments	✓	x	✓
			Effects on bedload sediment transport	x	✓	x
			Underwater noise and vibration	✓	x	✓
			Colonisation of cable protection *(Originally screened in)*	x	x	x
			Invasive species	✓	x	✓
			Electromagnetic fields	x	✓	x
South West Approaches to Bristol Channel MCZ	Subtidal coarse sediment	Indirect effects of the Offshore Export Cable Corridor (export	Increased SSCs	✓	x	✓
			Re-mobilisation of contaminated sediments	✓	x	✓

Site	Features screened in	Source of Impact	Impacts screened in (alone and cumulatively)	Construction	Operation and Maintenance	Decommissioning
	Subtidal sand	cables and associated works)	Effects on bedload sediment transport	x	✓	x
			Invasive species	✓	x	✓
Lundy MCZ	Spiny lobster *Palinurus elephas*	Indirect effects of the Offshore Export Cable Corridor (export cables and associated works)	Temporary physical disturbance	x	x	x
			Permanent/long term habitat loss	x	x	x
			Increased SSCs	x	x	x
			Re-mobilisation of contaminated sediments	x	x	x
			Effects on bedload sediment transport	x	x	x
			Underwater noise and vibration	✓	x	✓
			Colonisation of foundations and cable protection	x	x	x
			Invasive species	x	x	x
			Electromagnetic fields	x	x	x

6. Project Description

6.1 Project background

42. The Project is a proposed offshore windfarm located in the Celtic Sea (see **Figure 10.1 in the ES**) with a capacity of up to 100 MW.

43. The Windfarm Site is located over 52 km from the North Cornwall and North Devon coast (west-north-west of Hartland Point). The Offshore Export Cable will connect the Offshore Substation Platform (OSP) to shore. The Offshore Export Cable will make landfall at Saunton Sands on the North Devon coast. The Export Cable will then be routed underground to the grid connection. A new White Cross Onshore Substation will be constructed to accommodate the connection of the Project to the existing National Grid Onshore Substation and grid connection.

44. The key offshore components comprise:

- Six to eight semi-submersible floating platforms and Wind Turbine Generators (WTGs)
- Associated subsea catenary mooring lines, including clump weights
- A range of potential anchoring solutions (drag embedment anchors, suction anchor or pin piles)
- Up to ten dynamic inter-array cables and associated protection
- Offshore substation with a fixed jacket substructure
- Offshore Export Cable connecting the offshore substation to the landfall (single cable laying 2 circuits "wrapped together" as a bundled solution), cable joints, associated protection
- Other associated offshore infrastructure, such as navigational markers.

45. A full project description of the Project is given in **Chapter 5: Project Description**.

46. As discussed in **Section 1** only the Offshore Export Cables are of relevance to the MCZA and these are covered in the following section.

6.1.1 Offshore Export Cable

47. Electricity from the Windfarm Site will be transmitted via one or two subsea export cable(s) to shore depending on whether an OSP is required. Each Offshore Export Cable will be installed in an individual trench and protected in line with good industry practice.

48. The cable will be buried where possible to ensure that the cable is protected from damage by external factors. Typical burial depth is 1m but may range from 0.5m - 3m. The cable will be delivered in sections and jointed in-situ due to the distance from the Windfarm Site to the Landfall. If seabed conditions make burial unfeasible

cable may be protected by a hard-protective layer such as rock or concrete mattresses. No protection option will also be considered where practicable. The appropriate level of protection will be determined based on an assessment of the risks posed to the Project in specific areas.

49. The Applicant has committed to no cable protection being located in the nearshore including at the trenchless technique exit point (i.e. within the Bideford to Foreland Point MCZ).

6.1.2 Landfall

50. Cable installation methodology at the landfall will be selected based on a comparative assessment of environmental, commercial and technical factors. It is assumed that suitable technologies will include a mix of open cut trenching and trenchless techniques.

51. Open cut is a well-known installation methodology for underground cabling in relatively unconstrained areas. It can also be used to install a cable in a landfall and would require an open trench to be dug out before a cable is installed and the trench refilled.

52. If trenchless techniques are chosen as the appropriate installation methodology at the landfall, the drill commences from an onshore construction compound where the Transition Joint Bay) will be located (which is above MHWS and therefore part of the Onshore Project) and will exit the seabed in an exit pit at a suitable water depth. The length of the drill will depend upon factors such as water depth, seabed topography, shallow geology/soil conditions and environmental constraints. If a mix of trenchless and open cutting is used, the area of open trenching at exit point of the drill on the beach would be no greater than 135m^2.

Table 6.1 Landfall construction parameters

Landfall	Minimum	Maximum
Landfall installation method	Trenchless and/or open trench where no obstruction	
Number of drills	n/a	2
Drill horizontal length (m)	500	1,500
Trench dimensions for open trench down the beach	n/a	270m long x 0.5m wide x 1.2m deep

6.2 Worst Case Scenario

53. In accordance with the assessment approach to the 'Rochdale Envelope' set out in **Chapter 6: EIA Methodology**, the impact assessment for benthic and intertidal ecology has been undertaken based on a realistic worst-case scenario of predicted impacts. The Project Design Envelope for the Project is detailed **in Chapter 5: Project Description**.

54. Worst case scenarios align with those presented in **Chapter 10: Benthic and Intertidal Ecology**. However, **Table 6.2** only presents those elements considered relevant for the impacts screened in for assessment in this MCZA. As the Windfarm Site is 71 km from the Bideford to Foreland Point MCZ and 42km from the Lundy MCZ, other than potential underwater noise impacts from piling all other impacts (direct or indirect) are beyond the Zone of Influence of any likely effect upon the MCZs, therefore only impacts from the Offshore Export Cable Corridor are considered.

Table 6.2 Worst Case Assumptions for Benthic and Intertidal Ecology

Impact Construction	Parameter	Notes
Temporary habitat loss / physical disturbance (Offshore Export Cables)	Export cables: • Total length of cable = 93.60km per cable • Maximum width of disturbance = 25m (jetting/ploughing) • Cable burial (single cable) would disturb the subtidal = 4,680,000m^2 (plan area for two cables) • Total area of sand wave excavation works 280,800m^2	Only a 1.8km of trench would be within the Bideford to Foreland Point MCZ
Temporary habitat loss / physical disturbance (Landfall)	Trench dimensions for open trench at Landfall (MLWS to MHWS) for two cables • 270 (L) x 0.5 (W) • 135m^2	This assumes maximum footprint for open cut trenching between MLWS to MHWS
Increased suspended sediments and deposition	Export cable burial for two cables would displace a volume of 1,684,800m^3 assuming 3m wide, 3m deep excavation for each cable.	Jetting/ploughing considered the worst case installation method.

Impact	Parameter	Notes
	Total area of sand wave excavation works for Offshore Export Cable Corridor and inter-array cables is 292,800m^2 Suspended sediment from open trench at Landfall (MLWS to MHWS) for two cables ▪ 270 (L) x 0.5 (W) x 1.2 (D) ▪ 162m^3	
Re-mobilisation of contaminated sediments	As per increased suspended sediments and deposition	
Underwater noise and vibration	Any requirements for UXO clearance currently unknown, including locations, number, types and sizes of UXO. Seabed clearance methods: Pre-lay grapnel run, boulder grab, plough, sand wave levelling (pre-sweeping), dredging. Cable installation methods: Jetting / ploughing / trenching / mechanical cutting. Duration of Offshore Export Cable installation: 2 to 6 months.	**Appendix 12.A: Marine Mammal and Marine Turtle Underwater Noise Report.**
Introduction of Invasive Non-Native Species (INNS)	Maximum overall offshore construction duration = 10 months A total of 280 vessels movements will be required during construction with a maximum of five vessels being used simultaneously at any stage.	The greatest risk of introduction of INNS is through ballast water and biofouling from various vessels required during construction.
Operation		
Effects on bedload sediment transport	The Applicant will make reasonable endeavours to bury cables, minimising the requirement for cable protection measures and thus effects on sediment transport. Use of external cable protection would be minimised in all cases and no cable protection would be located in the nearshore including at the trenchless technique exit point.	
Electromagnetic fields (EMF)	93.6km (x2) export cable length Max voltage export cable: 132kV	

Impact	Parameter	Notes
	EMF levels will be measurable at 0.6μT above background levels (48.7μT) at 0 m from the cable, decreasingly rapidly with distance to levels negligible from background at 4m, and 5m at cable crossings.	
Decommissioning		
Temporary habitat loss / physical disturbance	As per construction or less	The area at risk of disturbance from decommissioning will likely be lower than that presented in construction.
Increased suspended sediments and deposition	As per construction or less	
Remobilisation of contaminated sediment	As per construction or less	
Effects on bedload sediment transport	As per construction or less	
Underwater noise and vibration	As per construction or less	
INNS	The number of vessels required for decommissioning is not yet known.	The greatest risk of introduction of INNS is through ballast water and biofouling from various vessels required during decommissioning

7. MCZ Baseline

55. This section summarises the protected features of the MCZs and their conservation objectives.

7.1 Bideford to Foreland Point MCZ

56. The Bideford to Foreland Point MCZ overlaps the Offshore Development Area. Specifically the Offshore Export Cable Corridor crosses the MCZ at Landfall.

7.1.1 Protected Features

57. The Bideford to Foreland Point MCZ protects a range of Broadscale Habitats (BSH), Species and Habitat Features of Conservation Importance (FOCI). These include subtidal sediment and rock habitats which are permanently submerged, as well as beaches of intertidal sand, which are exposed to air at low tide and below water at high tide (Natural England, 2016).

58. This site also protects a range of important and vulnerable species such as the Pink sea-fan *Eunicella verrucosa*, which provides a home to other species including the Celtic sea slug *Onchidella celtica* and Policeman anemone *Mesacmaea mitchellii* (The Wildlife Trust, 2019). Finally, the European spiny lobster *Palinurus elephas* which is protected with the aim to recover to favourable condition (Natural England, 2016).

59. **Table 7.1** shows the features designated by the Bideford to Foreland Point MCZ.

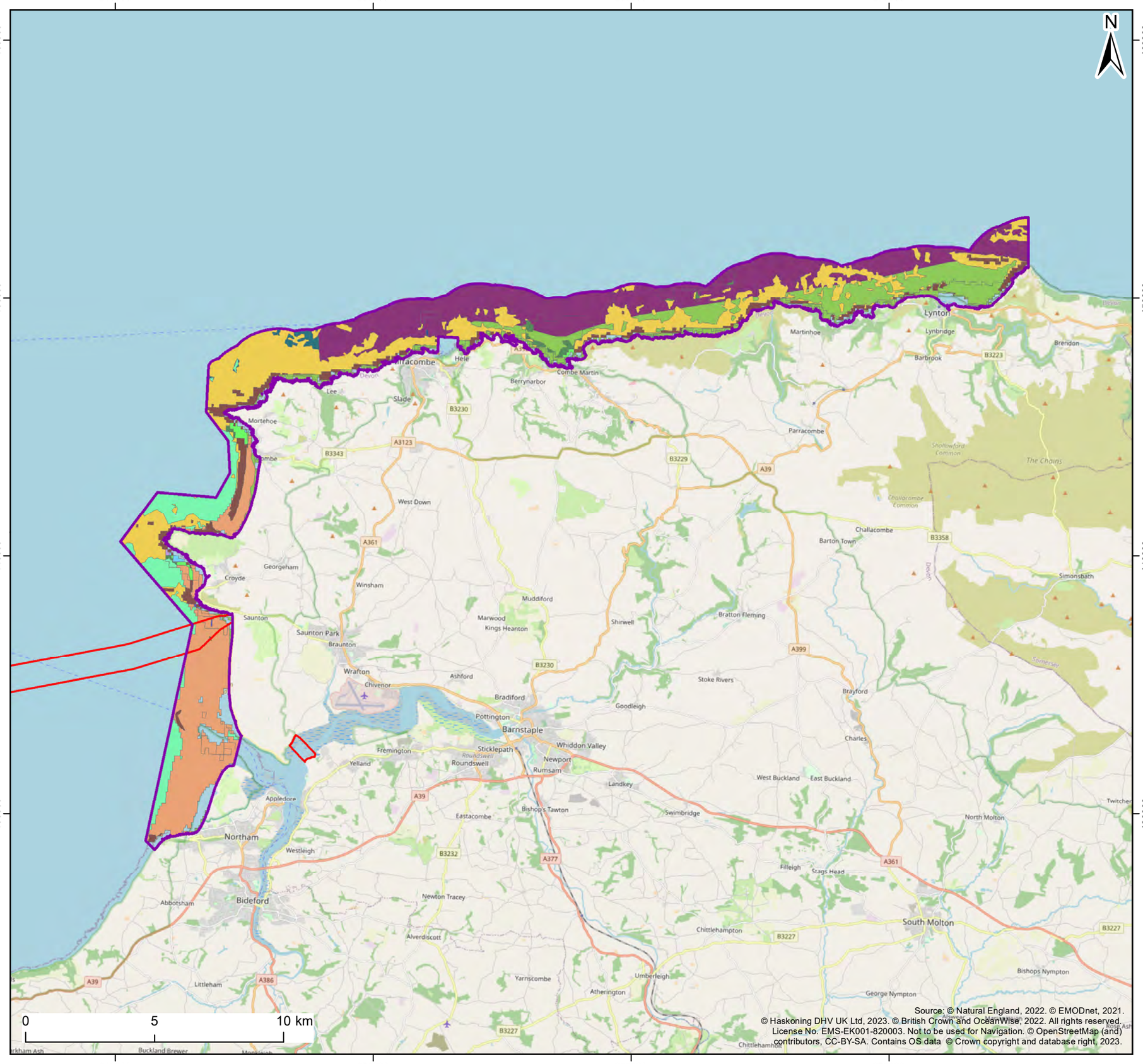
Table 7.1 Designated features for Bideford to Foreland MCZ (source: Defra, 2018a)

Protected feature	Management approach
Low energy intertidal rock	Maintain in favourable condition
Moderate energy intertidal rock	Maintain in favourable condition
High energy intertidal rock	Maintain in favourable condition
Intertidal coarse sediment	Maintain in favourable condition
Intertidal mixed sediments	Maintain in favourable condition
Intertidal sand and muddy sand	Maintain in favourable condition
Intertidal underboulder communities	Maintain in favourable condition
Littoral chalk communities	Maintain in favourable condition
Low energy infralittoral rock	Maintain in favourable condition
Moderate energy infralittoral rock	Maintain in favourable condition
High energy infralittoral rock	Maintain in favourable condition
Moderate energy circalittoral rock	Maintain in favourable condition
High energy circalittoral rock	Maintain in favourable condition
Subtidal coarse sediment	Maintain in favourable condition
Subtidal mixed sediments	Maintain in favourable condition
Subtidal sand	Recover to favourable condition
Fragile sponge & anthozoan communities on subtidal rocky habitats	Maintain in favourable condition

Protected feature	Management approach
Honeycomb worm *Sabellaria alveolata* reefs	Maintain in favourable condition
Pink sea-fan *Eunicella verrucosa*	Maintain in favourable condition
Spiny lobster *Palinurus elephas*	Recover to favourable condition

60. For subtidal sand, work prior to site designation indicated that benthic trawling occurs within the site and could damage the subtidal sand habitats, hence the management target to recover the feature (Natural England, 2022c). For spiny lobster the recover target is based upon evidence that populations in south west England have severely declined in the past and are not yet fully recovered (Natural England, 2022c).

61. Defra (2016) mapped the features of Bideford to Foreland Point MCZ. The habitat mapping has been updated using EMODNet data as shown in **Figure 7.1** whilst **Figure 7.2** shows the species mapping. It can be seen that the Offshore Export Cable Corridor falls largely within fine sand or mud habitats and therefore these are the only features which will be directly impacted. All other features would potentially be indirectly impacted.



