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White Cross Offshore Wind Farm Environmental Statement

Chapter 10: Benthic and Intertidal Ecology

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Glossary of Acronyms

Acronym	Definition
ADDs	Acoustic Deterrent Devices
AfL	Agreement for Lease
BAC	Background Assessment Concentration
BEIS	Department for Business, Energy and Industrial Strategy
BGS	British Geological Society
BSH	Broadscale Habitat
BTO	British Trust for Ornithology
BWM	Ballast Water and Sediments
CEA	Cumulative Effect Assessment
Cefas	Centre for the Environment and Fisheries and Aquaculture Science
CIEEM	Chartered Institute of Ecology and Environmental Management
CPA	Coast Protection Act
DDC	Drop-Down Camera
DEA	Drag Embedment Anchor
DECC	Department for Energy and Climate Change
EIA	Environmental Impact Assessment
EMFs	Electromagnetic Frequency
ES	Environmental Statement
EU	European Union
EUNIS	European Nature Information System
FEPA	Food and Environmental Protection Act
FERA	Food and Environment Research Agency
HDD	Horizontal Directional Drilling
INNS	Invasive Non-Native Species
IPC	Infrastructure Planning Commission
JNCC	Joint Nature Conservancy Council
km	Kilometre
Km2	Square kilometre
m	Metre
MARPOL	International Convention for the Prevention of Pollution from Ships
MCZ	Marine Conservation Zone
MMO	Marine Management Organisation
MPS	Marine Policy Statement
NPL	National Physical Laboratory
NPS	National Policy Statement
NSIP	Nationally Significant Infrastructure Project
OEL	Ocean Ecology Limited

Acronym	Definition
OWL	Offshore Wind Ltd
PAH	Polycyclic Aromatic Hydrocarbon
PDE	Project Design Envelope
PEMP	Project Environmental Management Plan
PSA	Particle Size Analysis
RIAA	Report to Inform an Appropriate Assessment
SAC	Special Area of Conservation
SMRU	Sea Mammal Research Unit
SSC	Suspended Sediment Concentrations
SSSI	Site of Special Scientific Interest
TOC	Total Organic Carbon
TOM	Total Organic Matter
UK	United Kingdom
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	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 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, maintenance, 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 National Grid Company Onshore Substation comprising both the Offshore Export Cable Corridor and Onshore Export Cable Corridor.
High Voltage Alternating Current	High voltage alternating current is the bulk transmission of electricity by alternating current (AC), whereby the flow of electric charge periodically reverses direction.
High Voltage Direct Current	High voltage direct current is the bulk transmission of electricity by direct current (DC), whereby the flow of electric charge is in one direction.
In-combination effects	In-combination effects are those effects that may arise from the development proposed in combination with other plans and projects proposed/consented but not yet built and operational.
Inter-array cables	Cables which link the wind turbines to each other and the Offshore Substation Platform, or at the inter-array cables junction box (if no offshore substation). Array cables will connect the wind turbines to one and other and to the Offshore Substation (if utilised). The initial section for the inter-array cables will be freely suspended in the water column below the substructure (dynamic sections) while the on seabed sections of the cables will be buried where possible.
Landfall	Where the Offshore Export Cables come ashore (up to MHWS)

Defined Term	Description
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.
Mooring system	The equipment (mooring lines and seabed anchors) that keeps the floating substructure in position during operation through a fixed connection to the seabed.
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 impacts. 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 (up to MHWS). 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 (up to MHWS)
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 (up to MHWS)
Offshore Infrastructure	All of the offshore infrastructure including wind turbine generators, substructures, mooring lines, seabed anchors, Offshore Substation Platform and all cable types (export and inter-array). This encompasses the infrastructure 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
the Offshore Project	The Offshore Project for the offshore Section 36 and Marine Licence application includes all components offshore of MHWS. This includes the infrastructure within the windfarm site (e.g. wind turbine generators,

Defined Term	Description
	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
Offshore Wind Limited	Offshore Wind Ltd (OWL) 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 components 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.
Scour protection	Protective materials to avoid sediment being eroded away from the base of the foundations as a result of the flow of water
White Cross Offshore Windfarm	Up to 100MW capacity offshore windfarm including associated onshore and offshore infrastructure
Wind Turbine Generators (WTG)	The wind turbine generators convert wind energy into electrical power. Key components include the rotor blades, nacelle (housing for electrical generator and other electrical and control equipment) and tower. The final selection of project wind turbine model will be made post-consent application
Windfarm Site	The area within which the wind turbines, Offshore Substation Platform and inter-array cables will be present
Works completion date	Date at which construction works are deemed to be complete and the windfarm is handed to the operations team. In reality, this may take place over a period of time.

10. Benthic and Intertidal Ecology

10.1 Introduction

1. This chapter of the Environmental Statement (ES) presents effects of the White Cross Offshore Windfarm Project (the Offshore Project) on benthic and intertidal ecology. Specifically, this chapter considers the potential effect of the Offshore Project seaward of Mean High-Water Springs (MHWS) 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**). The ES will accompany the application to the Marine Management Organisation (MMO) on behalf of the Secretary of State for Business for The Department for Business, Energy and Industrial Strategy (BEIS) for Section 36 Consent and relevant Marine Licences under the Marine and Coastal Access Act 2009.

3. This ES chapter:

- Presents the existing benthic and intertidal ecology baseline established from desk studies, and consultation
- Presents the potential environmental effects on benthic and intertidal ecology arising from the Offshore 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

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

10.2.1 National Policy Statements

5. National Policy Statements (NPS) are statutory documents which set out the government’s policy on specific types of NSIPs and are published in accordance with the Planning Act 2008.

6. The Planning Act 2008 makes provision for NPSs, which are designed to set the policy framework for determination of NSIP applications. They integrate the UK Government's objectives for infrastructure capacity and development with its wider economic, environmental and social policy objectives, including climate change goals and targets, in order to deliver sustainable development.

7. Although the Offshore 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 relevant to the Offshore Project and decision-making and are referred to in this ES.

8. There are twelve NPSs in total, of which six are relevant to energy and are produced by the former Department of Energy and Climate Change (DECC). The three NPSs of relevance to the Offshore Project includes:

- EN-1 Overarching Energy NPS (DECC, 2011a): Sets out the government's policy, regulatory framework and high-level objectives in relation to development of energy infrastructure. In combination with the relevant technology-specific energy NPSs, provides the basis on which the Infrastructure Planning Commission (IPC) makes its decisions in relation to applications for energy developments that fall within the scope of NPSs.
- EN-3 Renewable Energy Infrastructure NPS (DECC, 2011b): Considered together with EN-1 to form the primary policy for the IPCs decisions on applications for nationally significant renewable energy infrastructure. This NPS also includes general principles on how assessment of impacts is applied for renewable energy projects development consent applications.

9. The specific requirements of EN-1 and EN-3 are summarised in **Table 10.1**.

Table 10.1 Summary of NPS EN-1 and EN-3 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;	There will be no impact on the intertidal zone due to the use of Horizontal Directional Drilling (HDD) (or other trenchless) as embedded mitigation (**Section 10.6.1**).

Summary	How and where this is considered in the ES
▪ 4.Disturbance during cable installation and removal (decommissioning), ▪ Increased suspended sediment loads in the intertidal zone during installation; and ▪ Predicted rates at which the intertidal zone might recover from temporary effects. **- NPS EN-3, Section 2.6.81**	
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.
Where necessary, assessment of the effects on the subtidal environment should include: ▪ Loss of habitat due to foundation type including associated sea bed preparation, predicted scour, scour protection and altered sedimentary processes ▪ Environmental appraisal of array cables and cable routes and installation methods ▪ Habitat disturbance from construction vessels' extendible legs and anchors ▪ Increased suspended sediment loads during construction; and ▪ Predicted rates at which the subtidal zone might recover from temporary effects. **- NPS EN-3 Section 2.6.113.**	**Section 10.5: Potential Impacts during Construction**
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 ▪ Burying cables at a sufficient depth, taking into account other constraints, to allow the seabed to recover to its natural state; and ▪ 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**	Mitigation measures embedded in the Offshore Project design are outlined after each Impact in **Sections 10.5, 10.6 and 174**.

10. The Marine Policy Statement (MPS) (HM Government, 2011; discussed further in **Chapter 3: Policy and Legislative Context**) 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.

11. 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 Offshore 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

12. Guidance on the requirements for offshore wind farm projects are provided in the documents listed below:

- 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.

13. 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 (CIEEA) (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.

10.3 Assessment Methodology

10.3.1 Study Area

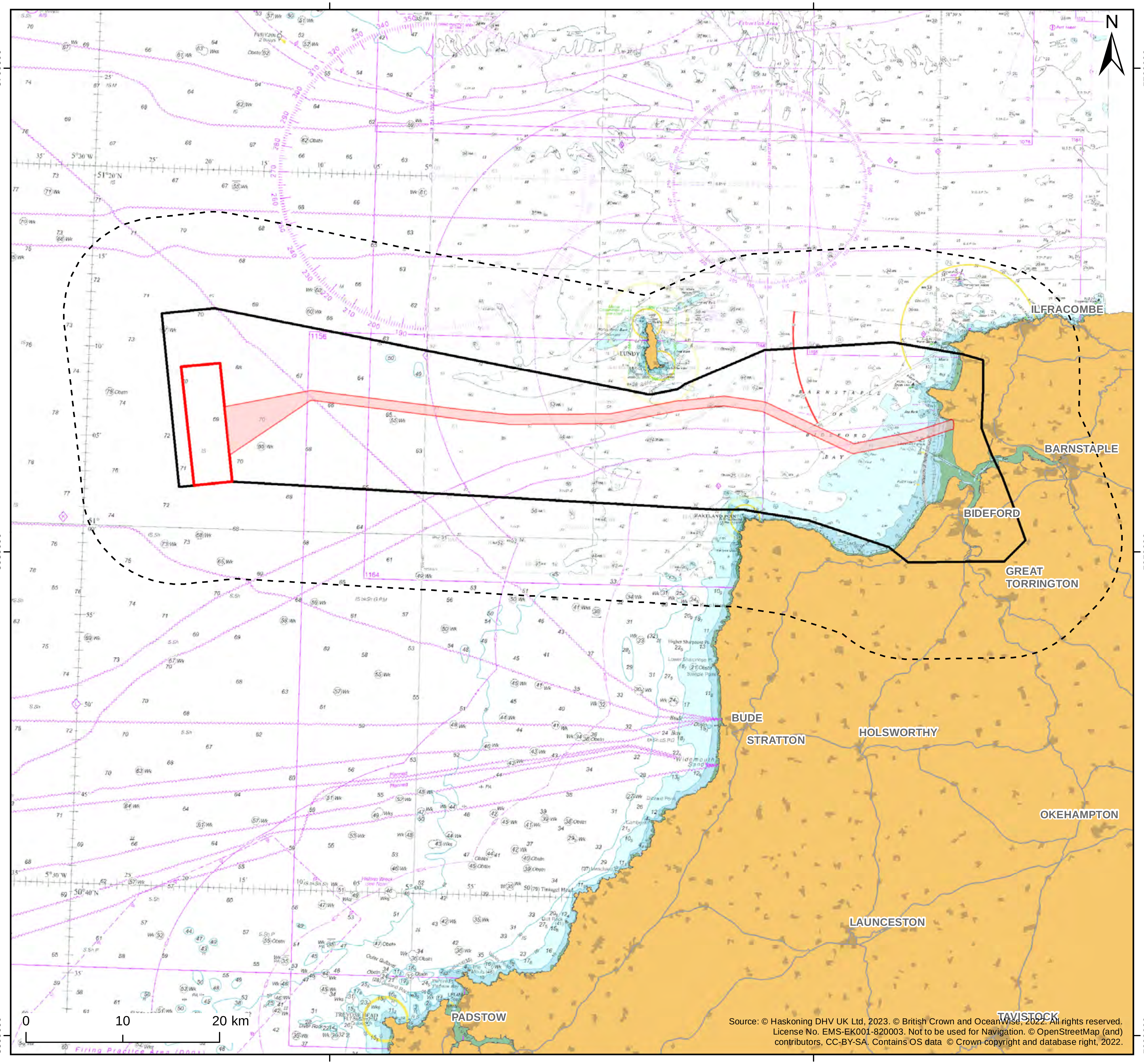
14. Details of the location of the Offshore Project and the offshore infrastructure are set out within **Chapter 5: Project Description.**

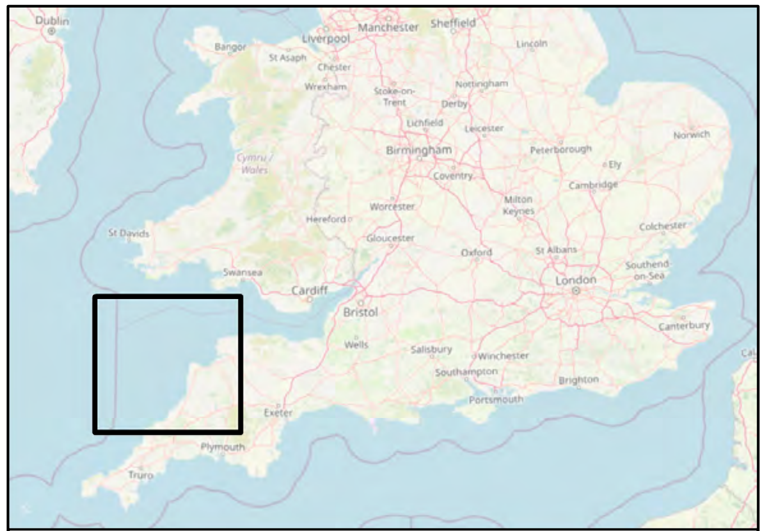
15. The benthic and intertidal ecology study area is defined by the distance over which impacts on geology and ground conditions from all the offshore project components (i.e.,

Windfarm Site, Offshore Export Cable Corridor, Offshore Substation Platform) may occur and by the location of any receptors that may be affected by those potential impacts.

16. The Study Area for benthic and intertidal ecology encompasses a 10km buffer around the Windfarm Site and the Offshore Export Cable Corridor.

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





Legend:
- White Cross Wind Farm Site
- Area of Search
- Study Area
- Offshore Cable Corridor

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

Title: Benthic and Intertidal Ecology Study Area

Figure: 10.1 | Drawing No: PC2978-RHD-ZZ-XX-DR-Z-0471

Revision:	Date:	Drawn:	Checked:	Size:	Scale:
P01	05/01/2023	AB	KH	A3	1:400,000

Co-ordinate system: WGS 1984 UTM Zone 30N

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10.3.2 Approach to Assessment

18. **Chapter 6: EIA Methodology** provides a summary of the general impact assessment methodology applied to the Offshore Project. The following sections expand upon this methodology in order to assess potential impacts on benthic and intertidal ecology.

19. As part of the EIA process, the existing environment with respect to benthic and intertidal ecology is described. This includes use of existing information and data from the characterisation survey commissioned to inform the EIA.

20. As far as possible, impacts are considered based on quantitative assessment of the area of habitat permanently or temporarily impacted by the works. The results of **Chapter 8: Marine Geology, Oceanography and Physical Processes** and **Chapter 9: Marine Water and Sediment Quality** are used to inform potential impacts relating to smothering and suspended sediments.

21. For each effect, the assessment identifies receptors sensitive to that effect and implements a systematic approach to understanding the impact pathways and the level of impacts on given receptors. The definitions of sensitivity, value and magnitude for the purpose of the benthic and intertidal ecology assessment are provided in **Sections 10.3.2.1, 10.3.2.2** and **10.3.2.3**.

10.3.2.1 Sensitivity

22. 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.

23. 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.

24. 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 10.2 Resistance and resilience scale definitions

Level	Description
Resistance (Tolerance)	
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.
Resilience (Recovery)	
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.

25. 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**.

26. 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 10.3 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

27. 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 effect. 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 10.4** states the definitions of value levels for benthic and intertidal ecology.

Table 10.4 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 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.

10.3.2.2 Impact assessment criteria

28. The terms used to define sensitivity and magnitude are outlined in **Table 10.5, Table 10.6** and **Table 10.7**.

Table 10.5 Definition of terms relating to receptor sensitivity

Sensitivity	Definition
High	Individual receptor has very limited or no capacity to avoid, adapt to, accommodate or recover from the anticipated impact.
Medium	Individual receptor has limited capacity to avoid, adapt to, accommodate or recover from the anticipated impact.
Low	Individual receptor has some tolerance to accommodate, adapt or recover from the anticipated impact.
Negligible	Individual receptor is generally tolerant to and can accommodate or recover from the anticipated impact.

Table 10.6 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, temporary (throughout 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, temporary (for part of the Offshore 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.

10.3.2.3 Significance of effect

29. The significance of the effect upon benthic and intertidal ecology is determined by correlating the magnitude of the impact and the sensitivity of the receptor. The method employed for this assessment is presented in **Table 10.7**.

Table 10.7 Significance of an impact - resulting from each combination of receptor sensitivity and the magnitude of the effect upon it

		Adverse 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	Negligible	Negligible	Minor	Moderate	Major
	Low	Moderate	Minor	Minor	Negligible	Negligible	Minor	Minor	Moderate
	Negligible	Minor	Negligible	Negligible	Negligible	Negligible	Negligible	Negligible	Minor

10.3.3 Worst-Case Scenario

30. In accordance with the assessment approach to the Project Design Envelope (PDE), or '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 PDE for the Offshore Project is detailed in **Chapter 5: Project Description**.

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

Table 10.8 Worst Case Assumptions for Benthic and Intertidal Ecology

Impact	Parameter	Notes
Construction		
Temporary habitat loss / physical disturbance	If 8 turbines with catenary mooring systems are used the maximum area of physical disturbance and temporary habitat loss of seabed habitat has been quantified based on the following: WTG: ▪ The footprint for anchoring systems for catenary turbines is 2,424m^2 per turbine, total area 19,392m^2 ▪ Maximum total WTGs prepared seabed area 11,066m^2 OSP: ▪ max footprint (4 piles) = 1,256.64m^2	In most places, burial of the inter array cables will be less than the 3m maximum and 0.5m minimum depth. Installation of all the moorings/anchors will take up to 53 days. Assuming the maximum length of array cable is installed, the duration of installation is predicted to be up to 70 days

Impact	Parameter	Notes
	Inter-array cable: ▪ Max footprint on seabed: 480,000m^2 (assumes 8 turbines) ▪ Total area of sand wave excavation works 12,000m^2. Offshore 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 ▪ Trench dimensions for open trench at Landfall (up to MHWS) for two cables (Intertidal) = 135m^2.	Based on four suction caissons at 20m diameter each.
Increased suspended sediments and deposition	The footprint for anchoring systems for catenary turbines is 2,424m2 per turbine, total area 19,392m2 Export cable burial for two cables would displace a volume of 1,684,800m^3 assuming 3m wide, 3m deep excavation for each cable. Total area of sand wave excavation works 280,800m^2 Inter-array cable burial would displace a volume of 216,000m^3 also assuming 3m wide, 3m deep excavation (based on max length of inter-array cable = 29.76km). 1,256.64m^2 footprint for the substation.	Jetting/ploughing considered the worst case installation method. Turbine foundations are anchors only – no seabed preparation required.

Impact	Parameter	Notes
Re-mobilisation of contaminated sediments	As per increased suspended sediments and deposition	
Underwater noise and vibration	Maximum hammer energy for mooring pin piles: up to 800kJ. Maximum hammer energy for OSP piles: up to 2,500kJ.	
	Maximum pile diameter for mooring pin piles: up to 4.0m. Maximum pile diameter for OSP piles: up to 2.0m.	
	Duration of mooring pin pile installation: two hours and 13 minutes per pin pile. Duration of OSP foundation installation: four hours and 30 minutes per OSP pile.	Total piling time includes soft-start and ramp-up, and provides allowance for issues such as low blow rate, refusal, etc.
	Total mooring piling time: total of up to 4.5 days of active piling Total OSP piling time: a total of up to 1 day of active piling	
	Use of Activation of Acoustic Deterrent Device (ADD) For example: 31 minutes per mooring pin-piles	
Invasive Non-Native Species (INNS)	The greatest risk of introduction of INNS is through ballast water and biofouling from various vessels required during construction.	Maximum overall offshore construction duration = 10 months
Operation		
Temporary habitat loss / Physical disturbance	As per construction Maintenance of wind turbines will be required during operation and maintenance. This will involve up to 12 vessel visits per turbine per year.	
Permanent habitat loss / long term habitat loss	If 8 turbines with catenary mooring systems are used the maximum area of physical disturbance and habitat loss of seabed habitat has been quantified based on the following: WTG:	

Impact	Parameter	Notes
	▪ The area of active benthic footprint for anchoring systems for catenary turbines is 2,424m^2 per turbine, total area 19,392m^2. OSP max footprint (4 piles) = 1,256.64m^2) Inter-array cables ▪ Total area of protection material: 22,400m^2 Offshore Export Cables: ▪ Maximum area cable scour protection material (all sources) = 252,560m^2 Total number of cable repairs of lifetime: 10 Total number of remediation events (re-burial): 40 Total area of seabed affected by remediation events: 1,500,000m2.	
Temporary increased suspended sediment concentrations and deposition	The catenary mooring and anchor footprint per turbine would be the sum of the drag anchor footprint (10m x 10m) and mooring seabed footprint (length of 600m x 0.5m chain width) multiplied by the maximum number of mooring lines (six) = 2,424m^2. For eight turbines = 19,392m^2. Maintenance activities may also cause the resuspension of sediment, however this will be localised and smaller in scale than during construction.	
Remobilisation of contaminated sediment		
Colonisation of introduced artificial substrate including Non-Native Species	One Offshore Substation Platform on four suction piles each 4m in diameter = footprint of 1,256.64m^2	Sour protection material: • Rock or gravel placement

Impact	Parameter	Notes
	Six anchors per turbine, mooring lines and chains. For catenary moorings, the footprint per turbine equals the anchor length (10m) x anchor width (10m) x maximum number of anchors per turbine (six) plus the mooring line radius (600m) x chain width (0.5m) x maximum number of anchors (six) = 2,424m^2. For eight turbines the footprint = 19,392m^2 Three inter-array cable/pipeline crossings with crossing widths of 7m, total crossing length of 750m and heights of 1.8m. Rock placement and / or mattresses. Footprint = 5,250m^2 Eight cable/pipeline crossings with crossing widths of 7m, total crossing length of 2,000m and heights of 1.8m. Rock placement and / or mattresses. Footprint = 14,000m^2.	• Concrete mattresses • Flow energy dissipation devices • Protective aprons or coverings • Bagged solutions.
Electromagnetic fields (EMF)	29.76km array cable length 93.6km (x2) Offshore Export Cable length Max voltage array cable: 66kV Max voltage Offshore Export Cable: 132kV 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 4 m, and 5 m at cable crossings.	Up to 1.6km of array cable will be situated within the water column. Therefore, EMF effects will be present in both the water and sediment within this area.
Decommissioning		
Temporary habitat loss / physical disturbance	As per construction or less	The area at risk of disturbance from decommissioning will likely be lower than

Impact	Parameter	Notes
		that presented in construction.
Increased suspended sediments and deposition	As per construction or less	
Remobilisation of contaminated sediment	As per construction or less	
Underwater noise and vibration	As per construction or less	
Invasive Non-Native Species (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

10.3.4 Summary of Mitigation

10.3.4.1 Embedded Mitigation

32. This section outlines the embedded mitigation relevant to the benthic and intertidal ecology assessment, which has been incorporated into the design of the Offshore Project (**Table 10.9**).

