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Environmental Statement – Volume 1 – Chapter 8 Intertidal and Benthic Habitats

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CONTENTS

TABLES

PLATES

FIGURES

APPENDICES

8. INTERTIDAL AND BENTHIC HABITATS

8.1. SCOPE OF THE ASSESSMENT

8.1.1. INTRODUCTION

8.1.1.1. This chapter provides the information regarding potential environmental impacts on intertidal and benthic habitats which may result from the Proposed Development.

8.1.1.2. This chapter outlines information regarding the potential impacts associated with the construction, operation (including repair and maintenance), and decommissioning of the Proposed Development.

8.1.1.3. Where effects arise as a result of the combination of the impacts of the Proposed Development and the impacts of projects in the United Kingdom ('UK') Marine Area and/or other European Economic Area ('EEA') states, these will also be identified and assessed in Section 8.7.

8.1.1.4. This chapter should be read in conjunction with Chapter 6 (Physical Processes) of the Environmental Statement ('ES') Volume 1 (document reference 6.1.6), which provides further information regarding potential effects and Appendix 8.1 (Benthic Ecology Survey Report) of the ES Volume 3 (document reference 6.3.8.1) presents the findings of the benthic ecology survey.

8.1.1.5. A Habitats Regulations Assessment ('HRA') Report (document reference 6.8.1) has also been submitted as part of the Application, in which likely significant effects ('LSE') on European sites and their qualifying features have been considered.

8.1.1.6. Appendix 8.5 (Marine Conservation Zone Assessment) of the ES Volume 3 (document reference 6.3.8.5) presents the assessment of potential effects on Marine Conservation Zones ('MCZ's).

8.1.2. STUDY AREA

8.1.2.1. The Entire Marine Cable Corridor extends from the Landfall at Eastney, near Portsmouth to Pourville in Normandy, France. For the purposes of assessment, this chapter focuses on the Landfall and Marine Cable Corridor within the UK Marine Area (as this comprises the Proposed Development; Figure 3.1 of the ES Volume 2 (document reference 6.2.3.1)).

Landfall

8.1.2.2. The Landfall is located at Eastney beach on the south coast of Portsea Island (Figure 8.1 of the ES Volume 2 (document reference 6.2.8.1) and Figure 3.3 of the ES Volume 2 (document reference 6.2.3.3)).

8.1.2.3. The Marine Cables will make Landfall through the use of Horizontal Directional Drilling ('HDD') methods which will travel underneath the intertidal area at Eastney from an exit/entry point in the marine environment, located over 1 km from the beach between Kilometre Point ('KP') 1 and KP 1.6 (Figure 3.3 in Chapter 3 (Description of the Proposed Development) of the ES Volume 1 (document reference 6.1.3 and 6.2.3.3)). It is not determined yet whether the HDD direction will be onshore to marine, marine to onshore, or drilling from both ends. For the purposes of this assessment, the Landfall is defined as the intertidal area where the Marine Cable Corridor comes ashore out to the HDD marine exit/entry points. HDD is also proposed to be undertaken at Langstone Harbour to enable the cables to cross underneath Langstone Harbour from Portsea Island to the mainland (see Sheet 2 of Figure 3.9 (see Section 7 on the map) of the ES Volume 2 (document reference 6.2.3.9) of Chapter 3 (Description of the Proposed Development)). It is anticipated that no HDD works will occur within the marine environment of Langstone Harbour as the drilling will be underneath seabed of the harbour area. The entry/exit points of the drill will be located above the Mean High Water Spring ('MHWS') mark. It has been agreed with the Marine Management Organisation ('MMO') that this is considered to be an exempt activity that does not require a Marine Licence, subject to the conditions of Article 35 of Marine Licensing (Exempted Activities) Order 2011 (as amended). The Consultation Report (document reference. 5.1) provides further detail on this and other consultations.

8.1.2.4. Chapter 3 (Description of the Proposed Development) provides further information on the HDD methodology at Langstone Harbour. Any of the onshore HDD works relating to the Proposed Development are not included in this assessment but are covered in the onshore chapters of the ES.

Marine Cable Corridor

8.1.2.5. The Marine Cable Corridor encompasses the location of the Landfall and extends from MHWS at Eastney out to the UK/France European Economic Zone ('EEZ') Boundary Line (see Figure 3.1).

8.1.2.6. The study area for the Proposed Development (Figure 8.1 document reference 6.2.8.1) is described regionally and locally. The regional study area describes the baseline across the eastern Channel whilst the local study area provides a more detailed baseline within the Marine Cable Corridor and immediate vicinity. This study area allows a description of the baseline in all areas where direct and indirect impacts may occur.

8.2. LEGISLATION, POLICY AND GUIDANCE

8.2.1.1. This assessment has taken into account the current legislation, policy and guidance relevant to Intertidal and Benthic Ecology. These are listed below.

8.2.2. LEGISLATION

- EC Directive 92/43/EEC on the conservation of natural habitats and of wild fauna and flora (known as the Habitats Directive);
- The Conservation of Habitats and Species Regulations 2017 (known as the Habitats Regulations) which transpose the Habitats Directive into national law. This legislation covers waters within the 12 nautical mile ('nmi') limit (known as Territorial Waters);
- The Conservation of Offshore Marine Habitats and Species Regulations 2017 (known as the Offshore Regulations) which transpose the Habitats Directive into UK law for all offshore activities. This legislation covers UK waters beyond the 12 nmi limit;
- Water Framework Directive ('WFD') (EC Directive 2000/60/EC);
- The Water Environment (WFD) (England and Wales) Regulations 2003 (Statutory Instrument 2003 No.3242);
- Marine and Coastal Access Act ('MCAA') 2009;
- UK Biodiversity Action Plan ('BAP') 2007;
- Natural Environment and Rural Communities ('NERC') Act 2006;
- Wildlife and Countryside Act 1981 (as amended);
- The Convention on the Conservation of European Wildlife and Natural Habitats (the Bern Convention, 1979);
- Rio Convention on Biological Diversity (1992); and
- Convention on the Protection of the Marine Environment of the North-East Atlantic ('OSPAR') (1992)

8.2.3. PLANNING POLICY

National Policy

- EN-1 Overarching NPS for Energy (2011)
  - Paragraph 5.3.3 states: '*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, on protected species and on habitats and other species identified as being of principal importance for the conservation of biodiversity. The applicant should provide environmental information proportionate to the infrastructure where EIA is not required to help the IPC consider thoroughly the potential effects of a proposed project*.'

- UK Marine Policy Statement ('MPS') (2011)
  - The UK MPS is the framework for preparing Marine Plans and taking decisions affecting the marine environment. This policy aims to contribute to the achievement of sustainable development and ensure that development aims to avoid harm to marine ecology and biodiversity through consideration of issues such as impacts of noise, ecological resources and water quality. The South Marine Plan, which covers the spatial extent of the Proposed Development, was adopted in July 2018.
- National Planning Policy Framework ('NPPF') (2019)

Regional Policy

- South Inshore and South Offshore Marine Plan (2018) including:
  - Objective 10 includes policies to avoid, minimise or mitigate adverse impacts on marine protected areas;
  - Objective 11 includes policies to avoid, minimise or mitigate adverse impacts through the introduction and transport of invasive non-indigenous species; and
  - Objective 12 includes policies to avoid, minimise or mitigate significant adverse impacts on natural habitat and species.

Local Policy

- BAP for Hampshire; Specifically, the Coastal Habitat Action Plan (2003) and the Water and Biodiversity Topic Action Plan (2003).

8.2.3.1. Further detail and consideration on how the proposals for the Proposed Development meet the requirements of these policies is presented within the Planning Statement (document reference 5.4) that accompanies the Application.

8.2.4. GUIDANCE

- Chartered Institute of Ecology and Environmental Management ('CIEEM') (2019) - Guidelines for Ecological Impact Assessment in the UK and Ireland: Terrestrial, Freshwater, Coastal and Marine;
- Centre for Environment, Fisheries, and Aquaculture and Science ('Cefas') (2011) - Guidelines for data acquisition to support marine environmental assessment of offshore renewable energy projects;
- Planning Inspectorate ('PINS') (2019) - Advice Note Seventeen: Cumulative Effects Assessment;
- PINS (2017) - Advice Note Ten: Habitat Regulations Assessment relevant to Nationally Significant Infrastructure Projects;

- OSPAR (2009) - Assessment of the environmental impacts of cables;
- MMO (2013) - Marine Conservation Zones and marine licencing.

8.3. SCOPING OPINION AND CONSULTATION

8.3.1. SCOPING OPINION

8.3.1.1. As detailed within Chapter 5 (Consultation) of the ES Volume 1 (document reference 6.1.5), a Scoping Opinion was received by the Applicant from PINS on 7 December 2018. Scoping Opinion comments from PINS and other key consultees, in relation to intertidal and benthic habitats, and how they were addressed is set out in Table 1 of Appendix 8.2 (Intertidal and Benthic Habitats Consultation Responses) of the ES Volume 3 (document reference 6.3.8.2).

8.3.1.2. Key items that were raised in the Scoping Opinion included;

- PINS agreed that impacts from invasive species can be scoped out of the ES on the basis the Proposed Development applies available best industry practice, including the production and implementation of a biosecurity plan.
- PINS agreed that effects of Electromagnetic Fields ('EMF') on benthic receptors can be scoped out of the ES.
- PINS requested that the ES should include an assessment of heat emissions from the Marine Cables during operation on sensitive receptors where significant effect could occur.
- PINS noted that the ES should clearly identify and justify the study area applied to the assessment of effects on intertidal and benthic ecology.
- PINS requested that the ES and/or accompanying technical appendices should therefore provide detailed information regarding the survey methodology and analysis used to inform the impact assessment, together with appropriate figures to present the sampling locations.
- PINS requested that quality standards applicable to the survey and analysis of impacts to benthic ecology be included in the ES.
- PINS requested that the ES assess 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 (LBAP) habitats and species and other habitats/species of conservation concern where significant effects are likely.
- PINS requested that habitat loss during construction and decommissioning be assessed.

- PINS requested that appropriate cross-referencing between this chapter and other relevant aspects, such as physical processes and marine water and sediment quality, should be included in the ES.

8.3.2. CONSULTATION PRIOR TO PUBLICATION OF THE PEIR

8.3.2.1. Consultation was also undertaken prior to the publication of the Preliminary Environmental Information Report ('PEIR'). The items discussed are summarised in Table 2 of Appendix 8.2 (Intertidal and Benthic Habitats Consultation Responses). Key items that were discussed included:

- In relation to HDD methods in Langstone Harbour, Natural England ('NE') confirmed that survey work in the marine environment would not be required. As such, a desk-based approach to assessment of potential effects has been undertaken in this chapter of the ES.

8.3.3. PEIR CONSULTATION

8.3.3.1. Consultation on the PEIR was undertaken between February and April 2019. All of the comments relevant to the assessment received from the consultation are presented in Table 3 of Appendix 8.2 (Intertidal and Benthic Habitats Consultation Responses) however some of the key items that were raised included;

- A need for pre-construction surveys to inform micro-routing of cable to minimise impacts to Annex I[1] reef features was identified;
- The information presented within the various sections of the PEIR relating to benthic ecology were considered appropriate by the MMO and it was considered that there was no missing information;
- The comments previously raised in the MMO Scoping Opinion had all been suitably addressed in the PEIR;
- The MMO considered that all the potential impacts relevant to benthic ecology have been identified; and
- The MMO did not identify any information gaps relating to benthic ecology in the PEIR and the embedded mitigation measures proposed (e.g. routing the cable corridor to minimise impacts with key receptors) were deemed suitable considering the assessments provided at that time.

8.3.4. POST-PEIR CONSULTATION

[1] Annex I refers to habitats considered to be of European interest and which are identified within Annex I of the European Commission ('EC') Directive 92/43/EEC on the conservation of natural habitats and of wild fauna and flora (known as the Habitats Directive).

8.3.4.1. Further consultation with key stakeholders has been undertaken. This was to ensure all species and impacts are assessed. The key items that have been discussed are presented in Table 8.1 below.

Table 8.1 – Summary of post-PEIR consultation

Consultee	Date (Method of Consultation)	Discussion/Topic
NE	13 February 2019 Teleconference	Discussion on the approach to HRA and pre-screening of sites for Annex I habitat, marine bird, Annex II migratory fish and marine mammal features.
NE, MMO and Joint Nature Conservation Committee (‘JNCC’)	7 May 2019 Teleconference	Discussion on the approach to dredge and disposal and the approach to plume dispersion modelling.
NE	27 June 2019 Teleconference	Discussion on the Applicant’s responses to the feedback received from NE on the PEIR.
Environment Agency (‘EA’)	8 July 2019 Email	Agreement on the approach to dredge and disposal and the approach to plume dispersion modelling.
MMO	18 July 2019 Teleconference	Discussion on the Applicant’s responses to the feedback received from MMO on the PEIR.
JNCC	24 July 2019 Email	Consultation feedback received on the draft Deemed Marine Licence (dML)
NE	25 July 2019 Teleconference	Review and discussions on the dML.
EA	31 July 2019 Email	Review and discussions on the dML.
MMO	1 August 2019 Teleconference	Review and discussions on the dML.
JNCC	13 August 2019 Email	Review and discussions on the dML.
EA	20 August 2019 Email	Review and agreement on the Applicant’s responses to EA feedback on the PEIR.
PINS	23 August 2019 Letter/Email	Feedback on draft HRA.

Consultee	Date (Method of Consultation)	Discussion/Topic
MMO	19 September and 02 October 2019 Email	MMO are content with approach to cumulative assessment and requested one new coastal project to be added to long list.
NE	20 September 2019 Email	Feedback on draft HRA. Natural England has reviewed the environmental baseline data presented and cross-referenced it with a previous review of the PEIR. Natural England are content with the data sources used to inform this environmental baseline.
EA	26 September 2019 Email	Review and feedback on the WFD assessment and draft HRA report.
JNCC	28 September 2019 Email	Feedback on draft HRA. Further feedback provided on 11 October 2019 in response to query for clarification.
States of Alderney	01 October 2019 Email	Feedback on draft HRA.
NE	08 October 2019 Email	Review and feedback on draft MCZ assessment
JNCC	09 October 2019 Email	Review and feedback on draft MCZ assessment
NE	09 October 2019 Email	NE are content with the plume dispersion modelling approach taken for disposal activities and the resultant outputs with respect to predicted sedimentation and suspended sediment concentration ('SSC') levels, spatial extent and duration.
MMO	11 October 2019 Email	MMO provided feedback that the rationale for the additional 10% non-burial protection contingency during operation looks satisfactory however further clarity to be provided post submission.
MMO/Cefas	22 October 2019	Review and feedback on the disposal site characterisation report.

8.3.4.2. The Consultation Report provides further detail on consultations (document reference 5.1). Feedback on the MCZ assessment is presented in Appendix 8.5

(Marine Conservation Zone Assessment) of the ES Volume 3 (document reference 6.3.8.5).

8.3.4.3. Consultation on the standalone HRA Report (document reference 6.8.1) was undertaken with statutory and non-statutory consultees including NE, EA, JNCC and States of Alderney.

8.3.4.4. All comments received from these consultations on the HRA for Annex I habitats specifically are provided in Appendix 4 of the HRA Report (document reference 6.8.3.4).

8.3.4.5. The key items with relevance to this chapter of the ES included;

- PINS strongly advised the Applicant to seek agreement with relevant consultation bodies, including NE, on the approach to baseline data appropriate for use in the HRA.
- NE agrees that the Studland and Portland Special Area of Conservation ('SAC') could be screened out of the HRA.
- NE was content with the data sources used to inform the environmental baseline used for the HRA.
- NE agreed with the UK SACs screened in for the HRA and the conclusions of the screening assessment.
- NE agreed with the approach to HRA in combination assessment and was content with the list of projects identified for assessment.
- EA were content with the approach and conclusions made in the HRA.
- JNCC advised that they agree with the conclusions on Wight Barfleur Reef SAC and Bassurelle Sandbank SAC.

8.3.5. ELEMENTS SCOPED OUT OF THE ASSESSMENT

8.3.5.1. In line with consultation advice received from PINS, impacts from invasive species and EMF on marine benthic and intertidal features have been scoped out of further assessment in this chapter of the ES.

