AQUIND Limited

PEIR CHAPTER 8

Intertidal and Benthic Ecology

CONTENTS

TABLES

PLATES

FIGURES

APPENDICES

8 INTERTIDAL AND BENTHIC ECOLOGY

8.1 SCOPE OF THE ASSESSMENT

8.1.1 INTRODUCTION

8.1.1.1 This chapter provides the preliminary information regarding environmental impacts on intertidal and benthic ecology as a result of the Proposed Development.

8.1.1.2 This chapter outlines information regarding the potential impacts associated with the construction/installation, operation (including repair and maintenance), and decommissioning of the Proposed Development, as known at the time of publication. The potential effects of decommissioning are considered, in the worst case, to be equivalent to the effects associated with construction/installation and are assessed on this basis. They may potentially be less than those associated with construction/installation depending on the decommissioning activities undertaken, for instance where the marine cable is left in situ.

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). Where impacts arise as a result of the combination of the impacts of the Proposed Development and the impacts of projects in the UK marine area and/or other EEA states, these will also be identified and assessed.

Landfall

8.1.2.2 The Landfall is defined as the intertidal area where the Marine Cable Corridor comes ashore (above MLWS). The Landfall is located at Eastney beach on the south coast of Portsea Island (Figure 8.1).

8.1.2.3 The marine cables will make Landfall through the use of HDD methods which will travel underneath the intertidal area at Eastney from an exit/entry point in the marine environment approximately 1 km seaward from the transition joint bays located in the car park behind Fraser Range (Figure 3.3 in Chapter 3 Description of the Proposed Development). The intertidal area of Landfall up to MHWS at Eastney is included within the baseline for completeness, as HDD methods were not part of the design process during early iterations.

8.1.2.4 HDD is now also proposed to be undertaken at Langstone Harbour to enable the cables to cross underneath Langstone Harbour from Portsea Island to the mainland (see Figure 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 MHWS mark.

8.1.2.5 Chapter 3 Description of the Proposed Development provides further information on the HDD methodology at Langstone Harbour. The HDD crossing under the north-western corner of Langstone Harbour has also been considered to be part of the study area for this PEIR chapter.

Marine Cable Corridor

8.1.2.6 The Marine Cable Corridor encompasses the location of the Landfall and extends from Eastney, from MHWS, out to the UK/France EEZ boundary line (see Figure 3.1).

8.1.2.7 The study area for the Proposed Development 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 (Figure 8.1).

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 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;
- WFD (EC Directive 2000/60/EC);
- The Water Environment (Water Framework Directive) (England and Wales) Regulations 2003 (Statutory Instrument 2003 No.3242);
- 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 MPS (2011)
  - The primary policy for preparing marine plans and determining marine licence applications. This policy aims to contribute to the achievement of sustainable development and ensure that development aims to avoid harm to marine ecology and biodiversity.
- NPPF (2018)

Regional Policy

- South Inshore and South Offshore Marine Plan (2018) with the following objectives of specific relevance:
  - 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).

8.2.4 GUIDANCE

- CIEEM (2018) - Guidelines for Ecological Impact Assessment in the UK and Ireland: Terrestrial, Freshwater, Coastal and Marine;
- Cefas (2011) - Guidelines for data acquisition to support marine environmental assessment of offshore renewable energy 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 1 Introduction, a Scoping Opinion was received by the Applicant from PINS on 7 December 2018. The Scoping Opinion from PINS in relation to intertidal and benthic ecology, and how comments have been addressed in this Chapter of the PEIR are set out below in Table 8.1.

Table 8.1 – Scoping opinion responses

Consultee	Scoping Opinion ID/Page	Summary of Comment Received	How this has been addressed by the Applicant in this PEIR
PINS	4.3.1	Introduction of Non-Native Species (INNS): The Inspectorate agrees that this matter can be scoped out of the ES on the basis that the Applicant intends to apply available best industry practice, including the production and implementation of a biosecurity plan. The Scoping Report also indicates that imported material for the Proposed Development will not be of large volume. The ES application should provide reference to how the delivery of best practice measures for the control of INNS, including a biosecurity plan, are secured through DCO requirements (or other suitably robust methods). Effort should be made to agree such measures with relevant consultation bodies.	Best practice measures for controlling INNS will be considered further as part of the ongoing EIA process, and will be set in more detail in the ES. Engagement with relevant consultees on the most appropriate mechanism to secure such measures will be undertaken e.g. biosecurity plan or wider environmental management plan as a standalone document or part of a wider environmental management plan)
PINS	4.3.2	Electro-Magnetic Field (EMF) and emissions from HVDC Cable: The Inspectorate agrees on the basis of the evidence provided and the nature of the Proposed Development that effects of EMF on benthic receptors can be scoped out of the ES.	Noted
PINS	4.3.3	Heat emissions from HVDC Cable: A number of features of the Solent Maritime Special Area of Conservation (SAC) are sensitive to temperature increases from power cable operation and therefore, the Inspectorate cannot agree to scope this matter out as significant effects may occur. The ES should include an assessment of heat emissions from the HVDC cable during operation on sensitive receptors where significant effect could occur	The ES (and accompanying information for Habitats Regulations Assessment report) will include an assessment of heat emissions during operation, unless otherwise agreed with relevant consultees.

Consultee	Scoping Opinion ID/Page	Summary of Comment Received	How this has been addressed by the Applicant in this PEIR
PINS	4.3.4	No study area is explicitly defined in this aspect chapter, although the Inspectorate notes the identification of protected areas within 50km of the Proposed Development in Table 8.1 and the benthic habitats identified at a variety of distances in paragraph 8.2.3. The ES should clearly identify and justify the study area applied to the assessment of effects on intertidal and benthic ecology.	The regional and local study area is described in Section 8.1.2 of this chapter, and identified in Figure 8.1.
PINS	4.3.5	The Inspectorate notes from the Scoping Report that a suit of benthic surveys, together with intertidal surveys have been undertaken. The Scoping Report does not include the detailed methodology for the surveys or specify what standard protocols and quality standards are being utilised. The Applicant should ensure that the baseline information used to inform the assessment of likely significant effects is robust and suitable for that purpose. The Applicant should make effort to agree the approach to data collection and quality assurance with relevant consultation bodies. 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.	The benthic and intertidal surveys (Appendix 8.1 and Appendix 8.2) which are appended to the PEIR identify their respective methodologies and identify the standard protocols and quality standards. These are also summarised in Section 8.6 of this chapter. In addition, as stated, within the PEIR response to JNCC, where guidelines exist for the detection and quality assessment of particular habitats these have been followed where relevant. Appendix 8.1: Section 1.2 regarding sample analysis: Taxonomic identification of macrofaunal species was undertaken in accordance with National Marine Biological Analytical Quality Control ('NMBAQC')

Consultee	Scoping Opinion ID/Page	Summary of Comment Received	How this has been addressed by the Applicant in this PEIR
			methodology standards. All biota was extracted and identified according to the NMBAQC Taxonomic Discrimination Protocol (TDP - Worsfold and Hall, 2010). Appendix 8.2 Section 2: 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)
PINS	4.3.6	The Scoping Report does not address relevant quality standards applicable to the survey and analysis of impacts to benthic ecology. The ES should provide a description of these matters and how they are applied in the assessment.	Relevant quality standards applicable to the survey are set out in Appendix 8.1 and 8.2. Where these standards or resultant methods are considered to have a bearing on the results, and therefore the assessment, this is highlighted.

Consultee	Scoping Opinion ID/Page	Summary of Comment Received	How this has been addressed by the Applicant in this PEIR
PINS	4.3.7	The baseline section of the Scoping Report does not discuss protected habitats or species of conservation concern outside of designated sites. The Inspectorate acknowledges that the surveys undertaken will seek to identify any protected habitats and species potentially affected by the Proposed Development, as confirmed in paragraph 8.4.2. The Proposed Development could, for example, increase suspended sediment concentrations which have the potential to smother native oyster (*Ostrea edulis*) within the Solent. The ES should ensure that impacts on protected habitats and species (including, but not limited to, those protected under the Habitats Directive, Wildlife and Countryside Act 1981, NERC Act s41 habitats and species of principal importance), together with local Biodiversity Action Plan (LBAP) habitats and species and other habitats/species of conservation concern are assessed where significant effects are likely.	A range of data sources have been used to define the baseline within the study area, and this is described within the PEIR. Any protected habitats or species (within or without designated sites) will be assessed within the ES where connectivity is considered to arise.
PINS	4.3.8	Habitat loss during construction is not specially identified in the Scoping Report as a potential impact, although it is noted that loss of habitat and species is included in the 'reason' column for the potential impact of seabed disturbance during construction. For the avoidance of doubt, the ES should include an assessment of habitat loss during construction and decommissioning.	The PIER chapter assesses the impact of temporary habitat disturbance and/or loss during construction (and decommissioning). The impact assessment will also be updated and presented in the ES.
PINS	4.3.9	Appropriate cross-referencing between this aspect chapter and other relevant aspects, such as physical processes and marine water and sediment quality, should be included in the ES.	The PEIR incorporates cross-referencing to other topics where inter-relationships with other topics exist.