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

Component/Activity	Mitigation embedded into the design of the Project
Landfall (up to MHWS)	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 (up to MHWS), 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 SSSI	Trenchless techniques will be used.

Component/Activity	Mitigation embedded into the design of the Project
	As the entry and exit areas for the trenchless technique used to cross the estuary are above Mean High-Water Springs (MHWS), the assessment will be carried out in the White Cross 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: • 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, 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

33. No additional mitigation measures are proposed.

10.3.5 Baseline Data Sources

10.3.5.1 Desktop Study

34. A desk study was undertaken to obtain information on benthic and intertidal ecology. Data were acquired within the study area through a detailed 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).

35. 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

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

37. Four areas (Saunton Sands north and south, Crow Point and East Yelland) were selected for intertidal surveys conducted in May 2022 (**Appendix 20.A**). 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.

38. Offshore survey was undertaken by Ocean Ecology Limited (OEL) during June and July 2022 (**Appendix 8.B** Ocean Ecology (2022) Benthic Survey Report). Sample stations are presented in **Figure 10.2**. The survey included sample collections for benthic habitat data across the Windfarm Site and Offshore Export Cable Corridor. Sampling methods included grab samples (0.1m^2 dual van Veen grab) and drop down video transects. The grab samples were analysed for physico-chemical properties and macrofaunal identification.

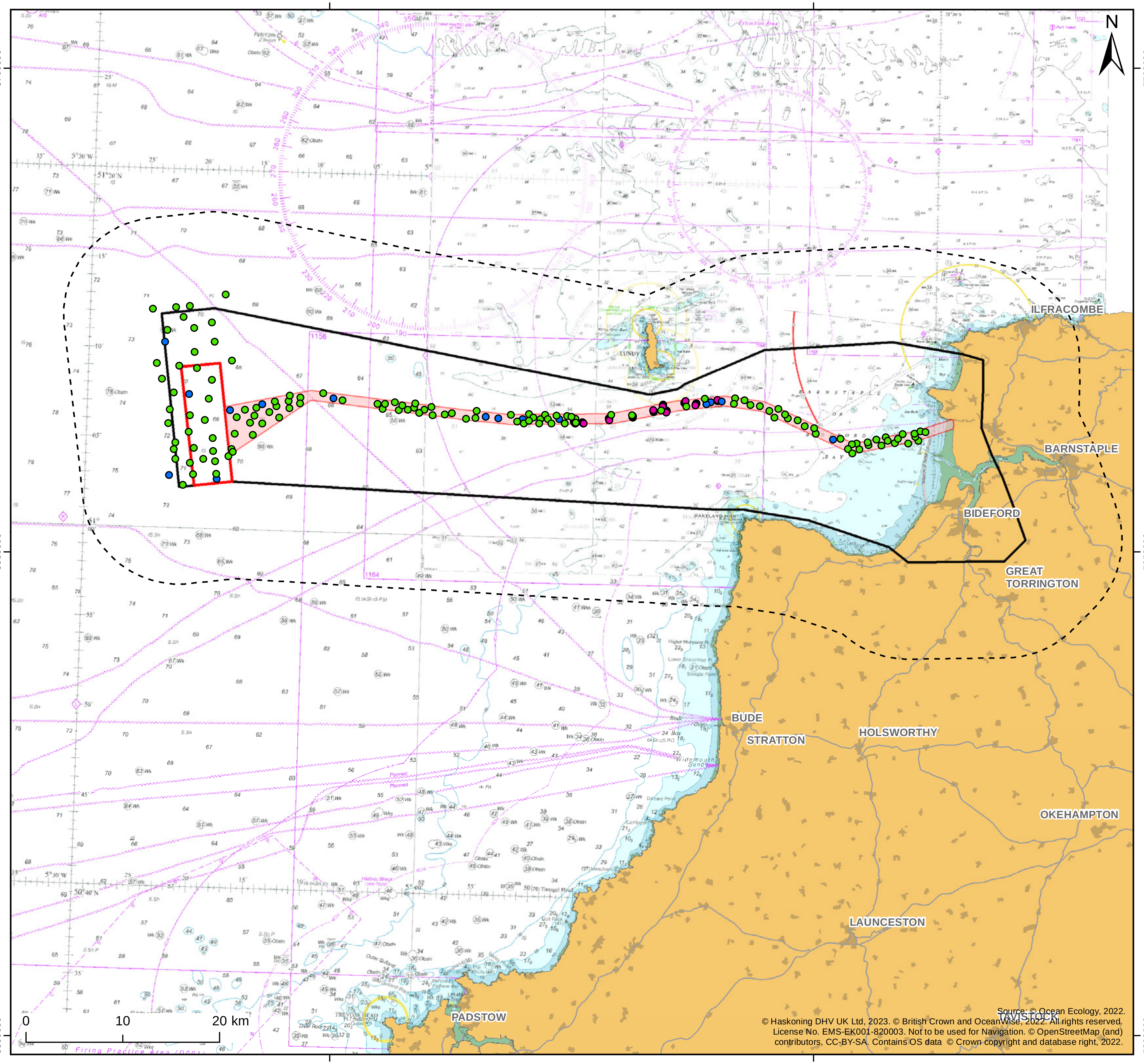
39. The aims of the environmental aspect of the survey were as follows:

- acquire environmental camera and seabed sample data to establish baseline environmental conditions
- identify any sensitive habitats and species
- provide a characterisation of the physical, chemical, and biological conditions of the area
- establish seabed conditions.

40. In total 134 stations plus an additional 10 camera transects were surveyed.

Table 10.11 Summary of site-specific survey data

Survey name and year	Purpose	Spatial coverage
White Cross Wind Farm Intertidal Survey (EcoLogic Consultant Ecologist LLP, 2022 – **Appendix 20.A)**	Sediment and habitat characterisation	Coastal and estuarine extents of the Offshore Export Cable within the intertidal zone
Grab samples and drop-down camera (DDC) and video samples in June and July 2022 (115 stations with an additional 10 DDC transects) (Ocean Ecology, 2022 – **Appendix 8.B**)	Seabed sediment and habitat characterisation	Offshore Development Area



Legend:

- White Cross Wind Farm Site
- Area of Search
- Study Area
- Offshore Cable Corridor
- PSD & Macro
- PSD & Macro & Contaminants
- DDV Transects

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

Title:

Benthic and Intertidal Ecology Sample Stations

Figure: 10.2 | Drawing No: PC2978-RHD-ZZ-XX-DR-Z-0472

Revision:	Date:	Drawn:	Checked:	Size:	Scale:
P01	09/01/2023	AB	KH	A3	1:400,000

Co-ordinate system: WGS 1984 UTM Zone 30N

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10.3.6 Scope

41. Upon consideration of the baseline environment, the Offshore 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.

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

Potential Impact	Justification
Construction	
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 benthic habitats and species.
Underwater noise and vibration	Not enough evidence at scoping to suggest that underwater noise would not be an issue to benthic communities
Invasive Non-Native Species (INNS)	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
Operation & Maintenance	
Temporary habitat loss / Physical disturbance	There is potential for ongoing physical disturbance of the seabed during the operational phase from maintenance activity
Temporary increased suspended sediment concentrations and deposition	Small volumes of sediment could be re-suspended during maintenance activities
Remobilisation of contaminated sediment	Sediment disturbance could lead to the mobilisation of contaminants (if present) that could be harmful to benthic habitats and species
Permanent habitat loss / long term habitat loss	The presence of foundations on the seabed (for the Offshore Substation Platform) and cable protection would result in a relatively small footprint of lost habitat in the context of the habitat from the surrounding region.
Colonisation of introduced artificial substrate including INNS	The sub-sea structures are expected to be colonised by a range of species leading to a localised increase in biodiversity.

Potential Impact	Justification
Underwater noise and vibration	Not enough evidence at scoping to suggest that underwater noise would not be an issue to benthic communities
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
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, therefore this has been assessed as an operational impact in **Section 10.6.1** and is not considered under construction or decommissioning.
Hele, Samson's and Combe Martin Bays SSSI	Beyond range of likely effect

10.3.7 Consultation

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

43. A summary of the key issues raised during consultation specific to benthic and intertidal ecology is outlined 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 (up to MHWS) 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 **Section 10.6**
		"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 **Section 10.4.4** and in the MCZ Assessment (**Appendix 10.A**)
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 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** and **10.6.3**
		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.	Included in **Section**

Consultee	Date, Document, Forum	Comment	Where addressed in the ES
		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.	**10.5.5** and **10.6.5**
		The MMO considers that the remobilisation of contaminated sediment should be screened in and included in the ES.	Included in **Section 10.5.3** and **10.6.3**
		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 **Section 10.5.4** and **10.6.6**
		Paragraph 279 suggests scoping out Electromagnetic Fields (EMF) due to lack of 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.	Included in **Section 10.6.7**
		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.	Included in **Section 174**

Consultee	Date, Document, Forum	Comment	Where addressed in the ES
		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.	
		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 **Section 10.6**
		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 10.1** 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	**Figure 10.2**

Consultee	Date, Document, Forum	Comment	Where addressed in the ES
		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.	
		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**

10.4 Existing Environment

44. 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 Types

45. A summary of the sediment types of the offshore development area is given in this section. Seabed sediment type distribution is described in full in **Chapter 9: Marine Water and Sediment Quality**.

46. The seabed sediments in the windfarm site are characterised by sand (EMODnet, 2022). Along the Offshore Export Cable Corridor are areas of coarse sediments and rock. From approximately 20km offshore to the Landfall site (up to MHWS) the sediments become finer sands with some mud, associated with the sheltering effect of Bideford Bay (EMODnet, 2022).

47. 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 (2022) 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. Physical impacts on Taw-Torridge Estuary due to the Offshore Project should be avoided with the use of trenchless techniques but as the entry and exit areas for the trenchless technique used are above MHWS, the assessment will be carried out in the White Cross Onshore Project. The impacts are therefore not considered further in this chapter.

48. 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.

49. The seabed characterisation from EMODnet is supported by the particle size analysis (PSA) of sediments during the benthic surveys. Grab samples were taken on an offshore survey at 134 stations. Sediment characterisation was classified using The Folk (British Geological Survey (BGS) modified) classification (Long, 2006) and the Wentworth (1922) sediment classification. Despite some variation in sediment types between stations, the majority of stations were dominated by sand. Mud content was highest close to land (ST01). Gravel content was overall low but variable along the Offshore Export Cable Corridor with a few stations along the route found to contain >50% gravel composition (ST03, ST07, ST09, ST10, ST102, ST118, and ST123). Further information about the sediments recorded can be found in **Appendix 8.B: Ocean Ecology (2022) benthic survey report**.

50. 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).

51. Most of the sediments recorded were classified as moderately sorted and comprised almost entirely of sand. Remaining stations were classified as moderately well sorted, poorly to very poorly sorted, resulting from mixed compositions of different size fractions of all three principal sediment types (gravel, sand, and mud). Sand was the main sediment fraction present at most stations, comprising the largest percentage contribution across the survey area. Sand content was greatest at stations from the Offshore Export Cable Corridor at ST078 out to the Windfarm Site and lowest at ST09 situated further inshore along the Offshore Export Cable Corridor route.

52. Sediment samples for chemical contaminant analysis were collected from 15 stations sampled across the survey area (**Figure 10.2**). Chemical analysis can be found in **Chapter 9: Marine Water and Sediment Quality** and **Appendix 8.B**.

53. No pattern was observed between stations with relatively high mud (>5%) and TOC content despite many studies based on the coastal ocean and marine environment having found a positive relationship between organic carbon content and proportions of finer sediment grain size (Winterwerp & van Kesteren 2004, McBreen et al. 2008, Hunt et al. 2020). Average Total Organic Carbon (TOC) compares well with global sediment average TOC content for the deep ocean (0.5 %) (Seiter et al. 2004).

54. Similarly, no pattern was observed between stations with relatively high mud (>5%) and percentage contribution of Total Organic Matter (TOM).

55. Metal concentrations indicated very low levels of contamination. Although Polycyclic Aromatic Hydrocarbon (PAH) exceedances occurred at two of the stations, concentrations were only marginally above the background assessment concentration (BAC) value and do not approach effects range low values. As adverse effects on organisms are rarely observed when concentrations fall below the effects range low value, it was therefore, concluded that overall contamination across the Offshore Development Area is very low.

10.4.2 Faunal Communities

56. 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 **Chapter 11: Fish and Shellfish Ecology**.

57. Seabed video and photography was acquired, and faunal samples were taken in grab samples. The survey recorded a total of 134 faunal grabs as part of the OEL surveys. A total of 12,651 individuals and 487 taxa were recorded with mean per sample values of, 27 taxa and 0.39g ash free dry weight (gAFDW).

58. From these samples, juvenile specimens of the brittle star family Amphiuridae were the most abundant taxon sampled accounting for 11.4 % of all individuals recorded. They were also the most frequently occurring taxon recorded in 72.4 % of samples and accounted for the greatest average density per sample.

59. The taxa Annelida contributed the highest abundance accounting for approximately 37% of all individuals, followed by Echinodermata accounting for 25%. Annelida also contributed the highest overall diversity of the macrobenthic assemblages at 44%, while Echinodermata dominated the biomass, accounting for 52% of the total (**Appendix 8.B**).

60. The multivariate analysis of the benthic infaunal data was carried out using the PRIMER V7 software package (Clarke & Gorley 2015), the results of which are presented in **Appendix 8.B**.

61. Fifteen distinct faunal groupings were identified across the survey area and assigned to matching biotopes (presented in **Appendix 8.B** and **Figure 10.3**).

62. A summary of the communities found across the study area is provided below:

- Macrobenthic Group A- Classified as EUNIS "A5.25 Circalittoral fine sand"
- Macrobenthic Group B, C & D- Classified as "A5.14 Circalittoral coarse sediment"
- Macrobenthic Group E- Classified as "A5.142 *Mediomastus fragilis, Lumbrineris spp.* and venerid bivalves in circalittoral coarse sand or gravel"
- Macrobenthic Group F - Two biotopes aligned with the community observed within this group; "A5.142 *Mediomastus fragilis, Lumbrineris spp.* and venerid bivalves in circalittoral coarse sand or gravel" and "A5.451 Polychaete-rich deep *Venus* community in offshore mixed sediments"

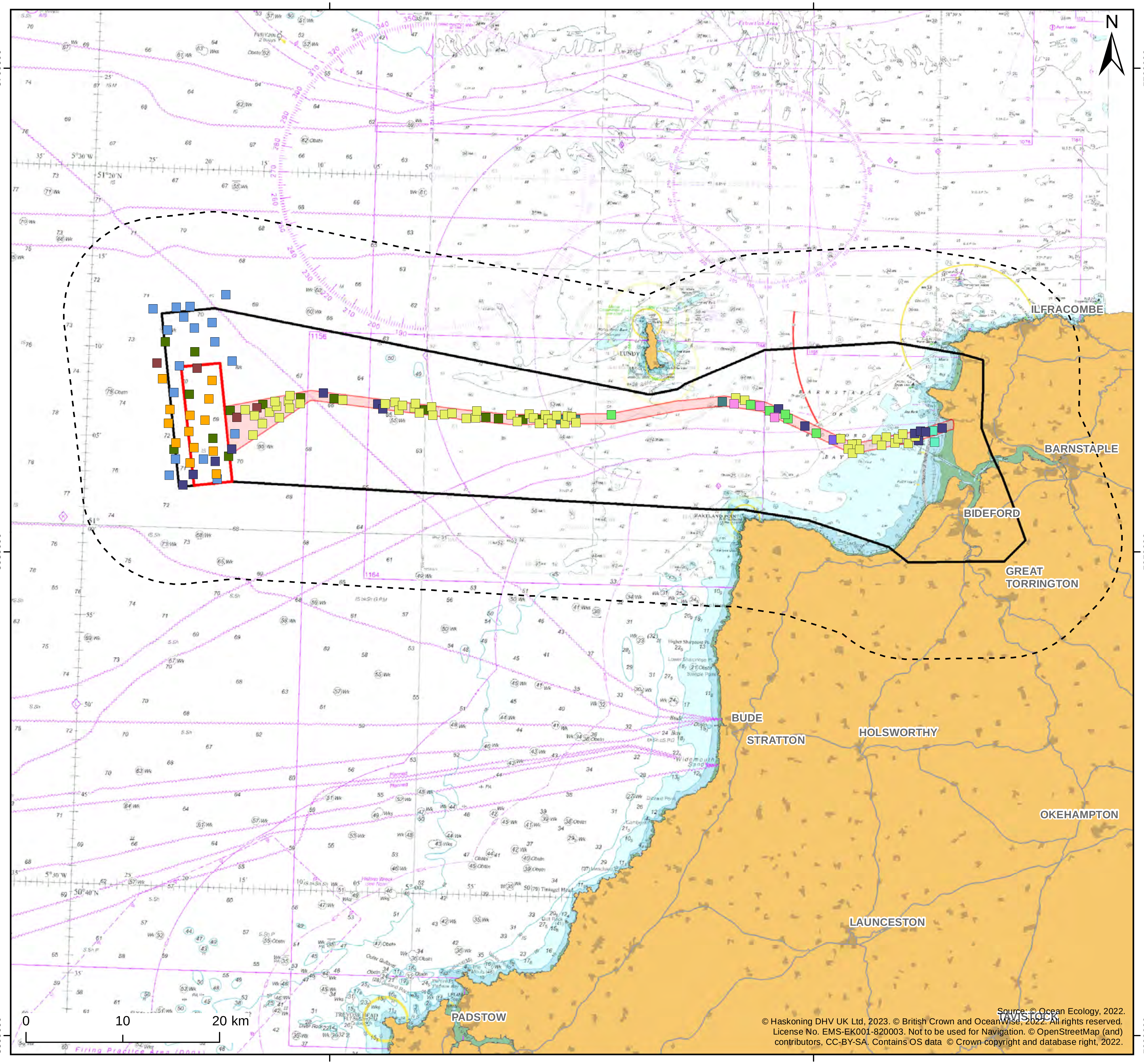
- Macrobenthic Group G, K & L - EUNIS level 4 habitat "A5.26 Circalittoral muddy sand"
- Macrobenthic Group H – Classified as "A5.242 *Fabulina fabula* and *Magelona mirabilis* with venerid bivalves and amphipods in infralittoral compacted fine muddy sand"
- Macrobenthic Group I - Only two stations (ST012 and ST128) belonged to this group with the pea urchin *E. pusillus* and juveniles of both the heart urchin Spatangoida and the polychaete *Nephtys*
- Macrobenthic Group J – Classified as "A5.233 - *Nephtys cirrosa* and *Bathyporeia* spp. in infralittoral sand"
- Macrobenthic Group M - Two biotopes aligned with the community observed within this group; "A5.252 -*Abra prismatica*, *Bathyporeia elegans* and polychaetes in circalittoral fine sand" and "A5.351 - *Amphiura filiformis*, *Mysella bidentata* and *Abra nitida* in circalittoral sandy mud". This grouping included 56 of the 134 stations analysed of which 47 were classified as BSH A5.2 while the remaining were a mix of BSHs A5.1, A5.3 and A5.4. Considering that this group covered a large portion of the survey area with slight variations in sediment type and composition, it is not surprising that a mosaic biotope was identified at these locations. Characterising taxa of group included *A. filiformis, K. bidentata, N. nitidosa, E. pusillus, A. prismatica* and *S. bombyx*
- Macrobenthic Group N - Only two stations (ST141 and ST144) belonged to this group with the transparent razor shell *Phaxas pellucidus* and the basket shell *Varicorbula gibba.*

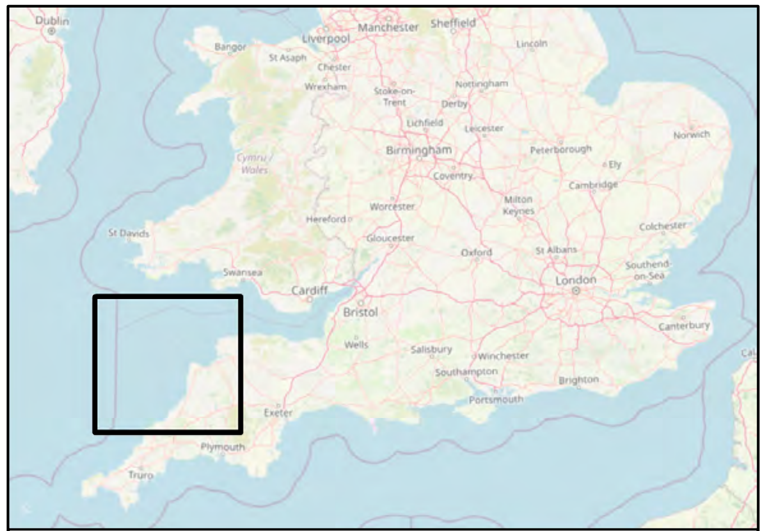
63. These groupings were clustered:

- Group A was only reported at stations ST024 and ST025 located in the nearshore section of the Offshore Export Cable Corridor
- A clear distinction was observed between stations located in the middle of the Offshore Export Cable Corridor and all other stations. Sediment composition was a key factor in determining the macrobenthic community structure at these locations (Hall 1994, Cooper et al. 2011) and was clearly reflected in Macrobenthic Groups B, C, D, E and F indicating an affinity for coarser substrates compared to the other macrobenthic groups typical of sandy substrates with variable mud content. Coarser sediment supported a community characterised by *M. fragilis* and *Lumbrineris* and venerid bivalves, while finer sediments were characterised by high abundances of *E. pusillus*, *A. filiformis*, *K. bidentata* and *N. nitidosa*. These groups (B, C, D, E and F) were located along the Offshore Export Cable Corridor

- Whilst Group M representing circalittoral muddy sand or slightly mixed sediment located further along the Offshore Export Cable Corridor towards the Windfarm Site. (**Figure 10.3**).