Legend:

- Offshore Export Cable Corridor
- Bideford to Foreland Point MCZ

Broad Scale Habitats

- A3.1: Atlantic and Mediterranean high energy infralittoral rock
- A3.2: Atlantic and Mediterranean moderate energy infralittoral rock
- A3.3: Atlantic and Mediterranean low energy infralittoral rock
- A3: Infralittoral rock and other hard substrata
- A4.1: Atlantic and Mediterranean high energy circalittoral rock
- A4.2: Atlantic and Mediterranean moderate energy circalittoral rock
- A4.3: Atlantic and Mediterranean low energy circalittoral rock
- A4: Circalittoral rock and other hard substrata
- A5.13: Infralittoral coarse sediment
- A5.14: Circalittoral coarse sediment
- A5.23 or A5.24: Infralittoral fine sand or Infralittoral muddy sand
- A5.25 or A5.26: Circalittoral fine sand or Circalittoral muddy sand
- A5.612: Sabellaria alveolata on variable salinity sublittoral mixed sediment
- A5: Sublittoral sediment
- Na

Client: Offshore Wind Ltd.	Project: White Cross Offshore Windfarm

Title: Bideford to Foreland Point MCZ Broad Scale Habitats

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Co-ordinate system: British National Grid

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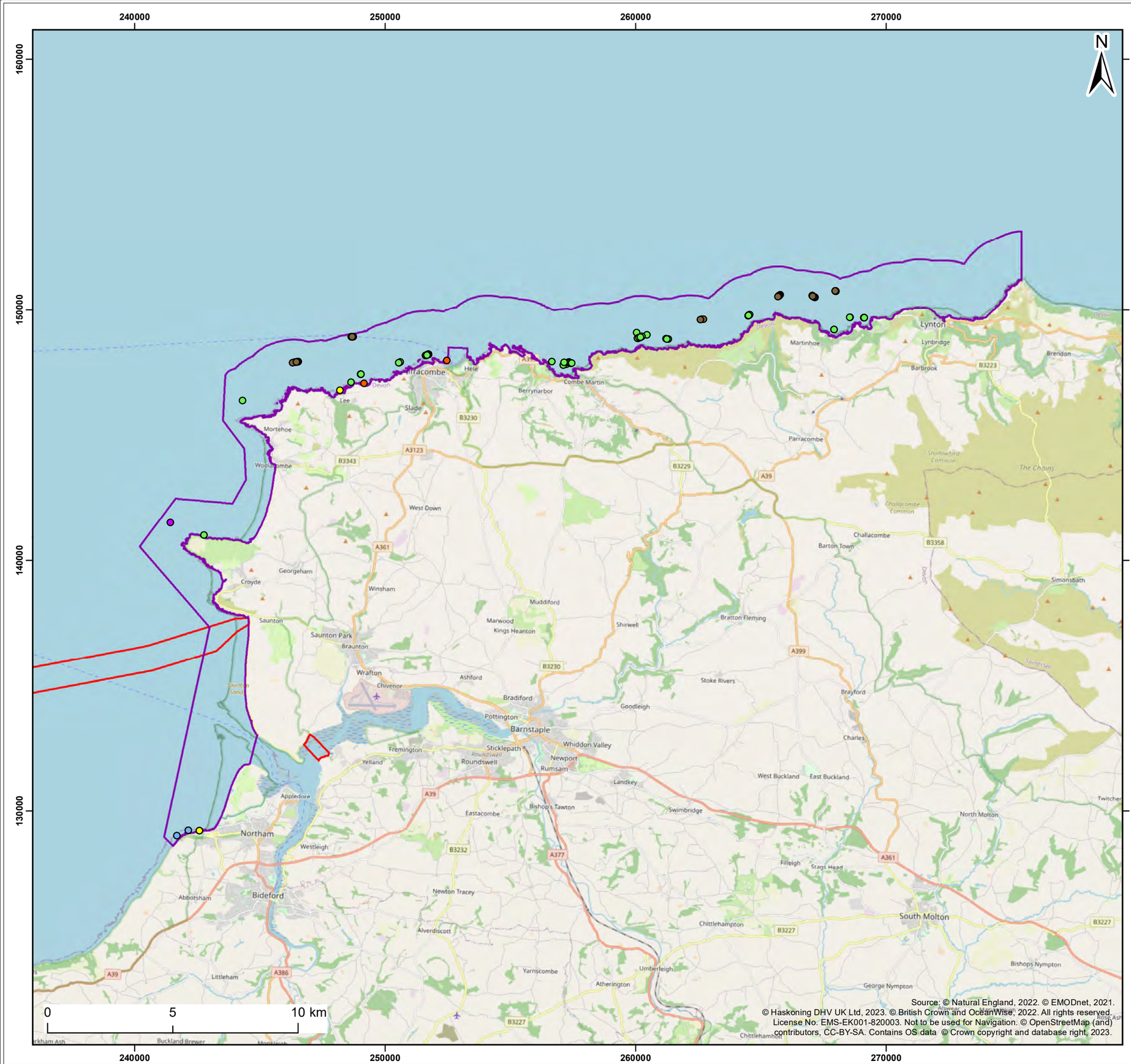

Legend:

- Offshore Export Cable Corridor
- Bideford to Foreland Point MCZ

Features of Conservation Importance

- Blue mussel (Mytilus edulis) beds
- Fragile sponge and anthozoan communities on subtidal rocky habitats
- Honeycomb worm (Sabellaria alveolata) reefs
- Intertidal under boulder communities
- Littoral chalk communities
- Ross worm (Sabellaria spinulosa) reefs

Client: Offshore Wind Ltd.	Project: White Cross Offshore Windfarm

Title: Bideford to Foreland Point MCZ Features of Conservation Importance

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7.1.2 Conservation Objectives

62. The overarching conservation objectives for the site is for its designated features either to be maintained in, or brought into, favourable condition.

63. For each protected feature, favourable condition means that, within a zone:

- its extent is stable or increasing
- its structure and functions, its quality, and the composition of its characteristic biological communities (including diversity and abundance of species forming part or inhabiting the habitat) are sufficient to ensure that its condition remains healthy and does not deteriorate.

64. With respect to a species of marine fauna within the zone, the quality and quantity of its habitat and the composition of its population in terms of number, age, and sex ratio are such to ensure that the population is maintained in numbers which enable it to thrive.

65. The reference to the composition of the characteristic biological communities of a habitat includes a reference to the diversity and abundance of species forming part of, or inhabiting, that habitat.

7.2 South West Approaches to Bristol Channel MCZ

66. The South West Approaches to Bristol Channel MCZ is located 8.9km from the Offshore Development Area.

7.2.1 Protected Features

67. The South West Approaches to the Bristol Channel MCZ is mainly comprised of two subtidal sediment types. These are made up of a range of fine sediments, coarser sediments, shell fragments, gravels, shingles and cobbles. These habitats provide a home for a wide variety of species that bury into the seabed, including worms, razor clams, anemones, sea cucumbers and sea urchins.

68. **Table 7.2** shows the features designated by the South West Approaches to Bristol Channel MCZ.

Table 7.2 Designated features for South West Approaches to Bristol Channel MCZ

Protected feature	Management approach
Subtidal coarse sediment	Recover to favourable condition
Subtidal sand	Recover to favourable condition

69. Formal conservation advice is not currently available for this MCZ, and no rationale for the recover target has been provided.

7.2.2 Conservation Objectives

70. The overarching conservation objectives of the MCZ is that the protected features so far as already in favourable condition, remain in such condition, and so far as not already in favourable condition, be brought into such condition, and remain in such condition.

71. For each protected feature, favourable condition means that, within a zone:

- its extent is stable or increasing
- its structure and functions, its quality, and the composition of its characteristic biological communities (including diversity and abundance of species forming part or inhabiting the habitat) are sufficient to ensure that its condition remains healthy and does not deteriorate.

72. The reference to the composition of the characteristic biological communities of a habitat includes a reference to the diversity and abundance of species forming part of, or inhabiting, that habitat.

7.3 Lundy MCZ

73. The Lundy MCZ is located 2km from the Offshore Development Area.

7.3.1 Protected Features

74. Lundy Island is exposed to a wide range of physical conditions as a result of differing degrees of wave action and tidal stream strength on sheltered and exposed coasts and headlands. This range of physical conditions, combined with the site's topographical variation, has resulted in the presence of an unusually diverse complex of marine habitats and associated communities within a small area. The MCZ is designated for a single feature spiny lobster *Palinurus elephas.*

75. The spiny lobster is listed by the IUCN as a globally 'Vulnerable' Red List species and is a UK priority species and a species of principal importance under the Natural Environment and Rural Communities Act (2006).

76. Once abundant in coastal habitats around the south west of England spiny lobsters suffered catastrophic population declines in the 1970's, 80's and 90's (Earll et al., 2018), (Hiscock, 2019), (Goñi and Latrouite, 2005). Since 2014 there has been evidence of large numbers of newly settled spiny lobsters recorded across the south west of England (Hiscock, 2019), (Bolton, 2018). The factors responsible for increased population recruitment are not well understood and it is not yet known whether this apparent population increase will persist.

77. The MCZ boundary is identical to the boundary of Lundy Special Area of Conservation (SAC) and contains an existing no-take zone.

78. **Table 7.3** shows the features designated by the Lundy MCZ.

Table 7.3 Designated features of Lundy MCZ

Protected feature	Management approach
Spiny lobster Palinurus elephas	Recover to favourable condition

79. For spiny lobster the recover target is based upon evidence that populations in south west England have severely declined in the past and are not yet fully recovered (Natural England, 2022b).

7.3.2 Conservation Objectives

80. The overarching conservation objectives for the site is for spiny lobster, either to be maintained in, or brought into, favourable condition.

81. Favourable condition means that a population within a zone is supported in numbers which enable it to thrive, by maintaining:

- the quality and quantity of its habitat
- the number, age and sex ratio of its population.

7.4 Project specific Surveys

82. To support the EIA and consenting of the Project, site specific surveys were undertaken both offshore and in the intertidal to characterise the seabed in the Windfarm Site and the Offshore Export Cable Corridor.

7.4.1 Project geophysical surveys

83. Site specific geophysical surveys were carried out in the Windfarm Site and the Offshore Export Cable Corridor in June through to August 2022. Data were acquired using a multibeam echosounder (MBES), side scan sonar (SSS), sub-bottom profiler (SBP) and single magnetometer (MAG). Projects benthic characterisation survey

7.4.2 Benthic characterisation survey

84. A benthic characterisation survey was conducted by Ocean Ecology Limited in 2022 (OEL, 2022).

85. The survey was conducted in June and July 2022 and covered the Windfarm Site and Offshore Export Cable Corridor. The survey included 134 sampling stations, none of which were taken within MCZ. The sampling consisted of drop-down video and stills photography at each sampling station, along with macrofaunal and physico-chemical grab samples. Sediment chemistry samples were acquired at 15

of the sampling stations. The distribution of this sampling is illustrated in **Figure 7.3.**

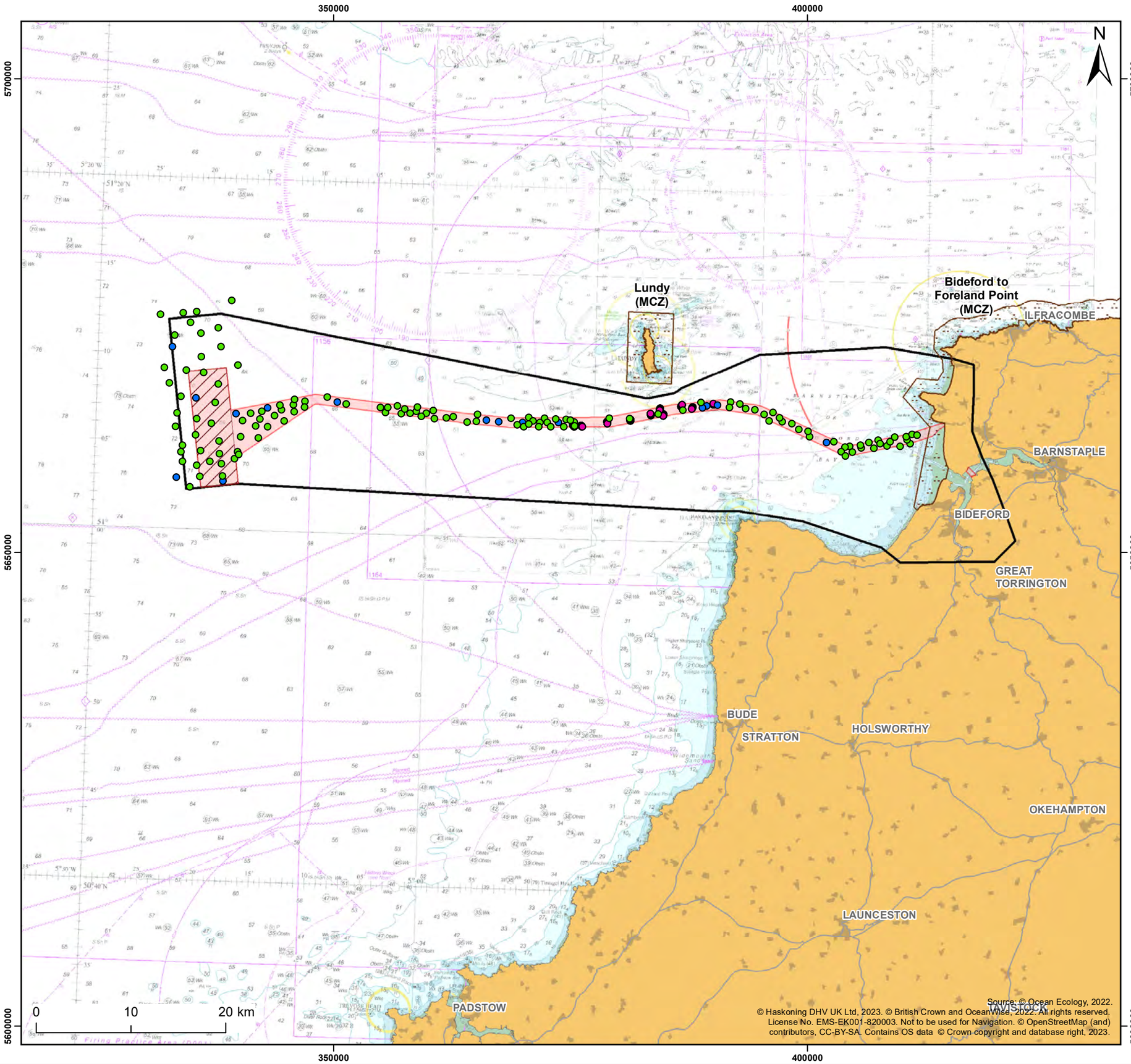
86. Four areas (Saunton Sands north and south, Crow Point and East Yelland) were selected for intertidal surveys conducted in May 2022 (EcoLogic Consultant Ecologist LLP, 2022). Five transects, running from the lower littoral to the high intertidal zone were followed within each intertidal survey area. Sediment samples were collected in order to separate infauna specimens from the substrate using a 1mm sieve. The collected infauna were identified prior to being released. In addition, 4-5 representative substrate samples per survey area were collected for laboratory particle size analysis.

87. The distribution of EUNIS habitats and biotopes were mapped for the survey area of the Project. By combining grab samples with seabed video and photography and evaluating them against multivariate groups (derived from faunal multivariate analysis), EUNIS habitats and biotopes were assigned along sampling stations.

88. Grab samples were taken on an offshore survey at 134 stations. Despite some variation in sediment types between stations, the majority of stations were dominated by sand. The majority of samples were comprised of sand representing EUNIS Broadscale Habitat (BSH) A5.2 (sand and muddy sand). Some stations were classified as sandy gravel (sG) or gravelly sand (gS) representing EUNIS BSH A5.1 (coarse sediment); one station was classified as muddy sandy gravel (msG), seven stations were classified as muddy sandy gravel (msG) and four station as gravelly muddy sand (gmS) representing EUNIS BSH A5.4 (mixed sediment). Further information about the sediments recorded can be found in **Appendix 8.B: Ocean Ecology (2022) benthic survey report**.