Consultee	Scoping Opinion ID/Page	Summary of Comment Received	How this has been addressed by the Applicant in this PEIR
PINS	4.12.2	The Inspectorate notes that assumptions have been made regarding potential impacts and mitigation measures to conclude that there is unlikely to be significant transboundary effects; however, such effects are stated as yet to be explored in the corresponding aspect chapter (e.g through sediment modelling). Limited information has been also provided with regard to the location of potential sensitive receptors in other EEA States. The Inspectorate notes reference in Appendix E to and the intention to consider transboundary effects in the EIA process. In accordance with the EIA Regulations, the ES should include a description of the likely significant effects as a result of the Proposed Development, including transboundary effects.	PINS are currently in the process of screening for possible transboundary impacts. Dependent on the outcome of the screening and in accordance with the EIA Regulations, the ES will include consideration of the likely significant effects as a result of the Proposed Development, including transboundary effects.
PINS	4.12.3	The ES should consider the potential for cumulative impacts with proposals to redevelop the Fraser Range site at Eastney and the North Portsea Coastal Defence schemes. The Applicant should seek to consult with the Eastern Solent Coastal Partnership (ESCP) with regards to the latter and potential cumulative effects. The Applicant's attention is drawn to the comments of Natural England and the Environment Agency contained in Appendix 2 to the Scoping Opinion in this regard.	Consultation is ongoing with the ESCP. Applications in relation to defence schemes in this area will be monitored and included within the committed developments list where appropriate. The status of the redevelopment of the Fraser Range site is not yet available. The only reference of this site available was in an officer report for an application Ref. 16/01438/FUL for a new access at Fraser Range that was refused. No Scoping Request has been submitted and no Screening Opinion has been provided for either the refused

Consultee	Scoping Opinion ID/Page	Summary of Comment Received	How this has been addressed by the Applicant in this PEIR
			application or the wider site. On this basis, the redevelopment of the Fraser Range site at Eastney has not been included in the CEA. The North Portsea Coastal Defence scheme has been considered as part of the CEA undertaken for benthic and intertidal ecology. The plans and project to be considered as part of the CEA will be kept under review and updated for the ES where required.
Environm-ent Agency	Page: 109	We agree with Section 6.2.14 that although the marine cable route does not directly overlap with any Marine Conservation Zones, the potential impact on these will need to be assessed.	An MCZ assessment will be submitted alongside the ES which will consider all impacts (including indirect) on any MCZs where there is potential for connectivity.
Environm ent Agency	Page: 109	In regard to Section 6.2.15, we agree that the potential impacts on the Solent Maritime SAC will also need to be assessed due to the close proximity to the proposed Landfall location at Eastney.	An information for Habitats Regulations Assessment report will be submitted alongside the ES which will consider all impacts (including indirect) on any Natura 2000 sites where there is potential for

Consultee	Scoping Opinion ID/Page	Summary of Comment Received	How this has been addressed by the Applicant in this PEIR
			connectivity, including the Solent Maritime SAC.
Environment Agency	Page: 109	In Section 8.3.1, we would expect habitat loss to be listed under potential impacts during construction and decommissioning. We agree with Table 8.3. We agree with the proposed methodology set out in section 8.4	This PEIR submission (and the subsequent ES) will assess the impact of temporary habitat disturbance and/or loss during construction.
Environment Agency	Page: 109	We agree with Table 8.3.	Noted
Environment Agency	Page: 109	We agree with the proposed methodology set out in section 8.4	Noted
Environment Agency	Page: 112	Habitat loss is to be listed in the ES under potential impacts during construction and decommissioning.	This PEIR chapter (and the ES) will assess the impact of temporary habitat disturbance and/or loss during construction.
Environment Agency (to East Hampshire District Council)	Page 107	In accordance with our previous advice (scoping opinion consultation response to Portsmouth City Council, dated 21 March 2018), we are pleased to see that the requirement to identify future phases of the North Portsea coastal defence scheme has been acknowledged (Appendix E - Table E3: LPA scoping opinion responses (page 127)). The proposed cable route through Portsmouth passes along sections of the North Portsea coastal defence scheme. The North Portsea coastal defence	Based upon the information currently available, the Fraser Range redevelopment appears to be an onshore project which will not result in significant cumulative effects, while the North Portsea Coastal Defence scheme has been considered as part

Consultee	Scoping Opinion ID/Page	Summary of Comment Received	How this has been addressed by the Applicant in this PEIR
		scheme is being delivered by the Eastern Solent Coastal Partnership (ESCP), a team of specialist coastal officers and engineers, who should be consulted during preparation of the ES to determine whether there will be a likely significant effect of the proposed cable route on the scheme.	of the cumulative effects assessment undertaken for benthic and intertidal ecology The plans and project to be considered as part of the cumulative effects assessment will be kept under review and updated for the ES where required. The ESCP will be consulted as appropriate during preparation of the ES.
JNCC	Page: 203	JNCC note that geophysical surveys and benthic ecology surveys were undertaken along the cable route corridor in 2017 and 2018 respectively. JNCC reiterate the need for evidence of sensitive habitats and species present in the potential impact area of proposed cable laying operations including Annex I species and Annex II habitats (under the Offshore Marine Regulations 2007, as amended), UK BAP and OSPAR Threatened and/or Declining Habitats and Species. Where guidelines exist for the detection and quality assessment of particular habitats (e.g. Irving, 2009 for stony reef; and Gubbay, 2007 and Limpenny *et al.* 2010 for *Sabellaria spinulosa* reef) then these should be followed.	A detailed survey and analysis report (including detailed methodology) is included with this PEIR submission as Appendix 8.1 Benthic Ecology Survey Report. Where guidelines exist for the detection and quality assessment of particular habitats (e.g. Irving, 2009 for stony reef; and Gubbay, 2007 and Limpenny *et al.* 2010 for Sabellaria spinulosa reef) these have been followed where relevant.
JNCC	Page: 203	The scoping report states that in the offshore area the High Voltage Direct Current (HVDC) cable route will pass close to the Offshore	An MCZ assessment will be submitted alongside the ES which will consider

Consultee	Scoping Opinion ID/Page	Summary of Comment Received	How this has been addressed by the Applicant in this PEIR
		Overfalls and Offshore Brighton Marine Conservation Zones (MCZs), 1.5 km and 8.5 km respectively: the former is partly in English inshore waters and the latter entirely offshore. The application should fully assess any potential impacts on these Marine Protected Areas (MPAs). Information on these MCZs is available via the following links: Offshore Overfalls MCZ - http://jncc.defra.gov.uk/page-6776 Offshore Brighton MCZ - http://jncc.defra.gov.uk/page-6775	all impacts (including indirect) on any MCZs where there is potential for connectivity.
MMO	Page: 210	The MMO EIA Scoping Opinion dated 22 June 2018 (paragraph 4.6.7) requested further information regarding the methods used to survey the intertidal benthos. This information has not been provided in the Scoping Report. In responding to this request (Table E1, Scoping Opinion Section 4.6.7), the Scoping Report briefly describes how the intertidal biotopes will be mapped in the ES, but not how the surveys used to infer biotopes were conducted. Without this information the MMO cannot comment on the appropriateness of the evidence base. The MMO and its advisers are happy to discuss this point in more detail if required.	A detailed intertidal survey and analysis report (including detailed methodology) is included with this PEIR submission as Appendix 8.2 Intertidal Survey Report.
MMO	Page: 210	The MMO recommends that additional information on the number and locations of drop-down video transects, benthic grab stations is provided, as and sediment contaminant samples stations. The latter is apparently presented in Figure 7.1. (according to Section 7.2.2 of the Scoping Report); however, this figure is not provided.	A detailed survey and analysis report (including detailed methodology) is included with this PEIR submission as Appendix 8.1 Benthic Ecology Survey Report. Information on the sampling for contaminated sediments is presented in Chapter 7 - Water and Sediment Quality.

Consultee	Scoping Opinion ID/Page	Summary of Comment Received	How this has been addressed by the Applicant in this PEIR
MMO	Page: 210	Details of quality standards have not been provided with respect to benthic ecology in Section 8 of the Scoping Report. For example, details on how benthic community samples were/will be collected (e.g. grab type, video transect length), processed onboard (e.g. sieve size), fixed (e.g. preserved in formaldehyde), and identified have not been provided.	Relevant quality standards applicable to the benthic survey are set out in Appendix 8.1 Benthic Ecology Survey Report.
MMO	Page: 210	The MMO recommends sample processing and species identification to follow a standard quality control protocol (e.g. the NMBAQC scheme) and the details of the approach adopted to be stated in the ES.	Relevant quality standards applicable to the benthic survey are set out in Appendix 8.1 Benthic Ecology Survey Report. All taxonomic identification was undertaken by a laboratory which participates in the NMBAQC scheme.
MMO	Page: 210	The MMO recommends similar standard protocols to be followed for sediment particle size analysis.	All particle size analysis was undertaken by a laboratory which participates in the NMBAQC scheme.
MMO	Page: 210	The proposed scope of the ES is adequate with respect to impacts on benthic ecological receptors (Table 8.3). This includes the assessment of impacts due to seabed disturbance, increase in suspended sediments, resuspension of contaminated sediments, and deposition of sediment during the construction phase, and habitat loss and seabed disturbance (associated with Operational and Maintenance (O and M) activity) during the operation phase.	Noted
MMO	Page: 210	In our EIA Scoping Opinion of 22 June 2018, the MMO advised that possible impacts on benthic ecological receptors due to contaminant release be considered and scoped into the ES if appropriate. Impacts	Correct

Consultee	Scoping Opinion ID/Page	Summary of Comment Received	How this has been addressed by the Applicant in this PEIR
		relating to the resuspension of contaminated sediment have now been scoped in (Table 8.3).	
MMO	Page: 211	A benthic survey campaign has been undertaken along the proposed cable route to characterise subtidal and intertidal habitats and identify any protected benthic features (Section 8.4.2).	Correct
MMO	Page: 211	The subtidal survey used drop-down video and benthic grabs to obtain information on sediment characteristics and infaunal/epifaunal communities (Section 8.4.3). The surveys were stratified so that sampling stations were placed in representative habitats along the entire route. Sampling stations were also placed in potentially sensitive or protected habitats, such as potential Annex I habitats or near designated sites such as Special Areas of Conservation (SACs) or Marine Conservation Zones (MCZs). This approach is appropriate.	Noted
MMO	Page: 211	The MMO agrees that the following can be scoped out of the ES: The introduction of invasive non-native benthic species (Table 8.3 and Section 8.3.4), The impact of Electro-magnetic field (EMF) emissions from High Voltage Direct Current (HVDC) cables on the benthos (Table 8.3 and Sections 8.3.5-8.3.7), The impacts from heat emissions from HVDC cables on the benthos (Table 8.3 and Sections 8.3.8-8.3.9).	Noted – though see also PINS comment (ref 4.3.3) and associated response regarding assessment of heat emissions.
MMO	Page: 211	Section 4.9 states that mitigation measures will be identified and incorporated into the design as environmental assessments are developed and any potentially high magnitude impacts are identified. This approach is reiterated with specific regard to impacts on benthic ecology that have been scoped in (Table 8.3). This approach is appropriate at this stage.	Noted