64. Similar patterns are seen in the EUSeaMAP (2022) data which shows that the intertidal, infralittoral and shallow circalittoral area is predominantly sand, with small areas of mud and sandy mud or muddy sand. The subtidal environment is mainly circalittoral coarse sediment along the Offshore Export Cable Corridor, with deep circalittoral sand occurring further offshore and overlapping the Windfarm Site. However, there are discrete areas of mixed sediment and rock substrate occurring around Lundy Island to the North of the area of search.





Legend:
- White Cross Wind Farm Site
- Area of Search
- Study Area
- Offshore Cable Corridor

EUNIS Classification
- A5.1
- A5.14
- A5.142
- A5.142/A5.451
- A5.2
- A5.233
- A5.242
- A5.25
- A5.252/A5.351
- A5.26
- A5.3

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

Title:

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

Figure: 10.3 | Drawing No: PC2978-RHD-ZZ-XX-DR-Z-0473

Revision:	Date:	Drawn:	Checked:	Size:	Scale:
P01	09/01/2023	AB	KH	A3	1:400,000

Co-ordinate system: WGS 1984 UTM Zone 30N

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10.4.3 Annex I Reef

65. There are records of Annex I bedrock and/or stony reef present along the coastline within the Offshore Export Cable Corridor (EUSeaMAP data 2022).

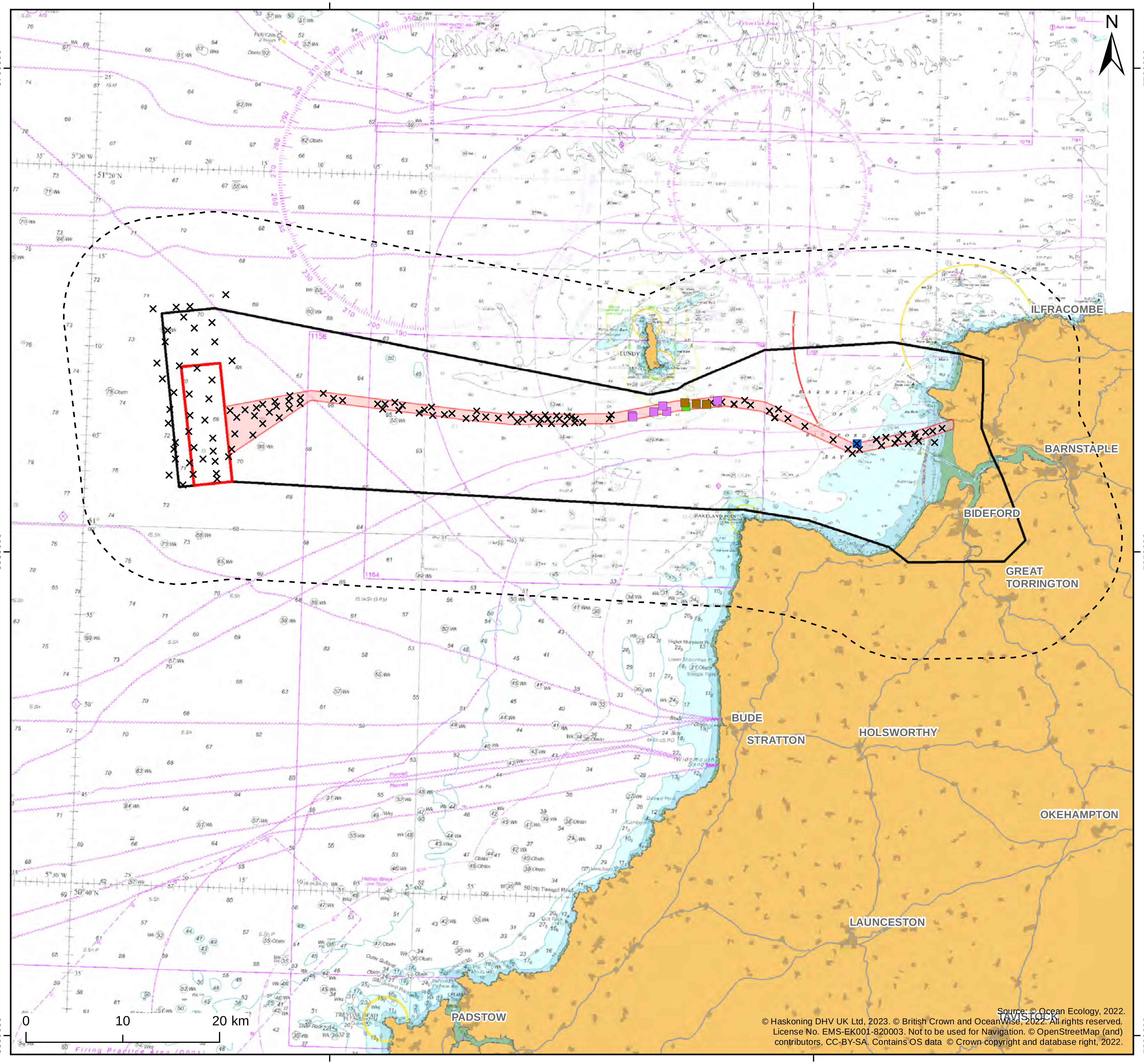
66. A full reef habitat assessment was conducted on all images from the site specific survey to determine whether habitats met the definitions of Annex I reef habitats. The assessment for each station is presented in **Table 18** of **Appendix 8.B**.

67. Of the areas meeting the criteria of Annex I reef, 50% consisted of Bedrock, 35% of Low Stony, 10% of Bedrock & Low Stony, 4% of Low Stony and Bedrock and 1% of Medium Stony[1] (**Figure 10.4**). In the instances where bedrock and stony reefs co-occurred, video transects were further analysed to assess whether the two features could be identified. Based on the assessment of both video footage and the still images, the overall biological community observed and the fact that cobbles were visible in a large number of images where bedrock was recorded, it is highly likely that there was continuous bedrock present under the stony reef veneer, but the height of stony cover was such that it was not possible to observe the bedrock underneath.

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).

69. The pink sea fan *Eunicella verrucosa* forms large colonies and has been described as slow growing in the British Isles (Picton & Morrow, 2005). NBN Atlas has pink sea fans recorded around Lundy Island which 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. These conditions are ideal for pink sea fans growth, which was the reason for requesting a comprehensive assessment (**Table 10.14** Consultation responses). It is a designated feature of the Bideford to Foreland Point MCZ and Hartland Point to Tintagel MCZ, but it is not listed for Lundy MCZ. The comment that the species is locally common (**Table 10.14** Consultation responses) is noted, however, no individual was collected in grab samples or identified in imagery analysed during the site specific survey. This would be expected as pink sea fan occurs only on bedrock or boulders and this substrate is of limited distribution within the Offshore Development Area.

[1] **Appendix 8.B Table 9 -** Characteristics of stony reef based on Irving (2009).



Source: © Ocean Ecology, 2022.

Legend:

- White Cross Wind Farm Site
- Area of Search
- Study Area
- Offshore Cable Corridor

Annex I Field Classification

- Bedrock
- Bedrock & Low Stony
- Low Stony
- Low Stony & Bedrock
- Not a reef

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

Title: Annex I Reef Assessment

Figure: 10.4 | Drawing No: PC2978-RHD-ZZ-XX-DR-Z-0474

Revision:	Date:	Drawn:	Checked:	Size:	Scale:
P01	09/01/2023	AB	KH	A3	1:400,000

Co-ordinate system: WGS 1984 UTM Zone 30N

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10.4.4 Designated Sites

70. 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 10.5** and described in **Table 10.15**.

71. 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.

72. However, as they are designated for features of geological interest, rather than benthic or intertidal habitats/species, they have not been included in **Table 10.15** or assessed in this chapter. They have been considered within **Chapter 8: Marine Geology, Oceanography and Physical Processes**.

73. 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 7 metres. The intertidal survey identified Intertidal Sand & Muddy Sand (A2.2) around the Landfall (up to MHWS) at Saunton Sands.

74. 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.

75. 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

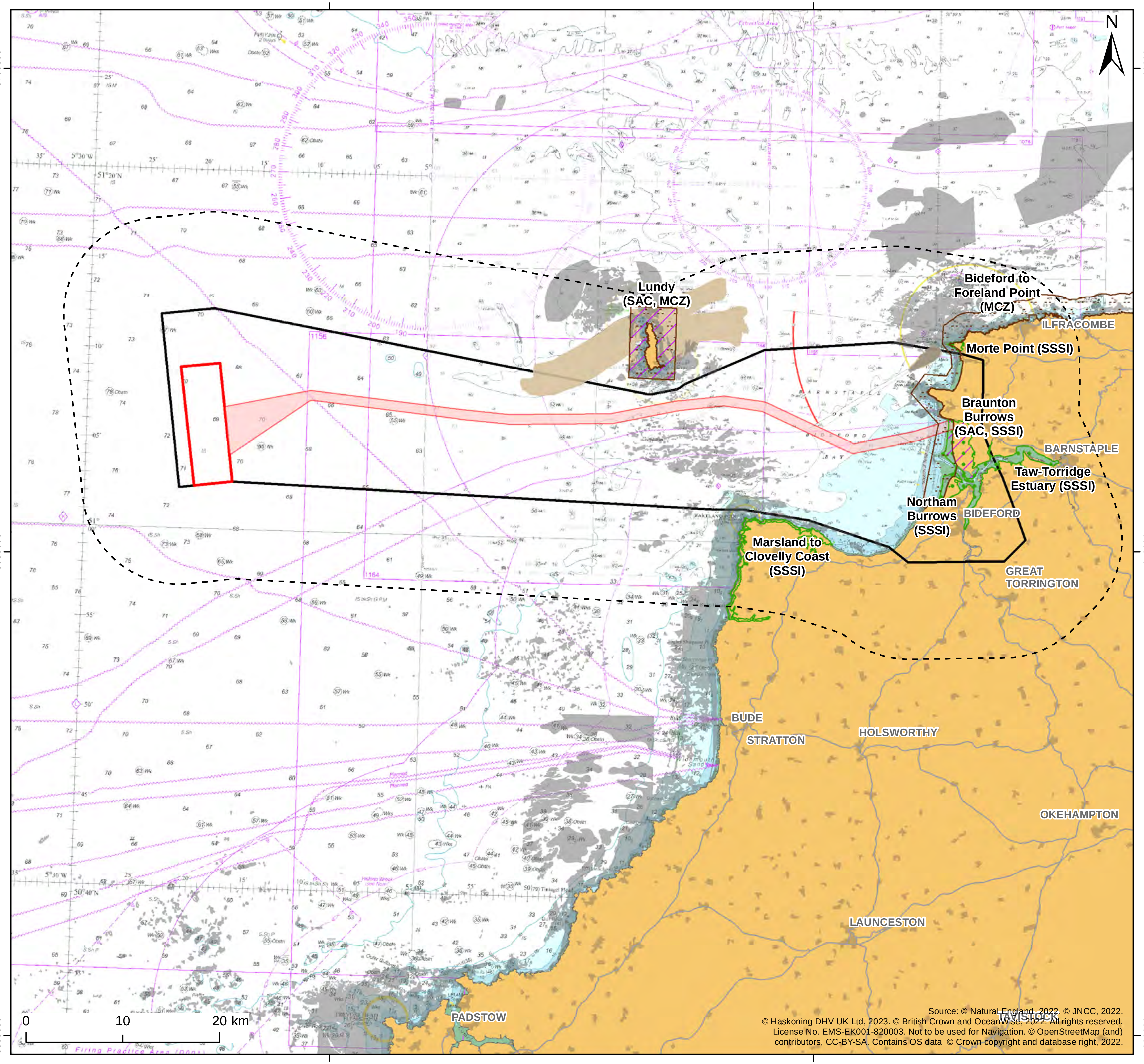
- Tintagel-Marsland-Clovelly Coast SAC.

76. Features listed in **Table 10.15** 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 Offshore Project and can be found in **Appendix 10.A**. The Report to Inform Appropriate Assessment can be found in **Appendix 13.A**.

Table 10.15 Designated sites with benthic or intertidal designated features within a 10km radius of the Offshore Project boundary and area of search

Designated site	Distance from 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.	
Lundy	2km from selected route for the Offshore Export Cable Corridor	Spiny lobster (*Palinurus elephas*)	Impacts covered in MCZ Assessment
South West Approaches to Bristol Channel	8.9km from the Offshore Development Area.	Subtidal coarse sediment; Subtidal sand	
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.	
Lundy	3.5km from selected route for the Offshore Export Cable Corridor	1170 Reefs; 1110 Sandbanks which are slightly covered by sea water all the time; 8330 Submerged or partially submerged sea caves.	Impacts covered in 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** and **10.6.1**. Indirect impacts relating to dunes habitat - **Chapter 8: Marine Geology, Oceanography and Physical Processes**

Designated site	Distance from Project	Relevant designated features	Considered within this chapter
Taw-Torridge Estuary	0km. Overlaps the Taw Estuary Crossing	The Taw-Torridge Estuary is of major importance for its overwintering and migratory populations of wading birds. In 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.	Trenchless techniques will be used and will have no interaction with the bed of the estuary. As the entry and exit areas for the trenchless technique used to cross the estuary are above Mean High-Water Springs (MHWS), the assessment will be carried out in the White Cross Onshore Project.
Northam Burrows	2km. from the selected route for the Offshore Export Cable Corridor	No benthic features	No
Morte Point	7km from the selected route for the Offshore Export Cable Corridor	No benthic features	No
Marsland to Clovelly Coast	0.5km from the selected route for the Offshore Export Cable Corridor	No benthic features	No



Source: © Natural England, 2022. © JNCC, 2022.

Legend:
- White Cross Wind Farm Site
- Area of Search
- Study Area
- Offshore Cable Corridor
- Marine Conservation Zones (MCZ)
- Special Areas of Conservation (SAC)
- Sites of Special Scientific Interest (SSSI)
- Annex 1 Reef
- Annex 1 Sandbanks

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

Title:

Designated Sites across White Cross Offshore Development Area

Figure: 10.5 Drawing No: PC2978-RHD-ZZ-XX-DR-Z-0475

Revision:	Date:	Drawn:	Checked:	Size:	Scale:
P02	19/01/2023	AB	KH	A3	1:400,000
P01	09/01/2023	AB	KH	A3	1:400,000

Co-ordinate system: WGS 1984 UTM Zone 30N

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10.4.5 Do Nothing Scenario

77. The Marine Works (Environmental Impact Assessment) Regulations 2007 (as amended) 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 Offshore Project (operational lifetime anticipated to be a minimum of 25 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 Offshore Project is not constructed, using available information and scientific knowledge of benthic and intertidal ecology.

78. The baseline conditions for benthic ecology are considered to be relatively stable within Offshore Development Area 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.

79. 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.

80. Anthropogenic pressures that currently exist across the study area such as commercial fishing, particularly using bottom towed gear, have the potential to influence future change in the existing benthic environment (**Chapter 14: Commercial Fisheries**).

10.5 Potential impacts during construction

81. A range of potential impacts to benthic and intertidal ecology may occur during the construction phase of the Offshore Project. Sensitivities of the benthic communities have been determined for each of these impacts on the basis of expert judgement and reference to MarESA available from MarLIN.

82. 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

83. During construction there will be disturbance in the array areas due to cable laying operations, mooring and anchor systems installation (including drag embedment anchors (DEAs)) and construction works for foundations (for the Offshore Substation Platform). There will also be disturbance to habitats due to construction vessels (e.g., anchoring or jack up legs). Disturbance in the offshore cable corridor due to seabed preparation (e.g., sandwave levelling) and cable installation (mix of open cut trenching and trenchless technology at Landfall (up to MHWS)) can also occur. This will cause temporary habitat loss and physical disturbance to the seabed.

84. Where disturbed sediments (e.g., preparation areas for foundations) are subsequently covered with infrastructure, habitat loss is long term or permanent, therefore this has been assessed as an operational impact in **Section 10.6.1** and is not considered further here.

10.5.1.1 Magnitude of impact

85. Details of the area of physical disturbance is presented in **Table 10.8**. However, due to the temporary and relatively localised nature of the impact (which will occur episodically in discrete locations across the Offshore Development Area, i.e. at individual turbine locations and along the Offshore Export Cable route, not in one location all at once) and resilience of the receptors which are common across the wider region, temporary physical disturbance is considered to be of **negligible** magnitude.

86. Worst case trench dimensions for open trench at Landfall (up to MHWS) for two cables is calculated to be 135m^2. Note that if trenchless technique were used at Landfall (up to MHWS), it is likely that Saunton Sands beach would be avoided entirely and there would be no impact on intertidal features.

10.5.1.2 Sensitivity of the receptor

87. The sensitivity of the biotopes identified in the Offshore Development Area 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

88. The sensitivity of identified habitats and biotopes to temporary habitat loss / disturbance pressures are summarised in **Table 10.16** below.

Table 10.16 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**
A5.142 *Mediomastus fragilis*, *Lumbrineris spp*. and venerid bivalves in circalittoral coarse sand or gravel	Medium	Low
A2.231 Polychaetes in littoral fine sand	Medium	Low
A5.233 *Nephtys cirrosa* and *Bathyporeia* spp. in infralittoral sand	Medium	Low
A5.242 *Fabulina fabula* and *Magelona mirabilis* with venerid bivalves and amphipods in infralittoral compacted fine muddy sand	Medium	Low
A5.252 *Abra prismatica, Bathyporeia elegans* and polychaetes in circalittoral fine sand	Medium	Low
A5.351 *Amphiura filiformis*, *Mysella bidentata* and *Abra nitida* in circalittoral sandy mud	Medium	Medium
A5.451 Polychaete-rich deep Venus community in offshore mixed sediments	Medium	Low
Pink sea fan *Eunicella verrucosa*	Not relevant (NR)	Medium
*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		

89. Pink sea fan occurs only on bedrock or boulders and this substrate is of limited distribution within the Offshore Development Area. Additionally, bedrock areas are likely to be avoided with regard to installation of infrastructure as these areas will be more difficult for construction (with longer construction duration and hence greater cost). Therefore, although pink sea fan is sensitive to abrasion and disturbance, there are likely to be limited pathways for impact.

90. 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

91. As the resilience across all biotopes are high and the habitats recorded in the offshore project area are representative of the wider Celtic Sea region, the impact magnitude is **negligible** when in context of the entire Offshore Development Area.

92. 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.

93. 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.

10.5.1.3.1Effect on SSSI

94. 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

95. Increases in suspended sediment concentrations (SSC) and subsequent deposition onto the seabed may occur as a result of seabed preparation and the installation of offshore infrastructure, including cables. Other activities, such as seabed disturbances from offshore support vessels and placement of cable protection are not expected to increase suspended sediment concentrations to the extent which there would be a significant effect to benthic ecology receptors. 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 Geology, Oceanography and Physical Processes** provides details of changes to SSC and subsequent sediment deposition. Indicating that the worst case of jetting/ploughing or trenching/cutting for cable installation (including sand wave removal) would displace a

volume of 1,684,800m^3 of sediment assuming 3m-wide, 3m-deep excavations. This activity would cause temporary increases in suspended sediment concentrations. In areas, where the cable is buried up to 3m, the cable would be installed mainly in sand (or coarser). The amount of fine sediment recorded from samples along the corridor is on average less than 7%. Therefore, dispersion of fine sediment from these areas would be very low.

96. Effects on benthic ecology may arise by the re-suspension of sediment within the catenary drag footprint of each WTG as DEAs could create a short-term increase in SSC when placed and dragged through the seabed within the Windfarm Site. The worst case scenario (**Table 10.8**) of 50 m drag distance across the seabed is highly conservative and the anchors should embed at a shorter distance within the identified sediment present in the Windfarm Site.

97. The increases in suspended sediment concentrations 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 sediments, as they become entrained within a plume within the water column and widely dispersed by tidal and wave action.

10.5.2.1 Magnitude of impact

98. **Chapter 8: Marine Geology, Oceanography and Physical Processes** describes the expected movement of sediment suspended during the construction phase for the above construction activities. Due to the short-term and highly temporary nature of the impact the magnitude is considered to be **negligible**.

10.5.2.2 Sensitivity of the receptor

99. The sensitivity of the biotopes identified in the Offshore Development Area 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).

100. 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.

101. The sensitivity of identified habitats and biotopes to increased suspended sediment pressures are summarised in **Table 10.17** below.

Table 10.17 Increased SSC and deposition

Habitat / biotope	MarESA sensitivity rating	
	Smothering and siltation rate changes (light)	Changes in suspended solids (water clarity)
A5.142 *Mediomastus fragilis*, *Lumbrineris spp*. and venerid bivalves in circalittoral coarse sand or gravel	Low	Low
A5.233 *Nephtys cirrosa* and *Bathyporeia* spp. in infralittoral sand	Not sensitive	Low
A5.242 *Fabulina fabula* and *Magelona mirabilis* with venerid bivalves and amphipods in infralittoral compacted fine muddy sand	Low	Low
A5.252 *Abra prismatica, Bathyporeia elegans* and polychaetes in circalittoral fine sand	Low	Low
A5.351 *Amphiura filiformis*, *Mysella bidentata* and *Abra nitida* in circalittoral sandy mud	Not sensitive	Not sensitive
A5.451 Polychaete-rich deep Venus community in offshore mixed sediments	Low	Low
Pink sea fan *Eunicella verrucosa*	Not sensitive	Not sensitive

10.5.2.3 Significance of effect

102. Due to the **negligible** magnitude and not sensitive to low sensitivity to each impact pathway for increased suspended sediment concentrations, the effect is considered to be of **negligible** adverse significance.