8.3.6. IMPACTS SCOPED IN TO THE ASSESSMENT

8.3.6.1. The following impacts have been scoped in to the assessment;

- Construction (and decommissioning)
  - Direct seabed disturbance/temporary habitat loss
  - Temporary increase in suspended sediments
  - Deposition of sediment (smothering)
  - Impacts from the resuspension of contaminated sediments

- Operation (including repair and maintenance)
  - Seabed disturbance
  - Habitat loss (permanent)
  - Heat emissions

8.4. ASSESEMENT METHODOLOGY

8.4.1.1. The assessment methodology used for benthic ecology follows that recommended by CIEEM for ecological impact assessment of marine and coastal developments in the UK (CIEEM, 2019). CIEEM promotes the highest standards of practice for the benefit of nature and society. These guidelines set out the process for assessment through the following stages:

- Describing the baseline within the study area;
- Identifying the receptors;
- Determining the nature conservation importance of the receptors present within the study area that may be affected by the Proposed Development;
- Identifying and characterising the potential impacts, based on the nature of the installation, operation, maintenance and decommissioning activities associated with the Proposed Development;
- Determining the significance of the impacts;
- Identifying the counter effect of any mitigation measures to be undertaken, that may be implemented in order to address significant adverse effects;
- Determining the residual impact significance after the effects of mitigation have been considered; and
- Assessing cumulative effects (with mitigation where applicable).

8.4.2. CHARACTERISING THE IMPACT

8.4.2.1. Each impact has been characterised in accordance with CIEEM (2019) guidelines. Wherever possible and relevant, the following criteria has been used to qualitatively describe each impact:

- Positive or Negative – direction of change in accordance with nature conservation objectives and policy;
- Extent – geographical area over which the impact will extend;
- Magnitude – size, amount, intensity, or volume of any change;
- Duration – time over which the impact will occur;
- Timing – co-incidence with receptor activities;

- Frequency – how often the impact will occur; and
- Reversibility – recovery potential.

8.4.3. DETERMINING SIGNIFICANCE

8.4.3.1. The evaluation of whether an effect is ecologically significant has been undertaken in line with CIEEM (2019) guidance. In determining whether an effect is of ecological significance, the following shall be considered:

- Any removal or change of any process or key characteristic;
- Any effect on the nature, extent, structure, and function of the component habitats; and
- Any effect on the average population size or viability of component species.

8.4.3.2. Assessment has been undertaken in the context of the wider conservation status of that receptor, and where uncertainty exists this has been acknowledged, and professional judgement has been applied throughout.

8.4.3.3. In general, a significant effect has been considered to be one which changes the structure and function of an ecosystem within the study area, or one which undermines the conservation objectives of a designated site, the conservation status of qualifying features or habitats; and/or affects the condition of the site or its interest/qualifying features.

8.4.3.4. Embedded mitigation and, where appropriate, additional mitigation measures has been identified and described where they will avoid, reduce and/or compensate for potentially significant effects. This includes avoidance through the design process.

8.4.4. ASSUMPTIONS AND LIMITATIONS

8.4.4.1. Assessment has been undertaken based on the information provided within Chapter 3 (Description of the Proposed Development) and using the worst case design parameters presented in Appendix 3.2 (Marine Worst-Case Design Parameters) of the ES Volume 3 (document reference 6.3.3.2). How these parameters are relevant for worst case scenarios for benthic ecology is presented in Section 8.6.2.

8.4.4.2. Receptors considered present, and therefore assessed, are described in Section 8.5. This includes species of conservation importance. Data sources used are defined in Section 8.5.1.

8.4.4.3. A benthic survey of the route was undertaken to characterise the habitats present within the Marine Cable Corridor. The survey data was combined with geophysical survey data to allow the change in habitat types to be more accurately described. The survey was undertaken between July 2017 and March 2018. The baseline survey data was analysed to provide a map of the benthic habitats present within the Marine Cable Corridor. No significant change is expected to have occurred in the habitats present since the survey was undertaken.

8.4.4.4. The Zones of Influence ('ZOI's) are defined per impact as each impact differs in spatial extent. The spatial extent of each impact is defined in Section 8.6.2. The study area for identification of receptors is defined in Section 8.1.2. Data sources used for each assessment are presented within Section 8.5.

8.4.4.5. Information on habitats present outside the Marine Cable Corridor were collated through a desk-based review of available information using data sources presented in Section 8.5.

8.5. BASELINE ENVIRONMENT

8.5.1. DATA SOURCES

8.5.1.1. The baseline has been written using information from a variety of organisations and data types summarised in Table 8.2.

Table 8.2 - Data sources

Data/information	Data Type	Details of Data available
Project specific benthic surveys (2017-2018)	Grab, Drop Down Video ('DDV'), fauna, Particle Size Analysis ('PSA'), Total Organic Carbon ('TOC') and biomass	Epifauna broad-scale habitats, infauna community and sediment composition. Results of these surveys are presented in Appendix 8.1 (Benthic Ecology Survey Report)
Project specific intertidal surveys (2017)	Sediment samples (fauna, PSA and biomass) and intertidal walk over	Extent and distribution of intertidal habitats and sediment composition
IFA2 ES (Benthic Ecology Chapter)	Survey data	Benthic habitats for the south of the central Channel
Rampion Offshore Wind Farm ES (Benthic Ecology Chapter)	Survey data	Benthic habitats for the south of the central Channel
CHARM II project study (Martin *et al.*, 2007)	Benthic habitat maps	Status of benthic invertebrate fauna in the Eastern Channel
South Coast Dredging Association	Abundance data	Distribution of benthic infauna across the South Coast Regional Environmental Characterisation ('REC') Region (EMU Ltd., 2012)
JNCC	Literature review	Review of coasts and seas in southern

Data/information	Data Type	Details of Data available
		England
MALSF (James *et al.*, 2010)	Grab, Fauna, PSA, Biotopes	Epibenthic and infauna biotopes in the south coast and central and eastern regions of the UK
NE (2018)	Designated sites information	Advice on the Conservation Objectives for European Sites
EMODnet (2016)	Benthic habitat data	Broad-scale seabed habitat map for Europe
EUNIS, European Environment Agency (2018)	Protected sites information	Information on protected sites and their features of conservation interest
Channel Coastal Observatory (2016)	Intertidal data	Aerial imagery of the UK Landfall
Magic Map Application (2018)	Designated sites information	Location of designated sites

8.5.2. DESIGNATED SITES/SPECIES OF CONSERVATION IMPORTANCE

8.5.2.1. The Proposed Development passes through one protected area designated for benthic habitats; the Solent Maritime SAC. It is also located *c.*0.1 km from the Chichester and Langstone Harbours Ramsar site (Table 8.3; Figure 8.2 of the ES Volume 2 (document reference 6.2.8.2). Several other protected areas lie within 50 km of the Proposed Development (Table 8.3; Figures 8.2 and 8.3 of the ES Volume 2 (document reference 6.2.8.3)).

8.5.2.2. Whilst some of the recommended MCZs ('rMCZ') listed below have subsequently been dropped from formal designation, they have been included for the sake of completeness and the features of those sites have been considered as part of the impact assessment where relevant.

8.5.2.3. Appendix 8.5 (Marine Conservation Zone Assessment) also presents the assessment on MCZ features, or any supporting ecological or geomorphological processes on which the conservation of any protected feature of an MCZ is (wholly or in part) dependent.

8.5.2.4. While not strictly designated for benthic habitats, the Eastney Beach Local Wildlife Site ('LWS') is an important intertidal habitat for coastal vegetated shingle and has therefore been included in the table below.

Table 8.3 - Sites designated for benthic species/habitats in the vicinity of the Proposed Development

Site Name	Criteria	Status	Approx. closest Distance to Proposed Development (km)
Solent Maritime (SAC)	Qualifying features: estuaries; mudflats and sandflats (not submerged at low tide); sandbanks (slightly covered by seawater all the time); shifting dunes along the shoreline; coastal lagoons	Designated	0
Eastney Beach (LWS)	Coastal vegetated shingle	Designated	0
Chichester and Langstone Harbours Wetland (Ramsar)	Intertidal mudflats; saltmarsh; sand; shingle spits; sand dunes; Zostera spp.	Designated	0.1
Langstone Harbour Site of Special Scientific Interest ('SSSI')	Notified features: saline coastal lagoons; sheltered muddy shores (including estuarine muds); Zostera communities; invertebrate assemblage	Notified	0.1
Offshore Overfalls (MCZ)	Protected features: subtidal coarse sediment; subtidal mixed sediments; subtidal sand	Designated	1.15
Utopia (MCZ)	Protected features: moderate/high energy circalittoral rock; subtidal coarse/mixed sediment; subtidal sand; fragile sponge and anthozoan communities on subtidal rocky habitats	Designated	1.3

Site Name	Criteria	Status	Approx. closest Distance to Proposed Development (km)
South Wight Maritime (SAC)	Qualifying features: reefs; submerged or partially submerged sea caves	Designated	3.3
Bembridge (MCZ)	Features considered: subtidal mixed sediments; subtidal coarse sediments; subtidal sand; subtidal mud; sheltered muddy gravels; seagrass beds; maerl beds; sea-pens and burrowing megafauna; peacock's tail seaweed; Stalked jellyfish (*Calvadosia campanulata*); Stalked jellyfish (*Haliclystus species*).	Designated	3.8
Selsey Bill and the Hounds (MCZ)	Features considered: subtidal mixed sediments; subtidal sand; high energy infralittoral rock; moderate energy infralittoral rock; moderate energy circalittoral rock; low energy infralittoral rock; tentacled lagoon worm (*Alkmaria romijni*); peat and clay exposures	Designated	4.0
Chichester Harbour (SSSI)	Notified features: Zostera communities; invertebrate assemblage	Notified	4.5
Solent and Isle of Wight Lagoons (SAC)	Qualifying features: coastal lagoons	Designated	4.6
Portsmouth Harbour (SSSI)	Notified features: lagoon sand shrimp (*Gammarus insensibilis)*, Starlet Sea Anemone (*Nematostella vectensis)*	Notified	4.9
Portsmouth	Intertidal mudflat areas with Zostera beds; saltmarsh; *Hydrobia*	Designated	4.9

Site Name	Criteria	Status	Approx. closest Distance to Proposed Development (km)
Harbour Wetland of International Importance (Ramsar)	*ulvae*; *Ulva spp*.; lagoon sand shrimp (*Gammarus insensibilis*); Starlet Sea Anemone (*Nematostella vectensis*)		
Ryde Sands and Wootton Creek (SSSI)	Notified features: moderately exposed sandy shores (with polychaetes and bivalves); sheltered muddy shores (including estuarine muds); Zostera communities	Notified	6.6
Solent and Southampton Water (Ramsar)	Saline lagoons; saltmarshes; estuaries; intertidal flats; shallow coastal waters; reedbeds; rocky boulder reef; rare plants and invertebrate assemblages	Listed	6.6
Norris to Ryde (rMCZ)	Features considered: low energy intertidal rock; estuarine rocky habitats; subtidal mixed sediments; subtidal macrophyte-dominated sediment; subtidal coarse sediment; peat and clay exposures; subtidal mud; sheltered muddy gravels; seagrass beds; tentacled lagoon worm (*Alkmaria romijni*)	Dropped	6.9
Gilkicker Lagoon (SSSI)	Notified features: lagoon sand shrimp, Starlet Sea Anemone	Notified	6.9
Fareham Creek (rMCZ)	Features considered: sheltered muddy gravel; saltmarsh	Dropped	7.6
Brading Marshes to St. Helen's	Notified features: invertebrate assemblage; sheltered muddy shores (including estuarine muds); sheltered rocky shores	Notified	7.9

Site Name	Criteria	Status	Approx. closest Distance to Proposed Development (km)
Ledges (SSSI)			
Whitecliff Bay and Bembridge Ledges (SSSI)	Notified features: moderately exposed rocky shores; moderately exposed sandy shores (with polychaetes and bivalves); reefs; Zostera communities	Notified	8.4
Offshore Brighton (MCZ)	Features protected: high energy circalittoral rock; subtidal coarse sediment; subtidal mixed sediments	Designated	8.5
Browndown (SSSI)	Notified features: lichens, invertebrate assemblage	Notified	9.2
Pagham Harbour (SSSI)	Notified features: invertebrate assemblage; Starlet Sea Anemone, saline coastal lagoons	Notified	9.5
Pagham Harbour (MCZ)	Features protected: Zostera beds, Defoin's lagoon snail (*Caecum armoricum*), lagoon sand shrimp	Designated	9.6
East Meridian (rMCZ)	Features considered: subtidal sand; subtidal mixed sediments; subtidal sands and gravels; ross worm reef	Dropped	10.6
Kingmere (MCZ)	Features protected: moderate energy infralittoral rock and thin mixed sediment; subtidal chalk	Designated	10.8
King's Quay Shore (SSSI)	Sheltered muddy shores (including estuarine muds)	Notified	12.7
Medina Estuary (SSSI)	Notified features: sheltered muddy shores (including estuarine muds)	Notified	17.3
North Solent	Notified features: invertebrate assemblage; sheltered muddy	Notified	18.8

Site Name	Criteria	Status	Approx. closest Distance to Proposed Development (km)
(SSSI)	shores (including estuarine muds); Zostera communities		
Isle of Wight Downs (SAC)	Annex I habitats: vegetated sea cliffs of the Atlantic and Baltic Coasts	Designated	19.6
Yarmouth to Cowes (MCZ)	Features considered: Boulder Cliff geological feature; estuarine rocky habitats; intertidal coarse sediment; intertidal under boulder communities; littoral chalk communities; low intertidal rock; moderate energy intertidal rock; subtidal coarse sediment; high energy circalittoral rock; high energy infralittoral rock; moderate energy circalittoral rock; moderate energy infralittoral rock; peat and clay exposures; sheltered muddy gravels; subtidal chalk; subtidal mixed sediments; subtidal mud	Designated	19.9
Thorness Bay (SSSI)	Notified features: moderately exposed sandy shores (with polychaetes and bivalves)	Notified	21.9
Compton Chine to Steephill Cove (SSSI)	Notified features: invertebrate assemblage; moderately exposed rocky shores	Notified	24.2
Newtown Harbour (SSSI)	Notified features: invertebrate assemblage	Notified	24.5
East Meridian Eastern Section	Features considered: subtidal sand; subtidal mixed sediments; subtidal sands and gravels	Dropped	27.5

Site Name	Criteria	Status	Approx. closest Distance to Proposed Development (km)
(rMCZ)			
Wight-Barfleur Reef (SAC)	Qualifying features: reefs	Designated	28.5
Hurst Castle and Lymington River Estuary (SSSI)	Notified features: sheltered muddy shores (including estuarine muds)	Notified	29.2
Adur estuary (SSSI)	Notified features: sheltered muddy shores (including estuarine muds)	Notified	30.1
Yar Estuary (SSSI)	Notified features: invertebrate assemblage; sheltered muddy shores (including estuarine muds)	Notified	33.5
Beachy Head West (MCZ)	Features protected: intertidal coarse sediment; subtidal mixed sediment; subtidal mud; subtidal sand; infralittoral muddy sand; infralittoral sandy mud; low energy infralittoral rock; blue mussel (*Mytilus edulis*) beds; subtidal chalk; littoral chalk communities; moderate energy circalittoral rock; high energy circalittoral rock	Designated	34.5
The Needles (MCZ)	Features protected: moderate energy infralittoral rock; high energy infralittoral rock; moderate energy circalittoral rock; subtidal chalk; subtidal coarse sediment; subtidal mixed sediments; subtidal sand; subtidal mud; sheltered muddy gravels; seagrass beds; peacock's tail seaweed	Designated	35.4

Site Name	Criteria	Status	Approx. closest Distance to Proposed Development (km)
Brighton to Newhaven cliffs (SSSI)	Notified features: reefs; invertebrate assemblage	Notified	36.1
Seaford to Beachy Head (SSSI)	Notified features: reefs; invertebrate assemblage	Notified	40.1
Beachy Head East (MCZ)	Features considered: littoral chalk communities; subtidal sand; subtidal coarse sediment; subtidal chalk; peat and clay exposures; rossworm reefs; high/moderate energy circalittoral rock	Designated	44.5

8.5.2.5. Defra (2019) data, presented on Magic Maps web application, also highlights the presence of several WFD high sensitivity habitats within the vicinity of the Proposed Development (Table 8.4).

Table 8.4 - WFD high sensitivity habitats in proximity to Proposed Development

Habitat	Approx. Distance to Proposed Development (km)
Chalk reef	0.5
Intertidal Seagrass beds	2
Subtidal Kelp Beds	3
Saltmarsh	5
Maerl beds	10
Subtidal Seagrass beds	12
Mussel Beds	20

8.5.3. LANDFALL

8.5.3.1. The proposed Landfall is located at Eastney beach at the south-eastern edge of Portsea Island, and the eastern end of a *c*.3.5 km continuous stretch of coast extending from Southsea Castle eastwards to Fort Cumberland. The Marine Cables will make Landfall through the use of HDD methods which will travel underneath the intertidal areas at Eastney from an exit/entry point in the marine environment approximately 1 km seaward of the beach, between KP 1 – KP 1.6.

8.5.3.2. Portsea Island, containing most of the city of Portsmouth, is a developed and densely populated area, and the south-east of Portsea Island has been largely developed by the MoD with Eastney Barracks, the MEME depot and Fort Cumberland (Halcrow Group Ltd, 2008).

8.5.3.3. A caravan site occupies land to the west of the Fort. Although the promenade veers away from the beach at Eastney, the shore remains accessible and is extensively used by visitors for leisure activities.