Consultee	Scoping Opinion ID/Page	Summary of Comment Received	How this has been addressed by the Applicant in this PEIR
MMO	Page: 211	Impacts due to EMF and heat emissions from HVDC cables (both of which have been scoped out for benthic receptors) will be mitigated by the shielding and burial of the cables (Table 8.3).	Noted
MMO	Page: 211	The EIA assessment methodology presented in Section 4 is appropriate and clearly justified with reference to Guidelines for Environmental Impact assessment (2004).	Noted
MMO	Page: 211	The data sources for subtidal benthic species and habitats (i.e. drop-down camera and benthic grab surveys, supplemented by geophysical data) are appropriate (Section 8.4.3).	Noted
MMO	Page: 211	The Scoping Report clarifies that cumulative impacts on benthic receptors will be scoped into the ES (Table E1, Scoping Report Section 4.6.11).	Correct
MMO	Page: 211	The effects of all activities on benthic features within designated sites in the vicinity of the proposed works will be assessed, and the possible implications for the sites' conservation objectives evaluated (Sections 8.4.5-8.4.7). These sections of the Scoping Report make specific reference to MCZs; however, the MMO recommends such transboundary effects to be considered for all designated sites (i.e. those listed in Table 8.1) and any other sensitive benthic receptors known to be present within the area likely to be affected by sediment resuspension, sediment deposition, and/or the release of contaminants. The Scoping Report acknowledges the requirement that such impacts must be included in the ES (Table E1, Scoping Opinion Section 4.6.13).	Noted. Any protected habitats or species (within or without designated sites) will be assessed where connectivity is considered to arise.
MMO	Page: 211	In Sections 7 and 8 of the Scoping Report, water quality and intertidal and benthic habitats organisms have been appropriately identified as	Noted

Consultee	Scoping Opinion ID/Page	Summary of Comment Received	How this has been addressed by the Applicant in this PEIR
		receptors to the potential impacts associated with dredge and disposal activities, such as temporary increased suspended sediments, the resuspension of contaminated sediments, smothering and disturbance of seabed.	
Natural England	Page: 224	• Solent Maritime Special Area of Conservation (SAC) • Chichester and Langstone Harbours Special Protection Area (SPA) • Chichester and Langstone Harbours Wetland of International Importance under the Ramsar • Convention (Ramsar site) • Chichester Harbour Site of Special Scientific Interest (SSSI) • Langstone Harbour Site of Special Scientific Interest (SSSI) • Portsmouth Harbour Special Protection Area (SPA) • Portsmouth Harbour Wetland of International Importance under the Ramsar Convention (Ramsar • site) • Portsmouth Harbour Site of Special Scientific Interest (SSSI) • Offshore Overfalls Marine Conservation Zone (MCZ) • Utopia Marine Conservation Zone (MCZ) • Offshore Brighton Marine Conservation Zone (MCZ) • Kingmere Marine Conservation Zone (MCZ) • Solent and Dorset Coast potential Special Protection Area (pSPA) • Bembridge proposed Marine Conservation Zone (pMCZ) • East Meridian Proposed Marine Conservation Zone (pMCZ) • Norris to Ryde proposed Marine Conservation Zone (pMCZ)	Noted - The ES should thoroughly assess the potential for the proposal to affect the designated sites listed, and will also be supported by a HRA Report which will be produced in consultation with Natural England.

Consultee	Scoping Opinion ID/Page	Summary of Comment Received	How this has been addressed by the Applicant in this PEIR
		• Selsey Bill and the Hounds proposed Marine Conservation Zone (pMCZ) The information supplied by the applicant confirms that the project will take place within or adjacent to the designated sites listed above. Whilst subsea cables are not a form of development specifically listed in Annex I or II of the EIA Directive, due to the length of the proposed cable and its route crossing internationally and nationally designated nature conservation sites, Natural England advises that an EIA should be undertaken to allow full consideration of the proposal's impacts as identified within the submitted scoping report. The ES should thoroughly assess the potential for the proposal to affect the designated sites listed above. Furthermore, the ES should also thoroughly assess the impact of the proposals on habitats and/or species listed as 'Habitats and Species of Principal Importance' within the England Biodiversity List, published under the requirements of S41 of the Natural Environment and Rural Communities (NERC) Act 2006. Section 40 of the NERC Act 2006 places a general duty on all public authorities to conserve and enhance biodiversity. Further information on Habitats and Species of Principal Importance is available via the following link: http://www.naturalengland.org.uk/ourwork/conservation/biodiversity/protectandmanage/habsandsp eciesimportance.aspx	
Natural England	Page: 225	Government Circular 06/2005 states that Biodiversity Action Plan (BAP) species and habitats 'are capable of being a material consideration…in the making of planning decisions'. Natural England therefore advises that survey, impact assessment and mitigation proposals for Habitats and Species of Principal Importance should be included in the ES.	Noted - survey, impact assessment and mitigation proposals for Habitats and Species of Principal Importance will be included in the ES. Where

Consultee	Scoping Opinion ID/Page	Summary of Comment Received	How this has been addressed by the Applicant in this PEIR
		Consideration should also be given to those species and habitats included in the relevant Local BAP. • The EIA should include details of: • Any historical data for the sites affected by the proposal (e.g. from previous surveys); • Additional surveys carried out as part of this proposal; • The habitats and species present; • The status of these habitats and species (e.g. whether BAP priority habitat); • The direct and indirect effects of the development upon those habitats and species; • Full details of any mitigation or compensation that might be required. The development should avoid adversely impacting the most important wildlife areas within the area of the project, and should if possible provide opportunities for overall wildlife gain. The record centre for the relevant Local Authorities should be able to provide the relevant information on the location and type of BAP habitat for the area under consideration.	possible, opportunities for wildlife gain will be identified.
Natural England	Pages: 225-226	This is a complex proposal which will result in a number of different impacts. Natural England supports the consideration of the following impacts which have been scoped in for further assessment (as summarised in Appendix C - Table C1 of the scoping report): • Intertidal and Benthic Ecology: • Seabed disturbance (construction and decommissioning) • Deposition of sediment (construction and decommissioning) • Increase in suspended sediments (construction and decommissioning)	Noted

Consultee	Scoping Opinion ID/Page	Summary of Comment Received	How this has been addressed by the Applicant in this PEIR
		• Impacts from the resuspension contaminated sediment (construction and decommissioning) • Habitat loss (operation) • Seabed disturbance due to O&M activity	
Natural England	Page:226	Habitat loss from (operation) has been listed as a potential impact for the receptors; intertidal and benthic ecology and fish and shellfish. The loss from the initial construction phase would be regarded as a one-off event in comparison to any habitat loss impacts from the operation phase. On this basis, Natural England recommends that habitat loss during the construction phase should be scoped in for the appropriate receptors.	This PEIR submission (and the subsequent ES) will assess the impact of temporary habitat disturbance and/or loss during construction.
Natural England	Page: 227	Natural England has noted that the following impacts have been scoped out of further assessment: • Intertidal and Benthic Ecology: • Impacts from EMF emissions (operation) • Introduction of invasive non-native species • Impacts from heat emissions (operation)	Correct
Natural England	Page: 227	Impacts from heat emissions upon intertidal and benthic ecology have been scoped out due to cable burial depth and dissipation within the sediment. However, Natural England's Advice on Operations for the Solent Maritime SAC identifies a number of intertidal and subtidal features that are sensitive to temperature increase from power cable operation. On this basis, Natural England recommends that impacts from heat emissions are scoped in for further assessment.	The ES (and accompanying information for HRA Report) will include an assessment of heat emissions during operation unless otherwise agreed with relevant consultees.

Consultee	Scoping Opinion ID/Page	Summary of Comment Received	How this has been addressed by the Applicant in this PEIR
Natural England	Page: 227	The works, as set out in the information supplied by the applicant, are near to the designated Marine Conservation Zones and proposed Marine Conservation Zones as listed above. Natural England understands that the current proposed cable route will not travel through any of these MCZs and welcomes the planned assessment for potential impacts on their geomorphological features and benthic communities.	Noted
Natural England	Pages: 227-228	Under Regulation 63 of the Conservation of Habitats and Species Regulations 2017, an appropriate assessment needs to be undertaken in respect of any plan or project which is (a) likely to have a significant effect on a European site (either alone or in combination with other plans or projects) and (b) not directly connected with or necessary to the management of the site. Natural England considers that this proposal is not directly connected with or necessary to the conservation management of the site and therefore requires a Habitats Regulations Assessment to determine whether there will be a likely significant effect on the European sites. Given the limited information available at this stage on the final design and potential construction/operational impacts, Natural England is of the view that, at present, it cannot be excluded, on the basis of the objective information supplied by the applicant, that the application will have a likely significant effect on the internationally designated sites listed above. This is because there is a risk that it will affect the following features of the designated site(s): Benthic habitats Breeding and non-breeding birds	An HRA Report will be provided alongside the ES.

Consultee	Scoping Opinion ID/Page	Summary of Comment Received	How this has been addressed by the Applicant in this PEIR
		In reference to the proposed structure of the environmental statement shown in Appendix D of the EIA scoping report, we recommend the inclusion of a separate section of the Environmental Statement to address impacts upon European and Ramsar sites entitled 'Information for Habitats Regulations Assessment' as this will help the Planning Inspectorate to determine whether the proposal is likely to have a significant effect on the European sites and to undertake an appropriate assessment if required.	
Natural England	Page: 228	We can confirm that the proposed works are located within the vicinity of the above SSSIs. Further information on these SSSIs and their special interest features can be found at: https://designatedsites.naturalengland.org.uk/SiteSearch.aspx The Environmental Statement should include a full assessment of the direct and indirect effects of the proposal on the features of special interest within these sites and should identify such mitigation measures as may be required in order to avoid, minimise or reduce any adverse significant effects.	The ES will include a full assessment of the direct and indirect effects of the proposal on the features of special interest within these sites and will identify such mitigation measures as may be required in order to avoid, minimise or reduce any adverse significant effects
Natural England	Page: 228	In addition to impacts on the designated sites listed above, the EIA will need to consider the potential impacts upon habitats or species listed within the UK and Hampshire Biodiversity Action Plans and suggest suitable mitigation should a negative impact arise. For example, construction work could increase suspended sediment concentrations and this could result in smothering effects on beds of native oysters (Ostrea edulis) within the Solent.	The ES will include a full assessment of the direct and indirect effects of the proposal on the habitats or species listed within the UK and Hampshire Biodiversity Action Plans and will identify such mitigation measures as may be required in order to avoid,

Consultee	Scoping Opinion ID/Page	Summary of Comment Received	How this has been addressed by the Applicant in this PEIR
			minimise or reduce any adverse significant effects
Natural England	Pages: 232-233	The ES should include an impact assessment to identify, describe and evaluate the effects that are likely to result from the project in combination with other projects and activities that are being, have been or will be carried out. The following types of projects should be included in such an assessment, (subject to available information): • existing completed projects; • approved but uncompleted projects; • ongoing activities; • plans or projects for which an application has been made and which are under consideration by the consenting authorities; and • plans and projects which are reasonably foreseeable, i.e. projects for which an application has not yet been submitted, but which are likely to progress before completion of the development and for which sufficient information is available to assess the likelihood of cumulative and in-combination effects. Natural England would advise that the cumulative impacts section should also consider impacts on ecologically sensitive receptors such as designated sites, non-designated sites, priority habitats and species, protected species etc. In relation to point e, Natural England advises that the Environmental Statement should also consider known forthcoming	A CEA of the Proposed Development in combination with other projects will be included within the ES. The scope of this assessment is set out within this PEIR submission. Also see response to PINS ID 4.12.3 above.