10.5.3 Impact 3: Re-mobilisation of contaminated sediments

103. 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.

104. Metal concentrations indicate very low levels of contamination (see **Chapter 9: Marine Water and Sediment Quality**). Concentrations of arsenic exceeded Cefas AL1 at four of the offshore stations; ST06, ST08, ST09 and ST10 (and BAC at three of those

stations). Mercury was found at levels exceeding BAC at two stations (ST01 and ST09) but did not exceed Cefas AL1. Concentrations of nickel at ST01 very marginally exceeded Cefas AL1.

105. With respect to PAHs, five exceeded the BAC at only two stations (ST08 and ST09) but there were no exceedances of the Cefas AL1. Where exceedances occurred, concentrations were only marginally above the BAC value and do not approach ERL values. In can therefore be concluded that contamination across the wind farm site is very low.

10.5.3.1 Magnitude of impact

106. 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.

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

10.5.3.2 Sensitivity of the receptor

108. '*Abra prismaticain* Circalittoral Fine Sand' has not been assessed for exposure to contaminants on MarESA. Given that the Offshore Development Area is in open seas the biotopes would have limited the exposure to contaminated sediments, and there is little evidence that the species characterising these biotopes are sensitive to this impact.

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

10.5.3.3 Significance of effect

110. 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: Underwater noise and vibration

111. Underwater noise and vibration from pile driving for the installation of some foundation types, cable installation and other construction activities including seabed preparation, rock placement and vessel activity (as described in **Chapter 5: Project Description**) have the potential to impact on benthic ecology receptors.

10.5.4.1 Magnitude of impact

112. Underwater noise from construction activities may result in temporary, discernible change over a small area of the assessed biotopes. The worst case scenario of pilling activities are as follows. One day for jacket pile for the substation and 5.25 days for pin

pile activities for the mooring anchors. Therefore, the magnitude of effect from noise and vibration is considered to be **negligible**.

10.5.4.2 Sensitivity of the receptor

113. The sensitivity of benthic species to noise and vibration is poorly understood, however studies have shown that some species are able to detect sound with studies with relevance to the benthos focused on crustaceans. Horridge (1966) found the hair-fan organ of the common lobster *Homarus gammarus* to act as an underwater vibration receptor. Lovell et al. (2005) showed that the common prawn *Palaemon serratusis* capable of hearing sounds within a range of 100 to 3,000Hz, and the brown shrimp *Crangon crangon*, has shown behavioural changes at frequencies around 170Hz (Heinisch and Weise, 1987).

114. Research into the effects of vibration on common benthic species was carried out by Roberts et al., 2016. Common hermit crabs *Pagurus bernhardus* exhibited behaviours associated with shell rapping as a consequence of vibrations within the sediment. At high amplitudes, individuals lifted their shells, and some left their shell completely. High amplitudes in the study matched levels within those produced by construction works such as pile-driving.

115. The sensitivity of biotopes identified in the Offshore Development Area have been assessed in relation to the following MarESA pressures relevant to underwater noise and vibration as a result of construction activities.

116. There is evidence to suggest that some benthic species perceive and react to noise, however the MarESA sensitivity assessment for all of biotopes recorded in the array areas is that noise impacts are 'Not Relevant'. '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 underwater noise and vibration is considered to be **negligible**.

10.5.4.3 Significance of effect

117. Construction noise may cause temporary disturbance to the benthos, however the MarESA sensitivity assessment concludes that there will be no effect from noise or vibration to the biotopes present.

118. Dannheim *et al.*, 2020 acknowledge that even though there is evidence to suggest a change in behaviour for some benthic species, the effects of noise and vibration is a priority area for future research as we do not know if changes to population structure and distribution may be affected long term. Based on the **negligible** sensitivity of

biotopes and the **negligible** magnitude of effect, the significance of effect is considered to be **negligible** adverse.

10.5.5 Impact 5: Invasive Non-Native Species (INNS)

119. The invasive non-native species (INNS) polychaete *Goniadella gracilis* and slipper limpet *Crepidula fornicata* were reported to be present within the Offshore Development Area during the survey campaign by OEL (2022).

120. The risk of spreading INNS will be mitigated by employing biosecurity measures to prevent their introduction in accordance with 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, 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
- These commitments would be secured in the Project Environmental Management Plan (PEMP) which will be agreed prior to the start of construction.

121. With mitigations in place, it is not expected INNS will be introduced by the Offshore Project and there will be **no effect**.

122.

10.5.6 Other Designated Sites

10.5.6.1 SAC

123. The full assessment can be found in the RIAA found in **Appendix 13.A**.

124. The intertidal area on the north side of the estuary therefore comprised Annex 1 habitat 'Mudflats and sandflats not covered by seawater at low tide', which is a qualifying feature of the Braunton Burrows SAC is assessed within **Chapter 20 Onshore Ecology and Ornithology**.

125. The conservation objectives for the Lundy SAC are to maintain the Annex I features in favourable condition. In particular the sub-features:

- Reefs
- Subtidal sandbanks which are slightly covered by seawater all the time
- and submerged or partially submerged caves.

126. Disturbance in the offshore cable corridor during construction due to seabed preparation and cable installation will cause temporary habitat loss and physical disturbance to the seabed. The impacts assessed will include indirect increased suspended sediments and sediment deposition.

10.5.6.2 MCZ

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

128. The assessment concludes that the conservation objective to recover the spiny lobster to favourable condition in the Lundy MCZ will not be hindered by the construction phase of White Cross.

129. It 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 the construction phase of White Cross.

130. It also 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

131. The potential impacts of the operation and maintenance of the Offshore Project have been assessed in relation to benthic and intertidal ecology and a description of the potential effect caused by each identified impact is given in this section.

10.6.1 Impact 1: Temporary habitat loss / Physical disturbance

132. 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.

133. Cables at the Landfall (up to 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 Offshore Project. There would therefore be no operational effects on intertidal habitats and no effects on the Braunton Burrows SSSI.

10.6.1.1 Magnitude of impact

134. 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.

10.6.1.2 Sensitivity of the receptor

135. The sensitivity of the biotopes identified in the Offshore Development Area 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.

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

10.6.1.3 Significance of effect

137. 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.

10.6.2 Impact 2: Temporary increased suspended sediment concentrations and deposition

138. There is potential for sediments to be re-suspended by the scouring effects of the catenary action of the mooring lines and around the foundations of the mooring anchors. However, particle size analysis of the sediments within the wind farm site show that the sediments are dominated by sand. As such, any sediment suspended during the operation of the wind farm will fall out of suspension shortly after disturbance. Only the finest fractions will reside in the water column and in these cases for short durations and in the lower layers of the water column (see **Chapter 8: Marine Geology, Oceanography, and Physical Processes)**.

139. Additionally, the total volume of sediment that could be disturbed is relatively low. Even the fullest swept area per turbine, affecting only a thin layer of surface sediment, equates to a few tens or, at most, a few hundred cubic metres of sediment per turbine, although this could be a frequent disturbance through the operation and maintenance phase. Scour is also only likely to occur during higher energy conditions (i.e., storms) where the baseline suspended solids concentrations are also likely to be higher.

10.6.2.1 Magnitude of impact

140. Although this effect will persist throughout the operation and maintenance phase the effect on suspended sediment concentrations of catenary action will be localised and small in magnitude, and hence the magnitude of the effect is considered to be **negligible**.

10.6.2.2 Sensitivity of the receptor

141. Water quality in the offshore area is considered to be of **low** sensitivity because it is not within a confined area and therefore has a high capacity to accommodate change due to its size and ability to dilute any alterations to water quality parameters.

10.6.2.3 Significance of effect

142. Due to the **negligible** magnitude and low sensitivity of identified biotopes to each impact pathway for increased SSC, the effect is considered to be of **negligible** adverse significance.

10.6.3 Impact 3: Remobilisation of contaminated sediment

143. During maintenance activities, there is a risk of disturbing contaminated sediment and remobilising it back into the water column. However, **Chapter 9: Marine Water and Sediment Quality** has assessed the impact in more detail and concluded that even though there are some elevated levels of contaminants within the sediments, they align with typical levels for the region and do not pose a high risk.

144. The MarESA sensitivity review of pink sea fans was classified as not assessed against transition components and organo-metal contamination, hydrocarbon and PAH contamination, or introduction of other substances. These pressures were the ones selected to assess remobilisation of contaminated sediment.

10.6.3.1 Magnitude of impact

145. As described in **Section 10.5.3**, sediment analysis has been conducted and sediment contamination levels are not to be of significant concern and are low risk in terms of potential impacts on the marine environment. Therefore, there is **negligible** magnitude of effect from re-mobilisation of contaminated sediments during maintenance activities.

10.6.3.2 Sensitivity of the receptor

146. The MarESA pressure benchmark for 'Pollution and other chemical changes' is named as 'Exposure of marine species or habitat to one or more relevant contaminants via uncontrolled releases or incidental spills' (Tyler-Walters et al., 2022). Given

contaminant levels are within environmental protection standards, marine species and habitats are **not sensitive** to changes that remain within these standards.

10.6.3.3 Significance of effect

147. Given the contaminant levels are within environmental protection standards, and marine species and habitats are not sensitive to changes that remain within these standards the effect is considered to be of **negligible significance**.

10.6.4 Impact 4: Permanent habitat loss / long term habitat loss

148. The presence of foundations on the seabed (for the Offshore Substation Platform) and cable protection would result in a relatively small footprint of lost habitat in the context of the habitat from the surrounding region. Depending on whether the infrastructure is removed or left in-situ at the decommissioning stage this impact is either long term or permanent habitat loss. As a worst case scenario, it is assumed it would be permanent habitat loss unless the Applicant commits to removing any areas of infrastructure at decommissioning.

149. It is possible that artificial infrastructure installed will be colonised by the same benthic community present before installation, and therefore there would be no long-term habitat loss. However, artificial hard substratum may also differ in character from natural hard substratum, so that replacement of natural surfaces with artificial hard substratum may lead to changes in the biotope through changes in species composition, richness and diversity.

10.6.4.1 Magnitude of impact

150. The change in habitat type is long term and irreversible during the lifespan of the Offshore Project. As indicated by **Table 10.8** the worst case scenario for permanent loss of seabed habitat within the Windfarm site is 0.02km^2 (footprint for anchoring systems for catenary turbines and offshore substation). This is considered to be **negligible** magnitude in relation to the surrounding habitat available and the highly localised nature of the impact.

10.6.4.2 Sensitivity of the receptor

151. The sensitivity of identified habitats and biotopes to habitat loss is summarised in **Table 10.18** below.

Table 10.18 The sensitivity of biotopes to physical change to another seabed type

Habitat / biotope	MarESA - Physical change (to another seabed type)		
	Sensitivity	Resistance	Resilience
A5.142 *Mediomastus fragilis, Lumbrineris spp*. and venerid bivalves in circalittoral coarse sand or gravel	High	None	Very Low
A5.233 *Nephtys cirrosa* and *Bathyporeia* spp. in infralittoral sand	High	None	Very Low
A5.242 *Fabulina fabula* and *Magelona mirabilis* with venerid bivalves and amphipods in infralittoral compacted fine muddy sand	High	None	Very Low
A5.252 *Abra prismatica, Bathyporeia elegans* and polychaetes in circalittoral fine sand	High	None	Very Low
A5.351 *Amphiura filiformis*, *Mysella bidentata* and *Abra nitida* in circalittoral sandy mud	High	None	Very Low
A5.451 Polychaete-rich deep Venus community in offshore mixed sediments	High	None	Very Low
Pink sea fan *Eunicella verrucosa*	High	None	Very Low

10.6.4.3 Significance of effect

152. The magnitude will be highly localised and has been assessed as **negligible**. The sensitivity of the receptors has been assessed as **high** (**Table 10.18**). Therefore, the significance of impact is assessed as minor, and, therefore, **not significant**.

10.6.5 Impact 5: Colonisation of introduced artificial substrate including non-native species.

153. The sub-sea structures (mooring systems, scour, and cable protection) are expected to be colonised by a range of species leading to a localised change in biodiversity. The presence of the structures would also provide habitat for mobile species and for example serve as a refuge for fish. This represents a change from the baseline ecology. Overall, the area available for colonisation would be low and to date there is no evidence of significant changes of the seabed beyond the vicinity of the foundation structures due to the installation of windfarms (Lindeboom et al, 2011).

154. As stated in the construction stage for INNS, it is not expected INNS will be introduced by the Offshore Project due to the mitigation measures (**Section 10.3.4**) which will be adhered to. The potential operational impact in relation to INNS during the operational phase is therefore related to the artificial structures introduced by the Offshore Project which have the potential to act as 'stepping stones' for the spread of INNS. There are other sources of hard infrastructure present in the area such as cables and vessels transiting in the area. Therefore, the stepping stone potential is already present in the area and the hard infrastructure introduced by the Offshore Project will not materially add to this.

10.6.5.1 Magnitude of impact

155. The change in habitat type is long term and irreversible during the lifespan of the Offshore Project but the magnitude is **negligible** in relation to the surrounding habitat available and the highly localised nature of the impact. Mitigation measures will ensure that the introduction of INNS from the Offshore Project are **negligible** or avoided entirely.

10.6.5.2 Sensitivity of the receptor

156. The sensitivity of identified habitats and biotopes to habitat loss is summarised in **Table 10.18**.

10.6.5.3 Significance of effect

157. The change of habitat type from a soft sediment to hard sediment and subsequent change in community structure is means that sensitivity of the receptors has been assessed as **high.** However, the change of species composition will be highly localised to sub-sea structures and their immediate environs, and the magnitude is considered **negligible** in terms of the total area of the Offshore Development Area. Therefore, the significance of impact is assessed as minor, and, therefore, **not significant**.

10.6.6 Impact 6: Underwater noise and vibration

158. During maintenance works, majority of underwater noise and vibration will occur as a result of vessel activity. There is, however, the possibility that noise produced by operational wind turbines can be conducted through the tower and foundations into the water column and effect benthic species. Monitoring studies of underwater noise from operational turbines have shown the noise levels from North Hoyle, Scroby Sands, Kentish Flats and Barrow windfarms to be only marginally above ambient noise levels (MMO,2014). There is no evidence to suggest this low level of noise and vibration has a significant impact on benthic ecology.

10.6.6.1 Magnitude of impact

159. Noise associated with the operational phase is primarily related to vessel movements on site. The impact of vessel noise on benthic species will be very localised and of a small-scale nature.

160. However, noise produced from the operation of wind turbines has also been considered. Norro et al (2011) found that steel pile wind turbines produce a sound pressure level increase of 20 to 25 dB re 1µPa for a wind farm with 3MW turbines. This increase is much lower than the effect of construction activities. Additionally, as the Offshore Project is floating rather than fixed foundations the noise and vibration to the seabed is expected to be lower than from fixed foundations.

161. Therefore, there is **low** magnitude of effect to benthic ecology receptors from underwater noise and vibration during maintenance activities.

10.6.6.2 Sensitivity of the receptor

162. The biotopes identified within the Offshore Development Area have MarESA sensitivity of 'Not Relevant' to the impact of underwater noise and vibration. '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 underwater noise and vibration is considered to be **negligible**.

163. Equally, it is likely that the benthic species in the Celtic Sea are habituated to noise created by existing shipping occurring in the area therefore limiting sensitivity to maintenance vessel activities within the Offshore Development Area.

10.6.6.3 Significance of effect

164. As the biotopes, and subsequent benthic species within, have no to **negligible** sensitivity to underwater noise and vibration, and the magnitude is concluded low. The

significance of effect from underwater noise and vibration is assessed as **negligible adverse significance**.

10.6.7 Impact 7: Electromagnetic fields (EMF)

165. There is potential for offshore Offshore Export Cables and the interconnector cable 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).

166. 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*.

167. Boles and Lohmann (2003) found the Spiny lobster *Panulirus argus* exhibits annual migrations and homing behaviours. They use geomagnetic fields to return to known locations after displacement. Therefore, other lobsters and crabs became the focus of EMF studies, assuming they would all display similar behaviour. Similar responses have been found in subsequent studies. Hutchinson et al., (2020) found the American lobster *Homarus americanus* showed an increase in exploratory response when exposed to EMF from a high voltage DC (HVDC) cable compared to their natural geomagnetic response. Similarly, Scott et al., (2018) studied the edible crab *Cancer pagarus* in a controlled environment and found individuals to have a strong attraction to EMF sources. Their roaming decreased by 21% and focus was turned to the EMF source. They concluded that with increased EMF around renewables projects, it is likely that there will be an increase in individuals populating these areas. They suggest further research into the effects on different life stages of *C. pagarus* as eggs and juveniles are highly likely to be found surrounding EMF sources in the future.

168. In contrast, yellow rock crabs *Metacarcinus anthonyu* and red rock crabs *Cancer productus* have shown no preferences to EMF sources (Love et al., 2015). When placed in in situ chambers, the crabs were able to get closer and farther away from an energised or unenergised cables. No preference was exhibited. Further support for the findings from

Love et al., (2017) found no significant differences among fish and invertebrate communities between energised cables, pipe and natural habitat.

169. The Offshore Project proposes to use armoured cables which mitigates both the electric and to an extent the magnetic fields. Cables will be buried where possible, which again reduces the magnetic fields and is a suggested mitigation technique in NPS EN-3. In areas where cable burial is not possible such as around cable crossings and the breakout point at Landfall (up to MHWS), cable protection will be placed. The maximum footprint of cable protection would be 18% of the Offshore Export Cable and 10% of the on seabed length of the inter-array cables.

10.6.7.1 Sensitivity of the receptor

170. The sensitivity of biotopes identified in the offshore cable corridor and the interconnector cable have been assessed in relation to the MarESA pressure relevant to the impact of EMF.

171. 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 as highlighted above. 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 over the Offshore Development Area have 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**.

10.6.7.2 Magnitude of impact

172. 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 inter-array and Offshore Export Cable. Therefore, the magnitude of the interactions of EMF is considered **low**.

10.6.7.3 Significance of effect

173. Due to the **negligible** sensitivity of biotopes present in the Offshore Development Area, and the low magnitude of effect, the overall significance of effect from interactions of EMF is **negligible**.

10.6.8 Other Designated Sites

10.6.8.1 SAC

174. The full assessment can be found in **Section 1.7** of the RIAA found in **Appendix13.A**.

175. The intertidal area on the north side of the estuary therefore comprised Annex 1 habitat 'Mudflats and sandflats not covered by seawater at low tide', which is a qualifying feature of the Braunton Burrows SAC is assessed within **Chapter 20: Onshore Ecology and Ornithology**.

176. As the cables will be buried during operation, no impacts are expected on Lundy SAC.

10.6.8.2 MCZ

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

178. The assessment concludes that the conservation objective to recover the spiny lobster to favourable condition in the Lundy MCZ will not be hindered by the operation phase of White Cross.

179. The assessment consideres 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 Offshore Project.

180. It also 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 operation phase of White Cross.

10.7 Potential impacts during decommissioning

181. No decision has been made regarding the final decommissioning policy for the Offshore Project as it is recognised that industry best practice, rules and legislation change over time. The decommissioning methodology would be finalised nearer to the end of the lifetime of the Offshore Project to be in line with current guidance, policy and legalisation at that point. Any such methodology would be agreed with the relevant authorities and statutory consultees. The decommissioning works are likely to be subject to a separate licencing and consenting approach. The anticipated decommissioning activities are outlined in **Section 5.10** of **Chapter 5: Project Description**.

182. The potential impacts of the decommissioning of the Offshore 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. During decommissioning, it is anticipated is potential to cause physical disturbance to the substratum and changes in suspended sediments.

10.7.1 Impact 1: Temporary habitat loss / physical disturbance

183. Potential impacts from decommissioning are considered to be less than the worst-case impacts for construction as no seabed preparation will be required. The impacts from decommissioning will relate to the assemblage of habitats present in the future baseline, and how the benthic community has altered. Accordingly, given that the impact was assessed to be **negligible** significance for the identified benthic ecology receptors during the construction phase, it is anticipated that the same would be true for the decommissioning phase.

10.7.2 Impact 2: Increased in suspended sediments and deposition

184. Decommissioning impacts on suspended sediment concentrations will be similar to those experienced during the construction phase. This means there will be **negligible** effect on benthic and intertidal ecology, which is deemed **not significant**. Upon completion of decommissioning, there will be no notable effect remaining from the Offshore Project.

10.7.3 Impact 3: Remobilisation of existing contaminated sediments

185. Decommissioning impacts on suspended sediment concentrations will be similar to those experienced during the construction phase. It has been established that contamination within the sediments is in the majority below guideline levels, and where exceedances occur these are marginally above the lower guideline level value and located within a discreet area along the Offshore Export Cable Corridor. This means there will be **negligible** effect on benthic and intertidal ecology, which is deemed **not significant**. Upon completion of decommissioning, there will be no notable effect remaining from the Offshore Project.

10.7.4 Impact 4: Underwater noise and vibration

186. Potential impacts from decommissioning e.g., from cutting foundation are considered to be less than the worst case impacts for construction. Accordingly, given that the impact was assessed to be **negligible** significance for the identified benthic ecology receptors during the construction phase, it is anticipated that the same would be true for the decommissioning phase.

10.7.5 Impact 4: Invasive Non-Native Species (INNS)

187. The risk of introduction of INNS during decommissioning will come from vessel ballast water and biofouling. The number of ships required for decommissioning is not

known at this stage, but it is anticipated that the impact assessed to be **negligible** significance for the identified benthic ecology receptors during the construction phase, would be true for the decommissioning phase. Adherence to the PEMP during decommissioning will minimise the risk of INNS being introduced into the environment.

10.8 Potential cumulative effects

188. 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 Offshore Project have been considered as part of the baseline for the EIA. Where possible OWL 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 established on a topic-by-topic basis with the relevant consultees as the EIA progresses.