8.5.3.4. The sediment at Eastney has been summarised as sand and vegetated shingle (Irving, 1996; James *et al*. 2010, EMU Ltd, 2012), the latter of which is listed as an Annex I habitat under the Habitats Directive (Eastern Solent Coastal Partnership, 2012). This shingle is occupied by over 100 different plant species including several locally rare plants such as sea kale (*Crambe maritima*), sea sandwort (*Honckenya peploides*) and sea radish (*Raphanus raphanistrum*). Due to its nature conservation value, the site was designated a LWS in 2006 (designation was extended in 2010) by Portsmouth City Council (2014).

8.5.3.5. Langstone Harbour is the middle of three extensive and connected tidal basins (Portsmouth, Langstone and Chichester Harbours). At low water, extensive mud flats are exposed, drained by three main channels which unite to make a common and narrow exit to the sea. The intertidal beds of common eelgrass (*Zostera* *marina*) and the nationally scarce dwarf eelgrass (*Zostera noltii*) are among the largest in Britain (NE, 1985), (Thomas *et al*., 2016). The predominant habitat found in Langstone harbour is *Hediste diversicolor* and *Macoma balthica* in littoral sandy mud (A2.312 or LS.LMu.MEst.HedMac,) with a large area of *Zostera noltii* beds in littoral muddy sand (A2.6111).

8.5.3.6. The lower shore typically consists of ephemeral green and red seaweeds on variable salinity and/or disturbed eulittoral mixed substrata (LR.FLR.Eph.EphX). Langstone Harbour has extensive evidence of estuarine eutrophication and the relationship with algal blanketing of the predominantly anoxic muds leads to changes in invertebrate communities and changes in the composition of vertebrate predator communities.

8.5.3.7. Under Langstone Harbour, above the proposed HDD route between Portsea Island and the mainland (see Section 7 in Figure 3.9), intermittent green algal mats cover intertidal mud with a network of various natural drainage routes that feed into the deeper Broom Channel. A small area of saltmarsh is present on the west side of Broom Channel.

SITE SPECIFIC SURVEY – INTERTIDAL

Intertidal Survey Methodology

8.5.3.8. An intertidal survey was performed at the Landfall location for the Proposed Development in order to map the extent and distribution of intertidal habitats in the vicinity of the Marine Cable Corridor. A summary of the results of the survey are presented here for completeness, with the full survey report provided as Appendix 8.3 (Intertidal Survey Report) of the ES Volume 3 (document reference 6.3.8.3).

8.5.3.9. The methodology used was taken from the Marine Monitoring Handbook (Davies *et al*., 2001), specifically Procedural Guidance No 3-2 - in situ ACE biotope mapping techniques, Procedural Guidance No 3-1 - in situ biotope recording techniques (and the Handbook for Marine Intertidal Phase 1 Biotope Mapping Survey (Wyn *et al*., 2000). This survey method allows both rocky shore areas and shingle / sediment shores to be surveyed.

8.5.3.10. The majority of the 1 km stretch of shore surveyed was made up of shingle top shore backed by Eastney Esplanade and Southsea Leisure Park. Beneath this, there was a steep bank of shingle which on spring tides gives way to a sandy shore. The exception to this is the far north east corner, beyond Fraser Range as Eastney beach turns north into the entrance to Langstone Harbour, where the shingle bank is replaced with the sea defences of Fort Cumberland.

8.5.3.11. Below Fort Cumberland the shore is very narrow (only 20 m wide) and made up of a mixture of course sand overlaid with patches of boulders which appeared to be sections of old sea defences, with some posts (the remains of an old jetty/groins) extending into the sea. At the time of the survey, work was being undertaken to repair the sea defences at Fort Cumberland by Southern Water. A fresh water drain was also found discharging water onto the mid shore at this far eastern edge of Eastney Beach.

8.5.3.12. Four distinct habitats were found on this shore, vegetated shingle (above the mean high water mark), loose shingle (on the upper/mid shore), sediment (mid and lower shore), and rocky shore. These are described in detail below, with their location within the survey area presented in Figure 8.4 of the ES Volume 2 (document reference 6.2.8.4).

Vegetated Shingle

8.5.3.13. To the west of the Marine Cable Corridor above the high water mark, a shingle plateau was present colonised by a variety of vegetated shingle species (Plate 8.1).

Plate 8.1 - Vegetated Shingle located west of the Marine Cable Corridor

Shingle Shore

8.5.3.14. On the shingle upper shore, a strand line of washed up seaweed (sugar kelp and sea bootlace) was found (Plate 8.2) corresponding with the biotope littoral coarse sediment (LS.LCS; A2.1).

Plate 8.2 - Shingle top shore

Sediment Habitats

8.5.3.15. The lower edge of the mid shore and lower shore areas was made up of sediment strewn with pebbles (Plate 8.3). The exception to this was at the east end of the transect where the mid shore was rocky, and sediment was restricted to small pockets on the lower shore between boulders.

8.5.3.16. Sediment characteristics were examined only in areas where sand was found, at a total of five stations. At these mid and lower shore stations, the sand was found to be a relatively thin veneer, only 2-10 cm deep, over shingle. Its appearance was consistent with medium to course sediment. No obvious signs of marine organisms were found at any of the sediment stations that were dug over, and no anoxic layer was seen.

8.5.3.17. The biotope this most closely corresponded to was barren or amphipod-dominated mobile sand shores (LS.LSa.MoSa; A2.22).

Plate 8.3 - Sediment habitats on the lower shore

Rocky Shore

8.5.3.18. To the east of the Marine Cable Corridor, the beach becomes narrower towards the entrance to Langstone Harbour. At the narrowest point the shore is only 20 m wide and backed by sea defences. Here, beneath the sea walls of Fort Cumberland there were isolated patches of rocks and boulders interspersed with coarse sediment (Plate 8.4).

8.5.3.19. The sea defence walls and large boulders of the upper and mid shore corresponded with the biotope *Porphyra purpurea* and *Enteromorpha spp*. on sand-scoured mid or lower eulittoral rock (A1.452; LR.FLR.Eph.EntPor).

8.5.3.20. Further down in the mid-shore zone, boulders most closely resembled *Fucus spiralis* on sheltered variable salinity upper eulittoral rock (A1.322; LR.LLR.FVS.FspiVS).

8.5.3.21. Entering the lower shore, there were patches of boulders as well as wooden posts which extended into the shallow sublittoral. These boulders were covered in a carpet of algae and had a diverse under boulder community. The upper sections of the wooden posts were covered in barnacles, green algae and red algae, with an assortment of hydroids, sponges, ascidians and anemones.

8.5.3.22. This lower shore community most closely corresponded to the biotope *Laminaria saccharina* with foliose red seaweeds and ascidians on sheltered tide-swept infralittoral rock (A3.224; IR.MIR.KT.LsacT).

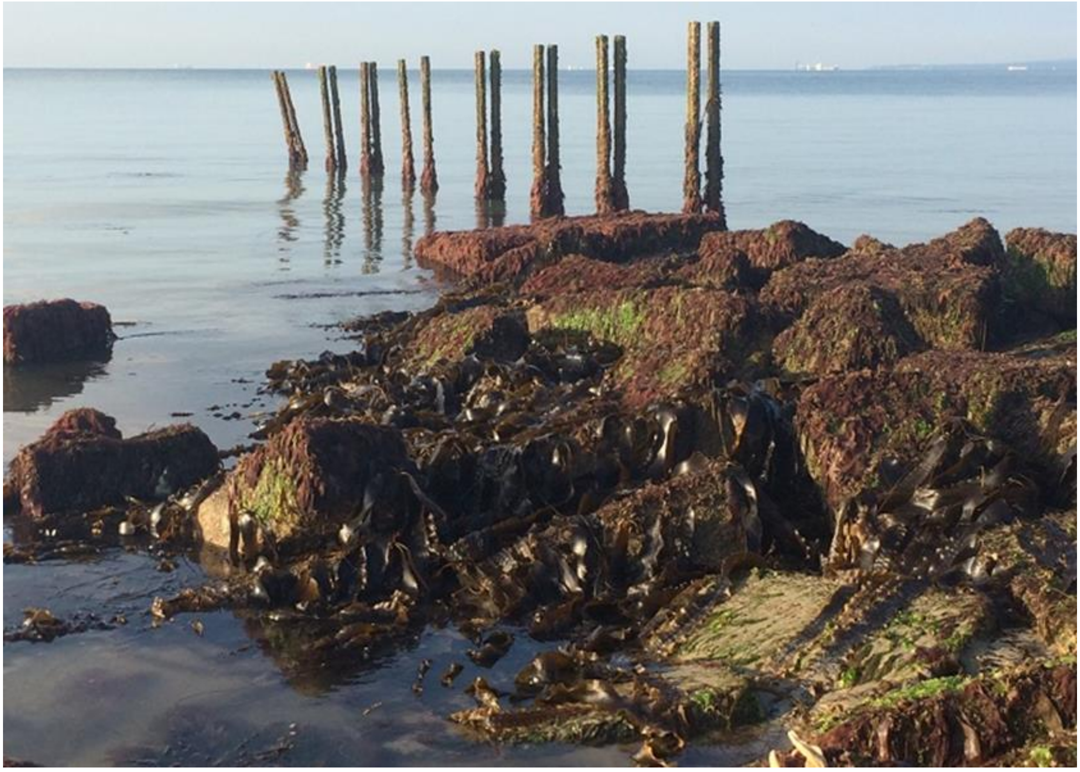

Plate 8.4 - Rocky shore habitats

Species and Habitats of Conservation Importance

8.5.3.23. Vegetated shingle is an Annex I habitat, however Eastney Beach is not part of a SAC, hence while it is a notable feature it is not protected under any SAC. This area is however designated for its coastal vegetated shingle as part of the Eastney Beach LWS.

8.5.3.24. No intertidal species or habitats of conservation importance were found. The intertidal area was found to be typical of a shingle shore sandy beach, with a surprisingly diverse, but limited in area, rocky shore area at the east end of the beach.

Invasive Species

8.5.3.25. A number of invasive, non-native, species were found on this survey. These included American slipper limpets (*Crepidula fornicata*), the leathery sea squirt (*Styela clava*), the American sting winkle (*Urosalpinx cinerea*) and Japanese wireweed (*Sargassum muticum*). All these species have been recorded in the south coast area previously (NBN atlas, 2017), and their presence on Eastney beach is not surprising given the proximity to the major ports of Portsmouth and Southampton and the high level of shipping activity.

8.5.4. MARINE CABLE CORRIDOR

8.5.4.1. The South Coast REC study (EMU Ltd., 2012) classified the UK South Coast region as large expanses of rock and thin sediment. Species identified during benthic surveys across the REC study area highlight the complex and wide ranging environmental conditions across the region, whereby a diverse suite of fauna is supported. The barnacle (*Balanus crenatus*) was the most abundant species recorded, with the sea squirt (*Dendrodoa grossularia*) and the invasive non-native American slipper limpet (*Crepidula fornicata*) the second and third most abundant, respectively. Other abundant species included the tubicolous polychaetes *Pomatoceros lamarcki* and *Sabellaria spinulosa*, as well as, the pea urchin (*Echinocyamus pusillus*) and interstitial polychaetes such as *Notomastus latericeus* and *Lumbrineris gracilis*.

8.5.4.2. Figure 8.5 (document reference 6.2.8.5) illustrates EMODnet predictive habitat maps showing the sediment composition within the nearshore as predominantly high energy infralittoral sand (SS.SSa.IFiSa or SS.SSa.IMuSa; A5.23 or A5.24) and high energy infralittoral coarse sediment (LS.LCS; A5.13) with patches of high energy circalittoral coarse sediment (SS.SCS.CCS; A5.14), high energy circalittoral sand (SS.SSa.CFiSa or SS.SSa.CMuSa; A5.25 or A5.26) and infralittoral/circalittoral sandy mud (SS.SMu.ISaMu, A5.33; SS.SMu.CSaMu, A5.35) (EMODnet, 2016). The Solent Maritime SAC habitat mapping project (MESL, 2015) also identified sandy gravel and the biotope complex infralittoral fine sand (SS.SSa.IFiSa; A5.23) off Eastney Beach, along with subtidal sandbanks colonised by burrowing infauna such as crustaceans, annelids, bivalve molluscs and echinoderms (MESL, 2015).

8.5.4.3. An earlier Regional Environmental Assessment (the South Coast Marine Aggregate Regional Environmental Assessment (EMU Ltd, 2008a, EMU Ltd, 2008b)) identified soft rock communities (CR.MCR.SfR; A4.23), *Crepidula fornicata* with ascidians and anemones on infralittoral coarse mixed sediment (SS.SMx.IMx.CreAsAn; A5.431) and infralittoral mixed sediment, particularly chalk cobbles (SS.SMx.IMx; A5.43) in the vicinity of the nearshore.

8.5.4.4. Numerous studies have been undertaken in the wider area for other offshore developments in the region, including Rampion OWF and the IFA2. The Landfall site for Rampion OWF is located *c*.50 km east of Eastney, at Worthing, whilst the northern end of the IFA2 marine cable route is located in the Solent, to the north west of Eastney.

8.5.4.5. Benthic surveys for Rampion OWF identified sand, sandy gravel and gravelly sand with megaripples within the nearshore. The seabed was characterised as predominantly circalittoral coarse/mixed sediment (SS.SCS.CCS or SS.SMx.CMx; A5.14 or A5.44) and clean sand with sparse fauna (SS.SSa.IFiSa.IMoSa; A5.231).

8.5.4.6. Subtidal biogenic blue mussel (*Mytilus edulis*) reef was recorded at nearshore sites, with *Mytilus edulis* beds on sublittoral sediment (SS.SBR.SMusMytSS; A5.625) identified at one site. Other biotopes identified at inshore sites included *Pomatoceros triqueter* with barnacles and bryozoan crusts on unstable circalittoral cobbles and pebbles (SS.SCS.CCS.PomB; A5.141) and infralittoral mixed sediment (SS.SMx.IMx; A5.43) (E.ON, 2012).

8.5.4.7. IFA2 benthic surveys identified the most common biotopes in the nearshore as *Crepidula fornicata* and *Mediomastus fragilis* in variable salinity infralittoral mixed sediment (SS.SMx.SMxVS.CreMed; A5.422) and *Abra alba* and *Nucula nitidosa* in circalittoral muddy sand or slightly mixed sediment (SS.SSa.CMuSa.AalbNuc; A5.261), with some *Nephtys cirrosa* and *Bathyporeia spp*. in infralittoral sand (SS.SSa.IFiSa.NcirBat; A5.233) (IFA2 ES, 2016).

8.5.4.8. The sediment composition along the deeper sections of the IFA2 Marine Cable Corridor predominantly consisted of circalittoral coarse sediment (SS.SCS.CCS; A5.14), and Rampion OWF surveys generally identified gravelly sand with bedforms, sandwaves and/or megaripples in the vicinity of their export cable corridor and OWF site. Rampion benthic surveys also identified patches of sandy gravel, slightly gravelly sand, sand and rock.

8.5.4.9. According to EMODnet (2016) data, sediments within the deeper areas of the Marine Cable Corridor are predicted to be similar to those found in the vicinity of the IFA2 and Rampion OWF projects, with the dominant habitats being circalittoral coarse sediment (SS.SCS.CCS; A5.14) and offshore circalittoral coarse sediment (SS.SCS.OCS; A5.15). Patches of circalittoral sand (SS.SSa.CFiSa or SS.SSa.CMuSa; A5.25 or A5.26), (offshore) circalittoral rock and other hard substrata (CR; A4), infralittoral coarse sediment (LS.LCS; A5.13) and infralittoral sand (SS.SSa.IFiSa or SS.SSa.IMuSa; A5.23 or A5.24) are also expected within the Marine Cable Corridor (Figure 8.5) (EMODnet, 2016).

8.5.4.10. Additional habitats predicted within 20 km of the Marine Cable Corridor include infralittoral rock (IR; A3.1, A3.2, A3.3), deep circalittoral sand (SS.SSa.OSa; A5.27), sandy mud (SS.SMu.ISaMu, A5.33; SS.SMu.CSaMu, A5.35), fine mud (SS.SMu.IFiMu, A5.34; SS.SMu.CFiMu, A5.36) and mixed sediments (SS.SMx.IMx, A5.43; SS.SMx.CMx, A5.44; A5.45, SS.SMx.OMx) (Figure 8.5) (EMODnet, 2016).

SITE SPECIFIC SURVEY – SUBTIDAL

Subtidal Survey Methodology

8.5.4.11. An extensive benthic survey campaign was undertaken between July 2017 and March 2018 to characterise the benthic area affected by the Proposed Development. Subtidal surveys (benthic grab and Drop Down Video ('DDV') were undertaken in the Channel within the benthic survey area, which was defined as 1 km either side of the Marine Cable Corridor. A full survey report including detail on sampling station collection and survey methods is provided as Appendix 8.1 (Benthic Ecology Survey Report).