Consultee	Scoping Opinion ID/Page	Summary of Comment Received	How this has been addressed by the Applicant in this PEIR
		planning applications in close proximity to the development application, where there is potential impacts on key ecological interests. For example, a scoping report has been submitted for the redevelopment of the Fraser Range site at Eastney, Portsmouth and the Coastal Defence schemes that are being progressed for Portsea Island. Cumulative impacts on sensitive receptors such as designated sites and priority habitats should be considered.	
Natural England (to East Hampshire District Council/ Havant Borough Council)	Page 99/ 131	Natural England advise that the ES be supported by a Biodiversity Mitigation and Enhancement Plan (BMEP) to include measures for mitigating impacts on protected species and habitats and include biodiversity compensation measures for residual biodiversity losses that cannot be mitigated on-site. This may include provision of off-site replacement habitats or a financial contribution for biodiversity improvements elsewhere. In the recent 25 Year Environment Plan, there is a drive to ensure net gains in biodiversity from development so the ES should demonstrate how the development will meet the duty set out in Section 40 of the Natural Environment and Rural Communities (NERC) Act 2006.	All benthic priority species and habitats with potential to be affected by the Proposed Development will be considered in the ES, which will also set out any mitigation required to ensure the development meets the duties set out in Section 40 of the NERC Act 2006. Opportunities for biodiversity gain will also be highlighted where relevant.

8.3.2 CONSULTATION

8.3.2.1 Consultation is a key part of the DCO application process. Further consultation will be undertaken after views have been sought on the PEIR, including as part of further pre-application engagement and following submission of the DCO application.

8.3.2.2 A summary of the consultation undertaken for the intertidal and benthic ecology assessment to date is detailed in Table 8.2 below.

8.3.2.3 Full details of consultation undertaken to date and planned future consultation for all disciplines is presented within Chapter 5 Consultation.

Table 8.2 - Consultation responses

Consultee	Date (Method of Consultation)	Discussion	Summary of outcome of discussions
Natural England	Consultation on HDD methods in Langstone Harbour (teleconference and emails - 16/07/2018)	Natural England agrees that HDD is a preferred method for this type of construction as it can reduce environmental impacts in some cases. Natural England recognised that Langstone Harbour possesses the full suite of designations and as such, features such as those (but not limited to) below will need to be given consideration: • Grasslands • Lagoons • Strandline communities • Saltmarsh • Seagrass • Mudflats • Native Oyster Overwintering birds (noise and visual impacts) Natural England's understanding of the HDD method is that a hole would be drilled underneath the area with an increasing in diameter drill bit. Natural England request that a water-based mud lubricant is used that is Cefas approved. Natural England also recognise that a fair amount of slurry can exit the drill entry and exit holes. It will be important	Noted. Natural England will be contacted during the assessment on these features.

Consultee	Date (Method of Consultation)	Discussion	Summary of outcome of discussions
		that this slurry is disposed of correctly (e.g. use of groundsheets to contain the material is often effective as the slurry can then be removed from site). If the HDD entry and exit holes are anywhere near the marine environment that may directly affect the marine environment then Natural England would generally require survey work to be undertaken. However, as the HDD compound and exit and entry holes will be above MHWS (and as pollution prevention measures should be in place in the HDD compound above MHWS) then Natural England has advised that it would not be proportionate to ask for surveys, but that consideration to the designated features/habitats of Langstone Harbour can be undertaken by desk based assessment using datasets available in the public domain. Natural England has habitats datasets available on their website and the Langstone Harbour environment officer should be contacted as they hold a wealth of knowledge on the area.	

8.4 METHODS OF ASSESSMENT

8.4.1.1 The assessment methodology used for benthic ecology will follow that recommended by CIEEM for marine and coastal developments (CIEEM, 2018). 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 will be characterised in accordance with CIEEM (2018) guidelines. Wherever possible and relevant, the following criteria will be used to characterise 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 OF EFFECT

8.4.3.1 The evaluation of whether an effect is ecologically significant will be undertaken in line with CIEEM (2018) 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 Any assessment will be undertaken in the context of the wider conservation status of that receptor, and where uncertainty exists this will be acknowledged.

8.4.3.3 Embedded mitigation and, where appropriate, additional mitigation measures will be identified and described where they will avoid, reduce and/or compensate for potentially significant effects. This includes avoidance through the design process. It is also good practice to propose mitigation measures to reduce negative effects that are not significant.

8.4.4 LIMITATIONS

8.4.4.1 The information presented within Chapter 3 Description of the Proposed Development presents the most recent emerging information on the most likely construction methods for the Proposed Development. As the design and construction methods for the Proposed Development are still evolving at the time of writing of this chapter, not all of the proposed construction methods have been assessed. Accordingly, assessments within this chapter do not give consideration to the following methods described in Chapter 3 Description of the Proposed Development;

- Use of flotation pits to enable installation vessels to approach closer to shore;
- Grounding of installation vessels on the seabed at low tide; and
- Use of a TSHD vessel to create the trench for pre-lay installation.

8.4.4.2 The approach to modelling of sediment deposition (resulting from seabed preparation, HDD exit/entry pit, and omega joint excavation) is described in Chapter 6 Physical Processes. Plume dispersion modelling is being undertaken for the Proposed Development, however the results of this are not available to inform the PEIR. This assessment is based upon available data sources and will be validated, and updated where required, once the modelled data is available. The outputs from the modelling will be used to refine the ZoI and update and finalise conclusions as part of the final ES.

8.4.4.3 The information contained herein is intended to inform consultation responses at this stage. Any gaps in information identified at this PEIR stage will be considered and addressed along with specific mitigation measures as part of the assessments for the production of the ES.

8.4.4.4 A more detailed assessment of potential significant impacts as a result of the final design and construction methods of the Proposed Development on identified sensitive receptors will be undertaken and presented in the ES.

8.4.4.5 A HRA Report will also be produced and presented as part of the final application. The HRA will follow the stepwise process outlined in PINS Advice Note 10 - Habitat Regulations Assessment relevant to NSIPs.

8.4.4.6 Similarly, an assessment of the potential effects of the Proposed Development on Marine Conservation Zones ('MCZ's) has not been included in the PEIR. The MCZ assessment will be undertaken and presented as part of the final ES.

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 8.3.

Table 8.3 - Data sources

Data/information	Data Type	Details of Data available
Project specific benthic surveys	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	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 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
Natural England (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 Coast 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 8.4; Figure 8.2). Several other protected areas lie within 50 km of the Proposed Development (Table 8.4; Figures 8.2 and 8.3). Whilst some recommended MCZs ('rMCZ') are listed below which have subsequently been dropped from formal designation, they have been included for the sake of completeness and the features of those sites will be considered as part of the impact assessment where relevant.

8.5.2.2 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.

Table 8.4 - 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 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
South Wight Maritime (SAC)	Qualifying features: reefs; submerged or partially submerged sea caves	Designated	3.3
Bembridge (pMCZ)	Features considered: subtidal mixed sediments; subtidal coarse sediments; subtidal sand; subtidal mud; sheltered muddy gravels;	Proposed	3.8

Site Name	Criteria	Status	Approx. closest Distance to Proposed Development (km)
	seagrass beds; maerl beds; sea-pens and burrowing megafauna; peacock's tail seaweed; rossworm reefs		
Selsey Bill and the Hounds (pMCZ)	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	Proposed	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 Harbour Wetland of International Importance (Ramsar)	Intertidal mudflat areas with Zostera beds; saltmarsh; *Hydrobia ulvae*; *Ulva spp*.; *Gammarus insensibilis; Nematostella vectensis*	Designated	4.9
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

Site Name	Criteria	Status	Approx. closest Distance to Proposed Development (km)
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 Ledges (SSSI)	Notified features: invertebrate assemblage; sheltered muddy shores (including estuarine muds); sheltered rocky shores	Notified	7.9
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

Site Name	Criteria	Status	Approx. closest Distance to Proposed Development (km)
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 (SSSI)	Notified features: invertebrate assemblage; sheltered muddy shores (including estuarine muds); Zostera communities	Notified	18.8
Isle of Wight Downs (SAC)	Annex I habitats: vegetated sea cliffs of the Atlantic and Baltic Coasts	Designated	19.6
Yarmouth to Cowes (pMCZ)	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	Proposed	19.9

Site Name	Criteria	Status	Approx. closest Distance to Proposed Development (km)
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 (rMCZ)	Features considered: subtidal sand; subtidal mixed sediments; subtidal sands and gravels	Dropped	27.5
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	Designated	34.5

Site Name	Criteria	Status	Approx. closest Distance to Proposed Development (km)
	(*Mytilus edulis*) beds; subtidal chalk; littoral chalk communities; moderate energy circalittoral rock; high energy circalittoral rock		
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
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 (pMCZ)	Features considered: littoral chalk communities; subtidal sand; subtidal coarse sediment; subtidal chalk; peat and clay exposures; rossworm reefs; high/moderate energy circalittoral rock	Proposed	44.5

8.5.2.3 Natural England (2014) data also highlights the presence of several WFD high sensitivity habitats within the vicinity of the Proposed Development (Table 8.5 and Figure 8.4).

Table 8.5 - 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 proposed Landfall location was expected to come ashore close to Fraser Range (a disused naval gunnery school and RADAR testing facility) and the Southsea Leisure Park (Figure 8.1). However, further optioneering has taken place, and it is now proposed that 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 from the transition joint bays located in the car park behind Fraser Range.

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 (ESCP, 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 PCC (PCC, 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 (Natural England, 1985), (APEM, 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 changes in invertebrate communities and changes in the composition of vertebrate predator communities.

