Rampion 2 WIND FARM

Rampion 2 Wind Farm
Category 6: Environmental Statement
Volume 2, Chapter 9: Benthic, subtidal and intertidal ecology (clean)

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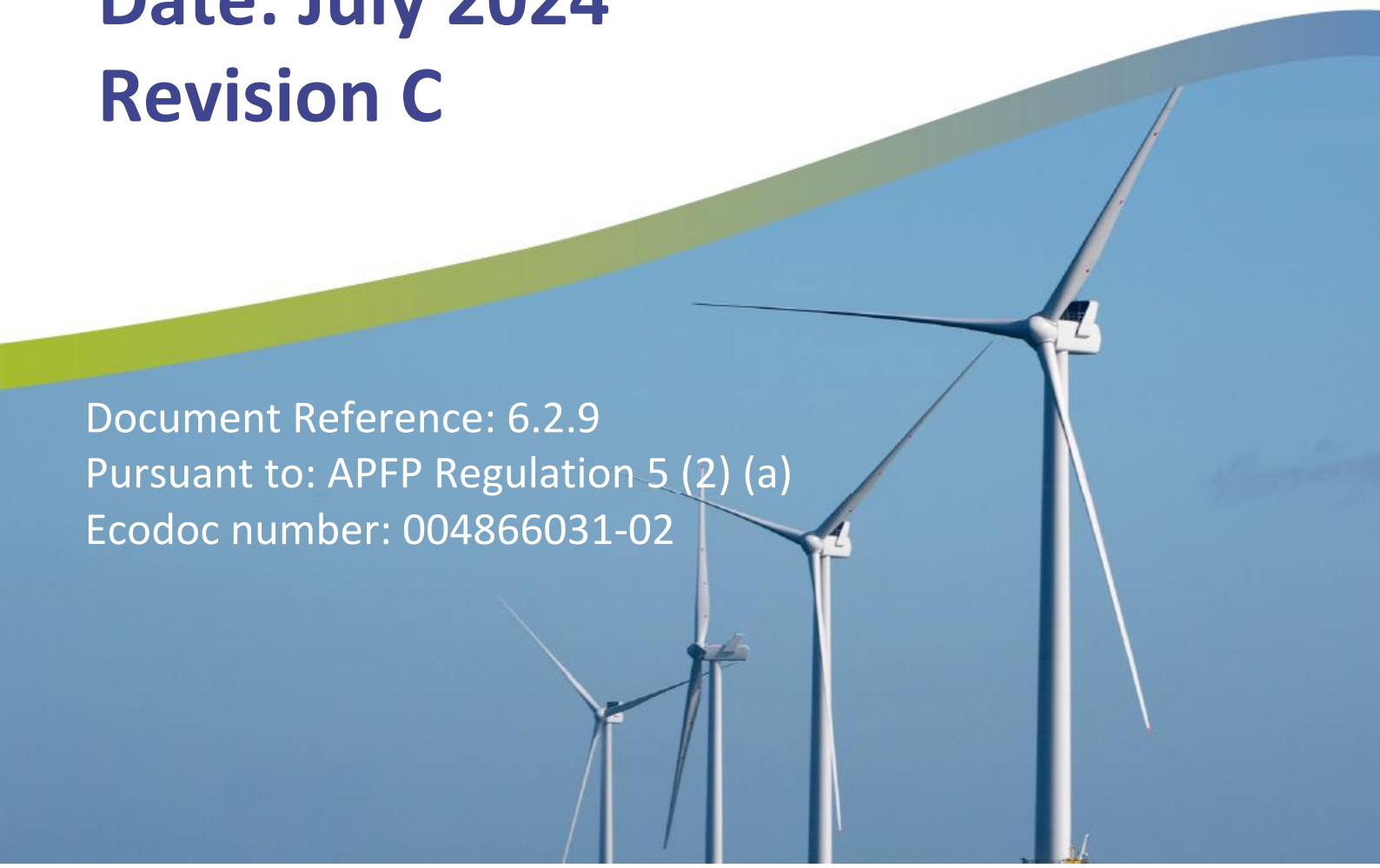

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Contents

List of Tables

List of Figures, Volume 3 — Document Reference

List of Appendices, Volume 4 — Document Reference

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Executive Summary

This chapter of the Rampion 2 Environmental Statement (ES) examines the likely significant effects that may be experienced as a result of Rampion 2 on benthic subtidal and intertidal ecology receptors.

A desk-based review of literature and existing datasets has been undertaken to establish a baseline (what exists in the area at the time of writing). This includes relevant historical geophysical, geotechnical, including survey results for Rampion 1, and consultation with Expert Topic Groups (ETG). The characterisation of the baseline environment has been supported by site-specific geophysical, subtidal and intertidal survey data from the study area collected in 2020 and 2021. The geophysical survey data form the base data for the predictive habitat mapping to present detailed information on the distribution of sediments, biological zones and biotopes across the study area for Rampion 2.

Existing data shows that the sediments within the western section of the study area are predominantly characterised by coarse and mixed sediments, with the eastern area identified as having a greater proportion of sand and muddy sand sediments. The predictive habitat modelling revealed that 15 biotopes were identified as occurring throughout the study area from a total of seven broadscale habitats. Habitat and biotope mapping of the intertidal area across the intertidal ecology study area revealed that there was a total of nine unique biotopes (EUNIS level 5 or above) from a total of four broadscale habitats.

The assessment focuses on the construction, operational and decommissioning phases of Rampion 2, as at the Scoping stage of the Environmental Impact Assessment (EIA) it was agreed that there are likely to be impacts from activities associated with these phases on benthic subtidal and intertidal ecology receptors. During the construction phase, temporary construction areas will be required for the array area, inter-array cables, offshore substations and export cable corridor.

A range of environmental measures are embedded as part of the Rampion 2 design to remove or reduce any significant environmental effects on benthic subtidal and intertidal ecology receptors, as far as possible. These include, but are not limited to, the following:

- commitments to ensure offshore cable routeing and micro-siting within the offshore export cable corridor area delivers avoidance of known sensitive features as far as practicable;
- offshore cable routeing design to maximise the potential to achieve cable burial, thus providing for seabed habitat recovery in sediment areas and reducing the need for secondary protection and consequently minimising any potential for longer-term residual effects;
- Adoption of offshore export cable laying and installation techniques to minimise seabed disturbance;
- offshore export cable to be drilled underneath the beach, ensuring no direct impact to intertidal designated sites; and

- commitments to reducing the risk of introducing or spreading marine invasive non-native species through the implementation of appropriate management measures.

Following the implementation of embedded measures, there are no residual significant effects predicted on all benthic ecology receptors from the construction, operation and decommissioning of Rampion 2.

9. Benthic, subtidal and intertidal ecology

9.1 Introduction

9.1.1 This chapter of the Environmental Statement (ES) presents the results of the assessment of the likely significant effects of Rampion 2 with respect to benthic subtidal and intertidal ecology. It should be read in conjunction with the project description provided in **Chapter 4: The Proposed Development, Volume 2** of the ES (Document Reference: 6.2.4) and the relevant parts of the following chapters and appendices:

- **Chapter 6: Coastal processes, Volume 2** of the ES (Document Reference: 6.2.6) (since changes to coastal processes have the potential to impact benthic subtidal and intertidal ecology receptors directly or indirectly); and
- **Chapter 8: Fish and shellfish ecology, Volume 2** of the ES (Document Reference: 6.2.8) (due to the inclusion of species that live within the benthos and therefore there is a degree of overlap between these topics).

9.1.2 This technical chapter describes:

- the legislation, planning policy and other documentation that has informed the assessment (**Section 9.2: Relevant legislation, planning policy, and other documentation**);
- the outcome of consultation and engagement that has been undertaken to date, including how matters relating to benthic subtidal and intertidal ecology within the Statutory Consultation periods, have been addressed (**Section 9.3: Consultation and engagement**);
- the scope of the assessment for benthic subtidal and intertidal ecology (**Section 9.4: Scope of the assessment**);
- the methods used for the baseline data gathering (**Section 9.5: Methodology for baseline data gathering**);
- the overall baseline (**Section 9.6: Baseline conditions**);
- embedded environmental measures relevant to benthic subtidal and intertidal ecology and the relevant maximum design scenario (**Section 9.7: Basis for ES assessment**);
- the assessment methods used for the ES (**Section 9.8: Methodology for ES assessment**);
- the assessment of benthic subtidal and intertidal ecology effects (**Section 9.9 - 9.11: Assessment of effects** and **Section 9.12: Assessment of cumulative effects**);
- consideration of transboundary effects (**Section 9.13: Transboundary effects**);

- inter-related effects (**Section 9.14: Inter-related effects**);
- a summary of residual effects for benthic subtidal and intertidal ecology (**Section 9.15: Summary of residual effects**);
- a glossary of terms and abbreviations is provided in **Section 9.16: Glossary of terms and abbreviations**; and
- a references list is provided in **Section 9.17: References**.

9.1.3 The chapter is also supported by the following appendices:

- **Appendix 9.1: Rampion 2 predictive seabed mapping methods report, Volume 4** of the ES (Document Reference: 6.4.9.1)**;**
- **Appendix 9.2: Rampion 2 offshore wind farm intertidal habitats survey report, Volume 4** of the ES (Document Reference: 6.4.9.2)**;**
- **Appendix 9.3: Rampion 2 offshore wind farm subtidal benthic characterisation survey report, Volume 4** of the ES (Document Reference: 6.4.9.3);
- **Appendix 9.4: Rampion 2 geophysical survey, Volume 4** of the ES (Document Reference: 6.4.9.4)**;** and
- **Appendix 9.5: Rampion 2 Technical Note: Cable Corridor area mitigation for sensitive features, Volume 4 of the ES** (Document Reference: 6.4.9.5).

9.2 Relevant legislation, planning policy and other documentation

Introduction

9.2.1 This section identifies the legislation, policy and other documentation that has informed the assessment of effects with respect to benthic subtidal and intertidal ecology. Further information on policies relevant to the Environmental Impact Assessment (EIA) and their status is provided in **Chapter 2: Policy and legislative context, Volume 2** of the ES (Document Reference: 6.2.2).

Legislation and national planning policy

9.2.2 **Table 9-1** lists the legislation relevant to the assessment of the effects on benthic subtidal and intertidal ecology receptors.

Table 9-1 Legislation relevant to benthic subtidal and intertidal ecology

Legislation description	Relevance to assessment
EC Directive 92/43/EEC on Conservation of Natural Habitats and Wild Fauna and Flora, 1992 (the 'Habitats Directive')	
The Habitats Directive requires Member States to take measures to maintain or	The Proposed Development is not expected to have any potential effects

Legislation description	Relevance to assessment
restore natural habitats (listed on Annex I) and wild species (Annex II) at favourable conservation status by the designation of Special Areas of Conservation (SACs). The Offshore Marine Conservation (Natural Habitats, &c.) Regulations 2007 (as amended) implement the Habitats Directive in relation to marine areas where the UK has jurisdiction beyond territorial waters (broadly 12 nautical miles (nm) to 200 nm). The Conservation of Habitats and Species Regulations 2017 (the Habitats Regulations) implement the Habitats Directive in relation to England and Wales as far as the limit of territorial waters (usually 12 nm).	on benthic subtidal or intertidal habitats or species that are listed as Annex I or Annex II habitats or species as the site does not directly or indirectly overlap with an SAC. However, Annex I habitat located within the secondary Zone of Influence (ZOI) and outwith a designated site have been considered within the ES assessment (see **Section 9.9** to **Section 9.12**). Sites within the national site network are considered in the **Report to Inform Appropriate Assessment** (Application Document Reference: 5.9)
The Wildlife and Countryside Act 1981	
Provides for the further protection of sites of at least national importance for nature conservation and varying levels of protection for species in need of conservation action, or other protection, within the UK. The Act provides for the designation of Sites of Special Scientific Interest (SSSIs). In SACs, Special Protection Areas (SPA) and Ramsar sites, SSSI designations also underpin the terrestrial and intertidal components of these sites.	The proposed DCO Order Limits overlap with the Climping Beach SSSI. Embedded environmental measures (**Table 9-16**) to avoid direct impacts on the intertidal area and therefore Climping Beach SSSI have been provisioned (C–43), whereby Horizontal Directional Drilling (HDD) installation works will be employed under the intertidal area. Potential indirect impacts to features have been assessed within **Section 9.9** to **9.12**.
Marine and Coastal Access Act 2009	
The Marine and Coastal Access Act 2009 created a new type of Marine Protected Area (MPA) called a Marine Conservation Zone (MCZ), which are of national importance. MCZs are intended to protect areas that are important to conserve the diversity of rare, threatened and representative marine habitats, species, geology and geomorphology in UK waters and they, together with other types of MPAs, deliver the Government's objective for an ecologically coherent network of MPAs. As part of the MCZ process, so- called 'reference areas' will be designated, in which all extractive,	The proposed DCO Order Limits do not cross any MCZs. There are three MCZs within the benthic subtidal and intertidal ecology study area (secondary ZOI), which comprise of the Kingmere, Offshore Overfalls and Pagham Harbour MCZs. Benthic features of these MCZs have been assessed within **Section 9.9** to **9.12**.

Legislation description	Relevance to assessment
depositional and/or disturbing and damaging activities are excluded.	
Natural Environment and Rural Communities (NERC) Act 2006 Section 41 Habitats of Principal Importance	
Places an obligation on public authorities, including local authorities, to encourage effective management of biodiversity. This includes internationally protected sites and habitats and species outside sites designated for their nature conservation importance.	NERC Act (2006) Section 41 Habitats of Principal importance are known to occur across the benthic subtidal and intertidal ecology study area. Impacts on habitats and species of conservation concern have been assessed within **Section 9.9**, using available literature to undertake a precautionary assessment.

9.2.3 **Table 9-2** lists the national planning policy relevant to the assessment of the effects on benthic subtidal and intertidal ecology receptors.

Table 9-2 National planning policy relevant to benthic subtidal and intertidal ecology

Policy description	Relevance to assessment
EN-1 NPS for Renewable Energy (July 2011)	
Paragraph 5.3.10 "*Sites of Special Scientific Interest (SSSIs) that are not incorporated within internationally designated sites should be provided with a high degree of protection*". Paragraph 5.3.11 "*Where a Proposed Development within or outside a SSSI is likely to have an adverse effect on an SSSI (alone or together with other developments) development consent should not normally be granted. If after mitigation an adverse effect is still likely then consent should only be given where the benefits (including need) for a development outweighs the impacts on the SSSI in question and also the wider SSSI network. The Secretary of State (SoS) should use requirements and/or planning obligations to mitigate the harmful aspects of the development, and where possible, ensure the conservation of the site's biodiversity or geological interest*".	The proposed DCO Order Limits overlap with the Climping Beach SSSI. Embedded environmental measures (**Table 9-16**) includes measures to avoid direct impacts on the intertidal area and therefore Climping Beach SSSI have been provisioned (C–43), whereby HDD installation works will be employed under the intertidal area. Potential indirect impacts to features have been assessed within **Section 9.9** to **9.12**.

Policy description	Relevance to assessment
Paragraph 5.3.12 "*The SoS is bound by the duties in relation to MCZs imposed by sections 125 and 126 of the Marine and Coastal Access Act (MCAA) 2009*"	The proposed DCO Order Limits do not cross or directly overlap with any MCZs. However, there are three MCZs within the benthic subtidal and intertidal ecology study area (secondary ZOI), which include the Kingmere, Offshore Overfalls and Pagham Harbour MCZs. Benthic features of these MCZs have been assessed within **Section 9.9** to **Section 9.12**.
EN-3 NPS for Renewable Energy (July 2011)	
Paragraph 2.6.64 "*Applicants should assess the effects on the offshore ecology and biodiversity for all stages of the lifespan of the proposed offshore wind farm*".	The potential effects on offshore ecology and biodiversity associated with the construction, operation and decommissioning of the Proposed Development have been assessed (**Section 9.9** to **Section 9.12**).
Paragraph 2.6.65 "*Consultation on the assessment methodologies should be undertaken at an early stage with the statutory consultees as appropriate*"	Engagement and consultation with relevant statutory and non-statutory stakeholders has been carried out from the early stages of the Proposed Development (**Section 9.3**).
Paragraph 2.6.66 "*Any relevant data that has been collected as part of post-construction ecological monitoring from existing, operational offshore wind farms should be referred to where appropriate".*	Post-construction monitoring from other offshore wind farms has informed the assessment of the Proposed Development (**Section 9.9** to **Section 9.12**). The Marine Management Organisation (MMO) have produced a review (MMO, 2014) on post-construction monitoring for offshore wind farms, within which it is noted that there have been limited effects arising on benthic communities from certain impacts. Where appropriate, this chapter cross-refers to those studies, either individually or through reference to the MMO review.
Paragraph 2.6.67 "*Applicants should assess the potential for the scheme to have both positive and negative effects on marine ecology and biodiversity*".	Both the positive and negative effects of the Proposed Development on marine ecology and biodiversity have been assessed (**Section 9.9** to **Section 9.12**).
Paragraph 2.6.113 "*Applicants should assess the effects on the subtidal environment from habitat loss due to foundations and seabed preparation, predicted scour, scour protection and*	The assessment has considered effects from all development stages on benthic subtidal and intertidal habitats and species in the vicinity of the proposed DCO Order Limits. These assessments included all

Policy description	Relevance to assessment
altered sedimentary processes", and Paragraph 2.6.81 "*effects on the intertidal zone*".	likely effects from temporary and long-term habitat loss and the effects of changes in physical processes (**Section 9.9** to **Section 9.12**).
Paragraph 2.6.113 "*Applicants should assess the effects on the benthic environment from extendible legs and anchors of construction vessels*" and Paragraph 2.6.81 "*habitat disturbance in the intertidal zone during cable installation and removal (decommissioning)*".	The assessment has considered the effects of the benthic subtidal and intertidal disturbances throughout all stages of the Proposed Development (**Section 9.9** to **Section 9.12**).
Paragraph 2.6.113 "*Applicants should assess the effects of increased suspended sediment loads during construction on subtidal habitats*" and Paragraph 2.6.81 "*intertidal habitats*".	The likely rates of recovery of benthic species/habitats have been assessed for each impact discussed and have been used to inform each assessment of the significance of the effect (**Section 9.9** to **Section 9.12**).
Paragraph 2.6.113 "*Applicants should include environmental appraisal of array and cable routes and installation methods*".	Effects of cable installation on benthic ecology, based upon maximum design scenarios for cable installation methodologies, are assessed for all stages of the Proposed Development (**Section 9.9** to **Section 9.12**).
The Marine Policy Statement (MPS) (September 2011)	
"*The high-level objective of 'Living within environmental limits' covers the points relevant to benthic ecology, this requires, that:* *1) Biodiversity is protected, conserved and where appropriate recovered and loss has been halted.* *2) 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.* 3) *Our oceans support viable populations of representative, rare, vulnerable, and valued species*".	The Proposed Development embedded environmental measures (as shown in **Table 9-16**) include measures designed to protect, and conserve benthic ecology features of ecological importance wherever possible.
UK Biodiversity Action Plan (BAP) Priority Species and Habitats	

Policy description	Relevance to assessment
The UK BAP identified priority species and habitats as being the most threatened and requiring conservation action.	Further details of UK BAP habitats are provided in **Section 9.6**, but of particular relevance to the Proposed Development are bedrock and chalk reef habitat which are listed as UK BAP.

9.2.4 **Table 9-3** lists the emerging national planning policy considerations relevant to the assessment of the effects on benthic subtidal and intertidal ecology receptors.

Table 9-3 Emerging national planning policy relevant to benthic subtidal and intertidal ecology

Policy description	Relevance to assessment
Draft Overarching National Policy Statement for Energy (EN-1), March 2023	
Paragraph 5.4.7 *"Many SSSIs are also designated as sites of international importance and will be protected accordingly. Those that are not, or those features of SSSIs not covered by an international designation, should be given a high degree of protection. Most National Nature Reserves are notified as SSSIs."*	The Proposed Development overlaps with the Climping Beach SSSI. Embedded environmental measures includes measures (**Table 9-16**) to avoid direct impacts on the intertidal area and therefore Climping Beach SSSI have been provisioned (C–43). Potential indirect impacts to features have been assessed within **Section 9.9** to **9.12**.
Paragraph 5.4.8 *"Development on land within or outside a SSSI, and which is likely to have an adverse effect on it (either individually or in combination with other developments), should not normally be permitted. The only exception is where the benefits (including need) of the development in the location proposed clearly outweigh both its likely impact on the features of the site that make it of special scientific interest, and any broader impacts on the national network of SSSIs."*	
Paragraph 5.4.9 *"Marine Conservation Zones (MCZs) (Marine Protected Areas in Scotland), introduced under the Marine and Coastal Access Act 2009, are areas that have been designated for the purpose of conserving marine flora or fauna, marine habitats or types of marine habitat or features of geological or geomorphological interest. The protected feature or features and the conservation objectives for the*	The proposed DCO Order Limits do not cross or directly overlap with any MCZs. However, there are three MCZs within the benthic subtidal and intertidal ecology study area (secondary ZOI), which include the Kingmere, Offshore Overfalls and Pagham Harbour MCZs. Benthic features of these MCZs have been assessed within **Section 9.9** to **Section 9.12**.

Policy description	Relevance to assessment
MCZ are stated in the designation order for the MCZ."	
Paragraph 5.4.17 "Where the development is subject to EIA the applicant should ensure that the ES clearly sets out any effects on internationally, nationally, and locally designated sites of ecological or geological conservation importance (including those outside England), on protected species and on habitats and other species identified as being of principal importance for the conservation of biodiversity, including irreplaceable habitats." Paragraph 5.4.18 "The applicant should provide environmental information proportionate to the infrastructure where EIA is not required to help the Secretary of State consider thoroughly the potential effects of a proposed project."	The potential effects of the Proposed Development have been assessed in relation to international, national and local sites designated for ecological or geological features of conservation importance (see **Section 9.9** to **Section 9.12**).
Paragraph 5.4.19 *"The applicant should show how the project has taken advantage of opportunities to conserve and enhance biodiversity and geological conservation interests."*	The Proposed Development embedded environmental measures (as shown in **Table 9-16**) include measures designed to protect and conserve benthic ecology features of ecological importance wherever possible.
Paragraph 5.4.20 *"Applicants should consider wider ecosystem services and benefits of natural capital when designing enhancement measures."*	
Paragraph 5.4.21 *"As set out in Section 4.6, the design process should embed opportunities for nature inclusive design. Energy infrastructure projects have the potential to deliver significant benefits and enhancements beyond Biodiversity Net Gain, which result in wider environmental gains (see Section 4.5 on Environmental and Biodiversity Net Gain). The scope of potential gains will be dependent on the type, scale, and location of each project."*	
Draft National Policy Statement for renewable energy infrastructure (EN-3), March 2023	

Policy description	Relevance to assessment
Paragraph 3.8.115 *"Applicants must undertake a detailed assessment of the offshore ecological, biodiversity and physical impacts of their proposed development, for all phases of the lifespan of that development, in accordance with the appropriate policy for offshore wind farm EIAs, HRAs and MCZ assessments (See Sections 4.2 and 5.4 of EN-1)."*	The assessment has considered effects from all development stages on benthic subtidal and intertidal habitats and species in the vicinity of the Proposed Development. These assessments are provided in **Section 9.9** to **Section 9.12**
Paragraph 3.8.116 *"Applicants need to consider environmental and biodiversity net gain as set out in Section 4.5 of EN-1 and the Environment Act 2021."*	A Biodiversity Net Gain assessment has been prepared to accompany the DCO Application, which outlines how the Proposed Development complies with the requirements of national and local planning policy. RED have made a commitment to deliver Biodiversity Net Gain (BNG[RR1] [RR2]) of at least 10% for all onshore and intertidal (above Mean High Water Springs (MHWS)) habitats subject to permanent or temporary losses as a result of the construction and operation of the Proposed Development. Whilst Marine Net Gain is not currently mandated in the same way as onshore (terrestrial) Biodiversity Net Gain, in recognition of the principles set out in the draft National Policy Statement EN-1 (2023), RED is currently exploring opportunities to partner with organisations who are able to deliver marine benefits in the region. The approach to delivering BNG is outlined in **Chapter 22: Terrestrial ecology and nature conservation, Volume 2** of the ES (Document Reference 6.2.22). This includes restoration and enhancement and the provision of off-site biodiversity units**.**
Paragraph 3.8.117 *"Applicants should assess the potential of their proposed development to have net positive effects on marine ecology and biodiversity, as well as negative effects."*	The assessment methodology includes the provision for assessment of both positive and negative effects (see **Section 9.8**).
Paragraph 3.8.118 *"Applicants should consult at an early stage of pre-application*	Engagement and consultation with relevant statutory and non-statutory stakeholders

Policy description	Relevance to assessment
with relevant statutory consultees, as appropriate, on the assessment methodologies, baseline data collection, and potential avoidance, mitigation and compensation options should be undertaken."	has been carried out from the early stages of the Proposed Development (**Section 9.3**).
Paragraph 3.8.120 *"Any relevant data that has been collected as part of post-construction ecological monitoring from existing, operational offshore wind farms should be referred to where appropriate."*	Post-construction monitoring from other offshore wind farms has informed the assessment of the Proposed Development (**Section 9.9** to **Section 9.12**). The MMO have produced a review (MMO, 2014) on post-construction monitoring for offshore wind farms, within which it is noted that there have been limited effects arising on benthic communities from certain impacts. Where appropriate, this chapter cross-refers to those studies, either individually or through reference to the MMO review.
Paragraph 3.8.166 *"Applicant assessment of the effects on the subtidal environment should include:* • *loss of habitat due to foundation type including associated seabed preparation, predicted scour, scour protection and altered sedimentary processes, e.g. sandwave/boulder/UXO clearance;* • *environmental appraisal of inter-array and export cable routes and installation/maintenance methods, including predicted loss of habitat due to predicted scour and scour/cable protection and sandwave/boulder/UXO clearance;* • *habitat disturbance from construction and maintenance/repair vessels' extendable legs and anchors;* • *increased suspended sediment loads during construction and from maintenance/repairs;* • *predicted rates at which the subtidal zone might recover from temporary effects;* • *potential impacts from EMF on benthic fauna;* • *protected sites; and* • *potential for invasive/non-native species introduction"*	The potential effects on benthic subtidal and intertidal ecology associated with the construction, operation and decommissioning of the Proposed Development have been assessed (**Section 9.9** to **Section 9.12**).

Local planning policy

9.2.5 **Table 9-4** lists the local planning policy relevant to the assessment of the potential effects on benthic subtidal and intertidal ecology receptors.

Table 9-4 Local planning policy relevant to benthic subtidal and intertidal ecology

Policy description	Relevance to assessment
South Inshore and South Offshore Coast Marine Plan (July 2018)	
Policy Reference: S-MPA-1 "*Proposals that may have adverse impacts on the objectives of marine protected areas and the ecological coherence of the marine protected area network must demonstrate that they will, in order of preference: a) avoid, b) minimise, c) mitigate adverse impacts, with due regard given to statutory advice on an ecologically coherent network*."	Designated nature conservation sites within the proposed DCO Order Limits benthic subtidal and intertidal ecology study area have been described in **Table 9-13**. Benthic features of marine protected areas have been assessed within **Section 9.9** to **Section 9.12**.
Policy Reference: S-NIS-1 "*Proposals must put in place appropriate measures to avoid or minimise significant adverse impacts on the marine area that would arise through the introduction and transport of non-indigenous species, particularly when: 1) moving equipment, boats or livestock (e.g. fish and shellfish) from one water body to another 2) introducing structures suitable for settlement of non-indigenous species, or the spread of invasive non-indigenous species known to exist in the area*."	The Proposed Development embedded measures (as shown in **Table 9-16**) include measures to avoid the introduction or spread of Marine Invasive Non-Native Species (INNS) through the implementation of the **Outline Project Environmental Management Plan** (Document Reference: 7.11) (C-95) which will be secured through the Development Consent Order (DCO).
Policy Reference: S-BIO-1 "*Proposals that may have significant adverse impacts on natural habitat and species adaptation, migration and connectivity must demonstrate that they will, in order of preference: a) avoid, b) minimise c) mitigate significant adverse impacts.*"	The potential effects on offshore ecology and biodiversity associated with the construction, operation and decommissioning of the Proposed Development have been assessed (**Section 9.9** to **Section 9.12**). The Proposed Development embedded environmental measures (as shown in **Table 9-16**) include measures designed to protect and conserve benthic ecology features of ecological importance wherever possible.

Policy description	Relevance to assessment
Sussex BAP	
A BAP addresses threatened species and habitats, designed to protect and restore biological systems. The overall aim of the Sussex BAP is to conserve and enhance the biological diversity of Sussex and contribute to the conservation and enhancement of both national and international biodiversity.	Further details of BAP habitats are provided in **Section 9.6**, but of particular relevance to the Proposed Development are the following: Chalk and clay exposures; Ross worm *Sabellaria spinulosa* beds; and subtidal sands and gravels.

Other relevant information and guidance

9.2.6 A summary of other relevant information and guidance relevant to the assessment undertaken for benthic subtidal and intertidal ecology is provided here.

- EIA Directive (11/92/EU) (as amended). Requires adequate characterisation of the receiving environment;
- The Infrastructure Planning (Environmental Impact Assessment) Regulations 2017. Requires a description of the relevant aspects of the current state of the environment (baseline scenario);
- The Marine Strategy Framework Directive (MSFD), adopted in July 2008, and transposed into law (The Marine Strategy Regulations 2010), has also been considered in the proposed DCO Order Limits for benthic ecology. The relevance of the MSFD to the Proposed Development is described in full in **Chapter 2: Policy and legislative context, Volume 2** (Document Reference: 6.2). The overarching goal of the MSFD is to achieve 'Good Environmental Status' (GES) by 2020 across Europe's marine environment;
- Guidelines for Ecological Impact Assessment in the UK and Ireland. Terrestrial, Freshwater, Coastal and Marine (CIEEM, 2018). Requires that the baseline conditions for each ecological feature should be described clearly, objectively and succinctly. Also requires that the ecological information is adequate for the purpose of the EIA;
- Review of post-consent offshore wind farm monitoring data associated with licence conditions (MMO, 2014);
- Guidelines for data acquisition to support marine environmental assessments of offshore renewable energy projects (Judd, 2012);
- Guidance on Environmental Considerations for Offshore Wind Farm Development (OSPAR, 2008); and
- Guidance note for Environmental Impact Assessment in respect of FEPA (Food and Environment Protection Act 1985) and CPA (Coastal Protection Act 1949) requirements (Cefas *et al*., 2004).

9.3 Consultation and engagement

Overview

9.3.1 This section describes the stakeholder engagement undertaken for Rampion 2. This consists of early engagement, the outcome of, and response to, the Scoping Opinion in relation to the benthic subtidal and intertidal ecology assessment, the Evidence Plan Process (EPP), non-statutory consultation and Rampion 2's statutory consultation. An overview of engagement undertaken for Rampion 2 as a whole can be found in **Chapter 5: Approach to the EIA, Volume 2** of the ES (Document Reference: 6.2.5).

Early engagement

Introduction

9.3.2 Early engagement was undertaken with a number of prescribed and non-prescribed consultation bodies including Natural England, the Marine Management Organisation (MMO) and Centre for Environment, Fisheries and Aquaculture Science (Cefas) in relation to benthic subtidal and intertidal ecology. This engagement was undertaken to introduce the Proposed Development and the proposed approach to scoping the EIA.

9.3.3 Rampion Extension Development Limited (RED) have engaged from the outset with Natural England, the MMO and Cefas on the subtidal survey terms of reference (ToR), with stakeholders receiving the document for first review in October 2020. All comments on the benthic subtidal scope were addressed ahead of survey commencement.

Scoping opinion

9.3.4 RED submitted a Scoping Report (RED, 2020) and request for a Scoping Opinion to the Secretary of State (administered by the Planning Inspectorate) on 2 July 2020. A Scoping Opinion was received on 11 August 2020. The Scoping Report sets out the proposed benthic subtidal and intertidal ecology assessment methodologies, outline of the baseline data collected to date and proposed, and the scope of the assessment. **Table 9-5** sets out the comments received in Section 4 of the Planning Inspectorate Scoping Opinion 'Aspect based scoping tables – Offshore' and how these have been addressed in this ES. A full list of the Planning Inspectorate Scoping Opinion comments and responses is provided in **Appendix 5.2: Responses to the Scoping Opinion, Volume 4** of the ES (Document Reference: 6.4.5.2). Regard has also been given to other stakeholder comments that were received in relation to the Scoping Report.

Table 9-5 The Planning Inspectorate Scoping Opinion responses – benthic subtidal and intertidal ecology

PINS ID number	Scoping Opinion comment	How this is addressed in this ES
4.4.1	*Accidental pollution events (Construction, operation and maintenance and decommissioning)* The Inspectorate agrees that, with the implementation of measures to limit any potential pollution incidents, any potential impacts on benthic subtidal and intertidal ecology are unlikely to result in significant effects and therefore further assessment is not required. However, the Inspectorate seeks assurances as to the detail of such measures that will be employed and how they will be secured and therefore considers that this detail should be described within the ES.	The likelihood of an incident will be reduced by implementation of an **Outline Project Environmental Management Plan** (Document Reference: 7.11) and Outline Marine Pollution Contingency Plan (MPCP) (Appendix A of the **Outline Project Environmental Management Plan**); details of which are presented in **Section 9.7** and **Table 9-16**. The impacts of accidental pollution events have also been addressed within the assessment **Section 9.9** to **Section 9.12**, using available literature to undertake a precautionary assessment.
4.4.2	*Electromagnetic fields (EMF) generated by inter array and export cables during operation*. Although the Inspectorate notes the basis of the evidence provided to support the Applicant's proposed approach (Orpwood *et al*. (2015) and Armstrong *et al*. (2015)), the MMO and its technical advisors do not support these findings. The Inspectorate is of the view that uncertainties concerning operation effects of electromagnetic effects remain. The Inspectorate therefore does not agree that likely significant effects upon fish receptors from operational EMF can be excluded at this stage and this matter should remain scoped into the ES.	The impacts of EMF on sensitive benthic subtidal ecology receptors have been addressed in **Section 9.10** using available literature to undertake a precautionary assessment. Specific EMF impacts on elasmobranch, fish and shellfish are considered in **Section 8.10** of **Chapter 8: Fish and Shellfish Ecology, Volume 2** of the ES (Document Reference: 6.2.8).
4.4.3	*Noise pollution during construction related activities.*	The impacts of noise pollution during construction related activities have been addressed within the assessment in **Section 9.9**, using

PINS ID number	Scoping Opinion comment	How this is addressed in this ES
	The Scoping Report provides limited evidence to support the request and nothing to demonstrate agreement with relevant consultation bodies. The Inspectorate is not in a position to agree to scope these matters from the assessment. Accordingly, the ES should include an assessment of these matters where significant effects are likely to occur.	available literature to undertake a precautionary assessment.
4.4.4	*Identification of sites and species.* Table 5.5.2 identifies designated sites and their features which have been screened in for assessment and these include European and nationally designated sites. The ES should ensure that impacts on protected habitats and species (including, but not limited to, those protected under the Habitats Directive, Wildlife and Countryside Act 1981, NERC Act s41 habitats and species of principal importance), together with local Biodiversity Action Plan (BAP) habitats and species and other habitats/species of conservation concern are assessed where significant effects are likely.	Impacts on protected habitats and species, together with local BAP habitats and species and other habitats/species of conservation concern have been assessed within **Section 9.9**, using available literature to undertake a precautionary assessment.
4.4.5	*C-45 cable burial.* It is not yet confirmed which method of cable protection will be adopted for the Proposed Development, though it is noted that cable burial is the preferred option. The ES should explain the types of cable protection which could be used, and the associated impacts upon benthic subtidal and intertidal ecology.	The exact form of cable protection to be used will depend upon local ground conditions, hydrodynamic regime/processes, and the selected cable protection contractor. However, the final choice will include one or more of the following: 1) concrete 'mattresses'; 2) rock placement; 3) geotextile bags filled with stone, rock or gravel;

PINS ID number	Scoping Opinion comment	How this is addressed in this ES
		4) polyethylene or steel pipe half shells, or sheathes; and/or 5) bags of grout, concrete, or another substance that cures hard over time. The impacts of introduced artificial substrates have been addressed in **Section 9.10** using available literature and a worst-case scenario to undertake a precautionary assessment.
4.4.6	*Baseline – subtidal sediments.* It is understood that of the eleven sites sampled, four supported levels of contaminants in excess of Action Level 1 for Arsenic and Chromium. The ES should explain the significance of this finding, and the risk posed from any other contaminants found in the context of characterising the whole survey area.	The impacts of sediment contamination have been addressed within the assessment **Section 9.9** to **Section 9.12**, using available literature to undertake a precautionary assessment.
4.4.7	*Non-indigenous species.* The ES should include an assessment of the potential for the spread of non-indigenous species via the colonisation of hard substrates and for the Proposed Development to be used to reach the designated hard habitats in the adjacent Kingmere MCZ.	The impacts of Marine INNS have been addressed within the assessment **Section 9.9** to **Section 9.12**, using available literature to undertake a precautionary assessment.

Evidence Plan Process (EPP)

9.3.5 The EPP has been set up to provide a formal, non-legally binding, independently chaired forum to agree the scope of the EIA and Habitats regulations Assessment (HRA), and the evidence required to support the DCO Application. The EPP commenced in January 2020 and has continued throughout the EIA helping to inform the ES.

9.3.6 For benthic subtidal and intertidal ecology, further engagement has been undertaken via the EPP Expert Topic Group (ETG) Coastal Processes, Water Quality, Benthic Ecology and Fish Ecology ETG Meeting.

9.3.7 Further information is provided in the **Evidence Plan** (Application Document Reference: 7.21).

9.3.8 The Coastal Processes, Water Quality, Benthic Ecology and Fish Ecology ETG Meeting has included Regulators (e.g. the MMO), Statutory Nature Conservation Bodies (SNCBs), local authorities, technical experts and interest groups. A summary of consultation undertaken between the completion of the Scoping Report (RED, 2020) and up to June 2022 is outlined in this section.

9.3.9 Engagement with Natural England, MMO, Cefas, Environment Agency, the Wildlife Trust (TWT), Sussex Wildlife Trust (SWT) and East Sussex County Council (ESCC) has been ongoing since 4 August 2020 in the form of conference calls and emails. The following section sets out the summary of discussions through the ETG meeting.

17 September 2020 – ETG Meeting

9.3.10 On 17 September 2020 the first Coastal Processes, Water Quality, Benthic Ecology and Fish Ecology ETG Meeting was held and the scope of the assessment following scoping opinion responses was discussed. The proposed methodology was presented and there was a brief discussion of key datasets. The MMO confirmed agreement with the conclusion provided by Cefas that the justification to scope out operational EMF, noise and accidental pollution is satisfactory in a written response to the ETG meeting minutes on 30 November 2020.

9.3.11 Cefas noted during the ETG meeting that they were happy for operational EMF (in relation to benthic invertebrates), noise and accidental pollution event effects on benthic ecology to be scoped out. No further agreements or disagreements were identified.

9.3.12 No further agreements or disagreements were identified by the MMO, Cefas, Environment Agency, TWT and SWT.

13 October 2020 – ETG Meeting (Natural England ‘catch-up’)

9.3.13 Natural England were unable to attend the first Coastal Processes, Water Quality, Benthic Ecology and Fish Ecology ETG meeting on 17 September 2020. However, an additional ‘catch-up’ ETG meeting was held on 13 October 2020, to present the topics to Natural England. Natural England noted that they will welcome consultation on the PEMP and MPCP documents and that they do not currently have any information on the measures that will be included to limit any potential pollution incidents. Therefore, they described it was too early to scope this impact out at this stage and has therefore been included in the assessment (see **Table 9-8** and **Section 9.9** to **Section 9.12**). No further agreements or disagreements were identified.

24 March 2021 – ETG Meeting

9.3.14 The second Coastal Processes, Water Quality, Benthic Ecology and Fish Ecology ETG Meeting was held. The meeting presented an update on the benthic surveys completed since the first ETG Meeting (17 September 2020), discussions on the benthic indicative habitat model approach and a discussion on the comments received on the benthic subtidal and intertidal ecology method statement. Natural England noted that they disagree with the coverage and use of existing data within the benthic habitat model as it will not be considered a full characterisation of the area if it is lacking site-specific data. Natural England noted that the site-specific data may show the same habitat composition as the benthic habitat model, but they cannot make a definitive assessment of what is presented in the model without a full picture.

9.3.15 Cefas noted in relation to the benthic habitat model approach that it will be useful to have additional new data, however Cefas recognised numerous data was used to create the model. In relation to scoping out EMF and operational noise Cefas initially were content with these out of the assessment. However, the Planning Inspectorate have requested both EMF and operational noise be scoped in. Both EMF and noise have been included with the assessment (see **Section 9.9** and **Section 9.10**).

9.3.16 No further agreements or disagreements were identified by Natural England, MMO, Cefas, Environment Agency, TWT and SWT.

3 November 2021 – ETG Meeting

9.3.17 The third Coastal Processes, Water Quality, Benthic Ecology and Fish Ecology ETG Meeting was held on the 3rd November, 2021. The meeting presented an update on the predictive habitat model utilised for the Preliminary Environmental Information Report (PEIR) (RED, 2021), a selection of key issues raised by stakeholders, including Natural England, MMO, Cefas, and an opportunity to discuss some of the issues raised, including floatation pit monitoring from Rampion 1. It was noted that the majority of the Section 42 (S42) comments received will be incorporated in the ES, any comments which could not be resolved at the ETG, will be discussed at targeted meetings. These include the offshore export cable corridor route and its potential impacts to black seabream nests and reef features.

9.3.18 It should be noted that representatives from TWT and SWT could not attend this ETG, however representatives from the Sussex Kelp Restoration Project (SKRP) were in attendance.

15 February 2022 – Targeted Meeting

9.3.19 On the 15 February 2022 targeted meetings were undertaken with relevant stakeholders, including Natural England, to discuss offshore cable corridor issues including black seabream nests and reef features. This targeted meeting detailed RED's proposed environmental measures options for cable laying in the export cable corridor. In preparation for this meeting a Technical Note was provided by RED, 'Rampion 2 Technical Note: Cable Corridor area mitigation for sensitive features' (**Appendix 9.5: Rampion 2 Technical Note: Cable Corridor area mitigation for sensitive features, Volume 4** of the ES (Document Reference:

6.4.9.5)). Different trenching methods have been considered to minimise the footprint and identify the shortest feasible path through the chalk beds. There was a positive response from Natural England, MMO on the measures proposed and acknowledgment of avoidance of any known black bream nests, including a 50m buffer. Natural England highlighted concerns around recoverability of reef features. However, RED confirmed that floatation pits are no longer required for Rampion 2. RED will commit to using an alternative solution, such as rock filter bags (or similar) for seabed preparation purposes. Following this meeting, the updated **Appendix 9.3: Offshore wind farm subtidal benthic characterisation survey report, Volume 4** of the ES (Document Reference: 6.4.9.3) circulated to attendees, which provided the full survey data, including chemical analysis and survey data from within the proposed DCO Order Limits.

9.3.20 Cefas commented that the mitigation was beneficial from a habitats perspective. No additional concerns were raised in this forum.

26 May 2022 - ETG Meeting

9.3.21 On 26 May 2022 the fourth Coastal Processes, Water Quality, Benthic Ecology and Fish Ecology ETG Meeting was held. The meeting was held to discuss the remaining S42 consultation responses and approach to dealing with comments in addition to the ES Assessment approach. Natural England expressed concerns over the predictive nature of the habitat model. However, this was further discussed to confirm that the predictions were modelled to fill data gaps at PEIR (RED, 2021) and whilst this was a useful exercise for gap filling, site specific data was collected for inclusion into this ES and the model was updated with this data. Furthermore, there were concerns regarding the lack of *Sabellaria spinulosa* found within the data. The recent subtidal report (**Appendix 9.3: Offshore wind farm subtidal benthic characterisation survey report, Volume 4** of the ES (Document Reference: 6.4.9.3)) describes the potential for *S. spinulosa* reefs across the nearshore offshore export cable corridor and western areas of the proposed DCO Order Limits. However, observations of discrete *S. spinulosa* encrustations were deemed to be low resemblance reef across the proposed DCO Order Limits. The encrusting *S. spinulosa* biotope 'A3.215: [*Sabellaria spinulosa*] with kelp and red seaweeds on sand-influenced infralittoral rock' was therefore included within the model and assessed within **Section 9.9**. Further assessment of habitats/species "of principal importance pursuant to section 41 of the NERC Act 2006" will be undertaken during pre-construction surveys.