8.5.4.12. In total, 22 sites were targeted within the benthic survey area spanning UK waters (Figure 8.6 of the ES Volume 2 (document reference 6.2.8.6). In line with Parry

(2015), DDV image(s) were taken at each sampling station prior to the deployment of a 0.1 m^2 mini-Hamon for the collection of a single grab sample. The purpose of the video/stills analysis was to identify what epifauna and broadscale habitats exist, to provide semi-quantitative data on their physical and biological characteristics and to note where a change in substrate type exists. This also ensured that any sensitive habitats present (e.g. reef habitats) were not damaged by the grab.

8.5.4.13. The DDV methodology was consistent with the Procedural Guidelines (Davies *et al*., 2001) of the JNCC's Marine Monitoring Handbook and the more current Epibiota Remote Monitoring from Digital Imagery: Operational Guidelines (Hitchin *et al*., 2015). Video and still images were reviewed, processed and analysed. All taxa were identified to the lowest practicable taxonomic level using relevant taxonomic keys and photographic guides. For each taxon identified in the imaging, an actual abundance (where appropriate) and a semi-quantitative (SACFOR) measurement was made based on the MNCR SACFOR abundances scale[2] (JNCC, 2017). Footage was also examined to determine if the habitats found constituted potential Annex I reef (as defined under Annex I of the EU Habitats Directive CEC, 2007) and if so, the quality and extent of this reef. Where stony reefs were found this was assessed against a standard set of criteria (Irving, 2009) to provide information on the 'reefiness' characteristics of the station.

8.5.4.14. Benthic grab sampling was undertaken in line with Section 3.9 of the JNCC Marine Monitoring Handbook (Thomas, 2001) and Cefas guidelines (2011). Upon retrieval of the grab, the sample was assessed by the lead surveyor and if deemed acceptable, a photograph was taken and a sediment sub-sample (approximately 600 g) was taken for PSA and TOC analysis, with the remaining sediment screened on board through a 1 mm mesh sieve. All material retained by the sieve was fixed in a 4% solution of neutral (saline) buffered formalin and stored for subsequent laboratory analysis.

8.5.4.15. Contaminated sediment sampling of the nearshore area was also undertaken during this survey. The methods and results of this sampling are reported separately in Appendix 7.3 (Contaminated Sediment Survey Report) of the ES Volume 3 (document reference 6.3.7.3).

8.5.4.16. Taxonomic identification of macrofaunal species, as well as PSA and TOC analysis, was undertaken in accordance with National Marine Biological Analytical Quality Control ('NMBAQC') methodology standards (Mason, 2016). Biomass (wet weight) was obtained in accordance with the Clean Seas Environment Monitoring Programme ('CSEMP') Green Book (CSEMP, 2012).

Data Analysis

8.5.4.17. All data collected were entered into an Excel spreadsheet. A suite of statistical analyses (including DIVERSE, Cluster Analysis, MDS, Plots, SIMPER) on the data

[2] Super-abundant (S), abundant (A), common (C), frequent (F), occasional (O), rare (R) and present (P)

collected from the grab survey work were undertaken using PRIMER v6 (Clarke and Warwick, 2001) to aid characterisation of the area in assigning biotopes (and highlight any spatial patterns).

8.5.4.18. Based on PSA results, each sampling station was assigned a Folk classification using the Folk ternary diagram provided in the JNCC guidance (Parry, 2015). The percentage composition of gravel, sand and mud was calculated for each sampling station.

8.5.4.19. Grab and DDV sample station biotopes were determined according to the Marine Habitat Classification (Connor *et al*., 2004). Classification was supported by use of JNCC comparative tables and guidance. Infauna (grab) and epibenthic (DDV) biotope classifications were incorporated into an Excel spreadsheet, and final benthic habitats assigned to each sampling station.

8.5.4.20. Benthic habitats and geophysical survey data (including seabed features such as sand waves and ripples) were incorporated into an ArcGIS worksheet to produce a multi-layered biotope map of the proposed benthic survey area. This allowed for extrapolation of biotopes between sampling stations.

Results

8.5.4.21. Nearshore benthic habitats between Eastney and sampling station 3 are predominantly sandy (infralittoral fine sand; infralittoral mobile clean sand with sparse fauna; infralittoral mixed sediment) with a small patch of sand ripples in the Solent (Figure 8.7 of the ES Volume 2 (document reference 6.2.8.7). The typical community structure is characterised by a range of species including polychaetes, amphipods, bivalves, tunicates, sea anemones and crabs.

8.5.4.22. Further from Landfall up to the 12 nmi limit (i.e. sampling station 11), the benthic habitat transitions to a coarser, mixed sediment composition of sand and gravel veneers over hardground, colonised by infaunal polychaetes (infralittoral mixed sediment; *Mediomastus fragilis, Lumbrineris spp*. and venerid bivalves in circalittoral coarse sand or gravel; moderate energy circalittoral rock). Depths of sediment in this area extend up to a maximum of 12.8 m. However, between sampling stations 3 to 11, hardground is often close to the surface and the sediment veneer is thin. Numerous boulder fields cover this area with a large boulder field between *c.*7 km to 17.5 km (sampling stations 4 to 6) from the UK coastline. A cluster of rocky outcrops was also identified in the vicinity of stations 7 and 8, with station 7 predominantly characterised by bryozoans and polychaetes. The presence of *Pisidia longicornis* at this station also indicates a rock/boulder environment. Clusters of sand ripples and waves are also present throughout the section.

8.5.4.23. Circalittoral coarse sediment biotopes make up the majority of the offshore benthic survey area between the 12 nmi limit and the EEZ Boundary Line (i.e. between sampling stations 11 to 22).

8.5.4.24. The most widespread infaunal biotopes are offshore circalittoral coarse sediment (SS.SCS.OCS) and *Mediomastus fragilis, Lumbrineris spp*. and venerid bivalves in circalittoral coarse sand or gravel (SS.SCS.CCS.MedLumVen). The geophysical survey data for the area defined several outcrops of hardground intermittently covered by sediment of depths ranging from 5 m to 16 m. Sand waves up to 15 m in height are present near to the 12 nmi limit between sampling stations 10 and 11 which were both characterised as *Mediomastus fragilis*, *Lumbrineris spp*. and venerid bivalves in circalittoral coarse sand or gravel. A large patch of sand ripples located between sampling stations 16 and 21 is characterised as the habitat SS.SCS.OCS. Boulder fields are common near to sampling station 21. Although epibenthic communities across the benthic survey area are generally sparse, elevated levels of silt at sampling station 22 have altered the habitat to a mixed substratum occupied by the brittlestars *Ophiothrix fragilis* and/or *Ophiocomina nigra*.

Species and Habitats of Conservation Importance

8.5.4.25. *Sabellaria spinulosa* was the most common species identified in grab samples at sampling stations 5 and 7, although it was not found in amounts required to correlate with any *Sabellaria* biotopes and no reef or encrusting formations were observed.

8.5.4.26. One sampling station (22) was considered to have the potential to be representative of Annex I reef during survey operations. The imagery from this station was reviewed and the biotope *Ophiothrix fragilis* and/or *Ophiocomina nigra* brittlestar beds on sublittoral mixed sediment (SS.SMx.CMx.OphMx) attributed to the station. The footage does suggest that the mixed sediment could be overlying bedrock or stable substratum with established epifaunal growths of *Alcyonium digitatum* present.

8.5.4.27. A 'reefiness' assessment was undertaken using the DDV and geophysical data which identified the area to be of medium resemblance to stony reef, according to Irving (2009). Therefore, the habitat is considered to have the potential to be Annex I reef although it is recognised that the area is not within any designated or proposed MCZs or SAC.

8.5.4.28. Rocky outcrops observed in other areas of the Marine Cable Corridor (e.g. sampling stations 7 and 8) were not deemed to be potential Annex I reef as they are poorly colonised and heavily influenced by scour from adjacent coarse sediments.

8.5.4.29. Subtidal sands and gravels and sheltered muddy gravels (UK BAP priority habitats) were identified across large areas of the benthic survey area.

8.5.4.30. Other UK BAP priority habitats recorded as present in the wider area (i.e. outside the Marine Cable Corridor), were:

- Estuarine rocky habitats;

- Mud habitats in deep water; and
- Subtidal chalk.

8.5.5. IDENTIFICATION OF RECEPTORS

8.5.5.1. The Proposed Development intersects a variety of benthic habitats that have the potential to be impacted by the Proposed Development. These are summarised in Table 8.5 below.

Table 8.5 - Benthic receptors within the Marine Cable Corridor

EUNIS description	EUNIS code	MNCR code*
Vegetated shingle	N/A	N/A
***Fucus spiralis* on sheltered variable salinity upper eulittoral rock**	A1.322	LR.LLR.FVS.Fspir
***Porphyra purpurea* and *Enteromorpha spp.* on sand-scoured mid or lower eulittoral rock**	A1.452	LR.FLR.Eph.EntPor
Littoral coarse sediment	A2.1	LS.LCS
Barren or amphipod-dominated mobile sand shores	A2.22	LS.LSa.MoSa
***Laminaria saccharina* with foliose red seaweeds and ascidians on sheltered tide-swept infralittoral rock**	A3.224	IR.MIR.KT.LsacT
Moderate energy circalittoral rock	A4.2	CR.MCR
Circalittoral coarse sediment	A5.14	SS.SCS.CCS
***Mediomastus fragilis, Lumbrineris spp.* and venerid bivalves in circalittoral coarse sand or gravel**	A5.142	SS.SCS.CCS.MedLumVen
Offshore circalittoral coarse sediment	A5.15	SS.SCS.OCS
Infralittoral fine sand	A5.23	SS.SSa.IFiSa
Infralittoral mobile clean sand with sparse fauna	A5.231	SS.SSa.IFiSa.IMoSa
Infralittoral mixed sediments	A5.43	SS.SMx.Imx
Circalittoral mixed sediments	A5.44	SS.SMx.CMx
***Ophiothrix fragilis* and/or *Ophiocomina nigra* brittlestar beds on sublittoral mixed sediment**	A5.445	SS.SMx.CMx.OphMx

8.5.5.2. In addition, a number of potentially sensitive and/or protected habitats exist within protected areas in proximity to the Proposed Development (Table 8.3 and Table 8.4).

8.5.6. FUTURE BASELINE

8.5.6.1. Baseline data have been obtained from the collation of existing information. The existing baseline is informed by data that are 'current' and a future baseline is informed by an extrapolation of the currently available data by reference to policy and plans, other proposal applications and expert judgement.

8.5.6.2. The baseline environment present in the vicinity of the Proposed Development has remained relatively consistent over time, with historic data indicating a very similar environment as to that currently present. As such, in the absence of the Proposed Development, the baseline is considered to remain as that identified above, subject to any variation in response to large scale climactic factors that may occur in such a time period.

8.5.6.3. Furthermore, baseline conditions within the study area may also change in relation to other projects/plans which may be implemented during this timeframe. Baseline conditions are therefore not static and are likely to exhibit some degree of change over time, with or without the Proposed Development in place.

8.5.6.4. Therefore, potential impacts have been assessed in the context of the envelope of change that might occur over the operational period of the Proposed Development. Consideration of other projects/plans is undertaken through cumulative effects assessment in Section 8.7 and in doing so, their ability to modify the existing baseline is also considered.

8.6. IMPACT ASSESSMENT

8.6.1.1. This section describes the potential impacts that may arise from the construction, operation (including maintenance and repair) and decommissioning of the Proposed Development and the effects these may have on benthic and intertidal ecology.

8.6.1.2. Chapter 3 (Description of the Proposed Development) provides further information regarding decommissioning. The options for decommissioning include leaving the Marine Cables in situ, removal of the entire cables or removal of sections of the Marine Cables. If the best practice guidance at the time is to leave the inert and environmentally benign cable in situ, it is considered that there is no potential for significant effects on benthic and intertidal receptors from leaving the inert Marine Cables in place.

8.6.1.3. It is acknowledged however, that the Crown Estate and the Department for Business Enterprise and Industrial Strategy ('BEIS') currently supports removal of offshore renewable energy installations ('OREI's), including cables where practicable (BEIS, 2019). If cables are retrieved, decommissioning will be undertaken in line with industry best practice, and any effects are considered to be equivalent to or lesser in nature than those assessed for activities undertaken during construction. As such, predicted effects from decommissioning the Proposed

Development are not assessed individually in the following paragraphs for each feature and impact.

8.6.2. WORST CASE DESIGN ENVELOPE

8.6.2.1. Table 8.6 gives the worst-case design parameters considered for benthic and intertidal ecology during construction, operation (including repair and maintenance) and decommissioning of the Proposed Development. Further details regarding the proposed activities and programme are presented in Chapter 3 (Description of Proposed Development) and Appendix 3.2 (Marine Worst-Case Design Parameters).

Table 8.6 - Worst case design parameters

Potential Impact	Worst Case Parameters used for assessment.
Construction (& Decommissioning) stage	
Direct seabed disturbance/temporary loss	Seabed preparation, HDD and cable installation works will take place over an indicative period of 30 months. A maximum of four (two bundled pairs) Marine Cables which will run from the Landfall at Eastney Beach to the UK/France EEZ Boundary Line. Maximum length for each cable is approximately 109 km, with each cable bundle installed in a separate trench (maximum of two trenches typically separated by 50 m). Maximum area for Marine Cable Corridor within UK Marine Area (i.e. Proposed Development) is approximately 57 km^2 (as Marine Cable Corridor is 500 m wide for 8.6 km and 520 m wide for 100.4 km). The subtidal area (i.e. seaward MLWS) of seabed disturbed across Marine Cable Corridor is approximately 3.6 km^2. This is based on: • a pre-lay grapnel run ('PLGR') along 2 x 108 km of Marine Cable Corridor to a footprint width of 1 m (0.22 km^2); • 15.6 km of an 80 m swathe footprint for boulder clearance (1.25 km^2); • an assumed worst case of sandwave clearance along 4.2 km of the Marine Cable Corridor to a footprint width of 160 m (0.67 km^2); • an assumed worst case of 108 km of the Marine Cable Corridor disturbed through 2 x 6.5 m width of displacement plough trenching (1.41 km^2); • a maximum of two vessels would be grounded at low tides between KP 1.0 and KP 4.7 for up to 4 weeks (0.008 km^2);

Potential Impact	Worst Case Parameters used for assessment.
	• anchor spreads (0.042 km^2); • HDD entry pit (if required for offshore to onshore scenario) excavation works will likely occur in areas that will have already been subject to some level of disturbance between KP 1.0 and 1.6. However, the worst case assumes a single pit approximately 60 m x 15 m (0.0009 km^2) rather than four discrete pits per cable; • HDD temporary mattressing prior to cable pull (0.0009 km^2) which will likely occur over the area of the excavated HDD pit or pits; and • A jack up barge will be used for the HDD works at up to four locations. Typical jack-up barge will possess four legs, each leg approximately 1.4 m diameter (totalling 6.16 m^2). Temporary casing support frame comprising four trestles spaced 12 m apart at each location. Each trestle has a footprint of 3 m^2 (totalling 12 m^2). Combined maximum footprint of 0.00002 km^2. Depth of penetration of seabed preparation (after bedform clearance) and burial tools will range from 1 m (PLGR) to 3 m (cable burial tools). The possible impacts from decommissioning are predicted to be equal to or less than construction activities.
Temporary increases in SSC	**Marine Cable Corridor** **Landfall to KP 21** • Worst-case activities which will lead to increased SSC are considered to be excavation at the marine HDD pits (KP 1.0-1.6) with backhoe dredger or Mass Flow Excavation ('MFE'), and cable installation (due to the potential for the liberation and dispersal of fines identified between KP 5 and 15, and in other isolated locations). • The finest sediments will be transported up to 6-10 km from the release point, however it is highly likely that SSC at these distances will be low (< 5 mg/l) and therefore not discernible above natural variation, which ranges from approximately < 5 to 75 mg/l in coastal areas, with annual

Potential Impact	Worst Case Parameters used for assessment.
	averages of between 5–15 mg/l observed within surface waters. • It is predicted that a peak SSC of up to 200 mg/l may be observed locally (i.e. within 2 km of the cable trench/HDD pit) and these concentrations could potentially persist for several hours following completion of construction activities. Sediment plumes are also likely to be transported up to 5 km from the cable trench/HDD pit at which point concentrations of 5 to 10 mg/l are predicted; SSC is expected to return to background levels within a few days following completion of these activities. **KP21 to KP 109** • Worst-case scenario considers surface release of up to 1,754,000 m^3 of sediment. • Peak SSC of 1000 mg/l within 1 km from the release point but coarser sediment is expected to deposit quickly (almost immediately) with significant reductions of SSC within hours of disposal at each location. • Beyond 1 km from release, the passive plume is likely to generate SSC in the region of approximately 20 mg/l, transported in the direction of the prevailing flow out to a worst-case distance of 25 km. • SSC is predicted to reduce to background levels (<1 – 6 mg/l) within the timeframe of a few days following completion of these activities.
Deposition of Sediment (smothering)	**Marine Cable Corridor** **Landfall – KP 21** • Coarse material mobilised as a result of cable installation and/or HDD pit excavation will deposit rapidly (i.e. within several hundred metres of the cable trench / HDD pit). • Finer sediment will be dispersed across a greater spatial extent, transiently depositing throughout the tidal cycle.