189. The cumulative effect assessment for benthic and intertidal ecology was undertaken in two stages. The first stage was to consider the potential for the impacts 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 effects considered for benthic and intertidal ecology

Impact Construction	Potential for cumulative effect	Rationale
Temporary habitat loss / physical disturbance	No	No pathway for effects of habitat loss/physical disturbance to spatially or temporally cause cumulative effects Landfall (up to MHWS) construction expected to take 24hrs and then cables will be buried at sufficient depth with no overlap with other project boundaries.
Increased suspended sediments and deposition	No	No potential for temporal overlap of Offshore Export Cable construction
Re-mobilisation of contaminated sediments	No	Due to the low levels of contaminants assessed in the benthic survey report and

Impact	Potential for cumulative effect	Rationale
		distances of projects, there are no viable pathways.
Underwater noise and vibration	No	MarESA sensitivity assessment for all of biotopes recorded in the array areas is that noise impacts are 'Not Relevant' suggesting no direct interaction between the impact and biotope or characteristic species.
Invasive Non-Native Species (INNS)	No	With the relevant mitigations in place (outlined in PEMP), it is not expected INNS will be introduced by the Offshore Project.
Operation		
Temporary habitat loss / Physical disturbance	No	As per construction.
Temporary increased suspended sediment concentrations and deposition	No	The Offshore Project is not within a confined area and therefore has a high capacity to accommodate change. Due to the distances between projects and the low expected levels of SSC.
Remobilisation of contaminated sediment	No	As per construction.
Permanent habitat loss / long term habitat loss	No	No overlap with project boundaries for artificial hard substratum habitat species to travel between projects.
Colonisation of introduced artificial substrate including Non-Native Species	No	No overlap with project boundaries for non-native species to travel between projects.
Underwater noise and vibration	No	MarESA sensitivity assessment for all of biotopes recorded in the array areas is that noise impacts are 'Not Relevant' suggesting no direct interaction between the impact and biotope or characteristic species.
Electromagnetic fields (EMF)	No	Due to the low levels of EMF expected to seep into the

Impact	Potential for cumulative effect	Rationale
		environment and distances of other projects in the area.
Decommissioning		
Temporary habitat loss / physical disturbance	No	As per construction or less
Increased suspended sediments and deposition	No	As per construction or less
Remobilisation of contaminated sediment	No	As per construction or less
Underwater noise and vibration	No	As per construction or less
Invasive Non-Native Species (INNS)	No	As per construction or less

190. 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 Section 6.6.11**) and their anticipated potential for cumulative effects are summarised in **Table 10.20**. A rationale for inclusion in the CEA for benthic and intertidal ecology has been provided and is predominately based on distance or the tiering approach described in Chapter 6: EIA Methodology.

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

Project	Status	Distance from Offshore Development Area (km)	Included in the CEA?	Rationale
White Cross OWF – Onshore Project	Planned	0 (Landfall)	No	All intertidal construction activities are assessed within this Chapter.
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
The Llŷr projects (floating offshore wind)	Pre-consent	22km	No	
South Pembrokeshire Demonstration Zone	Pre-planning application	30km	No	

Project	Status	Distance from Offshore Development Area (km)	Included in the CEA?	Rationale
Valorous Floating Wind Demo	Pre-planning application	34km	No	of effects for benthic ecology.
Erebus Floating Wind Demo	Pre-planning application	38km	No	

191. It is noted that the first project listed is the Town and Country Planning Application for the onshore components of the White Cross OWF which are a separate element to the offshore Section 36 consent 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 such as HDD.

192. The specific combined project components are assessed cumulatively first (**Table 10.19**) and then cumulatively with all other projects (**Table 10.20**). Due to the distance of all the projects listed within the area, all cumulative projects have been screened out. Any additive impacts across the region will be small scale and localised with no pathway for cumulative effects on benthic ecology.

10.9 Inter-relationships

193. Inter-relationship impacts are covered as part of the assessment and consider impacts from the construction, operation, maintenance, or decommissioning of the Offshore 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 Offshore Project (construction, operation, maintenance, 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.

194. **Table 10.21** serves as a sign-posting 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			
Temporary habitat loss/physical disturbance	**Chapter 8: Marine and Coastal Processes** **Chapter 11: Fish and Shellfish Ecology** **Chapter 12: Marine Mammal and Marine Turtle Ecology**	**Section 10.5.1** & **10.6.1**	Habitat loss through temporary or permanent alteration of the seabed could potentially disturb the form and function of the seabed (e.g., sand waves). Loss of habitat may also have knock-on effects on predator species, which may affect marine mammal populations, or populations of commercially important fishes.
Permanent habitat loss		**Section 10.6.4**	
Suspended sediments and deposition	**Chapter 8: Marine Geology, Oceanography and Physical Processes**	Impacts as a result of suspended sediment and deposition are assessed in **Section 10.5.2** and **10.6.2**.	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 potential impacts on benthic habitats and species.
Re-mobilisation of contaminated sediments	**Chapter 9: Marine Water and Sediment Quality**	Re-mobilisation of contaminated sediments during construction is	**Chapter 9: Marine Water and Sediment Quality** provides an assessment of the

Topic and description	Related chapter	Where addressed in this Chapter	Rationale
		assessed in **Section 10.5.3** and **10.6.3**.	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.
Fish and Shellfish –edible crabs, prey resources, nursery and spawning ground	**Chapter 11: Fish and Shellfish Ecology**	This chapter informs Chapter 11.	The benthic environment represents a habitat for many fish and shellfish species. Additionally, a number of benthic species are prey for fish and shellfish. Therefore, impacts on benthic ecology can lead to indirect impacts on fish and shellfish.
Decommissioning			
Inter- relationships for impacts during the decommissioning phase will be the same as those outlined above for the construction phase.			

10.10 Interactions

195. 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**, **Table 10.23** and **Table 10.24**, 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.

196. **Table 10.25** 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. If minor impact and minor impact were added this would effectively double count the sensitivity.

197. The assessment set out in **Sections 10.5, 10.6** and **10.7** concluded that the magnitude of potential effects on benthic and intertidal ecology arising from all impacts identified during the construction, operation, maintenance, and decommissioning of the Offshore Project was **negligible**. As such interactions between these effects within and between the development phases would not occur.

Table 10.22 Interaction between impacts during construction

Construction	Potential impact				
	Impact 1: Temporary habitat loss/physical disturbance	**Impact 2:** Increased suspended sediment concentrations	**Impact 3:** Remobilisation of contaminated sediments	**Impact 4:** Underwater noise and vibration	**Impact 5:** INNS
Impact 1: Temporary habitat loss/physical disturbance		Yes	Yes	No	No
Impact 2: Increased suspended sediment concentrations	Yes		Yes	No	No
Impact 3: Remobilisation of contaminated sediments	Yes	Yes		No	No
Impact 4: Underwater noise and vibration	No	No	No		No
Impact 5: INNS	No	No	No	No	

Table 10.23 Interaction between impacts during operation and maintenance

	Potential impact						
Operation & Maintenance	**Impact 1:** Temporary habitat loss/physical disturbance	**Impact 2:** Temporary increased suspended sediment concentrations	**Impact 3:** Remobilisation of contaminated sediments	**Impact 4:** Permanent habitat loss / long term habitat loss	**Impact 5:** Colonisation of introduced artificial substrate including non-native species	**Impact 6:** Underwater noise and vibration	**Impact 7:** EMF
Impact 1: Temporary habitat loss/physical disturbance		Yes	Yes	Yes	No	No	No
Impact 2: Temporary increased suspended sediment concentrations	Yes		Yes	No	No	No	No
Impact 3: Remobilisation of contaminated sediments	Yes	Yes		No	No	No	No
Impact 4: Permanent habitat loss / long term habitat loss	Yes	No	No		No	No	No
Impact 5: Colonisation of introduced artificial	No	No	No	No		No	No

Potential impact							
substrate including non-native species							
Impact 6: Underwater noise and vibration	No	No	No	No	No		No
Impact 7: EMF	No	No	No	No	No	No	

Table 10.24 Interaction between impacts during decommissioning

Decommissioning					
The magnitude of decommissioning effects will be comparable to or less than those identified for the construction and operational phases.					
	Potential impact				
	Impact 1: Temporary habitat loss/physical disturbance	**Impact 2:** Increased suspended sediment concentrations	**Impact 3:** Remobilisation of contaminated sediments	**Impact 4:** Underwater noise and vibration	**Impact 5:** INNS
Impact 1: Temporary habitat loss/physical disturbance		Yes	Yes	No	No
Impact 2: Increased suspended sediment concentrations	Yes		Yes	No	No
Impact 3: Remobilisation of contaminated sediments	Yes	Yes		No	No
Impact 4: Underwater noise and vibration	No	No	No		No
Impact 5: INNS	No	No	No	No	

Table 10.25 Potential interactions between impacts on benthic and intertidal ecology

Receptor	Highest level significance Construction	Operation and Maintenance	Decommissioning	Phase Assessment	Lifetime Assessment
Benthic habitats and biotopes	Negligible	Negligible	Negligible	No greater than individually assessed impacts: • Long term habitat loss during operation increases the potential for interactions with other impacts assessed for that phase • 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, being restricted to the Offshore Project ZoI. 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.

10.11 Summary

198. This chapter has investigated the potential effects on benthic ecology receptors arising from the Offshore 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.

199. The benthic and intertidal study area (which encompasses the Windfarm Site) extends seaward (west) from the Devon coastline, at the mouth of the rivers Taw and Torridge, and encompasses Bideford Bay and Lundy Island. Seabed sediments across the array areas, cable corridor and interconnector, are dominated by sand and mixed sediment. Benthic communities corresponding to these sediment types were recorded, consistent with typical communities found in the Celtic Sea.

200. The assessment has established that any residual effects during the construction, operation, maintenance, and decommissioning phases of the Offshore Project will be **negligible**. Effects will be generally localised in nature, being restricted to the Offshore Project and immediate surrounding area.

201. **Table 10.26** 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.

202. The assessment of cumulative effects from the Offshore Project and other developments and activities 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 10.26 Summary of potential impacts for benthic and intertidal during construction, operation, maintenance and decommission of the Offshore 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: Underwater noise and vibration		Negligible	Negligible	Negligible	None	None
Impact 5: INNS		Medium	Low	Minor Adverse	Employing biosecurity measures in accordance with the relevant regulations and guidance outlined in **Section 10.5.5**	None

Potential impact	Receptor	Sensitivity	Magnitude	Significance	Mitigation measure	Residual effect
Operation and Maintenance						
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: Temporary increased suspended sediment concentrations		Low	Negligible	Low	None	None
Impact 3: Remobilisation of contaminated sediments		Not sensitive	Negligible	Negligible	None	None
Impact 4: Permanent habitat loss / long term habitat loss		High	Negligible	Not significant	None	None
Impact 5: Colonisation of introduced artificial substrate including non-native species		High	Negligible	Not significant	None	None
Impact 6: Underwater noise and vibration		Negligible	Low	Negligible	None	None

Potential impact	Receptor	Sensitivity	Magnitude	Significance	Mitigation measure	Residual effect
Impact 7: EMF		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
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: Underwater noise and vibration		Negligible	Negligible	Negligible	None	None
Impact 5: INNS		Medium	Low	Minor Adverse	Employing biosecurity measures in accordance with the relevant regulations and guidance outlined in **Section 10.5.5**	None
Cumulative						

Potential impact	Receptor	Sensitivity	Magnitude	Significance	Mitigation measure	Residual effect
None						

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White Cross Offshore Wind Farm Appendix 10.A: Marine Conservation Zone Assessment

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WHITE CROSS

Glossary of Acronyms

Acronym	Definition
AoO	Natural England's Advice on Operations
BAC	Background Assessment Concentration
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
EEA	European Economic Area
EEZ	Economic Exclusion Zone
EIA	Environmental Impact Assessment
EMF	Electromagnetic Frequency
EPP	Evidence Plan Process
ERL	Effects Range Low
ES	Environmental Statement
ETG	Expert Topic Group
EU	European Union
FEED	Front-End Engineering and Design
FOCI	Features of Conservation Importance
GIS	Geographical Information System
GPS	Global Positioning System
ha	Hectare
HDD	Horizontal Directional Drilling
HRA	Habitats Regulation Assessment
HVAC	High Voltage Alternating Current
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
LSE	Likely Significant Effect
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
MoD	Ministry of Defence
MW	Megawatts
NPS	National Policy Statement
O&M	Operation and Maintenance
OEL	Ocean Ecology Limited
OSP	Offshore Service Platform
OSPAR	The Convention for the Protection of the Marine Environment of the North-East Atlantic
OWF	Offshore Windfarm
OWL	Offshore Wind Ltd
PAH	Polyaromatic Hydrocarbon
PCB	Polychlorinated Biphenyl
PINS	Planning Inspectorate
PTS	Permanent Threshold Shift
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
WPD	Western Power Distribution
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.
Dynamic cables	The floating substructures will require cables to run through the water column from their platform base at the water surface to the touchdown point on the seabed.
Engineer, Procure, Construct and Install	A common form of contracting for offshore construction. The contractor takes responsibility for a wide scope and delivers via own and subcontract resources.
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.
Floating substructure	The floating substructure acts as a stable and buoyant foundation for the WTG. The WTG is connected to the substructure via the transition piece and the substructure is kept in position by the mooring system.
Front end engineering and design	Front-end engineering and design (FEED) studies address areas of windfarm system design and develop the concept of the windfarm in advance of procurement, contracting and construction.
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

Defined Term	Description
High Voltage Alternating Current	High voltage alternating current is the bulk transmission of electricity by alternating current (AC), whereby the flow of electric charge periodically reverses direction.
High Voltage Direct Current	High voltage direct current is the bulk transmission of electricity by direct current (DC), whereby the flow of electric charge is in one direction.
In-combination effects	In-combination effects are those effects that may arise from the development proposed in combination with other plans and projects proposed/consented but not yet built and operational.
Inter-array cables	Cables which link the wind turbines to each other and the Offshore Substation Platform, or at the inter-array cables junction box (if no offshore substation). Array cables will connect the wind turbines to one and other and to the Offshore Substation (if utilised). The initial section for the inter-array cables will be freely suspended in the water column below the substructure (dynamic sections) while the on seabed sections of the cables will be buried where possible.
Jointing bay	Underground structures constructed at regular intervals along the Onshore Export Cable Corridor to join sections of cable and facilitate installation of the cables into the buried ducts
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.
Mean sea level	The average tidal height over a long period of time.
Mooring system	The equipment (mooring lines and seabed anchors) that keeps the floating substructure in position during operation through a fixed connection to the seabed.
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 impacts. Additional mitigation is therefore subsequently adopted by OWL as the EIA process progresses.

Defined Term	Description
National Grid Onshore Substation	Part of an electrical transmission and distribution system. Substations transform voltage from high to low, or the reverse by means of the electrical transformers.
National Grid Connection Point	The point at which the White Cross Offshore Windfarm connects into the distribution network at East Yelland substation and the distributed electricity network. From East Yelland substation electricity is transmitted to Alverdiscott where it enters the national transmission network.
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
Offshore Infrastructure	All of the offshore infrastructure including wind turbine generators, substructures, mooring lines, seabed anchors, Offshore Substation Platform and all cable types (export and inter-array). This encompasses the infrastructure 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
the Project	The 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
Offshore Transmission Assets	The aspects of the project related to the transmission of electricity from the generation assets including the Offshore Substation Platform (as applicable)) or offshore junction box, Offshore Cable Corridor to MHWS at the landfall
Offshore Transmission Owner	An OFTO, appointed in UK by Ofgem (Office of Gas and Electricity Markets), has ownership and responsibility for the transmission assets of an offshore windfarm.
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

Defined Term	Description
	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.
Onshore Infrastructure	The combined name for all infrastructure associated with the Project from MLWS at the Landfall to the NG grid connection point at East Yelland. The onshore infrastructure will form part of a separate Planning application to the Local Planning Authority (LPA) under the Town and Country Planning Act 1990
Onshore Transmission Assets	The aspects of the project related to the transmission of electricity from MLWS at the Landfall to the NG grid connection point at East Yelland including the Onshore Export Cable, the White Cross Onshore Substation and onward connection 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).
Offshore Wind Limited	Offshore Wind Ltd (OWL) 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.
Safety zones	A marine zone outlined for the purposes of safety around a possibly hazardous installation or works / construction area
Service operation vessel	A vessel that provides accommodation, workshops and equipment for the transfer of personnel to turbine during OMS. Vessels in service today are typically up to 85m long with accommodation for about 60 people.
Scour protection	Protective materials to avoid sediment being eroded away from the base of the foundations as a result of the flow of water
Transition joint bay	Underground structures at the Landfall that house the joints between the offshore export cables and the onshore export cables

Defined Term	Description
Transition piece	The transition piece includes various functionalities such as access for maintenance, cable connection for the energy of the turbine and the corrosion protection of the entire foundation
White Cross Offshore Windfarm	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.
Wind Turbine Generators (WTG)	The wind turbine generators convert wind energy into electrical power. Key components include the rotor blades, nacelle (housing for electrical generator and other electrical and control equipment) and tower. The final selection of project wind turbine model will be made post-consent application
Windfarm Site	The area within which the wind turbines, Offshore Substation Platform and inter-array cables will be present
Works completion date	Date at which construction works are deemed to be complete and the windfarm is handed to the operations team. In reality, this may take place over a period of time.

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 (O&M) 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)**.**

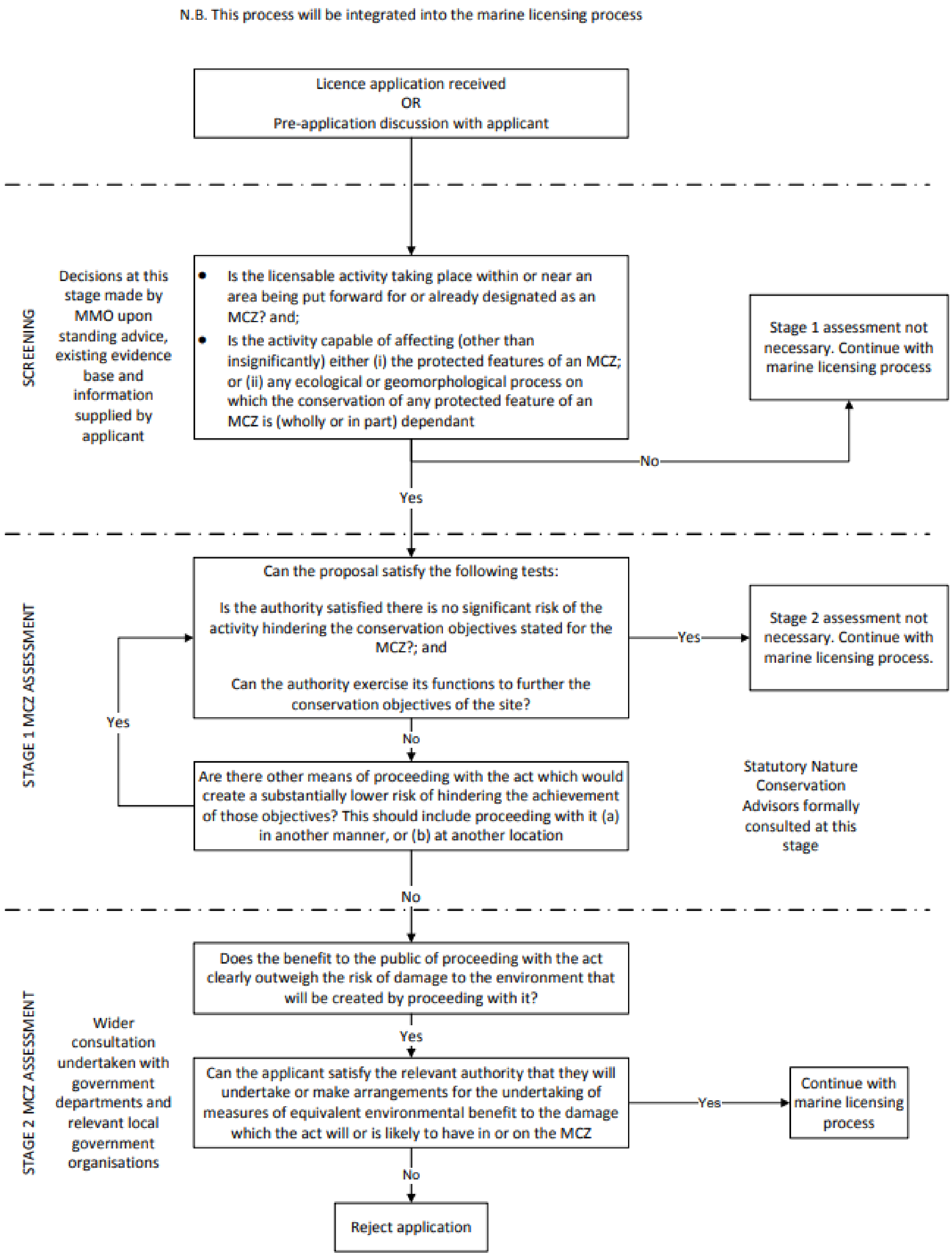
3.1 Screening (Appendix A)

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/2022/00002 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** of the ES.
MMO	30/05/2022 EIA/2022/00002 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 Geology, Oceanography and Physical 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.