8.5.3.7 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. It is anticipated that no HDD works will occur within the marine environment of Langstone Harbour as the drilling will be underneath the harbour area. The entry/exit points of the drill will be above the MHWS mark. Chapter 3 Description of the Proposed Development provides further information on the HDD methodology at Langstone Harbour.

8.5.3.8 Above the proposed HDD route under Langstone Harbour, 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

8.5.3.9 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 8.2 Intertidal Survey Report.

8.5.3.10 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.

8.5.3.11 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.

8.5.3.12 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.

8.5.3.13 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 8.5.

8.5.4 VEGETATED SHINGLE

8.5.4.1 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

8.5.5 SHINGLE SHORE

8.5.5.1 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

8.5.6 SEDIMENT HABITATS

8.5.6.1 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 of sediment on the lower shore between boulders.

8.5.6.2 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 of sand (of an appearance consistent with medium to course sediment) of only 2-10 cm deep over shingle. No obvious signs of marine organisms were found at any in the sediment stations that were dug over, and no anoxic layer was seen.

8.5.6.3 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

8.5.7 ROCKY SHORE

8.5.7.1 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).

8.5.7.2 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).

8.5.7.3 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).

8.5.7.4 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 surprisingly 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.

8.5.7.5 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).

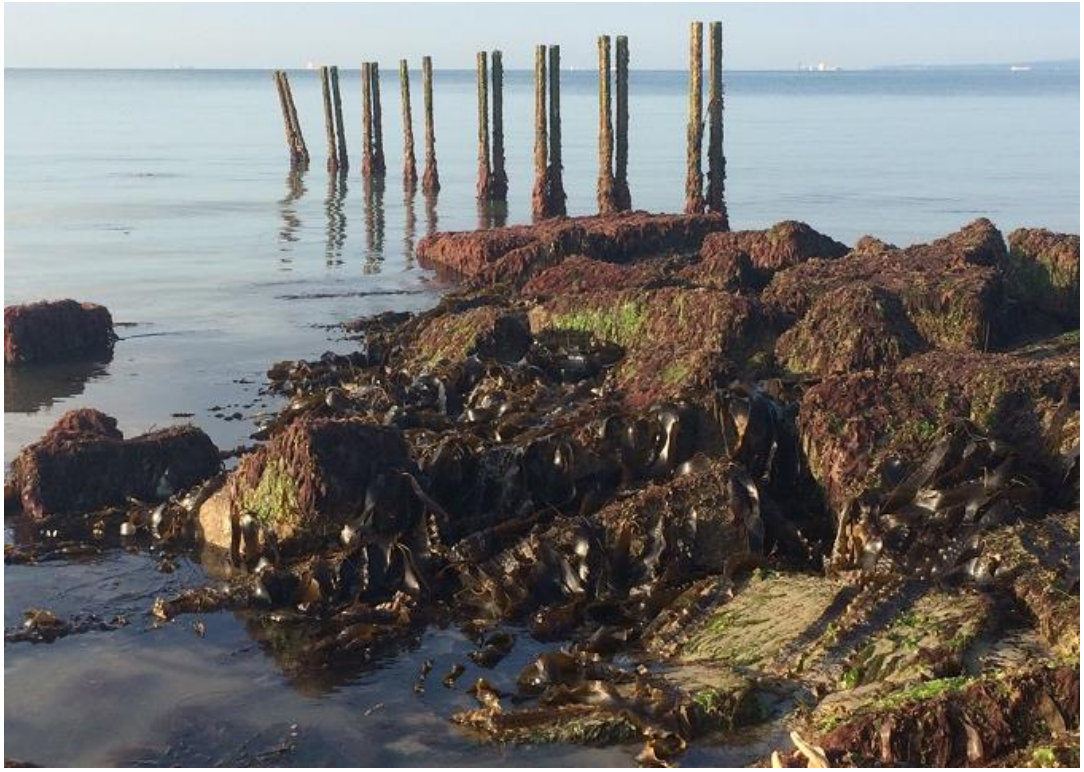

Plate 8.4 - Rocky shore habitats

8.5.8 SPECIES AND HABITATS OF CONSERVATION IMPORTANCE

8.5.8.1 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.

8.5.8.2 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.

8.5.9 INVASIVE SPECIES

8.5.9.1 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 of 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.

8.5.10 MARINE CABLE CORRIDOR

8.5.10.1 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*.

8.5.10.2 EMODnet predictive habitat maps show 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) (Figure 8.6). 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).

8.5.10.3 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.

8.5.10.4 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.

8.5.10.5 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).

8.5.10.6 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) (Rampion ES, 2012).

8.5.10.7 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).

8.5.10.8 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.

8.5.10.9 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 8.6) (EMODnet, 2016).

8.5.10.10 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 8.6) (EMODnet, 2016).

Site specific survey – Subtidal

8.5.11 SURVEY METHODOLOGY

8.5.11.1 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 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.

8.5.11.2 In total, 22 sites were targeted within the benthic survey area spanning UK waters (Figure 8.7). 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.

8.5.11.3 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 scale1 (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.

8.5.11.4 Benthic grab sampling was undertaken in line with Section 3.9 of the JNCC Marine Monitoring Handbook (Thomas, 2001) and Cefas guidelines (Judd, 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.

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

8.5.11.5 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.

8.5.11.6 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 National Marine Monitoring Programme ('NMMP') Green Book (NMMP, 2005).

8.5.12 DATA ANALYSIS

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

8.5.12.2 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.

8.5.12.3 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.

8.5.12.4 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.

8.5.13 RESULTS

8.5.13.1 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 8.8). The typical community structure is characterised by a range of species including polychaetes, amphipods, bivalves, tunicates, sea anemones and crabs.

8.5.13.2 Further from Landfall up to the 12 nmi limit (i.e. *c.* 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.

8.5.13.3 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).

8.5.13.4 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.*

8.5.14 SPECIES AND HABITATS OF CONSERVATION IMPORTANCE

8.5.14.1 *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.

8.5.14.2 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.

8.5.14.3 A 'reefiness' assessment was undertaken using the DDV and geophysical data which identified the area to be of medium resemblance of 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.

8.5.14.4 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.

8.5.14.5 Subtidal sands and gravels (a UK BAP priority habitat) were identified across the majority of the benthic survey area.

8.5.15 IDENTIFICATION OF RECEPTORS

8.5.15.1 The Proposed Development intersects a variety of benthic habitats that have the potential to be impacted by the Proposed Development (Table 8.6).

Table 8.6 - 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

EUNIS description	EUNIS code	MNCR code*
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

8.5.15.2 In addition, a number of potentially sensitive and/or protected habitats exist within protected areas in proximity to the Proposed Development (Table 8.4 and Table 8.5).

8.5.16 FUTURE BASELINE

8.5.16.1 The baseline environment present in the vicinity of the Proposed Development has remained relatively consistent over time, with more 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

8.6 IMPACT ASSESSMENT

8.6.1.1 The scoping exercise undertaken with PINS identified that potential impacts resulting from construction activities (introduction of invasive non-native species) could be scoped out as evidence was provided that any potential effects resulting from these impacts would be negligible.

8.6.1.2 The options for decommissioning will likely include consideration of leaving the marine cable in situ, removal of the entire marine cable or removal of sections of the marine cable. Current best practice is to leave the inert and environmentally benign cable in situ so as to avoid unnecessary disturbance of the seabed (see Chapter 3 Description of the Proposed Development). The corresponding potential impacts resulting from decommissioning are considered likely to be less in nature than those considered for construction, however as the decommissioning activities are at this time not confirmed, the worst case is considered which is that the impacts will be equivalent to those associated with construction.

8.6.1.3 The scoping exercise undertaken with PINS identified that potential impacts resulting from operation (including repair and maintenance) (impacts of EMF on the benthos) could be scoped out as evidence was provided that any potential effects resulting from this impact would be negligible.

8.6.2 WORST CASE DESIGN ENVELOPE

8.6.2.1 Table 8.7 shows the worst-case design parameters relevant to benthic ecology of the Proposed Development during the construction (and decommissioning) and operational stages.

Table 8.7 - Worst case design parameters

Potential Impact	Design Envelope Scenario Assessed
Construction (& Decommissioning) stage	
Direct seabed disturbance.	A maximum of four cables (two bundled pairs) will run from Eastney to the limit of UK territorial waters. Maximum length for each cable is approximately 109 km. Each bundled pair of cables will be installed in a separate trench (maximum of two trenches) at a depth below seabed of 0.6 to 5.1 m. The area of the Marine Cable Corridor is *c.* 57 km^2 (500 m wide for 8.6 km and 520 m wide for 101.4 km). Subtidal area of seabed disturbed across Marine Cable Corridor is 3.3 km^2. This is based on 7.9 km of Marine Cable Corridor being dredged to a width of 150 m (1.2 km^2), 19.9 km of an 80 m swathe for boulder clearance (1.29 km^2), and assumes a worst case of the remaining 82 km of the Marine Cable Corridor disturbed through 2 x 4.5 m width of mechanical trenching (0.74 km^2) and anchor spreads (0.046 km^2). HDD works will likely occur in areas that will have already been subject to some level of disturbance. However, if required, HDD entry/exit pits may be necessary to position the drill casing and protect the HDD end cap whilst minimising impacts on navigation depth. These will be location specific, however the worst case assumes a single pit (rather than 4 discrete pits) approximately 60 m x 15 m (900 m^2). Temporary HDD mattressing (0.0009 km^2) which will likely occur over the area of the pit. Up to two jack up barges will be used for the HDD works. Typical jack-up barge will possess 4 legs, each leg approximately 1.4 m diameter. Temporary casing support frame comprising two trestles spaced 12 m apart at each location. Each trestle has a footprint of 3 m^2.
Temporary increases in SSC	Worst case provides for deposition of maximum dredged volume (1,700,000 m^3) through surface release (multiple hopper sizes).
Deposition of Sediment (smothering)	Deposition of 1,700,000 m^3 of cleared sediment within Marine Cable Corridor. The marine HDD exit/entry Landfall location approx. 1 km off the coast of Eastney (KP 1 - KP1.6) will be dredged and sediment replaced post installation. Total sediment up to 2,700 m^3.
Impacts from the resuspension of contaminated sediment	Potential for contaminated sediments to be present identified within Chapter 7: Water and Sediment Quality Chapter. Resuspension considered possible from all seabed preparation and installation activities.
Operational (including repair and maintenance) stage	
Disturbance due to Operational &	The Proposed Development has been designed so that maintenance of the marine cables is not required during its operational lifetime.