Potential Impact	Worst Case Parameters used for assessment.
	• Due to the volumes of sediment likely to be liberated into the water column and significant dispersion of fine sediment, it is considered that deposition will be negligible with sediments quickly resuspended and redistributed under the forcing of tidal flows. **KP21 – KP 109** • Sediment deposition from disposal activities (disposal of up to 1,754,000 m^3 through surface release methods) will be local to the point of release (i.e. within 1000 m); • Deposits of coarser sediments may potentially be observed to depths of between 10 mm and 1.5 m, with greatest deposition observed across an area of a few hundred metres, elongated in the direction of the prevailing flow at the time of release, relative to the release site. • Finer sediments will be redistributed and any deposition outside the Marine Cable Corridor will be transient and negligible, with any settled material being quickly redistributed under the forcing of tidal flows.
Impacts from the resuspension of contaminated sediment	Potential for contaminated sediments to be present is discussed within Chapter 7 (Marine Water and Sediment Quality) of the ES Volume 1 (document reference 6.1.7). Resuspension is considered possible from all seabed preparation and installation activities.
Operational (including repair and maintenance) stage	
Disturbance due to Operational & Maintenance ('O&M') activity	The Proposed Development has been designed so that maintenance of the Marine Cables is not required during its operational lifetime. During operation, it is assumed that an indicative worst-case failure rate of the Marine Cables would require one repair every 10-12 years. During operation, reburial of cables and placement of cable protection may be required but it is predicted that the replacement of sections of cable would constitute the worst case. It is assumed

Potential Impact	Worst Case Parameters used for assessment.
	that an indicative worst-case failure rate of the Marine Cables would require: • one repair every 10-12 years; • a length of cable up to 3 x water depth to be recovered from the seabed (e.g. in the worst-case, at the maximum water depth of approximately 70 m, this could amount to approximately 1,100 m of cable to typically be recovered and re-laid for each repair of a cable pair); • The actual jointing operation may take up to 5 – 6 days, and the handling of the joint and deployment to the seabed could take 1 – 2 days. Depending on the extent of cable damage, cable repair operations typically have a duration of several weeks to months. It is therefore considered that should any repair and maintenance works be required, they would be of shorter duration and smaller in extent than the construction stage.
Habitat Loss	**Maximum area/footprint of original habitat loss is 0.7 km^2 due to non-burial protection.** Based on worst case non-burial protection for rock placement during construction (0.33 km^2) and maximum footprint for Atlantic crossing protection (0.038 km^2) and HDD permanent rockfill (0.0009 km^2). This maximum footprint also allows an addition 10% rock placement non-burial contingency (0.33 km^2) for if further non-burial protection is required during maintenance/repair activities during a 15-year period post construction.
Heat Emissions	At a burial depth of 1.0 m, seabed surface temperature increases can be expected to remain below 2°C in most circumstances, with no discernible increase in water temperature anticipated.

8.6.3. EMBEDDED MITIGATION

8.6.3.1. Embedded mitigation measures are considered to be those included as part of the project design or which constitute industry standard plans or best practice.

8.6.3.2. The route has been planned to avoid hard substrate as far as possible to ensure that the cable can be buried. It is the intention that the cable will be buried wherever possible along the route.

8.6.3.3. The route has also been planned to minimise the requirement for pre-sweeping of mobile sediments in the form of bedforms (sand waves and large ripples). This process comprises ongoing route development – comprising the initial desk-based assessment and route planning, route surveys and further engineering consideration.

8.6.3.4. The bundled cable design means that only two trenches will be required for burial along the entire route (except for a short stretch seaward of the HDD entry/exit).

8.6.3.5. Standard best practice in terms of waste management and spill response will also be followed and is described as part of the Marine Outline Construction Environmental Management Plan ('CEMP') (document reference 6.5) submitted with the Application and secured through the dML.

8.6.3.6. No disposal of dredge material will occur inside WFD waters (plus a 3 km buffer) in order to limit sediment loading in this area of increased sensitivity. This also ensures impacts of increased SSC and sediment disposal on sensitive habitats in this area is also minimised.

8.6.3.7. The Proposed Development has been designed so that routine maintenance to the Marine Cable is not required during its operational lifetime (40 years). Distributed Temperature Sensing System ('DTS') via two fibre optic cables will be laid within the cable bundle, which can be utilised to facilitate cable maintenance and repair by reducing cable inspection requirements, localise potential areas requiring maintenance

8.6.4. CONSTRUCTION (AND DECOMMISSIONING) IMPACTS

8.6.4.1. Potential impacts from construction of the Proposed Development are:

- Direct Seabed disturbance/temporary loss;
- Temporary increase in SSC;
- Deposition of sediment (smothering); and
- Impacts from the resuspension of contaminated sediment.

Direct Seabed Disturbance/Temporary Loss

8.6.4.2. Habitats within the Marine Cable Corridor are likely to be affected by direct disturbance and/or be subject to temporary loss. A number of activities, including route preparation (PLGR, boulder removal, sandwave clearance), or cable burial (plough, jet trenching, or mechanical trenching), could have impacts at various locations along the route.

8.6.4.3. Due to the use of HDD methods under the intertidal and nearshore subtidal areas out to the vicinity of the HDD exit/entry point (located approx. 1-1.5 km from Eastney beach), no direct seabed disturbance impacts are predicted on intertidal and nearshore features. No impacts are predicted on the marine environment as a result of the HDD operations under Langstone Harbour.

8.6.4.4. The HDD activities will be located between KP 1.0 and KP 1.6. Activities at the HDD entry/exit location will consist of a range of disturbance events with a combined footprint of *c*.0.00092 km^2. The potential additional disturbance from up a jack up barge and up to four trestles is considered to be smaller than the combined disturbance caused by HDD pit excavation, temporary cable protection at the HDD location, and the disturbance potentially caused by pre-lay grapnel run or boulder clearance that will have already occurred. As such, impacts from jack up placement and installation of trestles are considered to be of such small spatial extent and have been adequately assessed through assessment of all other activities.

8.6.4.5. The maximum footprint of impact is 3.6 km^2, which has the potential to impact any of the habitats identified within the corridor as the final route within the Marine Cable Corridor will be confirmed during final route design[3]. The duration of activities in any one location will be short, although due to the sequential nature of the work, disturbance events will re-occur during each stage of installation.

8.6.4.6. Some direct disturbance from anchor spreads has the potential to extend outside the Marine Cable Corridor, however the extent of any such impact will be small and highly localised and will only represent a fraction of the total area identified as potentially affected by anchors. It is therefore considered that disturbance from anchor spreads is already included in the impact assessment through use of the worst-case scenario approach.

8.6.4.7. The worst-case impacts considered at a habitat level are set out below. These worst-case impacts are based upon the distribution of seabed preparation and cable installation activities predicted to occur within the Marine Cable Corridor as set out in Chapter 3 (Description of the Proposed Development) and Appendix 3.2 (Marine Worst-Case Design Parameters).

[3] The sum of impact areas from each habitat assessed may exceed 3.6 km^2 due to the worst-case assessment approach and overlap in techniques between habitats. Regardless, it should be noted that total seabed disturbance will not exceed 3.6 km^2, and total disturbance per habitat area will not exceed that stated in this chapter.

Coarse Sediment Habitats (Incl. Circalittoral, Offshore and Mediomastus Fragilis, Lumbrineris Spp. and Venerid Bivalves in Circalittoral Coarse Sand or Gravel)

8.6.4.8. Coarse sediment habitats cover c. 48 km^2 of the Marine Cable Corridor. Species inhabiting these sediments include epifaunal and infaunal species, with the proportion of each varying depending on the degree of existing disturbance (e.g. from fishing activity). Based upon the design and worst-case assessment, a maximum of 3.6 km^2 has the potential to be disturbed through dredging of sand waves, boulder clearance and cable burial (see Appendix 3.2 (Marine Worst-Case Design Parameters)), which represents 0.01% of the available area of these habitats within the eastern Channel, and 7.5% of the available habitat within the Marine Cable Corridor.

8.6.4.9. Cable installation and seabed preparation are likely to impact both epifaunal and infaunal species due to the depth to which these activities are likely to penetrate into the seabed. Individuals of the more robust species (e.g. thick-shelled bivalves, hermit crabs, gastropods, and calcareous shelled encrusting species) are likely to be relatively unaffected by the activities, however less robust species (e.g. more fragile bivalves and infaunal polychaetes) are likely to suffer mortality under the footprint of the activities.

8.6.4.10. Notwithstanding the above, recovery of the characterising species is likely to be rapid, due to the wide availability of similar habitat containing the same community as that affected. Species likely to suffer mortality are typically highly fecund, rapid colonisers with multiple cohorts per year and populations are likely to return to pre-affected levels within a very short timeframe following cessation of activities.

Infralittoral Mobile Clean Sand with Sparse Fauna

8.6.4.11. Infralittoral fine sands are only present close to the Landfall and cover an area of *c.* 0.52 km^2 within the Marine Cable Corridor. As such, this habitat will largely be avoided by installation activities other than the HDD entry/exit works, although some seabed preparation and cable installation may occur towards the edge of the habitat depending on final the HDD entry/exit location. Based upon the design envelope and worst-case assessment, a maximum of *c.*0.0009 km^2 has the potential to be disturbed, which represents 0.0001% of the available area of these habitats within the eastern Channel, and 0.17% of the available habitat within the Marine Cable Corridor.

8.6.4.12. Infralittoral fine sands, due to the nearshore location are relatively mobile, and the low biomass recorded in this area is typical of such environments. Species present are therefore typically highly fecund rapid colonisers with multiple cohorts produced per year.

8.6.4.13. Seabed preparation and HDD activities that may occur in this area (i.e. HDD pit excavation) may lead to physical damage or mortality of some individuals however, as species inhabiting this habitat are accustomed to regular disturbance through natural sediment movements, no changes to species distributions or abundances are predicted in the wider habitat due to the small area affected and rapid recolonisation that would occur from adjacent unaffected areas after removal of any temporary protection measures (Tillin, 2016a).

Infralittoral Mixed Sediments

8.6.4.14. Infralittoral mixed sediments are located relatively close to the Landfall (within about 10 km of the shore) and cover an area of 8.97 km^2 of the Marine Cable Corridor. The community present in this area has relatively high abundances and is dominated by molluscs with annelids, echinoderms and crustacea also present. Based upon the design envelope and worst-case assessment, a maximum of 1.28 km^2 has the potential to be disturbed through boulder clearance and cable burial activities (see Appendix 3.2 Marine Worst-Case Design Parameters), which represents 8.5% of the available area of these habitats within the eastern Channel, and 14.3% of the available habitat within the Marine Cable Corridor.

8.6.4.15. Both the epifaunal and the infaunal species present are likely to be sensitive to physical disturbance (Readman, 2016a). Soft bodied epifauna, such as ascidians, are likely to suffer high mortality, whist any soft bodied infauna which live within a few centimetres of the sediment surface could easily be damaged by a physical disturbance event (Readman, 2016a). More robust individuals such as some molluscs may suffer less damage than soft bodied species, and deeper burrowing species may also be more protected than their shallower counterparts.

8.6.4.16. However, considering the depth of penetration of seabed preparation and cable burial activities all species present, are likely to be affected, with evidence suggesting that there will be a general reduction in abundances within the habitat following disturbance events (Readman, 2016a).

8.6.4.17. Recovery of the characterising species, however, is likely to be rapid due to the wide availability of similar habitat containing the same community as that affected. Species likely to suffer mortality are typically highly fecund, rapid colonisers with multiple cohorts per year ((Readman, 2016a) and populations are likely to return to pre-affected levels within a very short timeframe following cessation of activities.

Ophiothrix fragilis and/or *Ophiocomina nigra* brittlestar beds on sublittoral mixed sediment

8.6.4.18. A small area (*c.*0.04 km^2) of this habitat was recorded during the baseline benthic survey located near to the EEZ, within an area of coarse sediments with numerous boulders. The survey data indicated that the mixed sediment community present here may be overlying bedrock or other stable substrate as an established epifaunal community was present. Based upon the design and worst-case assessment, a maximum of *c.*0.0176 km^2 has the potential to be disturbed through boulder clearance and cable burial activities (see Appendix 3.2 (Marine Worst-Case

Design Parameters), which represents 44% of the available habitat within the Marine Cable Corridor. This habitat is not represented within the EMODnet broad habitat mapping data, however, the base habitat (circalittoral mixed sediments, of which this is a sub-type) covers an area of *c*.295 km^2 within the eastern Channel, of which the area disturbed represents 0.006%.

8.6.4.19. A 'reefiness' assessment in line with Irving (2009) was undertaken on the habitat to determine whether the area could be classified as potential Annex I reef. The findings concluded that the area was of medium reefiness and therefore has the potential to be classified as Annex I reef although noting that it is not located within any designated or proposed SAC.

8.6.4.20. Seabed preparation and cable installation activities will lead to damage to the seabed and the sub-surface which is likely to remove both the infaunal and epifaunal communities that occur in this biotope. Additionally, penetrative activities such as the PLGR and the boulder clearance are likely to remove or displace the cobbles, pebbles, or small boulders that occur in this biotope leading to the loss or severe damage of the habitat (De-Bastos and Hill, 2016a) with recovery unlikely in the short to medium term.

Moderate Energy Circalittoral Rock

8.6.4.21. Moderate energy circalittoral rock habitat occurs in various locations along the Marine Cable Corridor in various forms, from exposed bedrock to boulders.

8.6.4.22. Areas of bedrock (*c*.0.31 km^2) were observed as rocky outcrops in areas of otherwise coarse sediments in approximately 20 m water depth.

8.6.4.23. These examples of moderate energy circalittoral rock were poorly colonised and heavily scoured from adjacent sediments. Based upon the design envelope and worst-case assessment, a maximum of *c*.0.117 km^2 has the potential to be disturbed through boulder clearance and cable burial activities (see Appendix 3.2 Marine Worst-Case Design Parameters), which represents 0.4% of the available area of these habitats within the eastern Channel, and 37.7% of the available habitat within the Marine Cable Corridor.

8.6.4.24. Boulders in various concentrations (as identified by geophysical survey and assessment) are present along the length of the Marine Cable Corridor, within both mixed and coarse sediment habitats. In all cases, none of the areas of boulders identified by the geophysical data modified the habitat characterisation from one of a sedimentary nature.

8.6.4.25. Areas of bedrock and boulder will be subject to physical disturbance through seabed preparation activities, including displacement of boulders by plough or boulder grab. It is likely that, as with the areas of bedrock, any boulders present are subject to high degree of scour and potential covering and uncovering by sediment. Species abundances in such areas are low and communities are not diverse, being characterised by either rapid colonisers or scour and abrasion resistant species.

8.6.4.26. Any species present will be adversely affected by seabed preparation activities, however recovery to pre-impacted state will be rapid due to the community acclimatisation to disturbance. As none of boulders identified by the geophysical data altered the habitats from their sedimentary nature, no impact is considered to arise from displacement of such boulders to other areas of the same habitat.

Assessment of Significance – Direct Seabed Disturbance

8.6.4.27. Overall, seabed preparation and cable installation activities will only affect a very small proportion of the available habitat in any one location. Disturbance events will be short term and localised, and although there is the potential for repeated disturbance due to the sequential nature of the activities, recovery of the communities present is considered to be rapid in the majority of cases.

8.6.4.28. Direct disturbance occurring outside the Marine Cable Corridor (i.e. anchor placement) will be highly limited in extent, and as the habitats found to either side of the Marine Cable Corridor are comparable to those within, it is considered that the assessments presented above include provision for this impact.

8.6.4.29. Where disturbance is likely to lead to long term loss of a habitat, (e.g. where sensitive epifaunal communities are present and/or loss of suitable substrate is likely) the areas affected within the total available habitat within the Marine Cable Corridor, or wider region, are small in extent and will not lead to the complete loss of the habitats within either the local or regional setting, or affect the wider function of the remaining habitat.

8.6.4.30. Therefore, based upon the small areas affected, general high recovery and lack of impact to the wider community function it is considered that the effect of direct disturbance is **not significant** on any of the benthic habitats present.

Temporary increase in SSC

8.6.4.31. The following assessment of the worst case for increased SSC has been extracted from Chapter 6 (Physical Processes).