Figure 5.1 MCZs included in Stage 1 Assessment and MCZs originally screened in

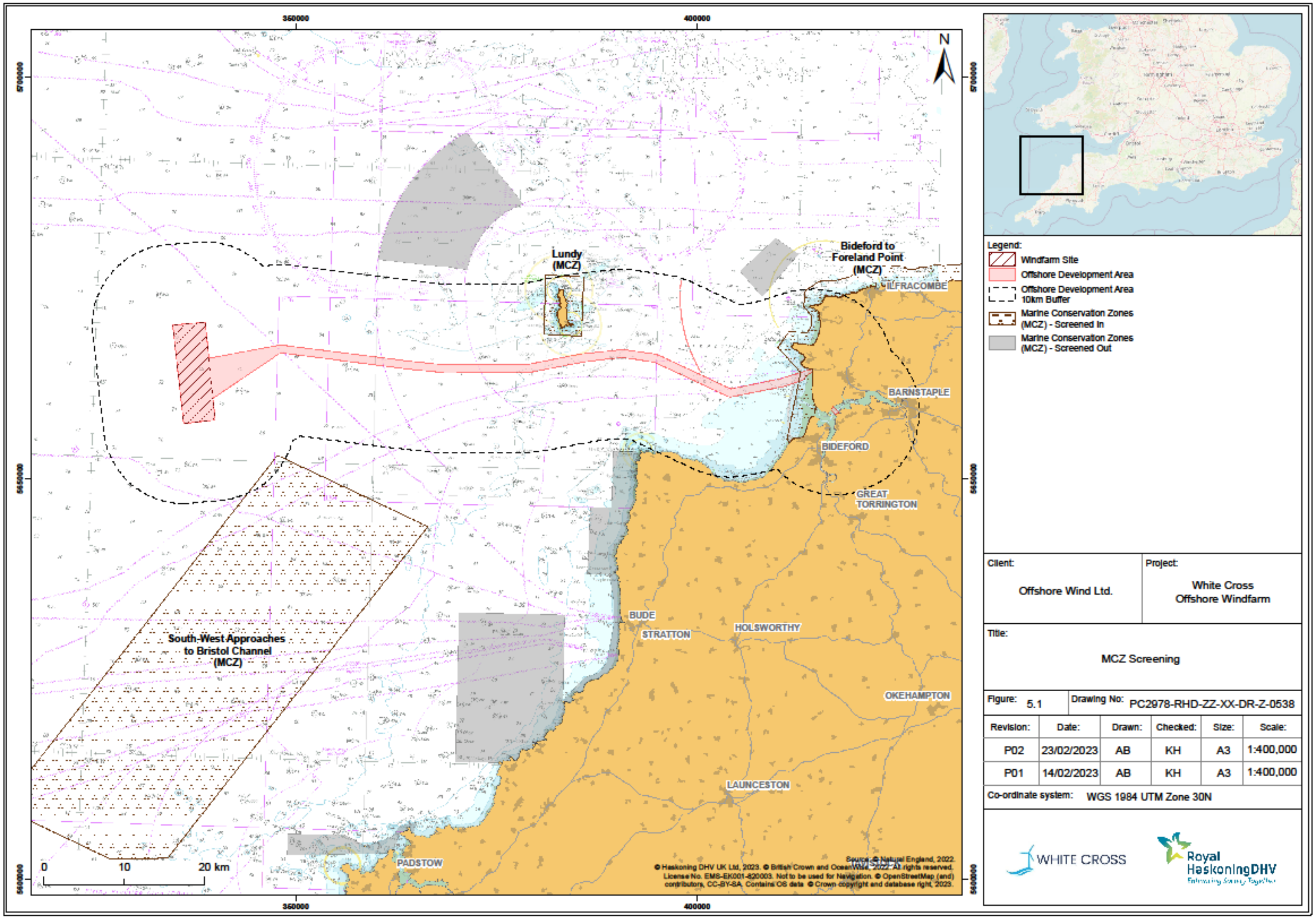


Table 5.1 Summary of screening

Site	Features screened in	Source of Impact	Impacts screened in (alone and cumulatively)	Construction	O&M	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 Subtidal sand	Indirect effects of the Offshore Export Cable Corridor (export cables and associated works)	Increased SSCs	✓	x	✓
			Re-mobilisation of contaminated sediments	✓	x	✓
			Effects on bedload sediment transport	x	✓	x
			Invasive species	✓	x	✓

Site	Features screened in	Source of Impact	Impacts screened in (alone and cumulatively)	Construction	O&M	Decommissioning
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	Parameter	Notes
Construction		
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. Total area of sand wave excavation works for Offshore Export Cable Corridor and inter-array cables is 292,800m^2	Jetting/ploughing considered the worst case installation method.

Impact	Parameter	Notes
	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 EMF levels will be measurable at 0.6μT above background levels (48.7μT) at 0 m from the cable, decreasingly rapidly with	

Impact	Parameter	Notes
	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.

Figure 7.1 Habitat features of the Bideford to Foreland Point MCZ

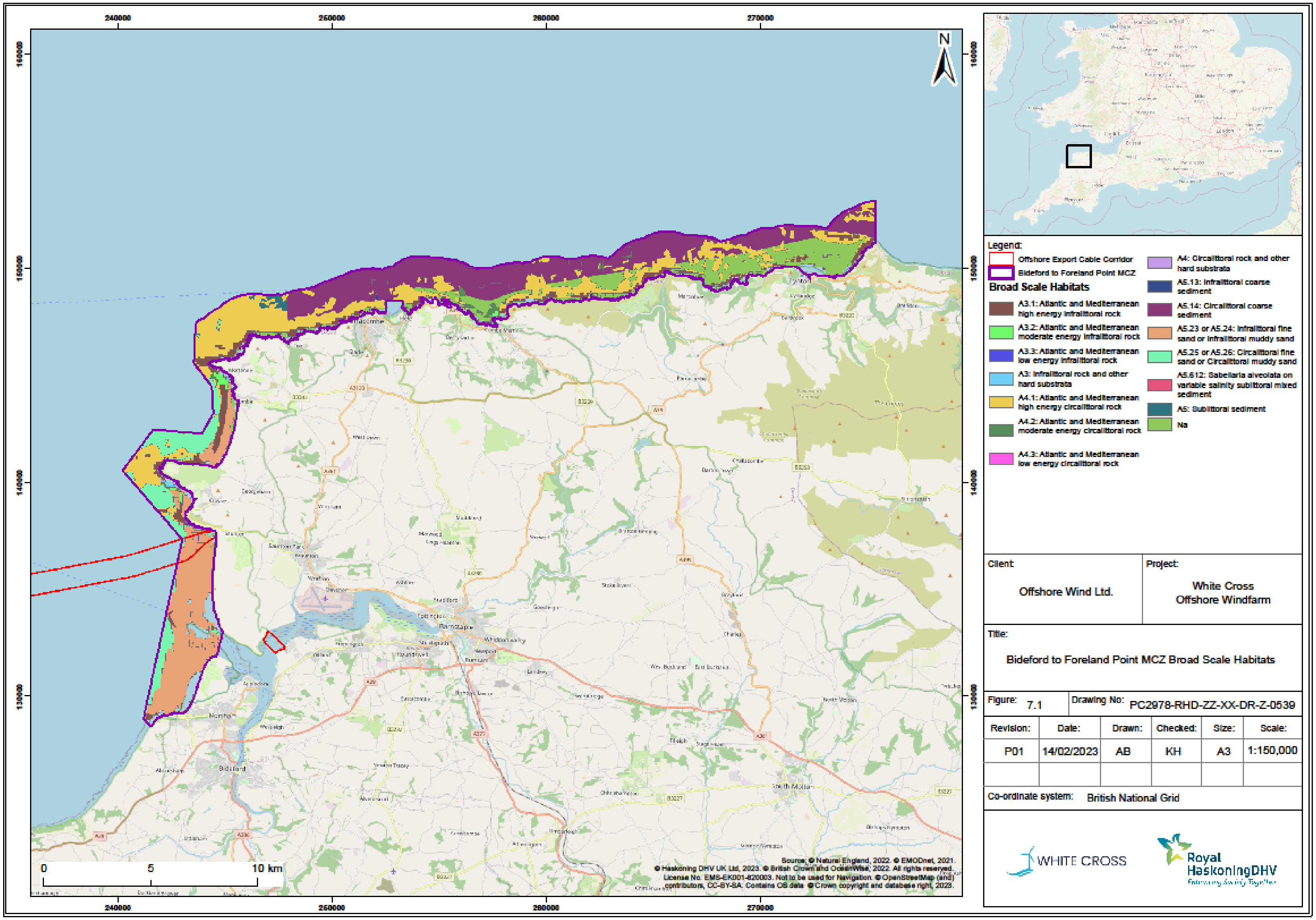


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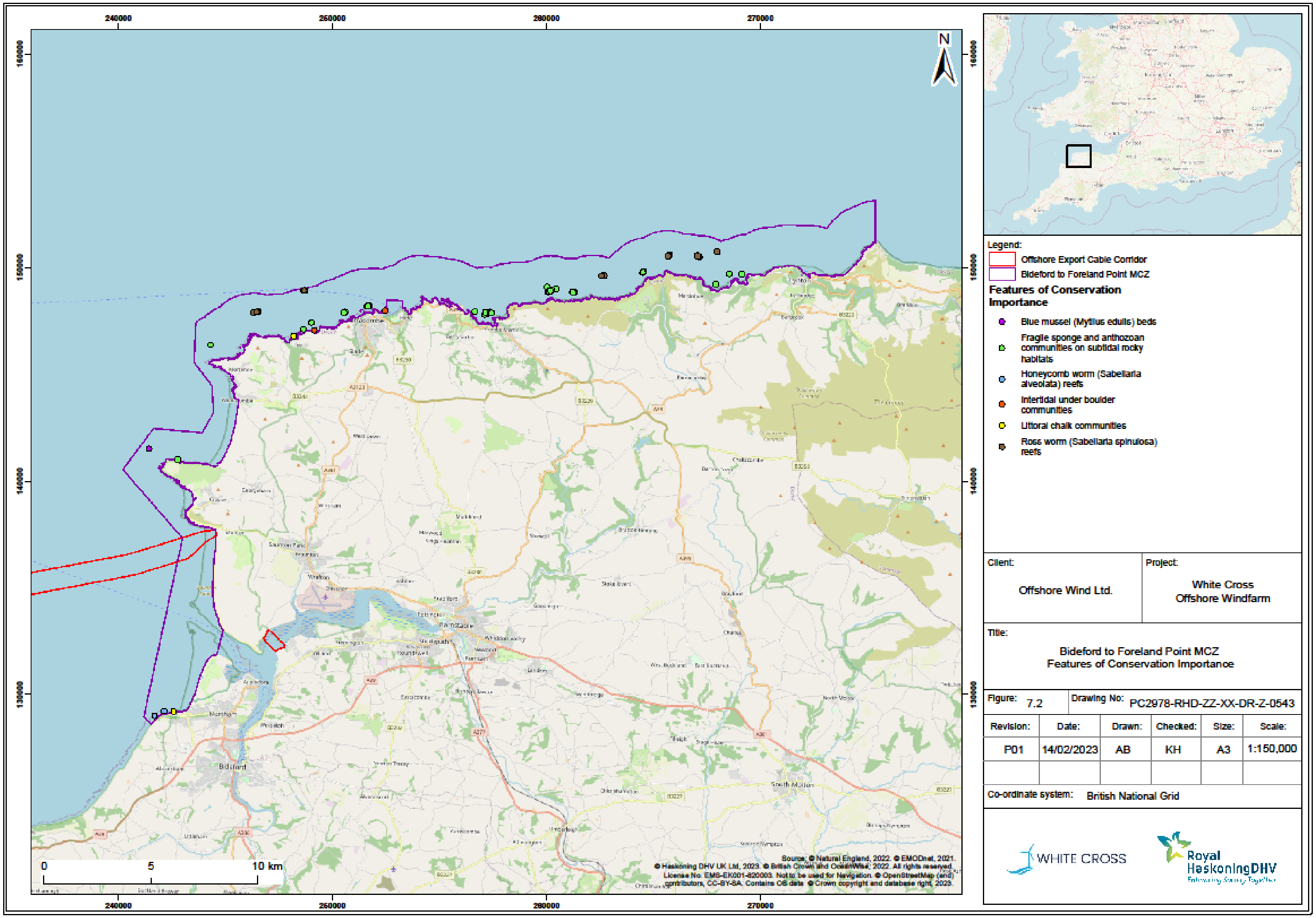
Figure 7.2 Bideford to Foreland Point MCZ Features of Conservation Importance



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.

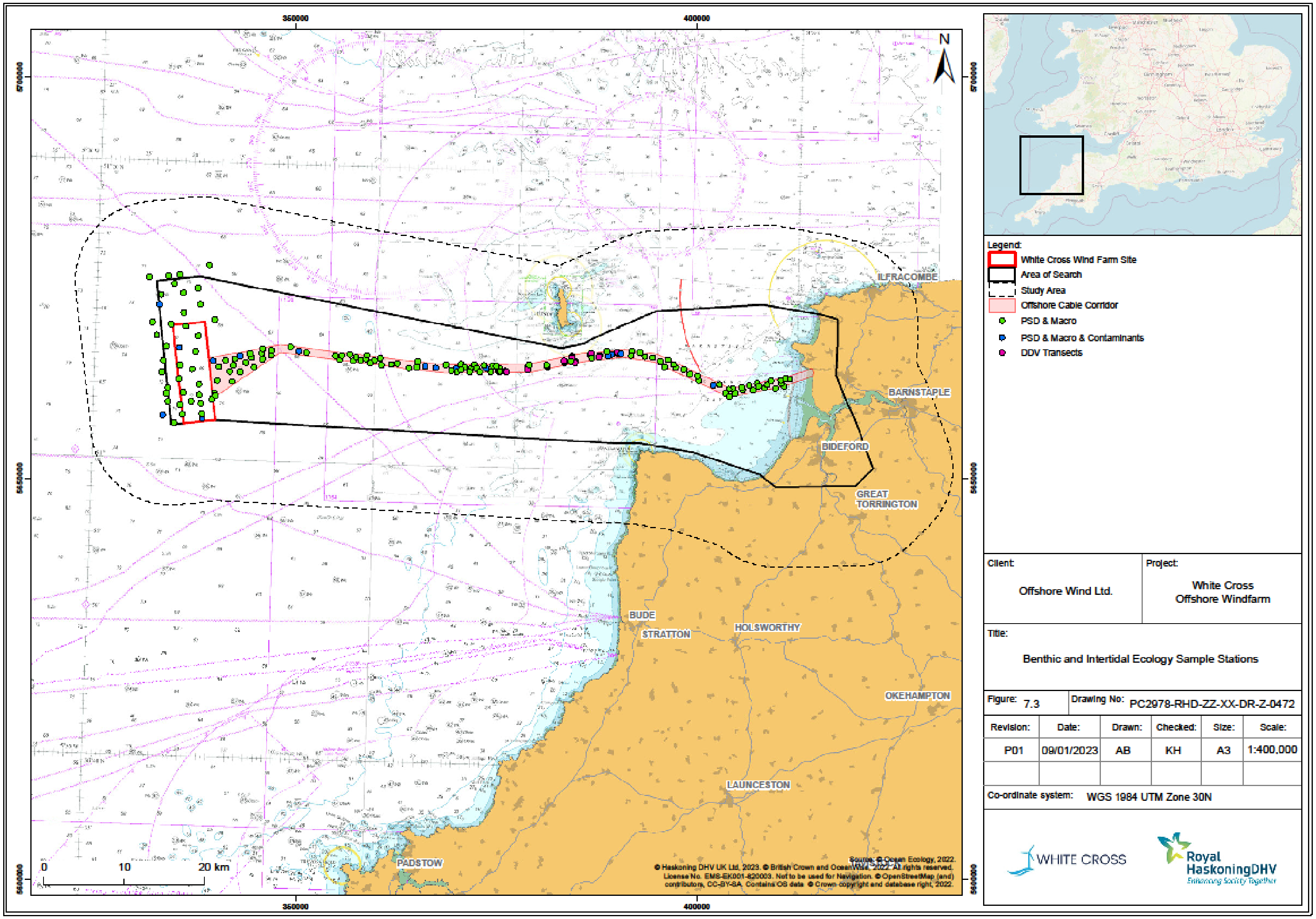
87. The distribution of EUNIS habitats and biotopes were mapped for the survey area of the Project. By combining grab samples with seabed video and photography and evaluating them against multivariate groups (derived from faunal multivariate analysis), EUNIS habitats and biotopes were assigned along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

Figure 7.3 Offshore survey area and sample location



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

Attribute	Target	Conclusion
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.	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: 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 allowing for natural responses to hydrodynamic regime, by preventing erosion or deposition through human-induced activity.	Target not affected 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)
Supporting processes: energy / exposure	Maintain the natural physical energy resulting from waves, tides and other water flows,	

Attribute	Target	Conclusion
	so that the exposure does not cause alteration to the biotopes and stability, across the habitat.	there would be no change to the topography or knock-on effects on physical processes.
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 Geology, Oceanography and Physical 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: Geology, Oceanography and Physical 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)

<table>
<tr><th>Attribute</th><th>Target</th><th>Conclusion</th></tr>
<tr><td>Supporting processes: water quality - turbidity (habitat)</td><td>Maintain natural levels of turbidity (e.g. concentrations of suspended sediment, plankton and other material) across the habitat</td><td rowspan="3">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 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</td></tr>
<tr><td>Supporting processes: water quality - turbidity (species)</td><td>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.</td></tr>
<tr><td>Supporting processes: sedimentation rate</td><td>Maintain the natural rate of sediment deposition.</td></tr>
</table>

Attribute	Target	Conclusion
		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**
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.	

Attribute	Target	Conclusion
		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.

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

Impacts screened in	Effects on bedload sediment transport		Electromagnetic fields
Equivalent pressure	Smothering and siltation rate changes (Light)	Water flow (tidal current) changes, including sediment transport considerations	
Protected feature			
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
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 Geology, Oceanography and Physical 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
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.	

Attribute	Target	Conclusion
		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

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: Geology, Oceanography and Physical 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 **Equivalent pressure** **Protected feature**	**Underwater noise and vibration** **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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Appendix A: Marine Conservation Zone Assessment Screening Report

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White Cross Offshore Wind Farm Marine Conservation Zone Assessment Screening Report

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V 1.0	Draft
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1. Introduction

1.1 Purpose of this document

1. This document provides the screening stage of the Marine Conservation Zone Assessment (MCZA) process for the White Cross Floating Offshore Wind Project (hereafter 'the Project').

2. The MCZA comprises up to three stages (see **Section 2: MCZ Assessment Methodology**). The aim of this stage is to determine whether or not an activity is capable of affecting (other than insignificantly) the protected features or physical processes of a marine conservation zone (MCZ), either directly or indirectly. This enables the competent authority to ensure compliance with the Marine and Coastal Access Act (MCAA) (2009).

3. Where it is considered that there is no potential for a significant effect as a result of the Project, it is proposed that the MCZ (or relevant feature of the MCZ) is 'screened out' from further consideration. Where the potential for a significant effect on the conservation objectives cannot be discounted, it remains 'screened in' and further assessment will be undertaken.

4. This document is to be used to inform stakeholder consultation. Agreement on whether sites and features should or should not be screened out will be sought through consultation.

1.2 Project Background

5. The Project is a proposed offshore windfarm located in the Celtic Sea (see **Figure 1.1.1 in the EIA Scoping Report**) with a capacity of up to 100MW. The Project is being developed by Offshore Wind Ltd (OWL) a joint venture between Cobra Instalaciones Servicios, S.A., and Flotation Energy plc. The Project was selected in 2021 as part of The Crown Estate's Test and Demonstration leasing opportunity.

6. The Windfarm Site is located over 52km off the North Cornwall and North Devon coast (west-north-west of Hartland Point). The Offshore Export Cable will connect the Offshore Substation Platform to shore. Onshore, the grid connection is confirmed as East Yelland (see **Figure 1.1.2 in the EIA Scoping Report**). The Export Cable will come ashore at a Landfall and then routed underground to the onshore substation where it connects into the Western Power Distribution Network.

1.3 Offshore Project Description

7. At this early stage in the development of the Project, the Project description is indicative.

8. The Agreement for Lease (AfL) area is illustrated in the map in (see **Figure 1.1.1 in the EIA Scoping Report**). The AfL area, known as the Windfarm Site, is located 52km north of the Cornwall and Devon coastline in a water depth of 60m – 80m. The Windfarm Site covers 50km^2.

9. The key characteristics of the AfL area are summarised in **Table 1.1**.

Table 1.1 Key characteristics

Area	Parameters	Values
AfL/windfarm site	Area	50km^2
	Closest distance to shore	52km
	Water depth	60m - 80m

1.3.1 Wind Turbine Generators

10. The size and capacity of the wind turbines will be decided at a later stage, prior to final investment decision. Technology develops rapidly and the available sizes of turbines are expected to increase over the coming years. The current wind turbine design envelope for the Project is outlined in **Table 1.2**.

Table 1.2 Wind Turbine Design Envelope

Wind Turbine Generator Parameter	Range to be considered
WTG capacity (MW)	12 – 24
Turbine type	3-bladed, with horizontal axis
Rotor Diameter (m)	220-300
Number of wind turbines	6-8
Individual Rotor swept area (m^2)	38,000 – 70,700
Total Rotor swept area (km^2)	~0.304km^2 (based on 8 x 220m diameter turbines)
Max Tip Height (m) above Mean Sea Level (MSL)	~345
Air Gap above MSL (m)	22
Indicative separation distance between turbines (inter-row)	Min. 1000m (subject to yield assessment)

Wind Turbine Floating Substructure

11. The floating substructure provides a base for the installation of the wind turbine. The substructure as defined here has three key components: (1) the mooring system, which anchors the structure to the seabed; (2) the substructure, a floating structure that supports the wind turbine; and (3) the transition, which provides the

connection from the substructure to the wind turbine tower. Substructures are typically made of tubular steel columns.

12. Conventional fixed substructures are less suitable for deeper waters (>50m), and floating substructures, where water depth presents less of an issue, could be a viable option. In addition to allowing turbines to be installed in deeper waters further from shore, floating structures offer benefits in that their construction is largely yard based, with significantly less offshore construction activity, therefore reducing the impacts of offshore construction, the cost and scheduling uncertainties traditionally associated with more conventional windfarm construction.

13. The substructure is constructed and the turbine installed in a dry dock or inshore (tensionleg/submersible only), thus reducing the high costs of assembly and installation at sea. Once complete it is towed to site where it is attached to the pre-installed moorings and interarray cables. The substructure is then fully ballasted (water), moorings are picked up and tensioned, the electrical cable head pulled-in and the Wind Turbine commissioned.

Tension leg platform (TLP)

14. A semi-submerged buoyant structure, anchored to the seabed with tensioned mooring lines, which provide stability (see illustration in **Plate 1**). The shallow draft and tension stability allows for a smaller and lighter structure, but this design increases stresses on the tendon and anchor system. There are also challenges with the installation process and increased operational risks if a tendon fails. Examples include: PelaStar (by Glosten); Blue H TLP (by Blue H Group); Eco TLP (by DBD Systems); GICON-SOF (by GICON).