9.3.22 Natural England expressed that they did not agree with the definitions of sensitivity currently applied to some biotopes. They also stated that they didn't agree with the assessment matrix itself which originally included the addition of 'very high' alongside the use of MarLIN data that does not include a 'very high' category. This was discussed and subsequently the 'very high' sensitivity category has been removed (**Table 9-17**).

9.3.23 During this meeting Natural England also expressed concern regarding chalk habitat loss during construction and disagreed with the proposed temporary nature of this impact. It was subsequently discussed and agreed that the assessment would be updated to reflect that the impact will be regarded as permanent (**Section 9.9**).

9.3.24 No disagreements were discussed with MMO, Cefas, Environment Agency, TWT, SWT and East Sussex County Council (ESCC) during this process.

Non-Statutory consultation

Overview

9.3.25 Non-statutory consultation captures all consultation and engagement outside of statutory consultation and has been ongoing with a number of prescribed and non-prescribed consultation bodies and local authorities in relation to benthic subtidal and intertidal ecology. A summary of the non-statutory consultation undertaken since completion of the Scoping Report is outlined in this section.

Sussex Kelp Restoration Project

9.3.26 Non-statutory consultation with Sussex Kelp Restoration Project (SKRP) has been ongoing since February 2021 in the form of conference calls.

9.3.27 A targeted meeting to discuss key questions raised to date was held on the 14 April 2022. The meeting included representatives from the SWT, Blue Marine Foundation and Sussex Inshore Fisheries and Conservation Authority (IFCA).

9.3.28 The meeting was held to discuss the SKRP concerns which included cable burial and the mitigation plan proposed for sensitive features. Concerns were raised regarding the offshore export cable and routing around sensitive features. RED confirmed that the route would avoid all known black bream nests with a 50m buffer wherever practicable. Furthermore, it was detailed that different trenching methods are being proposed to minimise the footprint and identify the shortest feasible path through the chalk beds, micrositing the cable around chalk features where possible.

9.3.29 SKRP raised concerns regarding the level of sedimentation that might occur in the inshore area. It was confirmed that the impact would be presented within the assessment with regards to Kelp biotopes. The assessment for Rampion 2 alone and cumulative impacts are presented within **Section 9.9** to **Section 9.12**, respectively. No other disagreements of concern were raised during this consultation.

Non-statutory Consultation Exercise – January/February 2021

9.3.30 RED carried out an non-statutory Consultation Exercise for a period of four weeks from 14 January 2021 to 11 February 2021. This non-statutory Consultation Exercise aimed to engage with a range of stakeholders including the prescribed and non-prescribed consultation bodies, local authorities, Parish Councils and general public with a view to introducing the Proposed Development and seeking early feedback on the emerging designs.

9.3.31 The key negative themes emerging from the non-statutory Consultation Exercise in January 2021 relating to benthic subtidal and intertidal ecology were:

- Concerns about the impact of the proposals on the environment and wildlife, with comments about the beach being a designated SSSI; and

- Concern about the proximity to the Marine Conservation Zone, in addition to statements about the negative impacts to the seabed and sea life.

9.3.32 Further detail about the results of the non-statutory Consultation Exercise can be found in the **Consultation Report** (Document Reference: 5.1).

Statutory consultation

9.3.33 Rampion 2's first statutory consultation exercise ran from 14 July to 16 September 2021, a period of nine weeks. The PEIR (RED, 2021) was published as part of Rampion 2's first statutory consultation exercise which provided preliminary information on shipping and navigation within Chapter 9: Benthic, subtidal and intertidal ecology (RED, 2021).

9.3.34 Following feedback to the Statutory Consultation exercise in 2021 it was identified that some coastal residents did not receive consultation leaflets as intended. Therefore, the first Statutory Consultation exercise was reopened between 7 February 2022 to 11 April 2022 for a further nine weeks. The original PEIR published as part of the first Statutory Consultation exercise in 2021 was unchanged and re-provided alongside the reopened Statutory Consultation exercise in early 2022.

9.3.35 The following statutory consultation exercises focussed on changes made to the onshore cable route, onshore substation, and National Grid interface point and did not consider offshore aspects of the Proposed Development.

9.3.36 The second Statutory Consultation exercise was undertaken from 18 October 2022 to 29 November 2022. This was a targeted consultation which focused on updates to the onshore cable route proposals which were being considered following feedback from consultation and further engineering and environmental works. As part of this second Statutory Consultation exercise, RED sought feedback on the potential changes to the onshore cable route proposals to inform the onshore design taken forward to DCO application.

9.3.37 The third Statutory Consultation exercise was undertaken from 24 February 2023 to 27 March 2023. This was a targeted consultation which focused on a further single onshore cable route alternative being considered following feedback from consultation and further engineering and environmental works. As part of this third Statutory Consultation exercise, RED sought feedback on the potential changes to the onshore cable route proposals to inform the onshore design taken forward to DCO Application.

9.3.38 The fourth Statutory Consultation exercise was undertaken from 28 April 2023 to 30 May 2023. This was a targeted consultation which focused on the proposed extension works to the existing National Grid Bolney substation to facilitate the connection of the Rampion 2 onshore cable route into the national grid electricity infrastructure. As part of this fourth Statutory Consultation exercise, RED sought feedback on the proposed substation extension works to inform the onshore design taken forward to the DCO Application.

9.3.39 **Table 9-6** provides a summary of the key themes of the feedback received in relation to benthic subtidal and intertidal ecology and outlines how the feedback has been considered in this ES chapter. A list of comments received during the

statutory consultation period and the responses to comments is provided in the **Consultation Report** (Application Document Reference: 5.1).

Table 9-6 Statutory consultation feedback

Stakeholder	Document/ Forum	Theme	How this is addressed in this ES
Sussex Wildlife Trust/ Sussex Kelp Restoration Project (SKRP)	Evidence Plan Process: Offshore Cable Corridor Issues Targeted Meeting (15/02/22)	Consultees expressed concerns regarding micro-siting of offshore export cables around features of conservation interest and the predictions for seabed habitat presented at PEIR (RED, 2021).	Since PEIR further site-specific survey data has been added to habitat mapping. It should be stressed that where site specific data have been collected, this has been prioritised within the predictive habitat map and that an appropriate baseline has been characterised. This Chapter has been updated accordingly and all available data was used in the cable routing and mitigation exercise. Furthermore, pre-construction surveys will be undertaken to inform final cable routing.
Natural England	Evidence Plan Process: Offshore Cable Corridor Issues Targeted Meeting (15/02/22)	Consultees requested confirmation on the use of floatation pits.	Floatation pits will no longer be considered for Rampion 2. RED will commit to using rock filter bags (or similar) for seabed preparation purposes. The placement of rock filter bags are currently RED's leading solution. One or two layers of rock bags will likely be required. This Chapter has been updated to remove all reference to floatation pits.
Natural England	Evidence Plan Process: Offshore Cable Corridor Issues Targeted Meeting (15/02/22)	Concerns were raised regarding trenching methodology. Consultees understand that RED are committed to minimising the impact but suggested a few different options.	RED can confirm that in terms of the impact from trenching, this has not changed since PEIR (RED, 2021) and a maximum design scenario has been assessed. Embedded environmental measures have been discussed in **Section 9.9** to detail how RED is aiming to reduce the impact of these methodologies.

Stakeholder	Document/ Forum	Theme	How this is addressed in this ES
MMO & Natural England	Section 42 Consultation (ID: 42, 351, 359, 458, 160)	Consultees expressed concern regarding the application of predictive habitat mapping, lack of site-specific survey data and baseline characterisation.	Predictive habitat mapping utilised the best available data for the array area and export cable corridor to produce a detailed predictive habitat map at PEIR (RED, 2021). The primary purpose of creating the predictive habitat map was to address data gaps identified at PEIR, due to planned further survey work not being available at that time. Since PEIR, further site-specific survey data has been added to the habitat mapping. It should be stressed that where site specific data have been collected, this has been prioritised within the predictive habitat map and that an appropriate baseline has been characterised.
MMO & Natural England	Section 42 Consultation (ID: 43, 44, 386, 411, 428)	Natural England expressed concern regarding the use of floatation pits and associated impacts and conclusions.	A targeted meeting with appropriate stakeholders took place on the 15 of February 2022 to discuss RED's proposed mitigation options for cable laying in the export cable corridor. As part of this meeting, it was stated that floatation pits will no longer be considered for Rampion 2. RED will commit to using alternative solutions such as rock filter bags (or similar) for seabed preparation purposes. Full details are presented in **Chapter 4: The Proposed Development, Volume 2** of the ES (Document Reference: 6.2.4).
Natural England	Section 42 Consultation (ID: 349, 350, 352, 387, 390,	Natural England expressed concern regarding the wide parameters and worst-case scenario (WCS) applied to the project description at PEIR, which made it challenging to understand the impacts.	The project has been refined for the ES assessment, with the proposed DCO Order Limits being reduced in the west and east of the ES Assessment Boundary. As a result, the maximum design scenario (**Table 9-15**)

Stakeholder	Document/ Forum	Theme	How this is addressed in this ES
	391, 393, 394, 412)	Clear calculations and links to the proposed development chapter will be beneficial and any mistakes identified in S42 responses reviewed and amended.	has been updated to reflect the changes since PEIR (RED, 2021).
Natural England	Section 42 Consultation (ID: 353, 414, 415, 416, 417, 418, 426)	Natural England expressed concern regarding sediment plume modelling to understand the impacts on designated sites, as well as Annex I/ Section 41 priority habitats.	Detailed quantitative assessments of sediment plumes are provided in **Appendix 6.3: Coastal processes impact assessment, Volume 4** of the ES (Document Reference: 6.4.6.3), also summarised in **Chapter 6: Coastal processes, Volume 2** of the ES (Document Reference: 6.2.6). The detailed effect descriptions are presented in a tabulated format and a description of the extent of potential effects from Suspended Sediment Concentrations (SSC) and deposition from any activity at any location within the ES Assessment Boundary is also provided. Details of the impacts on designated sites, as well as Annex I/ Section 41 priority habitats are considered within the assessment (**Section 9.9** to **Section 9.12**).
Natural England	Section 42 Consultation (ID: 354, 402, 410, 408)	Natural England expressed that they did not agree with the definitions of sensitivity currently applied to some biotopes. The assessment matrix itself also appears to be flawed with the addition of ‘very high’ alongside the use of MarLIN data that does not include a ‘very high’ category.	The 'very high' sensitivity category has been removed (**Table 9-17**) as per discussions with Natural England.

Stakeholder	Document/ Forum	Theme	How this is addressed in this ES
Natural England	Section 42 Consultation (ID: 355, 453)	Natural England expressed concerns regarding the cumulative impacts associated with the AQUIND Interconnector Cable. It was also stated that cumulative impacts should be modelled to understand the full extent of impacts.	Detailed assessments on the interaction between neighbouring projects are provided within **Section 9.12** and detailed cumulative physical processes assessments are provided in **Appendix 6.3: Coastal processes impact assessment, Volume 4** of the ES (Document Reference: 6.4.6.3), also summarised in **Chapter 6: Coastal processes, Volume 2** of the ES (Document Reference: 6.2.6).
Natural England	Section 42 Consultation (ID: 356)	Natural England advice that Annex I or Annex II habitats or species outside of designated sites should still be considered.	The 'relevance to assessment' section of **Table 9-1** has been amended to detail that any Annex I or Annex II habitats/species out-with SACs that are located within the ES study area have been considered within the assessment.
Natural England	Section 42 Consultation (ID: 357, 398, 405)	The proposed DCO Order Limits overlaps with the Climping Beach SSSI.	The onshore landfall proposed DCO Order Limits overlaps with Climping SSSI. However, this is to allow for an area of HDD works, which will be underneath the cliff face and the intertidal area. It will not be on the surface of the beach. The overlap with the proposed DCO Order Limits has not been removed, to allow space for the HDD. Potential indirect effects to features have been assessed within **Section 9.9**.
Natural England	Section 42 Consultation (ID: 362, 413, 449)	Natural England note that the ZOI for benthic ecology has been informed by the tidal excursion buffer. We note that the study area shown in Figure 9.1 and the	The secondary ZOI buffer area has been increased to 16km around the proposed DCO Order Limits to match the 16km tidal excursion zone for SSC (**Figure 9.1, Volume 3** of the ES (Document Reference: 6.3.9)).

Stakeholder	Document/ Forum	Theme	How this is addressed in this ES
		Spring tidal excursion buffer shown in Figure 6.5 differ.	
Natural England	Section 42 Consultation (ID: 363, 429)	The intertidal ecology study area is defined by the intertidal zone extending up to the Mean High-Water Spring (MHWS) mark within the offshore export cable corridor. Natural England understand that the direct impacts will occur within the offshore export cable corridor, however indirect impacts on surrounding intertidal /coastal habitats should also be considered.	Coastal SSSI's have been considered in **Table 9-13**. Indirect impacts on intertidal habitats have been considered within **Section 9.9**, where appropriate. HDD methods are being employed by the Proposed Development to avoid direct impact to the intertidal zone.
Natural England	Section 42 Consultation (ID: 364, 436)	Where habitat such as Chalk is lost due to construction, Natural England question whether this can be considered temporary in relation to direct habitat loss. Even if the excavated chalk is used to fill any pits or trenches, if the physical structure of subtidal chalk is altered, it will not recover, and potentially rare elements of the habitats may be completely lost (Natural England - Marine Chalk Characterisation Project Report). This needs to be considered.	A targeted meeting with appropriate stakeholders took place on the 15th of February 2022 to discuss RED's proposed mitigation options for cable laying in the offshore export cable corridor. Different trenching methods are being proposed to minimise the footprint and identify the shortest feasible path through the chalk beds. Micrositing of the cable around chalk features where possible will further reduce this impact. **Section 9.9** has been updated to assess for permanent loss in the inshore location where impact to chalk habitat can't be avoided.
Natural England	Section 42 Consultation	Long-term habitat loss/alteration will result from the presence of foundations, scour protection and cable protection. If there is a	The presence of foundations, scour protection and cable protection has been assessed as permanent in

Stakeholder	Document/ Forum	Theme	How this is addressed in this ES
	(ID: 365, 392, 395)	possibility that any of these aspects will not be removed on decommissioning, then this habitat loss should be considered permanent in the worst-case scenario.	the worst-case scenario for long-term habitat disturbance / alteration within **Section 9.9**.
Natural England	Section 42 Consultation (ID: 367, 396, 397, 400, 439, 447)	Natural England expressed concern regarding the direct impacts from EMF generated by the current flowing through the cables buried to <1.5m below the surface, cable exposure has been identified in the Rampion 1 monitoring. The Applicant therefore needs to consider how realistic it is that cable will remain buried, this is particularly important where they are relying on this as part of the mitigation.	The approach to cable burial within the array area and offshore export cable corridor will be considered in the cable burial risk assessment (CBRA). A 1m target depth is considered appropriate for interconnector and array cables and up to 1.5m is considered for the offshore export cable corridor. The CBRA will consider geological conditions in detail. RED will be using different burial equipment on Rampion 2 (compared to Rampion 1) and so the likelihood of exposure is considered much lower. Assessments of burial requirement will be made within the CBRA and detailed burial assessments performed for the selection of trenching tools.
Natural England	Section 42 Consultation (ID: 368)	Natural England expressed concerns regarding the availability of the subtidal survey report, associated relevant data and the ability to comment on it prior to submission.	Following a targeted meeting with appropriate stakeholders, including Natural England, on the 15th of February 2022, the Rampion 2 ES **Appendix 9.3: Offshore wind farm subtidal benthic characterisation survey report, Volume 4** (Document Reference: 6.4.9.3) was circulated. Rampion 2 ES **Appendix 9.3: Offshore wind farm subtidal benthic characterisation survey report, Volume 4** (Document Reference: 6.4.9.3) has been updated to include the

Stakeholder	Document/ Forum	Theme	How this is addressed in this ES
			missing site-specific data from PEIR (RED, 2021). This information is now included within this Chapter.
Natural England	Section 42 Consultation (ID: 369)	Natural England questioned the habitat model, as they assumed that not all datasets were analogous. Therefore, Natural England questioned how was it decided what data should take precedent? It is assumed that where up to date site specific data is available that this will take precedence over older, more general datasets?	Where site-specific data have been collected, this has been prioritised within the predictive habitat model and supersedes the historical data in the habitat map. Both the predictive seabed mapping methods report (**Appendix 9.1: Predictive seabed mapping methods report, Volume 4** of the ES (Document Reference: 6.4.9.1)) and the baseline characterisation (**Section 9.6**) have been updated to reflect this.
Natural England	Section 42 Consultation (ID: 370, 432)	Natural England questioned if site specific contaminant data will be included within the ES. Furthermore, cannot agree with the findings of the ES.	Rampion 2 ES **Appendix 9.3: Offshore wind farm subtidal benthic characterisation survey report, Volume 4** of the ES (Document Reference: 6.4.9.3) has been updated to include the missing site-specific data from PEIR (RED, 2021), including the contamination data. As a result, this information has now been presented within **Section 9.6** and carried through into the assessment (**Section 9.9** to **Section 9.12**).
Natural England	Section 42 Consultation (ID: 372)	As part of the intertidal surveys a large area of chalk outcrops was present in the upper and mid shore area. The lower shore was fringed with more littoral rocks consisting of chalk pebbles. The Applicant should show that they have in the first instance considered construction methods	A targeted meeting with appropriate stakeholders took place on 15 February 2022 to discuss RED's proposed mitigation options for cable laying in the offshore export cable corridor. In preparation for this meeting a Technical Note was provided by RED, 'Rampion 2 Technical Note: Cable Corridor area mitigation for sensitive features' (**Appendix 9.5: Technical Note:**

Stakeholder	Document/ Forum	Theme	How this is addressed in this ES
		that avoid impacts on areas of chalk. This includes extending the length of the HDD seaward to avoid the need for floatation pits.	**Cable Corridor area mitigation for sensitive features, Volume 4** of the ES (Document Reference: 6.4.9.5)). Different trenching methods are being proposed and floatation pits are no longer considered, to minimise the footprint and identify the shortest feasible path through the chalk beds. HDD will be used to avoid damage to the intertidal chalk.
Natural England	Section 42 Consultation (ID: 373)	Natural England expressed that it wasn't clear if and how the Applicant will seek to avoid damage to habitats protected under Section 41 of the Natural Environment and Rural Communities (NERC) Act 2006 listed in this section, such as the chalk reef, as well as other habitats of principal importance and Annex I habitats? The opportunities for micro-siting around such features or extending the use HDD further offshore should be discussed.	As previously discussed, a Technical Note was provided by RED, 'Rampion 2 Technical Note: Cable Corridor area mitigation for sensitive features' (**Appendix 9.5: Technical Note: Cable Corridor area mitigation for sensitive features, Volume 4** of the ES (Document Reference: 6.4.9.5)). It is proposed that micro-siting around habitats of principal importance (including chalk reef) and Annex I habitats is undertaken where practicable following a pre-construction survey. Where chalk is directly impacted, this has been considered as permanent within the assessment (**Section 9.9**).
Natural England	Section 42 Consultation (ID: 376)	Habitats and species protected under Section 41 of the Natural Environment and Rural Communities (NERC) Act 2006 should be considered to be of national importance rather than regional importance, as they are protected by national legislation. It is also unclear why the protection status is listed as 'none' for	**Table 9-14** has been amended to avoid confusion and provide clarity. As a result, the heading has been changed to 'Designation status'.

Stakeholder	Document/ Forum	Theme	How this is addressed in this ES
		biotopes that contain habitats that have protected status under this legislation	
	Section 42 Consultation (ID: 377)	Some priority habitats such as blue mussel beds appear to be missing from this list. It is important that this list is updated when it is based on the actual rather than predicted data to ensure all protected habitats and species that are found to present have been included.	Blue mussels are considered in **Chapter 8: Fish and shellfish ecology, Volume 2** of the ES (Document Reference: 6.2.8).
Natural England	Section 42 Consultation (ID: 378)	In light of the new Nearshore Trawling Byelaw 2019 which came into effect on 22 March 2021, and the associated ongoing Sussex Kelp Restoration Project (SKRP), the potential for this project to impact upon restoration efforts in this area should be considered.	Additional information on the SKRP has been included in the **Section 9.6** Future baseline. RED have been liaising with SKRP as requested by Sussex IFCA to provide results of site-specific ground truth data and to discuss and develop wider mitigation. A representative from SKRP was present at the targeted meeting with appropriate stakeholders which took place on the 15th of February 2022 to discuss RED's proposed mitigation options for cable laying in the export cable corridor, which was a positive engagement.
Natural England	Section 42 Consultation (ID: 380)	Natural England note that any cable protection/scour protection for WTG's appears to be missing from the temporary habitat disturbance MDS.	The assessment of cable and scour protection is presented within **Section 9.9** under Operation and Maintenance impacts 'Long-term habitat loss / alteration from the presence of foundations, scour protection and cable protection'.

Stakeholder	Document/ Forum	Theme	How this is addressed in this ES
	381, 382, 383	Natural England notes that the requirement for boulder and sandwave clearance contributes to a significant amount of the habitat disturbance.	RED will undertake pre-construction surveys to determine the exact amount of clearance required prior to construction within the array area and the offshore export cable corridor. Micro-sitting around boulders will be considered were appropriate. Furthermore, RED propose to use a plough to remove boulders. This will place boulders to the adjacent area of seabed, which will satisfy Natural England concerns regarding adjacent seabed. Furthermore, high level cable routing is presented in the Technical Note provided by RED, 'Rampion 2 Technical Note: Cable Corridor area mitigation for sensitive features' (**Appendix 9.5: Technical Note: Cable Corridor area mitigation for sensitive features, Volume 4** of the ES (Document Reference: 6.4.9.5)).
Natural England	388	Natural England expressed that contamination from water-based drilling muds associated with drilling to install foundations, should this be required.	RED have no detail at this stage until precise machinery is identified, however as part of the construction method statement, RED will produce a foundation installation methodology, including a dredging protocol, drilling methods and disposal of drill arisings and material extracted (C-279).
Natural England	354, 404	Natural England do not agree that the magnitude of impact of temporary habitat disturbance relating to construction activities at the Proposed Development will have on benthic subtidal receptors is minor.	A targeted meeting with appropriate stakeholders took place on 15 February 2022 to discuss RED's proposed mitigation options for cable laying in the export cable corridor. Different trenching methods have been considered to minimise the footprint and identify the shortest feasible path through the chalk beds.

Stakeholder	Document/ Forum	Theme	How this is addressed in this ES
			Therefore, the footprint should be the smallest feasible and the micro-siting of the cable around chalk features where possible will further reduce this impact. Any discernible impact to this feature has been considered within the assessment of habitat disturbance but has been detailed as permanent habitat loss where appropriate.
Natural England Natural England	406	'Where exposed chalk or clay substratum does remain, or where restoration work has emplaced comparable material to restore the habitat, recovery of the biological assemblage is reported to be 'medium', occurring over a period of two to ten years (Tillin and Hill, 2016)'. The physical structure of chalk cannot recover, and this statement relies on comparable material being used to restore the habitat in relation to the biological assemblage.	RED notes this comment and **Section 9.9** has been updated accordingly, noting that the impact to chalk has been considered as permanent habitat loss where the impact to this feature cannot be micro-sited.
Natural England	407, 409	Natural England expressed concern that *Sabellaria spinulosa* was not predicted to be present in the predictive modelling given it is known to be widespread in this area. It is not suitable to base the PEIR assessment on encrusting individuals rather than reef habitat, without the data from the baseline surveys.	The predictive habitat model utilised the best available data for the proposed DCO Order Limits, in addition to the results obtained from site-specific surveys, to produce a detailed predictive survey habitat map. The recent subtidal report (**Appendix 9.3: Offshore wind farm subtidal benthic characterisation survey report, Volume 4** of the ES (Document Reference: 6.4.9.3)) describes the potential for *S. spinulosa* reefs across the nearshore ECC and western areas of the

Stakeholder	Document/ Forum	Theme	How this is addressed in this ES
			proposed DCO Order Limits. However, observations of discrete *S. spinulosa* encrustations were deemed to be low resemblance reef where recorded. The encrusting *S. spinulosa* biotope 'A3.215: [*Sabellaria spinulosa*] with kelp and red seaweeds on sand-influenced infralittoral rock' was therefore included within the model and assessed within **Section 9.9**. Further assessment of habitats/species "of principal importance pursuant to section 41 of the NERC Act 2006" will be undertaken during pre-construction surveys.
Natural England	419	Natural England are concerned about material excavated from HDD exit pits potentially being temporarily stored within the offshore array area or export cable corridor, if and where designated as a spoil disposal area.	RED can confirm that there will be no exit 'pit' in the marine environment. The HDD drill string will protrude from the seabed at the end of the drill, prior to the liner duct being attached and the drill string being retracted towards shore. During the drilling process, drill cuttings are returned to the shoreside entry pit. Some limited cuttings may form at the seabed when the HDD drill first protrudes.
Natural England	420	Where heavy deposition is likely to occur, this will result in complete burial of the characterising species and the effect of this pressure will be mediated by the length of exposure to the deposit.	An additional sentence is added to direct the reader to **Table 9-22** where sensitivities from heavy deposition are detailed. Further information is presented regarding the length of exposure within **Section 9.9** to **Section 9.12**.
Natural England	423	Throughout this chapter there is reference to overall sensitivity being overall 'worst-case high', we consider that if some	RED note 'worst-case high' as some sensitivities are low. If any of the biotopes show a high sensitivity, then

Stakeholder	Document/ Forum	Theme	How this is addressed in this ES
		receptors are being assigned a high sensitivity then the overall sensitivity should be high.	this is considered the worst-case even though it is not the worst-case for all habitats.
Natural England	424	Natural England understand that the Applicant has referred to information from MarLIN throughout this chapter, however where decisions are being made based on peer reviewed literature or any other literature this should be referenced. Where this has not been provided Natural England are not in a position to agree with the overall conclusions in relation to the potential significance of an effect.	References to MarESA were provided initially in **Table 9-20**, however, for ease and clarity these footnotes have been repeated throughout the assessment tables from **Section 9.9** to **Section 9.12**. The link to the MarESA provide all the associated references to support these sensitivity assessments.
Natural England	425	Where a biotope has been allocated a high sensitivity in the text this should be reflected in the table.	**Table 9-20** shows the results of the MarESA. 'Piddocks with a sparse associated fauna in sublittoral very soft chalk or clay' was given a high sensitivity in the text due to its importance within the Kingmere MCZ; this has been detailed within the assessment. If this feature was not found within an MCZ its sensitivity would be 'medium' as per the MarESA.
Natural England	427	Where confidence is low the most precautionary approach should be taken.	Further details have been provided to discuss the result of MarESA when confidence in the assessment is low, as detailed within **Section 9.9** to **Section 9.12**.
Natural England	430/ 431	Protected intertidal habitats of the Solent and Dorset Coast and Pagham Harbour	No direct impacts will occur to intertidal habitats. As detailed within **Section 9.9** negligible impacts to

Stakeholder	Document/ Forum	Theme	How this is addressed in this ES
		SPA include mudflats and saltmarsh are not expected to be impacted due to the negligible magnitude recorded for this temporary impact. Natural England do not currently agree with the negligible assessment for the magnitude of impact based on the requirement for further information.	intertidal habitats are expected through indirect impacts associated with SSC and deposition because the fine material being dispersed from the HDD conduits during excavation is likely to be widely dispersed and quickly form part of the background concentration of SSC along the nearshore. This is further supported by **Chapter 6: Coastal Processes, Volume 2** of the ES (Document Reference: 6.2.6) and **Appendix 6.3: Coastal processes impact assessment, Volume 4** of the ES (Document Reference: 6.4.6.3).
Natural England	435	It is noted by the Applicant that there are potential beneficial effects from long-term habitat loss / alteration, as new habitats for different faunal assemblages to colonise, resulting in a likely increase in biodiversity and biomass. Natural England suggests that this is likely to result in a shift in the type of biotopes present in the area where the underlying habitat has changed. The potential loss of existing biotopes should not be seen to be balanced in anyway with the potential for them to be replaced by different biotopes.	RED has reviewed this comment and additional text has been provided within the assessment to detail that the impact will result in a shift in the baseline despite anticipated increases in biodiversity (**Section 9.9**).
Natural England	438	In relation to temporary habitat disturbance from jack-up vessels and cable maintenance activities, efforts should be	RED has committed to undertake a pre-construction of habitats / species "of principal importance pursuant to section 41 of the NERC Act 2006". Embedded environmental measures will be applied to avoid direct

Stakeholder	Document/ Forum	Theme	How this is addressed in this ES
		made to avoid known areas of priority habitats and species.	disturbance to sensitive habitats/species "of principal importance pursuant to section 41 of the NERC Act 2006", where practicable and a full appraisal will be provided at this stage of development.
Natural England	440	It is unclear whether the scenario presented in relation to suspension/ deposition sediments considers the possibility that cable repair works could include large sections of multiple cables, and that certain sections eg. those closest to Kingmere MCZ could be more sensitive to this impact.	RED has provided further details within the assessment, which includes details of the Kingmere MCZ in relation to operation and maintenance activities (**Section 9.10**)**.**
Natural England	441	Natural England do not agree that based on the information provided here scour effects can be considered negligible; scour and cable exposure has been shown to be an issue with regard to Rampion 1. Therefore, Natural England do not have confidence that the design of the project including scour protection at foundations and sufficiently buried cables will 'prevent scour occurring'. The worst-case scenario should therefore consider that some scour will occur and the observed situation in relation to Rampion 1 should feed into an assessment. Natural England are particularly concerned where scour may	As detailed within **Appendix 6.3: Coastal processes impact assessment, Volume 4** of the ES (Document Reference: 6.4.6.3) scour protection will only occur if and where scour protection is not applied. The approach to cable burial will be considered in the CBRA. A 1m target depth is considered appropriate for interconnector and array cables and up to 1.5m is considered for the offshore export cable corridor. The CBRA will appraise geological conditions in detail. Furthermore, RED will be using different burial equipment on Rampion 2 (compared to Rampion 1) and so the likelihood of exposure is considered much lower. Assessments of burial requirement will be made within the CBRA and detailed burial assessments performed

Stakeholder	Document/ Forum	Theme	How this is addressed in this ES
		occur on cables or foundation, or around scour protection in close proximity to the MCZ's.	for the selection of trenching tools. The magnitude of scour is therefore still considered to be negligible.
Natural England	442	Natural England consider external scour protection to be a last resort. Natural England welcome types of scour protection that can potentially be removed, such as geotextile bags. Nevertheless, Natural England are concerned that the introduction of plastics or other foreign materials into the marine environment could be harmful when broken down or degraded. Therefore, careful consideration should be given to the nature of the cable protection materials used.	Adequacy of protection as well as stability, durability and sustainability of the protection materials is being considered. However, at this stage a particular protection has not been decided until further requirements from geophysical survey are obtained. All protection options are outlined in the **Chapter 4: The Proposed Development, Volume 2** of the ES (Document Reference: 6.2.4).
Natural England	444	Natural England note that if MCZ habitats were to be affected by scour, this should be considered particularly sensitive.	RED can confirm that there is no anticipated risk to Kingmere MCZ from scour because cables will be buried. The CBRA will consider geological conditions in detail. RED will be using different burial equipment on Rampion 2 (compared to Rampion 1) and so the likelihood of exposure is considered much lower. Furthermore, there is no anticipated risk from scour to the Offshore Overfalls MCZ, because there will is no anticipated scour outside the proposed DCO Order Limits as detailed within **Chapter 6: Coastal Processes, Volume 2** of the ES (Document Reference: 6.2.6).

Stakeholder	Document/ Forum	Theme	How this is addressed in this ES
Natural England	448	Natural England questions whether decommissioning includes the removal of cable.	The details of the proposed decommissioning process will be included within the Decommissioning Programme which will be developed and updated throughout the lifetime of the Proposed Development to account for changing best practice. Some materials may be left in situ, and this will be reviewed closer to the time of decommissioning. As such, the maximum design scenario (**Table 9-15**) assumes the removal of all infrastructure.
Natural England	451	Natural England question the applicability of sediment modelling conducted to assess cumulative impacts between aggregates activities and Rampion 1. This is because Rampion 2 is not in the same location and therefore it is assumed that the model parameters will need to be altered to compare this different scenario. Additionally, this does not account for any differences that have occurred to the aggregates licenses and the monitoring of these activity that has taken place since 2012.	The assessment of plume dispersion has been completed using spreadsheet-based modelling. The assessment is detailed in **Section 2.8** of **Appendix 6.3: Coastal processes impact assessment, Volume 4** of the ES (Document Reference: 6.4.6.3) with results provided in tables showing distance from release**.**
Natural England	452	Is it possible that any cable maintenance works for IFA 2 could interact with the impacts of this development given it runs in very close proximity to the proposed DCO Order Limits and is in the ZOI?	IFA-2 and CrossChannel Fibre have been considered within the CEA, with detail presented in **paragraph 9.12.18**.

Stakeholder	Document/ Forum	Theme	How this is addressed in this ES
Natural England	454	The type of habitat that could be lost in relation to each development has not been considered here. If it is being suggest that there is not cumulative effect based on comparable habitats being widespread in the area this needs to be considered.	This has been considered and amended in the CEA (**Section 9.12**).
Natural England	456	There appear to be a very limited number of benthic chemical samples, but this is difficult to discern give the overlapping points.	The number of chemical samples taken is clarified in the text, **paragraph 9.6.7**. The number of samples were presented to Natural England / MMO through the EPP. The stations with the highest silt content were selected as per standard practice. Unfortunately, eight samples of a targeted 15 were unable to be collected for contaminant analysis due to the coarse nature of the sediments sampled at these stations.
Natural England	459	Natural England expressed concerns over the labelling of the intertidal habitat map as 'predicted'.	RED confirm that the habitat map produced for the intertidal area considers the combined analysis of the target notes obtained in the field, the imagery of the quadrats and surrounding imagery taken North, East, South and West of the quadrats, the Unmanned Aerial Vehicle (UAV) imagery and all available historical information. The word 'predicted' has therefore been removed from the intertidal figures (**Figure 9.5** to **Figures 9.7, Volume 3** of the ES (Document Reference: 6.3.9)).

9.4 Scope of the assessment

Overview

9.4.1 This section sets out the scope of the ES assessment for benthic subtidal and intertidal ecology. This scope has been developed as Rampion 2 design has evolved and responds to feedback received to-date as set out in **Section 9.3**.

Spatial scope and study area

9.4.2 The spatial scope of the benthic subtidal and intertidal ecology assessment is defined as the proposed DCO Order Limits together with the secondary impact ZOI that has formed the basis of the study area described in this section.

9.4.3 The secondary ZOI has been informed by the tidal excursion extent and coastal processes modelling undertaken to inform the existing Rampion 1 offshore wind farm EIA (ABPmer, 2012) and the likely extent of potential sediment plume impacts described by the tidal excursion buffer as described in **Chapter 6: Coastal processes, Volume 2** of the ES (Document Reference: 6.2.6). The secondary ZOI buffer therefore encompasses the area over which suspended sediments may travel following disturbance as a result of Proposed Development activities, extending a precautionary 16 kilometres (km) around the array, and 10km surrounding the offshore export cable corridor. However, following Section 42 consultation, the buffer surrounding the array area and offshore export cable corridor was extended to 16km in order to include the 16km maximum sediment plume distance during spring tides (see **Table 9-21** for more information) (**Figure 9.1, Volume 3** of the ES (Document Reference: 6.3.9)). This ZOI buffer has formed the basis of the study area described in this section.

9.4.4 The intertidal ecology study area is defined by the intertidal zone extending up to the Mean High-Water Spring (MHWS) mark within the offshore export cable corridor.

Temporal scope

9.4.5 The temporal scope of the assessment of benthic subtidal and intertidal ecology is the entire lifetime of Rampion 2, which therefore covers the construction, operation and maintenance, and decommissioning phases, as described in **Chapter 4: The Proposed Development, Volume 2** of the ES (Document Reference: 6.2.4).

Potential receptors

9.4.6 The spatial and temporal scope of the assessment enables the identification of receptors which may experience a change as a result of Rampion 2. The receptors identified that may experience likely significant effects for benthic subtidal and intertidal ecology are outlined in **Table 9-7**.

9.4.7 The broadscale habitat features have been updated from PEIR (RED, 2021) following the completed analysis of the Rampion 2 offshore wind farm subtidal benthic characterisation survey report (**Appendix 9.3: Offshore wind farm subtidal benthic characterisation survey report, Volume 4** of the ES

(Document Reference: 6.4.9.3)). Additionally, the features of the MCZs have also been updated following Section 42 consultation and inclusion of additional MCZs in the ES assessment.

Table 9-7 Receptors requiring assessment for benthic subtidal and intertidal ecology

Receptor group	Receptors included within group
Broadscale habitat features	*S. spinulosa* with kelp and red seaweeds on sand-influenced infralittoral rock; Bryozoan turf and erect sponges on tide-swept circalittoral rock; *Flustra foliacea* and colonial ascidians on tide-swept moderately wave exposed circalittoral rock; Faunal and algal crusts on exposed to moderately wave-exposed circalittoral rock; *S. spinulosa* encrusted circalittoral rock; Piddocks with a sparse associated fauna in sublittoral very soft chalk or clay; Sparse fauna on highly mobile sublittoral shingle (cobbles and pebbles); *Spirobranchus triqueter* with barnacles and bryozoan crusts on unstable circalittoral cobbles and pebbles; *Mediomastus fragilis*, *Lumbrineris* species and venerid bivalves in circalittoral coarse sand or gravel; Infralittoral mobile clean sand with sparse fauna; *Nephtys cirrosa* and *Bathyporeia* species in infralittoral sand; *Abra alba* and *Nucula nitidosa* in circalittoral muddy sand or slightly mixed sediment; *Crepidula fornicata* with ascidians and anemones on infralittoral coarse mixed sediment; *F. foliacea* and *H. falcata* on tide-swept circalittoral mixed sediment; *S. spinulosa* on stable circalittoral mixed sediment.
Features of MCZs	Subtidal chalk; Moderate energy infralittoral rock and thin mixed sediments; Seagrass beds; Defolin's lagoon snail (*Caecum armoricum*); Lagoon sand shrimp (*Gammarus insensibilis*), Low Energy Infralittoral Rock, Moderate Energy Circalittoral Rock, Peat and Clay, Bracklesham Bay Geological Feature.
Broadscale features of MCZs	Subtidal coarse sediment; Subtidal mixed sediments; Subtidal sand; Low, Moderate and High energy infralittoral rock; Moderate energy circalittoral rock

Potential effects

9.4.8 Potential effects on benthic subtidal and intertidal ecology receptors that have been scoped in for assessment are summarised in **Table 9-8**.

Table 9-8 Potential effects on benthic subtidal and intertidal ecology receptors scoped in for further assessment

Receptor	Activity or impact	Potential effect
Construction		
Benthic subtidal ecology	Habitat disturbance in the proposed DCO Order Limits array area and offshore export cable corridor from construction activities.	Potential for significant effect to benthic and intertidal resources through direct habitat loss and disturbance (**Section 9.9**). The habitat disturbance relates to seabed preparation for foundations and cables, jack up and anchoring operations, and cable installation.
Benthic subtidal ecology	Temporary increase in SSC and sediment deposition in the study area set out in paragraph 9.4.3.	Potential for significant effect through the temporary smothering of sensitive benthic habitats and species (**Section 9.9**). The temporary increase in SSC and deposition relates to seabed preparation for foundations and cables, jack up and anchoring operations, and cable installation.
Benthic intertidal ecology	Temporary increase in SSC and sediment deposition in the intertidal area.	Potential for significant effect through smothering of sensitive intertidal habitats and species (**Section 9.9**). The temporary increase in SSC and deposition relates to seabed preparation for foundations and cables, jack up and anchoring operations, and cable installation.
Benthic subtidal and intertidal ecology	Direct and indirect seabed disturbances leading to the release of sediment contaminants.	Potential for significant effect through release of sediment bound contaminants into the water column (**Section 9.9**).
Benthic subtidal ecology	Increased risk of introduction or spread of Marine INNS due to presence of partially constructed infrastructure and vessel movements (e.g. the discharge of ballast water).	Potential for significant effect through increased vessel movements during construction (e.g. ballast water) and may subsequently impact biodiversity and benthic ecology of the area (**Section 9.9**).

Receptor	Activity or impact	Potential effect
Benthic subtidal and intertidal ecology	Indirect disturbance arising from the accidental release of pollutants.	Potential for significant effect through accidental pollution events on benthic and intertidal resources (**Section 9.9**).
Benthic subtidal ecology	Indirect disturbance from increased noise and vibration from construction activities.	Potential for significant effect through the indirect disturbance from increased noise and vibration from construction activities (**Section 9.9**).
Operation and maintenance		
Benthic subtidal ecology	Long-term habitat loss/alteration from the presence of foundations, scour protection and cable protection.	Potential for significant effect through loss of suitable substrate or sensitive habitat (**Section 9.10**).
Benthic subtidal ecology	Temporary habitat disturbance from jack-up vessels and cable maintenance activities.	Potential for significant effect to benthic and intertidal resources through temporary, direct habitat loss and disturbance (**Section 9.10**). The temporary increase in disturbance relates to jack up and anchoring operations, and cable maintenance as required.
Benthic subtidal ecology	Changes to seabed habitats arising from effects on physical processes, including scour effects and changes in the sediment transport and wave regimes.	Potential for significant effect through changes in the sediment transport and wave regimes resulting in potential effects on benthic communities (**Section 9.10**).
Benthic subtidal ecology	Colonisation of the Wind Turbine Generators (WTG) and scour/cable protection.	Potential impacts on benthic ecology biodiversity and productivity due to the introduction of hard substrates (**Section 9.10**).
Benthic subtidal ecology	Increased risk of introduction or spread of Marine INNS due to presence of infrastructure and vessel movements (e.g. the discharge of ballast water).	Potential for significant effect through increased vessel movements during construction (e.g. ballast water) and may subsequently impact biodiversity and benthic ecology of the area (**Section 9.10**).

Receptor	Activity or impact	Potential effect
Benthic subtidal ecology	Indirect disturbance arising from the accidental release of pollutants.	Potential for significant effect through accidental pollution events on benthic resources (**Section 9.10**).
Benthic subtidal ecology	Indirect disturbance arising from EMF generated by the current flowing through the cables buried to <1.5 metres (m) below the surface.	Potential for significant effect through from EMF on benthic subtidal ecology (**Section 9.10**).
Decommissioning		
Benthic subtidal ecology	Habitat disturbance from decommissioning of foundations, cables and rock protection.	Potential for significant effect to benthic and intertidal resources through direct habitat loss and disturbance (**Section 9.11**). The disturbance relates to any decommissioning activities taking place.
Benthic subtidal ecology	Temporary increase in Suspended Sediment Concentrations (SSC) and sediment deposition from decommissioning of foundations, cables, and rock protection.	Potential for significant effect through smothering of sensitive benthic habitats and species (**Section 9.11**). The temporary increase in SSC and deposition relates to any decommissioning activities taking place.
Benthic subtidal ecology	Direct and indirect seabed disturbances leading to the release of sediment contaminants.	Potential for significant effect through release of sediment bound contaminants into the water column (**Section 9.11**).
Benthic subtidal ecology	Increased risk of introduction or spread of Marine INNS due to presence of partially decommissioned infrastructure and vessel movements (e.g. the discharge of ballast water).	Potential for significant effect through increased vessel movements during decommissioning (e.g. ballast water) and may subsequently impact biodiversity and benthic ecology of the area (**Section 9.11**).
Benthic subtidal and intertidal ecology	Indirect disturbance arising from the accidental release of pollutants.	Potential for significant effect through accidental pollution events on benthic and intertidal resources (**Section 9.11**).

Activities or impacts scoped out of assessment

9.4.9 All likely significant effects identified will be considered at further stages of the assessment as more detail regarding the design becomes available and greater levels of baseline data are collected and analysed. No matters or aspects are being scoped out at this stage.

9.5 Methodology for baseline data gathering

Overview

9.5.1 Baseline data collection has been undertaken to obtain information over the study areas described in **Section 9.4: Scope of the assessment**. The current baseline conditions presented in **Section 9.6: Baseline conditions** sets out data currently available information from the study area.

Desk study

9.5.2 The data sources that have been collected and used to inform this benthic subtidal and intertidal ecology assessment are summarised in **Table 9-9**.