Potential Impact	Design Envelope Scenario Assessed
Maintenance (O&M) activity	During operation, it is assumed that an indicative worst-case failure rate of the marine cables would require one repair every 10-12 years. Should repair and maintenance works be required, it is anticipated that the works would be of shorter duration and smaller in extent than the construction stage.
Habitat Loss	Total area of original habitat loss is 0.39 km^2 due to non-burial protection. Based on worst case non-burial protection for rock placement (0.38 km^2) and cable crossing protection (0.007 km^2).

8.6.3 CONSTRUCTION (AND DECOMMISSIONING) IMPACTS

8.6.3.1 Potential impacts from construction of the Proposed Development are:

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

8.6.3.2 For the purposes of the PEIR assessment, no consideration of the potential impacts of construction of the flotation pits, grounding of vessels at low tide or the use of TSHD for cable trenching is included in the below assessment. If these methods remain part of the final Project design, impacts associated with these activities will be assessed for the ES. The potential impact of heat emissions will also be considered within the ES.

Direct Seabed Disturbance

8.6.3.3 Habitats within the Marine Cable Corridor are likely to be affected by direct disturbance. A number of activities may affect various locations along the route, including route preparation (PLGR, boulder removal, sediment clearance), or cable burial (plough, jet trenching, or mechanical trenching).

8.6.3.4 Due to the use of HDD methods under the intertidal and nearshore subtidal areas out to the vicinity of the HDD exit/entry point is located (approx. 1-1.5 km from Eastney beach), no direct seabed disturbance impacts are predicted on these features.

8.6.3.5 The HDD activities will be located between KP1.0 and KP1.6. Activities at the HDD entry/exit location will consist of a range of disturbance events with a footprint of *c.*0.004 km^2. The potential disturbance from up to two jack up barges and two trestles is likely also smaller compared to works that include the HDD pit excavation, temporary cable protection at the HDD location as well as the disturbance potentially caused by pre-lay grapnel run or boulder clearance that will have already occurred.

8.6.3.6 No impacts are predicted on the marine environment as a result of the HDD operations across Langstone Harbour.

8.6.3.7 The maximum footprint of impact is 3.3 km^2, and it 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[2]. 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.

8.6.3.8 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.

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

8.6.3.9 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). Based upon the design envelope and worst-case assessment, a maximum of 3.3 km^2 has the potential to be disturbed, which represents 0.01% of the available area of these habitats within the eastern Channel, and 6% of the available habitat within the Marine Cable Corridor.

8.6.3.10 Both 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 (max 5.1 m). 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.

8.6.3.11 However, 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 time frame following cessation of activities.

[2] The sum of impact areas from each habitat assessed may exceed 3.3 km^2 due to the worst case assessment applied – however total seabed disturbance will not exceed 3.3 km^2.

Infralittoral Mobile Clean Sand with Sparse Fauna

8.6.3.12 Infralittoral fine sands are only present close to the Landfall and cover an area of *c.* 0.5 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.* 0.004 km^2 has the potential to be disturbed, which represents 0.001% of the available area of these habitats within the eastern Channel, and 0.7% of the available habitat within the Marine Cable Corridor.

8.6.3.13 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.

8.6.3.14 Seabed preparation and HDD activities that may occur in this area (e.g. jack up placement and 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 (Tillin, 2016b).

Infralittoral Mixed Sediments

8.6.3.15 Infralittoral mixed sediments are located relatively close to Eastney (within about 10 km of the shore) and cover an area of 9 km^2 of the Marine Cable Corridor. The community present in this area had relatively high abundances and was dominated by molluscs, with annelids, echinoderms and crustacea also present. Based upon the design envelope and worst-case assessment, a maximum of 2.48 km^2 has the potential to be disturbed, which represents.16.6% of the available area of these habitats within the eastern Channel, and 27.6% of the available habitat within the Marine Cable Corridor.

8.6.3.16 Both the epifaunal and the infaunal species present are likely to be sensitive to physical disturbance (Readman, 2016). 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, 2016). 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.

8.6.3.17 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, 2016).

8.6.3.18 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 and populations are likely to return to pre-affected levels within a very short time frame following cessation of activities.

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

8.6.3.19 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 envelope and worst-case assessment, a maximum of *c.* 0.02 km^2 has the potential to be disturbed, 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%.

8.6.3.20 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.

8.6.3.21 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, 2016b) with recovery unlikely in the short to medium term.

Moderate Energy Circalittoral Rock

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

8.6.3.23 Areas of bedrock (*c.* 0.3 km^2) were observed as rocky outcrops in areas of otherwise coarse sediments in approximately 20 m water depth.

8.6.3.24 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.* 0.1 km^2 has the potential to be disturbed, which represents 0.1% of the available area of these habitats within the eastern Channel, and 37.7% of the available habitat within the Marine Cable Corridor.

8.6.3.25 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.

8.6.3.26 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.

8.6.3.27 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

8.6.3.28 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.

8.6.3.29 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.

8.6.3.30 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.

8.6.3.31 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.

Temporary increase in Suspended Sediments

8.6.3.32 Plume dispersion modelling is being undertaken for the Project, however the results of this are not available to inform the PEIR. The following assessment is based upon available data sources and will be validated, and updated where required, once the modelled data is available.

8.6.3.33 Activities associated with seabed preparation (e.g. deposit of dredged material) and cable installation have the potential to lead to local increases in SSC (Chapter 6 Physical Processes).

8.6.3.34 It is expected that SSC may be elevated above background levels in the short term (hours-days) from seabed preparation and cable installation activities. Based on prevailing current information, in locations further offshore, the sediment plume may extend out for some distance from the point of deposit of material, whilst in more nearshore areas, the plume is likely to remain more localised.

8.6.3.35 The worst case for increased SSC is considered to arise through the deposit of dredge material and or MFE activities (i.e. pre-sweeping). It is expected that elevated levels of SSC that could occur as a result of the deposition of dredge material will peak above background storm levels, but such areas are likely to be highly localised and return to within comparable background concentrations within days of the deposit events.

8.6.3.36 Other seabed preparation and installation activities are also likely to raise SSC, however maximum levels arising, and the extent and duration of any plume will be limited and significantly lower in all cases than those arising from dredge deposition. Maximum SSC from other seabed preparation and installation activities is likely to be less than 100 mgl^{-1} (max 200 mgl^{-1} only in very shallow water depths of *c.* 5 m) with a plume extending no further than 2 km, and background levels established within 90 hours of cessation of the activity (Chapter 6 Physical Processes).

8.6.3.37 Literature indicates that background levels of SSC within the Solent are naturally higher than that of the English Channel, resulting in a spatial zonation in the English Channel between highly turbid coastal waters with mean near surface SSC of 10-25 mgl^{-1} and waters further offshore with low concentrations of 2 to 3 mgl^{-1} (Guillou, *et al.*, 2017). Storm events can reportedly raise SSC in nearshore naturally turbid environments by a factor of 10-20, with SSC reported up to 95 mgl^{-1} in coastal locations in the Channel (Guillou *et al.*, 2017; RSK Environmental Ltd, 2012). Further offshore, storm events can cause SSC levels to reach *c.* 20 mgl^{-1} (Guillou *et al.*, 2017).

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

8.6.3.38 Coarse sediment habitats are present within the Marine Cable Corridor from KP 19 out to the EEZ, and extend for considerable distance to both the east and west (EMODnet, 2016)

8.6.3.39 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

8.6.3.40 Infralittoral mobile clean sand with sparse fauna is present within the very nearshore. 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 deposition activities are considered likely to return to background levels quickly, especially considering the high energy environment present in this area.

8.6.3.41 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

8.6.3.42 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 (e.g. days-weeks following the completion of activities).

8.6.3.43 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 period 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.

8.6.3.44 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

8.6.3.45 A number of patches of moderate energy circalittoral rock exist within the wider area of coarse sediments and as such may be exposed to elevated SSC.

8.6.3.46 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 collected within this habitat. 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.

8.6.3.47 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.

Assessment of Significance – Temporary increases in SSC

8.6.3.48 Potential increases in SSC could occur as a result of seabed preparation and cable installation activities. SSC is likely to peak above storm levels but be back within comparable background concentrations within days.

8.6.3.49 Overall, the habitats present within and adjacent to the Marine Cable Corridor have limited sensitivity to such short term 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 variability. No effects to the functioning of any of the habitats affected are predicted, and as such the effect of temporary increases in SSC is deemed not to be significant.

8.6.3.50 It is recognised that a number of protected and potentially sensitive habitats and species do exist in proximity to the Marine Cable Corridor in the nearshore area which could be impacted by increases in SSC (i.e. Table 8.4, Table 8.5). The impact to these features from increased SSC will be assessed in full in the ES, but it is not included within this PEIR document due to a lack of model outputs allowing a robust and proportionate assessment.

Deposition of Sediment (Smothering)

8.6.3.51 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 however expected that the majority of deposited material will remain within the Marine Cable Corridor. It is considered that levels of deposition could be relatively high (e.g. in excess of 1000 mm) depending upon location, dredged material composition, and dredger hopper size.

8.6.3.52 Other seabed preparation and installation activities are also likely to result in resuspension and deposition of sediments, however maximum levels arising, and the area over which they will be distributed, will be highly limited and lower in all cases than those arising from dredge deposition (Chapter 6 Physical Processes).

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

8.6.3.53 Coarse sediment habitats are present along the Marine Cable Corridor from approximately KP 19 out to the EEZ boundary line.

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

8.6.3.55 There is potential for material to be deposited outside the Marine Cable Corridor at low levels, however coarse sediment habitats exist to either side of the Marine Cable Corridor for some distance (EMODnet, 2016) and as such all sediment deposits (fine material will likely be resuspended – see assessment of increased SSC) will be on comparable sediment types.

8.6.3.56 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 200-500 mm in sand, whilst any small sessile species attached to the sand or gravels would likely suffer mortality under such levels (Tillin, 2016b). Areas of light temporary deposition such as those encountered outside the Marine Cable Corridor are likely to have no effect on the faunal component of this habitat.

8.6.3.57 Although it is considered that the majority of deposited sediment will exceed survivable depths by species inhabiting this habitat, the area affected is very small (limited to the area immediately beneath 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 – In Tillin, 2016b). 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

8.6.3.58 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 (including potential HDD exit pits) the predicted depths of sediment deposition are likely to be relatively low.