Semi-submersible platform

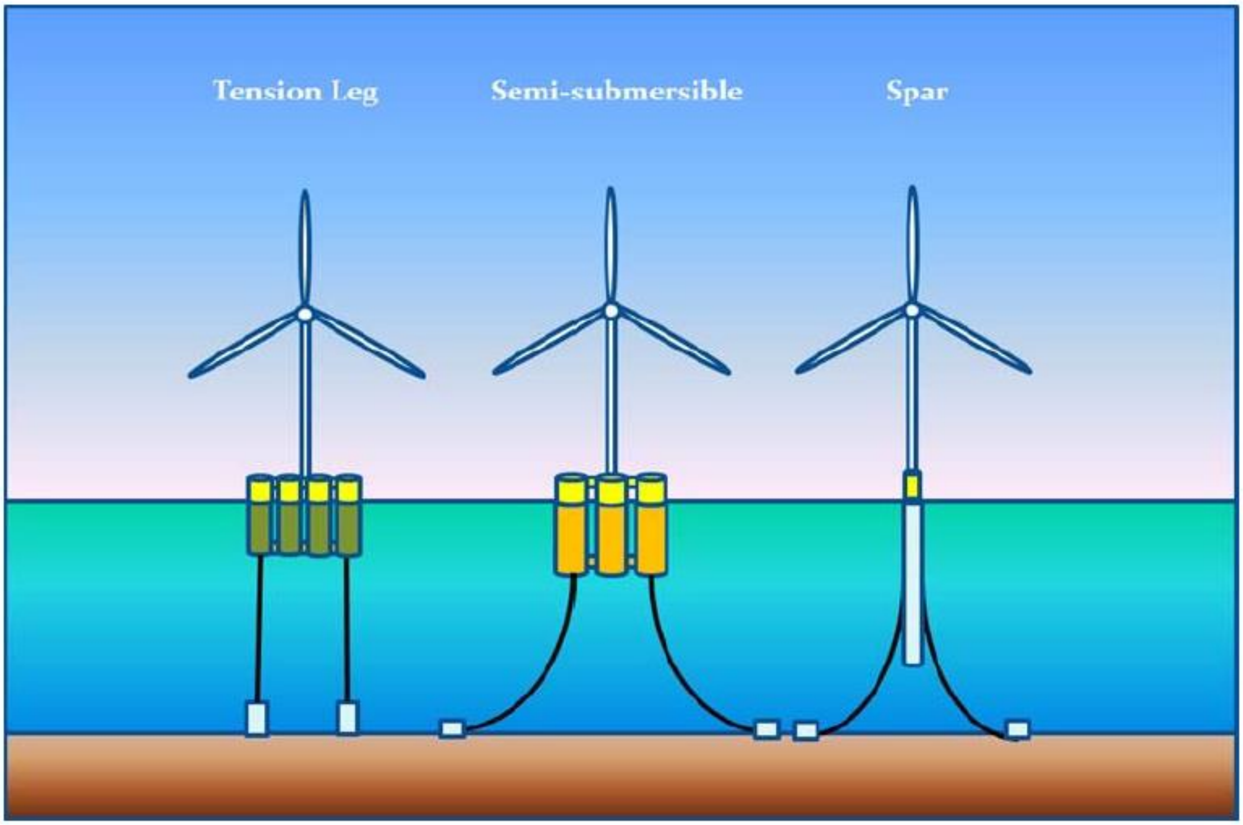
15. Buoyancy stabilised platform which floats semi-submerged on the surface of the ocean whilst anchored to the seabed with catenary mooring lines (see illustration in **Plate 1**). Often requires a large and heavy structure to maintain stability, but a low draft allows for more flexible application and simpler installation. Examples include: WindFloat (by Principle Power); Damping Pool (by IDEOL); SeaReed (by DCNS).

Spar-buoy

16. A cylindrical ballast-stabilised structure which gains its stability from having the centre of gravity lower in the water than the centre of buoyancy (see illustration in **Plate 1**). Thus, while the lower parts of the structure are heavy, the upper parts are usually lighter, thereby raising the centre of buoyancy. The simple structure of the spar-buoy is typically easy to fabricate and provides good stability, but the large draft requirement can create logistical challenges during assembly, transportation,

and installation (and decommissioning), and can constrain deployment to waters >100m depth. Therefore, this option is not anticipated to be used for the Project. Examples include: Hywind (by Statoil); Sway (by Sway); Advanced Spar (by Japan Marine United).

Plate 1 Types of floating offshore windfarm systems - Tension leg, Semi-sub and Spare Buoy



17. Currently the selection of the floating substructure is defined by the water depths that each substructure requires for safe operation and the suitable construction ports/locations where the proposed development is located. The Carbon Trust (2015) document highlights the key strengths of each system (**Table 1.3**).

18. Given the depth of the Windfarm Site, OWL is likely to use the semi-submersible technology type.

Table 1.3 Key strengths and weaknesses of each substructure type

Technology	Strengths	Weaknesses
Tension Leg (water depth +100m)	• Low Structural mass. • Onshore turbine assembly. • Few moving parts (no active ballast required). • Stability.	• High loads on the mooring and anchoring system. • Challenging installation process. • Bespoke installation barge often required.
Semi-submersible (water depth +40m)	• Flexible application due to the ability to operate in shallow water depths. • Low vessel requirement-only basic tug boats required. • Onshore turbine assembly. • Amendable to port-side major repairs.	• High structural mass to provide sufficient buoyancy and stability. • Complex steel structures with many welded joints - can be difficult to fabricate. • Potentially costly active ballast systems.
Spar-buoy (water depth +120m)	• Simple design is amenable to serial fabrication processes. • Few moving parts (No active ballast required). • Excellent stability.	• High loads on the mooring and anchoring system. • Challenging installation process. • Bespoke installation barge often required.

Table 1.4: Wind Turbine Floating Substructure Envelope

Turbine Floating Substructure Parameters*	Parameter
Overall length of each face (m)	~100
Water depth in operation (m)	12 – 18 (indicative range)
Freeboard (in operation) (m)	10 – 16 (indicative range)
Total substructure unit height (m)	22 – 34 (indicative range)

*The baseline assumption is that the type of floating substructure used will be **semi-submersible**. However, until sufficient engineering has been completed, other floating substructure types cannot be ruled out.

Wind Turbine Anchors and Mooring

19. The floating substructures described require moorings to anchor the turbine to the seabed in order to maintain position. The type and number of anchors and moorings used for the Project will depend on the type of floating substructure, loads imposed

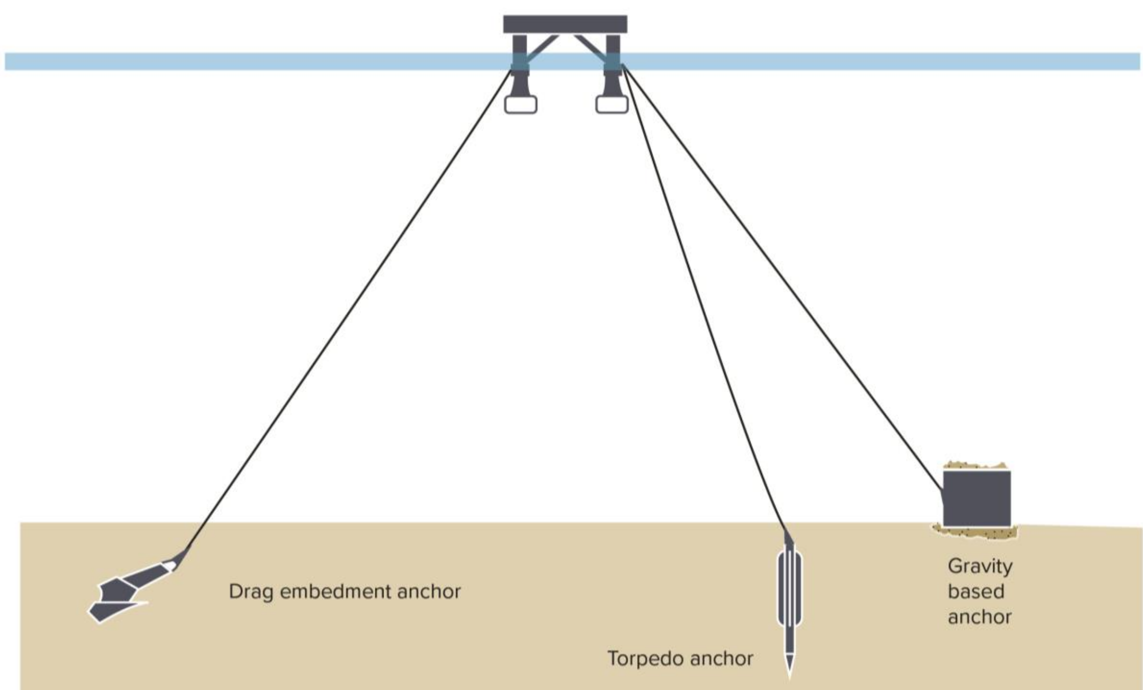
on the mooring system by the substructure/WTG assembly in the metocean conditions prevailing on site, in addition to geotechnical and environmental considerations.

20. The anchoring system options being considered are detailed in **Table 1.5**, with an illustration of the types shown in **Plate 2**.

Table 1.5 Wind Turbine Anchoring Options

Wind Turbine Substructure Anchoring Options	Maximum (unless specified)
Sub-structure types	Tension Leg, Semi-sub and Spar-buoy
Number of mooring lines	Depends on sub structure type
Mooring types	Depends on sub structure type
Anchor types	Drag embedment anchors, Torpedo Anchors, Gravity Based Anchors
Anchor mass	TBC
Mooring lines	Anchor chain, Mooring cables, polyester mooring lines
Pennant wires/buoys	Temporary surface buoys during construction, Permanent submersible buoys at seabed for ROV recovery
Mooring line radius	TBC

Plate 2 Types of floating offshore windfarm anchoring systems



21. **Table 1.6** presents the key dimensions of the anchoring systems.

Table 1.6 Wind Turbine Anchoring Systems Envelope

Turbine Anchoring Options Parameters	Parameter
Weight (tonnes)	15 – 20 tonnes per anchor
Estimated length of mooring line	Up to 800m
No. of anchors and mooring lines per turbine	3 – 6 per turbine

1.3.2 Electrical system

22. The electrical transmission system will collect the power produced at the wind turbines and transport it to the UK electricity transmission network. The transmission system will be constructed by OWL and the ownership will be transferred to an Offshore Transmission Operator (OFTO) in accordance with applicable rules and regulations in a transaction managed by the Office of Gas and Electricity Markets (Ofgem).

23. The key components of the electrical infrastructure are described below.

Array cables

24. Array cables connect the turbines to each other and to the offshore substation. The array cables are expected to be 66KV to 132kV alternating current (AC). The length of each array cable will depend on the final layout. A realistic maximum distance of array cables will be defined for the purposes of the EIA and used as the basis for the assessments.

25. The inter-array cables will be buried in the seabed, typically to a depth of 1m, but may range from 0.5m - 3m, and can be buried via several techniques depending on the seabed conditions along the route. These techniques can be ploughing, jetting, trenching or post-lay burial. Where cable burial is not possible alternative cable protection measures could be used. This includes rock placement, grout / sandbags, concrete mattresses and polyethylene ducting, but no protection will also be considered.

Offshore substation

26. The cables from turbines will be brought to an offshore substation platform, located appropriately to optimise the array cable and export cable lengths. One substation is required. At the substation, the generated power will be transformed to a higher AC voltage. This higher voltage will be determined by detailed studies, although it expected that the substation will step up the 66kV or 132kV array cable voltage to up to 220kV for the export cabling.

27. The offshore substation platform will typically include components including but not limited to transformers, batteries, generators, switchgear, fire systems, and modular facilities for operational and maintenance activities.

28. The offshore substation will comprise a topside platform installed on a foundation. The location of the offshore substation/s will be confirmed during the detailed design process. **Table 1.7** describes the substation foundation options.

29. The typical footprint plan of the offshore substation will be in the region of 80m x 60m with the topsides comprised of several layers / decks stacked on top of another as required. The offshore substation foundation type will likely be a jacket or a Gravity Based Structure (GBS) foundation. The jacket foundation will have 4 or 6 legs with up to three piles at each leg or one suction bucket at each leg. Leg spacing at the seabed will be up to 40m. In case of a GBS foundation the diameter of the foundation at seabed will be up to 50m.

Table 1.7 Offshore Substation Foundation Options Parameters

Offshore Substation Foundation Options Parameters	Parameter	Maximum (unless specified)
Jacket with piling	Leg spacing	<30m
	Hammer size	<3000kJ
	Pile Diameter	3m - 5m per pile
Tripod	Leg spacing	<30m
	Hammer size	<3000kJ
	Pile Diameter	3m - 5m per pile
Suction bucket	Leg spacing	<35m
	Bucket diameter	<20m
Gravity based structure	Diameter	<50m
	Diameter of seabed levelling	100m

Offshore export cable

30. Electricity from the offshore substation will be transmitted via one subsea export cable to shore. The export cable (up to 220kV AC) is likely to run from the offshore substation to a transition joint bay at the Landfall. The transition joint bay connects the offshore cable and onshore export cable. The export cable will be installed in an individual trench and protected in line with good industry practice. **Table 1.8** describes the main cable parameters.

31. 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 depth will be determined by a Burial Assessment Study (BAS) and a Cable Burial Risk Assessment (CBRA). Where cable burial is not possible alternative cable protection measures could be used. This includes rock placement, grout / sand bags, concrete mattresses and polyethylene ducting, but no protection option will also be considered. The appropriate level of protection will be determined based on an assessment of the risks posed to the Project in specific areas.

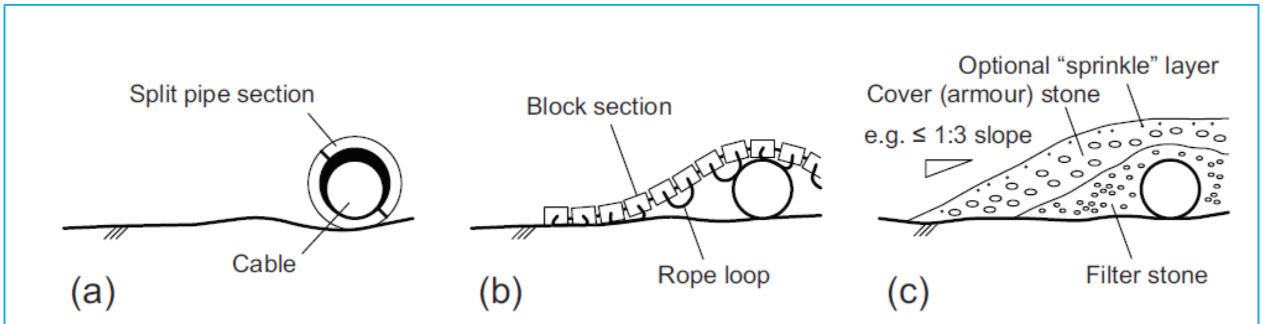
32. It is likely that the export cable will have to cross other cables and/or pipelines. Formal agreements with regards to existing cable crossings will be entered into by OWL and the existing owners / operators, with the installation techniques discussed and agreed to ensure integrity of the existing infrastructure and any new cables associated with the Project. Several techniques can be utilised, include tubular products, concrete mattresses, and rock placement as shown in **Plate 3**.

Table 1.8 Offshore cable parameters (based on an HVAC export cable system)

Item	Indicative parameters
Substation	1
Array cables	One per wind turbine plus potential cables for redundancy between strings
Export cable/trench	1
Fibre optic cables	Bundled in export cable
Export cable route standard working width (cable corridor)	Minimum 22m, maximum 50m
Length of cables	
Array cables	Dependent upon distance between turbines
Export cable	70km

* The baseline assumption is that **one offshore substation** will be required. However, once sufficient engineering has been completed, OWL will consider options to remove the need for an offshore substation from the Project.

Plate 3 Cable protection: (a) tubular product; (b) concrete mattress; (c) rock placement



33. Pre-lay intervention activities may be required prior to the installation of cables including boulder removal, sandwave clearance, installation of equipment at crossings and the cutting and removal of any out-of-service cables.

34. There will be no separate cables for fibre optics. Fibre optics will be integrated with the export cable.

1.4 Legislation, Policy and Guidance

1.4.1 Marine and Coastal Access Act (2009)

35. The UK Marine & Coastal Access Act (MCAA) (2009) establishes a range of measures to manage the marine environment, including establishing MCZs. The MCZ Project was established in 2008 by the Joint Nature Conservation Committee (JNCC) and Natural England to work with regional stakeholder led projects to identify and recommend MCZs to Government. MCZs were designated in three tranches (2013, 2016 and 2019) and the process is now complete.

36. Section 126 of the MCAA describes the duties of public authorities in relation to certain decisions and applies where:

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

37. The statutory nature conservation body (SNCB) (in this case Natural England) has responsibility under the MCAA to give advice on how to further the conservation objectives for the MCZ and identify the activities that are capable of affecting the designated features and the processes which they are dependent upon.

1.4.2 Guidance

38. The MCZ Screening gives consideration to the Marine Management Organisation (MMO) (2013) Marine Conservation Zones and Marine Licensing guidance.

39. The Stage 1 MCZA will also be informed by Supplementary Advice on Conservation Objectives (SACO) for each relevant site, where available.

2. MCZ Assessment Methodology

40. 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 licensing activities where they are capable of hindering the conservation objectives of an MCZ. The MCZ assessment process is similar to, but separate from, the Habitats Regulations Assessment (HRA) process. The stages of MCZ assessment are presented below.

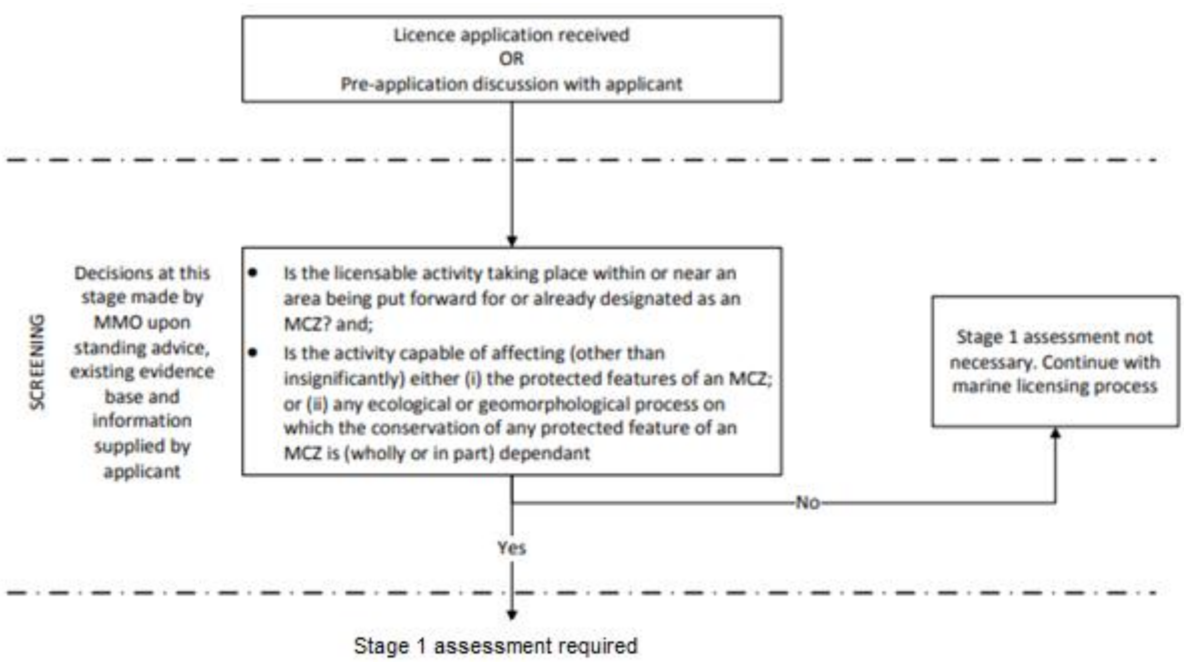
2.1 Screening (this report)

41. The need for the Project and its key objectives will be set out fully in consultation documents and/or application. In summary, there are four drivers for the development of offshore wind energy:

- The plan, project or activity within or near to an MCZ
- The plan, project or activity is capable of significantly affecting (without mitigation) (i) the protected features of an MCZ, or (ii) any ecological or geomorphological processes on which the conservation of the features depends

42. The MCZA screening stage is summarised in **Plate 4**.

Plate 4 MCZA Process



2.2 Stage 2 Assessment

43. The Stage 2 assessment considers the socio-economic impact of the Project together with the risk of environmental damage. There are two parts to the Stage 2 assessment process:

- 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 secure, or undertake arrangements to secure, measures of equivalent environmental benefit (MEEB) for the damage the Project will have on the MCZ features?

2.3 Cumulative Effects

44. 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.

45. Only projects which are reasonably well described and sufficiently advanced to provide information on which to base a meaningful and robust assessment will be included in the cumulative assessment.

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

- Other windfarms
- Aggregate extraction and dredging
- Licensed disposal sites
- Navigation and shipping
- Commercial fisheries
- Sub-sea cables and pipelines
- Potential port and harbour development
- Oil and gas activities
- Unexploded ordnance (UXO) clearance

47. 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.

48. The assessment will present relevant cumulative effects of projects based on their stage of development using the tiered approach as devised by Natural England (JNCC and Natural England, 2013) and presented in **Table 2.1**.

Table 2.1 Natural England Tiered Approach

Tier	Consenting or Construction Phase	Data Availability
Tier 1	Built and operational projects should be included within the cumulative assessment where they have not been included within the environmental characterisation survey, i.e. they were not operational when baseline surveys were undertaken, and/or any residual impact may not have yet fed through to and been captured in estimates of "baseline" conditions e.g. background" distribution or mortality rate for birds.	Pre-construction (and possibly post-construction) survey data from the built project(s) and environmental characterisation survey data from proposed project (including data analysis and interpretation within the ES for the Project).
Tier 2	Tier 1 + projects under construction	As Tier 1 but not including post construction survey data
Tier 3	Tier 2 + projects that have been consented (but construction has not yet commenced)	Environmental characterisation survey data from proposed project (including data analysis and interpretation within the ES for the Project) and possibly pre-construction
Tier 4	Tier 3 + projects that have an application submitted to the appropriate regulatory body that have not yet been determined	Environmental characterisation survey data from proposed project (including data analysis and interpretation within the ES for the Project)
Tier 5	Tier 4 + projects that the regulatory body are expecting an application to be submitted for determination (e.g. projects listed under the PINS programme of projects), including projects where a Preliminary Environmental Information Report (PEIR) has been undertaken and submitted	Possibly environmental characterisation survey data (but strong likelihood that this data will not be publicly available at this stage.
Tier 6	Tier 5 + projects that have been identified in relevant strategic plans or programmes (e.g. projects identified in Round 3 windfarm ZAP documents)	Historic survey data collected for other purposes/by other projects or industries or at a strategic level.