89. The habitat in the northern area of Saunton Sands was largely dominated by fine sand with patches of small rocks (approx. 5 -20cm) were scattered intermittently in areas of the upper littoral zone. The intertidal survey identified Intertidal Sand & Muddy Sand (A2.2) at the landfall location.

90. A technical report summarising the benthic ecology survey method and results is provided in **Appendix 8.B: Ocean Ecology (2022) benthic survey report**. A technical report summarising the intertidal ecology survey method and results is provided in Appendix 20.A of the EIA report.



Legend:

- Windfarm Site
- Area of Search
- Offshore Development Area
- Marine Conservation Zones (MCZ) - Screened In
- PSD & Macro
- PSD & Macro & Contaminants
- DDV Transects

Client: Offshore Wind Ltd.	Project: White Cross Offshore Windfarm

Title: Offshore Survey Area and Sample Locations

Figure:	Drawing No:
7.3	PC2978-RHD-ZZ-XX-DR-Z-0540

Revision:	Date:	Drawn:	Checked:	Size:	Scale:
P02	23/02/2023	AB	KH	A3	1:400,000
P01	14/02/2023	AB	KH	A3	1:400,000

Co-ordinate system: WGS 1984 UTM Zone 30N

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8. Stage 1 Assessment

91. This section presents the MCZA Stage 1 Assessment of the effects of the construction, operation and maintenance, and decommissioning of the Project on the protected features of the two MCZs. The assessment of each impact has considered the effects on the attributes and targets of each protected feature as provided by Natural England's SACOs (Natural England, 2022b and 2022c). The relevant attributes for each protected feature of the two MCZ's are considered in relation to each of the impacts screened in. The impacts screened in have been mapped to the pressures considered by Natural England's AoOs.

92. Following further consideration of each screened-in impact, in relation to each protected MCZ feature and corresponding attributes, an assessment is made as to whether the impact has the potential to hinder the achievement of the MCZ conservation objectives for each of the two sites and stated in **Table 7.1** and **Table 7.3**.

8.1 Bideford to Foreland Point MCZ

8.1.1 Potential Impacts during Construction

93. This section considers the potential impacts during construction. **Table 8.1** shows the sensitivities of each of the features of the MCZ to each of the impacts screened in.

94. The impacts screened in have been mapped to the pressures provided in Natural England's AoO (Natural England, 20122a and 2022b) using the most appropriate activity. For most of the impacts the relevant activity was 'Cables – Power cable: laying, burial and protection'. For underwater noise the relevant activity was 'Offshore wind: during construction'.

Table 8.1 Sensitivity of habitat features of Bideford to Foreland Point MCZ to construction impacts

Impacts screened in	Temporary physical disturbance		Increased SSCs	Re-mobilisation of contaminated sediments		Underwater noise and vibration	Invasive species
Equivalent pressure Protected feature	Abrasion/ disturbance of the substrate on the surface of the seabed	Habitat structure changes - removal of substratum (extraction)	Smothering and siltation rate changes (Light)	Synthetic compound contamination	Transition elements & organo-metal contamination	Underwater noise changes	Introduction or spread of invasive non-indigenous species (INIS)
High energy intertidal rock	Not sensitive-High	NR	Not sensitive-Medium	NA	NA	NR	Not sensitive-High
Intertidal under boulder communities	Medium	Medium	Low	NA	NA	NR	Medium
Littoral chalk communities	Low-Medium	Medium-High	Low-Medium	NA	NA	NR	Low-Medium
Low energy intertidal rock	Not sensitive-Medium	NR	Not sensitive-Medium	NA	NA	NR	Not sensitive-Medium
Moderate energy intertidal rock	Not sensitive-Medium	NR	Not sensitive-Medium	NA	NA	NR	Not sensitive-Medium
Honeycomb worm reefs	Low	Medium	Not sensitive	NA	NA	NR	Low

Impacts screened in	Temporary physical disturbance		Increased SSCs	Re-mobilisation of contaminated sediments		Underwater noise and vibration	Invasive species
Equivalent pressure Protected feature	Abrasion/ disturbance of the substrate on the surface of the seabed	Habitat structure changes - removal of substratum (extraction)	Smothering and siltation rate changes (Light)	Synthetic compound contamination	Transition elements & organo-metal contamination	Underwater noise changes	Introduction or spread of invasive non-indigenous species (INIS)
Intertidal coarse sediment	Not sensitive-Low	Medium	Not sensitive-Medium	NA	NA	NR	Not sensitive-Low
Intertidal mixed sediments	Low	Medium	Low	NA	NA	NR	Low
Intertidal sand and muddy sand	Low	Medium	Not sensitive	NA	NA	NR	Low
High energy infralittoral rock	Low-Medium	Medium	Not sensitive	NA	NA	NR	Low-Medium
Low energy infralittoral rock	Low-Medium	NR	Not sensitive-Low	NA	NA	NR	Low-Medium
Moderate energy infralittoral rock	Low-Medium	Medium	Not sensitive-Low	NA	NA	NR	Low-Medium

Impacts screened in	Temporary physical disturbance		Increased SSCs	Re-mobilisation of contaminated sediments		Underwater noise and vibration	Invasive species
Equivalent pressure Protected feature	Abrasion/ disturbance of the substrate on the surface of the seabed	Habitat structure changes - removal of substratum (extraction)	Smothering and siltation rate changes (Light)	Synthetic compound contamination	Transition elements & organo-metal contamination	Underwater noise changes	Introduction or spread of invasive non-indigenous species (INIS)
Subtidal coarse sediment	Not sensitive-Low	Medium	Not sensitive-Low	NA	NA	NR	Not sensitive-Low
Subtidal mixed sediments	Medium	Medium-High	Not sensitive-Medium	NA	NA	Not sensitive	Medium
Subtidal sand	Low-Medium	Medium	Not sensitive-Low	NA	NA	Not sensitive	Low-Medium
Fragile sponge and anthozoan communities	Medium-High	NR	Not sensitive	NA	NA	Not sensitive	Medium-High
High energy circalittoral rock	Low-High	Medium	Not sensitive-Low	NA	NA	NR	Low-High
Moderate energy circalittoral rock	Low-Medium	NR	Not sensitive-Medium	NA	NA	Not sensitive	Low-Medium
Spiny lobster	NR	NR	NR	NA	NA	Medium	NR

Impacts screened in	Temporary physical disturbance		Increased SSCs	Re-mobilisation of contaminated sediments		Underwater noise and vibration	Invasive species
Equivalent pressure Protected feature	Abrasion/ disturbance of the substrate on the surface of the seabed	Habitat structure changes - removal of substratum (extraction)	Smothering and siltation rate changes (Light)	Synthetic compound contamination	Transition elements & organo-metal contamination	Underwater noise changes	Introduction or spread of invasive non-indigenous species (INIS)
Pink sea-fan	Medium	NR	Not sensitive	NA	NA	NR	Medium

8.1.1.1 Temporary physical disturbance

95. Temporary physical disturbance within the Bideford to Foreland Point MCZ will occur as a result of any seabed preparation, export cable trenching, and works at the Landfall (in the worst case open trenching on the beach) where the Offshore Export Cable Corridor crosses the MCZ.

96. From reviewing the mapping of the habitats, the only potential for temporary physical disturbance is upon sediment features within the Offshore Export Cable Corridor and at the Landfall. The most likely features present, based upon site specific survey are Intertidal sand and muddy sand and Subtidal sand. As a precautionary measure, given the site-specific survey and mapping from EMODNet may not accurately describe the locations of habitats, all sediment habitats designated within the MCZ are considered to be potentially present. These are:

- Intertidal coarse sediment
- Intertidal mixed sediments
- Intertidal sand and muddy sand
- Subtidal coarse sediment
- Subtidal mixed sediments
- Subtidal sand.

97. **Table 8.1** summarises the sensitivity of the features to the pressures set out in the AoO (Natural England, 20122a and 2022b) under marine activity 'Cables – Power cable: laying, burial and protection'. The pressures relevant to construction-phase temporary physical disturbance are:

- Abrasion/disturbance of the substrate on the surface of the seabed
- Habitat structure changes –removal of substratum (extraction).

98. The sensitivity of the features for the two pressures ranges from Not-sensitive to Medium-High. The most likely habitats present, Intertidal sand and muddy sand and Subtidal sand have Not-sensitive to Medium sensitivity.

99. **Table 8.2** shows the attributes and targets from Natural England's SACOs (Natural England, 2022b) for the sediment features listed above, with conclusions against each on whether the impact will affect the target. Note that the relevant attributes and targets are the same for each of these features.

Table 8.2 Attributes and Targets for habitat features of Bideford to Foreland Point MCZ relevant to the pressure Abrasion/disturbance of the substrate on the surface of the seabed / Habitat structure changes - removal of substratum

Attribute	Target	Conclusion
Distribution: presence and spatial distribution of biological communities	Maintain the presence and spatial distribution of communities.	Target not affected The footprint of the Offshore Export Cable Corridor within the MCZ is minimal (approximately 1.8km length therefore 0.045ha), and given the nature of the sediments any disturbance will be temporary with the seabed returning to its preconstruction condition The temporary disturbance of the communities would have no effect on the distribution or composition of the communities affected. The most likely communities present (subtidal or sand) are noted in the AoO as having high resilience and therefore recovery within 2 years
Structure and function: presence and abundance of key structural and influential species	[Maintain OR Recover OR Restore] the abundance of listed species*, to enable each of them to be a viable component of the habitat.	
Structure: species composition of component communities	Maintain the species composition of component communities.	
Extent and distribution	Maintain the total extent and spatial distribution of the feature.	Target not affected The footprint of the Offshore Export Cable Corridor within the MCZ is minimal (0.045ha) and given the nature of the sediments any disturbance will be temporary with the seabed returning to its preconstruction condition. The temporary disturbance would not alter the extent of the features or the distribution or composition of their sediments only affecting the immediate construction footprint
Structure: sediment composition and distribution	Maintain the distribution of sediment composition types across the feature.	
Structure: topography	Maintain the presence of topographic features, while	Target not affected

Attribute	Target	Conclusion
	allowing for natural responses to hydrodynamic regime, by preventing erosion or deposition through human-induced activity.	The cable would be buried and there is a commitment to avoid use of cable protection in shallow coastal waters (including the MCZ). Once the seabed has recovered from construction (likely within a few years) there would be no change to the topography or knock-on effects on physical processes.
Supporting processes: energy / exposure	Maintain the natural physical energy resulting from waves, tides and other water flows, so that the exposure does not cause alteration to the biotopes and stability, across the habitat.	
Supporting processes: sediment movement and hydrodynamic regime (habitat)	Maintain all hydrodynamic and physical conditions such that natural water flow and sediment movement are not significantly altered or prevented from responding to changes in environmental conditions.	

100. Sediment features are generally highly dynamic and are noted by the AoO to generally have a high resilience, the highest sensitivity is to removal of substratum which would only happen in the immediate vicinity of the cables. Given the small footprint of any direct impact within the MCZ (0.045ha, assuming the worst case of 1.8km of cable routed within the site) any impact upon the features will be minimal as discussed in **Table 8.2**.

101. Based on the conclusions of **Table 8.2**.it is considered that the conservation objective of maintaining and recovering the features to favourable condition will not be hindered by temporary physical disturbance related to the construction of the Project.

8.1.1.2 Increased SSCs and subsequent deposition

102. During construction activities there may be a temporary increase in SSC and subsequent re-deposition of disturbed sediment. Increased SSCs have the potential to affect benthic ecology receptors by blocking feeding apparatus as well as by smothering sessile species upon redeposition. The EIA chapters below provide details of changes to SSC and subsequent sediment disposition:

- **Chapter 8: Marine and Coastal Processes**
- **Chapter 10: Benthic and Intertidal Ecology.**

103. The greatest effect (increases in SSCs and deposition) will be in the immediate vicinity of the cable installation works both subtidal and potentially intertidal. However, given that sediment will disperse, it is considered that all features of the MCZ could be affected.

104. **Table 8.1** summarises the sensitivity of the features to the pressures set out in the AoO (Natural England, 20122a) under marine activity 'Cables – Power cable: laying, burial and protection'. The relevant pressure for the impact of SSCs is:

- Smothering and siltation rate changes (Light).

105. The pressure 'Smothering and siltation rate changes (light)' has been used to assess the significance of effect as the MarESA justification for light smothering and siltation is 'up to 5cm' and in **Chapter 8: Marine and Coastal Processe**s the worst-case level sediment smothering, and deposition is approximately <1mm.

106. The sensitivity of the features for the pressure is Not Relevant for spiny lobster, and ranges from Not-sensitive to Medium-High for the habitat features.

107. **Table 8.3** shows the attributes and targets from Natural England's SACOs (Natural England, 2022b) for all the MCZ features (apart from spiny lobster as not relevant) with conclusions against each on whether the impact will affect the target. Note that the relevant attributes and targets are the same for each of these features.

Table 8.3 Attributes and Targets for habitat features of Bideford to Foreland Point MCZ relevant to the pressure Smothering and siltation rate changes (light)

Attribute	Target	Conclusion
Supporting processes: water quality - turbidity (habitat)	Maintain natural levels of turbidity (e.g. concentrations of suspended sediment, plankton and other material) across the habitat	Target not affected The increase in SSC is not likely to be high in magnitude for prolonged periods of time and is most likely to be within the range of natural variability in the system (e.g. during storms, SSC will naturally be higher than during calm periods). The increases in SSCs would be short in duration and, over time, the suspended sediment would disperse, either through settling of coarser sediments rapidly to the seabed close to the point of disturbance or, for finer
Supporting processes: water quality - turbidity (species)	Maintain natural levels of turbidity (e.g. concentrations of suspended sediment, plankton and other material) in areas where this species is, or could be, present.	

Attribute	Target	Conclusion
Supporting processes: sedimentation rate	Maintain the natural rate of sediment deposition.	sediments, as they become entrained within a plume within the water column and widely dispersed by tidal and wave action. It is anticipated that under the prevailing hydrodynamic conditions, this sediment would be readily re-mobilised, especially in the shallow inshore area where waves would regularly agitate the bed. Accordingly, outside the immediate vicinity of the Offshore Export Cable trench, bed level changes and any changes to seabed character are expected to be not measurable in practice. With the construction affecting different sections of the corridor progressively over time (rather than being instantaneous along the whole corridor at a single point in time), the impact is localised.

108. As described in **Table 8.3**, redeposition of suspended sediments will be local to the construction activity and is unlikely to change sediment composition and distribution. Increases in SSCs will be localised, short term and within the natural range of turbidity.

109. Based on the conclusions of **Table 8.3** it is considered that the conservation objective of maintaining and recovering the relevant features to favourable condition will not be hindered by increased SSCs and subsequent deposition related to the construction of the Project.

8.1.1.3 Re-mobilisation of contaminated sediments

110. The re-suspension of sediment during seabed preparation could lead to the release of contaminated sediment which may have an effect on benthic biological

communities associated with the protected features of Bideford to Foreland Point MCZ.

111. The impact of re-mobilisation of contaminated sediments has been defined using the following pressures identified by Natural England's AoO for the MCZ:

- Hydrocarbon & PAH contamination
- Transition elements & organo-metal (e.g. TBT) contamination.

112. However, these pressures have not been assessed and no sensitivities are provided by Natural England. To inform the baseline for sediment quality, a benthic survey of the offshore development areas was undertaken between June and July 2022 (Ocean Ecology, 2022) where grab sampling was undertaken and samples analysed for the following chemical contaminants:

- Trace metals
- Polyaromatic Hydrocarbons (PAHs)
- Polychlorinated Biphenyls (PCBs).