Table 9-9 Data sources used to inform the benthic subtidal and intertidal ecology ES assessment

Source	Date	Summary	Coverage of study area
The existing Rampion 1 benthic ecology baseline characterisation (EMU Limited, 2011)	Survey undertaken in April 2011	Drop-down video (DDV) and grab sampling gear were deployed to collect sediment for analysis (of benthic invertebrates, particle size, total organic carbon, and contaminants) across the existing Rampion 1 offshore wind farm and surrounding area as part of the baseline characterisation.	Coverage across the benthic subtidal ecology study area.
The existing Rampion 1 cable landfall intertidal baseline ecology survey (RSK Environment Ltd, 2011)	Survey undertaken in May 2011	A Phase 1 habitat survey across between East Worthing and South Lancing, as well as sampling sediment with a 0.01m^2 hand-core for analysis of benthic invertebrates, particle	No coverage within the study area landfall but provides regional context.

Source	Date	Summary	Coverage of study area
		size, total organic carbon and a range of contaminants.	
The existing Rampion 1 pre-construction benthic survey report (Natural Power, 2016)	Survey undertaken in September and October 2015	DDV, benthic grab and epibenthic trawl stations were sampled. DDV was deployed to ground-truth areas suspected to be Annex I reef.	Coverage across the benthic subtidal ecology study area, including several points within the study area.
The existing Rampion 1 post-construction benthic survey report – year 1 (OEL, 2020b)	Survey undertaken in Autumn 2019 and Spring 2020.	Benthic grab and epibenthic trawl stations.	Coverage across the benthic subtidal ecology study area, including several points within the study area.
UKSeaMap (2018)	2018	EUNIS Level 4 model, detailing biological zone and substrate.	Complete modelled coverage up to MHWS.
Regional Seabed Monitoring Plan (RSMP) baseline dataset (Cooper and Barry, 2017)	Samples have been collected over a period of 48 years from 1969 to 2016, although the vast majority (96 percent) were acquired since 2000	The dataset comprises of 33,198 macrofaunal samples covering large parts of the UK continental shelf (83 percent with associated data on sediment particle size composition). Data points for the benthic subtidal ecology study area were extracted[1].	Good coverage across the benthic subtidal ecology study area including the proposed DCO Order Limits.
Biologically informed habitat map (Cooper *et al.*, 2019)	As above.	A biologically informed habitat map produced using all available RSMP data[2].	Complete modelled coverage up to MHWS.
Area 435/396, Area 453 and Area 488	2009 to 2014	Environmental monitoring reports for	Regional context.

[1] Full details on the dataset can be found here: https://www.cefas.co.uk/data-and-publications/dois/rsmp-baseline-dataset/
[2] Full details of the habitat map can be found here: https://doi.org/10.1111/1365-2664.13381

Source	Date	Summary	Coverage of study area
Annual Monitoring Reports (EMU Limited, 2009; Fugro EMU Limited, 2013; 2014)		marine aggregate extraction areas (Area 435/396, Area 453 and Area 488) within the region.	
South Coast Regional Environmental Characterisation (REC) (James *et al*., 2010)	2010	South Coast REC. A multidisciplinary marine study of an extensive area of the English Channel[3].	Regional dataset and report covering the benthic subtidal ecology study area.
The Eastern English Channel Marine Habitat Map (James *et al*., 2007)	2007	The Eastern English Channel Marine Habitat Map (EECMHM). The study provides regional scale geological and biological interpretations aimed to contribute to the effective stewardship of the marine environment by providing a broader understanding of how the potential resource areas relate to the wider regional ecology and coastal processes[4].	Regional dataset and report covering the benthic subtidal ecology study area.
The Marine Aggregate Levy Sustainability Fund (MALSF) synthesis study in the central and eastern English Channel (James *et al*., 2011)	2011	The MALSF synthesis study in the central and eastern English Channel. This synthesis report has as its core two REC studies, the EECMHM (James *et al*., 2007) and the South Coast REC (James *et al*., 2010)[5].	Regional dataset and report covering the benthic subtidal ecology study area.

[3] The full report can be found here: http://nora.nerc.ac.uk/id/eprint/13120/1/OR09051.pdf
[4] The full report can be found here: https://www.cefas.co.uk/publications/techrep/tech139.pdf
[5] The full report can be found here: http://nora.nerc.ac.uk/id/eprint/14031/1/OR11001.pdf

Site surveys

9.5.3 Although the desktop data review provides an important and useful source of evidence in relation to the surrounding areas of seabed and the wider region, site specific sampling has also been undertaken, as agreed with the Coastal Processes, Water Quality, Benthic Ecology and Fish and Shellfish Ecology ETG. **Table 9-10** details the site-specific survey data collected.

9.5.4 The intertidal survey of the landfall and intertidal portion of the offshore export cable corridor was completed in July 2020. Detailed survey methodologies, analysis and results are presented within **Appendix 9.2: Offshore wind farm intertidal habitats survey report, Volume 4** of the ES (Document Reference: 6.4.9.2) and have been summarised in the baseline characterisation (**Section 9.6**).

9.5.5 A subtidal survey of the proposed DCO Order Limits was completed in February 2021, after weather and COVID-19 delays. As a result of these delays, the benthic subtidal analysis was still being undertaken during the drafting of the PEIR (RED, 2021) and consequently, quantitative grab data and DDV imagery were not available for the PEIR. The subtidal survey report was completed in Q3 2021, and relevant data have been included within the ES and incorporated into the predictive habitat mapping to inform the baseline characteristics. As a result, the predictive habitat model presented in the ES includes the most recent grab and video data from the benthic subtidal survey. Additional information on the modelling is presented below (**paragraph 9.5.8**).

9.5.6 The benthic subtidal survey was designed using a strategic and iterative approach, whereby sample locations are coincident with the site-specific geophysical survey lines and representative of key modelled habitats across the proposed DCO Order Limits. Furthermore, potential conservation features or sensitive habitat which were identified from the geophysical and/or benthic ground-truth data, were further investigated as 'Area(s) of Focus' by DDV and were undertaken to establish the extent and quality of such features (see **Table 9-10**). The data obtained from this survey has been used to update the characterisation of the benthic subtidal environment in terms of sediment type and associated benthic and epibenthic communities and which was fed into an update of the predictive habitat model to determine likelihood of biotope presence across the proposed DCO Order Limits as discussed with the Coastal Processes, Water Quality, Benthic Ecology and Fish Ecology ETG on 24 March 2021 (see **Section 9.3**).

9.5.7 All surveys have been designed to fulfil the aims of the EIA to provide a basis for an assessment of the direct and indirect physical disturbance and displacement during the construction, operation, and decommissioning phases of the Proposed Development. The data obtained has been used to update the characterisation of the benthic subtidal environment in terms of sediment type and associated benthic and epibenthic communities and has fed into an update of the predictive habitat model to determine likelihood of biotope presence across the proposed DCO Order Limits.

Table 9-10 Site surveys undertaken

Survey type	Scope of survey	Coverage of study area
Rampion 2 geophysical survey (Gardline, 2020) (see Appendix 9.4: Geophysical survey, Volume 4 of the ES (Document Reference: 6.4.9.4))	Geophysical survey using single-beam and multi-beam echo sounders (SBES and MBES), side scan sonar (SSS), magnetometer and a sub-bottom profiler (SBP) SBES, MBES and SSS survey was completed between July and August 2020 SBP and magnetometer survey was completed between September and October 2020	Full coverage of the study area.
Rampion 2 benthic subtidal survey (Ocean Ecology Limited (OEL), 2021) (see Appendix 9.3: Offshore wind farm subtidal benthic characterisation survey report, Volume 4 of the ES (Document Reference: 6.4.9.3))	45 mini-Hamon grab stations, 10 Day grab stations, 23 DDV stations, 39 DDV transects and 15 chemical sampling stations. Survey was completed between December 2020 and February 2021	Ground-truth locations across the study area (Figure 9.2, Volume 3 of the ES (Document Reference: 6.3.9)).
Rampion 2 intertidal habitats survey (OEL, 2020a) (see Appendix 9.2: Offshore wind farm intertidal habitats survey report, Volume 4 of the ES (Document Reference: 6.4.9.2))	Phase I walkover survey carried out landward to mean low water springs (MLWS), 23 quadrat samples, 10 sediment core sites, (two duplicate cores per site), Unmanned Aerial Vehicle (UAV) imagery (1263 high resolution images) Survey was completed in July 2020	Full coverage of the study area, in addition to a 25m buffer, from MLWS to MHWS (Figure 9.2, Volume 3 of the ES (Document Reference: 6.3.9)).

Predictive habitat modelling

9.5.8 The Proposed Development predictive habitat model was developed by OEL to provide the most up-to-date full coverage knowledge on the distribution of sediments, biological zones and biotopes across the proposed DCO Order Limits, using the newly acquired site specific acoustic data and wealth of existing ground-truthing data available (see **Table 9-10**). The primary purpose of creating the predictive habitat model was to address baseline characterisation data gaps within

the PEIR (RED, 2021). This was due to the subtidal survey work being delayed and as a result, the data was not available at the time of the PEIR submission. The site-specific ground-truthing results have been subsequently fed into the model to produce a final high confidence EUNIS map, which has utilised the best available data for the proposed DCO Order Limits. Where site-specific data have been collected, this has been prioritised within the predictive habitat model and supersedes the historical data in the habitat map. As the model collates all available physical and biological point data across the proposed DCO Order Limits, it has been retained to understand the occurrence of potential biotopes where ground-truth data weren't collected to support the Application and the assessment of effects on the subtidal benthic ecology.

9.5.9 The full methodologies and results of the model are presented within **Appendix 9.1: Predictive seabed mapping methods report, Volume 4** of the ES (Document Reference: 6.4.9.1).

Data limitations

9.5.10 Grab sampling and DDV surveys, while providing detailed information on the infauna and epifauna present, cannot cover wide swaths of the seabed and consequently represent point samples that must be interpreted in combination with the geophysical datasets to produce benthic maps that provide comprehensive cover.

9.5.11 Classification of survey data into benthic habitats and the production of benthic habitat maps from the survey data, while highly useful for assessment purposes, has two main limitations:

- difficulties in defining the precise extents of each biotope, even when using site specific geophysical survey data to characterise the seabed; and
- there is generally a transition from one biotope to another, rather than fixed limits and therefore, the boundaries of where one biotope ends, and another starts often cannot be precisely defined.

9.5.12 Consequently, the biotope maps presented in this chapter should not be considered as definitive, nor should the habitat boundaries be considered to be fixed, they do however represent a robust characterisation of the receiving environment appropriate for the purposes of EIA.

9.6 Baseline conditions

Current baseline

Overview

9.6.1 A detailed baseline description of benthic subtidal and intertidal ecology resources across the proposed DCO Order Limits are presented within **Appendix 9.1: Predictive seabed mapping methods report; 9.2: Offshore wind farm intertidal habitats survey report** and **9.3: Offshore wind farm subtidal benthic characterisation survey report, Volume 4** of the ES (Document Reference:

6.4.9.1, 6.4.9.2 and 6.4.9.3 respectively) and are summarised within the following section. The current baseline is drawn from a substantial body of existing data, site-specific geophysical datasets and benthic subtidal ecology and intertidal ecology site specific surveys and associated reporting. These form the base data for the predictive habitat modelling to present detailed information on the distribution of sediments, biological zones and biotopes across the proposed DCO Order Limits. Full details of the habitat modelling are presented within **Appendix 9.1: Predictive seabed mapping methods report, Volume 4** of the ES (Document Reference: 6.4.9.1).

Subtidal sediment

9.6.2 Broadscale regional habitat mapping to EUNIS Level 4, detailing biological zone and substrate (UKSeaMap, 2018), indicates that the dominant habitats across the proposed DCO Order Limits. These are predominantly characterised by circalittoral coarse sediments, deep circalittoral coarse sediments, and deep circalittoral sand across the mid to offshore portion of the proposed DCO Order Limits and by sublittoral sediments, infralittoral coarse sediments and circalittoral fine sands or circalittoral muddy sands across the inshore portion of the proposed offshore export cable corridor (**Figure 9.3, Volume 3** of the ES (Document Reference: 6.3.9)). Similar substrates are found across the wider benthic subtidal ecology study area.

9.6.3 UKSeaMap (2018) predictions also include Atlantic and Mediterranean low energy infralittoral rock within the inshore regions of the wider benthic subtidal ecology study area. This is further recorded by studies detailing the presence of underwater chalk features in the region (Irving, 1999; James *et al*., 2011). Irving (1999) describes the presence of underwater chalk cliffs and gullies in the region, although these are more likely within 1km of the shore, not the deeper subtidal regions. The UKSeaMap (2018) EUNIS broad-scale habitat map, builds upon UKSeaMap 2016 baseline with updates to substrate.

9.6.4 **Figure 9.3, Volume 3** of the ES (Document Reference: 6.3.9) represents point sediment data that have been collected across the benthic subtidal ecology study area, as part of monitoring programmes conducted at the existing Rampion 1 offshore wind farm (EMU Limited, 2011; Natural Power, 2016), in addition to the Regional Seabed Monitoring Plan (RSMP) baseline dataset (Cooper and Barry, 2017). This data shows that the sediments within the western section of the proposed DCO Order Limits and offshore export cable corridor are predominantly characterised by coarse and mixed sediments. In comparison, the eastern area of the proposed DCO Order Limits has a greater proportion of sand and muddy sand sediments.

9.6.5 Site specific sediment data has been collected within the benthic subtidal ecology proposed DCO Order Limits. Out of the 39 grab sample stations, 28 were dominated by sand, with gravel content varying across the study area and mud content recorded highest close to land and towards the east of the study area. The dominant habitats identified in the seabed imagery were subtidal coarse sediment (A5.1), high energy circalittoral rock (A4.1) and moderate energy circalittoral rock (A4.2). **Figure 8** within **Appendix 9.3: Offshore wind farm subtidal benthic characterisation survey report, Volume 4** of the ES (Document Reference: 6.4.9.3) presents the spatial distribution of these sediment types across the

proposed DCO Order Limits. These sublittoral sediment types represent 'subtidal sands and gravels' and 'subtidal mixed muddy sediments' listed as priority habitats under Section 41 of the NERC Act 2006. **Appendix 9.3: Offshore wind farm subtidal benthic characterisation survey report, Volume 4** of the ES (Document Reference: 6.4.9.3) also notes that these habitats are among the most common habitats found below the MLWS around the coast of the UK.

Sediment contamination

9.6.6 As part of the benthic ecology baseline characterisation at Rampion 1 offshore wind farm, surface sediments were tested for a range of contaminants. EMU Limited (2011) undertook the benthic subtidal and intertidal surveys and the results revealed that the levels of contaminants within the sediments were generally low, suggesting sediment across Rampion 1 offshore wind farm would not present any concern for seabed disturbance. However, eleven of the sites sampled supported levels of contaminants in excess of Action Level 1 (AL1) for Arsenic and Chromium, at four of the sites, prior to construction of Rampion 1 offshore wind farm (EMU Limited, 2011).

9.6.7 Site specific sediment contaminant data has been collected within the benthic subtidal ecology study area (**Figure 9.2**, **Volume 3** of the ES (Document Reference: 6.3.9)). OEL (2021) collected a total of seven successful chemical samples (Heavy Metals and Hydrocarbons) across the study area. Chemical samples were unable to be obtained from eight stations during the survey due to the coarse sediment (pebbles / cobbles / bedrock) present at the target location.

9.6.8 A total of eight heavy and trace metals were analysed from sediments taken at each of the seven stations. These were arsenic, cadmium, chromium, copper, lead, mercury, nickel, and zinc. Concentrations of arsenic were recorded at levels that exceeded Cefas AL1 at five stations, with no metals recording in excess of Cefas AL2. Metal concentrations significantly below the Convention for the Protection of the Marine Environment of the North-East Atlantic (OSPAR) Background Assessment Concentration (BAC) are considered to be near background levels, with concentrations below the Effect Range Low (ERL) rarely causing adverse effects in marine organisms. All stations exceeded ERL levels for arsenic. In addition, six stations exceeded BAC levels for chromium, but did not exceed ERL levels (see Table 11 of **Appendix 9.3: Offshore wind farm subtidal benthic characterisation survey report**, **Volume 4** of the ES (Document Reference: 6.4.9.3)). All remaining metals did not exceed ERL or BAC levels. For the Canadian sediment quality guideline (CSQG), levels above the Threshold Effect Level (TEL) adverse effects may occasionally occur, whilst at levels above the Probable Effect Level (PEL) adverse effects may occur frequently. Concentrations of arsenic above TEL were recorded at all seven stations and above PEL at one station (ST051). All remaining metals fell below TEL and PEL limits (see **Table 11** of **Appendix 9.3: Offshore wind farm subtidal benthic characterisation survey report**, **Volume 4** of the ES (Document Reference: 6.4.9.3)). All remaining metals did not exceed TEL or PEL limits.

9.6.9 Polycyclic Aromatic Hydrocarbons (PAH) were tested for all seven samples collected. With the exception of Phenanthrene (ST020) and Pyrene (ST030), all PAHs were recorded below limits of detection across all seven sampling stations. At the two stations where PAHs were detected, reference levels were not

exceeded (see **Table 12** of **Appendix 9.3: Offshore wind farm subtidal benthic characterisation survey report**, **Volume 4** of the ES (Document Reference: 6.4.9.3)).

Subtidal benthic ecology

9.6.10 As described above, the benthic subtidal ecology study area has been demonstrated to comprise of a mixture sands, muds and gravels which is typical of the wider region, representing a mosaic of different habitat types. James *et al*. (2010) also described the occurrence of occasional and sometimes extensive areas of exposed bedrock and boulder reefs across the central and eastern English Channel.

9.6.11 James *et al*. (2010) described the following variety of these habitats at a regional level:

- Gravel and mixed sediment habitats: cover extensive subtidal and offshore areas of the eastern English Channel (Jones *et al*., 2004). Areas of nearshore mixed sediments tend to be formed of variable amounts of sand, gravel and cobble, often mixed with dead shells and shell gravel. In areas where these mixed sediments are stable, settlement and subsequent growth of a rich variety of plant and animal species occurs. The anemones *Anemonia viridis* and *Urticina felina* are typical of gravel areas, with *Cerianthus lloydii* also frequently encountered. The slipper limpet *C. fornicata* (a non-native species) is commonly associated with gravel and its shells can form the main hard substrate in areas of soft sediments. Gravel habitats found in deeper offshore areas (>30m), tend to be less affected by natural disturbance than those closer inshore. As a result, these areas tend to support diverse marine fauna which may include a wide range of anemones and polychaete worms.
- Sandy sediments: are widespread throughout the eastern English Channel. Sand sediments are found in regions of moderate to strong tidal currents where they can settle but finer particles cannot. In such situations, the sand is often coarse and clean with little mud, but with occasional shell fragments present. Mobile sands tend to be characterised by robust and sometimes impoverished faunas, typically venerid bivalves, amphipods, polychaete worms and heart urchins. Clean sand is favoured by the burrowing heart urchin *Echinocardium cordatum*, the masked crab *Corystes cassivelaunus* and the sea mouse *Aphrodita aculeata*. A number of species, such as the anemones *U. felina* and *Cereus pedunculatus*, are sand tolerant but require an underlying stone or hard substrate for attachment (Collins and Mallinson, 2000). Mobile species typically found in such areas include hermit crabs *Pagurus* spescies and gastropod molluscs such as netted dog whelk *Tritia reticulata* and common whelk *Buccinum undatum*. Flatfish include brill *Scophthalmus rhombus*, plaice *Pleuronectes platessa*, dab *Limanda limanda* and Dover sole *Solea solea*.
- Mud Habitats: are less common because of the exposed nature of the seabed in much of the eastern English Channel, few areas of mud-dominated sediment are present except in deeper, sheltered, inshore waters such as the Solent. Generally, the muddy and silty sediments of the Solent contain chains of slipper limpets, which provide attachment for other organisms such as hydroids (e.g. *Kirchenpaueria pinnata* and *Hydrallmania falcata*) and sponges (e.g.

Halichondria species and *Suberites* species). Several small crab species, such as the long-clawed porcelain crab *Pisidia longicornis*, common spider crab *Macropodia rostrata* and common hermit crab *Pagurus bernhardus*, are found in cover provided by the slipper limpet shell epifauna. Polychaete worms, bivalve molluscs such as cockles, and brittlestars can also be numerically dominant in mud habitats where hard biogenic substrates (i.e. *Crepidula* shells) are absent.

- Rock Habitats: the type of organisms that can colonise rock habitats, including stony reefs, can be strongly influenced by the type of rock present, be it chalk, sandstone or limestone. Therefore, benthic assemblages tend to differ between rocky substrate types. Generally, harder rock habitats are often colonised by keelworms *S. triqueter* and by barnacles *Balanus* species. In slightly deeper water, the hydroids *Halecium halecinum*, *K. pinnata*, *H. falcata*, *Nemertesia antennina* and the foliose bryozoan *F. foliacea* can be found. Mobile species commonly found on rock are the common whelk, the grey top shell *Steromphala cineraria* and the netted dog whelk *Tritia reticulata*, together with hermit crabs *Pagurus* species and the swimming crabs *Liocarcinus* species. Where there is foliose algal cover there is a greater range of mobile fauna, including the common spider crab *M. rostrata* and the four-horned spider crab *Pisa tetraodon*. In even deeper water, several species of sponge are likely to be conspicuous, including *Esperiopsis fucorum* and *Dysidea fragilis*. Ross coral *Pentapora foliacea*, a bryozoan, is often conspicuous on bedrock outcrops. Softer chalk reef habitats in the eastern English Channel (which represent 75% of all chalk reefs in Europe) support a wide range of characteristic species, some of which are predominantly found on or in this type of substrate. A number of species are capable of boring into the rock, and these tend to dominate the associated subtidal communities. These species include bivalve piddocks (in particular *Pholas dactylus, Hiatella arctica, Barnea* species and *Petricola pholadiformis*), polychaete worms (especially spionids) and sponges. The biotope dominated by piddocks is often the most widespread of the biotopes which occur on these reefs.

Predictive subtidal habitat model and biotope maps

9.6.12 As detailed within **Appendix 9.2: Offshore wind farm intertidal habitats survey report, Volume 4** of the ES (Document Reference: 6.4.9.2) a diverse macrobenthic community was identified across the proposed DCO Order Limits. Most stations were characterised by the presence of Nemertea which occurred in 57.6% of the samples, while the polychaete *Spirobranchus lamarcki* was the most abundant species recorded. Macrobenthic abundance and richness varied across samples, with a higher abundance and diversity identified for the stations located furthest inshore and west of the survey area. The invasive non-native species *Crepidula fornicata* was recorded forming aggregations at the two grab samples collected closest to land and was also observed in 114 images across the nearshore area of the proposed DCO Order Limits.

9.6.13 The results from the OEL site specific monitoring and habitat modelling revealed that 15 biotopes were identified as occurring throughout the proposed DCO Order Limits. The biotopes are presented in **Table 9-11** and their predicted spatial

distribution are presented in **Figure 9.4, Volume 3** of the ES (Document Reference: 6.3.9). A description of each biotope identified is also presented below.

Table 9-11 Key biotopes recorded from site specific monitoring and habitat modelling

EUNIS BSH	EUNIS Code	EUNIS Description
A3.2 – Atlantic and Mediterranean moderate energy infralittoral rock	A3.215	*S. spinulosa* with kelp and red seaweeds on sand-influenced infralittoral rock
A4.1 – Atlantic and Mediterranean high energy circalittoral rock	A4.131	Bryozoan turf and erect sponges on tide-swept circalittoral rock
	A4.134	*F. foliacea* and colonial ascidians on tide-swept moderately wave exposed circalittoral rock
	A4.139	Sponges and anemones on vertical circalittoral bedrock
A4.2 – Atlantic and Mediterranean moderate energy circalittoral rock	A4.214	Faunal and algal crusts on exposed to moderately wave-exposed circalittoral rock
	A4.221	*S. spinulosa* encrusted circalittoral rock
	A4.231	Piddocks with a sparse associated fauna in sublittoral very soft chalk or clay
A5.1 – Sublittoral coarse sediment	A5.131	Sparse fauna on highly mobile sublittoral shingle (cobbles and pebbles)
	A5.141	*S. triqueter* with barnacles and bryozoan crusts on unstable circalittoral cobbles and pebbles
	A5.142	*M. fragilis*, *Lumbrineris* species and venerid bivalves in circalittoral coarse sand or gravel
A5.2 – Sublittoral sand	A5.231	Infralittoral mobile clean sand with sparse fauna
	A5.233	*N. cirrosa* and *Bathyporeia* species in infralittoral sand

EUNIS BSH	EUNIS Code	EUNIS Description
	A5.261	*A. alba* and *N. nitidosa* in circalittoral muddy sand or slightly mixed sediment
A5.4 – Sublittoral mixed sediments	A5.422	*C. fornicata* and *M. fragilis* in variable salinity infralittoral mixed sediment
	A5.431	*C. fornicata* with ascidians and anemones on infralittoral coarse mixed sediment
	A5.444	*F. foliacea* and *H. falcata* on tide-swept circalittoral mixed sediment
A5.6 – Sublittoral biogenic reefs	A5.611	*S. spinulosa* on stable circalittoral mixed sediment

- *Sabellaria spinulosa* with kelp and red seaweeds on sand-influenced infralittoral rock[6] (A3.215): *Laminaria hyperborea* kelp forest on shallow infralittoral bedrock and boulders characterised by encrustations of *S. spinulosa* tubes which cover much of the rock, together with sand-tolerant red seaweeds such as *Phyllophora pseudoceranoides*, *Dilsea carnosa* and *Polysiphonia elongate* and *Polysiphonia fucoides*. Red seaweeds such as *Plocamium cartilagineum* and *Delesseria sanguinea* may also be found beneath the kelp canopy, although typically low in abundance. They can be colonised by the ascidian *Botryllus schlosseri*. The cowrie *Trivia arctica* can also be found here. Much of the available rock is covered with encrusting coralline algae together with patches of the encrusting sponge *Halichondria panicea* and the anthozoan *U. felina*. More mobile fauna includes the echinoderms *Asterias rubens*, *Henricia sanguinolenta*, *Echinus esculentus* and *Ophiothrix fragilis*, the gastropod *S. cineraria* and the hermit crab *P. bernhardus.* The scouring effect of mobile sand adjacent to the rock maintains a reduced underflora and fauna compared to the association of species found in non-scoured kelp forests. Scour-resistant fauna such as the barnacle *Balanus crenatus* can be locally abundant on the rock, while the bivalve *Pododesmus patelliformis* can be found seeking shelter underneath the cobbles. Above the effect of scour, kelp stipes may be densely colonised by red seaweeds such as *Phycodrys rubens*, *Palmaria palmata* and *Membranoptera alata*, together with some sponges and ascidians.
- Bryozoan turf and erect sponges on tide-swept circalittoral rock (A4.131)[7]: Typically found on wave-exposed circalittoral bedrock or boulders subject to tidal streams ranging from moderately strong to strong. It often has a thin layer of silt covering the seabed and is characterised by a bryozoan / hydroid turf

[6] https://mhc.jncc.gov.uk/biotopes/jnccmncr00000723
[7] https://mhc.jncc.gov.uk/biotopes/jnccmncr00002134

with erect sponges. Typical bryozoans to be found include crisiids, *Alcyonidium diaphanum*, *F. foliacea*, *P. foliacea*, *Bugula plumosa* and *Bugula flabellata*, while typical hydroids include *N. antennina*, *Nemertesia ramosa* and *H. halecinum*. The soft coral *Alcyonium digitatum* is frequently recorded on the tops of boulders and rocky outcrops. Characteristic erect sponges include *Raspailia ramosa*, *Stelligera stuposa* and *Stelligera rigida*; other sponges present include *Cliona celata*, *D. fragilis*, *Pachymatisma johnstonia*, *Polymastia boletiformis*, *Hemimycale columella*, *E. fucorum*, *Polymastia mamillaris* and *Tethya aurantium*. Other species present include *Caryophyllia smithii*, *Actinothoe sphyrodeta*, *Corynactis viridis*, *U. felina*, *B. crenatus*, *A. rubens*, *Marthasterias glacialis*, *Henricia oculata*, *E. esculentus*, *Clavelina lepadiformis*, *Calliostoma zizyphinum* and *Necora puber*. Three variants of this biotope have been described, but all are characterised by a bryozoan turf with erect sponges. ByErSp.Eun is found primarily on circalittoral bedrock and is dominated by the sea fan *Eunicella verrucosa*. ByErSp.DysAct is found under slightly stronger tide-swept conditions and is characterised particularly by the sponge *D. fragilis* and the anemone *A. sphyrodeta*. Finally, ByErSp.Sag is characterised by the anemone *Sagartia elegans*.

- *Flustra foliacea* and colonial ascidians on tide-swept moderately wave exposed circalittoral rock (A4.134)[8]: Typically found on very exposed to moderately exposed, circalittoral mixed substrata subject to moderately strong tidal streams. It most frequently occurs between 10m and 20m water depth. This variant is characterised by a dense hydroid and *F. foliacea* turf, along with other scour-tolerant species, growing on the more stable boulders and cobbles which overlie coarse muddy sand and gravel. Although *N. antennina* is the dominant species within the hydroid turf, other species such as *H. halecinum*, *N. ramosa* and *H. falcata* may also be present. Other bryozoans found amongst the hydroid and Flustra turf include *Cellepora pumicosa*, *B. flabellata*, *Bugula turbinata*, and a crisiid turf. Encrusting red algae, the polychaete *S. triqueter* and barnacles such as *B. crenatus* may be found on the smaller cobbles and pebbles, which may become mobile during extreme storms. Echinoderms such as *A. rubens* and *O. fragilis* may be present on the boulders, or the coarse sediment in between. On the larger, more stable boulders, isolated sponge communities may develop, with species such as *Scypha ciliata*, *D. fragilis*, *H. columella*, *E. fucorum* and *S. rigida*. In addition, small *A. digitatum*, various ascidians (*C. lepadiformis*, *B. schlosseri*), *P. patelliformis* and top shells (*C. zizyphinum*, *S. cineraria*) may colonise the upper faces and vertical sides of larger boulders. At some shallower sites, the foliose red algae *Hypoglossum hypoglossoides* may be found on the tops of larger boulders. Within the coarse sediment underlying these boulders and cobbles, anemones such as *C. lloydii* and *U. felina* may be recorded. Under-boulder fauna typically consists of terebellid worms, and crabs such as *P. longicornis* and *Cancer pagurus*.
- Sponges and anemones on vertical circalittoral bedrock (A4.139)[9]: This biotope is found on exposed to moderately wave exposed, vertical and overhanging,

[8] https://mhc.jncc.gov.uk/biotopes/jnccmncr00002140
[9] https://mhc.jncc.gov.uk/biotopes/jnccmncr00000380

circalittoral bedrock, subject to strong through to weak tidal streams. This biotope is characterised by a mixed faunal turf of hydroids (*Nemertesis antennina*, *Tubularia indivisa* and *Halecium halecium*) and bryozoans (*A. diaphanum* and *crisiid* turf). There is frequently a diverse range of sponges recorded, including *C. celata*, *P. johnstonia*, *D. fragilis* and *H. columella*. There may be dense aggregation of dead mans fingers *A. digitatum* along with clumps of the cup coral *C smithii*, and the anthozoans *C. viridis*, *A. sphyrodeta*, *Cylista elegans* and *Metridium senile*. Other species present include the echinoderms *E. esculentus*, *A. rubens*, *M. glacialis*, *H. oculata*, *Holothuria (Panningothuria) forskali* and *Antedon bifida*, clumps of the lightbulb tunicate C. lepadiformis and the top shell *C. zizyphinum*.

- Faunal and algal crusts on exposed to moderately wave-exposed circalittoral rock (A4.214)[10]: Typically occurs on the vertical and upper faces of wave-exposed and moderately wave-exposed circalittoral bedrock or boulders subject to mostly moderate to weak tidal streams (a variant of this biotope containing brittlestar is found on bedrock, boulders and cobbles). The biotope is dominated by faunal (e.g. the encrusting bryozoan *Parasmittina trispinosa*) and algal (*Corallinaceae*) crusts, and tends to have a grazed appearance; this may be partially attributable to the abundance of *E. esculentus* found in this biotope. Occasionally, the rock may appear pink from a distance, due to the expanses of encrusting red algae on the rock surface. *A. digitatum* is one of the few species to stand erect from the encrusted rock surface and are frequently encountered, on the tops of rocky outcrops and boulders. Hydroids do not form a prominent feature of this biotope, with only robust species such as *Abietinaria abietina* frequently recorded. Sponges and *C. smithii* are rarely present while erect bryozoans and ascidians are scarce (although there are exceptions, see variants). The *E. esculentus* grazed substratum may be interspersed with other encrusting species such as the polychaete *S. triqueter* and the saddle oyster *P. patelliformis*. Other species present include *A. rubens*, *O. fragilis*, *U. felina*, *Ophiocomina nigra*, *P. bernhardus*, *F. foliacea*, *S. cineraria*, *C. zizyphinum*, *Ophiura albida*, *Ciona intestinalis* and *A. bifida*. Six variants of this biotope have been recorded. FaAlCr.Flu is dominated by the silt and scour tolerant bryozoan *F. foliacea*. FaAlCr.Adig is dominated by *A. digitatum*. FaAlCr.Sec is dominated by *Securiflustra securifrons*. FaAlCr.Pom looks extremely impoverished (even for a grazed community). FaAlCr.Bri has a dense covering of brittlestars while FaAlCr.Car is only found under weak/very weak tides and is dominated by *C. smithii*.
- *Sabellaria spinulosa* encrusted circalittoral rock (A4.221)[11]: Typically found encrusting the upper faces of wave-exposed and moderately wave-exposed circalittoral bedrock, boulders and cobbles subject to strong/moderately strong tidal streams in areas with high turbidity. The crusts formed by the sandy tubes of the polychaete worm *S. spinulosa* may even completely cover the rock, binding the substratum together to form a crust. A diverse fauna may be found attached to, and sometimes obscuring the crust, often reflecting the character of surrounding biotopes. Bryozoans such as *F. foliacea*, *P. foliacea* and

[10] https://mhc.jncc.gov.uk/biotopes/jnccmncr00002152
[11] https://mhc.jncc.gov.uk/biotopes/jnccmncr00002159

A. diaphanum, anemones such as *U. felina* and *S. elegans*, the polychaete *S. triqueter*, *A. digitatum*, the hydroid *N. antennina* and echinoderms such as *A. rubens* and *Crossaster papposus* may all be recorded within this biotope. There are two variants. The first (Sspi.ByB) contains significant cover of barnacles (*B. crenatus*) and bryozoans. The second (Sspi.As) has a dense turf of didemnid ascidians as well as scour-tolerant bryozoans such as *F. foliacea*, sponges such as *T. aurantium* and *Phorbas fictitius*, colonies of the serpulid worm *Salmacina dysteri* and patchy occurrences of the ascidians *Distomus variolosus*, *Polycarpa pomaria* and *Polycarpa scuba*. This biotope has been recorded from the Lleyn Peninsula, Lundy Island (including the wreck of the MV Robert) and the north-east and south coast of England.

- Piddocks with a sparse associated fauna in sublittoral very soft chalk or clay[12] (A4.231): This biotope occurs on circalittoral soft rock, such as soft chalk or clay, most often in moderately exposed tide-swept conditions. As soft chalk and firm clay are often too soft for sessile filter-feeding animals to attach and thrive in large numbers, an extremely impoverished epifauna results on upward-facing surfaces, although vertical faces may be somewhat richer. The rock is sufficiently soft to be bored by bivalves. Species vary with location, but *P. dactylus* is the most widespread borer and may be abundant. Other species present may include the sponges *D. fragilis* and *Suberites carnosus* and the polychaete *Bispira volutacornis*. Foliose red algae may be present on the harder, more stable areas of rock. Mobile fauna often includes the crabs *N. puber* and *C. pagurus*.
- Sparse fauna on highly mobile sublittoral shingle (cobbles and pebbles) (A5.131)[13]: Sublittoral clean shingle and pebble habitats with a lack of conspicuous fauna. Unstable, rounded pebbles and stones (as opposed to sub-angular cobbles, which are often found lying on or embedded in other sediment) that are strongly affected by tidal steams and/or wave action can support few animals and are consequently faunally impoverished. The species composition of this biotope may be highly variable seasonally and is likely to comprise of low numbers of robust polychaetes or bivalves with occasional epibiota including echinoderms and crustacea such as *Liocarcinus* species and *Pagurus* species. In more settled periods there may be colonisation by anemones such as *U. felina* and small populations of hydroids and Bryozoa.
- *Spirobranchus triqueter* with barnacles and bryozoan crusts on unstable circalittoral cobbles and pebbles[14] (A5.141): This biotope is characterised by a few ubiquitous robust and/or fast-growing ephemeral species which are able to colonise pebbles and unstable cobbles and slates which are regularly moved by wave and tidal action. The main cover organisms tend to be restricted to calcareous tube worms such as *S. triqueter*, small barnacles including *B. crenatus* and *Balanus balanus*, and a few bryozoans and coralline algal crusts. Scour action from the mobile substratum prevents colonisation by more delicate species. Occasionally in tide-swept conditions tufts of hydroids such as *Sertularia argentea* and *H. falcata* are present. This biotope often grades into

[12] https://mhc.jncc.gov.uk/biotopes/jnccmncr00002162
[13] https://mhc.jncc.gov.uk/biotopes/jnccmncr00001942
[14] https://mhc.jncc.gov.uk/biotopes/jnccmncr00000659

SMX.FluHyd which is characterised by large amounts of the above hydroids on stones also covered in *S. triqueter* and barnacles. The main difference here is that SMX.FluHyd, seems to develop on more stable, consolidated cobbles and pebbles or larger stones set in sediment in moderate tides. These stones may be disturbed in the winter and therefore long-lived and fragile species are not found.

- *Mediomastus fragilis*, *Lumbrineris* species and venerid bivalves in circalittoral coarse sand or gravel[15] (A5.142): Circalittoral gravels, coarse to medium sands, and shell gravels, sometimes with a small amount of silt and generally in relatively deep water (generally over 15 to 20m), may be characterised by polychaetes such as *M. fragilis*, *Lumbrineris* species, *Glycera lapidum* with the sea urchin *Echinocyamus pusillus*. Other taxa may include *Nemertea* species, *Protodorvillea kefersteini*, *Owenia fusiformis*, *Spiophanes bombyx* and *Amphipholis squamata* along with amphipods such as *Ampelisca spinipes*.
- Infralittoral mobile clean sand with sparse fauna[16] (A5.231): Medium to fine sandy sediment in shallow water, often formed into dunes, on exposed or tide-swept coasts often contains very little infauna due to the mobility of the substratum. Some opportunistic populations of infaunal amphipods may occur, particularly in less mobile examples in conjunction with low numbers of mysids such as *Gastrosaccus spinifer*, the polychaete *N. cirrosa* and the isopod *Eurydice pulchra*. Sand eels *Ammodytes* species may occasionally be observed in association with this biotope.
- *Nephtys cirrosa* and *Bathyporeia* species in infralittoral sand (A5.233)[17]: Well-sorted medium and fine sands characterised by *N. cirrosa* and *Bathyporeia* species (and sometimes *Pontocrates* species) which occur in the shallow sublittoral to at least 30m depth. This biotope occurs in sediments subject to physical disturbance, as a result of wave action (and occasionally strong tidal streams). The magelonid polychaete *Magelona mirabilis* may be frequent in this biotope in more sheltered, less tide swept areas whilst in coarser sediments the opportunistic polychaete *Chaetozone setosa* may be commonly found. The faunal diversity of this biotope is considerably reduced compared to less disturbed biotopes (such as FfabMag) and for the most part consists of the more actively-swimming amphipods. Sand eels *Ammodytes* species may occasionally be observed in association with this biotope (and others) and spionid polychaetes such as *Spio filicornis* and *Spio martinensis* may also be present. Occasional *Lanice conchilega* may be visible at the sediment surface.
- *Abra alba* and *Nucula nitidosa* in circalittoral muddy sand or slightly mixed sediment (A5.261)[18]: Non-cohesive muddy sands or slightly shelly/gravelly muddy sand characterised by the bivalves *A. alba* and *N. nitidosa*. Other important taxa include *Nephtys* species, *C. setosa* and *S. bombyx* with *Fabulina fabula* also common in many areas. The echinoderms *O. albida* and

[15] https://mhc.jncc.gov.uk/biotopes/jnccmncr00002012
[16] https://mhc.jncc.gov.uk/biotopes/jnccmncr00000775
[17] https://mhc.jncc.gov.uk/biotopes/jnccmncr00000785
[18] https://mhc.jncc.gov.uk/biotopes/jnccmncr00000356

A. *rubens* may also be present. The epibiotic biotope EcorEns may overlap this biotope.

- *Crepidula fornicata* and *Mediomastus fragilis* in variable salinity infralittoral mixed sediment (A5.422)[19]*:* Variable salinity mixed sediment characterised by the slipper limpet *C. fornicata* and the polychaetes *M. fragilis* and *Aphelochaeta marioni*. Other numerically important taxa include the oligochaetes *Tubificoides benedii*, syllids such as *Exogone naidinaand Sphaerosyllis*, and other polychaetes *Nephtys hombergii*. *Lepidonotus squamatus* and *Scoloplos armiger* may also be common. Shell debris and cobbles are colonised by encrusting worms, the ascidians *Ascidiella aspersa*, *Ascidiella scabra*, *Molgula* sp. and *Dendrodoa grossularia* (the ascidians may not be recorded adequately by remote infaunal survey techniques).
- *Crepidula fornicata* with ascidians and anemones on infralittoral coarse mixed sediment[20] (A5.431): Medium-coarse sands with gravel, shells, pebbles and cobbles on moderately exposed coasts may support populations of the slipper limpet *C. fornicata* with ascidians and anemones. *C. fornicata* is common in this biotope though not as abundant as in the muddier estuarine biotope CreMed to which this is related. Anemones such as *U. felina* and the soft coral *A. digitatum* and ascidians such as *Styela clava* are typically found in this biotope. Bryozoans such as *F. foliacea* are also found along with polychaetes such as *L. conchilega*. Little information is available with regard the infauna of this biotope but given the nature of the sediment the infaunal communities are liable to resemble those in biotopes from the SCS habitat complex. This biotope could be considered a superficial or epibiotic overlay but more data are required to support this.
- Flustra foliacea and Hydrallmania falcata on tide-swept circalittoral mixed sediment[21] (A5.444): This biotope represents part of a transition between sand-scoured circalittoral rock where the epifauna is conspicuous enough to be considered as a biotope and a sediment biotope where an infaunal sample is required to characterise it and is possibly best considered an epibiotic overlay. *F. foliacea* and the hydroid *H. falcata* characterise this biotope; lesser amounts of other hydroids such as *S. argentea*, *N. antennina* and occasionally *Nemertesia ramose*, occur where suitably stable hard substrata is found. The anemone *U. felina* and the soft coral *A. digitatum* may also characterise this biotope. Barnacles *B. crenatus* and tube worms *S. triqueter* may be present and the robust bryozoans *A. diaphanum* and *Vesicularia spinosa* appear amongst the hydroids at a few sites. *Sabella pavonina* and *L. conchilega* may be occasionally found in the coarse sediment around the stones. In shallower (i.e. upper circalittoral) examples of this biotope scour-tolerant robust red algae such as *Polysiphonia nigrescens*, *Calliblepharis* species and *Gracilaria gracilis* are found.

[19] https://mhc.jncc.gov.uk/biotopes/jnccmncr00001200
[20] https://mhc.jncc.gov.uk/biotopes/jnccmncr00001227
[21] https://mhc.jncc.gov.uk/biotopes/jnccmncr00000460

- *Sabellaria spinulosa* on stable circalittoral mixed sediment (A5.611)[22]: The tube-building polychaete *S. spinulosa* at high abundances on mixed sediment. These species typically form loose agglomerations of tubes forming a low-lying matrix of sand, gravel, mud and tubes on the seabed. The infauna comprises typical sublittoral polychaete species such as *P. kefersteini*, *Pholoe synophthalmica*, *Harmothoe* species, *S. armiger*, *M. fragilis*, *L. conchilega* and cirratulids, together with the bivalve *A. alba*, and tube building amphipods such as *Ampelisca* species. The epifauna comprise a variety of bryozoans including *F. foliacea*, *A. diaphanum* and *C. pumicosa*, in addition to calcareous tubeworms, pycnogonids, hermit crabs and amphipods. The reefs formed by *Sabellaria* consolidate the sediment and allow the settlement of other species not found in adjacent habitats leading to a diverse community of epifaunal and infauna species. The development of such reefs is assisted by the settlement behaviour of larval *Sabellaria* which are known to selectively settle in areas of suitable sediment and particularly on existing *Sabellaria* tubes (Tait and Dipper, 1997; Wilson 1929). These reefs are particularly affected by dredging or trawling and in heavily dredged or disturbed areas an impoverished community may be left (e.g. Pkef) particularly if the activity or disturbance is prolonged. However, it is likely that reefs of *S. spinulosa* can recover quite quickly from short term or intermediate levels of disturbance as found by Vorberg (2000) in the case of disturbance from shrimp fisheries and recovery will be accelerated if some of the reef is left intact following disturbance as this will assist larval settlement of the species.