49. Projects classified under Tiers 1-4 are included in the MCZA screening. Tier 5 and 6 projects will be considered where sufficient information is available.

50. For this screening assessment, 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 projects to act cumulatively on MCZs is considered in the context of the likely spatial and temporal extent of pressures.

2.4 Consultation

51. Consultation of relevance to the MCZA process will be undertaken with Statutory Nature Conservation Bodies (SNCBs) and other stakeholders through scoping and stakeholder engagement.

3. Is the activity within or near to a MCZ?

52. The first stage of the screening assessment is to determine whether the Project and associated activities take place within or near an MCZ.

53. A potential zone of influence (ZoI) from the Project has been analysed based on an understanding of the tidal regime. The potential ZoI is based on the knowledge that effects arising from WTG and substation platform foundations on the tidal regime are relatively small in magnitude, and localised. It is expected that changes to the tidal regime would have returned to background levels immediately outside the excursion of one spring tidal ellipse (approximately 10km from the Offshore Development Area) shown in see **Figure 1.8.1 in the EIA Scoping Report**.

54. **Figure 2.4.1 in the EIA Scoping Report** shows the MCZs within this ZoI, along with the distances measured to the nearest point of the Windfarm Site and Export Cable Corridor.

55. The MCZs listed in **Table 3.1** are considered further in **Section 4**.

Table 3.1 Marine Coastal Zones within the Zone of Influence

MCZ	Distance to the project (KM)
Bideford to Foreland Point	0km. Overlaps the Area of Search for the offshore Export Cable Corridor
Hartland Point to Tintagel	1km from Area of Search for the offshore Export Cable Corridor
Morte Platform	1km from Area of Search for the offshore Export Cable Corridor
South West Approaches to Bristol Channel	4km from Area of Search for the offshore Export Cable Corridor
North West of Lundy	6km from Area of Search for the offshore Export Cable Corridor

56. The next closest MCZ (Padstow Bay and Surround MCZ) is approximately 50km away from the Project Windfarm Site and therefore there is no potential pathway for impact from the Project, alone or cumulatively with other projects.

4. Screening of impacts on protected features

57. Of the MCZs identified in **Section 3**, this section considers the potential for any impacts as a result of the Project, alone or cumulatively with other plans and projects, on the protected features of the MCZ or any physical processes on which the features are dependent.

4.1 Bideford to Foreland Point MCZ

4.1.1 Protected Features

58. **Table 4.1** shows the features designated by the Bideford to Foreland Point MCZ.

Table 4.1 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
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

59. This site protects a wide range of habitats, from beaches of intertidal sand, which are exposed to the air at low tide and below water at high tide, to subtidal sediment and rock habitats, which are permanently submerged. This site is important for creating connectivity between sites along the north coast of Devon and Cornwall.

4.1.2 Conservation Objectives

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

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

- its extent is stable or increasing; and
- 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.

62. 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.

63. 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.

64. For the purposes of this MCZ, any temporary deterioration in condition is to be disregarded if the habitat is sufficiently healthy and resilient to enable its recovery, any temporary reduction of numbers is to be disregarded if the population is sufficiently thriving and resilient to enable its recovery, and for the purpose of determining whether a protected feature is in favourable condition within the meaning of this designation, any alteration to that feature brought about entirely by natural processes is to be disregarded.

4.1.3 Potential Impacts

65. This section summaries the sources of pressures with the potential to have significant effects on the protected features of the Bideford to Foreland Point MCZ.

66. The MCZ overlaps the Area of Search for the Export Cable Corridor and therefore potential impacts are associated with direct and indirect effects from the Export Cable Corridor.

67. The impacts screened in and discussed below will be assessed for the Project alone and cumulatively with other plans and projects.

Construction

68. During construction of the Project, the seabed preparation and Export Cable installation will have a direct effect on the seabed habitats, associated communities and priority species. This impact may also will occur at, and offshore of, the

Hydraulic Directional Drill (HDD) exit pits if required at the Landfall. If Landfall occurs on a beach, open trenching would be used instead of HDD. Any impact to intertidal sand or subtidal sand is considered short term and habitat will likely recover in one tidal cycle.

69. Indirect effects of seabed disturbance are the increased likelihood of sediment deposition and the resulting release of sediments into the water column. This seabed disturbance also has the potential to disturb contaminated sediments.

70. Increased vessel traffic and the introduction of vessels from a global destination increased the chances of introducing invasive non-native species from the discharge of ballast water or colonisation of vessel hulls.

71. The increase in vessel traffic and construction machinery could also potentially result in an increase of artificial underwater noise or vibration effects.

Operation and Maintenance (O&M)

72. Potential impacts during operation will mostly result from the physical presence of infrastructure situated within the proximity of the MCZ.

73. Maintenance activities also have the potential to result in temporary impacts, similar to those seen during construction, but significantly lower in magnitude.

74. The magnitude of underwater noise and vibration from windfarm operation is much lower than for activities such UXO clearance during construction.

75. Electromagnetic fields (EMFs) resulting from the presence of cables may be detected by some benthic species.

Decommissioning

76. The potential impacts arising during the decommissioning phase are envisaged to be similar to those described for the construction phase. The extent of removal of infrastructure during decommissioning will determine how much habitat loss will be lasting or long term and how much may be permanent.

Summary of pressures screened into MCZA

Table 4.2 Summary of screening of pressures for Bideford to Foreland MCZ

Potential Effect	Construction	O&M	Decommissioning
Temporary physical disturbance	✓	x	✓
Permanent/long term habitat loss	✓	x	✓
Increased suspended sediment concentrations	✓	x	✓

Potential Effect	Construction	O&M	Decommissioning
Re-mobilisation of contaminated sediments	✓	x	✓
Effects on bedload sediment transport	✓	x	✓
Underwater noise and vibration	✓	x	✓
Colonisation of foundations and cable protection	x	✓	x
Invasive species	✓	x	✓
Electromagnetic fields	x	✓	x

4.2 Hartland Point to Tintagel MCZ

4.2.1 Protected Features

77. **Table 4.3** shows the features designated by the Hartland Point to Tintagel MCZ.

Table 4.3 Designated features for Hartland Point to Tintagel MCZ (source: Defra, 2018b)

Protected feature	Management approach
Coastal saltmarshes and saline reedbeds	Maintain in favourable condition
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 sand and muddy sand	Maintain in favourable condition
Moderate energy infralittoral rock	Maintain in favourable condition
High energy infralittoral rock	Maintain in favourable condition
Moderate energy circalittoral rock	Recover to favourable condition
High energy circalittoral rock	Recover to favourable condition
Subtidal coarse sediment	Recover to favourable condition
Subtidal sand	Recover to favourable condition
Fragile sponge & anthozoan communities on subtidal rocky habitats	Recover to favourable condition
Honeycomb worm (*Sabellaria alveolata*) reefs	Maintain in favourable condition
Pink sea-fan (*Eunicella verrucosa*)	Recover to favourable condition

78. This MCZ contains rocky habitats in deeper waters (circalittoral rock) which are dominated by a mosaic of different marine creatures such as sponges, anemones and sea-fan corals living on the rocky surfaces. Intertidal sand and rocky areas, covered by water at high tide and exposed to the air at low tide, provide habitats

for many species, including the honeycomb worm. Honeycomb worm reefs are formed from the closely-packed sand tubes constructed by these colonial worms. The reef structures resemble honeycomb and can extend for tens of metres across and up to a metre tall. They, in turn, are able to support a wide range of shore-dwelling species including anemones, snails, shore crabs and seaweeds.

4.2.2 Conservation Objectives

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

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

- its extent is stable or increasing; and
- 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.

81. 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.

82. For the purposes of this MCZ, any temporary deterioration in condition is to be disregarded if the habitat is sufficiently healthy and resilient to enable its recovery, any temporary reduction of numbers is to be disregarded if the population is sufficiently thriving and resilient to enable its recovery, and for the purpose of determining whether a protected feature is in favourable condition within the meaning of this designation, any alteration to that feature brought about entirely by natural processes is to be disregarded.

4.2.3 Potential Impacts

83. This section summarises the sources of pressures with the potential to have significant effects on the protected features of the Hartland Point to Tintagel MCZ.

84. The MCZ is located 1km away from the Area of Search for the Export Cable Corridor and therefore potential impacts are limited to those associated with indirect effects from the Export Cable Corridor.

85. The impacts screened in and discussed below will be assessed for the Project alone and cumulatively with other plans and projects.

Construction

86. Indirect effects of seabed disturbance are the increased likelihood of sediment deposition and the resulting release of sediments into the water column. This seabed disturbance also has the potential to disturb contaminated sediments.

87. Increased vessel traffic and the introduction of vessels from a global destination increased the chances of introducing invasive non-native species from the discharge of ballast water or colonisation of vessel hulls.

88. The increase in vessel traffic and construction machinery could also potentially result in an increase of artificial underwater noise or vibration effects.

Operation and Maintenance (O&M)

89. At a distance of 1km from the Area of Search for the offshore export cable, there is no potential for operational impacts such as EMFs to affect the species supported by the Hartland Point to Tintagel MCZ.

Decommissioning

90. The potential impacts arising during the decommissioning phase are envisaged to be similar to those described for the construction phase. The extent of removal of infrastructure during decommissioning will determine how much habitat loss will be lasting / long term and how much may be permanent.

Summary of pressures screened into MCZA

91. Screening of pressures associated with construction, operation and decommissioning is shown in **Table 4.4** for each feature of the MCZ.

Table 4.4 Summary of screening of pressures for Hartland Point to Tintagel MCZ

Potential Effect	Construction	O&M	Decommissioning
Temporary physical disturbance	x	x	x
Permanent/long term habitat loss	x	x	x
Increased suspended sediment concentrations	✓	x	✓
Re-mobilisation of contaminated sediments	✓	x	✓
Effects on bedload sediment transport	✓	x	✓
Underwater noise and vibration	✓	x	✓
Colonisation of foundations and cable protection	x	x	x
Invasive species	✓	x	✓
Electromagnetic fields	x	x	x

4.3 Morte Platform

4.3.1 Protected Features

92. **Table 4.5** shows the features designated by the Morte Platform MCZ.

Table 4.5 Designated features for Morte Platform MCZ (source: Defra, 2019a)

Protected feature	Management approach
High energy circalittoral rock	Recover to favourable condition
Moderate energy circalittoral rock	Recover to favourable condition
Subtidal coarse sediment	Recover to favourable condition

93. Morte Platform contains a mix of habitats that is rarely represented elsewhere in the UK, primarily due to the high tidal flows, high sediment content within the water column, and the mosaic of sediment and rock ridges within the site.

94. Subtidal sediment provides important nursery grounds for many ecologically and commercially important fish such as flatfish (e.g. sole and plaice), seabass and sand eel (an important prey species for seabirds such as puffin and guillemots) as well as supporting nationally rare Ross worm reefs. Circalittoral rock habitats support a range of marine life, including worms, sponges, soft and hard corals, bryozoans, small, filter feeding animals and mobile species in more sheltered areas.

4.3.2 Conservation Objectives

95. 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.

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

- its extent is stable or increasing; and
- 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.

97. 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.

98. Any temporary deterioration in condition is to be disregarded if the habitat is sufficiently healthy and resilient to enable its recovery.

99. Any alteration to a feature brought about entirely by natural processes is to be disregarded when determining whether a protected feature is in favourable condition.

4.3.3 Potential Impacts

100. This section summaries the sources of pressures with the potential to have significant effects on the protected features of the Morte Platform MCZ.

101. The MCZ is located 1km away from the Area of Search for the Export Cable Corridor and therefore potential impacts are limited to those associated with indirect effects from the Export Cable Corridor.

102. The impacts screened in and discussed below will be assessed for the Project alone and cumulatively with other plans and projects.

Construction

103. Indirect effects of seabed disturbance are the increased likelihood of sediment deposition and the resulting release of sediments into the water column. This seabed disturbance also has the potential to disturb contaminated sediments.

104. Increased vessel traffic and the introduction of vessels from a global destination increased the chances of introducing invasive non-native species from the discharge of ballast water or colonisation of vessel hulls.

105. The increase in vessel traffic and construction machinery could also potentially result in an increase of artificial underwater noise or vibration effects.

Operation and Maintenance (O&M)

106. At a distance of 1km from the Area of Search for the offshore export cable, there is no potential for operational impacts such as EMFs to affect the species supported by the Morte Platform MCZ.

Decommissioning

107. The potential impacts arising during the decommissioning phase are envisaged to be similar to those described for the construction phase. The extent of removal of infrastructure during decommissioning will determine how much habitat loss will be lasting / long term and how much may be permanent.

Summary of pressures screened into MCZA

108. Screening of pressures associated with construction, operation and decommissioning is shown in **Table 4.6** for each feature of the MCZ.

Table 4.6 Summary of screening of pressures for Morte Platform MCZ

Potential Effect	Construction	O&M	Decommissioning
Temporary physical disturbance	x	x	x
Permanent/long term habitat loss	x	x	x
Increased suspended sediment concentrations	✓	x	✓
Re-mobilisation of contaminated sediments	✓	x	✓
Effects on bedload sediment transport	✓	x	✓
Underwater noise and vibration	✓	x	✓
Colonisation of foundations and cable protection	x	x	x
Invasive species	✓	x	✓
Electromagnetic fields	x	x	x

4.4 South West Approaches to Bristol Channel

4.4.1 Protected Features

109. **Table 4.7** shows the features designated by the South West Approaches to Bristol Channel MCZ.

Table 4.7 Designated features for South West Approaches to Bristol Channel MCZ (source: Defra, 2019b)

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

110. 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.

4.4.2 Conservation Objectives

111. 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.

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

- its extent is stable or increasing; and
- 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.

113. 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.

114. Any temporary deterioration in condition is to be disregarded if the habitat is sufficiently healthy and resilient to enable its recovery.

115. Any alteration to a feature brought about entirely by natural processes is to be disregarded when determining whether a protected feature is in favourable condition.

4.4.3 Potential Impacts

116. This section summaries the sources of pressures with the potential to have significant effects on the protected features of the South West Approaches to Bristol Channel MCZ.

117. The MCZ is located 4km away from the Area of Search for the Export Cable Corridor and therefore potential impacts are limited to those associated with indirect effects from the Export Cable Corridor.

118. The impacts screened in and discussed below will be assessed for the Project alone and cumulatively with other plans and projects.

Construction

119. Indirect effects of seabed disturbance are the increased likelihood of sediment deposition and the resulting release of sediments into the water column. This seabed disturbance also has the potential to disturb contaminated sediments.

120. Increased vessel traffic and the introduction of vessels from a global destination increased the chances of introducing invasive non-native species from the discharge of ballast water or colonisation of vessel hulls.

121. The increase in vessel traffic and construction machinery is unlikely to result in an increase of artificial underwater noise or vibration effects given the distance from the Offshore Development Area.

Operation and Maintenance (O&M)

122. At a distance of 4km from the Area of Search for the offshore export cable, there is no potential for operational impacts such as EMFs to affect the species supported by the South West Approaches to Bristol Channel MCZ.

Decommissioning

123. The potential impacts arising during the decommissioning phase are envisaged to be similar to those described for the construction phase. The extent of removal of infrastructure during decommissioning will determine how much habitat loss will be lasting / long term and how much may be permanent.

Summary of pressures screened into MCZA

124. Screening of pressures associated with construction, operation and decommissioning is shown in **Table 4.8** for each feature of the MCZ.

Table 4.8 Summary of screening of pressures for South West Approaches to Bristol Channel MCZ

Potential Effect	Construction	O&M	Decommissioning
Temporary physical disturbance	x	x	x
Permanent/long term habitat loss	x	x	x
Increased suspended sediment concentrations	✓	x	✓
Re-mobilisation of contaminated sediments	✓	x	✓
Effects on bedload sediment transport	✓	x	✓
Underwater noise and vibration	x	x	x
Colonisation of foundations and cable protection	x	x	x
Invasive species	✓	x	✓
Electromagnetic fields	x	x	x

4.5 North West of Lundy

4.5.1 Protected Features

125. **Table 4.9** shows the features designated by the North West of Lundy MCZ.

Table 4.9 Designated features for North West of Lundy MCZ

PROTECTED FEATURE	MANAGEMENT APPROACH
Subtidal coarse sediment	Recover to a favourable condition

126. The North West of Lundy site contains a large area of subtidal coarse sediment which provides habitat that supports a variety of species, for example segmented bristle worms, venus clams and small crustaceans (such as crabs and barnacles) living within and on top of the sediment. Coarse sediments include coarse sand, gravel, pebbles and shingle. The habitat is often unstable due to tidal currents and/or wave action.

4.5.2 Conservation Objectives

127. 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.

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

- its extent is stable or increasing; and
- 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.

129. Any temporary deterioration in condition is to be disregarded if the habitat is sufficiently healthy and resilient to enable its recovery.

130. Any alteration to a feature brought about entirely by natural processes is to be disregarded when determining whether a protected feature is in favourable condition.

4.5.3 Potential Impacts

131. This section summaries the sources of pressures with the potential to have significant effects on the protected features of the North West of Lundy MCZ.

132. The MCZ is located 6km away from the Area of Search for the Export Cable Corridor and therefore potential impacts are limited to those associated with indirect effects from the Export Cable Corridor.

133. The impacts screened in and discussed below will be assessed for the Project alone and cumulatively with other plans and projects.

Construction

134. Indirect effects of seabed disturbance are the increased likelihood of sediment deposition and the resulting release of sediments into the water column. This seabed disturbance also has the potential to disturb contaminated sediments.

135. Increased vessel traffic and the introduction of vessels from a global destination increased the chances of introducing invasive non-native species from the discharge of ballast water or colonisation of vessel hulls.

136. The increase in vessel traffic and construction machinery is unlikely to result in an increase of artificial underwater noise or vibration effects given the distance from the Offshore Development Area.

Operation and Maintenance (O&M)

137. At a distance of 6km from the Area of Search for the offshore export cable, there is no potential for operational impacts such as EMFs to affect the species supported by the North West of Lundy MCZ.

Decommissioning

138. The potential impacts arising during the decommissioning phase are envisaged to be similar to those described for the construction phase. The extent of removal of infrastructure during decommissioning will determine how much habitat loss will be lasting / long term and how much may be permanent.

Summary of pressures screened into MCZA

139. Screening of pressures associated with construction, operation and decommissioning is shown in for each feature of the MCZ.

Table 4.10 Summary of screening of pressures for North West of Lundy MCZ

Potential Effect	Construction	O&M	Decommissioning
Temporary physical disturbance	x	x	x
Permanent/long term habitat loss	x	x	x
Increased suspended sediment concentrations	✓	x	✓
Re-mobilisation of contaminated sediments	✓	x	✓

Potential Effect	Construction	O&M	Decommissioning
Effects on bedload sediment transport	✓	x	✓
Underwater noise and vibration	x	x	x
Colonisation of foundations and cable protection	x	x	x
Invasive species	✓	x	✓
Electromagnetic fields	x	x	x

5. Cumulative Effects

140. The ZoI for the Offshore Development Area shown in **Figure 2.4.1** shows the MCZs within this ZoI has a range of 10km. In order to provide a conservative search area for screening of plans and projects which have potential to interact with the impacts of the Project, a range of 20km from the Offshore Development Area has been used.

141. 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 Fortland Point MCZ and Hartland Point to Tintagel MCZ was included in the Defra (2018c) Marine Protected Areas Network Report. Morte Platform MCZ, South West Approaches to Bristol Channel MCZ and North West of Lundy MCZ were designated in 2019. Plans and projects prior to 2018 are therefore considered part of the baseline and are screened out of the cumulative assessment. No plans or projects have been identified within 20km. Therefore, no plans or projects are considered in the Stage 1 MCZA cumulative assessment.

6. Screening Summary

142. **Table 6.1** provides a summary of the MCZs screened in for further consideration of the potential for the Project to hinder the conservation objectives of the features of each site, alone or cumulatively with other plans and projects.

Table 6.1 Summary of screening

Site	Features screened in	Relevant Components	Impacts screened in (Alone and cumulatively)
Bideford to Foreland Point MCZ	All	Direct and in-direct effects of the Offshore Export Cable Corridor (export cables and associated works)	Temporary physical disturbance
			Permanent/long term habitat loss
			Increased suspended sediment concentrations
			Re-mobilisation of contaminated sediments
			Effects on bedload sediment transport
			Underwater noise and vibration
			Colonisation of foundations and cable protection
			Invasive species
			Electromagnetic fields
Hartland Point to Tintagel MCZ	Coastal saltmarshes and saline reedbeds Intertidal coarse sediment Intertidal sand and muddy sand	In-direct effects of the Offshore Export Cable Corridor (export cables and associated works)	Increased suspended sediment concentrations
			Re-mobilisation of contaminated sediments
			Effects on bedload sediment transport
			Underwater noise and vibration
			Invasive species
Morte Platform MCZ	Subtidal coarse sediment	In-direct effects of the Offshore Export Cable Corridor (export cables and associated works)	Increased suspended sediment concentrations
			Re-mobilisation of contaminated sediments
			Effects on bedload sediment transport
			Underwater noise and vibration
			Invasive species

Site	Features screened in	Relevant Components	Impacts screened in (Alone and cumulatively)
South West Approaches to Bristol Channel MCZ	Subtidal coarse sediment Subtidal sand	In-direct effects of the Offshore Export Cable Corridor (export cables and associated works)	Increased suspended sediment concentrations
			Re-mobilisation of contaminated sediments
			Effects on bedload sediment transport
			Invasive species
North West of Lundy MCZ	Subtidal coarse sediment	In-direct effects of the Offshore Export Cable Corridor (export cables and associated works)	Increased suspended sediment concentrations
			Re-mobilisation of contaminated sediments
			Effects on bedload sediment transport
			Invasive species
			Increased suspended sediment concentrations

7. References

Defra (2018a) Bideford to Foreland Point MCZ Factsheet. Available at: https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/492340/mcz-bideford-foreland-point-factsheet.pdf

Defra (2018b) Hartland Point to Tintagel MCZ Factsheet. Available at: https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/492391/mcz-hartland-point-tintagel-factsheet.pdf

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