113. The results indicate that for all parameters, sediment contaminant concentrations are low (**Chapter 9: Marine Water and Sediment Quality**).

114. Where exceedances of sediment guidelines occur, these are marginal (i.e. only just above the lower guideline level value) which indicates that there is minimal risk to the marine environment. These exceedances are located in a discreet area within the wind farm site and along the cable corridor route and as such works within this area will be short term, lasting the duration of the cable installation only.

115. Additionally, sediments are not predicted to remain in suspension for long periods of time given that the seabed material is predominantly sand and as such will settle quickly and be a temporary impact. Therefore, the risk to the water column for partitioning to occur (the transfer of contaminants bound to sediment particles to being dissolved into the water column) is reduced.

116. Based on the absence of contaminants at levels of concern recorded within the Project area, it can be concluded that the conservation objectives of recover to or maintain in favourable condition the features of the MCZ will not be hindered by re-mobilisation of contaminated sediments related to the construction of the Project.

8.1.1.4 Underwater noise and vibration

117. During construction, underwater noise and vibration will be caused by clearance of unexploded ordnance (UXO), pile driving for the installation of OSP foundations, noise from other activities such as seabed preparation and cable laying and from vessels. All of these have the potential to impact on benthic fauna. However, given the distance of the Windfarm Site from the MCZ (71km) it is considered that piling

noise will not be relevant. Other noisy activities could occur in the Offshore Export Cable Corridor and these sources of noise could affect the MCZ features.

118. The impact of underwater noise and vibration has been defined using the following pressure identified by Natural England's AoO for the Bideford to Foreland Point MCZ:

    - Underwater noise changes

119. **Table 8.1** summarises the sensitivity of the features to underwater noise as Not Sensitive or Not relevant with the exception of spiny lobster which is classed as having Medium sensitivity. The only feature considered further is therefore spiny lobster.

120. There have been some studies on the ability of aquatic invertebrates to respond to noise. For example, Horridge (1966) found the hair-fan organ of the common lobster *Homarus gammarus* acts as an underwater vibration receptor. Lovell et al. (2005) showed that the common prawn *Palaemon serratus* is capable of hearing sounds within a range of 100 to 3,000 Hz, and the brown shrimp *Crangon crangon* has shown behavioural changes at frequencies around 170 Hz (Heinisch and Weise, 1987). De Soto *et al*. (2013) suggested that underwater noise can cause body malformations and development delays in marine larvae. Laboratory studies by Wale *et al*. (2013) and Roberts *et al*. (2016) indicated that noise negatively affects foraging and antipredator behaviour in crustaceans such as *Carcinus maenas* and *Pagurus bernhardus*. During seismic surveys, polychaetes have been observed to retreat into the bottom of their burrows or retract their palps, and bivalve species withdrew their siphons (Richardson *et al*., 1995).

121. Whilst these studies demonstrate potential for noise to negatively impact benthic invertebrates, notably crustacea, the sensitivity of benthic species to noise and vibration in general is poorly understood. As such, it is not possible to make firm conclusions about individual receptor sensitivity or determine threshold noise levels above which effects may begin to manifest. It is likely, however, that aquatic invertebrates are capable of detecting particle motion, including seabed vibration.

122. **Table 8.4** shows the attributes and targets from Natural England's SACOs (Natural England, 2022b) for spiny lobster with conclusions against each on whether the impact will affect the target.

Table 8.4 Attributes and Targets for spiny lobster relevant to the pressure underwater noise changes

Attribute	Target	Conclusion
Population: population size	Recover the population size within the site.	Target not affected Noise from UXO clearance will be instantaneous and therefore whilst there could be physical effects on individuals within the immediate area of the clearance, wider behavioural impacts will not occur. There is no information on the distances at which mortality could occur in invertebrates but for species where such estimates have been made the range of effect would be within 1km (see **Appendix 12.A: Marine Mammal and Marine Turtle Underwater Noise Report**) Noise sources from other activities, such as dredging during seabed preparation, ploughing for cable installation, scour protection / cable protection placement and vessel use, are unlikely to have a significant effect on benthic ecology as the benthos in the study area is likely to be habituated to ambient noise such as that created by vessel traffic, aggregate dredging etc.
Population: recruitment and reproductive capability	Recover the reproductive and recruitment capability of the species.	
Presence and spatial distribution of the species	Recover the presence and spatial distribution of the species and their ability to undertake key life cycle stages and behaviours.	

123. Based on the conclusions of **Table 8.4**, it is considered that the conservation objectives of recovering and maintaining spiny lobster in a favourable condition will not be hindered by underwater noise and vibration.

8.1.1.5 Invasive Non-Native Species (INNS)

124. The introduction of non-native species poses a threat to benthic communities as they may become invasive and displace native organisms by preying on them or out competing them for resources such as food, space, or both. The primary pathway for the introduction of INNS is through vessels and infrastructure sourced from a different region of ocean or sea.

125. There are multiple pathways for the introduction of INNS, including ship ballast water, hull fouling and solid ballast. Also, the placement of human-made structures could act as vectors for invasive species to colonise on new habitats (Glasby et al., 2007).

126. The introduction of INNS has the highest potential to occur during the construction phase of the works as this is when vessel activity will be at its highest frequency, and new infrastructure will be introduced and placed in the marine environment. Given the commitment that no cable protection will be placed within shallow coastal waters which includes the Offshore Export Cable Corridor within the MCZ, they would be no placement of new substrate within the MCZ upon which INNS could settle. Impacts would therefore only be likely from hull fouling or ballast water.

127. **Table 8.1** summarises the sensitivity of the features to the pressures set out in the AoO (Natural England, 20122a) under marine activity 'Cables – Power cable: laying, burial and protection'. The relevant pressure for the impact of SSCs is:

    - Introduction or spread of invasive non-indigenous species (INIS)

128. The sensitivity of the features for the pressure is Not Relevant for spiny lobster, and ranges from Not-sensitive to Medium-High for the habitat features.

129. **Table 8.5** shows the attributes and targets from Natural England's SACOs (Natural England, 2022b) for the sediment features listed above with conclusions against each on whether the impact will affect the target. Note that the relevant attributes and targets are the same for each of these features.

Table 8.5 Attributes and Targets for habitat features of Bideford to Foreland Point MCZ relevant to the pressure Introduction or spread of invasive non-indigenous species (INIS)

Attribute	Target	Conclusion
Structure: non-native species and pathogens (habitat)	Restrict the introduction and spread of non-native species and pathogens, and their impacts.	Target not affected Following international standards and regulations will minimize risk of introduction of INNS
Structure: Non-native species and pathogens (species)	Restrict the introduction and spread of non-native species and pathogens, and their impacts.	

130. The risk of spreading INNS will be mitigated by the following relevant regulations and guidance:

- International Convention for the Prevention of Pollution from Ships (MARPOL). The MARPOL sets out appropriate vessel maintenance
- The Environmental Damage (Prevention and Remediation (England) Regulations 2015. These regulations set out a polluter pays principle where the operators who cause a risk of significant damage or cause significant damage to land, water or biodiversity will have the responsibility to prevent damage occurring. If the damage does occur will have the duty to reinstate the environment to the original condition
- The International Convention for the Control and Management of Ships' Ballast Water and Sediments (BWM Convention), which provide global regulations to control the transfer of potentially invasive species.

131. These commitments are assured in the Construction Environmental Management Plan (CEMP) which will be agreed prior to the start of construction. An Outline CEMP is provided in **Chapter 5: Project Description, Appendix 5.A** of the EIA.

132. Given the commitments listed above, it is considered that the conservation objectives of recovering and maintaining the MCZ features in a favourable condition will not be hindered by the introduction of non-native species.

8.1.2 Potential Impacts during Operation and Maintenance

133. This section considers the potential impacts during operation and maintenance . **Table 8.6** shows the sensitivities of each of the features of the MCZ to each of the impacts screened in.

134. The impacts screened in have been mapped to the pressures provided in Natural England's AoO (Natural England, 20122a) using the most appropriate activity, which was 'Power cable: operation and maintenance'.

Table 8.6 Sensitivity of habitat features of Bideford to Foreland Point MCZ to operation and maintenance impacts

Impacts screened in	Effects on bedload sediment transport		Electromagnetic fields
Equivalent pressure Protected feature	Smothering and siltation rate changes (Light)	Water flow (tidal current) changes, including sediment transport considerations	
High energy intertidal rock	Not sensitive-Medium	Not sensitive	Insufficient Evidence
Intertidal under boulder communities	Low	Not sensitive	Insufficient Evidence
Littoral chalk communities	Low-Medium	Not sensitive	Insufficient Evidence
Low energy intertidal rock	Not sensitive-Medium	Not sensitive	Insufficient Evidence
Moderate energy intertidal rock	Not sensitive-Medium	Not sensitive-Medium	Insufficient Evidence
Honeycomb worm reefs	Not sensitive	Not sensitive	Insufficient Evidence
Intertidal coarse sediment	Not sensitive-Medium	Not sensitive	Insufficient Evidence
Intertidal mixed sediments	Low	Not sensitive – Low	Insufficient Evidence
Intertidal sand and muddy sand	Not sensitive	Not relevant	Insufficient Evidence
High energy infralittoral rock	Not sensitive	Not sensitive – Low	Insufficient Evidence
Low energy infralittoral rock	Not sensitive - Low	Not sensitive	Insufficient Evidence
Moderate energy infralittoral rock	Not sensitive - Low	Not sensitive	Insufficient Evidence
Subtidal coarse sediment	Not sensitive - Low	Not sensitive	Insufficient Evidence
Subtidal mixed sediments	Not sensitive-Medium	Not sensitive	Insufficient Evidence
Subtidal sand	Not sensitive - Low	Not sensitive	Insufficient Evidence
Fragile sponge and anthozoan communities	Not sensitive	Not sensitive	Insufficient Evidence

Impacts screened in	Effects on bedload sediment transport		Electromagnetic fields
Equivalent pressure Protected feature	Smothering and siltation rate changes (Light)	Water flow (tidal current) changes, including sediment transport considerations	
High energy circalittoral rock	Not sensitive - Low	Not sensitive	Insufficient Evidence
Moderate energy circalittoral rock	Not sensitive-Medium	Not sensitive-Medium	Insufficient Evidence
Spiny lobster	Not relevant	Not relevant	Insufficient Evidence
Pink sea-fan	Not sensitive	Not sensitive	Insufficient Evidence

8.1.2.1 Effects on bedload sediment transport

135. Changes to bedload sediment transport may occur as a result of the installation of cable protection measures within Offshore Export Cable Corridor. If export cables cannot be buried, they would be surface laid and protected in some manner, and cable protection would be required at cable crossings. Cable protection will take the form of rock or concrete mattresses. If protection is required, any linear protrusion on the seabed may interrupt bedload sediment transport processes.

136. The Applicant will make reasonable endeavours to bury cables, minimising the requirement for cable protection measures and thus effects on sediment transport.

137. Use of external cable protection would be minimised in all cases and no cable protection would be located in the nearshore including at the trenchless technique exit point. Therefore, there will be no cable protection within the MCZ. Any effects on bedload sediment transport would come from cable protection outside the MCZ.

138. **Table 8.6** summarises the sensitivity of the features to the pressures set out in the AoO (Natural England, 20122a and 2022b) under marine activity "Power cable: operation and maintenance'. The pressures relevant to construction-phase temporary physical disturbance are:

- Smothering and siltation rate changes (Light)
- Water flow (tidal current) changes, including sediment transport considerations

139. The sensitivity of the features for the two pressures ranges from Not-sensitive to Medium for Smothering and siltation rate changes (Light) and Not Relevant to Not Sensitive for Water flow (tidal current) changes.

140. **Table 8.7** shows the attributes and targets from Natural England's SACOs (Natural England, 2022b) for the features with some sensitivity with conclusions against each on whether the impact will affect the target. Note that the relevant attributes and targets are the same for each of these features with some sensitivity.

Table 8.7 Attributes and Targets for habitat features of Bideford to Foreland Point MCZ relevant to the pressure Smothering and siltation rate changes (Light)

Attribute	Target	Conclusion
Supporting processes: sediment movement and hydrodynamic regime (habitat)	Maintain sediment transport pathways to and from the feature to ensure replenishment of habitats that rely on the sediment supply.	Target not affected As discussed in **Chapter 8: Marine and Coastal Processes**, armoured cables or cable protection works sit relatively low above the seabed (a maximum of 1.4 m) and therefore there is unlikely to be any significant effect on suspended sediment processes. Seabed morphology and sediment transport would not be affected far outside of the direct footprint of construction works. If cable protection does present an obstruction to bedload transport, then it is likely that sandwaves would pass over them. Gross patterns of bedload transport would therefore not be affected significantly. Given that no cable protection will be within the MCZ, any effect will be from cable protection outside the MCZ
Supporting processes: sediment movement and hydrodynamic regime (species)	Maintain all hydrodynamic and physical conditions such that natural water flow and sediment movement is not significantly altered or constrained.	

141. Based on the conclusions of **Table 8.7** it is considered that the conservation objective of maintaining and recovering the relevant features to favourable condition will not be hindered by changes to bedload sediment transport related to the operation and maintenance of the Project.

8.1.2.2 Electromagnetic fields

142. There is potential for Offshore Export Cables within the Bideford to Foreland Point MCZ to produce electromagnetic fields (EMFs) that could interfere with the behaviour of benthic and shellfish species.

143. **Table 8.6** summarises the sensitivity of the features to the pressure set out in the AoO (Natural England, 20122a and 2022b) under marine activity "Power cable: operation and maintenance'. The pressure relevant to EMFs are:

- Electromagnetic fields

144. For all features Natural England has provided no assessment of sensitivity with 'Insufficient Evidence' listed instead. This is defined as: "The evidence base is not considered to be developed enough for assessments to be made of sensitivity at the pressure benchmark. This activity-pressure-feature combination should therefore be taken to further assessment. The best available evidence, relevant to the activity in question, at the time of application, should be sourced and considered in any further assessment." Given this, no attributes or targets have been assigned for this assessment.

145. Studies have found contrasting behaviours in benthic species towards EMF. Spiny lobster *Panulirus argus*, American lobster *Homarus americanus* and the edible crab *Cancer pagurus* have been found to exhibit behavioural responses to EMF where they favoured EMF sources (Boles and Lohmann, 2003, Hutchinson et al., 2020 and Scott et al., 2018). Conversely, yellow rock crabs *Metacarcinus anthonyi* and red rock crabs *Cancer productus* have been found to have no preference to EMF sources (Love et al., 2015). Harsanyi et al (2022) have found from laboratory studies that crab and lobster larvae could be affected by exposure to EMF at 2.8mT. However, EMF strength has been measured in terms of µT windfarm inter-array cable (Normandeau et al., 2011), an order of magnitude lower. Given this, it is considered that the results of Harsanyi et al (2022) reflect conditions that would not occur in reality.

146. The Project proposes to use armoured cables which mitigates both the electric and to an extent the magnetic fields. Cables will be buried in the MCZ, which again reduces the magnetic fields and is a suggested mitigation technique in NPS EN-3. EMF strength dissipates from submarine transmission cables rapidly, from 7.85µT at 0m, to 1.47µT at 4m, from the average windfarm inter-array cable buried 1m below the seabed (Normandeau et al., 2011). For perspective, the earth's magnetic

field has an estimated background magnitude of 25-65μT (Hutchinson et al, 2020). Any surface laid and protected cables will be outside the MCZ.

147. The effects of EMF have been assessed further in **Chapter: 10 Benthic and Intertidal Ecology** of the EIA with an overall significance of effect from interactions of EMF being assessed as **negligible**. Based on this, it is concluded that the conservation objectives of the Bideford to Foreland Point MCZ will not be hindered by EMF related to the operation and maintenance of the Project.