Intertidal benthic ecology

9.6.14 The location of landfall that has been identified is shown in **Figure 9.1**, **Volume 3** of the ES (Document Reference: 6.3.9). Existing intertidal habitat mapping (MagicMap) suggests the biotopes present within Climping Beach and the surrounding area primarily consist of intertidal sand and gravel. The eastern part of the proposed DCO Order Limits is dominated by finer sand (EUNIS A2.2). Coarser sediments, including gravel and cobbles (EUNIS A2,1 and A5.1), are the most abundant habitats present in the central areas and to the west. Occasional rocky areas (EUNIS A1) occur, particularly around coastal defence structures.

9.6.15 As part of Sussex IFCA 'Sussex Coastal Habitats Inshore Pilot' (SCHIP1) project, a series of maps were produced, including surficial substrate, EUNIS marine habitats and anthropogenic features. In 2011, the Channel Coastal Observatory (CCO) surveyed between Hove and Selsey, down to EUNIS level 3 (Sussex IFCA, 2016). The SCHIP1 noted that the seabed in this region is dominated by extensive chalk rock, with generally limited sediment covering it. Moreover, the predominant sediment is sand, which is constrained nearshore, with a few pockets of coarser grained sediment at the seaward toe of the littoral sediment (Sussex IFCA, 2016). The 'Sussex Coastal Habitats Inshore Pilot II' (SCHIP2) project aimed to provided broad scale and fine habitat map and bathymetry models for the Sussex IFCA district (Sussex IFCA, 2015). This map covers the intertidal habitat and the majority of the offshore export cable corridor (approximately 13km). The data utilised in this Proposed Development is historical, the specific datasets which

[22] https://mhc.jncc.gov.uk/biotopes/jnccmncr00001112

cover the offshore export cable corridor are the 2007 Aggregates Levy Sustainability Fund and the 1992-2005 Seasearch data (Sussex IFCA, 2015).

9.6.16 Full details of the site-specific Phase I walkover, the UAV mapping and Phase II sampling survey undertaken across the intertidal ecology study area are detailed within **Appendix 9.2: Offshore wind farm intertidal habitats survey report**, **Volume 4** of the ES (Document Reference: 6.4.9.2), with the summary of results presented within this section.

9.6.17 Habitat and biotope mapping of the intertidal area across the intertidal ecology study area revealed that there was a total of nine unique biotopes (EUNIS level 5 or above) from a total of four broadscale habitats (**Table 9-11**) as mapped in **Figure 9.5** to **Figure 9.7**, **Volume 3** of the ES (Document Reference: 6.3.9). The habitat map produced for the intertidal area considers the combined analysis of the target notes obtained in the field, the imagery of the quadrats and surrounding imagery taken north, east, south and west of the quadrats, the UAV imagery and all available historical information.

9.6.18 The extreme upper shore of the eastern section of the survey area was characterised by shingle with sea kale *Crambe maritima* (B2.32) giving way to a steep bank of shingle (pebbles) and gravel representative of the biotope A2.11 (**Figure 9.5**, **Volume 3** of the ES (Document Reference: 6.3.9)). A narrow strandline habitat (A2.21) was present within the transition zone between A2.11 and a sandier area characterised by polychaete/amphipod-dominated fine sand shores (A2.23). The mid shore area was generally dominated by fine sand representative of the biotope A2.23 interspersed with muddy sand supporting the sandworm *Arenicola marina* and representative of the biotope A2.24. The lower shore was a mosaic of littoral rocks and sandy sediments consisting of chalk pebbles as well as bored chalk often covered in green and red seaweeds (A1.45) with small patches of fine rippled sand supporting the polychaete *L. conchilega* (A2.245) (**Figure 9.5**, **Volume 3** of the ES (Document Reference: 6.3.9)).

9.6.19 The middle section of the survey area showed a zonation similar to that of the east zone but with no *C. maritima* and a much narrower shingle bank in the upper shore (A2.11) (**Figure 9.6**, **Volume 3** of the ES (Document Reference: 6.3.9)). The mid shore was similarly dominated by fine and muddy sands representative of the biotopes A2.2, A2.23 and A2.24; however, outcropping chalk and clay exposures (A1.46) were also observed in the upper shore.

9.6.20 The western area had coarser sediments in the upper shore grading into fine sand/muddy sand in the mid shore (**Figure 9.7**, **Volume 3** of the ES (Document Reference: 6.3.9)). A larger area of chalk outcrops was present in the upper and mid shore area as well as a number of rockpools characterised by the presence of green and red seaweeds (A1.45). The lower shore was fringed with more littoral rocks consisting of chalk pebbles covered in *Ulva* species. The area to the west of Climping beach was also interspersed with various artificial defences including rock armour groynes running parallel to the shore with barnacles (*Balanoidea*) on the lower 2m and bare rock above. Wooden groin structures running down the shore were either covered in *Ulva* species and *Fucus spiralis* or *Balanoidea* (**Figure 9.7**, **Volume 3** of the ES (Document Reference: 6.3.9)).

9.6.21 A summary of EUNIS classifications recorded during the survey is provided in **Appendix 9.2: Offshore wind farm intertidal habitats survey report, Volume 4**

of the ES (Document Reference: 6.4.9.2) along with supporting example photographs.

Table 9-12 Key biotopes recorded from the intertidal survey of Proposed Development intertidal ecology study area

EUNIS BSH	EUNIS Code	EUNIS Description
A1.4 – Features of Littoral Rock	A1.45	Ephemeral green or red seaweeds (freshwater or sand-influenced) on non-mobile substrata
	A1.46	Hydrolittoral soft rock
A2.1 – Littoral Coarse Sediment	A2.11	Shingle (pebble) and gravel shores
	A2.111	Barren littoral shingle
A2.2 – Littoral Sand and Muddy Sand	A2.21	Strandline
	A2.23	Polychaete/amphipod-dominated fine sand shores
	A2.24	Polychaete/bivalve-dominated muddy sand shores
	A2.245	*L. conchilega* in littoral sand
B2.3 – Upper shingle beaches with open vegetation	B2.32	Channel *C. maritima* communities

Feature of conservation interest

9.6.22 Bedrock, stony reef and *S. spinulosa* reef habitats were observed across the western areas of the array area and nearshore areas of the offshore export cable corridor (**Figure 4, Section 6.1.1** of **Appendix 9.3: Offshore wind farm subtidal benthic characterisation survey report, Volume 4** of the ES (Document Reference: 6.4.9.3)). These reef habitats were deemed to correlate to those which fall under Annex I of the EC Habitats Directive but not protected under this legislation as they do not represent Annex I habitat designated within an SAC. The bedrock reef habitats present were representative of the habitat of conservation interest subtidal chalk at two stations (ST004 and ST036) and 6 transects, and peat and clay exposures at one station (ST032) and three transects (T_011, T_027 and T_033). Both these features are considered habitats of principle importance in England under Section 41 of the NERC Act (2006). The stony reef habitats across the study area were assessed to be of both low and medium resemblance (as per Irving (2009)). These stony reef habitats can, in some circumstances, support diverse communities of branching sponges and sea fans. Across the proposed DCO Order Limits these reef habitats were deemed to be representative of the HOCI 'Fragile sponge and anthozoan communities on

subtidal rocky habitats', at one station (ST032) and three transects (T_011, T_027 and T_033). Observations of discrete *S. spinulosa* reef habitats were deemed to be of low 'reefiness' across the development site and representative of '*S. spinulosa* on stable circalittoral mixed sediment (A5.611)' and '*S. spinulosa* encrusted circalittoral rock' (A4.221).

9.6.23 In addition to the above, NERC Act (2006) Section 41 Habitats of Principal importance are known to occur across the proposed DCO Order Limits benthic subtidal study area. These include 'Sheltered Muddy Gravels' and 'Subtidal Sands and Gravel'.

9.6.24 Areas of rock noted across the intertidal survey area were almost entirely made up of rockpools dominated by chalk cobbles and bored chalk covered in green seaweeds; these were deemed to be representative of the biotope 'ephemeral green or red seaweeds (freshwater or sand-influenced) on non-mobile substrata (A1.45)'. These features of littoral rock are protected here under NERC Act 2006. Significant portions of the upper and middle shore were dominated by chalk outcrops and clay exposures 'hydrolittoral soft rock (A1.46)', especially to the west of the survey area also representative of NERC habitats. Habitats of Principal importance include 'mudflats and sandflats not covered by seawater at low tide'.

Designated sites

9.6.25 Following Section 42 comments received from Natural England, the dedicated nature conservation assessment chapter provided at PEIR (RED, 2021) has been removed for the ES, with all relevant information and assessment now included in the relevant chapters, namely **Chapter 9: Benthic ecology, Chapter 11: Marine mammals, Chapter 12: Offshore and intertidal ornithology,** and **Chapter 8: Fish and shellfish ecology, Volume 2** of the ES (Document Reference: 6.2.9, 6.2.11, 6.2.12 and 6.2.8 respectively).

9.6.26 The proposed DCO Order Limits do not overlap spatially with the international site network (i.e. instance SACs and SPAs) with benthic ecology features. A few nationally designated sites overlap with the proposed offshore export cable corridor landfall as detailed within **Table 9-13**. The sites that lie in the area of potential secondary ZOI of the Proposed Development are also detailed in **Table 9-13**. This table also summarises the qualifying features that relate to seabed habitats and benthic subtidal and intertidal ecology and the distance from the closest part of the proposed DCO Order Limits.

9.6.27 As no subtidal designated sites with benthic ecology features directly overlap with the proposed DCO Order Limits, there will be no direct impact assessment of any designated sites. An assessment of indirect impacts (e.g. changes in SSC and/or sediment deposition) as determined by the assessment presented in **Chapter 6: Coastal processes, Volume 2** of the ES (Document Reference: 6.2.6) has been undertaken on relevant benthic subtidal ecology features within sites that have the potential to be indirectly affected by the Proposed Development. Those benthic subtidal ecology and seabed habitat features of designated sites within a 16km buffer surrounding the Proposed Development have been screened into the assessment.

9.6.28 Climping Beach SSSI and Worthing Lumps LWS both contain intertidal ecology features and overlap with the proposed DCO Order Limits, however there will be no direct impact assessment of features within these designated sites, as the Proposed Development embedded environmental measures (as shown in **Table 9-16**) include measures to avoid any direct impact to these features through horizontal directional drilling (HDD) installation work (C-43). Indirect impacts on these features have been assessed.

9.6.29 Several of the qualifying broadscale habitat features of the MCZs are predicted to occur within the proposed DCO Order Limits (although there is no spatial overlap with the MCZ sites) and have therefore been assessed for both direct and indirect impacts, as per the normal assessment. Where broadscale habitat or marine features were not found within the proposed DCO Order Limits these features have only been assessed under the indirect impact assessment.

9.6.30 Features of the Local Wildlife Sites (LWS) and Local Nature Reserves (LNR) have either been designated in an international or national conservation designation and have been assessed formally through that mechanism. Or the features form part of the baseline assessment, so are covered within the biotope designations for the proposed DCO Order Limits and are assessed formally via the biotope. Where there are wreckages or manmade substructures the effect to the associated biotopes and species have not been assessed directly but it is assumed that the epibenthic fauna found would be akin to bedrock and coarse substrate biotopes identified (**Table 9-11**).

Table 9-13 Marine nature conservation designations with relevance to benthic subtidal and intertidal ecology

Site	Location relative to the Proposed Development	Features or description
International		
Solent and Dorset Coast SPA	Approximately 1km from the proposed DCO Order Limits	The site has been designated to protect internationally important breeding populations of common tern (*Sterna hirundo*), Sandwich tern (*Sterna sandvicensis*) and little tern (*Sternula albifrons*).
Pagham Harbour SPA	Approximately 10km from the proposed DCO Order Limits	This site is designated as the estuarine basin and is made up of an extensive central area of saltmarsh and intertidal mudflats, surrounded by lagoons, shingle, open water, reed swamp and wet permanent grassland. The mudflats are rich in invertebrates and algae and provide important feeding areas for the many bird species that use the site.
National		

Site	Location relative to the Proposed Development	Features or description
Kingmere MCZ	Lies adjacent to the proposed DCO Order Limits offshore export cable corridor	Kingmere MCZ is named after Kingmere Rocks, which is a rocky and boulder reef running through the middle of the MCZ. There are also areas of chalk and different types of sediment. It is a place where black seabream (*Spondyliosoma cantharus*) come to breed in the spring. The features of this site are moderate energy infralittoral rock and thin mixed sediments, subtidal chalk and black seabream.
Offshore Overfalls MCZ	Lies 0.25km from the proposed DCO Order Limits array area	The site is designated for several marine habitats including subtidal coarse sediment, subtidal mixed sediments, subtidal sand and English Channel outburst flood features.
Pagham Harbour MCZ	Approximately 10.5km from the proposed DCO Order Limits	This site is designated for several marine features including: Seagrass beds, defolin's lagoon snail (*C. armoricum*), and the Lagoon sand shrimp (*G. insensibilis*).
Selsey Bill and the Hounds MCZ	Approximately 10.5km from the proposed DCO Order Limits	The site is designated for several marine habitats including high, moderate and low energy infralittoral rock, moderate circalittoral rock, peat and clay exposures, and subtidal mixed sediment and sand.
Climping Beach SSSI[23]	Overlaps with the proposed DCO Order Limits offshore export cable corridor landfall, but HDD works will ensure no direct impact to features.	This site is designated for aggregations of non-breeding birds including sanderling and *Calidris alba* as well as coastal vegetated shingle, fixed dune grassland and sand dune communities.
Bognor Reef SSSI	Approximately 4.5km from the proposed DCO Order Limits	Supralittoral sediment.

[23] Although there is an overlap with this SSSI, the Proposed Development will be using HDD technology to travel under the SSSI, preventing direct impacts.

Site	Location relative to the Proposed Development	Features or description
	offshore export cable corridor	
Pagham Harbour SSSI	Approximately 6km from the proposed DCO Order Limits	Salt marsh and tidal mudflats with surrounding habitats including vegetated shingle. The nationally endangered starlet sea anemone *Nematostella vectensis* may also be found here.
Local		
West Beach Local Nature Reserve (LNR)[24]	Overlaps with the proposed DCO Order Limits offshore export cable corridor landfall	The West Beach LNR is part of the Climping Beach SSSI. It includes sand dunes, vegetated shingle, sand flats and a small patch of saltmarsh. Sand lizards (*Lacerta agilis)* protected under the Wildlife and Countryside Act 1984, and four nationally scarce burrowing bees and wasps occur in the dunes. The vegetated shingle, though locally common, is internationally rare, and is used by a Red Data Book ant species. The sand flats host large numbers of migratory waders in the winter months.
Pagham Harbour LNR	Approximately 10.5km from the proposed DCO Order Limits	The main habitats include intertidal mudflats, saltmarsh, saline lagoons and vegetated shingle. The intertidal area supports a vast number of invertebrates including ragworms, snails, shrimps and crabs.
Shoreham Beach LNR	Approximately 14km from the proposed DCO Order Limits	The vegetated shingle on this beach is an internationally rare habitat.
Worthing Lumps Local Wildlife Sites (LWS)[25]	Approximately 6.5km from the proposed DCO Order Limits array area	Worthing Lumps LWS is a marine Sites of Nature Conservation Importance (SNCI). Its seabed includes chalk cliff with boulders, gravel and sand. Two separate north facing chalk cliffs exposures (approximately 2 to 3m

[24] Although there is an overlap with this LNR, the Proposed Development will be using HDD technology to travel under the LNR, preventing direct impacts.

[25] https://www.rspb.org.uk/globalassets/downloads/documents/positions/marine/examples-of-nationally-important-marine-areas-in-the-territorial-waters-around-england-and-wales.pdf

Site	Location relative to the Proposed Development	Features or description
		in height), separated by pebble/gavel/sand. Sublittoral exposures of chalk are rare, though they are relatively common off the Sussex coast. The upper parts of the cliff are bored by piddocks, with the common piddock *P. dactylus* present here.
City of Waterford Wreck LWS[25]	Approximately 2.5km from the proposed DCO Order Limits array area	Metal plates and superstructure lying proud of surrounding seabed of sand and gravel. Artificial reef providing a hard and stable surface to an abundant epifaunal community which in turn increases local fish assemblages.
H.M.S Northcoates LWS[25]	Approximately 1km from the proposed DCO Order Limits	Steel wreckage in deep water laying on a seabed of silty gravel and coarse shell fragments. The communities present are typical of many deep-water wrecks found in this region. Bryozoans and hydroids dominate the vertical surfaces, with patches of Devonshire cup corals, jewel anemones, soft corals and sponges. The surrounding seabed is colonised by sandmason worms, mussels, burrowing anemones and finger bryozoan.
Shelley Rocks LWS[25]	Approximately 1.4km from the proposed DCO Order Limits offshore export cable corridor	The site contains mixed sediment of boulders, cobbles, gravel and sand on chalk bedrock or exposures of grey clay. This site is a marine SNCI due to the wide range of seabed types found in a relatively small area. Boring organisms including piddocks and sponges are found on the chalk cobbles and flint cobbles are dominated by growths of the leafy bryozoan (*Flustra*), sea squirts and sponges.
Waldrons Reef LWS[25]	Approximately 2.7km from the proposed DCO Order Limits offshore export cable corridor	The site main features include sandstone bedrock reef with large boulders. Pink calcareous algae encrust much of the bedrock. Foliaceous algae with sparse, stunted kelp plants dominate the uppermost surfaces.
Outer Owers LWS[25]	Approximately 5km from the proposed	The sites seabed feature includes shallow (to deep) mixed substrata with limestone

Site	Location relative to the Proposed Development	Features or description
	DCO Order Limits array area	bedrock, boulders and mudstone on a tide-swept grave slope.
Kingmere Rocks LWS[25]	Approximately 5.8km from the proposed DCO Order Limits offshore export cable corridor	The site comprises of a large area of sandstone and mudstone reefs, mostly of boulders, cobbles and mixed ground. The upward-facing surfaces of sandstone bedrock and boulders having a covering of foliose red algae, whilst those slightly deeper are dominated by a dense animal turf, particularly the bryozoans *Bugula* species and *F. foliacea*. Extensive patches of encrusting coralline algae are present on the sides of the boulders, together with various sponges (*E. fucorum*, *D. fragilis*, *T. aurantium*, *Suberites ficus* and *P. mamillaris*), *A. digitatum*, sea squirts (especially *C. lepadiformis*, *Aplidium punctum* and *Morchellium argus*), and occasional *A. rubens.*
Outer Mulberry Harbour Unit[25]	Approximately 7.5km from the proposed DCO Order Limits offshore export cable corridor	Wreckage of concrete and rusted steel. Surrounding seabed of pebbles, gravel and silty sand. The artificial reef structure is colonised by a low faunal turf of hydroids and bryozoans as well as occasional sponges and anemones. Plumose anemones and soft coral dominate the overhanging wall.
Inner Mulberry Harbour Unit[25]	Approximately 9.2km from the proposed DCO Order Limits offshore export cable corridor	Wreckage of concrete and rusted steel. Surrounding seabed of pebbles, gravel and silty sand. The artificial reef supports kelp and are colonised by sessile organisms that are characteristic of a typical exposed rocky shore / shallow infralittoral community. This red algae, sponges and sea squirts in deeper waters, with the internal surfaces colonised by plumose anemones.
South-West Rocks LWS[25]	Approximately 10km from the proposed DCO Order Limits	Chalk cliff, sand and pebbles. The upper part of the vertical face extending onto the upper horizontal surface is dominated by a dense animal turf including hydroids and foliose red algae. Other faunal components of the 'turf' include *A. digitatum* and sponges, principally

Site	Location relative to the Proposed Development	Features or description
		E. fucorum and *D. fragilis*, and bryozoans such as *F. foliacea* and Bugula species.
Looe Gate LWS[25]	Approximately 10km from the proposed DCO Order Limits	Chalk cliff, silty sand mixed with shells. The uppermost parts of the cliff support a sparse foliose red algal turf. The seabed on the north (lower) side of the reef is of mixed sediment: chalk pebbles, gravel, sand, shell debris and occasional small chalk boulders. Occasional sparse red algae can be found attached to cobbles and small boulders.
Ship Rock LWS[25]	Approximately 11km from the proposed DCO Order Limits	Low-lying chalk reef / cliff. The vertical chalk faces have a general covering of hydroid-bryozoan turf and are frequently riddled by piddock holes. Other fauna such as colonial ascidians, sponges and bryozoans cover the chalk surface. Occasional clusters of *B. volutacornis* are present in places.
Marina Reef LWS[25]	Approximately 11.5km from the proposed DCO Order Limits	Reef of chalk and grey clay with chalk slabs and boulders. Sparse foliose red algae are present on the shallowest parts of the reef, with the upper vertical faces being dominated by a hydroid-bryozoan turf along with *N. antennina* and *H. falcata*, *A. digitatum*, *B. volutacornis*, white anemones *A. sphyrodeta* and various small ascidians.
Mixon Hole LWS[25]	Approximately 13km from the proposed DCO Order Limits	The sites main features include limestone, a cap of limestone bedrock overlying cliff or 'soft grey' and 'stiff blue' clay; boulders, pebble and shell seabed. Hydroids, keel worms and sea squirts have colonised the cobbles and small boulders near the base of the cliff.
Brighton Marina LWS[25]	Approximately 13.3km from the proposed DCO Order Limits	Mud seabed, but most interest in the communities associated with the floating pontoon, for epifaunal communities. The inner harbour of the marina is considered an artificial lagoon.
Whirlpool Hole LWS[25]	Approximately 14.4km from the proposed DCO Order Limits	Steeply sloping seabed of gravel, with a few large boulders at the base which are adorned with encrusting sponges, sea squirts and bryozoans and dense clusters of *F. foliacea*.

Site	Location relative to the Proposed Development	Features or description
Subtidal wave-cut chalk platform (Brighton to Newhaven) LWS[25]	Approximately 15km from the proposed DCO Order Limits	Dissected chalk platform with ridges and gullies - site extends from mid-shore to approximately 750m seaward. The gully floors have a light covering of sand or silt, with occasional chalk and flint cobbles. The surface of the chalk bedrock is pitted by holes, mostly caused by piddocks or boring worms such as spionids and horseshoe worms *Phoronis hippocrepia.*

Valued Ecological Receptors (VERs)

9.6.31 The value of ecological features is dependent upon their biodiversity, social, and economic value within a geographic framework of appropriate reference (CIEEM, 2018). The most straightforward context for assessing ecological value is to identify those species and habitats that have a specific biodiversity importance recognised through international or national legislation or through local, regional or national conservation plans (e.g. Annex I habitats under the Habitats Directive, OSPAR, UK BAP habitats and species, habitats / species of principal importance listed under the NERC Act 2006 and habitats / species listed as features of MCZs/recommended MCZs). However, only a very small proportion of marine habitats and species are afforded protection under the existing legislative or policy framework. Therefore, evaluation must also assess value according to the functional role of the habitat or species. For example, some features may not have a specific conservation value in themselves but may be functionally linked to a feature of high conservation value.

9.6.32 **Table 9-14** presents the VERs, their conservation status and importance within the benthic subtidal and intertidal ecology study area and the justification and regional importance of each receptor.

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Table 9-14 Valued Ecological Receptors (VERs) within the benthic subtidal and intertidal ecology study area

VERs	Representative biotope found within the study area	Designation status	Conservation interest	Distribution within the benthic and intertidal ecology study area	Importance within the benthic and intertidal ecology study area and justification
Sandy sediments with low infaunal diversity and sparse epibenthic communities	A5.231	None	Habitats of Principal importance (sublittoral sands and gravels)	Modelling predicted that this habitat is likely located across much of the proposed DCO Order Limits eastern array and further offshore of the western array where sandy sediments are characteristic (**Figure 9.4, Volume 3** of the ES (Document Reference: 6.3.9))	Regional – Habitats of Principal Importance with regional distribution across the English Channel.
Coarse and mixed sediments with moderate to high infaunal diversity and scour tolerant epibenthic communities	A5.141, A5.142, A5.431, A5.422, A5.444	None	Habitats of Principal importance (sublittoral sands and gravels)	Modelling predicted this habitat is likely located across much of the offshore export cable corridor and western array, particularly further inshore on the array where coarse and mixed sediments are more abundant (**Figure 9.4, Volume 3** of the ES (Document Reference: 6.3.9))	Regional – Habitats of Principal Importance with regional distribution across the English Channel.
S. spinulosa with kelp and red seaweeds on sand-	A3.215	None	Habitats of Principal importance and UK BAP	Modelling predicted this habitat is likely to occur at locations where hard substrate or rock outcrop occur across the middle of the offshore export cable	*S. spinulosa* habitat was not recorded in reef form therefore no

VERs	Representative biotope found within the study area	Designation status	Conservation interest	Distribution within the benthic and intertidal ecology study area	Importance within the benthic and intertidal ecology study area and justification
influenced infralittoral rock			(*S. spinulosa* reefs) FOCI under the Nature Conservation part (Part 5) of the MCAA 2009.	corridor, which is patchy in nature (**Figure 9.4, Volume 3**)	national or international importance applied to this habitat.
***S. spinulosa* encrusted circalittoral rock**	A4.221	None	Habitats of Principal importance and UK BAP (*S. spinulosa* reefs) FOCI under the Nature Conservation part (Part 5) of the MCAA 2009.	Subtidal surveys identified low resemblance biogenic reef in two discrete areas (Station T-25 and T-27) at the offshore portion of the export cable corridor (**Appendix 9.3: Offshore wind farm subtidal benthic characterisation survey report, Volume 4** of the ES (Document Reference: 6.4.9.3)).	*S. spinulosa* habitat was not recorded in reef form therefore no national or international importance applied to this habitat.

VERs	Representative biotope found within the study area	Designation status	Conservation interest	Distribution within the benthic and intertidal ecology study area	Importance within the benthic and intertidal ecology study area and justification
***S. spinulosa* on stable circalittoral mixed sediment**	A5.611	None	Habitats of Principal importance and UK BAP (*S. spinulosa* reefs) FOCI under the Nature Conservation part (Part 5) of the MCAA 2009.	Subtidal surveys identified low resemblance biogenic reef in two discrete areas (Station T-25 and T-27) at the offshore portion of the export cable corridor (**Appendix 9.3: Offshore wind farm subtidal benthic characterisation survey report, Volume 4** of the ES (Document Reference: 6.4.9.3)).	*S. spinulosa* habitat was not recorded in reef form therefore no national or international importance applied to this habitat.
Piddocks with a sparse associated fauna in sublittoral very soft chalk or clay	A4.231	None	Habitats of Principal importance and UK BAP (Littoral and sublittoral chalk) FOCI under the Nature Conservation	Modelling predicted this habitats occurrence at discreet locations across the middle of the offshore export cable corridor, where soft chalk or clay outcrops are expected to occur (**Figure 9.4, Volume 3** of the ES (Document Reference: 6.3.9))	National – Habitats of Principal Importance protected under Section 41 of the NERC Act 2006.

VERs	Representative biotope found within the study area	Designation status	Conservation interest	Distribution within the benthic and intertidal ecology study area	Importance within the benthic and intertidal ecology study area and justification
			part (Part 5) of the MCAA 2009		
Circalittoral rock and coarse substrate with diverse epifaunal communities	A4.214, A4.131, A4.134, A4.139	None	Habitats of Principal importance and UK BAP (stony reefs) FOCI under the Nature Conservation part (Part 5) of the MCAA 2009.	This habitat was recorded throughout the proposed DCO Order Limits (**Figure 9.4, Volume 3** of the ES (Document Reference: 6.3.9)). Subtidal surveys identified these reef habitats were deemed to be representative of the HOCI 'Fragile sponge and anthozoan communities on subtidal rocky habitats', at one station (ST032) and three transects (T_011, T_027 and T_033).	National – Habitats of Principal Importance protected under Section 41 of the NERC Act 2006.
Littoral barren sand and coarse sand with low infaunal diversity	A2.111, A2.21	None	N/A	This habitat was recorded at the upper shore of the intertidal proposed DCO Order Limits surrounding the strandline (**Figure 9.5; Figure 9.6; Figure 9.7, Volume 3** of the ES (Document Reference: 6.3.9))	Local – Habitat is not protected under any conservation legislation and are found widespread

VERs	Representative biotope found within the study area	Designation status	Conservation interest	Distribution within the benthic and intertidal ecology study area	Importance within the benthic and intertidal ecology study area and justification
					around much of the UK.
Littoral exposed soft bedrock with burrowing infauna	A1.46	None	Habitats of Principal importance and UK BAP (Littoral and sublittoral chalk) FOCI under the Nature Conservation part (Part 5) of the MCAA 2009	Outcropping chalk and clay exposures were recorded in the upper shore of the intertidal proposed DCO Order Limits (**Figure 9.5; Figure 9.6; Figure 9.7, Volume 3** of the ES (Document Reference: 6.3.9))	National – Habitats of Principal Importance protected under Section 41 of the NERC Act 2006.
Littoral rock and non-mobile substrata with ephemeral green or red	A1.45	None	N/A	Numerous chalk outcrops were present in the upper, mid-shore and lower area of the intertidal Proposed DCO Order Limits, which were characterised by this habitat (**Figure 9.5; Figure 9.6; Figure 9.7,**	Local – Habitat is not protected under any conservation legislation

VERs	Representative biotope found within the study area	Designation status	Conservation interest	Distribution within the benthic and intertidal ecology study area	Importance within the benthic and intertidal ecology study area and justification
seaweeds (freshwater or sand-influenced)				**Volume 3** of the ES (Document Reference: 6.3.9))	
Littoral sandy sediments with moderate to high infaunal diversity	A2.23, A2.24, A2.245, B2.32	SSSI	Protected feature within the Climping Beach SSSI	This habitat was recorded across much of the intertidal area across the proposed DCO Order Limits (**Figure 9.5; Figure 9.6; Figure 9.7, Volume 3** of the ES (Document Reference: 6.3.9))	National – included as a protected feature of the Climping Beach SSSI
Features of MCZs					
Subtidal chalk	A4.231	MCZ	Protected feature within the Kingmere MCZ Habitats of Principal importance and UK BAP (subtidal chalk)	Representative biotopes of this feature of the Kingmere MCZ are predicted to occur within the proposed DCO Order Limits but are not protected as part of the MCZ. Protected features of the MCZ fall within the secondary ZOI (**Figure 9.8, Volume 3** of the ES (Document Reference: 6.3.9))	National – included as a protected feature of the Kingmere MCZ

VERs	Representative biotope found within the study area	Designation status	Conservation interest	Distribution within the benthic and intertidal ecology study area	Importance within the benthic and intertidal ecology study area and justification
Moderate energy infralittoral rock and thin mixed sediments	A3.215	MCZ	Protected feature within the Kingmere MCZ Habitats of Principal importance	Representative biotopes of this feature of the Kingmere MCZ are predicted to occur within the proposed DCO Order Limits but are not protected as part of the MCZ. Protected features of the MCZ fall within the secondary ZOI (**Figure 9.8, Volume 3** of the ES (Document Reference: 6.3.9))	National – included as a protected feature of the Kingmere MCZ
Seagrass beds	N/A	MCZ	Protected feature within the Pagham Harbour MCZ Habitat of Principal importance and UK BAP (seagrass beds)	This habitat is not predicted to be found within the proposed DCO Order Limits but is a protected feature of the Pagham Harbour MCZ which falls within the secondary ZOI (**Figure 9.8, Volume 3** of the ES (Document Reference: 6.3.9))	National – included as a protected feature of the Pagham Harbour MCZ
Defolin's lagoon snail (*C. armoricum*)	N/A	MCZ	Protected feature within	This species is a protected feature of the Pagham Harbour MCZ which falls within the secondary ZOI (**Figure 9.8,**	National – included as a protected species

VERs	Representative biotope found within the study area	Designation status	Conservation interest	Distribution within the benthic and intertidal ecology study area	Importance within the benthic and intertidal ecology study area and justification
Lagoon sand shrimp (*G. insensibilis*)	N/A	MCZ	the Pagham Harbour MCZ Species of principal importance	**Volume 3** of the ES (Document Reference: 6.3.9))	of the Pagham Harbour MCZ
Broadscale features of MCZs					
Subtidal coarse sediment	A5.131, A5.142, A5.141, A5.431, A5.422, A5.444	MCZ	Broadscale feature of Offshore Overfalls MCZ	Representative biotopes of this broadscale feature of the Offshore Overfalls MCZ are predicted to occur within the proposed DCO Order Limits but are not protected as part of the MCZ. Protected features of the MCZ fall within the secondary ZOI (**Figure 9.8, Volume 3** of the ES (Document Reference: 6.3.9))	National – included as broadscale feature of Offshore Overfalls MCZ
Subtidal mixed sediments	A5.142, A5.141, A5.431, A5.422, A5.444				
Subtidal sand	A5.231, A5.233, A5.261				
Moderate energy infralittoral rock	A3.215, A4.231	MCZ	Broadscale feature of Kingmere MCZ	Representative biotopes of this broadscale feature of the Kingmere MCZ are predicted to occur within the proposed DCO Order Limits but are not protected as part of the MCZ. Protected features of the MCZ fall	National – included as broadscale feature of Kingmere MCZ

VERs	Representative biotope found within the study area	Designation status	Conservation interest	Distribution within the benthic and intertidal ecology study area	Importance within the benthic and intertidal ecology study area and justification
				within the secondary ZOI (**Figure 9.8, Volume 3** of the ES (Document Reference: 6.3.9))	
Subtidal mixed sediments	A5.142, A5.141, A5.431, A5.422, A5.444	MCZ	Broadscale feature of Selsey Bill and the Hounds MCZ	Representative biotopes of this broadscale feature of the Selsey Bill and the Hounds MCZ are predicted to occur within the proposed DCO Order Limits but are not protected as part of the MCZ. Protected features of the MCZ fall within the secondary ZOI (**Figure 9.8, Volume 3** of the ES (Document Reference: 6.3.9))	National – included as broadscale feature of Selsey Bill and the Hounds MCZ
Subtidal sand	A5.231, A5.233, A5.261				
Moderate energy infralittoral rock	A4.214, A4.221, A4.231				
Moderate energy circalittoral rock	A3.215; A4.139				

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Future baseline

9.6.33 An assessment of the future baseline conditions has been carried out (in the event of no development) and is described within this section. The baseline environment is not static and will exhibit some degree of natural change over time, with or without the Proposed Development in place, due to naturally occurring cycles and processes. Therefore, when undertaking impact assessments, it will be necessary to place any potential impacts in the context of the envelope of change that might occur naturally over the timescale of the Proposed Development.

9.6.34 Further to potential change associated with existing cycles and processes, it is necessary to take account of the potential effects of climate change on the marine environment. Variability and long-term changes on physical influences may bring direct and indirect changes to benthic and intertidal habitats and communities in the mid to long term future (BEIS, 2016). A strong base of evidence indicates that long-term changes in the benthic ecology may be related to long-term changes in the climate or in nutrients (BEIS, 2016), with climatic process driving shifts in abundances and species composition of benthic communities (Marine Climate Change Impacts Partnership (MCCIP), 2015). Studies of the benthic ecology over the last three decades have shown that biomass has increased by at least 250 to 400 percent; opportunistic and short-lived species have increased; and the abundance of long-living sessile animals has decreased (Krönke, 1995; Krönke, 2011). Modelling sea surface temperature in relation to climate change in the UK has shown that the rate of temperature increase over the previous 50 years has been greater in waters off the east coast of the UK compared to the west and this is predicted to continue for the next 50 years (MCCIP, 2015). MCCIP (2020) noted over the past 30 years, warming has been most pronounced to the north of Scotland and in the North Sea, with sea-surface temperature increasing by up to 0.24°C per decade. Within the English Channel and the southern North Sea, increased sea surface temperatures may lead to an increase in the relative abundance of species associated with more southerly areas and subsequently MCCIP (2020) suggest further declines in some cold-water species are expected as sea temperature increases.

9.6.35 Furthermore, most literature to date focuses on specifically temperature, with regards to the effects of climate change on marine habitats. MCCIP (2020) suggest the warming of UK shelf seas is projected to continue over the coming century, with most models suggesting an increase of between 0.25°C and 0.4°C per decade. Warming is expected to be greatest in the English Channel and the North Sea, with smaller increases in the outer UK shelf regions (MCCIP, 2020). Climatic warming also causes deoxygenation within the water column. Over the past 50 years, oxygen content within the water column has decreased from 0.06 to 0.43 percent (Stramma *et al*., 2010) with a further 7 percent decrease predicted for the year 2100 (IPCC, 2013). It was concluded from 26 years of monitoring a benthic community within the Firth of Clyde, UK that the benthic communities had been affected by the decreasing levels of oxygen. This finding agreed with other short-term studies (Breitburg *et al*., 2018, Levin *et al*., 2009). Specific changes included changes in morphology, burrow depth, bioturbation and feeding mode (Caswell *et al*.,2018).

9.6.36 The Sussex IFCA introduced the Nearshore Trawling Byelaw 2019 which came into effect on the 22 March 2021. This byelaw updates a previous trawling exclusion byelaw, which incorporated a seasonal trawling ban in inshore IFCA waters. The Nearshore Trawling Byelaw 2019 bans trawling along a large area of the Sussex inshore coastline out to 4km between Selsey and Shoreham-by-Sea and encompasses Selsey Bill and the Hounds MCZ. The aim of this byelaw is to encourage the regeneration of marine habitats – particularly kelp forests – that act as nursery and feeding grounds for fish species, and prevent damage to sensitive marine habitats (Sussex IFCA, 2021).

9.6.37 Further to natural variation, significant work is being undertaken in the region to protect and restore kelp. The SKRP was launched in 2021. The restoration project will support and enhance the kelp communities within Sussex, with the aim of restoring 300 km^2 of kelp along the Sussex coast. The restoration of this habitat will likely result in an increase in biodiversity and ecosystem services, including carbon sequestration and reducing coastal erosion[26].

9.6.38 As such, the baseline in the proposed DCO Order Limits benthic, subtidal and intertidal ecology study area described in **Section 9.6** is a 'snapshot' of the present benthic ecosystem within a gradually yet continuously changing environment. Any changes that may occur during the construction, operation and decommissioning of the Proposed Development should be considered in the context of both greater variability and sustained trends occurring on national and international scales in the marine environment, and the changes that will be expected to occur naturally in the absence of the Proposed Development.

9.7 Basis for ES assessment

Maximum design scenario

9.7.1 Assessing using a parameter-based design envelope approach means that the assessment considers a maximum design scenario whilst allowing the flexibility to make improvements in the future in ways that cannot be predicted at the time of submission of the DCO Application. The assessment of the maximum adverse scenario for each receptor establishes the maximum potential adverse impact and as a result impacts of greater adverse significance will not arise should any other development scenario (as described in **Chapter 4: The Proposed Development, Volume 2** of the ES (Document Reference: 6.2.4)) to that assessed within this Chapter be taken forward in the final scheme design.

9.7.2 The maximum parameters and assessment assumptions that have been identified to be relevant to benthic subtidal and intertidal ecology are outlined in **Table 9-15** and are in line with the Project Design Envelope (**Chapter 4: The Proposed Development, Volume 2** of the ES (Document Reference: 6.2.4)).

[26] More information on the restoration project can be found here: https://www.rewildingbritain.org.uk/rewilding-projects/sussex-kelp-restoration-project

Table 9-15 Maximum parameters and assessment assumptions for impacts on benthic subtidal and intertidal ecology

Project phase and activity/impact	Maximum parameters	Maximum assessment assumptions	Justification
Construction			
Habitat disturbance in the Rampion 2 array area and offshore cable corridor from construction works		**Total habitat disturbance =** 32,618,416m^2 **Boulder clearance in the array area:** Total clearance impact area - Pre-lay Plough/ Pre-lay grapnel for cables (based on array cables, interconnector cables in the array area) = 8,800,000m^2 Total clearance impact area - subsea grab for cables (based on array cables and export cables in the array area) = 5,280,000m^2 Total clearance impact area - Foundations and Jack-up legs (based on number of WTG, jack-up legs with a 15m buffer) = 1,313,000m^2 **Boulder clearance in the offshore export cable corridor:**	The habitat disturbance relates to seabed preparation for foundations and cables, jack up and anchoring operations, and cable installation. It should be noted that the seabed preparation area for foundations is less than the footprint of the foundation scour protection and the footprint of infrastructure, including cable protection, is assessed as a permanent impact in operation and maintenance.

Project phase and activity/impact	Maximum parameters	Maximum assessment assumptions	Justification
		Total clearance impact area - Pre-lay Plough/ Pre-lay grapnel = 1,700,000m^2 Total clearance impact area - subsea grab ((length of cable x number of cables) x clearance width) = 1,020,000m^2 **Sandwave clearance in the array area** Total sandwave clearance area = 600,000m^2 Construction vessel anchorage footprint = 334,000m^2 **Total sandwave clearance area in m^2**: 60,000m of array cable x 10m width = 600,000m^2; and π x 100m^2 radius = 31,415.93m^2 for foundations **Interconnector cable installation** Total seabed disturbance = 1,000,000m^2 **Array cable installation**	

Project phase and activity/impact	Maximum parameters	Maximum assessment assumptions	Justification
		Total seabed disturbance = 6,250,000m^2 Impact area for cable/pipeline crossings (array) = 10,000m^2 **Array and interconnector cables:** Cable crossings = 40,000m^2 **Offshore export cable installation** Total seabed disturbance = 6,250,000m^2	
Temporary increase in SSC and sediment deposition in the Rampion 2 array area and offshore cable corridor		**Total volume disturbed:** 2,614,005m^3 **Sandwave clearance** Total sandwave clearance volume in array area = 1,375,000m^3 (including up to 475,000m^3 for foundations, and up to 900,000m^3 for cables) **WTG foundations spoil volume:** Spoil volume per WTG foundation from drill arising	The maximum design scenario for foundation installation results from the largest volume suspended from seabed preparation and presents the worst case for WTG installation. 90 turbines result in the greatest volume of spoil from drill arisings. For cable installation, the maximum design scenario results from the greatest volume from sandwave clearance and installation. This also assumes the largest number of cables and the greatest burial depth.

Project phase and activity/impact	Maximum parameters	Maximum assessment assumptions	Justification
		(larger WTG type monopile) = 8,588 m^3 8,588 m^3 x 33 (50% of 65) monopiles = 283,404m^3. **Spoil volume for offshore substation foundations:** Spoil volume per offshore substation foundation (jacket with pin piles foundations) from drilling arisings (if drilling required) = 11,451m^3 11,451m^3x 3 offshore substations = 34,353m^3. **Export cable installation** Burial spoil (ploughing/mass flow excavation/trenching) = 340,000m^3 Total HDD exit pit excavated material volume = 1,248m^3 fluid (99,840kg bentonite) **Interconnector cable installation**	

Project phase and activity/impact	Maximum parameters	Maximum assessment assumptions	Justification
		Burial spoil (ploughing/mass flow excavation/trenching) = 80,000m^3 **Array cable installation** Burial spoil (ploughing and jetting/mass flow excavation) = 500,000m^3	
Temporary increase in SSC and sediment deposition in the intertidal area	The maximum design scenario for seabed disturbance is presented above in '*Temporary habitat disturbance in the Rampion 2 array area and offshore export cable corridor from construction works*'		The maximum design scenario for temporary habitat disturbance in the intertidal area from the HDD works is included, however, this includes the full export cable corridor, so this figure is highly precautionary.
Direct and indirect seabed disturbances leading to the release of sediment contaminants	The maximum design scenario for seabed disturbance is presented above in '*Habitat disturbance in the Rampion 2 array area and offshore export cable corridor from construction activities*'		This scenario represents the maximum total seabed disturbance and therefore the maximum amount of contaminated sediment that may be released into the water column during construction activities.
Increased risk of introduction or spread of Marine INNS may affect benthic ecology and biodiversity		The total number of vessel return trips made during construction = 2,205 **WTG foundation installation (90):**	Maximum design scenario with regards to maximum number of vessel movements during construction activities in relation to the maximum number of WTG (90).