8.6.3.59 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

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

8.6.3.61 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.

8.6.3.62 Activities in this area which leads 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 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

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

8.6.3.64 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.

8.6.3.65 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

8.6.3.66 No dredging and thus no deposition of sediment is currently predicted on the small areas of *Ophiothrix fragilis* and/or *Ophiocomina nigra* brittlestar beds on sublittoral mixed sediment which are located near to the EEZ. However, this will be kept under review as results of the physical process modelling become available.

Assessment of Significance - Deposition of Sediment (Smothering)

8.6.3.67 The habitat areas affected by the deposition of dredged sediment are likely to be very small, and in the main will be constrained to within the Marine Cable Corridor. Some loss of abundance may result within these areas, 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, smothering resulting from deposited sediment is considered not to result in significant effects.

Impacts from the Resuspension of Contaminated Sediments

8.6.3.68 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 events and do not indicate a pattern or common source.

8.6.3.69 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

8.6.3.70 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 there is no potential for significant effects to arise from this impact.

8.6.4 OPERATION IMPACTS (INCLUDING REPAIR AND MAINTENANCE)

8.6.4.1 Potential operational impacts of the Proposed Development on receptors are:

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

Seabed Disturbance

8.6.4.2 The Proposed Development has been designed so that 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

8.6.4.3 No specific locations for repair activities are possible to define at this time. However, as any such repair work will be infrequent 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, no significant impacts are predicted to arise through disturbance due to O&M activity.

Habitat Loss

8.6.4.4 Chapter 3 - Description of the Proposed Development identifies locations where it may not be possible to bury the marine cables and thus where non-burial protection will be required (Figure 3.5 Sheets 1-4).

8.6.4.5 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). Due to the use of HDD under the intertidal, no habitat loss is predicted in the intertidal area.

8.6.4.6 The maximum footprint of impact is 0.39 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 predicted burial depths are not met during construction and/or if further non- burial protection is required during maintenance/repair activities during operation.

8.6.4.7 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.

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).

8.6.4.9 The greatest amount of coarse sediment habitat that could be lost due to non-burial protection is 0.8% of the total area of coarse sediment habitat within the Marine Cable Corridor. This equates to 0.001% of available habitat within the eastern Channel.

Infralittoral Mobile Clean Sand with Sparse Fauna

8.6.4.10 Infralittoral fine sands are only present close to the Landfall and cover an area of *c.* 0.5 km^2 within the Marine Cable Corridor. As such, this habitat will largely be avoided by installation activities other than the HDD entry/exit, although some cable protection may occur towards the offshore edge of the habitat depending on final HDD entry/exit location.

8.6.4.11 The greatest amount of infralittoral mobile clean sand habitat that could be lost due to non-burial protection is 3.7% of the total within the Marine Cable Corridor. This equates to 0.003% of available habitat within the eastern Channel.

Infralittoral Mixed Sediments

8.6.4.12 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.

8.6.4.13 The greatest amount of infralittoral mixed sediment habitat that could be lost due to non-burial protection is 3.9% of the total within the Marine Cable Corridor. This equates to 2.4% of available habitat within the region (Channel).

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

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

8.6.4.15 The greatest amount of this habitat that could be lost due to non-burial protection is 11% 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 0.001%.

Moderate Energy Circalittoral Rock

8.6.4.16 A small area (*c.* 0.3 km^2) of moderate energy circalittoral rock habitat (as exposed bedrock) occurs in patches along the Marine Cable Corridor.

8.6.4.17 The greatest amount of this habitat that could be lost due to non-burial protection is 9.4% of the total habitat area within the Marine Cable Corridor. This equates to 0.03% of available habitat within the eastern Channel.

Assessment of Significance - Habitat Loss

8.6.4.18 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.

8.6.4.19 Although the loss is considered long term, 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 function of the remaining habitats.

8.6.4.20 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.

8.6.5 CUMULATIVE EFFECTS ASSESSMENT

8.6.5.1 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.

8.6.5.2 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 have been considered (Appendix 8.3 Cumulative Effects Assessment Matrix).

8.6.5.3 As detailed in Chapter 28 Cumulative Effects, the CEA is to be undertaken with regards to PINS Advice Note 17 – Cumulative Effects Assessment (PINS, 2015). The list of projects presented in Appendix 8.3 Cumulative Effects 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 (20 km – 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.

8.6.5.4 Of all impacts assessed, only increases in suspended sediment and associated smothering (during construction (and decommissioning)) have the potential to interact cumulatively with other projects. Those projects where a significant cumulative impact was considered a possibility are identified below:

- AQUIND Interconnector (France); and
- IFA2.

8.6.5.5 The cumulative assessment for these projects is yet to be undertaken and will be detailed in the ES to be submitted in support of the application for development consent in due course.

8.6.6 TRANSBOUNDARY EFFECTS

8.6.6.1 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.

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

8.7 PROPOSED MITIGATION

8.7.1.1 At this stage, the approach to assessment in this chapter assumes that mitigation measures embedded into the design (e.g. routing the cable to avoid constraints, use of appropriate construction techniques, pollution prevention measures) or which constitute industry standard environmental plans and best practice will be in place. As the final design evolves further detail on all embedded mitigation measures will be provided and assessments will reflect all the embedded and proposed mitigation measures within the ES.

8.7.1.2 Embedded mitigation has been included within the assessment, and no further mitigation requirements have been identified to date.

8.7.2 CONSTRUCTION (AND DECOMMISSIONING)

8.7.2.1 No potentially significant effects are predicted to arise on benthic ecology features as a result of the construction of the Proposed Development (based upon those impacts and receptors assessed within this PEIR chapter). Therefore, no additional mitigation is proposed.

8.7.3 OPERATION

8.7.3.1 No potentially significant effects are predicted to arise on benthic ecology features as a result of the operation or repair/maintenance of the Proposed Development (based upon those impacts and receptors assessed within this PEIR chapter). Therefore, no additional mitigation is proposed.

8.8 RESIDUAL EFFECTS

8.8.1.1 Table 8.8 details summarises the significance of effects of all impacts assessed as part of this PEIR chapter.

Table 8.8 – Summary of effects

Project Phase	Potential Impact	Receptor	Significance	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	N/A
		Infralittoral mobile clean sand with sparse fauna	Not significant	None	N/A
		Infralittoral mixed sediments	Not significant	None	N/A
		Ophiothrix fragilis and/or *ophiocomina nigra* brittlestar beds on sublittoral mixed sediment	Not significant	None	N/A
		Moderate energy circalittoral rock	Not significant	None	N/A
	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	N/A
		Infralittoral mobile clean sand with sparse fauna	Not significant	None	N/A
		Infralittoral mixed sediments	Not significant	None	N/A
		Moderate energy circalittoral rock	Not significant	None	N/A

Project Phase	Potential Impact	Receptor	Significance	Mitigation	Significance of Residual Effect
		Ophiothrix fragilis and/or *ophiocomina nigra* brittlestar beds on sublittoral mixed sediment	No impact	None	N/A
	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	N/A
		Infralittoral mixed sediments	Not significant	None	N/A
		Infralittoral mobile clean sand with sparse fauna	Not significant	None	N/A
		Moderate energy circalittoral rock	Not significant	None	N/A
		Ophiothrix fragilis and/or *ophiocomina nigra* brittlestar beds on sublittoral mixed sediment	No impact	None	N/A
	Impacts from the resuspension of contaminated sediment	All receptors	Not significant	None	N/A
Operation (including repair and maintenance)	Disturbance due to Operation and	All receptors	Not significant	None	N/A

Project Phase	Potential Impact	Receptor	Significance	Mitigation	Significance of Residual Effect
	Maintenance (O&M) activity				
	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	N/A
		Infralittoral mobile clean sand with sparse fauna	Not significant	None	N/A
		Infralittoral mixed sediments	Not significant	None	N/A
		Ophiothrix fragilis and/or *ophiocomina nigra* brittlestar beds on sublittoral mixed sediment	Not significant	None	N/A
		Moderate energy circalittoral rock	Not significant	None	N/A

8.9 SUMMARY AND CONCLUSION

BASELINE

8.9.1.1 A comprehensive baseline has been developed describing the benthic ecology along the Marine Cable Corridor relating to the Proposed Development and the surrounding area, including through use of project specific data from benthic and intertidal survey work.

8.9.1.2 Intertidal habitats present at the Landfall location include shingle banks, sedimentary habitats, rocky shore habitats, and vegetated shingle. Subtidal habitats present within the Marine Cable Corridor include mobile fine sands, mixed sediments, coarse sediments, and subtidal rock.

8.9.1.3 A single area of potential Annex I habitat was identified near to the EEZ, although this habitat is not within any designated or proposed protected area.

ASSESSMENT

8.9.1.4 The following impacts were assessed on relevant receptors:

- Construction (and decommissioning)
  - Direct Seabed disturbance;
  - Temporary increase in suspended sediment concentrations;
  - Deposition of sediment (smothering); and
  - Impacts from the resuspension of contaminated sediment.
- Operation (incl. repair/maintenance)
  - Disturbance due to O&M activity; and
  - Habitat loss.

8.9.1.5 A cumulative screening exercise was also undertaken which identified the following projects as having the potential to lead to significant cumulative effects:

- AQUIND Interconnector (France); and
- IFA2.

8.9.1.6 The potential for cumulative effects with these projects will be assessed in the ES to be submitted in support of the application for development consent.

8.9.1.7 While there is potential for any sediment plume arising to extend into French waters, transboundary impacts are not currently considered to have the potential to be significant. This will be further assessed in detail within the final ES.

MITIGATION

8.9.1.8 No mitigation has been proposed to date.

RESIDUAL EFFECTS

8.9.1.9 No potentially significant effects are predicted to arise on the benthic ecology features assessed as a result of the construction, decommissioning and operation (including repair and maintenance) of the Proposed Development. No further mitigation requirements were identified. Therefore, no residual effects were identified.

CONCLUSION

8.9.1.10 This chapter provides the PEIR of benthic ecology for the Proposed Development (as described in Chapter 3 Description of the Proposed Development and accounting for activities excluded from assessment in Section 8.4.4) based upon the data available at the time of production. No potentially significant effects are currently predicted to arise on the benthic ecology features assessed.