8.1.3 Potential Impacts during Decommissioning

148. The following effects have been considered for decommissioning:

- Temporary physical disturbance
- Increased SSCs
- Re-mobilisation of contaminated sediments
- Underwater noise and vibration
- Invasive Non-Native Species (INNS).

149. Effects on the features of the MCZ would be no greater than, and are expected to be less, those of the construction phase for all effects (**8.1.1**).

150. Given the lack of information regarding timing and methodology used for decommissioning, nor the conservation status of the MCZ features at the time of decommissioning, it is not possible to undertake a detailed assessment at this time. However, based on the relevant pressures, receptor sensitivity, and the assessment of impacts against the attributes of affected Bideford to Foreland Point MCZ features it can be concluded that the conservation objectives of maintaining their features to favourable condition will not be hindered by any of the effects related to the decommissioning of the Project.

151. A further assessment will be undertaken at the time of decommissioning.

8.1.4 Cumulative Effects

152. Plans and projects that existed at the time of MCZ designation or the latest status reports, undertaken every 6 years (whichever is most recent) are considered to be part of the baseline environment. Bideford to Foreland Point MCZ was included in the Defra (2018c) Marine Protected Areas Network Report. Lundy MCZ was designated in 2013. Plans and projects prior to 2018 are therefore considered part of the baseline and are screened out of the cumulative assessment. Relevant projects considered for potential cumulative effects are listed in **Table 8.8.**

Table 8.8 Projects considered in the cumulative impact assessment on benthic and intertidal ecology

Project	Status	Distance from windfarm site (km)	Included in the CEA?	Rationale
White Cross OWF – Onshore Project	Planned	0 (Landfall)	No	All intertidal construction activities are assessed within this assessment.
XLinks	Concept/Early planning	No exact location is publicly available, cable routes do not cross	No	Non-significant: The projects are beyond the 10km Zone of Influence. Additive impacts across the region will be small scale and localised with no overlap of effects for benthic ecology.
The Llŷr projects (floating offshore wind)	Pre-consent	22km	No	
South Pembrokeshire Demonstration Zone	Pre-planning application	30km	No	
Valorous Floating Wind Demo	Pre-planning application	34km	No	
Erebus Floating Wind Demo	Pre-planning application	38km	No	

153. No plans or projects have been identified within 10 km (ZoI). Therefore, no plans or projects are considered for cumulative assessment in the Stage 1 MCZA.

8.2 South West Approaches to Bristol Channel MCZ

154. Formal conservation advice is not currently available for this MCZ. In the absence of AoO or SACO for this site the information on relevant pressures, attributes and targets for the features (Subtidal coarse sediment and Subtidal sand) have been taken from those provided for the Bideford to Foreland Point MCZ. This assessment therefore cross references the relevant assessments and conclusions provided above.

8.2.1 Potential Impacts during Construction

155. This section considers the potential impacts during construction. shows the sensitivities of each of the features of the MCZ to each of the impacts screened in.

Table 8.9 Sensitivity of habitat features of South West Approaches to Bristol Channel MCZ to construction impacts

Impacts screened in	Increased SSCs / Effects on bedload sediment transport	Re-mobilisation of contaminated sediments		Invasive species
Equivalent pressure	Smothering and siltation rate changes (Light)	Synthetic compound contamination	Transition elements & organo-metal contamination	Introduction or spread of invasive non-indigenous species (INIS)
Protected feature				
Subtidal coarse sediment	Not sensitive-Low	NA	NA	Not sensitive-Low
Subtidal sand	Not sensitive-Low	NA	NA	Low-Medium

8.2.1.1 Increased SSCs and subsequent deposition

156. During construction activities there may be a temporary increase in SSC and subsequent re-deposition of disturbed sediment.

157. The assessment for the Bideford to Foreland Point MCZ (**Section 8.1.1.2**) concluded that the conservation objective of maintaining and recovering the relevant features to favourable condition will not be hindered by increased SSCs and subsequent deposition. It should be noted that the Bideford to Foreland Point MCZ would have construction works taking place within its boundaries. Therefore, given that the South West Approaches to Bristol Channel MCZ is 8.9km from the Offshore Development Area at its nearest point, effects would be lower (see **Chapter 8: Marine and Coastal Processes**).

158. It is therefore concluded that for the South West Approaches to Bristol Channel MCZ the conservation objective of maintaining and recovering the relevant features to favourable condition will not be hindered by increased SSCs and subsequent deposition related to the construction of the Project.

8.2.1.2 Re-mobilisation of contaminated sediments

159. The re-suspension of sediment during seabed preparation could lead to the release of contaminated sediment which may have an effect on benthic biological communities associated with the protected features of the South West Approaches to Bristol Channel MCZ.

160. As described in **Section 8.1.1.3** sediment contaminant concentrations within the Project Area are low and the risk of re-mobilisation of contaminated sediments is considered to be minimal. Given the distance of the South West Approaches to Bristol Channel MCZ from the Project Area, any risk for this site would be lower than for the Bideford to Foreland Point MCZ.

161. Based on the absence of contaminants at levels of concern recorded within the Project area, it can be concluded that the conservation objectives of recover to or maintain in favourable condition the features of the South West Approaches to Bristol Channel MCZ will not be hindered by re-mobilisation of contaminated sediments related to the construction of the Project.

8.2.1.3 Invasive Non-Native Species (INNS)

162. The introduction of non-native species poses a threat to benthic communities as they may become invasive and displace native organisms by preying on them or out competing them for resources such as food, space, or both. The primary pathway for the introduction of INNS is through vessels and infrastructure sourced from a different region of ocean or sea.

163. As described in **Section 8.1.1.5**, the risk of spreading INNS will be mitigated by following relevant regulations and guidance.

164. Given these commitments, it is considered that the conservation objectives of recovering and maintaining the MCZ features in a favourable condition will not be hindered by the introduction of non-native species.

8.2.2 Potential Impacts during Operation and Maintenance

165. This section considers the potential impacts during operation and maintenance. **Table 8.10** shows the sensitivities of each of the features of the MCZ to each of the impacts screened in.

Table 8.10 Sensitivity of habitat features of South West Approaches to Bristol Channel MCZ to operation and maintenance impacts

Impacts screened in	Effects on bedload sediment transport	
Equivalent pressure	Smothering and siltation rate changes (Light)	Water flow (tidal current) changes, including sediment transport considerations
Protected feature		
Subtidal coarse sediment	Not sensitive - Low	Not sensitive
Subtidal sand	Not sensitive - Low	Not sensitive

8.2.2.1 Effects on bedload sediment transport

166. Changes to bedload sediment transport may occur as a result of the installation of cable protection measures within Offshore Export Cable Corridor. If the Offshore Export Cables cannot be buried, they would be surface laid and protected in some manner, and cable protection would be required at cable crossings. Cable protection will take the form of rock or concrete mattresses. If protection is required, any linear protrusion on the seabed may interrupt bedload sediment transport processes.

167. The Applicant will make reasonable endeavours to bury cables, minimising the requirement for cable protection measures and thus effects on sediment transport.

168. As described in **Section 8.1.2.1** armoured cables or cable protection works sit relatively low above the seabed and therefore there is unlikely to be any significant effect on suspended sediment processes.

169. Given the distance of the South West Approaches to Bristol Channel MCZ from the Project Area, any effects for this site would be lower than for the Bideford to Foreland Point MCZ. Based on this, it is considered that the conservation objective of maintaining and recovering the relevant features to favourable condition will not be hindered by changes to bedload sediment transport related to the operation and maintenance of the Project.

8.2.3 Potential Impacts during Decommissioning

170. The following effects have been considered for decommissioning:

- Increased SSCs
- Re-mobilisation of contaminated sediments
- Invasive Non-Native Species (INNS).

171. Effects on the features of the MCZ would be no greater than, and are expected to be less, those of the construction phase for all effects (**Section 8.2.1**).

172. Given the lack of information regarding timing and methodology used for decommissioning, nor the conservation status of the MCZ features at the time of decommissioning, it is not possible to undertake a detailed assessment at this time. However, based on the relevant pressures, receptor sensitivity, and the assessment of impacts against the attributes of affected South West Approaches to Bristol Channel MCZ features it can be concluded that the conservation objectives of maintaining their features to favourable condition will not be hindered by any of the effects related to the decommissioning of the Project.

173. A further assessment will be undertaken at the time of decommissioning.

8.2.4 Cumulative Effects

174. As for the Bideford to Foreland Point MCZ (**Section 8.1.4**) no plans or projects have been identified within 10 km (ZoI). Therefore, no plans or projects are considered for cumulative assessment in the Stage 1 MCZA.

8.3 Lundy MCZ

8.3.1 Potential Impacts during Construction

175. This section considers the potential impacts during construction. **Table 8.11** shows the sensitivities of each of the features of the MCZ to each of the impacts screened in.

176. The impacts screened in have been mapped to the pressures provided in Natural England's AoO (Natural England, 20122a and 2022b) using the most appropriate activity 'Offshore wind: during construction'.

Table 8.11 Sensitivity of spiny lobster for Lundy MCZ to construction impacts

Impacts screened in	**Underwater noise and vibration**
Equivalent pressure **Protected feature**	**Underwater noise changes**
Spiny lobster	Medium

8.3.1.1 Underwater noise and vibration

177. During construction, underwater noise and vibration will be caused by clearance of unexploded ordnance (UXO), pile driving for the installation of OSP foundations, noise from other activities such as seabed preparation and cable laying and from vessels. Given the distance of the Windfarm Site from the MCZ (42km) it is considered that piling noise will not be relevant. Other noisy activities could occur in the Offshore Export Cable Corridor and these sources of noise could affect spiny lobster.

178. **Section 8.1.1.4** assesses the potential sources of noise for the Bideford to Foreland Point MCZ. It should be noted that for that site, noise sources would be present within the MCZ, whereas noise sources will be at least 2km from the Lundy MCZ.

179. Based on the conclusions presented in **Table 8.4**, it is considered that the conservation objectives of recovering and maintaining spiny lobster in a favourable condition will not be hindered by underwater noise and vibration.

8.3.2 Potential Impacts during Operation and Maintenance

180. No impacts were screened in for operation and maintenance.

8.3.3 Potential Impacts during Decommissioning

181. The following effects have been considered for decommissioning:

- Underwater noise and vibration

182. Given the lack of information regarding timing and methodology used for decommissioning, nor the conservation status of spiny lobster at the time of decommissioning, it is not possible to undertake a detailed assessment at this time. However, as per **Section 8.3.1** it is considered that the conservation objectives of recovering and maintaining spiny lobster in a favourable condition will not be hindered by effects of decommissioning.

183. A further assessment will be undertaken at the time of decommissioning.

8.3.4 Cumulative Effects

184. As for the Bideford to Foreland Point MCZ (**Section 8.1.4**) no plans or projects have been identified within 10 km (ZoI). Therefore, no plans or projects are considered for cumulative assessment in the Stage 1 MCZA.

9. Stage 1 Assessment Conclusion

185. Based on the information presented in the preceding sections, which include assessments on the relevant broadscale habitats and habitat FOCI, it can be concluded that the conservation objective to maintain and recover selected broadscale marine habitat features to favourable condition in the Bideford to Foreland Point MCZ will not be hindered by the construction, operation and maintenance, and decommissioning phases of the Project.

186. It can be concluded that the conservation objective to recover the spiny lobster to favourable condition in the Lundy MCZ will not be hindered by the construction, operation and maintenance, and decommissioning phases of the Project.

187. It can be concluded that the conservation objective to maintain and recover selected broadscale marine habitat features to favourable condition in the South West Approaches to Bristol Channel MCZ will not be hindered by the construction, operation and maintenance, and decommissioning phases of the Project.

188. Based on the outcome of this Stage 1 Assessment, the effects of the operation and maintenance phase of the Project on the MCZs does not require to be taken to Stage 2 Assessment.

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WHITE CROSS

White Cross Offshore Windfarm Environmental Statement

Chapter 10: Benthic and Intertidal Ecology

Appendix 10.B: Intertidal Survey Report

Appendix 20.B Intertidal Survey 2022

White Cross Wind Farm
Braunton Burrows, Braunton Marsh & East Yelland
Devon

Report Reference:	220316 IS rev02
Client/s:	Offshore Wind Ltd. (OWL)
Architect/Agent:	Royal HaskoningDHV
Survey Dates:	7th, 12th, and 14th May 2022
Report Date:	November 2022
Report Author:	Erin Reardon, BSc, PhD, MCIEEM
Approved By:	Andrew Charles BSc (Hons), MSc, MCIEEM
Surveyors	Erin Reardon, Jane Usher & Andrew Charles

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Disclaimer

1. Introduction

1.1 Site Background & Survey Purpose

Royal HaskoningDHV commissioned EcoLogic Consultant Ecologists LLP to undertake an Intertidal Survey at the coastal and estuarine extents of the proposed onshore export cable corridor routes for the White Cross Windfarm ("the Project").

The proposed onshore export cable corridor routes extend from the onshore substation at East Yelland, beneath the Taw-Torridge Estuary to Crow Point using horizontal directional drilling (HDD), and through Braunton Marsh and Braunton Burrows (Figure 1-1). There are two onshore export cable corridor routes. The first onshore export cable corridor route extends to the coast midway within the Braunton Burrows sand dunes, with a second route extending through/below Saunton Golf Course and extending to the coast at Saunton Sands (final preferred route is to be determined; see Figure 1.1).

Saunton Sands forms part of the Bideford to Foreland Point Marine Conservation Zone (MCZ). Braunton Burrows is a Special Area of Conservation (SAC) with marine components encompassing Saunton Sands and the intertidal area extending from Crow Point. Each of these areas lie within Oslo and Paris Conventions (OSPAR) Region III: Celtic Seas. The entire Taw-Torridge Estuary is designated a Marine Annex 1 Habitat – SAC Complex Features for estuaries.

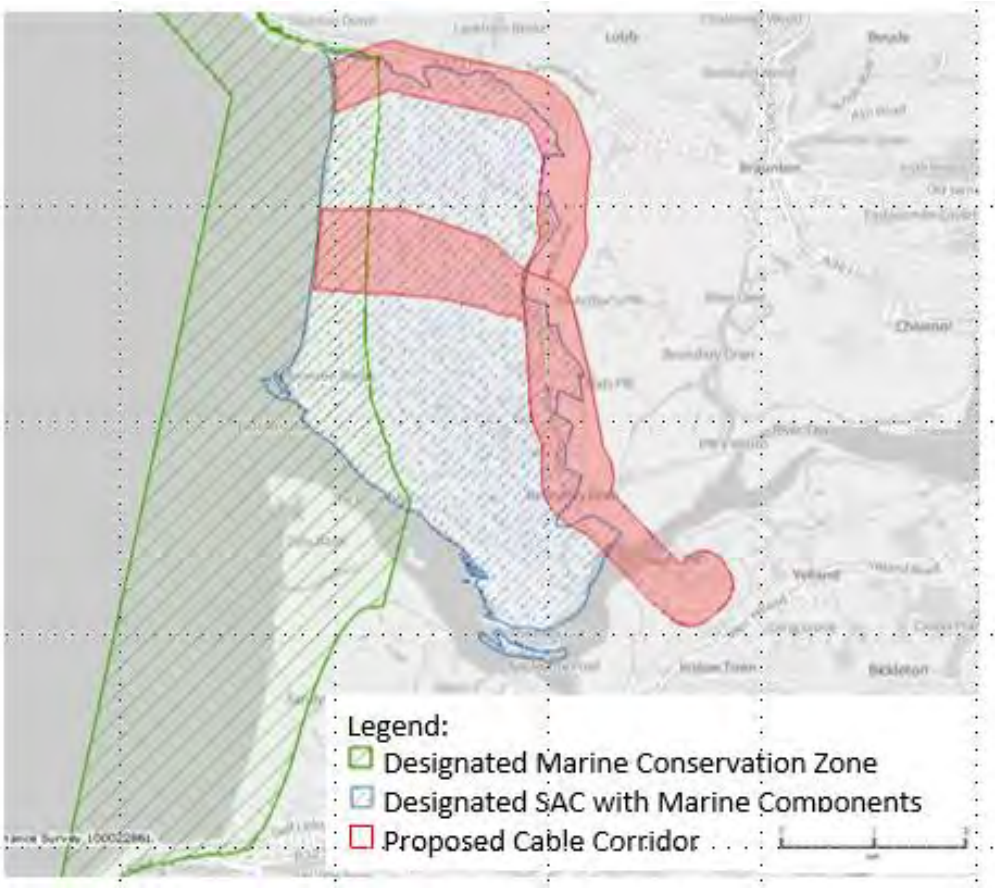

Figure 1.1. Marine-designated areas within the proposed Onshore Export Cable Corridor routes (red) including the portions of the Bideford to Foreland Point Marine Conservation Zone and the Braunton Burrows SAC with Marine Components (adapted from the JNCC MPA Mapper, May 2022).