Project phase and activity/impact	Maximum parameters	Maximum assessment assumptions	Justification
		3 installation vessels (60 return trips) 10 support vessels (60 return trips) 6 transport vessels (60 return trips) 6 crew transport vessels (500 return trips) **WTG installation (90):** 2 installation vessels (33 return trips) 10 support vessels (100 return trips) 10 crew transport vessels (900 return trips). **Offshore substation installation:** 3 installation vessels (12 return trips) 20 support vessels (12 return trips) 6 transport vessels (12 return trips)	

Project phase and activity/impact	Maximum parameters	Maximum assessment assumptions	Justification
		6 crew transfer vessels (60 return trips). **Inter-array and interconnector cable installation:** 3 main cable laying vessels (12 return trips) 3 main burial vessels (6 return trips) 6 support vessels (300 return trips). **Offshore export cable installation:** 2 main laying vessel (6 return trips) 2 main cable joining vessel (6 return trips) 2 main cable burial vessels (6 return trips) 10 support vessels (60 return trips)	
Indirect disturbance arising from the accidental release of pollutants		The maximum number of vessel return trips made during construction = 2,205	These maximum assessment assumptions are considered to represent the maximum design

Project phase and activity/impact	Maximum parameters	Maximum assessment assumptions	Justification
		See parameters above for '*Increased risk of introduction or spread of Marine INNS may affect benthic ecology and biodiversity*' Synthetic compound, heavy metal and hydrocarbon contamination resulting from offshore infrastructure installation and return trips to port by construction vessels over the construction period (as detailed above). Water-based drilling muds associated with drilling to install foundations, should this be required. Potential contamination of intertidal habitats resulting from machinery use and vehicle movement	scenario with regards to vessel movement during construction.
Indirect disturbance from increased noise and vibration from construction activities	**Maximum spatial design scenario:** 90 smaller monopile WTG foundations	The total number of vessel return trips made during construction = 2,205 **Maximum spatial design scenario:**	The maximum spatial design scenario equates to the greatest effect from subsea noise at any one-time during piling. Piling fewer WTGs (65) 13.5m monopiles

Project phase and activity/impact	Maximum parameters	Maximum assessment assumptions	Justification
	Up to 3 offshore converter substations **Maximum temporal design scenario**: 90 smaller WTGs on piled jacket foundations (maximum of 4 legs per jacket, maximum of 4 piles per jacket) Up to 3 offshore converter substations (maximum of 6 legs per jacket, up to 12 pins per jacket)	2 monopiles per day = 45 days piling Maximum hammer energy 4,400kJ 4- hour piling duration (24-hours) **Maximum temporal design scenario:** 90 WTGs on piled jacket foundations = 360 pin piles Up to 3 offshore substations = 36 pin piles Total of 396 pin piles in the array = 99 piling days Maximum hammer energy 2,500kJ 4 pin piles per day (24-hours) 30-minute soft-start ramp up. **WTG foundation installation:** Crew transport vessels; 400 trips - assuming 4 visits per foundation for bolting and finalising purposes from local construction harbour	represents a greater spatial impact than (90) 10m monopiles. The maximum temporal design scenario represents the longest duration of effects from subsea noise. This scenario assumes pin-pile foundations, which could result in a longer duration of piling per foundation.

Project phase and activity/impact	Maximum parameters	Maximum assessment assumptions	Justification
Operation and Maintenance			
Long-term habitat loss/alteration from the presence of foundations, scour protection and cable protection		**Total habitat loss/change:** 1,390,900m^2 **WTG foundation footprint with scour protection - 65 WTGs**: WTG footprint (based on 65 WTG scenario) with scour protection = 6,000m^2 (per multi-leg foundation with suction buckets) Offshore substation footprint (jacket with pin piles foundation) with scour protection = 7,300m^2 (per substation) 6,000m^2 x 65 monopiles = 390,000m^2 **Array and interconnector cables:** Maximum rock protection area for array cable crossings (10,000m^2 per crossing (four crossing expected) Maximum rock protection area for array cables (based on	The maximum design scenario is defined by the maximum area of seabed lost as a result of the placement of structures, scour protection and cable protection. Habitat loss from drilling and drill arisings is of a smaller magnitude than presence of Proposed Development infrastructure.

Project phase and activity/impact	Maximum parameters	Maximum assessment assumptions	Justification
		20percent of 250km cable requiring protection) = 300,000m^2 Maximum rock protection area for interconnector cables (based on 20percent of 10km cable requiring protection) = 122,000m^2 Cable crossings = 40,000m^2 **Offshore substation footprint with scour protection - 3 offshore substations** 7,300m^2 x 3 jackets = 21,900m^2 **Offshore export cable corridor** Maximum rock protection area for export cables (based on 20 percent of 170km cable requiring protection) = 517,000m^2	
Temporary habitat disturbance from jack-up vessels and cable maintenance activities		**Total direct disturbance to seabed:** 4,334,900m^2 **WTG maintenance**	Defined by the maximum number of jack-up vessel operations and maintenance activities that could have an interaction with the seabed anticipated during operation.

Project phase and activity/impact	Maximum parameters	Maximum assessment assumptions	Justification
		Major WTG component replacement Maximum of 4 events per WTG over the lifetime of the Proposed Development = 350. The footprint of seabed disturbance for all events via jacking-up activities = 1,100m^2 (+ 10percent) The maximum major WTG component replacement is 350 events x 1,100m^2 footprint = 385,000m^2 *WTG access ladder replacement* Maximum of 450 ladder replacement events. The footprint of seabed disturbance for all events via jacking-up activities = 1,100m^2 (+ 10percent) The WTG access ladder and anode replacement are 450 events x 1,100m^2 footprint = 506,000m^2 *Wind WTG anode replacement*	

Project phase and activity/impact	Maximum parameters	Maximum assessment assumptions	Justification
		Maximum of 450 anode replacement events. The footprint of seabed disturbance for all events via jacking-up activities = 1,100m^2 (+ 10percent) *WTG J-tube replacement or modification* Maximum of 180 J-tube replacement or modification. The footprint of seabed disturbance for all events via jacking-up activities = 1,100m^2 (+ 10percent) The WTG J-tube replacement or modification is 180 events x 1,100m^2 footprint = 198,000m^2 **Offshore substation and accommodation** *Offshore substation platform major component replacement* Maximum of 27 exchange events (9 per platform). The footprint of seabed disturbance for all events via jacking-up activities = 1,100m^2 (+ 10percent)	

Project phase and activity/impact	Maximum parameters	Maximum assessment assumptions	Justification
		The offshore substation platform major component replacement is 27 events x 1,100m^2 footprint = 29,700m^2 *Offshore platform access ladder replacement* Maximum of 30 ladder replacement events (assumes 3 platforms, 2 ladders per platform). The footprint of seabed disturbance for all events via jacking-up activities = 1,100m^2 (+ 10percent) The offshore platform access ladder replacement is 30 events x 1,100m^2 footprint = 33,000m^2 *Offshore platform anode replacement* Maximum of 60 anode replacement events (assumes 4 legs on each of 3 platforms). The footprint of seabed disturbance for all events via jacking-up activities = 1,100m^2 (+ 10percent)	

Project phase and activity/impact	Maximum parameters	Maximum assessment assumptions	Justification
		The offshore platform anode replacement is 60 events x 1,100m^2 footprint = 66,200m^2 *Offshore platform J-Tube replacement* Maximum of 60 J-tube replacement or modification (assumes 2 per J-Tube over lifetime). The footprint of seabed disturbance for all events via jacking-up activities = 1,100m^2 (+ 10percent) The offshore platform J-Tube replacement is 60 events x 1,100m^2 footprint = 66,000m^2 **Array and export cables** Maximum of 14 remedial burial events. The maximum temporary footprint of seabed disturbance for array remedial burial events = 200,000m^2 Total footprint of seabed disturbance for array cable repairs via jacking-up activities = 1,100m^2.	

Project phase and activity/impact	Maximum parameters	Maximum assessment assumptions	Justification
		Total footprint of seabed disturbance for all array remedial burial events = 2,800,000m^2 (14 x 200,000m^2) Total footprint of seabed disturbance for array cable repairs = 6,600m^2 (6 x 1,100m^2). **Offshore export cable:** Maximum of 3 remedial burial events per cable (4 export cables). The maximum temporary footprint of seabed disturbance for all offshore cable corridor remedial burial events = 20,000m^2 Total footprint of seabed disturbance for all export cable repairs via jacking-up activities = 1,100m^2 The maximum temporary footprint of seabed disturbance for all export cable corridor remedial burial events = 240,000m^2 (3 per cable (4 cables) x 20,000m^2)	

Project phase and activity/impact	Maximum parameters	Maximum assessment assumptions	Justification
		Total footprint of seabed disturbance for all export cable repairs via jacking-up activities = 4,400m^2 (4 x 1,100m^2).	
Changes to seabed habitats arising from effects on physical processes, including scour effects and changes in the sediment transport and wave regimes resulting in potential effects on benthic communities	See maximum design scenario presented in **Chapter 6: Coastal processes, Volume 2** of the ES (Document Reference: 6.2.6)		This impact is defined by any anticipated changes to physical processes as defined in **Chapter 6: Coastal processes, Volume 2** of the ES (Document Reference: 6.2.6).
Colonisation of the WTGs and scour/cable protection may affect benthic ecology and biodiversity	Maximum water depth in array area = 65m Maximum number of WTG = 90 Maximum number of Offshore Substations = up to 3	The total area of introduced hard substrate at seabed level (scour and cable protection) = 1,390,900m^2 Total surface area of introduced hard substrate in the water column for monopiles: 31.4m^2 per m of water depth x 65 x 90 = 183,690m^2 Total surface area of introduced hard substrate in the water column for offshore substation: 38m^2 per m of water depth x 65 x 3 = 7,410m^2	The maximum design scenario is defined by the maximum area of structures, scour protection, cable protection and cable crossings introduced to the water column, including surface area of vertical structures.

Project phase and activity/impact	Maximum parameters	Maximum assessment assumptions	Justification
		Therefore, the total surface area of introduced hard substrate in the water column = 1,582,000m^2	
Increased risk of introduction or spread of marine INNS due to presence of infrastructure and vessel movements (e.g. the discharge of ballast water) may affect benthic ecology and biodiversity		**Total surface area of introduced hard substrate in the water column** = 1,582,000m^2 **Total of number of vessel return trips per year:** Jack-up WTG visits (per year) = 10 Jack-up platform visits (per year) = 9 Crew transfer vessels WTG visits (per year) = 850 Total number of vessel trips over the lifetime of the Proposed Development (30 years) = 26,070	Defined by the maximum surface area introduced into the water column as described maximum design scenario with regards to maximum number of vessel movements during operation and maintenance activities.
Indirect disturbance arising from the accidental release of pollutants	Synthetic compound, heavy metal and hydrocarbon contamination resulting from operation and maintenance of up to 90 WTGs and up to three offshore substations. Accidental		This presents the maximum design scenario with regards to vessel movement during the operational period.

Project phase and activity/impact	Maximum parameters	Maximum assessment assumptions	Justification
	pollution may also result from the number of vessel return trips over the approximate 30-year design lifetime.		
Indirect disturbance arising from EMF generated by the current flowing through the cables buried to less than 1.5m below the surface	**WTGs** 90 WTGs **Array Cables** Up to 250km of array cable, **Interconnector Cables** Up to 50km of interconnector cable (two cables approximately 25km in length) **Offshore Export Cables** Length of cable corridor 170km (four cables approximately 19km length each in corridor)	**Array Cables** Array cable operating at a maximum of 132kV **Interconnector Cables** interconnector cable operating up to 275Kv Array and interconnector cables target cable depth = 1m **Offshore Export Cables** Offshore export cables operating up to 275kV Target cable depth = <1.5m	The maximum design scenario is associated with the greatest length of inter-array cable and four export cables as this results in the longest total length of export cable.
Decommissioning[27]			

[27] The approach to decommissioning will be detailed in the Decommissioning Plan, which will be developed to cover the decommissioning phase as required under Chapter 3 of the Energy Act 2004. It is noted that Decommissioning Plan will be subject to best practice at the time of decommissioning and surveys conducted to assess the quality of the communities established and a decision on infrastructure removal made in conjunction with the statutory authorities and key stakeholders.

Project phase and activity/impact	Maximum parameters	Maximum assessment assumptions	Justification
Habitat disturbance from decommissioning of foundations, cables and rock protection		**Total seabed disturbance** = 12,479,000m^2 **Interconnector cable** Total seabed disturbance = 1,000,000m^2 **Array cable** Total seabed disturbance = 6,250,000m^2 **Array and interconnector cables** Maximum rock protection area for array cable crossing = 10,000m^2 per crossing (four crossing expected). Maximum rock protection area for array cables (based on 20percent of cable requiring protection) = 300,000m^2 Maximum rock protection area for interconnector cables (based on 20percent of cable requiring protection) = 122,000m^2	Maximum design scenario is assumed to be similar to the construction phase, with all infrastructure removed in reverse-construction order. The removal of cables and rock protection is considered the maximum design scenario, however the necessity to remove cables and rock protection will be reviewed at the time of decommissioning. Removal will be subject to agreement with key stakeholders as part of the decommissioning programme.

Project phase and activity/impact	Maximum parameters	Maximum assessment assumptions	Justification
		Array and interconnector cable crossings: Cable crossings = 40,000m^2 **Offshore export cable** Total seabed disturbance = 4,250,000m^2 Maximum rock protection area for export cables = 517,000m^2	
Temporary increase in suspended sediment and sediment deposition from decommissioning of foundations, cables, and rock protection	The impacts are expected to be equivalent to construction apart from the structures that may remain (e.g. cable protection measures to be removed but not cables)[28]		Maximum design scenario is assumed to be as per the construction phase, with all infrastructure removed in reverse-construction order. The removal of cables is considered the maximum design scenario, however the necessity to remove cables will be reviewed at the time of decommissioning. Removal will be subject to agreement with key stakeholders as part of the decommissioning plan.

[28] It is noted that this will be subject to best practice at the time of decommissioning and surveys conducted to assess the quality of the communities established and a decision on their removal made in conjunction with the statutory authorities.

Project phase and activity/impact	Maximum parameters	Maximum assessment assumptions	Justification
Direct and indirect seabed disturbances leading to the release of sediment contaminants	As above for construction impacts.		This scenario represents the maximum total seabed disturbance and therefore the maximum amount of contaminated sediment that may be released into the water column. Maximum design scenario as per the construction phase and assumes the removal of all foundations and buried subtidal and intertidal cables.
Increased risk of introduction or spread of marine INNS may affect benthic ecology and biodiversity	As above for construction impacts. The removal of introduced hard substrate from the water column, which will be a positive impact apart from the structures that may remain (e.g. cable protection measures to be removed but not cables)		Maximum design scenario for vessel return trips as per construction.
Indirect disturbance arising from the accidental release of pollutants	Synthetic compound, heavy metal and hydrocarbon contamination resulting from the decommissioning of a maximum of 90 WTGs and up to three offshore substations. Potential contamination in the intertidal resulting from machinery use and vehicle movement.		Maximum design scenario as per construction phase.

Embedded environmental measures

9.7.3 As part of the Rampion 2 design process, a number of embedded environmental measures have been adopted to reduce the potential for impacts on benthic subtidal and intertidal ecology. These embedded environmental measures have evolved over the development process as the EIA has progressed and in response to consultation.

9.7.4 These measures also include those that have been identified as good or standard practice and include actions that will be undertaken to meet existing legislation requirements. As there is a commitment to implementing these embedded environmental measures, and also to various standard sectoral practices and procedures, they are considered inherently part of the design of Rampion 2 and are set out in this ES.

9.7.5 **Table 9-16** sets out the relevant embedded environmental measures within the design and how these affect the benthic subtidal and intertidal ecology assessment.

Table 9-16 Relevant benthic subtidal and intertidal ecology embedded environmental measures

ID	Environmental measure proposed	Project phase measure introduced	How the environmental measures will be secured	Relevance to benthic subtidal and intertidal ecology assessment
C-41	The subsea inter-array cables will typically be buried at a target burial depth of 1m below the seabed surface. The final depth of the cables will be dependent on the seabed geological conditions and the risks to the cable (e.g. from anchor drag damage).	Scoping	DCO requirements or deemed Marine Licence (dML) conditions.	This measure will reduce the risk of EMF impacts on sensitive receptors and requirements for cable protection.
C-43	The subsea export cable ducts will be drilled underneath the beach using horizontal directional drilling (HDD) techniques.	Scoping	DCO requirements or dML conditions.	This measure will avoid direct impacts to intertidal designated sites associated with the offshore export cable corridor.

ID	Environmental measure proposed	Project phase measure introduced	How the environmental measures will be secured	Relevance to benthic subtidal and intertidal ecology assessment
C-44	An **Outline Scour Protection and Cable Protection Plan** (Document Reference: 7.12) has been submitted with this application, and includes details of the need, type, quantity and installation methods for scour protection. A Final Scour Protection and Cable Protection Plan will be completed prior to construction commencing and submitted to the Marine Management Organisation (MMO) for approval.	Scoping, updated for ES	DCO requirements or dML conditions.	This measure will reduce where possible temporary habitat disturbance.
C-45	Where possible, subsea cable burial will be the preferred option for cable protection. Cable burial will be informed by the cable burial risk assessment and detailed within the Cable Specification and Installation Plan.	Scoping	DCO requirements or dML conditions.	This measure will reduce the risk of EMF impacts on sensitive receptors and requirements for cable protection.
C-53	An Outline Marine Pollution Contingency Plan (MPCP) has been submitted with this Application as Appendix A of the **Outline Project Environmental Management Plan** (Application Document Reference: 7.11). This Outline MPCP provides details of procedures to protect personnel working and to safeguard the marine environment and mitigation measures in the event of an accidental pollution event	Scoping, updated for ES	DCO requirements or dML conditions.	This measure will minimise the risk of accidental pollution associated with the Proposed Development on sensitive receptors.

ID	Environmental measure proposed	Project phase measure introduced	How the environmental measures will be secured	Relevance to benthic subtidal and intertidal ecology assessment
	arising from offshore operations relating to Rampion 2. The Final MPCP will include relevant key emergency contact details.			
C-65	The proposed offshore cable corridor and cable landfall (below mean high water springs [MHWS]) will avoid all statutory marine designated areas.	Scoping	DCO requirements or dML conditions.	This measure will reduce the risk of disturbance on sensitive receptors within statutory marine designated areas.
C-95	The assessment has taken into consideration the mitigation and control of invasive species measures, this has been incorporated into the **Outline Project Environmental Management Plan** (PEMP) (Document Reference: 7.11).	Scoping	DCO requirements or dML conditions.	This measure will reduce where possible the risk of introducing invasive species into the region.
C-96	Subsea array and export cables will be installed via either ploughing, jetting, trenching, or post-lay burial techniques, to a target burial depth of 1m.	Scoping	DCO requirements or dML conditions.	This measure will reduce the risk of EMF impacts on sensitive receptors and requirements for cable protection.
C-111	A Decommissioning Plan will be prepared for the project in line with the latest relevant available guidance.	ES	DCO requirements or dML conditions.	This measure will be developed to cover the decommissioning phase and will minimise impact on benthic, subtidal and intertidal ecology

ID	Environmental measure proposed	Project phase measure introduced	How the environmental measures will be secured	Relevance to benthic subtidal and intertidal ecology assessment
				receptors, where appropriate.
C-269	Cable routeing design will be developed to ensure micrositing where possible to identify the shortest feasible path avoiding subtidal chalk and reef features and areas considered to potentially support black seabream nesting.	ES	DCO requirements or dML conditions	In relation to benthic ecology this measure will be of direct benefit to subtidal chalk outcrops and *S. spinulosa* reef.
C-270	As part of the routeing design, a working separation distance (buffer) will be maintained wherever possible from sensitive features, notably black seabream nesting areas, as informed by the outputs of the physical processes assessment, to limit the potential for impacts to arise (direct or indirect).	ES	DCO requirements or dML conditions	In relation to benthic ecology this measure will be of direct benefit to subtidal chalk outcrops and *S. spinulosa* reef.
C-271	The offshore export cable routeing design will target areas of the seabed that enable maximising the potential for cables to be buried, thus providing for seabed habitat recovery in sediment areas and reducing the need for secondary protection and consequently minimising any potential for longer-term residual effects.	ES	DCO requirements or dML conditions	This measure will be of direct benefit to benthic subtidal habitats by minimising and managing total impact.
C-272	Adoption of specialist offshore export cable laying and installation techniques	ES	DCO requirements	This measure will be of direct benefit to benthic

ID	Environmental measure proposed	Project phase measure introduced	How the environmental measures will be secured	Relevance to benthic subtidal and intertidal ecology assessment
	will minimise the direct and indirect (secondary) seabed disturbance footprint to reduce impacts, which will provide mitigation of impacts to all seabed habitats, but particularly chalk and reef areas as well as potential (unknown) black seabream nesting locations, where avoidance is not possible. The Applicant will seek to utilise the most appropriate technology available at the time of construction to reduce the direct footprint impact from cutting machinery.		or dML conditions	subtidal habitats by minimising and managing total impact.
C-279	As part of the construction method statement, RED will produce a foundation installation methodology, including a dredging protocol, drilling methods and disposal of drill arisings and material extracted.	ES	DCO requirements or dML conditions	This measure will be of direct benefit to benthic subtidal habitats by minimising and managing total impact.
C-283	Gravel bags laid on the seabed to protect the cable barge during construction of Rampion 2, will be removed prior to the completion of construction, where practicable.	ES	DCO requirements or dML conditions	This measure will minimise and total impact to benthic subtidal habitats.

9.7.6 Further detail on the embedded environmental measures in **Table 9-16** is provided in the **Commitments Register** (Application Document Reference: 7.23) which sets out how and where particular environmental measures will be implemented and secured.

9.8 Methodology for ES assessment

Introduction

9.8.1 The project-wide generic approach to assessment is set out in **Chapter 5: Approach to the EIA, Volume 2** of the ES (Document Reference: 6.2.5). The assessment methodology for benthic subtidal and intertidal ecology for the ES is consistent with that provided in the Scoping Report (RED, 2020) and no changes have been made since the scoping phase. Further method statements in relation to benthic subtidal and intertidal ecology were also submitted to stakeholders and agreed through the EIA EPP. These methodologies were incorporated into the and PEIR (RED, 2021) methodology sections (**Sections 9.5** and **9.8**) provided alongside Statutory Consultation and have been included in this ES section.

9.8.2 The assessment of potential impacts upon benthic subtidal and intertidal receptors is based on the maximum design scenario as identified from the design envelope (see **Chapter 4: The proposed development, Volume 2** of the ES (Document Reference: 6.2.4)). The key assumptions are the layout of the wind farm array, the number and size of offshore structures, the type and size of foundations used, as well as the timing and duration of the proposed offshore works (see **Table 9-15**).

9.8.3 Cumulative effects have been assessed by taking into consideration all other relevant developments, proposed or existing, that are in the vicinity of the proposed DCO Order Limits and which have the potential to affect the same receptors. Where other developments are expected to be completed prior to the construction of the Proposed Development, and the effects of these developments are fully determined, the effects arising from the developments have been considered as part of the baseline and may also be considered as part of the construction and operational cumulative assessment. Developments forming part of the dynamic baseline, and those included in the cumulative assessment have been identified in **Section 9.12**.

Impact assessment criteria

9.8.4 The criteria for determining the significance of effects is a two-stage process that involves defining the sensitivity of the receptors and the magnitude of the impacts. This section describes the criteria applied in this chapter to assign values to the sensitivity of receptors and the magnitude of potential impacts.

9.8.5 In line with the Chartered Institute of Ecology and Environmental Management (CIEEM) guidance (CIEEM, 2018), the sensitivities of different biotopes have been classified by the Marine Life Information Network (MarLIN) on the Marine Evidence based Sensitivity Assessment (MarESA) scale (MarLIN, 2021). The scale takes account of the resistance and recoverability (resilience) of a species or biotope in response to a stressor. Specific benchmarks (duration and intensity) are defined for the different impacts for which sensitivity has been assessed (e.g. smothering, abrasion, habitat alteration etc.). Detailed information on the benchmarks used

and for further information on the definition of resistance and resilience can be found on the MarLIN website[29].

9.8.6 For the purposes of this assessment, four sensitivity categories have been defined, each drawing on the four MarLIN MarESA categories (**Table 9-17**). The values for the MarESA criteria and the assessment sensitivity values are therefore the same.

Table 9-17 Definition of terms relating to the sensitivity of the receptor

Sensitivity	Definition used in this chapter
High	Equivalent to MarLIN MarESA sensitivity category 'High', whereby: The habitat or species is noted as exhibiting 'None' or 'Low' resistance (tolerance) to an external factor, whether that arises from natural events or human activities, and is expected to recover only over very extended timescales i.e. > 25 years or not at all (resilience is 'Very Low'); OR The habitat or species is noted as exhibiting 'None' or 'Low' resistance (tolerance) to an external factor, whether that arises from natural events or human activities, and is expected to recover only over very extended timescales i.e. > 10 or up to 25 years (resilience is 'Low').
Medium	Equivalent to MarLIN MarESA sensitivity category 'Medium', whereby: The habitat or species is noted as exhibiting 'None' or 'Low' resistance (tolerance) to an external factor, whether that arises from natural events or human activities, and is expected to recover over medium timescales i.e. > 2 or up to ten years (resilience is 'Medium'); OR The habitat or species is noted as exhibiting 'None' resistance (tolerance) to an external factor, whether that arises from natural events or human activities, and is expected to recover over < 2 years (resilience is 'High'); OR The habitat or species is noted as exhibiting 'Medium' resistance (tolerance) to an external factor, whether that arises from natural events or human activities, and is expected to recover over medium to very long timescales, i.e. > 2 years or up to 25 years or not at all (resilience is 'Medium', 'Low' or 'Very Low').
Low	Equivalent to MarLIN MarESA sensitivity category 'Low', whereby:

[29] https://www.marlin.ac.uk/sensitivity/sensitivity_rationale

Sensitivity	Definition used in this chapter
	'The habitat or species is noted as exhibiting 'Low' or 'Medium' resistance (tolerance) to an external factor, whether that arises from natural events or human activities, and is expected to recover over < 2 years (resilience is 'High'); OR The habitat or species is noted as exhibiting 'High' resistance (tolerance) to an external factor, whether that arises from natural events or human activities, and is expected to recover over medium to very long timescales, i.e. > 2 years or up to 25 years or not at all (resilience is 'Medium', 'Low' or 'Very Low').
Negligible	Equivalent to MarLIN MarESA sensitivity category 'Not Sensitive', whereby: The habitat or species is noted as exhibiting 'High' resistance (tolerance) to an external factor, whether that arises from natural events or human activities, and is expected to recover over short timescales, i.e. <2 years (resilience is 'High')

9.8.7 The criteria for defining magnitude in this chapter are outlined in **Table 9-18** below. The magnitude of potential impacts is defined by a series of factors, including the spatial extent of any interaction, the likelihood, frequency and duration of a potential impact.

Table 9-18 Definition of terms relating to the magnitude of impact

Magnitude of impact	Definition used in this chapter
Major	Fundamental, permanent / irreversible changes, over the whole receptor, and/or fundamental alteration to key characteristics or features of the particular receptors character or distinctiveness.
Moderate	Considerable, permanent / irreversible changes, over the majority of the receptor, and/or discernible alteration to key characteristics or features of the particular receptors character or distinctiveness.
Minor	Discernible, temporary (throughout Proposed Development duration) change, over a minority of the receptor, and/or limited but discernible alteration to key characteristics or features of the particular receptors character or distinctiveness.
Negligible	Receptor is not vulnerable to impacts regardless of value/ importance.

9.8.8 The significance of the effect upon benthic subtidal 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 9-19**. Where a range of significance of effect is presented in **Table 9-19**, the final assessment for each effect is based upon expert judgement.

9.8.9 For the purposes of this assessment, any effects with a significance level of minor or less have been concluded to be not significant in terms of the EIA Regulations.

Table 9-19 Matrix used for the assessment of the significance of the effect

		Magnitude			
		Major	**Moderate**	**Minor**	**Negligible**
Sensitivity	**High**	Major (Significant)	Major (Significant)	Moderate (Potentially significant)	Minor (Not significant)
	Medium	Major (Significant)	Moderate (Potentially significant)	Minor (Not significant)	Minor (Not significant)
	Low	Moderate (Potentially significant)	Minor (Not significant)	Minor (Not significant)	Negligible (Not significant)
	Negligible	Minor (Not significant)	Minor (Not significant)	Negligible (Not significant)	Negligible (Not significant)

9.9 Assessment of effects: Construction phase

Introduction

9.9.1 The impacts of offshore construction of the Proposed Development have been assessed on benthic subtidal and intertidal ecology. A description of the potential effects on benthic subtidal and intertidal ecology receptors caused by each identified impact is given below.

Habitat disturbance in the Rampion 2 array area and offshore cable corridor from construction activities

Magnitude of impact

9.9.2 The total maximum area of subtidal habitat disturbance due to construction activities described in **Table 9-15** is predicted to be up to approximately 30.28km^2. This equates to approximately 14 percent of the total seabed area within the proposed DCO Order Limits. It should be noted that the maximum design scenario presents a precautionary approach to habitat disturbance because it counts both the total footprint of seabed clearance as well as cable burial across both the array and offshore export cable corridor. This approach effectively counts the footprint of seabed habitat to be impacted by construction in the same area twice in some instances. However, this precautionary approach has been taken because there is some potential for recovery of habitats between the activities due to Proposed Development timescales.

9.9.3 Of the total area of habitat loss described in **Table 9-15**, a maximum of approximately 23.62km^2 is predicted to be temporarily lost/disturbed within the proposed DCO Order Limits area as a result of seabed preparations for foundations, jack-up barge operations and the installation and burial of inter-array cables (including associated anchor placements). This equates to 15% of the total seabed area within the proposed DCO Order Limits array area.

9.9.4 Of the total habitat loss/disturbance described in **Table 9-15**, a maximum of approximately 8.97km^2 will be temporarily disturbed within the subtidal areas of the proposed DCO Order Limits offshore export cable corridor as a result of seabed preparation, offshore substation installation, export cable installation, burial and jointing. This equates to approximately 15.3% of the total seabed area within the proposed DCO Order Limits offshore export cable corridor. Any potential permanent loss have been considered in **Section 9.10**, **paragraph 9.10.1** to **paragraph 9.10.5**.

9.9.5 Given that the benthic habitats that characterise the proposed DCO Order Limits are not geographically restricted to within the proposed development area and are typically widespread throughout the eastern English Channel region (as described in **Section 9.6**), the habitat disturbance during construction activities will have an impact on a limited footprint compared to their overall extent. The magnitude of habitat disturbance relating to construction activities on benthic subtidal receptors is therefore considered to be **minor**, indicating that the potential is for localised disturbance and/or loss of habitat that does not threaten the long-term viability of the resource.

9.9.6 The magnitude of the impact on known chalk habitat within the offshore export cable corridor during construction is classified as **minor**. Whilst this impact is classified as potential permanent change to the habitat due to cable installation activities the impact is still expected to be very localised compared to the overall extent of this feature within the wider region, particularly as methods of constraining this impact will be applied as detailed in **paragraph 9.9.16**.

9.9.7 As noted in the project description as provided in **Chapter 4: The Proposed Development, Volume 2** of the ES (Document Reference: 6.2.4) and within

Table 9-16, there is a commitment made for HDD (C-43). Therefore, no habitat disturbance will occur within the intertidal area from export cable installation as the two HDD works exit pits will be located within the subtidal area and will be discrete in nature. Therefore, the magnitude that habitat disturbance relating to construction activities at the Proposed Development will have on benthic intertidal receptors is considered to be **negligible**.

Sensitivity of receptor

9.9.8 The sensitivity of all subtidal biotopes that have been predicted to characterise the proposed DCO Order Limits (**Section 9.6**) have been assessed according to the detailed MarESA sensitivity assessments (**Table 9-20**). This assessment has determined that all biotopes have a ‘low’ to ‘medium’ sensitivity to a disturbance of this nature. As detailed within the baseline characterisation (**Section 9.6**), comparable habitats are distributed within the wider region and eastern English Channel. Therefore, given the relatively small spatial scales for the total habitat disturbance outlined above, this loss is not expected to undermine regional ecosystem functions or diminish biodiversity.

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Table 9-20 MarESA assessment for benthic subtidal habitats for abrasion/disturbance

Biotope code (JNCC and EUNIS)	Biotope name	MarESA sensitivity assessment	Assessment confidence
A5.131/ SS.SCS.ICS.SSh[30]	Sparse fauna on highly mobile sublittoral shingle (cobbles and pebbles)	Not sensitive (based on a low resistance and high resilience)	Confidence is high as the assessment is based on peer reviewed papers, although the assessment was based on similar pressures on the feature.
A5.141/ SS.SCS.CCS.SpiB[31]	*S. triqueter* with barnacles and bryozoan crusts on unstable circalittoral cobbles and pebbles	Low (based on a high resistance and high resilience)	Confidence is high as the assessment is based on peer reviewed papers and the assessment is based on the same pressures acting on the same type of feature in the UK.
A5.142/ SS.SCS.CCS.MedLumVen[32]	*M. fragilis*, *Lumbrineris* species and venerid bivalves in circalittoral coarse sand or gravel	Low (based on a medium resistance and high resilience)	Confidence is high as the assessment is based on peer reviewed papers, although the assessment was based on similar pressures on the feature.
A5.231/ SS.SSa.IFiSa.IMoSa[33]	Infralittoral mobile clean sand with sparse fauna	Low (based on a low resistance and high resilience)	Confidence is high as the assessment is based on peer reviewed papers, although the assessment was based on similar pressures on the feature.

[30] https://www.marlin.ac.uk/habitats/detail/1080
[31] https://www.marlin.ac.uk/habitats/detail/177
[32] https://www.marlin.ac.uk/habitats/detail/382
[33] https://www.marlin.ac.uk/habitats/detail/262

Biotope code (JNCC and EUNIS)	Biotope name	MarESA sensitivity assessment	Assessment confidence
A5.233/ SS.SSa.IFiSa.NcirBat[34]	*N. cirrosa* and *Bathyporeia* species in infralittoral sand	Low (based on a low resistance and high resilience)	Confidence is high as the assessment is based on peer reviewed papers; however, the assessment is based on proxies for pressures.
A5.261/ SS.SSa.CMuSa.AalbNuc[35]	*A. alba* and *N. nitidosa* in circalittoral muddy sand or slightly mixed sediment	Low (based on a medium resistance and high resilience)	Confidence is low as the assessment is based on expert judgement and therefore a baseline is not available.
A5.431/ SS.SMx.IMx.CreAsAn[36]	*C. fornicata* with ascidians and anemones on infralittoral coarse mixed sediment	Low (based on a low resistance and high resilience)	Confidence is medium as the assessment is based on some peer reviewed papers but also relies on grey literature and relies on similar pressures on the feature.
A5.422/ SS.SMx.SMxVS.CreMed[37]	*C. fornicata* and M. *fragilis* in variable salinity infralittoral mixed sediment	Low (based on a low resistance and high resilience)	Confidence is medium as the assessment is based on some peer reviewed papers but also relies on grey literature and relies on similar pressures on the feature.
A5.444/ SS.SMx.CMx.FluHyd[38]	*F. foliacea* and *H. falcata* on tide-swept circalittoral mixed sediment	Medium (based on low resistance and medium resilience)	Confidence is medium as the assessment is based on some peer reviewed papers

[34] https://www.marlin.ac.uk/habitats/detail/154
[35] https://www.marlin.ac.uk/habitats/detail/62
[36] https://www.marlin.ac.uk/habitats/detail/1139
[37] https://www.marlin.ac.uk/habitats/detail/52
[38] https://www.marlin.ac.uk/habitats/detail/74

Biotope code (JNCC and EUNIS)	Biotope name	MarESA sensitivity assessment	Assessment confidence
			but also relies on grey literature and relies on similar pressures on the feature.
A5.611/ SS.SBR.PoR.SspiMx[39]	*S. spinulosa* on stable circalittoral mixed sediment	Medium (based on low resistance and medium resilience)	Confidence is low as the assessment is based on expert judgement and therefore a baseline is not available.
A4.131/ CR.HCR.XFa.ByErSp[40]	Bryozoan turf and erect sponges on tide-swept circalittoral rock	Medium (based on low resistance and medium resilience)	Confidence is medium as the assessment is based on some peer reviewed papers but also relies on grey literature and relies on similar pressures on the feature.
A4.134/ CR.HCR.XFa.FluCoAs[41]	*F. foliacea* and colonial ascidians on tide-swept moderately wave exposed circalittoral rock	Low (based on a medium resistance and high resilience)	Confidence is medium as the assessment is based on some peer reviewed papers but also relies on grey literature and relies on proxies for pressures.
A4.139/ CR.HCR.XFa.SpAnVt[42]	Sponges and anemones on vertical circalittoral bedrock	Medium (based on low resistance and medium resilience)	Confidence is low as the assessment is based on expert judgement and therefore a baseline is not available.
A4.214 CR.MCR.EcCr.FaAlCr[43]	Faunal and algal crusts on exposed to moderately	Low (based on a medium resistance and high resilience)	Confidence is high as the assessment is based on peer reviewed papers and the

[39] https://www.marlin.ac.uk/habitats/detail/377
[40] https://www.marlin.ac.uk/habitats/detail/9
[41] https://www.marlin.ac.uk/habitats/detail/1096
[42] https://www.marlin.ac.uk/habitats/detail/1129
[43] https://www.marlin.ac.uk/habitats/detail/337

Biotope code (JNCC and EUNIS)	Biotope name	MarESA sensitivity assessment	Assessment confidence
	wave-exposed circalittoral rock		assessment is based on the same pressures acting on the same type of feature in the UK.
A4.221 CR.MCR.CSab.Sspi[44]	*S. spinulosa* encrusted circalittoral rock	Medium (based on low resistance and medium resilience)	Confidence is low as the assessment is based on expert judgement and relies on proxies for pressures.
A4.231/ CR.MCR.SfR.Pid[45]	Piddocks with a sparse associated fauna in sublittoral very soft chalk or clay	Medium (based on medium resistance and very low resilience)	Confidence is low as the assessment is based on expert judgement and therefore a baseline is not available.
A3.215/ IR.MIR.KR.Lhyp.Sab[46]	*S. spinulosa* with kelp and red seaweeds on sand-influenced infralittoral rock	Medium (based on low resistance and medium resilience)	Confidence is medium as the assessment is based on some peer reviewed papers but also relies on grey literature and relies on similar pressures on the feature.

44 https://www.marlin.ac.uk/habitats/detail/1169
45 https://www.marlin.ac.uk/habitats/detail/152
46 https://www.marlin.ac.uk/habitats/detail/144

9.9.9 As demonstrated in **Table 9-20** above, the sandy sediment communities were all determined as having a 'low' sensitivity. These biotopes are typical of high energy environments and are therefore naturally subject to, and tolerant of, high levels of physical disturbance. The communities that predominantly characterise these biotopes include infaunal mobile species such as polychaetes and bivalves that are able to re-bury. Such species can re-enter the substratum following habitat disturbance. The recoverability of such communities is likely to occur as a result of the combination of recruitment from surrounding unaffected areas and larval dispersal, and recovery is likely to occur within one to ten years (based on the MarESA assessments).

9.9.10 Further evidence to support recovery is supported by research at aggregate extraction sites, where it was reported that the characteristic recovery time for typical sand communities may be two to three years, following cessation of dredging activity (Newell *et al*., 2004). Research indicated that following the initial suppression of species' diversity, abundance and biomass recovery of species' diversity to within 70 to 80% of that in non-dredged areas was achieved within 100 days (Newell *et al*., 2004). Species' abundance also recovered within 175 days (Newell *et al*., 2004). It is important to acknowledge however, that the activities associated with aggregate extraction are different to those associated with offshore wind farm construction activities (for instance, they involve the complete removal of sediment). Data collated from more analogous activities such as the burial of telecommunications cables, as well as the monitoring of offshore wind farms indicate that recovery is rapid with limited, if any, with significant effects being discernible (Foden *et al*., 2011).

9.9.11 Abrasion of coarse sediments and hard substrata is likely to disturb epifauna and may damage a proportion of the characterising species, which is why resistance is recorded as either 'low' or 'medium', for these habitat types. However, opportunistic species are likely to recruit rapidly, and some damaged characterising species may recover or recolonise, resulting in a high resilience (see **Table 9-20**). Impacts to the epibenthic community from the construction of Rampion 1 offshore wind farm noted that the taxa diversity and abundance increase between pre- and postconstruction, with high abundances of green sea urchin (*Psammechinus miliaris*), common starfish (*A. rubens*) and brittle stars (*Ophiura* species), however, no significant changes were observed in taxa diversity between treatment areas and seasons (OEL, 2020b).

9.9.12 The biotope 'Piddocks with a sparse associated fauna in sublittoral very soft chalk or clay (A4.231)' is present within the array area specifically in relation to Worthing Lumps LWS (see **Table 9-13**) and has been identified within offshore export cable corridor through the geophysical survey (Gardline, 2020) and the habitat model (see **Table 9-11** and **paragraph 9.6.12**). Piddocks are afforded some protection from surface abrasion due to the species inhabiting burrows, however where abrasion or disturbance impacts occur deeper than the surface of the soft rock, individuals inhabiting the chalk or clay are vulnerable to damage. The MarSEA data highlight that sensitivity in relation to physical seabed change for this habitat is 'high', albeit with a low confidence based on lack of evidence (Tillin and Hill, 2016). Whilst denuded areas of exposed chalk will likely be recolonised by piddocks once construction activities have ceased, where removal of chalk or clay results in a loss of exposed soft substratum, these specific parts of the substratum directly impacted cannot recover through natural processes. The resilience of this

biotope is therefore assessed as very low and whilst the MarESA assessment describes the sensitivity as 'medium' for abrasion and disturbance (**Table 9-20**), this assessment has been undertaken following a precautionary approach and have appraised its sensitivity as 'high' due to its nature conservation status and with the impact viewed as a permanent habitat disturbance rather than temporary.

9.9.13 The biotopes '*S. spinulosa* on stable circalittoral mixed sediment' (A5.611), '*S. spinulosa* encrusted circalittoral rock' (A4.221) and '*S. spinulosa* with kelp and red seaweeds on sand-influenced infralittoral rock (A3.215)' are described (**Table 9-20**) as having a 'medium' MarESA sensitivity to a disturbance of this nature. Observations of discrete patches of *S. spinulosa* reef within the DDV data were deemed to be low resemblance reef across the proposed DCO Order Limits, further detail of this assessment is presented in **Appendix 9.3: Offshore wind farm subtidal benthic characterisation survey report**, **Volume 4** of the ES (Document Reference: 6.4.9.3). The resistance of the characteristic species of these biotopes is regarded as low as abrasion at the surface of *S. spinulosa* crusts is likely to damage the tubes and result in sub-lethal and lethal damage to the worms. It is also likely to remove a proportion of the *Laminaria* species canopy (*Laminaria hyperborea* and *Laminaria digitata*), attached epiphytes, *Laminaria* holdfasts and understorey macroalgae (where present). However, the resilience of this biotope is regarded as medium, with the ability to recover within two to ten years (Hill, 2008; Tyler-Walters, 2007).

9.9.14 The sensitivity of the majority of benthic subtidal features of the proposed DCO Order Limits is therefore considered to be worst case **medium**, reflecting that the receptors have some ability to tolerate the potential impacts and could potentially recover to an acceptable status over a 10-year period. The sensitivity of the biotope 'Piddocks with a sparse associated fauna in sublittoral very soft chalk or clay (A4.231)' is considered **high** for physical disturbance and an impact of this nature is considered to be permanent.

Significance of residual effect

9.9.15 The direct impact of habitat disturbance will represent a local spatial extent, short term intermittent impact (for the majority of biotopes), affecting a relatively small portion of the benthic subtidal habitats in the proposed DCO Order Limits. However, it is noted that the proposed export cable corridor will enter a recently designated "no-trawling zone" (see **paragraph 9.6.36**) and a site for kelp restoration and protection (see **paragraph 9.6.37**). Although most benthic receptors are known to have a medium to high degree of tolerance to this impact, based on MarESA assessments, the sensitivity of the receptors has been assessed as worst-case **medium** (disregarding Piddocks with a sparse associated fauna in sublittoral very soft chalk or clay which is discussed in paragraph **9.9.16**), and the magnitude is **minor** for subtidal receptors. The short-term and localised nature of this impact and the tolerance and recoverability of the majority of the benthic receptors, the significance of the residual effect is deemed **minor adverse significance** (**not significant** in EIA terms).