- Nearshore (KP1 – KP21):
  - Worst-case activities which will lead to increased SSC in the nearshore area are considered to be; excavation at the HDD pits, and cable installation (due to the potential for the liberation and dispersal of fines identified between KP 5 and 15, and in other isolated locations).
  - The finest sediments will potentially be transported up to 6 – 10 km in the nearshore area, however it is highly likely that SSCs at these distances will be low (<5 mg/l) and therefore not discernible above natural variation, which ranges from approximately <5 to 75 mg/l in coastal areas, with annual averages of between 5 – 15 mg/l observed within surface waters.

  - It is predicted that peak SSCs of up to 200 mg/l may be observed locally (i.e. within 2 km of the cable trench or HDD pit) and these concentrations could potentially persist for several hours following completion of construction activities. Sediment plumes are also likely to be transported up to 5 km away from the trench / pit at which point concentrations of 5 – 10 mg/l are predicted; SSC is expected to return to background levels within a few days following completion of these activities.

- Offshore (beyond KP 21):
  - The worst-case is dredge disposal of up to approx. 1.7 million m^3 (as modelled).
  - Peak SSC of 1000 mg/l within 1 km from the release point but coarser sediment expected to deposit quickly (almost immediately) with significant reduction of SSC within hours of disposal at each location.
  - Beyond 1 km from release, the passive plume is likely to generate SSC in the region of approximately 20 mg/l, transported in the direction of the prevailing flow out to a worst case distance of up to 25 km. SSC is predicted to reduce to back within background levels (<1 – 6 mg/l) within the timeframe of a few days following completion of these activities.

8.6.4.32. The worst-case impacts resulting from temporary SCC are considered at a habitat level below. These worst-case scenarios are based upon the location of the habitat relative to the works, and the predicted level of SSC as defined above.

Intertidal Habitats

8.6.4.33. Intertidal habitats recorded within the Marine Cable Corridor consist of a shingle sediment upper shore with a lower shore consisting of a sandy sediment veneer over bedrock. A limited area of rocky shore habitat was found to be present towards the mouth of Langstone Harbour. Coastal vegetated shingle was recorded on the top of the shore, above the strandline. Due to its terrestrial nature, this habitat is not considered to be impacted by the marine elements of the proposed development and is therefore not assessed further.

8.6.4.34. The sedimentary intertidal habitats present (shingle and mobile sandy shores) are highly mobile and impoverished habitats which are typified by high sediment mobility. As such, the increases in SSC that may potentially arise are considered to have no effect on the habitats or any inhabiting fauna that will be highly tolerant to such environmental pressures.

8.6.4.35. Rocky shore environments consisted of bedrock and boulders interspersed with coarse sediments. Habitats present included; *Porphyra purpurea* and *Enteromorpha* spp. on sand-scoured mid or lower eulittoral rock (A1.452; LR.FLR.Eph.EntPor), *Fucus spiralis* on sheltered variable salinity upper eulittoral rock (A1.322; LR.LLR.FVS.FspiVS), and *Laminaria saccharina* with foliose red seaweeds and ascidians on sheltered tide-swept infralittoral rock (A3.224; IR.MIR.KT.LsacT).

8.6.4.36. The majority of species present in these rocky habitats are relatively resilient to short term increases in SSC, existing as they do in a highly mobile environment which sees large changes in SSC naturally. Some increases in scour and reduction in photosynthesis may occur, but any such effects will be short term and will not affect the majority of species present or alter the habitat classification (Perry and d'Avack, 2015; Tillin and Budd, 2016; and Tillin, 2016b). Species present in the areas most affected (lower shore) are also rapid colonisers and any minor losses in abundance or reduction in growth will be quickly recovered following completion of activities.

Coarse Sediment Habitats (Incl. Circalittoral, Offshore and *Mediomastus fragilis*, *Lumbrineris Spp*. and Venerid Bivalves in Circalittoral Coarse Sand or Gravel)

8.6.4.37. Coarse sediment habitats are present within the Marine Cable Corridor from KP19 out to the EEZ, and extend for considerable distance to both the east and west (EMODnet, 2016)

8.6.4.38. The central Channel experiences significant sediment transport under normal environmental conditions and as such the species present within these habitats will be tolerant of increases in suspended sediments, although some energetic cost may arise during such events (e.g. additional cleaning requirements).

Infralittoral Mobile Clean Sand with Sparse Fauna

8.6.4.39. Infralittoral mobile clean sand with sparse fauna is present within the very nearshore area, both within the Marine Cable Corridor and outwith it. This area is likely to experience a level of increased SSC although it is not anticipated to be elevated considerably above background, and any short term peaks in SSC from nearby activities are considered likely to return to background levels quickly, especially considering the high energy environment present in this area.

8.6.4.40. The species present within this habitat are not considered overly sensitive to increases in SSC, and any short term increases in SSC will not adversely affect food resource or increase energetic costs for activities such as feeding.

Infralittoral Mixed Sediments and *Ophiothrix fragilis* and/or *Ophiocomina nigra* Brittlestar Beds on Sublittoral Mixed Sediment

8.6.4.41. Sublittoral mixed sediment habitats are present in various locations along and adjacent to the Marine Cable Corridor.

8.6.4.42. Infralittoral mixed sediment habitats may potentially be affected by considerable increases above background SSC in the short term. However, the duration of such increases is likely to be short with background levels re-established quickly (i.e. hours - days following the completion of activities).

8.6.4.43. An increase in suspended sediment is likely to have an adverse effect on the suspension feeding community (e.g. hydroids) as it may interfere with feeding activity, resulting in reduced growth and potentially abundances in periods of extended increase in SSC (Jackson and Hiscock 2008). Infaunal and deposit feeding species are likely to more resistant to such elevated SSCs, although some increases in the energetic costs of feeding are likely.

8.6.4.44. Based upon the predictions of SSC arising from the proposed deposition activities, any adverse effects are likely to be very transient (days). Recovery will be immediate or will occur over the very short term for any reductions in abundance due to the continuation of available substrate and abundance of similar habitat in the surrounding area with populations of affected species.

Moderate Energy Circalittoral Rock

8.6.4.45. A number of patches of moderate energy circalittoral rock exist within the wider area of coarse sediments present within and adjacent to the Marine Cable Corridor and as such may be exposed to elevated SSC.

8.6.4.46. As this biotope occurs within areas of sediment, it is likely to experience a high degree of scour as was evidenced by the benthic survey data. As such, this habitat can be expected to be frequently exposed to chronic or intermittent episodes of high-levels of suspended solids as local sediments are re-mobilised and transported.

8.6.4.47. As the habitat present is naturally highly scoured and exposed to high levels of suspended sediments, the levels of SSC predicted to arise due to seabed preparation, installation activities and the proposed deposition of dredge material will not lead to any change in the function of the habitat due to its natural state as a highly scoured habitat.

Habitats of Conservation importance (located outwith the Marine Cable Corridor)

8.6.4.48. It is recognised that a number of protected habitats and species do exist in proximity to the Marine Cable Corridor (Table 8.3, Table 8.4) which could be impacted by increases in SSC. Of these habitats, a number are already present within the Marine Cable Corridor and as such are considered to be suitably assessed above. The assessment of additional protected habitats not present within the Marine Cable Corridor (Table 8.7) is presented below. This assessment includes WFD high sensitivity habitats identified in Section 8.5.

Table 8.7 - Additional Protected Marine Habitats Located in the Vicinity of the Proposed Development

Location	Habitat Present
Estuarine/Coastal Feature	Coastal lagoons (and associated lagoon species) Shingle spits Submerged or partially submerged sea caves Saltmarsh (and associated species) Estuarine rocky habitats
Littoral habitats	Mudflats and sandflats (not submerged at low tide), including invertebrate assemblages Littoral Seagrass beds
Sublittoral habitats	Maerl beds Seagrass beds Chalk reef Moderate energy infralittoral rock Low energy infralittoral rock High energy circalittoral rock Fragile sponge and anthozoan communities on subtidal rocky habitats Subtidal mud Sheltered muddy gravels Sea pens and burrowing megafauna Peacock's tail seaweed Peat and clay exposures Subtidal Kelp Beds Stalked jellyfish (*Calvadosia campanulate and Haliclystus Sp.*) Subtidal blue mussel beds

Estuarine/Coastal Features

8.6.4.49. Due to their separation from the open marine environment, coastal lagoons (and any associated species) are deemed to have no connectivity to any increases in SSC caused by the Proposed Development. As such, no negligible impacts are predicted on these features.

8.6.4.50. Shingle spits are a physical feature, and as no deposition of sediments or change in physical habitat type are likely at the distance from the proposed development, no impact is predicted on this feature.

8.6.4.51. The nearest submerged or partially submerged sea caves are located c.10 km from the development. At this distance SSC arising from the Proposed Development is predicted be <5 mg/l. This is well within the natural background SSC variation experienced by these features and will not lead to any effects on the species present.

8.6.4.52. Saltmarsh habitats are present within Langstone harbour, the mouth of which is c.1 km from the Marine Cable Corridor.

8.6.4.53. The mouth of Langstone harbour (the closest Estuary feature) is approximately 1 km from the proposed HDD entry/exit pits (at their closest possible location), and the closest areas of saltmarsh habitat is located a further kilometre from the entrance.

8.6.4.54. SSC variability within the harbour is high, owing to its tidal nature and frequent exposure to storm induced fluctuations (New Forest District Council, 2017). Suspended sediments within Langstone harbour have been measured at 200 mg/l, while measured SSC in nearby harbours have been recorded up to 100 mg/l (Portsmouth) (Humby and Dunn, 1975 – cited in New Forest District Council, 2017).

8.6.4.55. Saltmarsh plants are tolerant of a degree of increased SSC, and the resulting turbidity. Turbidity reduces the light attenuation through water, however the plants photosynthesise at low tide and are unlikely to be completely covered at high tides, so that the turbidity of the water is probably not of great importance. Any species covered by high tide, that experience reduced photosynthesis, will be able to compensate when exposed to air and low tides (Tyler-Walters, 2004). Therefore, slight increases in SSC as predicted to arise from the Proposed Development, which are likely to be well within natural background levels already experienced, are considered unlikely to affect the growth or distribution of saltmarsh habitats (or any associated fauna) within the nearby estuaries.

8.6.4.56. The closest estuarine rocky habitats are c.7 km from the Proposed Development. At this distance, habitats are likely to experience <5 mg/l of increases in SSC as a result of the Proposed Development. Estuarine rocky habitats already exist in an area of high SSC, and such a negligible increase resulting from the Proposed Development will have no impact on this already highly tolerant feature.

Littoral Habitats

8.6.4.57. Mudflats and sandflats not covered by seawater at low tide, are present throughout the Solent, as well as being found in close proximity to the Proposed Development (i.e. within 2 km). Mudflat and sandflat habitats are however not considered overly sensitive to increases in SSC, and any invertebrate assemblages present will also be tolerant due their location within an already heavily sediment affected area. Therefore, considering the discrete events predicted will be similar to natural variation, and the prediction that baseline environmental conditions will re-establish in the short term (hours - days), no significant changes to the mudflat and sandflat habitats or associated communities are predicted.

8.6.4.58. Littoral seagrass beds are present in various locations within the Solent, with the closest examples within Langstone Harbour approximately 1 km from the Proposed Development at its closest possible location (other examples are >5 km distant and considered not sensitive to the received levels at this distance).

8.6.4.59. SSC variability within the harbour is high (see paragraph 8.6.3.53). Seagrass beds, although not tolerant to very high or long term increases in SSC (due to a reduction in photosynthesis and reduced oxygen levels), are considered to potentially be tolerant to such short term isolated events as would be experienced as a result of the Proposed Development (D'Avack, *et al.,* 2019a). Seagrass beds are also located over a kilometre from the mouth of the harbour and as such are unlikely to be affected by high levels of SSC with received levels likely well within normal background levels, and lower than peak levels experienced in this environment. Littoral beds are also able to photosynthesise during periods of exposure. No changes to littoral seagrass bed function or distribution are therefore considered likely to arise as a result of the Proposed Development.

Sublittoral Habitats

8.6.4.60. Maerl beds are located *c.*10 km from the Proposed Development at their closest location. At this distance, increases in SSC from the Proposed Development are likely to be <5 mg/l. Although sensitive to reductions in light attenuation due to increased SSC, the negligible levels predicted to arise at this distance from the Proposed Development, and the short term transient nature of the impact, will not result in any effects on the function, health or distribution of the mearl beds.

8.6.4.61. Subtidal seagrass beds, although not tolerant to very high or long term increases in SSC (due to a reduction in photosynthesis and reduced oxygen levels), are considered to potentially be tolerant to such short term isolated events as would be experienced as a result of the Proposed Development (D'Avack, *et al.,* 2019b). Seagrass beds are also located over a kilometre from the mouth of the harbour and as such are unlikely to be affected by high levels of SSC with received levels likely well within normal background levels, and lower than peak levels experienced in this environment. No changes to seagrass bed function or distribution are therefore considered likely to arise as a result of the Proposed Development.

8.6.4.62. Subtidal chalk reef in the south-east of England is described as a formation of vertical cliffs or platforms which are easily eroded by extreme water temperatures, high levels of turbidity, siltation and scouring (Chapman, 2008). Increased turbidity caused by higher SSCs can inhibit light penetration whilst potentially increasing organic particles/food supply and simultaneously reducing feeding efficiency (Tillin, 2016c, Tillin and Hill, 2016). Significantly higher levels of SSC could potentially block respiratory and feeding organs while increasing scouring and abrasion (Tillin, 2016c). Overall, an increase in SSC is likely to have an adverse effect on the suspension feeding community (e.g. hydroids) as it may interfere with feeding activity, resulting in reduced growth and potentially abundances in periods of extended increases in SSC (Jackson and Hiscock, 2008). Infaunal and deposit feeding species are likely more resistant to such elevated SSC, although some increases in the energetic costs of feeding are likely. While maximum SSC in the vicinity of the chalk reef habitat may reach up to 200 mg/l, the plume is anticipated to persist at this concentration for a matter of minutes to hours, before reducing over the following hours and days to levels within natural variation. Concentrations are therefore considered to be within those tolerated by the organisms inhabiting the reef and no long-term deterioration of the functioning of the habitats is expected.

8.6.4.63. Infralittoral rocky habitats (low and moderate energy) are found outwith 2 km of the Proposed Development. At this distance SSC will be relatively low and within the background concentrations found in the Solent. These habitats can be observed under several habitat categorisations which are, to varying extent, sheltered from wave action and tidal water-flow. This allows for siltier substratum which can support various kelp such as *Laminaria hyperborea* and *L. saccharina*. This also promotes communities of associated seaweeds which are relatively tolerant to the siltier conditions. Increases in SSC can cause a reduction in light availability, which is likely to inhibit the photosynthetic ability of kelp species, however due to the distance from the Marine Cable Corridor increases in SSC are only likely to be low and of short duration (hours), before returning back to regular background levels. Therefore, it is considered that there will be no observable effects on these habitats.

8.6.4.64. High energy circalittoral rock exhibits a variety of habitat types, depending on the specific environmental factors, particularly the energy regime. Characterising species include scour tolerant faunal and algal crusts, as well as a range of filter feeding species including; cnidarians (e.g. *Alcyonium* spp, cup corals), sponges, hydroids, ascidians, bryozoans, anemones, and mussels (*Mytilus edulis*) (Stamp, 2016; Stamp & Tyler-Walters, 2016; Tyler-Walters, 2016a).

8.6.4.65. Although most characterising species of high energy circalittoral rock habitats are not deemed to be sensitive to increases in SSC, Temporary increases in SSC could potentially affect feeding apparatus of suspension feeders causing a slight reduction in growth and consequently biomass (Readman, 2016b). There may also be a slight increase in energy expended to clean the clogged apparatus, although increases in mortality are unlikely (Readman, 2018). With increased SSC, there is likely to be some increased scouring and abrasion which with particularly high SSC has the potential to be damaging in the high tidal streams present (Readman, 2016c; Readman, 2016d). High energy circalittoral rock is found in numerous locations, including Utopia MCZ (1.3 km distant), Selsey Bill and Hounds MCZ (4 km distant), and Offshore Brighton MCZ (8.4 km distant). At its closest distance, this habitat may receive increases in SSC of up to 200 mg/l. Such increases will however be of short duration (hours) and as this habitat's associated characterising species display little sensitivity to this effect, no significant changes in the species abundances or their distribution is expected even at the highest levels of SSC which could potentially be received.

8.6.4.66. Fragile sponge and anthozoan communities on subtidal rocky habitats are present within 2 km of the Proposed Development. Increases in SSC could potentially affect feeding apparatus of suspension feeders present in this habitat causing a slight reduction in growth and consequently biomass. There may also be a slight increase in energy expended to clean the clogged apparatus, however this is unlikely to result in increased mortality. With increased SSC, there is likely to be some increased scouring and abrasion. This can be potentially damaging if high tidal streams are present. Any increases in SSC will however be of short duration (hours) and although some limited increases in scour could occur if the feature was located in areas of high tidal streams, it is not expected that this will lead to any significant change in the habitat due to short duration of the effect and lack of sensitivity of the main characterising species. In addition, the wider area has an abundance of sediment habitats and as such the communities present are expected to be tolerant or adapted to a degree of scour. Therefore, no significant changes in this feature are predicted.