2. Survey Methods

2.1 Scope of the Assessment

The zone of influence covers the intertidal habitats within the proposed Onshore Export Cable Corridor routes at Saunton Sands and the Taw-Torridge Estuary. The assessment considers designated sites, habitats, species of importance for biodiversity conservation and legally protected species.

2.2 Desk Study

A desk-based review was undertaken to identify protected species and habitats and/or species and habitats of conservation concern, with emphasis on coastal and marine zones associated with the estuary.

The desk-based review included review of the following resources:

- MAGIC (https://magic.defra.gov.uk/ – May 2022); and,
- JNCC mapper (https://jncc.gov.uk/mpa-mapper/ – May 2022).

2.3 Intertidal Biotope Survey

The intertidal biotope survey comprised of a walkover assessment of the intertidal extents of the proposed Onshore Export Cable Corridor routes and a 50m buffer area, using the marine intertidal Phase 1 biotope mapping survey (Wyn et al. 2000; JNCC, 2010), a standard technique for classifying and mapping British intertidal biotopes.

The intertidal biotope survey was carried out by Erin Reardon BSc. PhD MCIEEM, Jane Usher PhD and Andrew Charles BSc. (Hons) MSc. MCIEEM on the 7th, 12th and 14th May 2022 within two hours of low tide.

Five transects, running from the lower littoral to the high intertidal zone were followed within each intertidal survey area. This included a 'central' transect positioned along the tidal extents of the proposed onshore export cable corridor routes. With two further transects, one either side of the central transect, and two further transects again, each within the 250m outer buffer zone. The transect routes and substrate sampling points are presented on Figure 2.

Along each transect, the zones were identified based on visual features and assessed for indicators of ecological value, including the presence of, or field signs for any protected or rare habitats and species.

At a point within each zone along each transect route, a substrate sample was collected from approximately 20cm depth. Collected infauna specimens were separated from the substrate by 1mm sieve. The collected infauna were retained for identification prior to being released.

In addition, 4-5 representative substrate samples per survey area were collected from 15cm and stored in clean, plastic, labelled containers for laboratory particle size analysis.

2.4 Sediment Particle Size Analysis

A total of 19 sediment samples were collected in the field. In the laboratory at the University of Exeter, all samples were dried for 36 hours in a 56°C drying oven. To ensure no loss of sample, lid openings were wrapped in parafilm, and 3 puncture holes made with a 26-gauge needle. An EVOS M5000 (Invitrogen) was used to scan and quantify particle size.

Predetermined size particles were used for calibration (acid-washed glass beads, Sigma), size boundaries were determined using three diameter measurements from each glass bead size selection used. This is to allow for the irregular shape of sand/sediment and clay particles.

Each of the sediment sample was subsampled in triplicate for a total of 57 samples analysed. For each sample, 500mg of dry weight material was weighed.

Runs were performed in triplicate and plates randomised to minimise error.

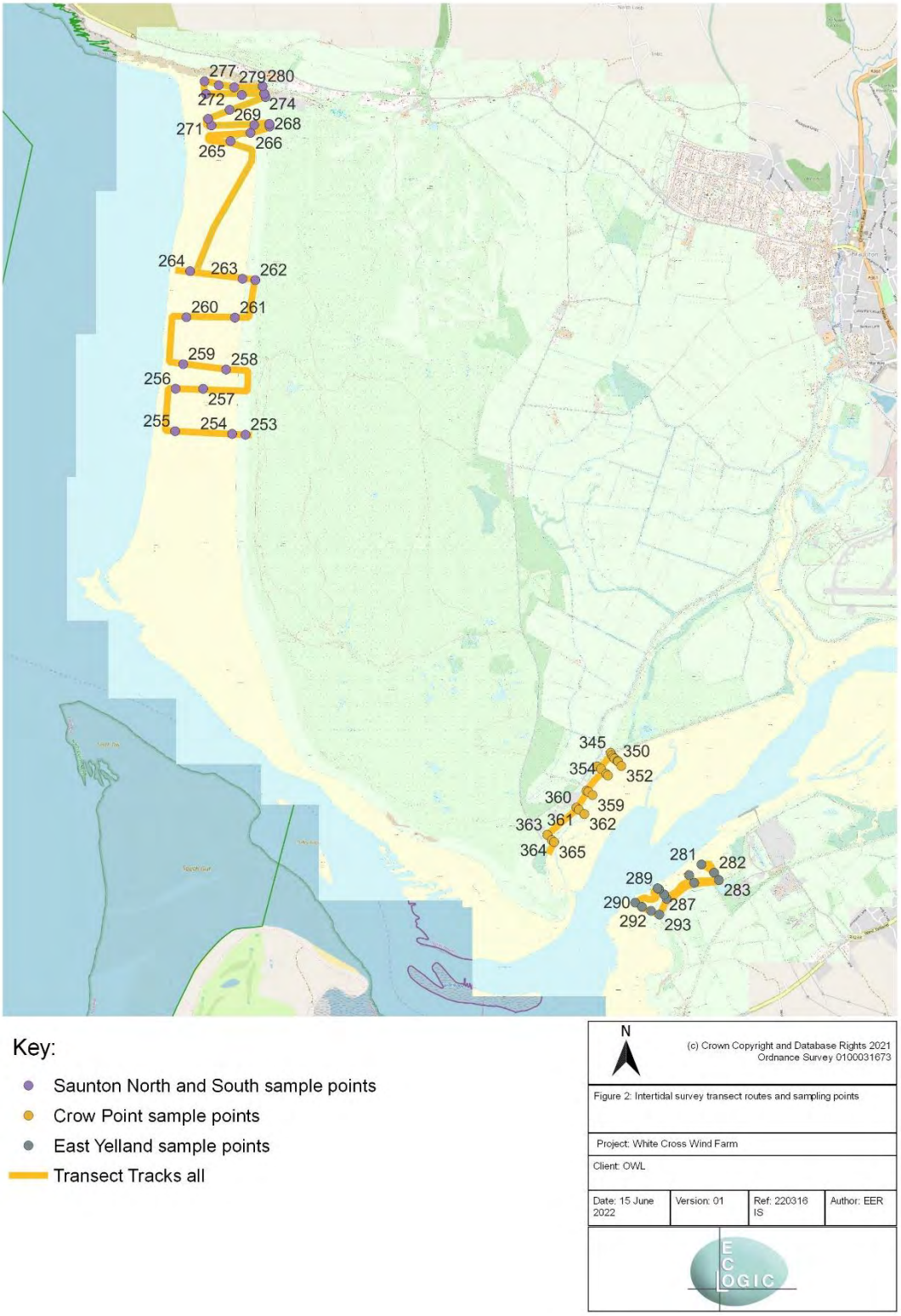

Figure 2-1. Intertidal survey transect routes and sampling points

3. Results

3.1 Desk Study

Bideford to Foreland Point MCZ

The Bideford to Foreland Point MCZ (UKMCZ0029; area 104 km^2) is located along the north coast of Devon. It was designated in 2016 based on the presence of 20 designated features of conservation importance (DEFRA, 2016).

The Saunton Sands portion of the study site sits within the central area of this MCZ. Within the proposed Onshore Export Cable Corridor, there were six designated features (EUNIS habitat classification 2012, amended 2019, Bern Convention):

- Intertidal Sand & Muddy Sand (A2.2): Shores comprising of clean sands (coarse, medium or fine-grained) and muddy sands with up to 25% silt and clay fraction. Shells and stones may occasionally be present on the surface. The sand may be duned or rippled as a result of wave action or tidal currents. Littoral sands exhibit varying degrees of drying at low tide depending on the steepness of the shore, the sediment grade and the height on the shore.
- Subtidal Sand (A5.2): lean medium to fine sands or non-cohesive slightly muddy sands on open coasts, offshore or in estuaries and marine inlets. Such habitats are often subject to a degree of wave action or tidal currents which restrict the silt and clay content to less than 15%. This habitat is characterised by a range of taxa including polychaetes, bivalve molluscs and amphipod crustacea.
- Low energy infralittoral rock (A3.3): Infralittoral rock in wave and tide-sheltered conditions, supporting silty communities with *Laminaria hyperborea* and/or *Laminaria saccharina* (A3.31). Associated seaweeds are typically silt-tolerant and include a high proportion of delicate filamentous types.
- High energy infralittoral rock (A3.1): Rocky habitats in the infralittoral zone subject to exposed to extremely exposed wave action or strong tidal streams. Typically, the rock supports a community of kelp *Laminaria hyperborean* with foliose seaweeds and animals, the latter tending to become more prominent in areas of strongest water movement.
- High energy intertidal rock (A1.1): Extremely exposed to moderately exposed or tide-swept bedrock and boulder shores. Extremely exposed shores dominated by mussels and barnacles, occasionally with robust fucoids or turfs of red

seaweed. Tide-swept shores support communities of fucoids, sponges and ascidians on the mid to lower shore.

- Patches of honeycomb worm *Sabellaria alveolata* (A2.7, HOCI_8) reefs: Many wave-exposed boulder scar grounds in the eastern basin of the Irish Sea (and as far south as Cornwall), are characterized by reefs of *S. alveolata* which build tubes from the mobile sand surrounding the boulders and cobbles. The tubes formed by *S. alveolata* form large reef-like hummocks, which serve to further stabilize the boulders. Small patches of honeycomb worm are present along the rocky shore along the northern boundary to Saunton Sands (Figure 3.1).

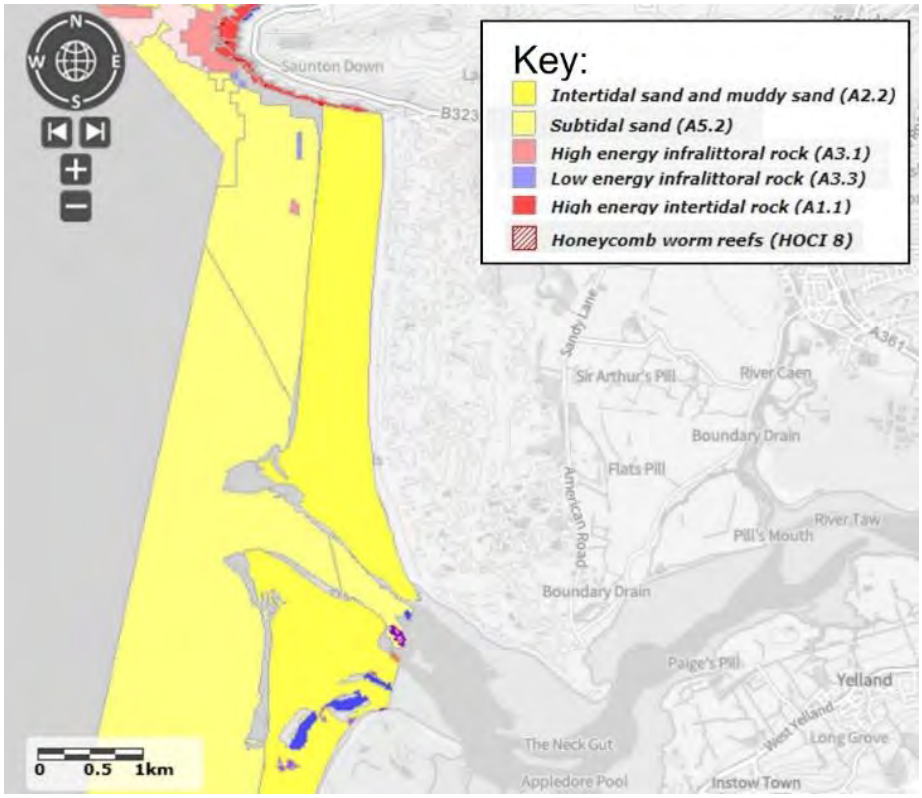

Figure 3-1. MCZ designated features identifying broad scale habitats, priority habitats and species of conservation importance at Saunton Sands (adapted from MAGIC, 2022).

Marine Components of the Braunton Burrows SAC

Braunton Burrows (~1,357 ha) is one of the largest dune systems in the UK, ~5 km long north-south and 1.5 km wide, with lime-rich dunes up to 30 m high, and an extensive system of variably flooded slacks, grassland and scrub, inland of a wide sandy foreshore. This site is also designated as a SSSI and forms the centre of the UNESCO North Devon Biosphere Reserve and North Devon AONB. This SAC is formed of predominately coastal sand dunes and sand beaches with a mosaic of scrub, broad-leaved deciduous woodland, improved grassland with small areas of sea cliff and inland water bodies. The terrestrial features of this SAC have been previously described in the Preliminary Ecology Appraisal for the Project (Ecologic, 2022). This site's marine features include intertidal sand & muddy sand (A2.2, described above) and Marine Annex 1 Habitat - SAC Complex Features of: large shallow inlets and bays (H1160) along Saunton Sands and estuaries (H1130) around Crow Point (Figure 3-2).

Taw-Torridge Estuary Marine Annex 1 Habitat

The Taw-Torridge Estuary is comprised of large areas of mudflats, sandbanks and areas of saltmarsh and beaches which supports a variety of overwintering and migratory wading birds, estuarine fish species, and a diversity of invertebrates (described in Ecologic, 2022). This estuary has one marine designation for Marine Annex 1 Habitat – SAC Complex Features for estuaries (H1130; Figure 3-2).

OSPAR Region III: Celtic Seas

All survey areas lie within the OSPAR Region III: Celtic Seas region.