9.9.16 The MarESA assessments identify that the confidence for the sensitivity of the biotope 'Piddocks with a sparse associated fauna in sublittoral very soft chalk or clay (A4.231)' to abrasion / disturbance is low. However, through the appraisal of available literature and expert knowledge we have assigned this biotope as having

a high sensitivity to direct construction impacts, particularly those associated with the offshore export cable, as the impact is regarded permanent due to the low recovery expectations. In the absence of mitigation there is the potential for significant effects to arise due to the sensitivity of the feature. However, the implementation of mitigation options (C-269, C-270, C-272, **Table 9-16**) whereby cable installation will be constrained to minimise the area of physical disturbance and interaction on chalk habitat will ensure a reduction in the magnitude of the impact to a **negligible** level for this feature. On this basis, and considering the **high** sensitivity of chalk, the residual effect significance will be **minor**, **not significant** in EIA terms.

Temporary increase in Suspended Sediment Concentration (SSC) and sediment deposition in the Rampion 2 array area and offshore cable corridor

Magnitude of impact

9.9.17 Temporary localised increases in SSC and associated sediment deposition are expected from foundation and cable installation works and seabed preparation works (including sandwave clearance). This assessment should be read in conjunction with **Chapter 6: Coastal processes, Volume 2** of the ES (Document Reference: 6.2.6) and **Appendix 6.3: Coastal processes technical report: Impact assessment, Volume 4** of the ES (Document Reference: 6.4.6.3) which provides a full description of the offshore physical environment assessment.

9.9.18 Background surface SSCs values within the study area typically range between 10 to 20mg/l during winter months and generally less than 4mg/l during the summer period. Surface turbidity is relatively low across the offshore array area, with monthly averaged concentrations typically less than 5mg/l across the whole year (Cefas, 2016). **Table 9-15** presents the maximum assessment assumptions associated with increases in SSC and deposition. The maximum design scenario for SSC and deposition during the construction phase of the Proposed Development will result in the total release of approximately 2,619,084m^3 of sediment and drill fluid in the proposed DCO Order Limits

9.9.19 **Table 9-21** details the maximum sediment plume distance and the peak increases in SSC and deposition that could occur because of construction activities and relates to individual plumes/activities.

9.9.20 Plumes, as a result of boulder clearance will be similar in nature to that described for ‘offshore trenching of cables’ in **Table 9-21**. The SSC, dimensions and duration of the plumes resulting from boulder clearance will be at most similar to, or relatively smaller than described for trenching activities.

9.9.21 Jack-up vessels might cause very localised and temporary plumes as their feet are lowered into and raised from the seabed. The volume of sediment disturbed will be relatively small compared to the other activities considered (proportional to the size and number of feet on the vessel). The SSC, dimensions and duration of the resulting plumes will be at most similar to, or relatively smaller than described for other activities.

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Table 9-21 Temporary increases in SSC and sediment deposition as a result of construction activities at Rampion 2

Construction impact	Location	Maximum sediment plume distance	Details of increase in SSC and deposition
Sandwave clearance Seabed preparation for foundations (overspill during active dredging using a trailing suction hopper dredger)	Offshore export cable corridor and array area	16km (springs) and 8km (neaps)	• Within small distances (<50m) of the dredger, SSC associated with overspill at the water surface during active dredging can be in the order of thousands to low tens of thousands of mg/l, reducing rapidly with time and distance (through settlement and dispersion) to the order of hundreds or tens of mg/l. • All SSC effects associated with overspill of sands during active dredging are expected to be spatially limited to within 150 to 500m of the dredger, settling to the seabed within 5 to 15 minutes following the surface release (depending on the local water depth and current speed). Effects associated with gravels are expected to be more limited (up to tens of metres and 0 to 1.5 minutes). • At 2km downstream during or shortly after active dredging, the concentration of any fine sediments persisting in suspension is expected to be less than approximately 100mg/l; at 5km downstream, this may have reduced to approximately 10mg/l. Concentrations of suspended fines will continue to reduce gradually over time through dispersion, to less than measurable levels (<10mg/l) within two to three days. • For the maximum design scenario of 90 smaller WTG jacket foundations and three OSP jackets, resulting from overspill, an average deposit thickness of 0.50m has been

Construction impact	Location	Maximum sediment plume distance	Details of increase in SSC and deposition
			calculated to occur over a maximum area of 16,950m^2 whilst an average deposit thickness of 0.05m has been calculated for an area of 169,503m^2. These relate to 0.01% and 0.09% of the total Rampion 2 Offshore Array area, respectively. • Fines are expected to become widely dispersed and so will not resettle with measurable thickness locally.
Sandwave clearance Seabed preparation for foundations (spoil disposal from a trailing suction hopper dredger)	Offshore export cable corridor and array area	16km (springs) and 8km (neaps)	• Approximately 90% of the total spoil volume in the hopper will descend directly to the seabed as a high-density discrete unit in the 'active phase' of the plume. This does not directly cause any meaningful change of SSC. The remaining 10% of material will form a more diffuse suspension in the 'passive phase' of the plume. • Within a few tens of metres, at the time of spoil release, very high passive phase plume concentrations are expected, up to hundreds of thousands to millions of mg/l initially, reducing to thousands of mg/l as the plume diffuses to a size of 100m or larger. • All SSC effects associated with sands and gravels in the passive phase of the plume are expected to be spatially limited to within 65 to 650m of the dredger, and temporally limited to 5 to 15 minutes following release (depending on the local water depth and current speed). Effects

Construction impact	Location	Maximum sediment plume distance	Details of increase in SSC and deposition
			associated with gravels are expected to be more limited (up to tens of metres and 0 to 1.5 minutes). • The concentration of any fine sediments persisting in suspension will vary in proportion to the dimensions of the plume as it is dispersed over time. A plume with a small footprint (100m) may have a maximum concentration in the order of thousands of mg/l, but when dispersed to a larger footprint (1000m) may have a maximum concentration in the order of low tens of mg/l. Concentrations of suspended fines will continue to reduce gradually over time through dispersion and deposition, to less than measurable levels (<10mg/l) within two to three days. • The final distribution of sediment on the seabed from the active phase cannot be predicted in advance, but the total volume, and therefore the area of effect for a given average thickness, is limited. If the average local thickness of deposition is 5cm, the maximum area of effect per spoil disposal event is approximately 198,000m^2, equivalent to a 500m diameter circle; if the average local thickness of deposition is 30cm, the maximum area of effect per spoil disposal event is approximately 33,000m^2, equivalent to a 200m diameter circle. In all cases, a relatively thicker deposit will have a smaller footprint and a relatively larger footprint will require a smaller average thickness. • Sands and gravels in the passive phase will also be advected by any tidal currents present as they settle to the

Construction impact	Location	Maximum sediment plume distance	Details of increase in SSC and deposition
			seabed, and so may or may not overlap the main active phase deposit. The additional deposit may contribute or may add up to approximately 10% to the area of effect for the given average thicknesses above, or 10% additional thickness for the same area, or a proportional combination of the two. • Fines in the passive phase are expected to become widely dispersed and so will not resettle with measurable thickness locally.
Offshore trenching for cables	Offshore export cable corridor and array area	16km (springs) and 8km (neaps)	• Within 5m of active trenching, very high plume concentrations are expected. SSC could be hundreds of thousands to millions of mg/l. • Within 100 to 200m downstream from active trenching (depending on the initial height of ejection and the local current speed) in a relatively narrow plume (up to tens of metres wide), mainly resuspended sands and gravels will cause high SSC in the order of thousands to tens of thousands of mg/l. However, the majority of such coarser sediments are expected to resettle to the seabed (reducing or ending any associated plume effects) within approximately 2 to 5 minutes of resuspension. • At 2km downstream during or shortly after active trenching, the concentration of any fine sediments persisting in suspension is expected to be less than approximately 100mg/l; at 5km downstream, this may have reduced to

Construction impact	Location	Maximum sediment plume distance	Details of increase in SSC and deposition
			approximately 50mg/l. Concentrations of suspended fines will continue to reduce gradually over time through dispersion, to less than measurable levels (<10mg/l) within two to three days. • The maximum expected average local thickness of deposition in the case of predominantly gravelly sediments is 30 to 60cm, over an area up to 5 to 10m downstream, along the length of the trench. • The maximum expected average local thickness of deposition in the case of predominantly sandy sediments is 3 to 6cm, over an area up to 100 to 200m downstream, along the length of the trench. • Fines are expected to become widely dispersed and so will not resettle with measurable thickness locally.
HDD exit pit preparations	Offshore export cable corridor	16km (springs) and 8km (neaps)	• Within 5m of active pit preparation (using dredging or trenching type techniques), very high plume concentrations are expected. SSC could be hundreds of thousands to millions of mg/l, but decreasing rapidly with distance, and with time following cessation of active works. • Within 100 to 200m downstream from active pit preparation (depending on the method and rate of excavation and the local current speed) in a relatively narrow plume (up to tens of metres wide), mainly resuspended sands and gravels will cause high SSC in the order of hundreds to thousands or

Construction impact	Location	Maximum sediment plume distance	Details of increase in SSC and deposition
			tens of thousands of mg/l. However, the majority of such coarser sediments are expected to resettle to the seabed (reducing or ending any associated plume effects) within approximately 2 to 5 minutes of resuspension. • At 2km downstream during or shortly after active trenching, the concentration of any fine sediments persisting in suspension is expected to be less than approximately 100mg/l; at 5km downstream, this may have reduced to approximately 50mg/l. Concentrations of suspended fines will continue to reduce gradually over time through dispersion, to less than measurable levels (<10mg/l) within two to three days. • The material excavated from the subtidal pits will be temporarily stored, either sidecast nearby or moved into a nearby spoil disposal area (e.g. the array area). The thickness and extent of the deposit will be variable depending on the method and nature of the deposition, but will be relatively small, in proportion to the total volume of the pits being excavated. The material in storage may be subject to redistribution by naturally occurring sediment transport during the storage period. • Any fully resuspended fines are expected to become widely dispersed and so will not resettle with measurable thickness locally.

Construction impact	Location	Maximum sediment plume distance	Details of increase in SSC and deposition
Drilling at foundations	Array area	16km (springs) and 8km (neaps)	• Within small distances (<50m) of the drilling, SSC associated with overspill at the water surface during active drilling can be in the order of thousands to low tens of thousands of mg/l, reducing rapidly with time and distance (through settlement and dispersion) to the order of hundreds or tens of mg/l. • All SSC effects associated with overspill of sands during active dredging are expected to be spatially limited to within 400 to 700m of the dredger, and temporally limited to the period of active dredging plus 10 to 25 minutes afterwards (depending on the local water depth and current speed). Effects associated with gravels are expected to be more limited (up to 100m and 1 to 5 minutes). • At 2km downstream during or shortly after active dredging, the concentration of any fine sediments persisting in suspension is expected to be less than approximately 1000mg/l; at 5km downstream, this may have reduced to approximately 300mg/l. Concentrations of suspended fines will continue to reduce gradually over time through dispersion, to less than measurable levels (<10mg/l) within two to three days. • Deposition thicknesses are comparable to and no more than described for spoil disposal from a trailing suction hopper dredger.

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9.9.22 To summarise the information presented above in **Table 9-21**, sediment plumes caused by seabed preparation and installation activities are expected to occur over a maximum distance of 16km (spring) from the source. Sediment plumes are expected to quickly dissipate after cessation of the activities, due to settling and wider dispersion with the concentrations reducing quickly over time (<25 minutes) to background levels. Sediment deposition will consist primarily of coarser sediments deposited close to the source, with a small proportion of silt deposition (reducing exponentially from source). **Figure 6.3.4** within **Appendix 6.3: Coastal processes technical report: Impact assessment, Volume 4** of the ES (Document Reference: 6.4.6.3) provides a useful schematic summarising the spatial extent of the impact zones associated with SSC and deposition in relation to Rampion 2. The figure details that the results of modelling can be summarised broadly in terms of four main zones of effect, based on the distance from the activity causing sediment disturbance:-

- 0 to 50m – zone of highest SSC increase and greatest likely thickness of deposition. All gravel sized sediment likely deposited in this zone, also a large proportion of sands that are not resuspended high into the water column, and also most or all dredge spoil in the active phase. Plume dimensions and SSC, and deposit extent and thickness, are primarily controlled by the volume of sediment released and the manner in which the deposit settles;
- 50 to 500m – zone of measurable SSC increase and measurable but lesser thickness of deposition. Mainly sands that are released or resuspended higher in the water column and resettling to the seabed whilst being advected by ambient tidal currents. Plume dimensions and SSC, and deposit extent and thickness, are primarily controlled by the volume of sediment released, the height of resuspension or release above the seabed, and the ambient current speed and direction at the time; and
- 500m to the tidal excursion buffer distance – zone of lesser but measurable SSC increase and no measurable thickness of deposition. Mainly fines that are maintained in suspension for more than one tidal cycle and are advected by ambient tidal currents. Plume dimensions and SSC are primarily controlled by the volume of sediment released, the patterns of current speed and direction at the place and time of release and where the plume moves to over the following 24 hours.

9.9.23 Further information on sediment plume distances and modelling are provided in **Chapter 6: Coastal processes, Volume 2** of the ES (Document Reference: 6.2.6) and **Appendix 6.3: Coastal processes technical report: Impact assessment, Volume 4** of the ES (Document Reference: 6.4.6.3).

9.9.24 Taking the above into consideration, it can be concluded that there will be a quick dissipation of the sediment plume and local nature (0-50m) of deposition impacts where smothering effects on benthic habitats and features might be observed. The impact of increased SSC and deposition from construction activities is therefore expected to be short-term, intermittent and of relatively localised extent, the magnitude of the impact on all VERs is assessed as being **minor**.

9.9.25 Increased SSC and deposition are likely to occur where the array area is near the Offshore Overfalls MCZ and where the offshore export cable corridor is in relatively close proximity to the Kingmere MCZ. However, as detailed above, these

impacts will be limited at the outer 500m zone of effect (> 500m there will be no expected deposition).

9.9.26 **Figure 6.3.4** (Document Reference: 6.3.6) within **Appendix 6.3: Coastal processes technical report: Impact assessment, Volume 4** (Document Reference: 6.4.6.3) illustrates the 500m zone of effect in relation to MCZs, with the only anticipated overlap to a discrete area on the northern boundary of the Offshore Overfalls MCZ and the western boundary of the Kingmere MCZ. This is also regarded as worst case, which anticipates construction works being carried out directly on the proposed DCO Order Limits (which is not anticipated). The magnitude of the impact to neighbouring MCZ's is therefore assessed as being **minor**.

9.9.27 No impacts to the Pagham Harber MCZ and Selsey Bill and the Hounds MCZ are anticipated as they are located 10.5km away from the proposed DCO Order Limits where no measurable thickness of deposition is expected. The magnitude of effect to these features is therefore assessed as **Negligible**.

9.9.28 There is a requirement to use drilling mud, such as bentonite (or another inert mud), in order to undertake HDD activities and make landfall. This in turn may result in the release of drilling mud within the intertidal area at the punch out points. Bentonite is a non-toxic, natural clay mineral (<63 µm particle diameter) and is included in the List of Notified Chemicals approved for use and discharge into the marine environment and is classified as a Group E substance under the Offshore Chemical Notification Scheme. Substances in Group E are defined as the group least likely to cause environmental harm and are "readily biodegradable and non-bioaccumulative". This is further supported by bentonite being included on the OSPAR List of Substances Used and Discharged Offshore which are considered to Pose Little or No Risk to the Environment (PLONOR).

9.9.29 As bentonite is a clay-based substance, it may persist in suspension for hours to days or longer, becoming diluted to very low concentrations (indistinguishable from natural background levels and variability). The SSC at the point of HDD 'punch out' would decrease notably within one tidal cycle. The maximum design scenario sediment volume for the HDD (which is below MLWS within the shallow subtidal zone is a total of up 1,800m^3 fluid (99,840kg bentonite) for all four HDD 'punch out' locations (**Table 9-15**). The duration and footprint of the temporary bentonite plume will be small in absolute and relative terms (e.g. order of <10mg/l over footprints larger than 500m over a period of days; or, order of tens to low hundreds of mg/l over footprints less than 500m over a period of minutes to one hour). Therefore, bentonite is not expected to accumulate anywhere in measurable thicknesses. Moreover, it is noted that material excavated from HDD exit pits might also be temporarily stored within the offshore array area or export cable corridor, if and where designated as a spoil disposal area. Overall, the magnitude of impact on these protected features is therefore, considered to be **minor**.

9.9.30 Overall, therefore, the magnitude of temporary increase in suspended sediment and sediment deposition relating from construction activities at the Proposed Development will have on benthic subtidal receptors is considered to be **minor**, indicating that the potential is for localised disturbance and/or loss of habitat that does not threaten the long-term viability of the resource.

Sensitivity of receptor

9.9.31 All biotopes identified within the proposed DCO Order Limits have been assessed according to the MarESA criteria as ranging from 'not sensitive' to having a 'medium' sensitivity to a disturbance of this nature (**Table 9-22**). The habitats identified are naturally subject to a degree of sedimentation and scour and characterising species are therefore likely to tolerate intermittent episodes of sediment movement and deposition. Although, as described in **Table 9-21** heavy deposition is only likely to occur in small discreet areas directly next to the construction activity. Where this does occur, complete burial of the characterising species is likely and the effect of this pressure will be mediated by the length of exposure to the deposit. The levels of tolerance to smothering and increase to SSC by each biotope are detailed in **Table 9-22**.

9.9.32 The biotope 'piddocks with a sparse associated fauna in sublittoral very soft chalk or clay (A4.231)' have been identified as having a 'medium' sensitivity to both light and heavy smothering, as per the MarESA assessment. Piddocks are essentially sedentary and as siphons are relatively short, siltation from fine sediments that add to existing silt layers could be lethal[47]. However, they are expected to fully recover within two to ten years where the resource has not been completely impacted (Tillin and Hill, 2016).

9.9.33 The biotope '*S. spinulosa* with kelp and red seaweeds on sand-influenced infralittoral rock (A3.215)' was assessed as having a 'medium' sensitivity to changes in SSC and heavy smothering, as per the MarESA assessment[48]. *S. spinulosa* does not photosynthesise and therefore no effects are predicted to this species from a decrease in clarity resulting from a change in one rank on the water framework directive scale e.g. from clear (<10mg/l) to intermediate (10 to 100mg/l) or intermediate to medium (100 to 300mg/l). However, an increase in turbidity is likely to reduce the abundance of the *L. hyperborea* canopy if the impact was persistent. Where heavy deposits persist underlying flora and fauna of this biotope are likely to occur. However, the biotope is expected to fully recover within two to ten years for both changes in SSC and heavy smothering (Hill *et al*., 2020).

9.9.34 As detailed within the baseline characterisation (**Section 9.6**), comparable habitats are distributed within the wider region and eastern English Channel. Therefore, given the relatively small spatial scales for the total disturbance outlined above, temporary increases in SSC and sediment deposition as a result of construction activities are not expected to undermine regional ecosystem functions or diminish biodiversity.

9.9.35 Subtidal chalk is a protected feature of the Kingmere MCZ which is located adjacent to the proposed DCO Order Limits offshore export cable corridor. Impacts on the representative biotope 'Piddocks with a sparse associated fauna in sublittoral very soft chalk or clay (A4.231)', are discussed above (**paragraph 9.9.32**). Based on the evidence presented above, subtidal chalk of the

[47] https://www.marlin.ac.uk/habitats/detail/152#sensitivity_review
[48] https://www.marlin.ac.uk/habitats/detail/144/sabellaria_spinulosa_with_kelp_and_red_seaweeds_on_sand-influenced_infralittoral_rock#sensitivity_review

Kingmere MCZ has been assigned a 'medium' sensitivity to temporary increases in SSC and sediment deposition. The same sensitivity value has been allocated to the moderate energy infralittoral rock and thin mixed sediments feature of the Kingmere MCZ, although this habitat feature is likely to be less sensitive to a disturbance of this nature so this is regarded precautionary.

9.9.36 Protected features of the Pagham Harbour MCZ, which is located at the furthest extent of the secondary ZOI, include seagrass beds. According to the evidence presented in the MarESA assessment, seagrass beds have a medium sensitivity to temporary light increases in SSC and sediment deposition[49]. Heavy levels of suspended sediments and smothering are not expected based on the distance of the MCZ from the proposed DCO Order Limits.

9.9.37 Protected species of the Pagham Harbour MCZ include the Defolin's lagoon snail (*C. armoricum*) and the lagoon sand shrimp (*G. insensibilis*). *C. armoricum* inhabits loose shingle where sea water percolates and where soft flocculent silty material is present but leaving plenty space subject to gently flowing water[50]. Therefore, increases in fine sediments might reduce the suitability of the habitat to support this species (Little *et al*., 1989). However, based on the distance of this protected species from the proposed DCO Order Limits and the limited impact that is likely to occur, a precautionary sensitivity of 'medium' has been attributed to this feature.

9.9.38 Changes in suspended solids are not likely to directly affect *G. insensibilis*[51]. However, limited water movement in the closed lagoon habitat where this species is found could result in any sediment deposits remaining in-situ, causing smothering. As discussed above, based on the distance of this protected species from the proposed DCO Order Limits and the limited impact that is likely to occur, a precautionary sensitivity of 'medium' has been attributed to this feature.

9.9.39 The sensitivity of the benthic subtidal features found within the proposed DCO Order Limits benthic subtidal ecology study area is therefore considered to be at worst-case **medium**.

[49] https://www.marlin.ac.uk/habitats/detail/257
[50] https://www.marlin.ac.uk/species/detail/1166
[51] https://www.marlin.ac.uk/species/detail/1142

Table 9-22 MarESA assessment for the benthic subtidal habitats for temporary increase in SSC and sediment deposition (changes in suspended solids, smothering and siltation rate)

Biotope code (JNCC and EUNIS)	Biotope name	MarESA sensitivity assessment	Assessment confidence
A5.131/ SS.SCS.ICS.SSh[52]	Sparse fauna on highly mobile sublittoral shingle (cobbles and pebbles)	1) Not sensitive to changes in SSC; 2) Not sensitive to light smothering (<5cm); and 3) Not sensitive to heavy smothering (5 to 30cm).	Confidence is high as the assessment is based on peer reviewed papers and the assessment is based on similar pressures on the feature.
A5.141/ SS.SCS.CCS.SpiB[53]	*S. triqueter* with barnacles and bryozoan crusts on unstable circalittoral cobbles and pebbles	1) Not sensitive to changes in SSC; 2) Not sensitive to light smothering (<5cm); and 3) Low sensitivity to heavy smothering (5 to 30cm).	Confidence is high for the SSC assessment as assessment is based on peer reviewed papers. Confidence is medium for smothering and siltation, as the assessment is based on peer reviewed papers, although was based on similar pressures on the feature.
A5.142/ SS.SCS.CCS.MedLumVen[54]	*M. fragilis*, *Lumbrineris* species and venerid bivalves in circalittoral coarse sand or gravel	1) Low sensitivity to changes in SSC; 2) Not sensitive to light smothering (<5cm); and 3) Low sensitivity to heavy smothering (5 to 30cm).	Confidence is low for the SSC assessment as assessment is based on expert judgement. Confidence is low to medium for smothering and siltation. Confidence in the quality of the evidence is high for the smothering assessments, although the

[redacted]

Biotope code (JNCC and EUNIS)	Biotope name	MarESA sensitivity assessment	Assessment confidence
			applicability and agreement between the evidence is low.
A5.231/ SS.SSa.IFiSa.IMoSa[55]	Infralittoral mobile clean sand with sparse fauna	1) Low sensitivity to changes in SSC; 2) Not sensitive to light smothering (<5cm); and 3) Low sensitivity to heavy smothering (5 to 30cm).	Confidence is low for the SSC assessment as assessment is based on expert judgement. Confidence is high for the SSC assessment as assessment is based on peer reviewed papers.
A5.233/ SS.SSa.IFiSa.NcirBat[56]	*N. cirrosa* and *Bathyporeia* species in infralittoral sand	1) Low sensitivity to changes in SSC; 2) Not sensitive to light smothering (<5cm); and 3) Low sensitivity to heavy smothering (5 to 30cm).	Confidence is low for SSC as the assessment is based on expert judgement and therefore a baseline is not available. Confidence is medium for smothering and siltation as the assessment is based on peer reviewed papers and the assessment is based on similar pressures on the features.
A5.261/ SS.SSa.CMuSa.AalbNuc[57]	*A. alba* and *N. nitidosa* in circalittoral muddy sand or slightly mixed sediment	1) Low sensitivity to changes in SSC; 2) Low sensitivity to light smothering (<5cm); and	Confidence is low for SSC as the assessment is based on expert judgement and therefore a baseline is not available. Confidence is medium for smothering and siltation as the assessment is based on peer

[redacted]

Biotope code (JNCC and EUNIS)	Biotope name	MarESA sensitivity assessment	Assessment confidence
		3) Medium sensitivity to heavy smothering (5 to 30cm).	reviewed papers but the assessment is based on proxies for pressures.
A5.431/ SS.SMx.IMx.CreAsAn[58]	*C. fornicata* with ascidians and anemones on infralittoral coarse mixed sediment	1) Not sensitive to changes in SSC; 2) Low sensitivity to light smothering (<5cm); and 3) Low sensitivity to heavy smothering (5 to 30cm).	Confidence is medium for the SSC assessment as the assessment is based on peer reviewed papers, although was based on similar pressures on the feature. Confidence is low for the smothering assessments as the assessment is based on expert judgement.
A5.422/ SS.SMx.SMxVS.CreMed[59]	*C. fornicata* and M*. fragilis* in variable salinity infralittoral mixed sediment	1) Low sensitivity to changes in SSC; 2) Not sensitive to light smothering (<5cm); and 3) Low sensitivity to heavy smothering (5 to 30cm).	Confidence is medium for the SSC assessment and for the heavy smothering assessment as these assessments are based on peer reviewed papers, although was based on similar pressures on the feature. Confidence is low for the light smothering assessments as the assessment is based on expert judgement.
A5.444/ SS.SMx.CMx.FluHyd[60]	*F. foliacea* and *H. falcata* on tide-swept circalittoral mixed sediment	1) Not sensitive to changes in SSC;	Confidence is low for the SSC assessment as assessment is based on expert judgement. Confidence is medium for the

[redacted]

Biotope code (JNCC and EUNIS)	Biotope name	MarESA sensitivity assessment	Assessment confidence
		2) Not sensitive to light smothering (<5cm); and 3) Low sensitivity to heavy smothering (5 to 30cm).	smothering assessments as the assessment is based on some peer reviewed papers but relies heavily on grey literature or expert judgement.
A5.611/ SS.SBR.PoR.SspiMx[61]	*S. spinulosa* on stable circalittoral mixed sediment	1) Not sensitive to changes in SSC; 2) Not sensitive to light smothering (<5cm); and 3) Medium sensitivity to heavy smothering (5 to 30cm).	Confidence is low for the SSC assessment as assessment is based on peer reviewed papers but is also based on proxies for pressures. Confidence is medium for light smothering as the assessment is based on some peer reviewed papers but also relies on grey literature and relies on proxies for pressures. Confidence is low for the high smothering assessment as assessment is based on expert judgement and relies on proxies for pressures.
A4.131/ CR.HCR.XFa.ByErSp[62]	Bryozoan turf and erect sponges on tide-swept circalittoral rock	1) Medium to changes in SSC; 2) Not sensitive to light smothering (<5cm); and 3) Low sensitivity to heavy smothering (5 to 30cm).	Confidence is low for the SSC and heavy smothering assessment as assessment is based on expert judgement and relies on proxies for pressures. Confidence is medium for light smothering as the assessment is based on some peer reviewed papers but also relies on grey literature and relies on proxies for pressures.

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Biotope code (JNCC and EUNIS)	Biotope name	MarESA sensitivity assessment	Assessment confidence
A4.134/ CR.HCR.XFa.FluCoAs[63]	*F. foliacea* and colonial ascidians on tide-swept moderately wave exposed circalittoral rock	1) Not sensitive to changes in SSC; 2) Low sensitivity to light smothering (<5cm); and 3) Medium sensitivity to heavy smothering (5 to 30cm).	Confidence is medium for SSC as the assessment is based on some peer reviewed papers but also relies on grey literature and is based on similar pressures on the feature. Confidence is low for the smothering assessment as assessment is based on expert judgement and relies on proxies for pressures.
A4.139/ CR.HCR.XFa.SpAnVt[64]	Sponges and anemones on vertical circalittoral bedrock	1) Medium sensitivity to changes in SSC; 2) Not sensitive to light smothering (<5cm); and 3) Not sensitive to heavy smothering (5 to 30cm).	Confidence is low for the SSC assessment and for the heavy smothering assessment as these assessments are based on peer reviewed papers, but also based on proxies for pressures. Confidence is medium for light smothering assessment as the assessment is based on peer reviewed papers, but also based on similar pressures on the feature.
A4.214 CR.MCR.EcCr.FaAlCr[65]	Faunal and algal crusts on exposed to moderately wave-exposed circalittoral rock	1) Not sensitive to changes in SSC; 2) Not sensitive to light smothering (<5cm); and	Confidence is high for the SSC assessment as assessment is based on peer reviewed papers. Confidence is low for smothering assessment as assessment is based on

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Biotope code (JNCC and EUNIS)	Biotope name	MarESA sensitivity assessment	Assessment confidence
		3) Low sensitivity to heavy smothering (5 to 30cm).	expert judgement and relies on proxies for pressures.
A4.221 CR.MCR.CSab.Sspi[66]	*S. spinulosa* encrusted circalittoral rock	1) Not sensitive to changes in SSC; 2) Not sensitive to light smothering (<5cm); and 3) Medium sensitivity to heavy smothering (5 to 30cm).	Confidence is low for the SSC assessment and for the heavy smothering assessment as these assessments are based on peer reviewed papers, but also based on proxies for pressures. Confidence is medium for light smothering assessment as the assessment is based on peer reviewed papers, but also based on similar pressures on the feature.
A4.231/ CR.MCR.SfR.Pid[67]	Piddocks with a sparse associated fauna in sublittoral very soft chalk or clay	1) Not sensitive to changes in SSC; 2) Medium sensitivity to light smothering (<5cm); and 3) Medium sensitivity to heavy smothering (5 to 30cm).	Confidence is low for the SSC assessment as assessment is based on expert judgement. Confidence is low to medium for smothering and siltation. Confidence in the quality of the evidence is medium for the smothering assessments, although the applicability and agreement between the evidence is low.
A3.215/	*S. spinulosa* with kelp and red seaweeds on sand-influenced infralittoral rock	1) Medium sensitivity to changes in SSC;	Confidence is medium as the assessment is based on some peer reviewed papers but

[redacted]

Biotope code (JNCC and EUNIS)	Biotope name	MarESA sensitivity assessment	Assessment confidence
IR.MIR.KR.Lhyp.Sab[68]		2) Not sensitive to light smothering (<5cm); and 3) Medium sensitivity to heavy smothering (5 to 30cm).	also relies on grey literature and relies on similar pressures on the feature.

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Significance of residual effect

9.9.40 The indirect impact of increases in SSC and associated sediment deposition will represent a temporary and short-term intermittent impact, affecting a relatively small portion of the benthic subtidal habitats in the proposed DCO Order Limits and benthic ecology study area. Most benthic receptors are known to have a medium to high degree of tolerance to this impact, based on MarESA assessments. It is predicted that the sensitivity of the majority of receptors is worst-case **Medium**, and the magnitude is **Minor**. The short-term and localised nature of the higher SSCs and deposition rates and the tolerance and recoverability of the majority of the benthic receptors; the significance of effect is deemed **Minor, Not Significant** in EIA terms.

9.9.41 The MarESA assessments identify that some aspects of the confidence for the sensitivity of the specified habitats to changes in SSC and for sediment deposition (smothering) is low. For these habitats, the low confidence score for the sensitivity assessment is associated with the resistance assessment rather than the resilience assessment. The significance of effect has been assessed based on the lowest resistance score of medium and resilience of medium as part of the sensitivity assessments. Therefore, while the confidence score is low, the assessment is using the most conservative sensitivity, as precautionary. As such, the assessment of the significance of effects as **Not Significant**, is considered to be robust.

Temporary increase in Suspended Sediment Concentration (SSC) and sediment deposition in the intertidal area

Magnitude of impact

9.9.42 Temporary increases in SSC and associated sediment deposition in the intertidal area are expected from the cable installation works. **Chapter 6: Coastal processes, Volume 2** of the ES (Document Reference: 6.2.6) provides an assessment of the impacts on marine processes including the development and fate of suspended sediments and seabed deposition.

9.9.43 As detailed in **paragraphs 9.9.28 and 9.9.29**, there is a requirement to use drilling mud, such as bentonite (or another inert mud), in order to undertake HDD activities and make landfall. This in turn may result in the release of drilling mud within the intertidal area at the 'punch out' points. As bentonite is a clay-based substance, it may persist in suspension for hours to days or longer, becoming diluted to very low concentrations (indistinguishable from natural background levels and variability). The SSC at the point of HDD 'punch out' would decrease notably within one tidal cycle. The maximum design scenario sediment volume for the HDD (which is below MLWS, outwith the intertidal zone) is a total of up 1,800m^3 fluid (99,840kg bentonite) for all four HDD 'punch out' locations (**Table 9-15**). Any fine material being dispersed from the HDD 'punch out' locations during excavation is likely to be widely dispersed and quickly form part of the background concentration of SSC along the nearshore.

9.9.44 Therefore, based on the evidence the magnitude of temporary increase in suspended sediment concentrations and sediment deposition relating to

construction activities at the Proposed Development will have on benthic intertidal receptors is considered to be **Negligible**, indicating that the potential is for barely discernible change for any length that does not threaten the long-term viability of the resource.

Sensitivity of receptor

9.9.45 All biotopes identified within the proposed DCO Order Limits have been assessed according to the MarESA criteria as 'not sensitive' to having a 'low' sensitivity to a disturbance of this nature (**Table 9-23**). The habitats identified are naturally subject to sedimentation and exposure and characterising species are therefore likely to tolerate intermittent episodes of sediment movement and deposition.

9.9.46 Chalk outcrops and clay exposures (hydrolittoral soft rock outcrops) that were identified within the intertidal as a worst-case scenario are likely to have the same sensitivity to light smothering as identified by the biotope 'Piddocks with a sparse associated fauna in sublittoral very soft chalk or clay (A4.231)' (**Table 9-22**), which classifies the biotope as having a medium sensitivity to an impact of this nature.

9.9.47 Several habitat types identified in **Appendix 9.2: Offshore wind farm intertidal habitats survey report**, **Volume 4** of the ES (Document Reference: 6.4.9.2), are not considered in **Table 9-23** as they are not recorded within the MarESA assessment. This includes: Hydrolittoral soft rock (A1.46), Shingle (pebble) and gravel shores (A2.11), Strandline (A2.21), Polychaete/amphipod-dominated fine sand shores (A2.23), Polychaete/bivalve-dominated muddy sand shores (A2.24), and Channel *C. maritima* communities (B2.32). However, it is expected that these features are able to withstand an element of temporary light to heavy smothering due to their location on an open/ high energy shore. On account of some of these habitats having been recorded within the LNR's and LWS's and Climping Beach SSSI the sensitivity of intertidal features is considered worst-case **Medium**.

9.9.48 Protected intertidal habitats of the Solent and Dorset Coast SPA and Pagham Harbour SPA include mudflats and saltmarsh are not expected to be impacted due to the negligible magnitude recorded for this temporary impact. However, features of these sites have been classified as having a **Medium** sensitivity to impacts of this nature.

9.9.49 The sensitivity of the benthic intertidal features found within the proposed DCO Order Limits is therefore considered to be at worst-case **Medium.**

Table 9-23 MarESA assessment for the benthic intertidal habitats for temporary increase in SSC and sediment deposition (changes in suspended solids, smothering and siltation rate)

Biotope code (JNCC and EUNIS)	Biotope name	MarESA sensitivity assessment	Assessment confidence
A1.45/ LR.FLR.Eph[69]	Ephemeral green or red seaweeds (freshwater or sand-influenced) on non-mobile substrata	1) Low sensitivity to changes in SSC; and 2) Low sensitivity to light smothering (<5cm).	Confidence is low for the SSC assessment as assessment is based on expert judgement. Confidence is medium for the smothering assessment as the assessment is based on some peer reviewed papers but relies heavily on grey literature or expert judgement.
A2.111/ LS.LCS.Sh.BarSh[70]	Barren littoral shingle	1) Not sensitive to changes in SSC; and 2) Not sensitive to light smothering (<5cm).	Confidence is low for both assessments. The quality of the evidence is high in both instances however the assessment is based on a similar pressure.
A2.245/ LS.LSa.MuSa.Lan[71]	*L. conchilega* in littoral sand	1) Not sensitive to changes in SSC; and 2) Not sensitive to light smothering (<5cm).	Confidence is low for the SSC assessment as assessment is based on expert judgement. Confidence is high for the smothering assessment as it is based on peer reviewed papers.

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Significance of residual effect

9.9.50 The indirect impact of increases in SSC and associated sediment deposition will represent a discernible impact on intertidal features recorded within the proposed DCO Order Limits and wider study area. Intertidal receptors recorded within the proposed DCO Order Limits are recorded as being 'not sensitive' to having a 'medium' sensitivity to changes in SSC and light smothering (<5cm), based on MarESA assessments. The sensitivity of the benthic subtidal features found within the proposed DCO Order Limits and wider benthic subtidal ecology study area is at worst-case **Medium**. The magnitude is **Negligible**. The residual significant effect is therefore **Minor**, **Not Significant** in EIA terms.

9.9.51 The MarESA assessments identify that some aspects of the confidence for the sensitivity of the specified habitats to changes in SSC and for sediment deposition (smothering) is low. For these habitats, the low confidence score for the sensitivity assessment is associated with the resistance assessment rather than the resilience assessment, which has a high confidence. Since the evidence agrees in terms of direction and magnitude of the impact this is a conservative and robust assessment.

Direct and indirect seabed disturbances leading to the release of sediment contaminants

Magnitude of impact

9.9.52 There is the potential for sediment bound contaminants, such as metals, hydrocarbons, and organic pollutants, to be released into the water column and lead to an effect on benthic ecology receptors, as a result of construction activities and associated sediment mobilisation.

9.9.53 Evidence from the nearby Interconnexion France-Angleterre 2 interconnector (IFA-2) suggests that the area is not heavily contaminated. IFA-2 is situated at a minimum distance of 300m west of the Proposed Development. Contaminated sediment surveys undertaken for IFA-2 detected arsenic at two sites, located approximately 10km west of the Proposed Development, and measurable amounts of Dibutyltin (DBT) and Tributyltin (TBT) at the mouth of Southampton Water (IFA-2, 2016).

9.9.54 The assessment of contaminants undertaken during the Rampion 1 offshore wind farm baseline characterisation, which covers part of the proposed DCO Order Limits and wider benthic subtidal ecology study area, revealed that the levels of contaminants within the sediments were generally low, suggesting sediments will not present any concern for seabed disturbance. However, eleven of the sites sampled supported levels of contaminants in excess of AL1 for Arsenic and Chromium, at four of the sites (EMU Limited, 2011).

9.9.55 The results of the sediment contaminant survey that has been undertaken across proposed DCO Order Limits (see **Appendix 9.3: Offshore wind farm subtidal benthic characterisation survey report**, **Volume 4** of the ES (Document Reference: 6.4.9.3)) revealed a total of eight heavy and trace metals were analysed from sediments taken at each of the seven stations (see

paragraph 9.6.7). Concentrations of arsenic were recorded at levels that exceeded Cefas AL1 at five stations. All stations exceeded OSPAR BAC ERL levels for arsenic. In addition, six stations exceeded BAC levels for chromium, but did not exceed ERL levels (see **Table 11** of **Appendix 9.3: Offshore wind farm subtidal benthic characterisation survey report**, **Volume 4** of the ES (Document Reference: 6.4.9.3)). Concentrations of arsenic above CSQG TEL were recorded at all seven stations and above PEL at one station (ST051) (see **Table 11** of **Appendix 9.3: Offshore wind farm subtidal benthic characterisation survey report**, **Volume 4** of the ES (Document Reference: 6.4.9.3)). As detailed in **paragraph 9.6.9**, all PAHs were recorded below limits of detection across all seven sampling stations, with the exception of Phenanthrene (ST020) and Pyrene (ST030).

9.9.56 Following disturbance as a result of construction activities, the majority of resuspended sediments are expected to be deposited within the immediate vicinity of the works. The release of contaminants from the small proportion of fine sediments is likely to be rapidly dispersed with the tide and/or currents and therefore increased bioavailability resulting in adverse eco-toxicological effects are not expected.

9.9.57 Therefore, the magnitude of the impact is considered to be **negligible**, indicating that any release of sediment contamination is likely to be discernible over a very small area of the receptor, which does not threaten benthic subtidal ecology features, undermine regional ecosystem functions or diminish biodiversity.

Sensitivity of receptor

9.9.58 The sensitivity of benthic species to toxic pollutants that may be disturbed is deemed to be worst-case **high**, which is considered precautionary and reflects the lack of evidence on individual receptors and biotopes. A sensitivity of high describes the habitat or species as exhibiting 'None' or 'low' resistance (tolerance) to an external factor and is expected to recover only over very extended timescales, e.g. greater than 25 years or not all (**Table 9-17**).

Significance of residual effect

9.9.59 The direct and indirect impact of seabed disturbances leading to the release of sediment contaminants will represent a discernible impact on benthic subtidal habitats in the proposed DCO Order Limits benthic subtidal ecology study area. The sensitivity of the benthic subtidal features found within the proposed DCO Order Limits benthic subtidal ecology study area is considered to be at worst-case **high** and the magnitude is **negligible**. The residual significant effect is therefore **minor**, **not significant** in EIA terms.

Increased risk of introduction or spread of Marine INNS may affect benthic ecology and biodiversity

Magnitude of impact

9.9.60 There is a risk that increased vessel movements during construction will contribute to the risk of introduction or spread of Marine INNS through ballast water

discharge (Eno *et al*., 1997). As presented in **Table 9-15**, there will be up to 2,205 round trips to port during the construction phase. Impacts associated with introduction of hard substrate is discussed within **Section 9.10**. However, the movement of commercial vessels is common throughout the region (**Chapter 13: Shipping and navigation, Volume 2** of the ES (Document Reference: 6.2.13)) and this provides an existing and potentially more likely method of transport for Marine INNS species (due to the higher variety of ports and passage routes).

9.9.61 As detailed within **Table 9-16**, embedded environmental measures which include an **Outline Project Environmental Management Plan** (Document Reference: 7.11) (C-95). The Final PEMP will include a biosecurity plan to ensure that the risk of potential introduction and spread of Marine INNS from increased vessel activity is minimised.

9.9.62 It should be noted that there is a wide-spread presence of Marine INNS across the eastern English Channel, which is evident from the presence of the biotope '*C. fornicata* with ascidians and anemones on infralittoral coarse mixed sediment (A5.431)' across the near shore portion of the proposed DCO Order Limits (**Figure 9.4**, **Volume 3** of the ES (Document Reference: 6.3.9)). The Marine INNS *C. fornicata* has successfully established to an extent that it outcompetes indigenous species causing large scale habitat changes across the wider south coast (EMU Limited, 2012), with IFA-2 interconnector recording *C. fornicata* as one of the most common biotopes in the nearshore area (IFA-2, 2016), demonstrating that the region is not absent of Marine INNS. Moreover, the Marine INNS carpet sea-squirt, *Didemnum vexillum*, is known to be present in the English Channel. In 2009, wider occurrences of *D. vexillum* were documented in the Solent region, with relatively dense populations in three adjacent marinas in Gosport, in addition to minor infestations in single marinas in Lymington (western Solent) and Cowes (Isle of Wight) (Bishop *et al*., 2015). Furthermore, the species is known to colonise artificial structures (Gibson-Hall and Bilewitch, 2018). Other known Marine INNS include the compass sea squirt, *Asterocarpa humilis* (Bishop *et al*., 2013), the leathery sea squirt, *Styela clava* (Neish, 2007), and the orange tipped sea squirt, *Corella eumyota* (Collin *et al*., 2010).

9.9.63 Therefore, the magnitude of the impact that construction activities will have to the introduction or spread of Marine INNS is considered to be **negligible**, indicating that there will be a discernible change for any length of time, over a small area of the receptor that does not threaten benthic subtidal ecology features, undermine regional ecosystem functions or diminish biodiversity.

Sensitivity of receptor

9.9.64 The sensitivity of benthic biotopes within the proposed DCO Order Limits to the introduction or spread of Marine INNS is deemed to be 'not-sensitive' to having a 'high' sensitivity to an impact of this nature, according to the MarESA criteria (**Table 9-24**). The sensitivity of nearby MCZ features is also regarded as high given their protection status. Therefore, the sensitivity is considered to be **high**, reflecting that at worst-case benthic receptors have 'none' or 'low' resistance (tolerance) to an impact of this nature.