8.6.4.67. Subtidal muds are present within 5 km of the proposed development. The infaunal species which characterise this biotope are unlikely to be significantly affected by increased levels of SSC due to the fine silts and muds that accumulate in low energy habitats such as these. There is also likely to be an inherent level of adaptation to this pressure due to re-suspension of these fine sediments (Tyler-Walters, 2016b). Burrowing megafauna are not expected to be impacted by this pressure due to predominantly existing within their burrows (Tillin and Tyler-Walters, 2016a). Significant increases in turbidity as a result of organic particles will increase the availability of food, however, should the suspended particles be non-organic material, this has the potential to increase associated energetic costs with feeding and cleaning whilst inhibiting growth rates and reproductive success. Lethal effects are considered very unlikely (Tillin and Tyler-Walters, 2016a). Subtidal muds could potentially receive increases in SSC, however these are likely to be within the natural background levels already experienced. The potential impact is expected to be short in duration (hours) and it is unlikely to cause any noticeable negative impacts and the characterising species of these habitats are well adapted to residing within environments with varied turbidity. Consequently, no significant effects on the species present within, or the distribution of, subtidal muds are considered likely to arise as a result of the Proposed Development.

8.6.4.68. As sheltered muddy gravels are dominated by suspension feeders there is the potential for increases in SSC to influence the energy expenditure for feeding and/or cleaning feeding apparatus which may cause sub-lethal effects (Perry, 2016). However, the fine sediments that exist naturally in this environment ensure that any species present are already naturally tolerant to a reasonable degree of SSC. Examples of this habitat are over 5 km from the Proposed Development and as such increases in SSC will be low (<5 mg/l). At this magnitude of impact, and the fact that this increase will be short in duration (hours), no significant effects on species present are likely as the received level of SSC is well within background.

8.6.4.69. Sea pens and burrowing megafauna are typically found in sheltered areas composed of fine sediments which are regularly subjected to high levels of SSC. Burrowing fauna are not considered sensitive to SSC, and sea pens are known to demonstrate self-cleaning capabilities through grasping and physical removal of the particles, and through production of excess mucus (Hoare & Wilson, 1977; Hiscock, 1983; Hill & Tyler-Walters, 2018). Communities of sea pens and burrowing megafauna have been recorded at sites within *c.*4 km of the Marine Cable Corridor. At this distance, it is expected to experience increased levels of SSC of c. 5 – 10 mg/l over a short duration (hours). Given the short duration, low levels of increased SSC predicted, and relatively tolerant species present, no significant effects are predicted on this habitat.

8.6.4.70. Peacock's tail seaweed (*Padina pavonica*) is often found in the infralittoral zone and often in close proximity to clay, sand and silts. As such, it is regularly exposed to high water movements and increased SSC. As with other species of algae, increases in SSC will decrease the light penetration and promote scouring. However, as *P. pavonica* is a calcified alga, it has high resistance to scour. Records of *P. pavonica* are present in sites within c.4 km of the Marine Cable Corridor, and as such may be subject to increases in SSC of *c.*5 – 10 mg / l. This increase in SSC is expected to be short in duration (hours) and is within natural background variation. Given the short duration, low levels of SSC predicted, and relative tolerance of the species, no detrimental effects are predicted on the abundance or distribution of this species.

8.6.4.71. Peat and Clay Exposures can be found in exposed to extremely sheltered shores paired with moderate to strong tidal streams (Maddock, 2011). Consequently, this habitat is expected to endure a degree of sediment mobility, and as a result, increased scour. Therefore, associated species will be tolerant to a degree of increased SSC variations, however instances of particularly high SSC may limit macroalgal cover of this habitat and where filter feeding species are present, there may be some reduction in feeding efficiency from increases in SSC but in general this will not lead to increases in mortality. This feature is recorded 4 km from the Marine Cable Corridor, therefore SSC of *c.* 5 – 10 mg/l may occur. However, such increase will be short in duration (hours) before dissipating. As the potential increase in SSC is low, and of a short duration, with species not considered overly sensitive to this effect, no significant changes to species abundances or distribution of this feature are predicted.

8.6.4.72. Subtidal Kelp Beds are present within 3 km of the Marine Cable Corridor. Although increased SSC can reduce light attenuation and therefore limit photosynthesis, received levels at this distance are likely to be low and of short duration, returning to background within hours. Kelp species (adult or gametophyte) are unlikely to be negatively affected by such short duration and limited increases in SSC and no changes to the habitat are predicted.

8.6.4.73. Stalked jellyfish (*Calvadosia campanulate* and *Haliclystus* sp.) can be found fixed on macroalage and seagrass habitats in mid intertidal and shallow sublittoral zones. Stalked jellyfish are recorded as present beyond 5 km from the Proposed Development and as such will receive very little in the way of increased SSC (<5 mg/l) which will dissipate rapidly. There is no evidence of negative effects from increased SSC on stalked jellyfish, however it is recognised that increasing SSC may adversely affect abundances of suitable substratum, which can include seagrass or subtidal macrophyte species (Tyler-Walters & Heard, 2017). No significant effects on seagrass or macrophyte species are predicted at these levels of increased SSC, and as such there are no predicted effects on the distribution or abundance of stalked jellyfish as a result of the Proposed Development.

8.6.4.74. Blue mussel beds are located *c*.20 km from the Proposed Development at their closest location. The modelling of the disposal of dredge material (see Chapter 6, (Physical Processes)) indicates that there will be no connectivity with this feature as the distance to the Marine Cable Corridor in an easterly direction (the main direction of current is east/west) is significantly greater than the 25 km over which increases in SSC are predicted to occur. Other cable installation techniques are only predicted to give rise to increases in SSC over a maximum of 10 km. As such, no effects on blue mussel beds are predicted from the Proposed Development.

Assessment of Significance – Temporary increases in SSC

8.6.4.75. Potential increases in SSC could occur as a result of seabed preparation and cable installation activities. Any increases in SSC are likely to be back within comparable background concentrations within hours to days (depending on distance to receiving habitat).

8.6.4.76. Overall, the habitats present within and adjacent to the Marine Cable Corridor have limited sensitivity to such short duration increases in SSC and impacts are likely to be restricted to increased energetic costs and any loss of abundance is likely to be in line with natural scour processes. No significant effects to the functioning of any of the habitats affected are predicted, and as such the effect of temporary increases in SSC is deemed to be **not significant**.

Deposition of Sediment (Smothering)

8.6.4.77. The worst case for deposition of sediment is considered to arise from deposition of dredged material. Based on the predominant sediment types present, it is predicted that the most significant deposits of material will remain within, or in close proximity to Marine Cable Corridor (with any deposits outwith this area considered to be negligible and transient).

8.6.4.78. It is considered that levels of deposition from dredge disposal activities will be local to the point of release (i.e. within 1000 m) and could be relatively high (between 10 and 1500 mm) depending upon location, dredged material composition, and dredger hopper size.

8.6.4.79. Deposition from other seabed preparation and installation activities is not predicted to be significant, with any coarse material settling rapidly (i.e. within several hundred metres of the cable trench). Finer sediment will be dispersed across a greater spatial extent, transiently depositing throughout the tidal cycle. However, due to the low volumes of sediment likely to be liberated into the water column and significant dispersion of fine sediment, it is considered that deposition will be negligible with sediments quickly resuspended and redistributed under the forcing of tidal flows.

8.6.4.80. The habitats in close proximity to the Marine Cable Corridor are consistent with those contained and assessed within the Marine Cable Corridor. As significant deposits will only be present in close proximity to the work, no significant effects from sediment deposition are deemed to be possible on any other receptor. Therefore, only habitats present within, and immediately adjacent to the Marine Cable Corridor are assessed below for this impact.

8.6.4.81. The worst-case impacts resulting from deposition of sediment are considered at a habitat level below.

Coarse Sediment Habitats (Incl. Circalittoral, Offshore and *Mediomastus fragilis*, *Lumbrineris Spp*. and Venerid Bivalves in Circalittoral Coarse Sand Or Gravel)

8.6.4.82. Coarse sediment habitats are present along the Marine Cable Corridor from approximately KP 19 out to the EEZ Boundary Line.

8.6.4.83. The depths of deposition received within the Marine Cable Corridor may be considerable, however the extent over which these levels will present is small as the coarse material will generally fall out rapidly without dispersing great distances.

8.6.4.84. Species present within these coarse sediment habitats are tolerant to increases in sedimentation and smothering, with individuals able to escape smothering events particularly where sediment types are consistent. Research indicates that the bivalves could migrate between 200 and 500 mm in sand, whilst any small sessile species attached to the sand or gravels would likely suffer mortality under such levels (Tillin, 2016d).

8.6.4.85. Although it is considered that the majority of deposited sediment will exceed survivable depths by species inhabiting this habitat, the extent of the area affected is very small (limited to the area in close proximity of the disposal location), and recovery is predicted to be high. Due to the general high mobility of sediments in this area, sessile fauna present in this habitat are fast-growing early colonisers which able to establish themselves in short periods of stability during summer months, and considering the abundance of surrounding habitat, recruitment back to the affected area should occur rapidly (Holme and Wilson, 1985). The infaunal biomass of this habitat predominantly consists of molluscs, and the abundance of comparable habitat will ensure that recruitment into the affected area occurs quickly, with recovery back to a pre-impacted state occurring in a very short time frame.

Infralittoral Mixed Sediments

8.6.4.86. Infralittoral mixed sediments occur along the Marine Cable Corridor between *c*.KP1 and KP19. Due to the greater proportion of fine sediments in this area and smaller volume of dredging required (i.e. the HDD exit pits) the predicted depths of sediment deposition are likely to be relatively low.

8.6.4.87. Infaunal species affected by low levels of deposition are unlikely to be affected as burrowing habits will allow escape back to their preferred location within the sediment. The epifaunal community present is however likely to suffer some mortality, especially of sessile organisms, although recovery from adjacent communities is likely to occur in the short term through recruitment events as the composition of sediment will be consistent with the wider area.

Infralittoral Mobile Clean Sand with Sparse Fauna

8.6.4.88. Infralittoral mobile clean sand with sparse fauna is present within the very near shore and only a small extent of this area may be affected by material from the marine HDD exit/entry pits.

8.6.4.89. Infralittoral fine sands are however relatively mobile due to their inshore location, and the low biomass recorded in this area is typical of such environments. Species present are typically highly fecund rapid colonisers with multiple cohorts produced per year.

8.6.4.90. Activities in this area which lead to a degree of smothering may lead to mortality of some individuals. However, as species inhabiting this habitat are accustomed to regular disturbance and sediment movement, most are highly mobile and are likely able to reposition to a more favourable depth. As such, no significant changes to species distributions or abundances are predicted in the wider habitat due to the small area affected, ease of repositioning of most species, and rapid recolonisation of any adversely affected species that would occur from adjacent unaffected areas (Tillin, 2016a).

Moderate Energy Circalittoral Rock

8.6.4.91. A number of patches of moderate energy circalittoral rock exist within the area of coarse sediments of the Marine Cable Corridor and as such may be exposed to sediment deposition from dredged material.

8.6.4.92. As this biotope occurs within areas of sediment, it is likely to experience a high degree of scour and periodic covering and uncovering by sediments. This was evidenced by the benthic survey data and geophysical data that indicate a shallow veneer of sediment present above a hard substratum. As such, this habitat can be expected to be exposed to intermittent episodes of smothering as local sediments are re-mobilised and transported.

8.6.4.93. Sessile epifaunal species present are likely to be lost during any episode of smothering, however this represents the natural state of this habitat, and it can be expected that on uncovering through natural processes similar fauna will settle due to their ubiquitous nature in the wider area.

Ophiothrix fragilis and/or *Ophiocomina nigra* Brittlestar Beds on Sublittoral Mixed Sediment

8.6.4.94. In the event that disposal of dredged material occurs within this habitat, it can be concluded that any habitat within the disposal footprint would be lost with recovery unlikely.

8.6.4.95. Deposition from other seabed preparation and installation activities is not predicted to be significant, with any coarse material settling rapidly (i.e. within several hundred metres of the cable trench).

8.6.4.96. Although the predicted level of sedimentation is unlikely to affect the underlying reef structure, there may be a loss of abundances in the areas of sedimentation depending on received levels due to a lack of resilience to increased sedimentation of brittlestar species (De-Bastos and Hill, 2016a).

8.6.4.97. The impacts will however be transient in nature, and as the surrounding habitat will be unaffected, recovery is expected following cessation of activities.

Assessment of Significance - Deposition of Sediment (Smothering)

8.6.4.98. The extent of habitat affected by the deposition of dredged sediment are likely to be very small and will be constrained to within, or in close proximity to the Marine Cable Corridor. Some loss of abundance may result within these areas on sensitive habitats, however due to the wide availability of existing habitats and communities adjacent to the affected areas, recruitment and recovery to pre-impacted levels are expected in the short term. Therefore, the effects of smothering resulting from deposited sediment are considered to be **not significant** for all habitats except *Ophiothrix fragilis* and/or *Ophiocomina nigra* Brittlestar Beds on Sublittoral Mixed Sediment.

8.6.4.99. Due to the very small area of *Ophiothrix fragilis* and/or *Ophiocomina nigra* Brittlestar Beds on Sublittoral Mixed Sediment habitat within the Marine Cable Corridor, and the high likelihood of the loss of any habitat where deposition occurs, it is concluded the effect of deposition from disposal of dredged material on *Ophiothrix fragilis* and/or *Ophiocomina nigra* Brittlestar Beds on Sublittoral Mixed Sediment would be **significant**. Effects of sediment deposition from other cable installation activities on this habitat are considered to be transient in nature with recovery highly likely, and as such **not significant.**

Impacts from the Resuspension of Contaminated Sediments

8.6.4.100. Results from the subtidal contaminated sediment survey (Chapter 7 (Marine Water and Sediment Quality)), indicate that the sediments within the Marine Cable Corridor do not contain significantly elevated levels of contaminants with no records of any contaminant exceeding Cefas Action Level 2. In addition, for all contaminants other than Arsenic, no exceedance of Action Level 1 was seen. Arsenic did exceed Action Level 1 at two locations (although only at one of these was it above the OSPAR Background Assessment Concentration) however these appear isolated areas and with no indication of a pattern or common source.

8.6.4.101. Evidence from the nearby IFA2 interconnector and Rampion OWF projects also suggests that the wider area is not heavily contaminated despite the long history of port, heavy shipping, and military activity in the area.

Assessment of Significance - Impacts from the Resuspension of Contaminated Sediments

8.6.4.102. The lack of contamination in the nearshore sediments within the Marine Cable Corridor indicates that there is a very low risk of sediment borne contaminants being re-released into the water column. As such, it is considered that effects from this impact will be **not significant**.

8.6.5. OPERATION IMPACTS (INCLUDING REPAIR AND MAINTENANCE)

8.6.5.1. Potential operational impacts of the Proposed Development on receptors are:

- Disturbance due to O&M activity;
- Habitat loss; and
- Heat emissions.

Seabed Disturbance

8.6.5.2. The Proposed Development has been designed so that regular maintenance of the Marine Cables is not required during its operational lifetime. Should maintenance or repair works be required, it is anticipated that the relevant section of the Marine Cable will be recovered using methods like those employed during installation/construction stage. As such, the activities described above in relation to cable installation are relevant for the operational repair and maintenance of the Proposed Development although works would be of shorter duration and smaller in extent.

Assessment of Significance – Seabed Disturbance

8.6.5.3. No specific locations for repair activities are possible to define at this time. However, as any such repair work will be infrequent (predicted every 10-12 years) and will only affect a very small and localised area, considering the assessment of direct disturbance during construction, and based upon the high recovery potential of the majority of the habitats within the Marine Cable Corridor, it is predicted that effects arising through disturbance due to O&M would be **not significant.**

Habitat Loss

8.6.5.4. Chapter 3 (Description of the Proposed Development) identifies indicative locations where it may not be possible to bury the Marine Cables and thus where non-burial protection will be required (Figure 3.5 of the ES Volume 2 (document reference 6.2.3.5) Sheets 1-4).

8.6.5.5. Habitats within the Marine Cable Corridor may be affected by habitat loss due to non-burial protection measures applied to the cable route (including at cable crossings and permanent HDD protection). Due to the use of HDD under the intertidal area, no habitat loss is predicted in the intertidal area.

8.6.5.6. The maximum footprint of impact is 0.7 km^2 and it has the potential to impact any of the habitats identified within the Marine Cable Corridor as the final route within the Marine Cable Corridor will be confirmed during final route design. This maximum footprint also allows a 10% rock placement non-burial contingency, in case further non-burial protection is required during maintenance/repair activities during operation.