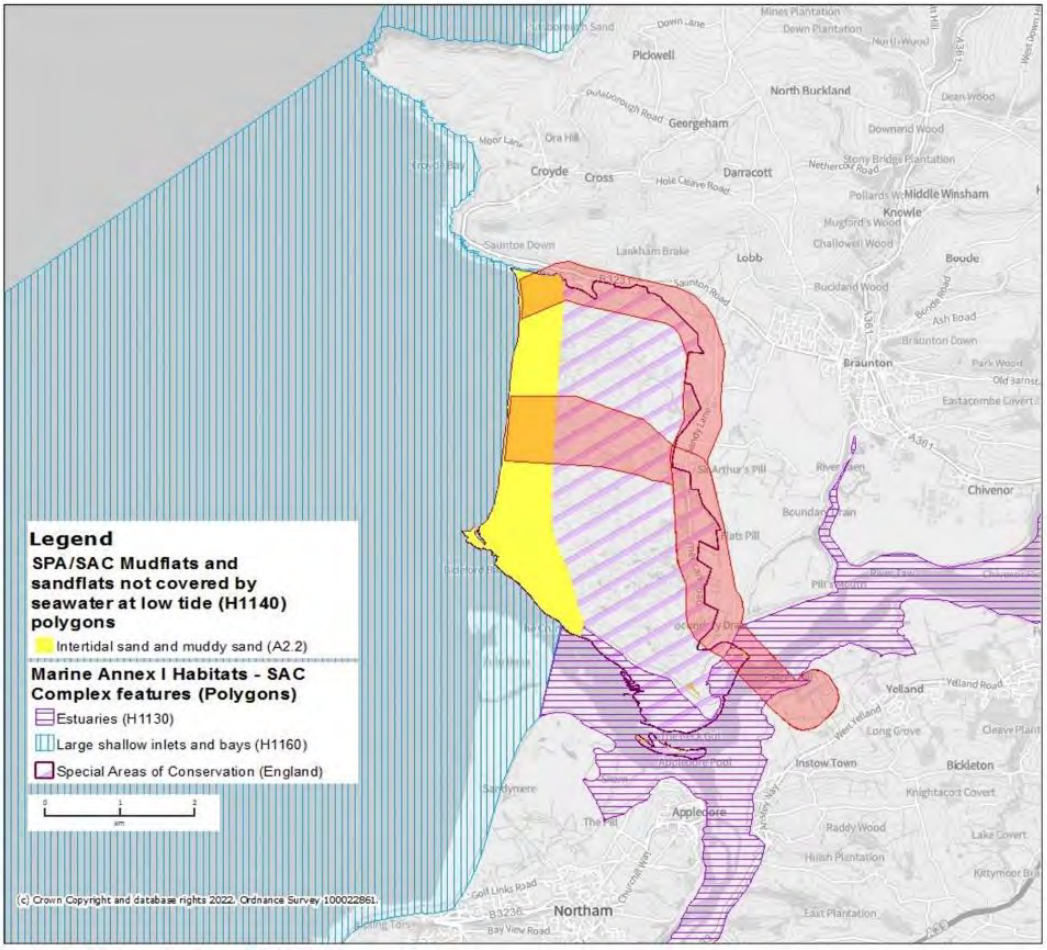

Figure 3-2. SAC features associated with the marine components of the Braunton Burrows SAC and Taw-Torridge Estuary Marine Annex 1 Habitat – SAC Complex Features for estuaries with the proposed cable route outlined in red.

3.2 Intertidal Biotope Survey

Weather conditions and timings of the May 2022 intertidal survey are presented in Table 3.1.

Table 3.1. Weather conditions and timings of the May 2022 intertidal survey.

Date	Area	Low tide time	Survey timing	Temp (C)	Cloud cover %	Wind	Precip-itation
7th May 2022	Saunton Sands (southern area)	4:56 pm	3-5pm	20	Transitioned from full sun to low visibility sea mist during survey	2-3	0
7th May 2022	Saunton Sands (northern area)	4:56 pm	5-6:30pm	19	100%	2	0
12th May 2022	East Yelland Quay	11:45 am	10 – 11:30am	15	30%	2-3	0
14th May 2022	Crow Point	11:39 am	11:45 – 13:00	17	20%	1	0

3.2.1 Saunton Sands – South

Across the Saunton Sands intertidal survey area, the habitat was sandy (ranging from 0.5-0.50mm), with finer sand/silt/mud at the low tide boundary and small rocks (less than 5cm) scattered near the high tide line (Figure 3-3; Plates 1-4). Although the beach was wide, the habitat was the same across the transects. There was evidence of marine worms such as blow lugworm *Arenicola marina* in the sandy sediment including breathing holes, sand trails, bore holes in mollusc shells scattered through the littoral zone (Plate 5). Across sediment dig points, only one specimen was collected. It was a small white catworm *Nephtys hombergii*, collected near the low tide line of the southernmost transect near point 255 (Plate 6). In addition, scattered sand brittle stars *Ophiura ophiura*, both alive and dead (Plate 7), sea potato *Echinocardium cordatum* exoskeletons, moon snail *Euspira heros* egg cases, cuttlefish *Sepia officinalis* cases and several ray egg cases were scattered across the littoral zone. A sanderling *Calidris alba* (~30 individuals) flock was feeding at water line near point 264 (Plate 8).

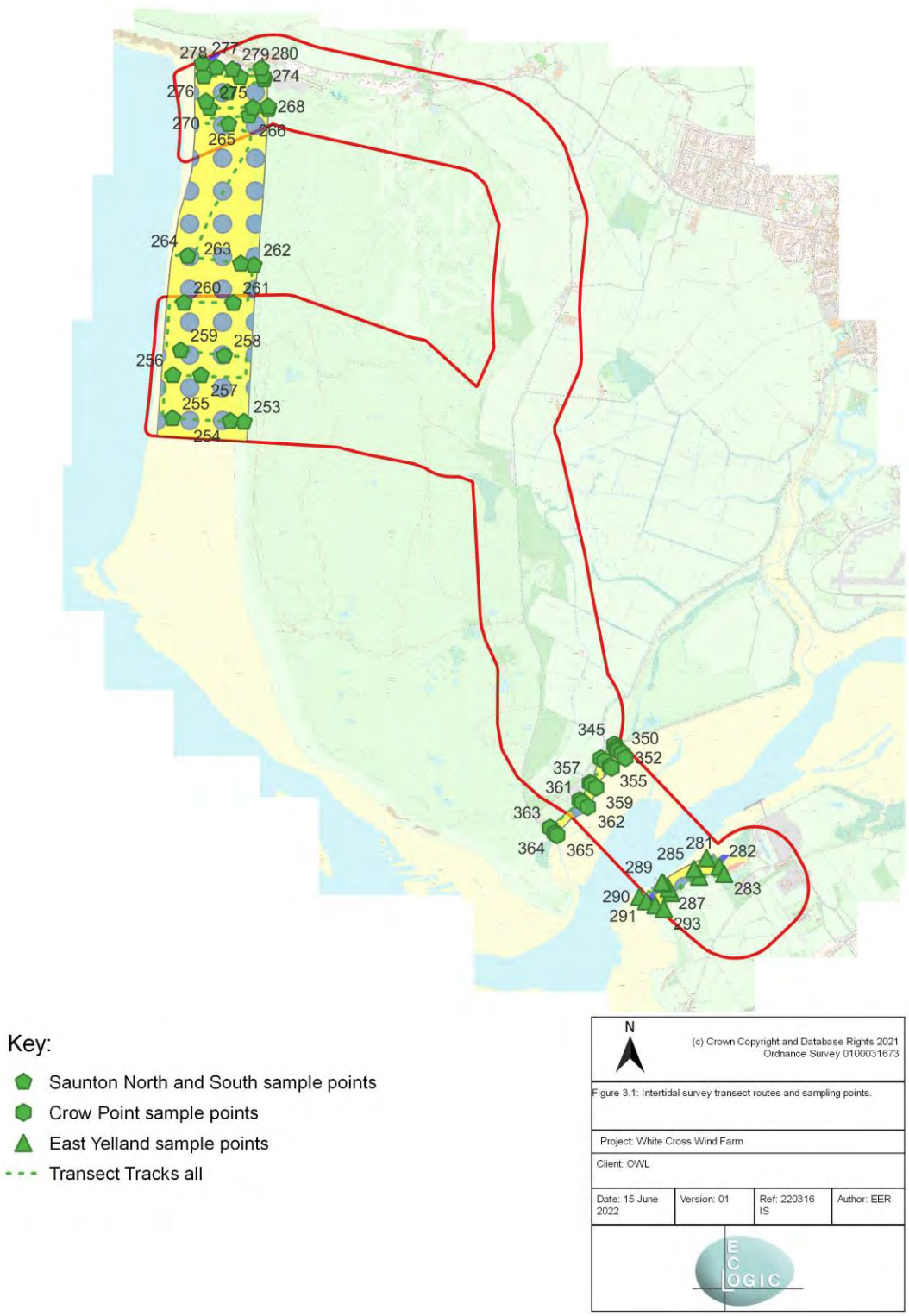

Figure 3-3. Intertidal survey transect routes and sample point identification numbers

Plate 1. Saunton Sands south from the southernmost transect with a view north.

Plate 2. Saunton Sands south with a view south.

Plate 3. Saunton Sands south looking east.

Plate 4. Area of sand habitat with scattered small rocks (point 261).

Plate 5. An example blow worm hole.

Plate 6. Cat worm collected from sediment sampling at point 255.

Plate 7. An example brittle star.

Plate 8. Group of Sanderling near point 264.

3.2.2 Saunton Sands – North

Similar to the southern survey area, the habitat in the northern area of Saunton Sands was largely dominated by fine sand (Figure 3-3, Plates 10-13; ranging from 0.002 – 0.50mm; fine-very fine range). Patches of small rocks (approx. 5 - 20cm) were scattered intermittently in areas of the upper littoral zone. There was evidence of marine worms such as blow lugworm in the sandy sediment including breathing holes, sand trails, bore holes in mollusc shells scattered through the littoral zone. One small white ragworm was collected at point 270. There was steady human presence (both people and dogs) in the upper littoral zone in the northern half of the survey area. The northern-most transect in this area was formed of rocky shore. Species present in the rock pools included: shanny *Lipophrys pholis*, Beadlet sea anemone *Actinia equina*, shore crab *Carcinus maenas* (Plate 14), periwinkle *Littorina littorea* (Plate 15), limpet *Patella sp.*, common rock barnacle *Semibalanus balanoides*, purple top shell *Gibbula umbilcalis* and thick topshell *Steromphala umbilicalis*. Seaweed species present in the rock pools included serrated wrack *Fucus serratus,* bladderwrack *Fucus vesiculosus*, sea lettuce *Ulva intestinalis* and coral weed *Corallina officinalis* (Plates 16-17).

Plate 10. The north survey area at Saunton Sands from the littoral rock habitat looking south across the sand.

Plate 11. The north Saunton survey area from the low water line looking east.

Plate 12. The high energy littoral rock habitat at the northern extent of the north Saunton survey area.

Plate 13. The southern portion of the upper littoral area of the north Saunton survey area.

Plate 14. The northern portion of the upper littoral area of the north Saunton survey area.

Plate 12. The northern portion of the upper littoral area of the north Saunton survey area.

Plate 13. The southern portion of the lower littoral area of the north Saunton survey area.

Plate 14. The shore crab observed near point 275.

Plate 15. Beadlet sea anemone, periwinkles and barnacles in the intertidal rock pools associated with the high energy littoral rock along the northern extent of the survey area.

Plate 16. Example flora and fauna of rock pool habitat assocaited with the high energy littoral rock along the northern extent of the survey area.

Plate 17. Example flora and fauna of rock pool habitat assocaited with the high energy littoral rock along the northern extent of the survey area.

3.2.3 East Yelland

The littoral habitat at East Yelland transitioned from intertidal mud and sand in the eastern extent of the survey area to sand in the central area to rocky shore with underlying mud along the western extent of the survey area (Figure 3-3; Plates 18-22). Throughout all habitats signs of blow lugworm and ragworm (feeding holes, sand castings; Plate 19). Dead shore crabs were found intermittently in the upper littoral zone (close to high tide line).

Along the eastern transect (points 281-283), the littoral habitat was intertidal mud (dominated by silt and very fine sand; sediment size ranging from 0.002-0.10mm). Several cockles were collected at point 281. West of point 282, there were intermittent patches of common cord grass *Spartina anglica* with gut weed on the sandy mud (Plate 22). There were also occasional seaweeds present such as egg wrack. One common ragworm *Hediste diversicolor* was collected at point 285.

The upper littoral habitat was shingle overlying sand and mud with patches of salt tolerant vegetation (area surveyed along points 284, 284 and 286; Plate 24) including sea purslane *Halimione portulacoides*, sea beet *Beta vulgaris maritima*, couch grass *Elymus repens*, and sea plantain *Plantago maritima*.

The intertidal habitat in the central portion of the survey area (between points 285 and 288) was in sand and mud (Plate 25; sediment sizes ranging from 0.002 – 0.10 mm in diameter). Two sand hoppers *Talitrus saltator* were collected at point 287. There was a patch of shale rock substrate along the sublittoral zone extending east from the jetty (Plate 26). There was a thick covering of egg wrack *Ascophyllum nodosum* on this rocky substrate brown with intermittent areas of gutweed. Species present in attached to the rocks in this area included barnacle, periwinkle, limpet, mussel, cockle and purple topshell. A cockle was collected from the sediment at point 289 (Plate 27).

The habitat along the western portion of this survey area (west of the jetty) transitioned from sand and mud with small, scattered rocks to rocky shore with underlying sand and mud (Plates 28-29). Two common ragworm were collected at points 290 and 291. There was a group of 18 oystercatchers *Haematopus ostralegus* foraging at an outcrop into the river (west of point 291).

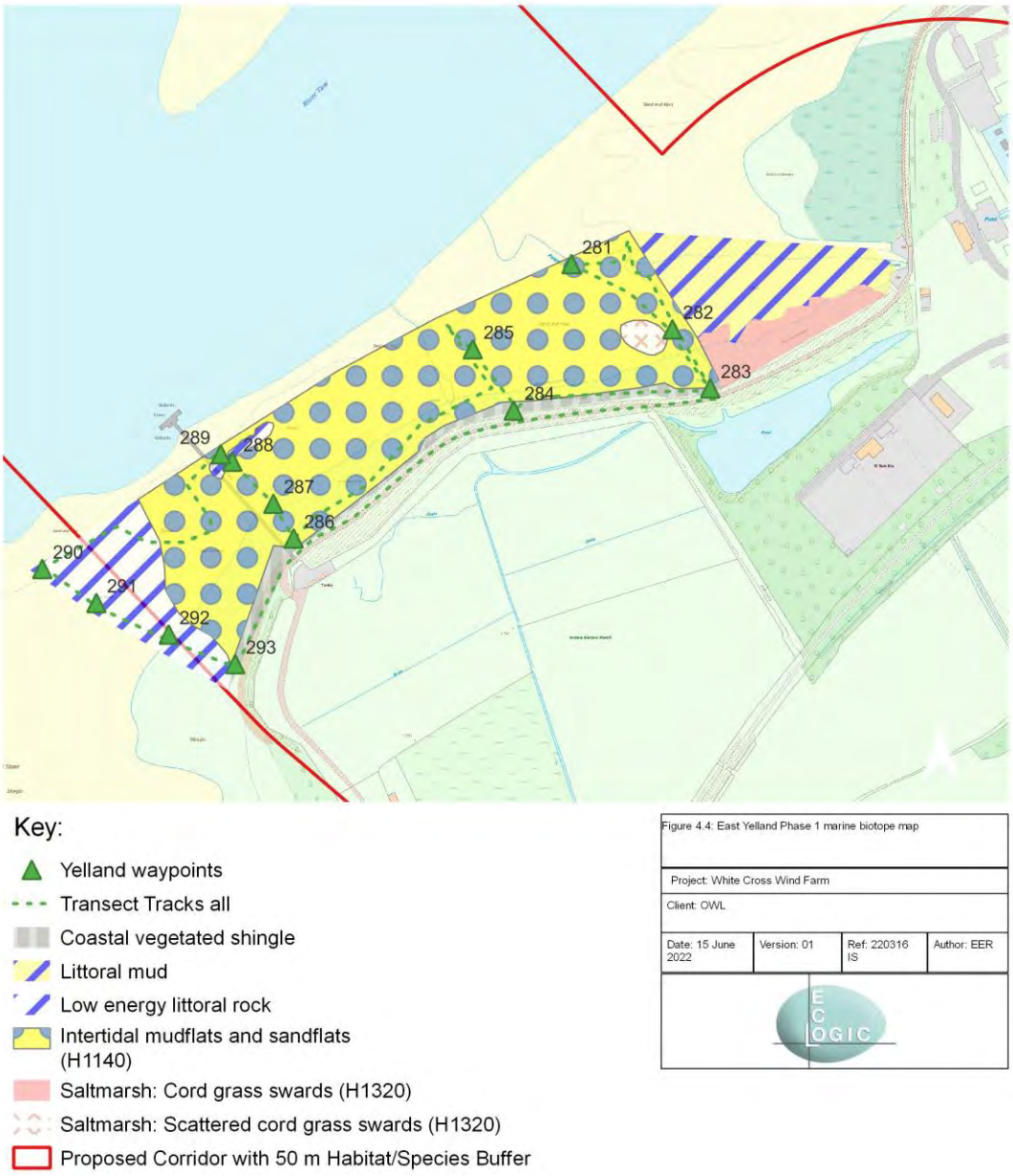

Figure 3-4. East Yelland Phase 1 marine biotope map

Plate 18. The eastern portion of the East Yelland survey area.