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Table 9-24 MarESA assessment for the benthic subtidal habitats for introduction or spread of Marine INNS

Biotope code (JNCC and EUNIS)	Biotope name	MarESA sensitivity assessment	Assessment confidence
A5.131/ SS.SCS.ICS.SSh[72]	Sparse fauna on highly mobile sublittoral shingle (cobbles and pebbles)	There is no evidence at present that this biotope has been affected by Marine INNS	Not relevant.
A5.141/ SS.SCS.CCS.SpiB[73]	*S. triqueter* with barnacles and bryozoan crusts on unstable circalittoral cobbles and pebbles	Not sensitive (based on a high resistance and high resilience)	Confidence is low as the assessment is based on expert judgement and therefore a baseline is not available.
A5.142/ SS.SCS.CCS.MedLumVen[74]	*M. fragilis*, *Lumbrineris* species and venerid bivalves in circalittoral coarse sand or gravel	High (based on a resistance of none and a very low resilience)	Confidence is high as the assessment is based on peer reviewed papers and the assessment is based on the same pressures acting on the same type of feature in the UK.
A5.231/ SS.SSa.IFiSa.IMoSa[75]	Infralittoral mobile clean sand with sparse fauna	Not sensitive (based on a high resistance and high resilience)	Confidence is low as the assessment is based on expert judgement and therefore a baseline is not available.
A5.233/	*N. cirrosa* and *Bathyporeia* species in infralittoral sand	Not sensitive (based on a high resistance and a high resilience)	Confidence is low for suspended solids as the assessment is based on expert

[redacted]

Biotope code (JNCC and EUNIS)	Biotope name	MarESA sensitivity assessment	Assessment confidence
SS.SSa.IFiSa.NcirBat[76]			judgement and therefore a baseline is not available.
A5.261/ SS.SSa.CMuSa.AalbNuc[77]	*A. alba* and *N. nitidosa* in circalittoral muddy sand or slightly mixed sediment	High (based on a resistance of none and a very low resilience)	Confidence is medium as the assessment is based on peer reviewed papers but the assessment is based on proxies for pressures.
A5.431/ SS.SMx.IMx.CreAsAn[78]	*C. fornicata* with ascidians and anemones on infralittoral coarse mixed sediment	This biotope is dominated by *C. fornicata*, which is itself a Marine INNS. This pressure is therefore 'Not relevant'.	Not relevant.
A5.422/ SS.SMx.SMxVS.CreMed[79]	*C. fornicata* and M*. fragilis* in variable salinity infralittoral mixed sediment	This biotope is dominated by *C. fornicata*, which is itself a Marine INNS. This pressure is therefore 'Not relevant'.	Not relevant.
A5.444/ SS.SMx.CMx.FluHyd[80]	*F. foliacea* and *H. falcata* on tide-swept circalittoral mixed sediment	The high levels of scour in this biotope will limit the establishment of all but the most scour resistant Marine	Not relevant.

[redacted]

Biotope code (JNCC and EUNIS)	Biotope name	MarESA sensitivity assessment	Assessment confidence
		INNS from this biotope and no direct evidence was found for effects of INNIS on this biotope. There is currently no evidence on which to assess this pressure	
A5.611/ SS.SBR.PoR.SspiMx[81]	*S. spinulosa* on stable circalittoral mixed sediment	Not sensitive (based on a high resistance and high resilience)	Confidence is low as the assessment is based on expert judgement and therefore a baseline is not available.
A4.131/ CR.HCR.XFa.ByErSp[82]	Bryozoan turf and erect sponges on tide-swept circalittoral rock	There is no evidence at present that this biotope has been affected by Marine INNS.	Not relevant.
A4.134/ CR.HCR.XFa.FluCoAs[83]	*F. foliacea* and colonial ascidians on tide-swept moderately wave exposed circalittoral rock	There is no evidence at present that this biotope has been affected by Marine INNS.	Not relevant.
A4.139/	Sponges and anemones on vertical circalittoral bedrock	There is no evidence at present that this biotope has	Not relevant.

[redacted]

Biotope code (JNCC and EUNIS)	Biotope name	MarESA sensitivity assessment	Assessment confidence
CR.HCR.XFa.SpAnVt[84]		been affected by Marine INNS.	
A4.214 CR.MCR.EcCr.FaAlCr[85]	Faunal and algal crusts on exposed to moderately wave-exposed circalittoral rock	There is no evidence at present that this biotope has been affected by Marine INNS.	Not relevant.
A4.221 CR.MCR.CSab.Sspi[86]	*S. spinulosa* encrusted circalittoral rock	Not sensitive (based on a high resistance and high resilience).	Confidence is low as the assessment is based on expert judgement and therefore a baseline is not available.
A4.231/ CR.MCR.SfR.Pid[87]	Piddocks with a sparse associated fauna in sublittoral very soft chalk or clay	Not sensitive (based on a high resistance and high resilience).	Confidence is low as the assessment is based on expert judgement and therefore a baseline is not available.
A3.215/ IR.MIR.KR.Lhyp.Sab[88]	*S. spinulosa* with kelp and red seaweeds on sand-influenced infralittoral rock	High (based on low resistance and high resilience)	Confidence is high as the assessment is based on peer reviewed papers, although the assessment was based on similar pressures on the feature.

[redacted]

Significance of residual effect

9.9.65 The MarESA assessments identify that the sensitivity of benthic biotopes within the proposed DCO Order Limits to the introduction or spread of Marine INNS is deemed to be 'not-sensitive' to having a 'high' sensitivity to an impact of this nature. Where benthic receptors are deemed to have a high sensitivity and in the absence of mitigation there is the potential for significant effects to arise. However, the implementation of embedded environmental measures (as shown in **Table 9-16**) includes mitigation to avoid the introduction or spread of Marine INNS through the implementation of the **Outline Project Environmental Management Plan** (Document Reference: 7.11) (C-95). These measures will ensure a reduction in the magnitude to a negligible level for this impact. These measures will be secured through the DCO, to minimise the disturbance to benthic receptors. Overall, it is predicted that the sensitivity of the receptor is worst-case **high**, and the magnitude is **negligible**. The residual effect significance will be **minor**, **not significant** in EIA terms.

9.9.66 The MarESA assessments identify that some aspects of the confidence for the sensitivity of the specified habitats to increased risk of introduction or spread of Marine INNS is low. For these habitats, this is a result of lack of available evidence with the assessment based on expert judgement. However, as the sensitivity of the receptors have been classified as worst-case high, this can be considered a conservative and robust assessment.

Indirect disturbance arising from the accidental release of pollutants

Magnitude of impact

9.9.67 There is a risk that indirect disturbance arising from the accidental release of pollutants such as synthetic compounds, heavy metal and hydrocarbon contamination resulting from offshore infrastructure installation and construction vessels (approximately 2,205 return trips anticipated to port) could lead to an adverse effect on benthic subtidal ecology receptors. Furthermore, there is potential adverse effect risk to intertidal receptors from accidental release of pollutants from machinery use and vehicle movement across the intertidal zone.

9.9.68 As detailed within **Table 9-16**, embedded environmental measures which include an Outline MPCP (C–53) will act to safeguard the marine and intertidal environment and provide environmental measures in the event of an accidental pollution event arising from offshore operations relating to the Proposed Development, ensuring that the risk of an accidental pollution event is minimised.

9.9.69 Therefore, the magnitude of the impact accidental release of pollutants is considered to be **negligible**, indicating that there will be a discernible change for any length of time, over a small area of the receptor that does not threaten benthic subtidal ecology features, undermine regional ecosystem functions or diminish biodiversity.

Sensitivity of receptor

9.9.70 The sensitivity of benthic species to toxic pollutants that may be released because of construction activities is deemed to be **High** which is considered precautionary and reflects the lack of evidence on individual receptors and biotopes. A sensitivity of high describes the habitat or species as exhibiting 'None' or 'low' resistance (tolerance) to an external factor and is expected to recover only over very extended timescales, e.g. greater than 25 years or not all (**Table 9-17**).

Significance of residual effect

9.9.71 The Proposed Development embedded environmental measures (as shown in **Table 9-16**) include measures to safeguard the marine environment and provide mitigation measures in the event of an accidental pollution event arising from offshore operations relating to the Proposed Development (C-53) which will be secured through DCO, to minimise the disturbance to benthic receptors. Overall, it is predicted that the sensitivity of the benthic subtidal and intertidal receptors found within the proposed DCO Order Limits benthic subtidal ecology study area is **High** and the magnitude is **Negligible**. The residual effect significance will be **Minor, Not Significant** in EIA terms.

Indirect disturbance from increased noise and vibration from construction activities

Magnitude of impact

9.9.72 There is potential for indirect disturbance to benthic features associated with underwater noise from pile-driving (monopiles and pin piles) from the installation of foundations for offshore structures (i.e., WTGs and offshore substations), cable installation, vessel disturbance and UXO clearance. These construction activities will result in the generation of underwater noise which will extend out from the source, travelling both through the water column and through the sediment. **Chapter 8: Fish and shellfish ecology, Volume 2** of the ES (Document Reference: 6.2.8), provides a detailed assessment of the effects of noise on fish and shellfish species.

9.9.73 To establish if anthropogenic noise can affect invertebrates, it is important to ascertain the extent to which it can be sensed. Underwater sound is characterised by pressure variations (sound pressure) and the oscillation of the water molecules, referred to as particle motion. Benthic invertebrates lack gas filled organs (e.g. swim bladders) required for sound pressure detection but studies have demonstrated that crustaceans appear sensitive to low frequency acoustic stimuli arising from particle motion (Roberts *et al*., 2016, Salmon, 1971, Goodall *et al.*, 1990). Awareness of sound is believed to be associated with mechanical disturbances of surrounding water/sediment as detected by a pair of statocysts organs in the cephalothorax, chordotonal organs associated with joints of antenna, legs and an array of internal and external hair like mechano-receptors (sensilla) (in crustaceans) (Popper *et al*., 2001). The relative role and sensitivity of each in detecting particle motion is unknown (Edmonds *et al*., 2016).

9.9.74 Sound pressure waves arising from anthropogenic noise can spread many kilometres from a site of introduction, however particle motion associated with the production of such sound is much more localised (Urick, 1983). Current research suggests that benthic invertebrate sensitivity is restricted to particle motion, primarily localised to the site of sound introduction (Edmonds *et al*., 2016).

9.9.75 The current evidence suggests that the particle motion component associated with noise will dissipate in close proximity to the noise source. In addition to this the noise from high amplitude noise, such as piling events will be temporary in nature and conditions will return to baseline following cessation of the event. Therefore, the magnitude of the impact that construction activities relating to the Proposed Development will have on benthic subtidal receptors is assessed as **negligible**, indicating that the potential effect is over a very small area of the receptor compared to their overall extent, for a short period of time, and the disturbance does not threaten the long-term viability of benthic resources.

Sensitivity of receptor

9.9.76 Few studies have been conducted to enable a definition to be drawn on benthic invertebrates sensitivity to sound (Hawkins and Popper, 2012). While thresholds for harmful sound exposure levels have been derived for marine mammals (Southall *et al*., 2007, Lucke *et al*., 2009) and estimated for fish (Popper *et al*., 2006), no such injury criteria have been developed for marine invertebrates. Variable documentation of units and measurement methods in the literature, make firm conclusions difficult and can lead to subjective interpretation of finding.

9.9.77 Studies on marine crustaceans have been shown to produce, detect and respond to sound (Staaterman *et al*., 2011, Hughes *et al*., 2014). Again, in relation to crustaceans, the physical capacity for slow moving benthic adult or mid-water larval crustaceans to avoid exposure to sound is limited although no significant deleterious effect of seismic prospecting upon fishing yields of shrimp and catches of the Norweigan lobster *Nephrops norvegicus* (24 h post exposure, 210 dB re 1 µPa (zero-peak) @ 1 m) have been found (Andriguetto-Filho *et al*., 2005, La Bella *et al*., 1996). Such experiments provide site-specific insights into short term effects of high amplitude sound on discrete crustacean species but do not quantify sound exposure levels (specifically particle motion measurements) experienced by the test organisms themselves. Such issues must be resolved through controlled exposure studies to determine the influence of discrete sounds on benthic invertebrates (Edmonds *et al*., 2016).

9.9.78 The scarcity of studies carried out on benthic invertebrates severely constrains the assessment of noise pollution. However, there are no long term trends in landings data that can reveal effects from anthropogenic sound. One of the few studies to explore the issue found no statistically significant correlative link between seismic surveys and changes in commercial rock lobster (*Panulirus cygnus*) (Parry and Gason, 2006). Further studies are needed to reveal in detail potential impacts on benthic invertebrates. As a result of the scarcity of available evidence for the impacts of noise on benthic invertebrates the sensitivity of benthic receptors in considered to be worst-case **medium,** on a precautionary basis.

Significance of residual effect

9.9.79 The current research suggests that benthic invertebrate sensitivity is restricted to particle motion, primarily localised to the site of sound introduction. The area of likely impact is therefore considered to be limited to the point source of piling for high amplitude noise and is assessed as **Negligible**, indicating that the potential effect is over a small area of the receptor and the disturbance does not threaten the long-term viability of benthic resources. On account of the lack of current research on noise sensitivity of benthic receptors, a sensitivity of **Medium** is considered to be worst-case**,** and is considered precautionary. The residual effect significance will be **Minor, Not Significant** in EIA terms.

9.10 Assessment of effects: Operation and maintenance phase

Long-term habitat loss/alteration from the presence of foundations, scour protection and cable protection

Magnitude of impact

9.10.1 The presence of foundations and the associated scour protection, along with the cable protection measures used at cable crossings and areas where cable burial is not possible, will lead to a change from a sedimentary habitat to one characterised by hard substrate. This will be either a long-term habitat loss (for the approximate 30-year design life duration of the Proposed Development) or a permanent change and is therefore considered an impact of the operational phase of the development and potentially beyond. It is assessed here as habitat loss and a potential adverse effect (due to the potential shift in the baseline condition), although it is noted that this also comprises potential beneficial effects, providing new habitats for different faunal assemblages to colonise, resulting in a likely increase in biodiversity and biomass.

9.10.2 **Table 9-15** identifies the maximum design scenario for foundation, scour and cable protection footprint. The total habitat loss arising from these components will be 1.39km^2, which equates to approximately 0.6% of the proposed DCO Order Limits. Therefore, the magnitude of the impact is considered to be **Negligible**, indicating that there will be a slight alteration to key characteristics or features of the particular receptors character or distinctiveness that does not threaten benthic subtidal ecology features, undermine regional ecosystem functions or diminish biodiversity.

9.10.3 No long-term habitat loss will occur in the intertidal area of the proposed DCO Order Limits offshore export cable corridor as cable protection will not be used in this area as HDD works will install the cable underground (C-43, **Table 9-14**).

Sensitivity of receptor

9.10.4 All biotopes identified within the proposed DCO Order Limits have been assessed according to the MarESA criteria as having no resistance to long-term or permanent habitat loss / change, with recovery assessed as very low as the

change at the pressure benchmark is at worst case permanent. The sensitivity of subtidal receptors is therefore considered to be at worst-case **High** according to the EIA assessment values.

Significance of residual effect

9.10.5 Artificial rock and hard substratum will alter the character of the biotopes recorded within the proposed DCO Order Limits leading to reclassification and the loss of the existing communities. However, while the impact will comprise a long-term or permanent change in seabed habitat within the footprint of the structures and where scour and cable protection are placed, the footprint of the area affected is highly localised, compared to the extent of features. Overall, it is predicted that the sensitivity of the receptor is **High** and the magnitude is **Negligible**. The residual effect is therefore **Minor**, **Not Significant** in EIA terms.

Habitat disturbance from jack-up vessels and cable maintenance works

Magnitude of impact

9.10.6 The total maximum area of subtidal habitat loss will arise from the use of jack-up vessels for operational and maintenance activities as well as from cable maintenance and cable repair. A total of up to 4.33km^2 of habitat disturbance is predicted to arise over the approximate 30-year design life of the Proposed Development (equating to approximately 2% of the proposed DCO Order Limits). Given that the majority of habitats and characterising biotopes are not geographically restricted to the proposed DCO Order Limits and are generally widespread throughout the eastern English Channel region, impacts from individual operation and maintenance activities will represent a very small footprint compared to their overall extent.

9.10.7 Cable repair works will require de-burial and re-burial of a cable or cable sections and along with cable preventative maintenance, including re-burial, will consequently result in increases in SSC and sediment deposition. However, the impacts from these works will be spread over the approximate 30-year period of operation and maintenance activities, with only a limited number of activities occurring within any one year. Furthermore, as the works will be undertaken within the proposed DCO Order Limits, no direct impacts are anticipated on the neighbouring Kingmere MCZ and Offshore Overfalls MCZ.

9.10.8 Therefore, the magnitude of habitat disturbance from jack-up vessels and cable maintenance activities relating to the Proposed Development will have on benthic subtidal receptors is considered to be **minor**, indicating that the disturbance of habitat does not threaten the long-term viability of the benthic resource within the proposed DCO Order Limits.

Sensitivity of receptor

9.10.9 As detailed within **paragraph 9.9.8** to **paragraph 9.9.14**, the habitats directly affected by habitat loss / disturbance have a worst-case sensitivity of **High** to a disturbance of this nature, with the MarESA assessment also presented in detail. **Paragraph 9.9.31** to **paragraph 9.9.39**, detail that the habitats indirectly affected

by increased SSC and deposition have a worst-case **Medium** sensitivity to the expected levels of SSC and deposition, with the MarESA assessment also presented in detail.

Significance of residual effect

9.10.10 The direct impact of habitat disturbance will represent a local spatial extent and / or short-term intermittent impact, affecting a relatively small portion of the benthic subtidal habitats in the proposed DCO Order Limits. Most benthic receptors are known to have a medium to high degree of tolerance to this impact, based on MarESA assessments. However, it is predicted that the sensitivity of some receptors is worst-case high, where this is the case the following paragraphs detail additional mitigation to reduce the potential impact to these features. Where receptors are **Medium** sensitivity, the **Minor** magnitude will result in an effect significance of **Minor, which is Not Significant** in EIA terms.

9.10.11 The biotope 'Piddocks with a sparse associated fauna in sublittoral very soft chalk or clay (A4.231)' has been assessed as having a high sensitivity to direct habitat disturbance, as the impact is regarded permanent due to the low recovery expectations. In the absence of mitigation there is the potential for significant effects to arise due to the sensitivity of the feature. However, the implementation of mitigation options (C-269, C-270, C-272, **Table 9-16**), whereby cable installation will be constrained and the adoption of specialist offshore export cable laying and installation techniques employed to minimise the area of physical disturbance and interaction on chalk habitat. These measures will ensure a reduction in the magnitude of the impact to a **Negligible** level for this feature. On this basis, and considering the **High** sensitivity of chalk, the residual effect significance will be **Minor**, **Not Significant** in EIA terms.

9.10.12 The indirect impact of increases in SSC and associated sediment deposition will represent a temporary and short-term intermittent impact, affecting a relatively small portion of the benthic subtidal habitats in the proposed DCO Order Limits and benthic ecology study area. Most benthic receptors are known to have a medium to high degree of tolerance to this impact, based on MarESA assessments. It is predicted that the sensitivity of the majority of receptors is worst-case **Medium**, and the magnitude is **Minor**. The short-term and localised nature of the higher SSCs and deposition rates and the tolerance and recoverability of the majority of the benthic receptors; the significance of effect is deemed **Minor, which is Not Significant** in EIA terms.

Changes to seabed habitats arising from effects on physical processes, including scour effects and changes in the sediment transport and wave regimes resulting in potential effects on benthic communities

Magnitude of impact

9.10.13 The presence of foundations, scour protection and cable protection material may introduce changes to the local hydrodynamic and wave regime (**Table 9-15**), resulting in changes to the sediment transport pathways and associated effects on benthic ecology. Scour and increases in flow rates can change the characteristics of the sediment potentially making the habitat less suitable for some species.

9.10.14 The use of appropriately designed scour protection at foundations and sufficiently buried cables (see C-44, **Table 9-16**) will prevent scour occurring (see **Chapter 6: Coastal Processes, Volume 2** of the ES (Document Reference: 6.2.6)). Scour will therefore only occur if and where scour protection has not been applied.

9.10.15 The exact form of cable protection to be used will depend upon local ground conditions, hydrodynamic processes, and the selected cable protection contractor. However, the final choice will include one or more of the following: concrete 'mattresses', rock placement, geotextile bags filled with stone, rock or gravel, polyethylene or steel pipe half shells, or sheathes and bags of grout, concrete, or another substance that cures hard over time. Where cable protection is used, some scouring is predicted to occur throughout the operational phase at these features. The extent of this scouring is predicted to be local, occurring around the perimeter of rock berms.

9.10.16 The Coastal processes assessment (**Chapter 6: Coastal Processes, Volume 2** of the ES (Document Reference: 6.2.6)) has determined that the impacts on hydrodynamic and wave regimes will be not significant to coastal and physical processes and will therefore not result in any significant changes to sediment transport and consequently will not have any significant impacts on benthic ecology. The magnitude of this impact is therefore considered to be **Negligible**.

Sensitivity of receptor

9.10.17 As detailed within **paragraph 9.9.8** to **paragraph 9.9.14**, the habitats directly affected by abrasion / disturbance have a worst-case sensitivity of **high** to a disturbance of this nature, with the MarESA assessment also presented in detail. **Paragraph 9.9.31** to **paragraph 9.9.39**, detail that the habitats indirectly affected by increased SSC and deposition have a worst-case **Medium** sensitivity to the expected levels of SSC and deposition, with the MarESA assessment also presented in detail.

Significance of residual effect

9.10.18 The Proposed Development embedded environmental measures (as shown in **Table 9-16**) include the development of an Outline Scour Protection Management Plan (SPMP), to prevent scour occurring at foundations and at buried cable (C-44), which will be secured through the DCO, to minimise the disturbance to benthic receptors. Overall, it is predicted that the sensitivity of the benthic subtidal and intertidal receptors found within the proposed DCO Order Limits benthic subtidal ecology study area is **High** and the magnitude is **Negligible**. The residual effect significance will be **Minor**, **Not Significant** in EIA terms.

Colonisation of the WTGs and scour / cable protection may affect benthic ecology and biodiversity

Magnitude of impact

9.10.19 The introduction of hard substrate will change the type of available habitats within the proposed DCO Order Limits. However, the amount of introduced substrate is

relatively small at approximately 1.39km^2, which accounts for approximately 0.6% of the total proposed DCO Order Limits.

9.10.20 Hard substrate habitats are not rare within the proposed DCO Order Limits which are characterised by a range of sedimentary habitats, coarser sediments and rocky outcrops. The introduction of additional hard substrate will alter sedimentary biotopes that characterise the area at the location of the introduction of the Proposed Development infrastructure and will be long term, lasting for the duration of the development. Any effects on benthic subtidal ecology, arising from the introduction of hard substrates will be localised to the proposed DCO Order Limits array area and offshore export cable corridor (at locations where cable protection is laid).

9.10.21 The impact is therefore predicted to be of local spatial extent, long-term duration but reversable where the infrastructure is removed, noting that not all introduced hard substrate is likely to be removed, with cable and scour protection remaining in-situ. Therefore, the magnitude of the impact is considered to be **minor**, as the habitats and characterising biotopes are not geographically restricted and are typically common and widespread throughout the wider region.

Sensitivity of receptor

9.10.22 The introduction of new hard substrate will represent a potential shift in the baseline condition within a small proportion of proposed DCO Order Limits. Potential beneficial effects that may occur are associated with the likely increase in biodiversity and biomass, as has been observed at the Egmond aan Zee Offshore Windfarm (Lindeboom *et al*., 2011). Individual species with the potential to benefit from the introduction of hard substrate due to increased substrate for attachment are those which are typical of rocky habitats environments.

9.10.23 The species potentially introduced may also have indirect and adverse effects through increased predation on, or competition with, neighbouring soft sediment species. However, such effects are difficult to predict. The increased biodiversity associated with the structures could provide benefits at higher trophic levels as the benthic organisms colonising the structures provide an additional food source. Studies at the Horns Rev Offshore Windfarm in Denmark provided evidence that offshore wind farm structures are used as successful nursery habitats for the edible crab *C. pagurus* (Vattenfall, 2006). However, any direct benefits are only likely to occur on a very localised basis (for instance in the immediate vicinity of the infrastructure).

9.10.24 Given the presence of epifaunal species and colonising fauna across parts of the proposed DCO Order Limits (for instance associated with coarser sediment and rocky habitats), it is predicted that colonisation of hard substrates by common species such as bryozoans and ascidians will occur.

9.10.25 The sediment biotopes likely to be affected are deemed to be of low vulnerability to an impact of this nature. Recoverability following removal of the infrastructure is expected to be high although not all introduced hard substrate is likely to be removed, with cable and scour protection remaining in-situ. The sensitivity of these receptors is therefore considered to be at worst-case **Medium**, in areas where infrastructure is not removed.

Significance of residual effect

9.10.26 Any beneficial effects associated with an increase in biodiversity will be highly localised in nature. The introduction of hard structures such as scour protection can lead to an increase in biomass and biodiversity which may be considered beneficial, but it also represents a change from the baseline environment which may be considered adverse.

9.10.27 Overall, it is predicted that the sensitivity of the receptor is **Medium**, and the magnitude is **Minor**. While the impact will comprise a permanent change in seabed habitat within the footprint of the structures and scour and cable protection, the footprint of the area affected and any associated increases and/or changes in biodiversity will be highly localised. Given that the benthic habitats that characterise the proposed DCO Order Limits are not geographically restricted to within the proposed development area and are typically widespread throughout the wider eastern English Channel region (as described in **Section 9.6**), the predicted change in species composition and biodiversity in discreet areas are not expected to threaten the long-term viability of the resource. The residual effect significance will be **Minor, Not Significant** in EIA terms.

Increased risk of introduction or spread of Marine INNS due to presence of infrastructure and vessel movements (e.g. the discharge of ballast water) may affect benthic ecology and biodiversity

Magnitude of impact

9.10.28 There is a risk that the introduction of hard substrate into a sedimentary habitat will enable the colonisation of the introduced substrate by invasive/non-indigenous species that might otherwise not have had a suitable habitat for colonisation, thereby enabling their spread. This along with the movement of operation and maintenance vessels in and out of the proposed DCO Order Limits has the potential to impact upon benthic ecology and biodiversity locally and in the broader region.

9.10.29 As presented in **Table 9-15**, up to 1.39km^2 of new hard substrate habitat will be introduced into the proposed DCO Order Limits, which has the potential to provide new habitat for colonisation by Marine INNS.

9.10.30 In addition to this there will be an estimated total of 26,070 vessel return trips during the operation and maintenance phase of the Proposed Development. The majority of these return trips (25,500) comprise crew transfer vessel journeys. As these crew transfer vessel trips will originate from local operations ports to the Proposed Development, the risk of Marine INNS introductions are minimal. However, the movement of commercial vessels is common throughout the region (**Chapter 13: Shipping and Navigation, Volume 2** of the ES (Document Reference: 6.2.13)), and this provides an existing and potentially more likely method of transport for Marine INNS species (due to the higher variety of ports and passage routes).

9.10.31 It should be noted that there is a wide-spread presence of Marine INNS across the eastern English Channel (see **paragraph 9.9.62**), which is evident from the biotope '*C. fornicata* with ascidians and anemones on infralittoral coarse mixed

sediment (A5.431)' which is predicted to occur across the proposed DCO Order Limits. The Marine INNS *C. fornicata* has successfully established to an extent that it outcompetes indigenous species causing large scale habitat changes across the wider south coast (EMU Limited, 2012). Furthermore, there is extensive areas of hard substrate recorded within the benthic subtidal ecology study area (**Section 9.6**), so the introduction of artificial hard substrate will not interrupt a pristine sedimentary habitat.

9.10.32 As detailed within **Table 9-16**, embedded environmental measures which include an **Outline Project Environmental Management Plan** (Document Reference: 7.11) (C-95). The Final PEMP will include a biosecurity plan to ensure that the risk of potential introduction and spread of Marine INNS will be minimised.

9.10.33 The magnitude of the impact that construction activities will have to the introduction or spread of Marine INNS is considered to be **Minor**, indicating that there will be a limited but discernible change that does not threaten benthic subtidal ecology features, undermine regional ecosystem functions or diminish biodiversity.

Sensitivity of receptor

9.10.34 As described in **paragraph 9.9.64**, benthic biotopes within the proposed DCO Order Limits are deemed to be 'not sensitive' to having a 'high' sensitivity to the introduction or spread of Marine INNS, according to the MarESA. The sensitivity of nearby MCZ features is also regarded as high given their protection status. Therefore, the sensitivity is considered to be **high**, reflecting that those benthic receptors have 'none' or 'low' resistance (tolerance) to an impact of this nature.

Significance of residual effect

9.10.35 The sensitivity of benthic receptors to the introduction or spread of Marine INNS have been assessed as high. Implementation of mitigation (C-95, **Table 9-16**) through the implementation of the **Outline Project Environmental Management Plan** (Document Reference: 7.11) and biosecurity mitigation plan which will be submitted with the Final PEMP, will ensure a reduction in the magnitude of the impact to a **Negligible.** On this basis, and considering the potentially **High** sensitivity of benthic features, the residual effect significance will be **Minor, Not Significant** in EIA terms.

Indirect disturbance arising from the accidental release of pollutants

Magnitude of impact

9.10.36 There is a risk that indirect disturbance arising from the accidental release of pollutants such as synthetic compounds, heavy metal and hydrocarbon contamination resulting from up to 90 WTGs and up to three offshore substations. Accidental pollution may also result from up to 26,070 vessel return trips over the approximate 30-year design lifetime, which could lead to an adverse effect on benthic subtidal and intertidal ecology receptors.

9.10.37 As detailed within **Table 9-16**, embedded environmental measures which include an Outline MPCP (Appendix A of the **Outline Project Environmental Management Plan** (Document Reference: 7.11) (C–53) will act to safeguard the marine environment and provide environmental measures in the event of an accidental pollution event arising from offshore operations relating to the Proposed Development, ensuring that the risk of an accidental pollution event is minimised.

9.10.38 Therefore, the magnitude of the impact that operation and maintenance activities will have to the release of pollutants is considered to be **Negligible**, indicating that there will be barely discernible change for any length of time, over a small area of the receptor that does not threaten benthic subtidal ecology features, undermine regional ecosystem functions or diminish biodiversity.

Sensitivity of receptor

9.10.39 The sensitivity of benthic species to toxic pollutants that may be released as a result of operation and maintenance activities is deemed to be **High**, which is considered precautionary and reflects the lack of evidence on individual receptors and biotopes. A sensitivity of high describes the habitat or species as exhibiting 'None' or 'low' resistance (tolerance) to an external factor and is expected to recover only over very extended timescales, e.g. greater than 25 years or not all (**Table 9-17**).

Significance of residual effect

9.10.40 The Proposed Development embedded environmental measures (as shown in **Table 9-16**) include measures to safeguard the marine environment and provide mitigation measures in the event of an accidental pollution event arising from offshore operations relating to Proposed Development (C-53) which will be secured through the dML, to minimise the disturbance to benthic receptors. Overall, it is predicted that the sensitivity of the benthic subtidal and intertidal receptors found within the proposed DCO Order Limits benthic subtidal ecology study area is **High** and the magnitude is **Negligible**. The residual effect is significance will be **Minor, Not Significant** in EIA terms.

Indirect disturbance arising from EMF generated by the current flowing through the cables buried to less than 1.5m below the surface

Magnitude of impact

9.10.41 EMF are generated by the current that passes through an electric cable. It is known that EMF can be detected by fish and elasmobranchs, and it is thought that any benthic invertebrates can also detect EMF. Three types of fields are generated by underwater electric cables: electric fields (E-fields), magnetic fields (B-fields) and induced electric fields (iE-fields). Standard industry practice is for the cables used to have sufficient shielding to contain the E-fields generated and the cable system descriptions for the inter-array and export cables have abided by this (**Chapter 4: The Proposed Development, Volume 2** of the ES (Document Reference: 6.2.4). Shielding and/or burial does not reduce the B-fields and it is

these fields that allow the formation of iE-fields. As such, further reference here to EMF is limited to B-fields and associated iE-fields.

9.10.42 Impacts from changes in EMFs arising from cables, are not considered to result in a significant effect on benthic subtidal and intertidal receptors. EMFs are likely to be generated by subsea cables and detectable above background levels in close proximity to the cables. Although burial does not mask EMFs it increases the distance between species that may be affected by EMFs and the source. As the cable will be buried or protected, as detailed within **Table 9-16** (embedded environmental measures C-41, C-43 and C-45), any behavioural responses are likely to be mitigated.

9.10.43 In total, 2.35km of route length (per cable) may require a level of alternative protection, such as rock dumping. Overall, the engineering study has identified that a mechanical cutting trencher is necessary for up to 54% of the route length, of which 13% is considered likely to require further protection with rock placement. The remaining 46% is considered possible to achieve with jet trenching. This can be further clarified when route-specific geotechnical data is obtained at the pre-construction stage and the burial potential is confirmed (RED, 2022).

9.10.44 It is considered unlikely that EMFs will result in a significant behavioural response that will cause a change in benthic communities within the benthic subtidal ecology study area and that any potential negative effects will be confined to a localised area surrounding the cables. Therefore, the magnitude of the impact considered to be **Negligible**, indicating that any behavioural response of benthic fauna is likely to be discernible or barely discernible over a very small area, that does not threaten benthic subtidal ecology features, undermine regional ecosystem functions or diminish biodiversity.

Sensitivity of receptor

9.10.45 The MarESA sensitivity assessments do not consider there to be sufficient evidence to support assessments of impacts of EMF on benthic and intertidal habitats; therefore, a desktop study has been undertaken to describe the typical responses of benthic invertebrates. A detailed assessment on elasmobranch, fish and shellfish species is provided in **Chapter 8: Fish and shellfish ecology, Volume 2**, of the ES (Document Reference: 6.2.8) **Section 8.10**.

9.10.46 Typically, the impacts of EMF on marine organisms have focused on electrically sensitive fish and elasmobranchs, with little research focusing on benthic invertebrates, with the few studies using invertebrates focusing on crustaceans (e.g. Woodruff *et al*., 2012). Furthermore, many studies contradict each other or provide inconclusive results (Switzer and Meggitt, 2010), further reducing the available evidence.

9.10.47 However, evidence of sensing, responding to, or orienting to natural magnetic field cues has been shown for invertebrates including molluscs and arthropods (Boles and Lohmann, 2003; Lohman and Willows, 1987; Ugolini, 2006; Ugolini and Pezzani, 1995). A study by Scott *et al*. (2019) reported that edible crabs (*C. pagurus*) exposed to EMF in the laboratory at the strength predicted around subsea cables resulted in a clear attraction of the crabs to EMF and significantly reduced their time spent roaming. This suggests that the natural roaming

behaviour, where individuals will actively seek food and/or mates has been overridden by an attraction to the source of the EMF. The EMF had no effect on stress-related parameters, such as respiration rate or activity level, but the results predict that in benthic areas where there is increased EMFs, there will be an increase in the abundance of *C. pagurus* present.

9.10.48 A laboratory study assessing the effects of environmentally realistic, low-frequency B-field exposure on the behaviour and physiology of the common ragworm (*Hediste diversicolor*) did not find any evidence of avoidance or attraction behaviours (Jakubowska *et al*., 2019). The polychaetes did, however, exhibit enhanced burrowing activity when exposed to the B-field, with plausible consequences for their metabolism; however, knowledge about the biological relevance of this response is currently absent (Jakubowska *et al*., 2019).

9.10.49 One recent study examined the difference in invertebrate communities along an energised and nearby unenergised surface laid cables. The study identified that there were no functional differences between the communities on and around the cables up to three years after installation (Love *et al*., 2016). The same study also identified that EMF levels reduce to background levels generally within one metre of the cable.

9.10.50 For invertebrate receptor species, it is difficult to translate the patchwork of knowledge about individual-level EMF effects into assessments of biologically or ecologically significant impacts on populations (Boehlert and Gill, 2010). However, given the evidence presented, it is predicted that EMFs have no significant impact on mobile or sessile benthic invertebrates, including if the cable is surface laid.

9.10.51 The sensitivity of benthic receptors is therefore considered to be **Low**, reflecting that the receptor has a high resistance and ability to tolerate the impacts of EMF over the approximate 30-year operational lifetime of the Proposed Development.

Significance of residual effect

9.10.52 The Proposed Development include measures to bury or protect cables (C-41, C-43 and C-45, **Table 9-16**), therefore any behavioural responses of benthic receptors are likely to be mitigated. Overall, it is predicted that the sensitivity of the benthic subtidal and intertidal receptors found within the Proposed DCO Order Limits is **Low** and the magnitude is **Negligible**. The residual effect significance is therefore **Negligible, Not Significant** in EIA terms.

9.11 Assessment of effects: Decommissioning phase

Habitat disturbance from decommissioning of foundations, cable and rock protection

Overview

9.11.1 The nature and extent of habitat loss/disturbance within the proposed DCO Order Limits during decommissioning is assumed (for the purposes of this assessment) to be similar to that described for the equivalent activities during the construction phase in **paragraph 9.9.2** to **paragraph 9.9.7** unless otherwise stated.

9.11.2 The maximum design scenario (**Table 9-15**) has assumed the same quantitative requirements for sandwave clearance and boulder clearance activities, prior to decommissioning, as that required during the construction phase, although this is also likely to be over-precautionary.

9.11.3 Decommissioning has the potential to cause temporary loss of, or disturbance to, benthic habitats within the proposed DCO Order Limits, similar to those described during the construction phase. However, as seabed preparation works will not be required, the magnitude of this impact will be lower than during the construction phase.

9.11.4 The details of the proposed decommissioning process will be included within the Decommissioning Programme which will be developed and updated throughout the lifetime of the Proposed Development to account for changing best practice[89]. Some materials may be left *in situ*, and this will be reviewed closer to the time of decommissioning (e.g. export and inter-array cables). As such, the maximum design scenario assumes the removal of all infrastructure.

9.11.5 The magnitude of the impact and the sensitivities of the benthic habitats to habitat disturbance are as described for the construction phase (described in detail in **paragraph 9.9.2** to **paragraph 9.9.7**).

Significance of residual effect

9.11.6 The direct impact of habitat disturbance will represent a local spatial extent, short term intermittent impact (for most biotopes), affecting a relatively small portion of the benthic subtidal habitats in the proposed DCO Order Limits. However, it is noted that the proposed export cable corridor will enter a recently designated “no-trawling zone” (see **paragraph 9.6.36**) and a site for kelp restoration and protection (see **paragraph 9.6.37**). Although most benthic receptors are known to have a medium to high degree of tolerance to this impact, based on MarESA assessments, the sensitivity of the receptors has been assessed as worst-case **Medium** (disregarding Piddocks with a sparse associated fauna in sublittoral very soft chalk or clay which is discussed in **paragraph 9.11.7**), and the magnitude is **Minor** for subtidal receptors. The short-term and localised nature of this impact and the tolerance and recoverability of the majority of the benthic receptors, the significance of the residual effect is deemed **Minor Significance, Not Significant** in EIA terms.

9.11.7 The biotope ‘Piddocks with a sparse associated fauna in sublittoral very soft chalk or clay (A4.231)’ has been assigned a high sensitivity to direct decommissioning impacts, as the impact is regarded permanent due to the low recovery expectations. In the absence of mitigation there is the potential for significant effects to arise due to the sensitivity of the feature, however the implementation of mitigation options (C-269, C-270, C-272, **Table 9-16**) whereby cable installation will be constrained to minimise the area of physical disturbance and interaction on chalk habitat. These measures will ensure a reduction in the magnitude of the

[89] It is noted that this will be subject to best practice at the time of decommissioning and surveys conducted to assess the quality of the communities established and a decision on their removal made in conjunction with the statutory authorities.

impact to a **Negligible** level for this feature. On this basis, and considering the **High** sensitivity of chalk, the residual effect significance will be **Minor**, **Not Significant** in EIA terms.

Temporary increase in Suspended Sediment Concentration (SSC) and sediment deposition from decommissioning of foundations, cables, and rock protection

Overview

9.11.8 The nature and extent of temporary increase in suspended sediment and sediment deposition during decommissioning is assumed (for the purposes of this assessment) to be similar to that described for the equivalent activities during the construction phase in **paragraph 9.9.17** to **paragraph 9.9.30** unless otherwise stated (for instance activities involved in the decommissioning process that give rise to impacts that are similar to those arising from the construction process such as sandwave clearance, cable installation and drilling at foundations).

9.11.9 The maximum design scenario has assumed the same quantitative requirements for sandwave clearance, prior to decommissioning, as that required during the construction phase, although this is also likely to be over-precautionary.

9.11.10 Decommissioning has the potential to cause a temporary increase in suspended sediment and sediment deposition within the proposed DCO Order Limits, similar to those described during the construction phase. However, as seabed preparation works will not be required, the magnitude of this impact will be lower than during the construction phase.

9.11.11 The details of the proposed decommissioning process will be included within the Decommissioning Programme which will be developed and updated throughout the lifetime of the Proposed Development to account for changing best practice.

9.11.12 The magnitude of the impact and the sensitivities of the benthic habitats to temporary increase in suspended sediment and sediment deposition are as described for the construction phase (described in detail in **paragraph 9.9.17** to **paragraph 9.9.30**).

Significance of residual effect

Based on the assessment undertaken for construction (which represents the maximum design scenario), the indirect impact of increases in SSC and associated sediment deposition will represent a temporary and short-term intermittent impact, affecting a relatively small portion of the benthic subtidal habitats in the proposed DCO Order Limits and benthic ecology study area. Most benthic receptors are known to have a medium to high degree of tolerance to this impact, based on MarESA assessments. It is predicted that the sensitivity of the majority of receptors is worst-case **Medium**, and the magnitude is M**inor**. The short-term and localised nature of the higher SSCs and deposition rates and the tolerance and recoverability of the majority of the benthic receptors; the significance of effect is deemed **Minor, Not Significant** in EIA terms.

Direct and indirect seabed disturbances leading to the release of sediment contaminants

Overview

9.11.13 The nature and extent of direct and indirect seabed disturbances leading to the release of sediment contaminants during decommissioning is assumed (for the purposes of this assessment) to be similar to that described for the equivalent activities during the construction phase in **paragraph 9.9.52** to **paragraph 9.9.57**, unless otherwise stated.

9.11.14 The details of the proposed decommissioning process will be included within the Decommissioning Programme which will be developed and updated throughout the lifetime of the Proposed Development to account for changing best practice.

9.11.15 The magnitude of the impact and the sensitivities of the benthic habitats to direct and indirect disturbance leading to a release of sediment contaminants are as described for the construction phase (described in detail in **paragraph 9.9.52** to **paragraph 9.9.57**).

Significance of residual effect

9.11.16 Based on the assessment undertaken for construction (which represents the maximum design scenario), it is predicted that the maximum sensitivity of benthic receptors is at worst-case **High**, and the magnitude is **Negligible**. The residual effect significance will be **Minor, Not Significant** in EIA terms.

Increased risk of introduction or spread of Marine INNS may affect benthic ecology and biodiversity

Overview

9.11.17 The nature and extent of increased risk of introduction or spread of Marine INNS is assumed (for the purposes of this assessment) to be similar to that described for the equivalent activities during the construction phase in **paragraph 9.9.60** to **paragraph 9.9.63**, unless otherwise stated (for instance vessel movements).

9.11.18 The details of the proposed decommissioning process will be included within the Decommissioning Programme which will be developed and updated throughout the lifetime of the Proposed Development to account for changing best practice.

9.11.19 The magnitude of the impact and the sensitivities of the benthic habitats to the introduction or spread of Marine INNS are as described for the construction phase (described in detail in **paragraph 9.9.60** to **paragraph 9.9.63**).

Significance of residual effect

9.11.20 Based on the assessment undertaken for construction (which represents the maximum design scenario), it is predicted that the maximum sensitivity of benthic receptors is at worst-case **High**, and the magnitude is **Negligible**. The residual effect significance will be **Minor, Not Significant** in EIA terms.

Indirect disturbance arising from the accidental release of pollutants

Overview

9.11.21 The nature and extent of indirect disturbance arising from the accidental release of pollutants is assumed (for the purposes of this assessment) to be similar to that described for the equivalent activities during the construction phase in **paragraph 9.9.67** to **paragraph 9.9.69**, (for instance synthetic compound, heavy metal and hydrocarbon contamination).

9.11.22 The details of the proposed decommissioning process will be included within the Decommissioning Programme which will be developed and updated throughout the lifetime of the Proposed Development to account for changing best practice.

9.11.23 The magnitude of the impact and the sensitivities of the benthic habitats to the indirect disturbance arising from the accidental release of pollutants are as described for the construction phase (described in detail in **paragraph 9.9.67** to **paragraph 9.9.69**).