8.6.5.7. It should be noted that the areas of non-burial protection will be within the areas previously disturbed, and as such the impacted areas should be viewed as being within the already disturbed habitat, and not in addition to. However, it is proposed that cable protection may be installed up to 15 years post construction, so it is expected that, depending on how long after the construction period, the disturbed habitat may have recovered.

8.6.5.8. The worst-case impacts resulting from deposition of habitat loss are considered at a habitat level below.

Coarse Sediment Habitats (Incl. Circalittoral, Offshore and *Mediomastus fragilis*, *Lumbrineris Spp*. and Venerid Bivalves in Circalittoral Coarse Sand or Gravel)

8.6.5.9. Coarse sediment habitats cover *c*.48 km^2 of the Marine Cable Corridor. Species inhabiting these sediments include epifaunal and infaunal species, with the proportion of each varying depending on the degree of existing disturbance (e.g. from fishing activity).

8.6.5.10. The greatest amount of coarse sediment habitat that could be lost due to non-burial protection is 0. 7 km^2. This accounts for 1.45% of the total area of coarse sediment habitat within the Marine Cable Corridor. This equates to 0.003% of available habitat within the eastern Channel.

Infralittoral Mobile Clean Sand with Sparse Fauna

8.6.5.11. Infralittoral fine sands are only present close to the Landfall and cover an area of *c*.0.52 km^2 within the Marine Cable Corridor. As such, this habitat will largely be avoided by installation activities other than the HDD entry/exit works.

8.6.5.12. The greatest amount of infralittoral mobile clean sand habitat that could be lost due to non-burial protection is 0.0009 km^2 (0.17% of the total within the Marine Cable Corridor). This equates to 0.0001% of available habitat within the eastern Channel.

Infralittoral Mixed Sediments

8.6.5.13. Infralittoral mixed sediments are located relatively close to shore (within about 10 km of the shore) and cover an area of 8.97 km^2 of the Marine Cable Corridor.

8.6.5.14. Based upon the extent of this habitat along the Marine Cable Corridor (*c*.18 km as measured down the centre line), and the width of potential cable protection, the greatest amount of infralittoral mixed sediment habitat that could be lost due to non-burial protection is 0.54 km^2 (6.0% of the total within the Marine Cable Corridor). This equates to 3.6% of available habitat within the eastern Channel.

Ophiothrix fragilis and/or *Ophiocomina nigra* Brittlestar Beds on Sublittoral Mixed Sediment

8.6.5.15. A small area (*c*.0.04 km^2) of this habitat was recorded during the baseline benthic survey located near to the EEZ.

8.6.5.16. The greatest amount of this habitat that could be lost due to non-burial protection is 0.066 km^2 (16.5% of the total habitat area within the Marine Cable Corridor). As previously noted, this habitat is not represented within the EMODnet broad habitat mapping data, however, the base habitat (circalittoral mixed sediments) of which this is a sub-type, covers an area of *c*.295 km^2 within the eastern Channel, of which the area disturbed represents 0.002%.

Moderate Energy Circalittoral Rock

8.6.5.17. A small area (*c*.0.31 km^2) of moderate energy circalittoral rock habitat (as exposed bedrock) occurs in patches along the Marine Cable Corridor.

8.6.5.18. The greatest amount of this habitat that could be lost due to non-burial protection is 0.0438 km^2 (14.1% of the total habitat area within the Marine Cable Corridor). This equates to 0.04% of available habitat within the eastern Channel.

Assessment of Significance - Habitat Loss

8.6.5.19. Overall, habitat loss due to non-burial cable protection measures will only affect a very small proportion of the available habitat in any one location.

8.6.5.20. Although the loss is considered long term, the areas affected within the total available habitat within the Marine Cable Corridor or wider region (eastern Channel) are small in extent and will not lead to the complete loss of the habitats within either the local or regional setting or affect the function of the remaining habitats.

8.6.5.21. Therefore, based upon the small areas affected and lack of impact to the wider community function it is considered that the effect of habitat loss is **not significant**.

Heat Emissions

8.6.5.22. Operation of the cables will result in heat being emitted and subsequent warming of the surrounding environment. Heat losses reduce the efficiency of the cable and as a result, the cables have been designed to minimise thermal loss. Heating effects will be localised to the proximity of the cable and quickly dissipate (Western HVDC Link, 2011; Nemo Link, 2013). Thermal emission and its effects will depend on the type of cables, transmission rate and the receiving environment (OSPAR, 2012).

8.6.5.23. Thermal resistance for the sediment surrounding a buried cable usually increases burial depth. A study undertaken to inform the Nemo Link Interconnector project (Nemo Link, 2013) calculated that localised temperature increases in the seabed above the bundled cables buried to a depth of 2.5 m would be 1.2°C at 30 cm depth above the cable (i.e. at a distance of 2.2 m directly above the cable, 30 cm below the seabed surface) and 0.7°C at 10 cm. A conservative calculation of temperature increases for bundled cables conducted for Viking Link Interconnector project (Brakelmann and Stammen, 2017; Viking Link, 2017) for the purpose of cable installation in German waters showed the potential for an increase of 2 °C at a sediment depth of 0.2 m above an operating cable as a worst-case scenario. In contrast, a study undertaken for NorthConnect project (2018) predicted that bundled cables buried at a depth of 0.5 m would result in a temperature rise of 1 °C above background levels at the seabed level directly above the cable, decreasing with distance.

8.6.5.24. These results are not directly comparable due to differences in baseline scenarios, particularly background temperature, however they demonstrate an association between burial depth and heat, and the dissipation effect of distance from the cable.

8.6.5.25. The target burial depth for the Proposed Development is 1.0 m and is therefore expected to be consistent with these predictions for the majority of the route. At a burial depth of 1.0 m, seabed surface temperature increases can be expected to remain between 0 °C and 2°C in most circumstances, with no discernible increase in water temperature anticipated.

8.6.5.26. Marine benthic fauna are considered sensitive to acute increases in temperature, and can tolerate an increase of 2°C, however increases of 5°C can have lethal effects, particularly in summer conditions (Tillin and Tyler-Walters, 2016b). Marine organisms are however capable of acclimating to long term, stable increased temperature (Menon, 1972), such as would be produced by a generating cable (Tillin, 2016a; Tillin 2016d; Tillin and Rayment, 2001; De-Bastos and Hill, 2016a), and already experience natural seasonal variations in temperature from *c.*5° to 8°C in winter to *c.*16° to 19°C in summer in the Eastern Channel (Frost, 2010).

8.6.5.27. Temperature increases have the potential to cause an initial disturbance to infaunal assemblages, however the impact will become less significant as individuals acclimate, and the presence of the cables is not considered likely to affect marine benthic organism abundances or distribution in the long term. Infaunal organisms may potentially be exposed to increases in temperatures, however epifaunal organisms are unlikely to be affected. It should be noted that the majority of organisms in sediment do not exceed a burrowing depth of 0.2 m, with 95 to 99% remaining in the top 5 cm (Kingston, 2001), and as such are unlikely to be affected by temperature changes nearer the cable.

8.6.5.28. Within the HDD, target burial depth beneath the seabed is 5 m. HDD methods resulting in cable burial to 5 m are likely to maintain a higher temperature locally, however the cable will be contained within a duct and when considering the distance to the surface sediments, it is considered that temperature increases are unlikely to be detectable at the surface.

Assessment of Significance – Heat Emissions

8.6.5.29. The anticipated emissions at a burial depth of 1.0 m are not expected to exceed the tolerances of benthic organisms and will be a chronic, stable increase to which organisms will be able to acclimatise. In addition, only habitats located directly above the operating cable will be affected, with similar habitats available in the vicinity and in the wider Channel.

8.6.5.30. Therefore, based upon the small extent of the area affected, lack of long-term impact or effect on functioning, and recovery expected in the short term as species acclimate, the effect of heat emissions is **not significant**.

8.7. CUMULATIVE EFFECTS ASSESSMENT

8.7.1. INTER-PROJECT EFFECTS

8.7.1.1. Cumulative impacts on benthic ecology may arise from the interaction of impacts from the Proposed Development during construction, operation or decommissioning, and impacts from other planned or consented projects in the wider vicinity of the Proposed Development.

8.7.1.2. It has generally been considered that the potential for cumulative effects will be greatest during the construction phase of the Proposed Development.

Decommissioning is assumed to have similar (or lesser) impacts than construction. In the event that cables need to be repaired or maintained, the activities required to undertake the works are considered similar to the effects that may arise during construction although much lower in magnitude due to the considerable reduced scale and shorter duration of works.

8.7.1.3. A list of projects within the wider vicinity of the Proposed Development that have the potential to give rise to a cumulative effect on benthic receptors has been considered (Appendix 8.4 (Intertidal and Benthic Habitats Cumulative Assessment Matrix) of ES Volume 3 (document reference 6.3.8.4)). This included major projects (offshore wind farms, interconnector cables, oil and gas), aggregate dredging projects, dredging and disposal projects, and coastal projects. This long list was agreed with the MMO (see Table 8.1). The locations of projects within this list in relation to the Proposed Development are shown in Figures 29.1 to 29.5 of the ES Volume 2 (document reference 6.3.29.1, 6.2.29.2, 6.2.29.3, 6.2.29.4 and 6.2.29.5).

8.7.1.4. As detailed in Chapter 29 (Cumulative Effects) of the ES Volume 1 (document reference 6.1.29), this assessment is to be undertaken with regards to PINS Advice Note 17 – Cumulative Effects Assessment (PINS, 2019). The list of projects presented in Appendix 8.4 (Intertidal and Benthic Habitats Cumulative Assessment Matrix) has been refined for intertidal and benthic ecology as follows:

- First, a spatial assessment was conducted. Any project identified in the long list of projects falling within the ZOI for benthic ecology (25 km offshore, 10 km nearshore – though this may be reduced when operating in a north-south direction due to the predominant east-west direction of currents in the Channel) was screened in for further consideration;
- A temporal, scale and nature-based assessment was conducted for those projects where a potential spatial overlap was identified; and
- Taking the above into account, any projects considered likely to affect the benthic receptors, and/or likely to result in significant effects due to their scale and nature have been identified.

8.7.1.5. After review of all potential cumulative projects, as explained in Appendix 8.4 (Intertidal and Benthic Habitats Cumulative Assessment Matrix), it is considered that due to the small linear spatial scale of all effects arising from the Proposed Development on benthic ecology receptors, in addition to the non-significant levels of effect, that there is no potential for the Proposed Development to contribute to potentially significant cumulative effects on benthic ecology receptors. Therefore, no projects have been considered in a Stage 3 or 4 assessment.

8.7.2. INTRA-PROJECT EFFECTS

8.7.2.1. As detailed in Chapter 4 (EIA Methodology) of the ES Volume 1 (document reference 6.1.4), Chapter 29 (Cumulative Effects) presents consideration of potential intra-project effects on intertidal and benthic ecology receptors.

8.7.3. TRANSBOUNDARY EFFECTS

8.7.3.1. The possibility for transboundary effects exists where the impacts of the Proposed Development extend beyond the UK Marine Area, either in isolation or cumulatively. No significant effects on benthic ecology receptors in UK waters have been identified as a result of the Proposed Development.

8.7.3.2. While there is potential for any sediment plume arising to extend into French waters, transboundary impacts are not considered to have the potential to be significant due to the low SSC predicted, and transient nature of this impact. The potential effects on French designated sites has also been considered as part of the HRA process. This assessment concluded no connectivity for any French sites identified (HRA Report; document reference 6.8.1).

8.7.3.3. Therefore, it is considered that there will be no significant transboundary effects resulting from the Proposed Development.

8.8. PROPOSED MITIGATION

8.8.1.1. The approach to assessment in this chapter assumes that mitigation measures are embedded into the design (e.g. use of appropriate construction techniques, pollution prevention measures) or that industry standard environmental plans and best practice measures will be in place.

8.8.2. CONSTRUCTION (AND DECOMMISSIONING)

8.8.2.1. Advice from NE and MMO on the PEIR requested the inclusion of a pre-construction survey to inform micro-routing of the Marine Cable Route to minimise impacts to any Annex I reef features if identified in construction areas. This requirement has been included in the dML submitted as part of the Development Consent Order ('DCO') (document reference 3.1).

8.8.2.2. The pre-construction survey would also be used to identify any areas of brittlestar beds present within the Marine Cable Corridor. Disposal of dredge material will not take place within these areas (plus a suitable buffer to avoid significant deposition effects on this habitat). The exact areas of disposal will be detailed within a Disposal Method Statement which will be produced post consent once all pre-construction survey work is complete. As this mitigation will prevent significant effects from sediment deposition occurring on this habitat, it can be concluded that the effect of deposition of sediment (smothering) is **not significant.**

8.8.3. OPERATION

8.8.3.1. No potentially significant effects are predicted to arise on benthic and intertidal habitat features as a result of the operation or repair/maintenance of the Proposed Development. Therefore, no additional mitigation is proposed.

8.9. RESIDUAL EFFECTS

8.9.1.1. Table 8.7 details summarises the significance of effects of all impacts assessed as part of this chapter.

8.9.1.2. As illustrated in Table 8.7 the Proposed Development will result in no significant effects.

Table 8.7 - Summary of Effects for Benthic Ecology

Project Phase	Potential Impact	Receptor	Significance of Effect	Mitigation	Significance of Residual Effect
Construction (and Decommissioning)	Direct seabed disturbance	Coarse sediment habitats (incl. Circalittoral, offshore and *mediomastus fragilis, lumbrineris* spp. and venerid bivalves in circalittoral coarse sand or gravel)	Not significant	None	Not significant
		Infralittoral mobile clean sand with sparse fauna	Not significant	None	Not significant
		Infralittoral mixed sediments	Not significant	None	Not significant
		Ophiothrix fragilis and/or *Ophiocomina nigra* brittlestar beds on sublittoral mixed sediment	Not significant	Preconstruction survey, and potential micro siting of Marine Cable Route to reduce possible impacts on Annex I reef identified in construction areas in the Marine Cable	Not significant

Project Phase	Potential Impact	Receptor	Significance of Effect	Mitigation	Significance of Residual Effect
				Corridor	
		Moderate energy circalittoral rock	Not significant	Preconstruction survey, and potential micro siting of Marine Cable Route to reduce possible impacts on Annex I reef identified in construction areas in the Marine Cable Corridor	Not significant
	Temporary increase in suspended sediments	Coarse sediment habitats (incl. Circalittoral, offshore and *Mediomastus fragilis, Lumbrineris* spp and venerid bivalves in circalittoral coarse sand or gravel)	Not significant	None	Not significant
		Infralittoral mobile clean sand with sparse fauna	Not significant	None	Not significant
		Infralittoral mixed sediments	Not significant	None	Not significant

Project Phase	Potential Impact	Receptor	Significance of Effect	Mitigation	Significance of Residual Effect
		Moderate energy circalittoral rock	Not significant	None	Not significant
		Ophiothrix fragilis and/or *Ophiocomina nigra* brittlestar beds on sublittoral mixed sediment	Not significant	None	Not significant
		Species and habitats of conservation importance (located outwith the marine Cable Corridor)	Not Significant	None	Not significant
	Deposition of sediment (smothering)	Coarse sediment habitats (incl. Circalittoral, offshore and *Mediomastus fragilis, Lumbrineris* spp. and venerid bivalves in circalittoral coarse sand or gravel)	Not significant	None	Not significant
		Infralittoral mixed sediments	Not significant	None	Not significant
		Infralittoral mobile clean sand with sparse fauna	Not significant	None	Not significant
		Moderate energy circalittoral rock	Not significant	None	Not significant
		Ophiothrix fragilis and/or *Ophiocomina nigra* brittlestar beds on sublittoral mixed sediment	Significant	Preconstruction survey to identify possible habitat, and avoidance of	Not Significant

Project Phase	Potential Impact	Receptor	Significance of Effect	Mitigation	Significance of Residual Effect
				dredge disposal on this habitat	
	Impacts from the resuspension of contaminated sediment	All receptors	Not significant	None	Not significant
Operation (including repair and maintenance)	Disturbance due to Operation and Maintenance (O&M) activity	All receptors	Not significant	None	Not significant
	Habitat loss	Coarse sediment habitats (incl. Circalittoral, offshore and *Mediomastus fragilis, Lumbrineris* spp. and venerid bivalves in circalittoral coarse sand or gravel)	Not significant	None	Not significant
		Infralittoral mobile clean sand with sparse fauna	Not significant	None	Not significant

Project Phase	Potential Impact	Receptor	Significance of Effect	Mitigation	Significance of Residual Effect
		Infralittoral mixed sediments	Not significant	None	Not significant
		Ophiothrix fragilis and/or *Ophiocomina nigra* brittlestar beds on sublittoral mixed sediment	Not significant	None	Not significant
		Moderate energy circalittoral rock	Not significant	None	Not significant
	Heat Emissions	All Receptors	Not significant	None	Not significant

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