Plate 19. The muddy sand central East Yelland survey area of sand with scattered blow worm casings.

Plate 20. Intertidal mud habitat near point 281 with the outflow from the East Yelland pond further bound by salt marsh to the east.

Plate 21. Intertidal mud habitat near point 281 with the outflow from the East Yelland pond with patches of bladderwrack and empty cockle shells.

Plate 22. Sand with small patches of cord grass in the eastern portion of the survey area.

Plate 23. Example of sand with underlying mud.

Plate 24. Upper littoral zone in the central survey area.

Plate 25. The western portion of the central survey area.

Plate 26. Rock substrate with a thick covering of egg wrack

Plate 27. An example cockle collected at point 289.

Plate 28. The transition from sand to rock habitat west of the jetty.

Plate 29. Rocky habitat with egg wrack in the western portion of the survey area.

3.2.4 Crow Point

The majority of the upper littoral zone habitat was sand, transitioning to mud leading up to a small channel with flowing water at low tide (Figure 3-5; Plates 30-32, and 39). Beyond the channel, exposed mud flats extended to the low tide water line (Plate 30). A shore crab was observed on the bank near the channel (point 352).

Across this survey area, the lower littoral zone had signs of blow lugworm throughout. Three cockles were collected a point 350.

Moving from east to west, the beach transitioned from sandy to small rocks with underlying sand and mud. Near the channel bank (point 362) the substrate was predominately mud covering of gutweed and intermittent bladderwrack. At waypoint

362, two juvenile shore crabs (Plate 35) observed and two specimens of common ragworm (Plate 34) were collected.

On the western portion of the survey area, the rocky shore transitioned to a mix of mud and salt marsh. The salt marsh habitat was dominated by common cord, eelgrass and glass wort (Plates 37-38). Mud snails *Hydrobia ulvae* were abundant in this habitat, as well as periwinkle and cockle. Sounds of cockles filter feeding were clearly audible close to the water line (near point 365).

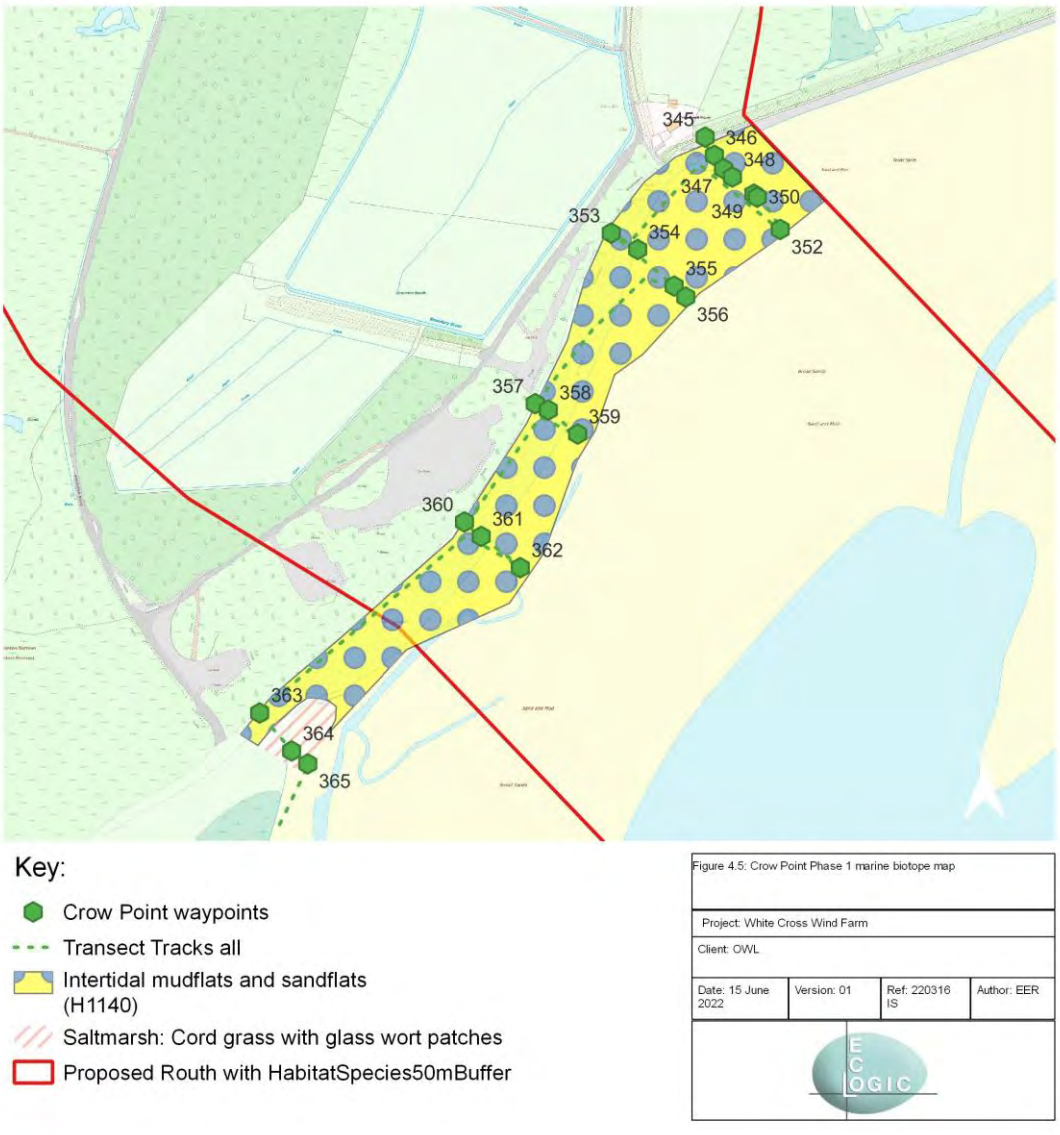

Figure 3-5. Crow Point Phase 1 marine biotope map

Plate 30. The eastern portion of the Crow Point survey area.

Plate 31. Sandy mud habitat with lugworm along the east of the Crow Point survey area.

Plate 32. The central survey area at Crow Point.

Plate 33. The muddy bank near the channel at point 362.

Plate 34. A ragworm collected at point 362.

Plate 35. A juvenile shore crab at point 362.

Plate 36. The western portion of the Crow Point survey area.

Plate 37. Cord grass swards in the western portion of the Crow Point survey area.

Plate 38. Glass wort and gut weed in the western extent of the Crow Point survey area.

Plate 39. The central portion of the Crow Point survey area.

3.3 Sediment Particle Size Analysis

See Table 3.2 for the composition of sediment size classes for each sample point.

Table 3.2. The composition of sediment size classes as percent of sample dry weight. Sample points correspond with waypoints presented on Figure 2.

Survey area	Sample point	Clay (less than 0.002 mm)	Silt (0.002-0.05 mm diam)	Very fine Sand (0.05-0.10 mm)	Fine Sand (0.10-0.25 mm)	Medium Sand (0.25 -0.50 mm)	Coarse Sand (0.50-1.00 mm)	Very Coarse Sand (1.00-2.00 mm)
Saunton South	254	0	3	36	38	23	0	0
	257	0	0	25	41	32	2	0
	258	0	6	25	42	24	3	0
	260	0	0	4	47	35	12	2
	263	0	0	17	26	55	2	0
Saunton North	265	0	11	38	39	4	6	2
	270	0	3	27	46	22	1	1
	272	0	8	39	26	24	2	1
	276	0	9	62	22	7	0	0
	278	0	26	46	24	4	0	0
East Yelland	281	0	51	36	7	6	0	0
	285	13	37	37	11	1	1	0
	287	0	43	39	18	0	0	0
	291	36	28	29	7	0	0	0
Crow Point	347	53	33	11	3	0	0	0
	354	0	3	26	37	34	0	0
	359	26	31	36	5	2	0	0
	361	0	2	21	46	28	3	0
	365	0	45	25	28	2	0	0

4. Discussion

4.1 Proposed Works

Potential damaging activities associated with the Project, include:

- Short term local disturbance to the downstream intertidal habitats during proposed works;
- Risk of short-term reduction in water quality to occur as a result of a fuel/oil/chemical spill or simply due to an increase in turbidity; and,
- Risk of introduction of non-native invasive species from equipment and supplies.

4.2 Designated Habitats & Species

The proposed Onshore Export Cable Corridor lies within the boundary of the designated Bideford to Foreland Point MCZ, Braunton Burrows SAC with marine components, and Marine Annex I Habitat with SAC Complex Features for estuaries (Figure 1-1).

The installation phase of the Project may cause short term disturbance and/or damage to an extent of intertidal habitats at Saunton Sands. It is understood that the onshore export cable corridor route will pass beneath the Taw-Torridge Estuary and thus will not be impacted by the Project.

Intertidal Sand & Muddy Sand (A2.2)

The four intertidal survey areas predominately comprised of intertidal sand & muddy sand (A2.2) habitat.

This habitat is afforded legal protection under the Resolution 4 (1996) of the Bern Convention on endangered natural habitats types using the EUNIS habitat classification (year of revision 2014).

The Project has potential to impact intertidal coarse sediment habitat due to:

- Any works taking place in or close to water have the potential to result in a reduction in water quality to occur as a result of a fuel/oil/chemical spill or simply due to an increase in turbidity during the installation phase of the Project.

Within Saunton Sands, it is considered unlikely that the Project will have any impact beyond insignificant on intertidal coarse sediment habitat due to the narrow working corridor and temporary time scale of disturbance. However, precautionary recommendations are provided to ensure the proposed construction works minimize impacts on this habitat.

There are no perceived long-term impacts of the Project after works are completed.

There will be no impact on the areas surveyed within the Taw Estuary because the proposed Onshore Export Cable Corridor runs beneath this habitat.

Subtidal sand (A5.2)

The habitat adjacent to the intertidal zone at Saunton Sands will be subtidal sand (Figure 3). There is no intertidal subtidal sand habitat located within or directly adjacent to the Taw River Estuary survey areas.

This habitat is afforded legal protection under the Annex I of Council Directive 92/43/EEC of 21 May 1992 on the conservation of natural habitats and of wild fauna and flora – consolidated version 01/01/2007.

The Project has potential to impact subtidal sand due to:

- Any works taking place in or close to water have the potential to result in a reduction in water quality to occur as a result of a fuel/oil/chemical spill or simply due to an increase in turbidity during the installation phase of the Project; and/or,
- Physical damage and/or disturbance during the installation phase due to alter tidal flow regimes and wave exposure, or resulting in sediment deposition influence the structure of the sedimentary habitat.

It is considered unlikely that the Project will have any impact beyond insignificant on subtidal sand sediment habitat due to due to the narrow working corridor and temporary time scale of disturbance. However, precautionary recommendations are provided to ensure the Project minimizes impacts on this habitat.

There are no perceived long-term impacts of the Project after works are completed.

Low energy infralittoral rock (A3.3)

There were small patches of low energy infralittoral rock west of the north Saunton Sands survey area. There were no other instances of this habitat within or directly adjacent to the other survey areas.

This habitat is afforded legal protection under the Annex I of Council Directive 92/43/EEC of 21 May 1992 on the conservation of natural habitats and of wild fauna and flora – consolidated version 01/01/2007.

The Project has potential to impact low energy infralittoral rock habitat due to:

- Construction works in or close to water create the potential to result in a reduction in water quality to occur as a result of a fuel/oil/chemical spill or simply due to an increase in turbidity during the installation phase of the Project.

It is considered unlikely that the Project will have any impact beyond insignificant on the low energy infralittoral rock. However, precautionary recommendations are provided to ensure the Project minimizes impacts on this habitat.

There are no perceived long-term impacts of the Project after works are completed.

High energy infralittoral rock (A1.1)

There was a small area of high energy infralittoral rock along the northern boundary of the north Saunton Sands survey area. There were no other instances of this habitat within or directly adjacent to the other three survey areas.

This habitat is afforded legal protection under the Annex I of Council Directive 92/43/EEC of 21 May 1992 on the conservation of natural habitats and of wild fauna and flora – consolidated version 01/01/2007.

The Project has potential to impact high energy infralittoral rock due to:

- Construction works in or close to water create the potential to result in a reduction in water quality to occur as a result of a fuel/oil/chemical spill or

simply due to an increase in turbidity during the installation phase of the Project.

It is considered unlikely that the Project will have any impact beyond insignificant on the high energy infralittoral rock. However, precautionary recommendations are provided to ensure the Project minimizes impact on this habitat.

There are no perceived long-term impacts of the Project after works are completed.

Honeycomb worm (A2.7)

There was no honeycomb worm identified within any of the survey areas. However, there were several patches of honeycomb located along the rocky shore west of the north Saunton survey area with the closest instance 100 m to the west. There was no honeycomb worm identified within or directly adjacent to the sites at Taw-Torridge Estuary.

This habitat is afforded legal protection under the Annex I of Council Directive 92/43/EEC of 21 May 1992 on the conservation of natural habitats and of wild fauna and flora – consolidated version 01/01/2007.

The Project has potential to impact honeycomb worm due to:

- Changes in sedimentation impacting filtration through gills due to contamination from construction phase, and post-construction due to altered sediment dynamics due to the changes to the sediment's profile;
- Construction works in or close to water create the potential to result in a reduction in water quality to occur as a result of a fuel/oil/chemical spill or simply due to an increase in turbidity during the proposed works; and/or,
- Habitat damage and/or disturbance during the construction phase.

It is considered unlikely that the Project will have any impact beyond insignificant on honeycomb worm due to the distance and scale of the Project. However, precautionary recommendations are provided to ensure the Project minimizes impacts on this habitat.

There are no perceived long-term impacts of the Project after works are completed.

4.3 Recommendations

Compliance Monitoring

Ecological supervision during the works to confirm adherence to constraints and implementation of control measures**.**

Timing of Works

All proposed works must avoid high tide. This is to avoid direct or indirect incidents or disturbance reducing water quality**.**

Pollution Prevention Measures

The works must be undertaken in compliance with Statutory Pollution Prevention Guidelines.

A site compound is to be established upon hardstanding and enclosed by protective fencing. While not in use all construction materials, equipment, machinery, facilities etc. must be sited within a designated compound.

All equipment and vehicles will be fit for purpose and will be subject to daily checks for signs of wear and tear, including leaks of any substance. Refuelling and maintenance of all equipment will take place within the site compound only.

Storage facilities must be installed to contain and prevent the release of fuel, oils, and chemicals associated with plant, refuelling and construction equipment, into the terrestrial or marine environment. Secondary containment must be used with a capacity of no less than 110% of the container's storage capacity.

No personal, equipment or vehicles are to operate within inundated tidal areas – i.e. works effecting the riverbank and/or newly created tidal areas, must avoid high tide. The Project is to include a pre-commencement site meeting and subsequent compliance monitoring visits, undertaken and recorded by a suitably qualified and pre-appointed ecologist. Such visits would be required to confirm adherence to recommendations/constraints and implementation of ecological mitigation and compensation recommendations.

4.4 Conclusion

Taking mitigation measures into account, the proposed development will likely have no significant negative impacts on the Bideford to Foreland Point MCZ, Marine Components of the Braunton Burrows SAC and the Taw-Torridge Estuary Marine Annex 1 Habitat. With implementation of the recommended mitigation and compensation measures, the proposal is considered to represent a neutral impact on the Bideford to Foreland Point MCZ, Marine Components of the Braunton Burrows SAC and the Taw-Torridge Estuary Marine Annex 1 Habitat.

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