Significance of residual effect

9.11.24 The Proposed Development embedded environmental measures (C-53; **Table 9-15**) include measures to safeguard the marine environment and provide mitigation to prevent an accidental pollution event arising from offshore operations. This will be secured through the DCO, to minimise disturbance to benthic receptors.

9.11.25 Overall, it is predicted that the sensitivity of the benthic subtidal and intertidal receptors found within the proposed DCO Order Limits benthic subtidal ecology study area is **Medium** and the magnitude is **Negligible**. The residual effect significance will be **Minor, Not Significant** in EIA terms.

9.12 Assessment of cumulative effects

Approach

9.12.1 A CEA examines the combined impacts of Rampion 2 in combination with other developments on the same single receptor or resource and the contribution of Rampion 2 to those impacts. The overall method followed in identifying and assessing potential cumulative effects in relation to the offshore environment is set out in **Chapter 5: Approach to the EIA, Volume 2** of the ES (Document Reference: 6.2.5).

9.12.2 The offshore screening approach is based on the Planning Inspectorate's Advice Note Nine (Planning Inspectorate, 2018) and Advice Note Seventeen (Planning Inspectorate, 2019), with relevant components of the RenewableUK (RenewableUK, 2013) accepted guidance, which includes aspects specific to the marine elements of an offshore wind farm, addressing the need to consider mobile wide-ranging species (foraging species, migratory routes, etc.).

Cumulative effects assessment

9.12.3 For benthic subtidal and intertidal ecology, a ZOI as described in **Section 9.4: Scope of the assessment** and shown in **Figure 9.1**, **Volume 3** of the ES (Document Reference: 6.3.9) has been applied for the CEA to ensure direct and indirect cumulative effects can be appropriately identified and assessed. The secondary ZOI has been determined as the largest distance over which an impact may occur. For the purpose of the benthic subtidal and intertidal ecology assessment, this is defined over the distance which increased SSC and deposition may occur and therefore extends 16km around the proposed DCO Order Limits. As detailed in **paragraph 9.9.18** sediment plumes caused by seabed preparation and installation activities are expected to occur over a maximum distance of 16km (spring) from the source. However, sediment plumes are expected to quickly dissipate after cessation of the activities, due to settling and wider dispersion with the concentrations reducing quickly over time to background levels. The benthic subtidal and intertidal ecology ZOI is shown in **Figure 9.1, Volume 3** of the ES (Document Reference: 6.3.9).

9.12.4 A short list of 'other developments' that may interact with the Rampion 2 ZOIs during their construction, operation or decommissioning is presented in **Appendix 5.4: Cumulative effects assessment shortlisted developments, Volume 4** of the ES (Document Reference: 6.4.5.4) and on **Figure 5.4.1, Volume 3** of the ES (Document Reference: 6.4.5.4). This list has been generated applying criteria set out in **Chapter 5: Approach to the EIA, Volume 2** of the ES (Document Reference: 6.2.5) and has been collated up to the finalisation of the ES through desk study, consultation and engagement.

9.12.5 Only those 'other developments' in the short list that fall within the benthic subtidal and intertidal ecology ZOI have the potential to result in cumulative effects with the Proposed Development on benthic subtidal and intertidal ecology. All 'other developments' falling outside the benthic subtidal and intertidal ecology ZOI are excluded from this assessment. The following types of 'other development' have the potential to result in cumulative effects on benthic subtidal and intertidal ecology.

- sub-sea cables (telecommunication and power cables) and pipelines;
- aggregate production areas;
- disposal sites; and
- offshore wind farms.

9.12.6 On the basis of the above, the 'other developments' that are scoped into the benthic subtidal and intertidal ecology CEA are outlined in **Table 9-25**. It should be noted that developments which are proposed or under construction, at the time of writing this chapter, are included in the table below due to lack of certainty around any ongoing effect.

9.12.7 The cumulative Project Design Envelope is described in **Table 9-26**.

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Table 9-25 Developments considered as part of the benthic subtidal and intertidal ecology CEA

ID (Figure 5.4.1)	Development type	Development name	Application reference	Status	Confidence in assessment	Tier[90]	Distance to Rampion 2 (km)
W48	Offshore wind farm	Rampion 1	Rampion 1	Operational[91]	High – Third-party project details published in the public domain and confirmed as being 'accurate' by the developer.	1	0
C1	Cable	AQUIND (UK to France)	AQUIND Interconnector	Application submitted, consent refused January 2022, applying for judicial review,	High – Third-party project details published in the public domain and confirmed as being 'accurate' by the developer.	1	0

[90] **Chapter 5: Approach to the EIA, Volume 2** of the ES (Document Reference: 6.2.5) sets out the full definitions of the tiers. Tier 1: high level of certainty or information availability (including under construction or where a planning application has been approved or is awaiting decision). Tier 2: medium level of certainty or information (such as developments on PINS Programme of Projects where a Scoping Report has been submitted). Tier 3: low level of certainty or information available (no planning applications submitted or identified for potential future development only).

[91] the Planning Inspectorate Advice Note 17 states 'Where other projects are expected to be completed before construction of the proposed NSIP and the effects of those projects are fully determined, effects arising from them should be considered as part of the baseline and may be considered as part of both the construction and operational assessment.' Rampion 1, IFCA-2 and CrossChannel Fibre are therefore included in the CEA because the full effects of the project offshore are considered to not yet be fully realised.

ID (Figure 5.4.1)	Development type	Development name	Application reference	Status	Confidence in assessment	Tier[90]	Distance to Rampion 2 (km)
				currently being redetermined.			
C2	Cable	IFA-2	Interconnexion France-Angleterre 2 – IFA-2 HVDC	Operational[91]	High – Third-party project details published in the public domain and confirmed as being 'accurate' by the developer.	1	0.9
C3	Cable	CrossChannel Fibre	CrossChannel Fibre	Dormant	Low, ES not available.	1	8.8
TC1	Telecommun-ication	ATLANTIC CROSSING 1	ATLANTIC CROSSING 1 Century Link	Active	Low, ES not available	1	14.6
TC6	Telecommun-ication	CIRCLE SOUTH ZAYO	CIRCLE SOUTH ZAYO	Active	Low, ES not available or does not contain environmental impact assessment	1	16
A351	Aggregates	395/1 Off Selsey Bill	395/1 Off Selsey Bill – Aggregates Industries UK Ltd / Kendall Bros (Portsmouth) Ltd /	Active	High, environmental statement impact assessments are undertaken.	1	15.8

ID (Figure 5.4.1)	Development type	Development name	Application reference	Status	Confidence in assessment	Tier[90]	Distance to Rampion 2 (km)
			Tarmac Marine Ltd (MLA/2012/00374/5)				
A395/1	Aggregates	395/1 Off Selsey Bill	395/1 Off Selsey Bill – Aggregates Industries UK Ltd / Kendall Bros (Portsmouth) Ltd / Tarmac Marine Ltd (MLA/2012/00374/5)	Active (end date 05/03/2028)	High – Third-party project details published in the public domain and confirmed as being 'accurate' by the developer	1	15
A396/1	Aggregates	396/1 Inner Owers	396/1 Inner Owers – Tarmac Marine Ltd	Active (end date 07/07/2030)	High – Third-party project details published in the public domain and confirmed as being 'accurate' by the developer.	1	0
A396/2	Aggregates	396/2 Inner Owers	396/2 Inner Owers – Tarmac Marine Ltd	Active (end date 07/07/2030)	High – Third-party project details published in the public domain and confirmed as being 'accurate' by the developer.	1	2

ID (Figure 5.4.1)	Development type	Development name	Application reference	Status	Confidence in assessment	Tier[90]	Distance to Rampion 2 (km)
A435/1	Aggregates	435/1 Inner Owers	435/1 Inner Owers – Hanson Aggregates Marine Ltd	Active (end date 07/07/2030)	High – Third-party project details published in the public domain and confirmed as being 'accurate' by the developer.	1	0.7
A435/2	Aggregates	435/2 Inner Owers	435/2 Inner Owers – Hanson Aggregates Marine Ltd	Active (end date 07/07/2030)	High – Third-party project details published in the public domain and confirmed as being 'accurate' by the developer.	1	1.5
A453	Aggregates	453 Owers Extension	453 Owers Extension – CEMEX UK Marine Ltd.	Active (end date 31/03/2032)	High – Third-party project details published in the public domain and confirmed as being 'accurate' by the developer.	1	0.4
A488	Aggregates	488 Inner Owers North	488 Inner Owers North – Tarmac Marine Ltd.	Active (end date 07/07/2030)	High – Third-party project details published in the public domain and confirmed as being 'accurate' by the developer.	1	0.5

ID (Figure 5.4.1)	Development type	Development name	Application reference	Status	Confidence in assessment	Tier[90]	Distance to Rampion 2 (km)
D1[92]	Burial at sea	Newhaven	Open disposal site – Newhaven	Open	High – Third-party project details published in the public domain and confirmed as being 'accurate' by the developer.	1	17
D2	Disposal for the existing Rampion 1 project	Rampion 1	Open disposal site – Rampion 1	Open	High – Third-party project details published in the public domain and confirmed as being 'accurate' by the developer.	1	0
D3	Disposal	Shoreham	Open disposal site - Shoreham	Open	High – Third-party project details published in the public domain and confirmed as being 'accurate' by the developer.	1	12.4

[92] Open disposal sites are those where activities are still ongoing, hence effects arising from them may still be ongoing. In line with the Planning Inspectorate Advice Note 17, all such sites are included in the CEA as the effects are considered to not yet be fully realised.

ID (Figure 5.4.1)	Development type	Development name	Application reference	Status	Confidence in assessment	Tier[90]	Distance to Rampion 2 (km)
D4	Dredged material from Brighton Marina	Brighton/ Rottingdean	Open disposal site – Brighton/ Rottingdean	Open	High – Third-party project details published in the public domain and confirmed as being 'accurate' by the developer.	1	13.3
D6	Unknown waste type	AQUIND Cable Site A	Open disposal site – AQUIND Cable Site A	Open	High – Third-party project details published in the public domain and confirmed as being 'accurate' by the developer	1	0

Table 9-26 Cumulative Project Design Envelope for benthic subtidal and intertidal ecology

Project phase and activity/impact	Scenario	Justification
Construction		
Cumulative temporary increases in SSC and associated sediment deposition	Maximum design scenario as described for the construction of the Proposed Development assessed cumulatively with the following projects within the benthic subtidal ecology study area: Tier 1: Construction phase of AQUIND interconnector cables; Operation and maintenance of operational cables; Operation of aggregate licence areas (351, 395/1, 396/1, 396/2, 435/1, 435/2, 453, 488); and Operation of active disposal sites. Tier 2: No other developments to consider. Tier 3: No other developments to consider.	Maximum cumulative increases in SSC and smothering is calculated within the proposed DCO Order Limits benthic ecology study area (further detail is presented in **paragraph 9.10.13** to **paragraph 9.10.16**).
Operation and Maintenance		
Cumulative changes to seabed habitats arising from effects on physical processes, including scour	Maximum design scenario as described for the construction of the Proposed Development assessed cumulatively	The maximum design scenario of these projects have the potential to result in cumulative changes to seabed habitats arising from effects on physical

Project phase and activity/impact	Scenario	Justification
effects and changes in the sediment transport and wave regimes resulting in potential effects on benthic communities.	with the following projects within the benthic subtidal ecology study area: Tier 1: Operation and maintenance of operational cables Tier 2: No other developments to consider. Tier 3: No other developments to consider.	processes, which in turn has the potential to impact benthic communities. Further detail is presented in **paragraph 9.12.18**, and are also detailed in **Chapter 6: Coastal Processes, Volume 2** of the ES (Document Reference: 6.2.6).

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9.12.8 A description of the significance of cumulative effects upon benthic and intertidal ecology arising from each identified impact is given below. The CEA has been based on information available in the ESs for the other developments where these are available. It is noted that the other development parameters quoted within these ESs are often refined during the determination period and in the post-consent phase such that the final schemes built out may have a reduced impact compared to what has been concluded in the ES.

9.12.9 The other developments considered in this CEA are illustrated in **Figure 9.9, Volume 3** of the ES (Document Reference: 6.3.9).

Cumulative temporary increases in SSC and associated sediment deposition during construction

9.12.10 There is potential for cumulative increases in SSC and associated deposition as a result of construction activities associated with the Proposed Development and other developments (**Table 9-26**). For the purposes of this assessment, this additive impact has been assessed within the benthic subtidal ecology ZOI, which extends 16km around the Proposed Development, representing the maximum tidal excursion in the area, and therefore the furthest distance sediments can travel from the site. The projects identified in Tier 1 are the construction of the AQUIND interconnector cables, the operation of aggregate licence areas 351, 395/1, 396/1, 396/2, 435/1, 435/2, 453, 488 and the operation of active disposal sites. There are no Tier 2 or Tier 3 projects.

9.12.11 The AQUIND interconnector cable is located with the proposed DCO Order Limits and it is assumed that construction will coincide with the construction of the Proposed Development. From kilometre point 21 to 109 the worst-case scenario for increased SSC is considered to be surface release of up to 1,754,000m^3 of sediment (AQUIND Limited, 2019). Cumulatively with the Proposed Development construction this may result in the disturbance and deposition of up to 4,645,000m^3 of sediment. However, only a small portion of the AQUIND interconnector cable intersects with the proposed DCO Order Limits (9.34km of cable) with a total of 24.72km overlapping the Secondary ZOI, and therefore the maximum amount of sediment released cumulatively with the Proposed Development will be considerably less. Any cable maintenance repairs undertaken within the operational phase of the developments will be short term, intermittent and localised to the site and therefore cumulative impacts are expected to be minimal. Additionally, due to the naturally dynamic environment of the site, any sediment released from these operations during the construction and operational phases of the development will likely be dispersed in the faster flows. Therefore, taking this into consideration, there are not predicted to be any significant cumulative impacts from the construction or operation of the AQUIND interconnector cable.

9.12.12 A small number of operational disposal sites are located in proximity to Rampion 2 and within one tidal excursion distance of the site, and therefore there is the potential for a cumulative sediment plume effect. It is not known what volumes of sediment will be deposited at these disposal sites at any one time, and as the use of these sites is intermittent, it is not possible to determine if the use of these sites will overlap with sediment deposition from the construction phase of Rampion 2. If

Rampion 2 construction activities are undertaken at the same time as spoil disposal is occurring at the disposal sites then a larger sediment plume may form, however, this will quickly disperse given the dynamic nature of the site.

9.12.13 Aggregate licence areas 351, 395/1, 396/1, 396/2, 435/1, 435/2, 453 and 488 will be operational during the construction of the Proposed Development, therefore the potential for cumulative temporary increases in SSC and sediment deposition from these active dredge operations. The target material at these marine aggregate areas is sands and gravels and characteristically, the aggregate deposits in the MAREA region contain 1 to 3% mud (silt and clay) in situ and therefore the SSCs in the overflow from dredging vessels are relatively low compared to other regions of the UK (EMU Limited, 2012). As part of the Rampion 1 offshore wind farm ES, changes to seabed sediment thickness as a result of combined foundation installation and aggregate extraction works were modelled as part of the impact assessment (ABPMer, 2012). The modelling predicted that bed level changes of up to around 1mm could occur; however, it was expected that this sediment will be widely remobilised. The addition of 1mm of sediment is not anticipated to cause any significant impacts to benthos associated with the proposed DCO Order Limits. ABPMer (2012) also considered that there was only a minimal potential for of any interaction between suspended sediment from export cable installation and aggregate extraction. Similar observations are anticipated for the Proposed Development. Therefore, no significant cumulative effects are predicted.

9.12.14 Cumulative effects can also be considered in terms of duration of exposure from multiple projects which do not overlap but happen consecutively. However, as the effects from the majority of the projects will be short-lived, there are likely to be significant temporal gaps between the discrete construction and maintenance events, which will have localised effects. As aggregate activities are not considered to cause a significant cumulative increase to SSC and deposition and as a result of the ‘not sensitive’ to ‘high’ sensitivity of benthic receptors in proposed DCO Order Limits benthic ecology study area (**paragraph 9.9.40** and **paragraph 9.9.41**), cumulative effects in terms of duration of exposure are not expected.

9.12.15 The cumulative impacts of increased SSC and sediment deposition is considered to be **minor** magnitude, indicating that the potential is for localised disturbance that does not threaten the long-term viability of the resource.

9.12.16 Full discussion of the sensitivity of benthic ecology receptors to increased SSC and sediment deposition is discussed in **paragraph 9.9.40** and **paragraph 9.9.41** which conclude that most benthic receptors have a ‘not sensitive’ to ‘medium’ sensitivity to increased SSC and deposition. The maximum sensitivity of receptors in the area is therefore assessed as ‘worst-case’ **medium** and the magnitude **minor.** The short-term and localised nature of the higher SSCs and deposition rates and the tolerance and recoverability of the majority of the benthic receptors; the significance of effect is deemed **minor, not significant** in EIA terms.

Cumulative changes to seabed habitats arising from effects on physical processes, including scour effects and changes in the sediment transport and wave regimes resulting in potential effects on benthic communities during operation and maintenance

9.12.17 The cumulative presence of offshore structures associated with the Proposed Development and other developments in the region have the potential to introduce changes to the local hydrodynamic and wave regime, resulting in cumulative changes to the sediment transport pathways and associated effects on benthic ecology. For the purpose of this assessment, this additive impact has been assessed within the representative proposed DCO Order Limits benthic subtidal ecology ZOI. The other developments identified under Tier 1 are the CrossChannel Fibre, the AQUIND and the IFA-2 interconnector cables and the Atlantic Crossing 1 and Circle South Zayon telecommunication cables. However, many of these cables and interconnectors are buried below the seabed and therefore do not represent long term effects on physical processes. There are no Tier 2 or Tier 3 projects.

9.12.18 The coastal processes assessment (**Chapter 6: Coastal processes, Volume 2** of the ES (Document Reference: 6.2.6)) has determined that the impacts on hydrodynamic and wave regimes from cumulative impacts will be not significant and will therefore not result in any significant changes to sediment transport and consequently will not have any significant adverse impacts on benthic ecology.

9.12.19 The CEA for benthic subtidal and intertidal ecology is set out in **Table 9-27**.

Table 9-27 Cumulative effects assessment for benthic subtidal and intertidal ecology

ID (Figure 5.4.1)	Development name	Application reference	Assessment discussion	Environmental measures
W48	Rampion 1	Rampion 1	No spatial overlap or direct impact expected. Indirect impact as a result of loss or accumulation of sediment (should it occur) is assumed to be minor or indistinguishable from natural variation.	Relevant embedded environmental measures, as outlined in **Table 9-16**, focus on minimising long-term habitat loss, where possible (C-44), cables will be buried where possible to ensure minimal use of cable protection (C-41, C-45 and C-96).
C1	AQUIND (UK to France)	AQUIND Interconnector		
C2	IFA-2	Interconnexion France-Angleterre 2 – IFA-2 HVDC		
C3	CrossChannel Fibre	CrossChannel Fibre		
TC1	ATLANTIC CROSSING 1	ATLANTIC CROSSING 1 Century Link		
TC6	CIRCLE SOUTH ZAYO	CIRCLE SOUTH ZAYO		
A351	351 South East IOW Area	351 South East IOW Area – Tarmac Marine Ltd / Volker Dredging Ltd (MLA/2012/00374/5)		
A395/1	395/1 Off Selsey Bill	395/1 Off Selsey Bill – Aggregates Industries UK Ltd / Kendall Bros (Portsmouth) Ltd / Tarmac Marine Ltd (MLA/2012/00374/5)		
A396/1	396/1 Inner Owers	396/1 Inner Owers – Tarmac Marine Ltd		

ID (Figure 5.4.1)	Development name	Application reference	Assessment discussion	Environmental measures
A396/2	396/2 Inner Owers	396/2 Inner Owers – Tarmac Marine Ltd		
A435/1	435/1 Inner Owers	435/1 Inner Owers – Hanson Aggregates Marine Ltd		
A435/2	435/2 Inner Owers	435/2 Inner Owers – Hanson Aggregates Marine Ltd		
A435	453 Owers Extension	453 Owers Extension – CEMEX UK Marine Ltd.		
A488	488 Inner Owers North	488 Inner Owers North – Tarmac Marine Ltd.		
D1	Newhaven	Open disposal site – Newhaven		
D2	Rampion 1	Open disposal site – Rampion 1		
D3	Shoreham	Open disposal site – Shoreham		
D4	Brighton/ Rottingdean	Open disposal site – Brighton/ Rottingdean		
D6	AQUIND Cable Site A	Open disposal site – AQUIND Cable Site A		

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9.13 Transboundary effects

9.13.1 Transboundary effects arise when impacts from a development has the potential to give rise to significant effects on the environment in a European Economic Area (EEA). The consideration of effects of a transboundary nature is required under the EIA Regulations 2017. A screening of transboundary effects has been carried out and is presented in Appendix B of the Scoping Report (RED, 2020).

9.13.2 The screening exercise identified that there was no potential for significant transboundary effects to occur in relation to benthic and intertidal ecology. For this reason, it is not discussed any further.

9.14 Inter-related effects

9.14.1 The inter-related effects assessment considers likely significant effects from multiple impacts and activities from the construction, operation and maintenance and decommissioning phases of Rampion 2 on the same receptor, or group of receptors.

9.14.2 Inter-related effects could potentially arise in one of two ways. The first type of inter-related effect is a Proposed Development lifetime effect, where multiple phases of the Proposed Development interact to create a potentially more significant effect on a receptor than in one phase alone. The phases for Rampion 2 are construction, operation and maintenance, and decommissioning. All Proposed Development lifetime effects are assessed in **Chapter 30: Inter-related effects, Volume 2** of the ES (Document Reference: 6.2.30).

9.14.3 The second type of inter-related effect is receptor-led effects. Receptor-led effects are where effects from different environmental aspects combine spatially and temporally on a receptor. These effects may be short-term, temporary, transient, or longer-term.

9.14.4 Receptor-led effects have been considered, where relevant, in this chapter for potential interactions between benthic subtidal and intertidal ecology and the following environmental aspects:

- **Chapter 6: Coastal processes, Volume 2** of the ES (Document Reference: 6.2.6); and
- **Chapter 8: Fish and shellfish ecology, Volume 2** of the ES (Document Reference: 6.2.8).

9.14.5 Full results of the receptor-led effects assessment can be found in **Chapter 30: Inter-related effects, Volume 2** of the ES (Document Reference: 6.2.30).

9.15 Summary of residual effects

9.15.1 **Table 9-28** presents a summary of the assessment of significant impacts, any relevant embedded environmental measures and residual effects on benthic subtidal and intertidal ecology receptors.

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Table 9-28 Summary of assessment of residual effects

Activity and impact	Magnitude of impact	Receptor and sensitivity or value	Embedded environmental measures & mitigation	Overall assessment of residual effect (significance)
Construction				
Habitat disturbance in the Rampion 2 array area and offshore cable corridor from construction activities	Subtidal receptors: **Minor** Intertidal receptors: **Negligible**	A5.131: **Not sensitive** A5.141, A5.142, A5.231, A5.231, A5.431, A5.422, A4.134, A4.214, A4.231: **Medium** Piddocks/ Chalk (A4.231): **High**	C-269, C-270, C-272	**Minor adverse**
Temporary increase in suspended sediment and sediment deposition in the Rampion 2 array area and offshore cable corridor	All receptors: **Minor**	A5.131, A5.444, A4.139: **Not sensitive*** A5.141, A5.142, A5.231, A5.233, A5.431, A5.422, A4.131, A4.214: **Low*** A5.261, A5.611, A4.134, A4.221, A3.215: **Medium***	C-279	**Minor adverse**

Activity and impact	Magnitude of impact	Receptor and sensitivity or value	Embedded environmental measures & mitigation	Overall assessment of residual effect (significance)
		Features of Kingmere MCZ**: Medium*** ***Assessment based on heavy smothering*		
Temporary increase in SSC and sediment deposition in the intertidal area	**Negligible**	A1.45: **Low** A2.111, A2.245: **Not sensitive** **Medium*** **Assessment based on light smothering*	C-43	**Minor adverse**
Direct and indirect seabed disturbances leading to the release of sediment contaminants	**Negligible**	**High**	N/A	**Minor adverse**
Increased risk of introduction or spread of Marine INNS may affect benthic ecology and biodiversity	**Negligible**	**High**	C-95	**Minor adverse**
Indirect disturbance arising from the accidental release of pollutants	**Negligible**	**High**	C-53	**Minor adverse**

Activity and impact	Magnitude of impact	Receptor and sensitivity or value	Embedded environmental measures & mitigation	Overall assessment of residual effect (significance)
Indirect disturbance from increased noise and vibration from construction activities	**Negligible**	**Medium**	N/A	**Minor adverse** (not significant in EIA terms)
Operation and maintenance				
Long-term habitat loss/alteration from the presence of foundations, scour protection and cable protection	**Negligible**	**High**	N/A	**Minor adverse**
Temporary habitat disturbance from jackup vessels and cable maintenance works	**Minor**	A5.131: **Not sensitive** A5.141, A5.142, A5.231, A5.231, A5.431, A5.422, A4.134, A4.214: **Medium** Piddocks/ Chalk (A4.231): **High**	C-269, C-270	**Minor adverse**
Changes to seabed habitats arising from effects on physical processes, including scour effects and changes in the sediment transport and wave regimes resulting in potential effects on benthic communities	**Negligible**	A5.131: **Not sensitive** A5.141, A5.142, A5.231, A5.231, A5.431, A5.422, A4.134, A4.214: **Medium**	N/A	**Minor adverse**

Activity and impact	Magnitude of impact	Receptor and sensitivity or value	Embedded environmental measures & mitigation	Overall assessment of residual effect (significance)
		Piddocks/ Chalk (A4.231): **High**		
Colonisation of the WTGs and scour/cable protection may affect benthic ecology and biodiversity	**Minor**	**Medium**	N/A	**Minor adverse**
Increased risk of introduction or spread of Marine INNS due to presence of infrastructure and vessel mvements (for example the discharge of ballast water) may affect benthic ecology and biodiversity	**Minor**	**High**	C-95	**Minor adverse**
Indirect disturbance arising from the accidental release of pollutants	**Negligible**	**High**	C-53	**Minor adverse**
Indirect disturbance arising from EMF generated by the current flowing through the cables buried to less than 1.5m below the surface	**Negligible**	**Low**	C-41, C-43 and C,45	**Negligible**
Decommissioning				

Activity and impact	Magnitude of impact	Receptor and sensitivity or value	Embedded environmental measures & mitigation	Overall assessment of residual effect (significance)
Temporary habitat disturbance from decommissioning of foundations, cables and rock protection	Subtidal receptors: **Minor** Intertidal receptors: **Negligible**	A5.131: **Not sensitive** A5.141, A5.142, A5.231, A5.231, A5.431, A5.422, A4.134, A4.214, A4.231: **Medium** Piddocks/ Chalk (A4.231): **High**	C-269, C-270, C-272	**Minor adverse**
Temporary increase in suspended sediment and sediment deposition from decommissioning of foundations, cables and rock protection	All receptors: **Minor**	A5.131, A5.444, A4.139: **Not sensitive*** A5.141, A5.142, A5.231, A5.233, A5.431, A5.422, A4.131, A4.214: **Low*** A5.261, A5.611, A4.134, A4.221, A3.215: **Medium*** Features of Kingmere MCZ**: Medium*** ***Assessment based on heavy smothering*	N/A	**Minor adverse**

Activity and impact	Magnitude of impact	Receptor and sensitivity or value	Embedded environmental measures & mitigation	Overall assessment of residual effect (significance)
Direct and indirect seabed disturbances leading to the release of sediment contaminants	**Negligible**	**High**	N/A	**Minor adverse**
Increased risk of introduction or spread of Marine INNS may affect benthic ecology and biodiversity	**Negligible**	**High**	C-95	**Minor adverse**
Indirect disturbance arising from the accidental release of pollutants	**Negligible**	**High**	C-53	**Minor adverse**

9.16 Glossary of terms and abbreviations

Table 9-29 Glossary of terms and abbreviations – benthic subtidal and intertidal ecology

Term (acronym)	Definition
Aspect	Used to refer to the individual environmental topics.
BAP	Biodiversity Action Plan
Baseline	Refers to existing conditions as represented by latest available survey and other data which is used as a benchmark for making comparisons to assess the impact of development.
Baseline conditions	The environment as it appears (or would appear) immediately prior to the implementation of the Proposed Development together with any known or foreseeable future changes that will take place before completion of the Proposed Development.
Benthic ecology	Benthic ecology encompasses the study of the organisms living in and on the sea floor, the interactions between them and impacts on the surrounding environment
B-field	Magnetic fields
Biotope	A region of habitat associated with a particular ecological community
Cable Burial Risk Assessment (CBRA)	A report detailing the risks associated with cable burial including but not limited to an appraisal of burial depth and scour risks.
CCO	Channel Coastal Observatory
Centre for Environment Fisheries and Aquaculture Science (Cefas)	The Government's marine and freshwater science experts, advising the UK government and overseas partners.
CIEEM	Chartered Institute of Ecology and Environmental Management
Climate Change	A change in the state of the climate that can be identified (e.g. by using statistical tests) by changes in the mean and/or the variability of its properties, and that persists for an extended period, typically decades or longer. Climate change may be due to natural internal processes, to external forcing or to persistent anthropogenic changes in the composition of the atmosphere, ocean or in land use.

Term (acronym)	Definition
cm	centimetre
Coastal processes	The processes that interact to control the physical characteristics of a natural environment, for example: winds; waves; currents; water levels; sediment transport; turbidity; coastline, beach and seabed morphology.
Crustacea	Arthropod of the large, mainly aquatic group Crustacea, such as a crab, lobster, shrimp, or barnacle
Cumulative effects	Additional changes caused by a Proposed Development in conjunction with other similar developments or as a combined effect of a set of developments, taken together.
Cumulative Effects Assessment (CEA)	Assessment of impacts as a result of the incremental changes caused by other past, present and reasonably foreseeable human activities and natural processes together with the Proposed Development.
Cumulative impact	Impacts that result from incremental changes caused by other past, present or reasonably foreseeable actions together with the Proposed Development.
DCO Application	An application for consent under the Planning Act 2008 to undertake a Nationally Significant Infrastructure Project made to the Planning Inspectorate who will consider the application and make a recommendation to the Secretary of State, who will decide on whether development consent should be granted for the Proposed Development.
Decommissioning	The period during which a development and its associated processes are removed from active operation.
Development Consent Order (DCO)	This is the means of obtaining permission for developments categorised as Nationally Significant Infrastructure Projects, under the Planning Act 2008.
dML	Deemed Marine Licence
Drop Down Video (DDV)	A survey method in which imagery of habitat is collected, used predominantly to survey marine environment
Ecological feature	Ecological feature is the term used to refer to biodiversity receptors. This term is taken directly from Ecological Impact Assessment guidance from the Chartered Institute of Ecology and Environmental Management.
EEA	European Economic Area

Term (acronym)	Definition
EECMHM	Eastern English Channel Marine Habitat Map
E-field	Electric field
EIA Regulations, 2017	The Infrastructure Planning (Environmental Impact Assessment) Regulations 2017. The EIA regulations require that the effects of a project, where these are likely to have a significant effect on the environment, are taken into account in the decision-making process for the project.
Electromagnetic field (EMF)	An electromagnetic field is an electric and magnetic force field that surrounds a moving electric charge.
Elements	Individual parts which make up the landscape, such as, for example, trees, hedges and buildings.
Embedded environmental measures	Equate to 'primary environmental measures' as defined by Institute of Environmental Management and Assessment (2016). They are measures to avoid or reduce environmental effects that are directly incorporated into the design of the Proposed Development.
Enhancement	A measure that is over and above what is required to mitigate the adverse effects of a project.
Environment Agency	A non-departmental public body, with responsibilities relating to the protection and enhancement of the environment in England.
Environmental Impact Assessment (EIA)	The process of evaluating the likely significant environmental effects of a proposed project or development over and above the existing circumstances (or 'baseline').
Environmental Statement (ES)	The written output presenting the full findings of the Environmental Impact Assessment.
ETG	Expert Topic Group
EUNIS habitat classification	A pan-European system which facilitates the harmonised description and classification of all types of habitat, through the use of criteria for habitat identification
European site	European sites are those that are designated through the Habitats Directive and Birds Directive (via national legislation as appropriate). Within England additional sites designated through international convention are given the

Term (acronym)	Definition
	same protection through policy – overall all of these are referred to as European sites. European sites in England are considered to be SPAs, SACs, candidate SACs and Sites of Community Importance (SCI). Potential SPAs (pSPA), possible SACs (pSACs), Ramsar sites (designated under international convention) and proposed Ramsar sites.
Evidence Plan Process (EPP)	A voluntary consultation process with specialist stakeholders to agree the approach and the information required to support the EIA and HRA for certain aspects.
Feature	Particularly prominent or eye-catching elements in the landscape such as tree clumps, church towers or wooded skylines OR a particular aspect of the Proposed Development.
FEPA	Food and Environment Protection Act
Future Baseline	Refers to the situation in future years without the Proposed Development.
Geographical Information System (GIS)	A system that captures, stores, analyses, manages and presents data linked to location. It links spatial information to a digital database.
Geophysical	Relating to the physics of the earth
Habitats Regulation Assessment (HRA)	The assessment of the impacts of implementing a plan or policy on a European Site, the purpose being to consider the impacts of a project against conservation objectives of the site and to ascertain whether it would adversely affect the integrity of the site.
Habitats Regulations	EC Council Directive 92/43/EEC, known as the Habitats Directive, was transposed in the UK by the Habitats Regulations 1994 (as amended). The Habitats Regulations apply to UK land and territorial waters and act to ensure biodiversity of natural habitats and of wild flora and fauna through a range of measures including designation of SACs.
Horizontal Directional Drill (HDD)	A trenchless crossing engineering technique using a drill steered underground without the requirement for open trenches. This technique is often employed when crossing environmentally sensitive areas, major water courses and highways. This method is able to carry out the underground installation of pipes and cables with minimal surface disruption.

Term (acronym)	Definition
Hydrodynamic regime	The characteristic patterns and statistics of variation in water levels and currents for a given location or area. Potentially includes tidal, surge and other residual flow processes; (does not include waves).
iE field	Induced electric field
Impact	The changes resulting from an action.
Indirect effects	Effects that result indirectly from the Proposed Development as a consequence of the direct effects, often occurring away from the site, or as a result of a sequence of interrelationships or a complex pathway. They may be separated by distance or in time from the source of the effects. Often used to describe effects on landscape character that are not directly impacted by the Proposed Development such as effects on perceptual characteristics and qualities of the landscape.
INNS	Invasive Non-Native Species
Inshore	The sea up to two miles from the coast.
Inshore Fisheries and Conservation Authority (IFCA)	There are 10 Inshore Fisheries and Conservation Authorities (IFCAs) in England. The 10 IFCA Districts cover English coastal waters out to 6 nautical miles from Territorial Baselines. The IFCAs have shared powers and duties which are found in the Marine and Coastal Access Act, 2009.
Intertidal	The area of the shoreline which is covered at high tide and uncovered at low tide.
Iterative design	A process by which the design is repeated to make improvements, solve problems, respond to environmental measures and engage local communities and statutory stakeholders.
Joint Nature Conservation Committee (JNCC)	JNCC is the public body that advises the UK Government and devolved administrations on UK-wide and international nature conservation.
Key characteristics	Those combinations of elements which are particularly important to the current character of the landscape and help to give an area its particularly distinctive sense of place.
km	Kilometre

Term (acronym)	Definition
Level of effect	Determined through the combination of sensitivity of the receptor and the proposed magnitude of change brought about by the development.
Likely Significant Effects (LSE)	It is a requirement of Environmental Impact Assessment Regulations to determine the likely significant effects of the Proposed Development on the environment which should relate to the level of an effect and the type of effect.
LNR	Local Nature Reserve
Local Wildlife Site (LWS)	Local Wildlife Sites are non-statutory designations conferred by local planning authorities and given weight through local planning policy. These sites are selected through a selection of criteria (criteria are area dependent) aimed at identifying “substantive nature conservation value”.
m	Metre
Magnitude (of change)	A term that combines judgements about the size and scale of the effect, the extent of the area over which it occurs, whether it is reversible or irreversible and whether it is short term or long term in duration’. Also known as the ‘degree’ or ‘nature’ of change.
MALSF	The Marine Aggregate Levy Sustainability Fund.
MarESA	Marine Evidence based Sensitivity Assessment
Marine aggregate	Marine dredged sand and/or gravel.
Marine Conservation Zone (MCZ)	A Marine Conservation Zone (MCZ) is a type of marine nature reserve in UK waters. They were established under the Marine and Coastal Access Act (2009) and are areas designated with the aim to protect nationally important, rare or threatened habitats and species.
Marine Management Organisation (MMO)	MMO is an executive non-departmental public body, sponsored by the Department for Environment, Food & Rural Affairs. MMO license, regulate and plan marine activities in the seas around England so that they’re carried out in a sustainable way.
Marine Policy Statement (MPS)	Framework for preparing Marine Plans and taking decisions affecting the marine environment.
MarLIN	Marine Life Information Network

Term (acronym)	Definition
MBES	Multi-beam Echo Sounder
MCCIP	Marine Climate change Impacts Partnership
MEMR	Mitigation, Enhancement and Monitoring Register
MHWS	Mean High-Water Springs
MLWS	Mean Low-Water Springs
MPA	Marine Protected Area
MPCP	Marine Pollution Contingency Plan
MSFD	Marine Strategy Framework Directive
MW	Megawatts
Nationally Significant Infrastructure Project (NSIP)	Nationally Significant Infrastructure Projects are major infrastructure developments in England and Wales which are consented by DCO. These include proposals for renewable energy projects with an installed capacity greater than 100MW.
Natural England	The government advisor for the natural environment in England.
NERC	Natural Environment and Rural Communities
nm	Nautical Mile
Noise sensitive receptors	Locations or receptors that may potentially be adversely affected by the addition of a new source of noise. These can include residential properties, people and sensitive species.
Non-statutory consultation	Non-statutory consultation refers to the voluntary consultation that RED undertake in addition to the statutory consultation requirements.
NPS	National Policy Statement
Nursery habitat	Habitats where high numbers of juveniles of a species occur, having a greater level of productivity per unit area than other juvenile habitats.
OEL	Ocean Ecology Limited
Offshore	The sea further than two miles from the coast.

Term (acronym)	Definition
Offshore area	An area that encompasses all planned offshore infrastructure.
Offshore Wind Farm	An offshore wind farm is a group of wind turbines in the same location (offshore) in the sea which are used to produce electricity.
PEMP	Project Environmental Management Plan
Planning Act 2008	The legislative framework for the process of approving major new infrastructure projects.
Planning Inspectorate	The Planning Inspectorate deals with planning appeals, national infrastructure planning applications, examinations of local plans and other planning-related and specialist casework in England and Wales.
Preliminary Environmental Information Report (PEIR)	The written output of the Preliminary Environmental Impact Assessment undertaken for the Proposed Development. It was developed to support Statutory Consultation and presented the preliminary findings of the assessment to allow an informed view to be developed of the Proposed Development, the assessment approach that was undertaken, and the preliminary conclusions on the likely significant effects of the Proposed Development and environmental measures proposed.
Proposed Development	The development that is subject to the application for development consent, as described in **Chapter 4: The Proposed development, Volume 2** of the ES (Document Reference: 6.2.4).
Rampion 1	The existing Rampion Offshore Wind Farm located in the English Channel in off the south coast of England.
Ramsar site	Areas designated by the UK Government under the International Ramsar Convention (the Convention on Wetlands of International Importance) 1971.
Receptor	These are as defined in Regulation 5(2) of The Infrastructure Planning 'Environmental Impact Assessment' Regulations 2017 and include population and human health, biodiversity, land, soil, water, air, climate, material assets, cultural heritage and landscape that may be at risk from exposure to direct and indirect impacts as a result of the Proposed Development.
RED	Rampion Extension Development Limited
SBES	Single-beam Echo Sounder

Term (acronym)	Definition
SBP	Sub-bottom Profiler
SCHIP1	Sussex Coastal Habitats Inshore Pilot
SCHIP2	Sussex Coastal Habitats Inshore Pilot II
Scoping Opinion	A Scoping Opinion is adopted by the Secretary of State for a Proposed Development.
Scoping Report	A report that presents the findings of an initial stage in the Environmental Impact Assessment process.
Scour	A localised sediment erosion feature caused by local enhancement of flow speed and turbulence due to interaction with an obstacle.
Secretary of State	The senior minister who makes the decision to grant development consent.
Sediment deposition	Settlement of sediment in suspension back to the seabed, causing a localised accumulation.
Sediment transport	The movement of sediment by natural processes, as individual grains or as a collective volume
Sensitivity	A term applied to specific receptors, combining judgements of the susceptibility of the receptor to the specific type of change or development proposed and the value associated to that receptor.
Significance	A measure of the importance of the environmental effect, defined by criteria specific to the environmental aspect.
Significant effect	It is a requirement of the EIA Regulations to determine the likely significant effects of the development on the environment which should relate to the level of an effect and the type of effect. Where possible significant effects should be mitigated. The significance of an effect gives an indication as to the degree of importance (based on the magnitude of the effect and the sensitivity of the receptor) that should be attached to the impact described. Whether or not an effect should be considered significant is not absolute and requires the application of professional judgement.

Term (acronym)	Definition
	Significant – 'noteworthy, of considerable amount or effect or importance, not insignificant or negligible' (The Concise Oxford Dictionary). Those levels and types of landscape and visual effect likely to have a major or important/noteworthy or special effect of which a decision maker should take particular note.
Site of Special Scientific Interest (SSSI)	Sites designated at the national level under the Wildlife & Countryside Act 1981 (as amended). They are a series of sites that are designated to protect the best examples of significant natural habitats and populations of species.
SKRP	Sussex Kelp Restoration Project
SNCB	Statutory Nature Conservation Body
Source	A substance that is in, on or under the land and has the potential to cause harm or to cause pollution of controlled waters.
Spatial Scope	Spatial scope is the area over which changes to the environment are predicted to occur as a consequence of a Proposed Development.
Special Area of Conservation (SAC)	International designation implemented under the Habitats Regulations for the protection of habitats and (non-bird) species. Sites designated to protect habitats and species on Annexes I and II of the Habitats Directive. Sufficient habitat to maintain favourable conservation status of the particular feature in each member state needs to be identified and designated.
Special Protection Area (SPA)	Sites designated under EU Directive (79/409/EEC) to protect habitats of migratory birds and certain threatened birds under the Birds Directive
SSS	Side Scan Sonar
Stakeholder	Person or organisation with a specific interest (commercial, professional or personal) in a particular issue.
Statutory consultation	Statutory consultation refers to statutory consultation that is required under Section 42 and Section 47 of the Planning Act 2008 with the relevant consultation bodies and the public on the preliminary environmental information.

Term (acronym)	Definition
Study area	Area where potential impacts from the Proposed Development could occur, as defined for each aspect.
Subtidal	The region of shallow waters which are below the level of low tide.
Suspended sediment concentration (SSC)	The mass concentration (mass/volume) of sediment in suspension.
Sustainability	The principle that the environment should be protected in such a condition and to such a degree that ensures new development meets the needs of the present without compromising the ability of future generations to meet their own needs.
Temporal Scope	The temporal scope covers the time period over which changes to the environment and the resultant effects are predicted to occur and are typically defined as either being temporary or permanent.
Temporary or permanent effects	Effects may be considered as temporary or permanent. In the case of wind energy development the application is for a 30 year period after which the assessment assumes that decommissioning will occur and that the site will be restored. For these reasons the development is referred to as long term and reversible.
The Applicant	Rampion Extension Development Limited (RED).
The Proposed Development	The development that is subject to the application for development consent, as described in **Chapter 4: The Proposed Development, Volume 2** of the ES (Document Reference: 6.2.4).
Tidal excursion buffer	The greatest distance and direction that water carrying an impact might be carried during one mean spring tide, from a given location or area.
Transboundary effects	Assessment of changes to the environment caused by the combined effect of past, present and future human activities and natural processes on other European Economic Area Member States.
Type or Nature of effect	Whether an effect is direct or indirect, temporary or permanent, positive (beneficial), neutral or negative (adverse) or cumulative.
UAV	Unmanned Aerial Vehicle

Term (acronym)	Definition
VER	Valued Ecological Receptor
Wave regime	The characteristic patterns and statistics of variation in waves for a given location or area.
WTG	Wind Turbine Generator
Zone of Influence (ZOI)	The area surrounding the Proposed Development which could result in likely significant effects

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