8.10 ASSESSMENTS AND SURVEYS STILL TO BE UNDERTAKEN

8.10.1.1 A number of additional assessments will be undertaken for submission with the ES, including:

- Assessment of impacts arising from construction and operation of flotation pits, use of a TSHD vessel for trenching and vessel groundings;
- Assessment of impacts from increased SSC on nearshore protected and/or sensitive features in proximity to the Marine Cable Corridor;
- CEA;
- HRA for SACs with benthic interest features; and
- MCZ Assessment.

REFERENCES

APEM, Thomas, P.M.D., Pears, S., Hubble, M. & Pérez-Dominguez, R. (2016). Intertidal sediment surveys of Langstone Harbour SSSI, Ryde Sands and Wootton Creek SSSI and Newtown Harbour SSSI. Scientific Report 414122. Natural England, April 2016. [Accessed on: 28/11/2018].

Biodiversity Action Plan for Hampshire (2003) volume II. Available from: http://www.hampshirebiodiversity.org.uk/pdf/PublishedPlans/Coastal_BAP.pdf [Accessed on: 28/11/2018].

CEFAS, Judd A., (2011) Guidelines for data acquisition to support marine environmental assessments for offshore renewable energy projects [Accessed on: 28/11/2018].

Channel Coastal Observatory (2016) National Network of Regional Coastal Monitoring Programmes of England. Available from: https://www.channelcoast.org/ [Accessed on: 03/01/2019]

CIEEM (2018) Guidelines for Ecological Impact Assessment in the UK and Ireland: Terrestrial, Freshwater, Coastal and Marine. Chartered Institute of Ecology and Environmental Management, Winchester. [Accessed on: 28/11/2018].

Clarke KR, Warwick RM (2001). Change in Marine Communities: An Approach to Statistical Analysis and Interpretation. Primer-E Ltd: Plymouth, UK [Accessed on: 28/11/2018].

Connor, D.W., Allen, J.H., Golding, N., Howell, K.L., Lieberknecht, L.M., Northen, K.O. & Reker, J.B. (2004). The Marine Habitat Classification for Britain and Ireland. Version 04.05. Joint Nature Conservation Committee, Peterborough. www.jncc.gov.uk/MarineHabitatClassification [Accessed on: 28/11/2018].

Davies, J., Baxter, J., Bradley, M., Connor, D., Khan, J., Murray, E., Sanderson, W., Turnbull, C. & Vincent, M., (2001), Marine Monitoring Handbook, 405 pp, ISBN 1 85716 550 0 [Accessed on: 28/11/2018].

De-Bastos, E.S.R. and Hill, J. (2016b) Polydora sp. tubes on moderately exposed sublittoral soft rock. In TylerWalters H. and Hiscock K. (eds) Marine Life Information Network: Biology and Sensitivity Key Information Reviews, [on-line] [Accessed on: 28/11/2018].

EMODnet (2016) Broad-scale seabed habitat map for Europe. Available from: http://www.emodnet-seabedhabitats.eu/access-data/launch-map-viewer/. [Accessed on: 20/08/2018].

EMU Limited. (2008a). South Coast Dredging Association (SCDA). South Coast Regional Environmental Assessment. Macrobenthic Ecology Survey. Final Report. [Accessed on: 28/11/2018].

EMU Limited. (2008b). South Coast Dredging Association (SCDA). South Coast Regional Environmental Assessment. Benthic Review. Final Report. [Accessed on: 28/11/2018].EMU

Limited. (2012). South Coast Marine Aggregate Regional Environmental Assessment, Volume 1 and 2. Report for the South Coast

EUNIS (2018) European Nature Information System, Find species, Habitat types and protected sites across Europe, European Environment Agency. Available from: https://eunis.eea.europa.eu/index.jsp. [Accessed on: 03/01/2019]

ESCP (2012) Eastern Solent Coastal Partnership. Southsea and North Portsea Island Coastal Flood and Erosion Risk Management Schemes. Scoping Stage Report. Technical Report 11: Environmental. [Accessed on: 28/11/2018].

Guillou N., Rivier A., Chapalain G., Gohin F., (2017) The impact of tides and waves on near-surface suspended sediment concentrations in the English Channel Oceanologia (2017) 59, 28—36 [Accessed on: 28/11/2018].

Halcrow Group Ltd (2008) Portsmouth City Council: Portsea Island Coastal Strategy Study Strategic Environmental Assessment Environmental Report. Available from: https://www.escp.org.uk/sites/default/files/documents/5.1_PICSS-Strategic-Environmental-Assessment.pdf. [Accessed: 21/06/2018].

Hitchin, R., Turner, J.A., Verling, E. (2015). Epibiota remote monitoring from digital imagery: Operational guidelines. [Accessed on: 28/11/2018].Institute of Ecology and Environmental Management, (2010). Guidelines for Ecological Impact Assessment in Britain and Ireland. Marine and Coastal. s.l.:s.n. [Accessed on: 28/11/2018].

IFA2 ES (2016) IFA2 UK Offshore Development Environmental Statement. Version 1.0. Document Reference: IF2-ENV-STM-0024. [Accessed on: 28/11/2018].

Irving (1996) Chapter 4.2 The Sea Bed. In: Coasts and seas of the United Kingdom. Region 9 Southern England: Hayling Island to Lyme Regis, ed. by J.H. Barne, C.F. Robson, S.S. Kaznowska, J.P. Doody & N.C. Davidson, 61-64. Peterborough, Joint Nature Conservation Committee. (Coastal Directories Series.) [Accessed on: 28/11/2018].

Irving, R. (2009). The identification of the main characteristics of stony reef habitats under the Habitats Directive. Summary report of an inter-agency workshop 26-27 March 2008. JNCC Report No. 432 [Accessed on: 28/11/2018].

Jackson, A. & Hiscock, K. (2008). Sabellaria spinulosa Ross worm. In Tyler-Walters H. and Hiscock K. (eds) Marine Life Information Network: Biology and Sensitivity Key Information Reviews, [on-line]. Plymouth: Marine Biological Association of the United Kingdom. [cited 21-11-2018]. Available from: https://www.marlin.ac.uk/species/detail/1133. [Accessed on: 28/11/2018].

James, J.W.C, Pearce, B, Coggan, R.A, Leivers, M, Clark, R.W.E, Plim, J.F, Pinnion, J, Barrio Frójan, C, Gardiner, J.P., Morando, A, Baggaley, P.A, Scott, G, Bigourdan, N. (2010) The South Coast Regional Environmental Characterisation. British Geological Survey Open Report OR/09/51. 249 pp. [Accessed on: 28/11/2018].

JNCC SACFOR abundance scale use for both littoral and sublittoral taxa from 1990 onwards (updated 2017). Available from http://jncc.defra.gov.uk/page-2684 [Accessed on 03/01/2019]

Mason C., (2016), NMBAQC's Best Practice Guidance, Particle Size Analysis (PSA) for Supporting Biological Analysis 77 pp. [Accessed on: 28/11/2018].

Martin, C, Carpentier, A, Warembourg, C, Coppin, F, Curet, L, Dauvin, J.C, Delpech, J, Desroy, N, Dewarumez, J.M, Dupuis, L and Ernande, B. (2007) Eastern Channel habitat atlas for marine resource management (CHARM): from a descriptive approach (phase I) to a process-oriented approach (phase II). *Aquatic Living Resources*, *22*(4). [Accessed on: 28/11/2018].

MESL (2015) Solent Maritime European Marine Site Sandbank Habitat Mapping Project: Solent Maritime SAC – (2015). Prepared for Natural England. Available at: publications.naturalengland.org.uk/file/5275315539017728. [Accessed on: 28/11/2018].

MMO (2013) Marine conservation zones and marine licensing. Available from: https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/410273/Marine_conservation_zones_and_marine_licensing.pdf [Accessed on: 28/11/2018].

Natural England (2018), Designated Sites View. Available from https://designatedsites.naturalengland.org.uk/SiteSearch.aspx. [Accessed on: 03/01/2019]

NBN atlas (2017), National Biodiversity Network. Available from: https://nbnatlas.org/. [Accessed on: 03/01/2019]

OSPAR, (2009), Overview of the impacts of anthropogenic underwater sound in the marine environment. Available from: http://www.ospar.org/documents/dbase/publications/p00441_Noise%20Background%20document.pdf. [Accessed on: 28/11/2018].

Parry, M.E.V. (2015). Guidance on Assigning Benthic Biotopes using EUNIS or the Marine Habitat Classification of Britain and Ireland JNCC report No. 546 Joint Nature Conservation Committee, Peterborough.

PINS (2015) Advice Note Seventeen: Cumulative Effects Assessment. Available online from: https://infrastructure.planninginspectorate.gov.uk/legislation-and-advice/advice-notes/ [Accessed 02/01/2019]

Portsmouth City Council (2014) Eastney Beach Habitat Restoration and Management Plan Supplementary Planning Document. Available at: https://www.portsmouth.gov.uk/ext/documents-external/dev-eastneybeach-habitat-restoration-management-plan-spd.pdf. [Accessed: 29/06/2018].

Rampion ES (2012) Environmental Statement Section 7: Benthos and Sediment Quality. Document 6.1.7. [Accessed on: 28/11/2018].

Readman, J.A.J. (2016). Flustra foliacea on slightly scoured silty circalittoral rock. In Tyler-Walters H. and Hiscock K. (eds) Marine Life Information Network: Biology and Sensitivity Key Information Reviews, [on-line]. Plymouth: Marine Biological Association of the United Kingdom. Available from: http://www.marlin.ac.uk/habitat/detail/24 [Accessed on: 28/11/2018].

RSK Environment Ltd, 2012. Rampion Offshore Wind Farm Environmental Statement. s.l.:s.n. [Accessed on: 28/11/2018].

Tillin, H.M. & Riley, K., (2016a). [Rhodothamniella floridula] on sand-scoured lower eulittoral rock. In Tyler-Walters H. and Hiscock K. (eds) Marine Life Information Network: Biology and Sensitivity Key Information Reviews, [on-line]. Plymouth: Marine Biological Association of the United Kingdom. [cited 21-11-2018]. Available from: https://www.marlin.ac.uk/habitat/detail/12 [Accessed on: 28/11/2018].

Tillin, H.M. & Tyler-Walters, H. (2016b). Pomatoceros triqueter with barnacles and bryozoan crusts on unstable circalittoral cobbles and pebbles. In Tyler-Walters H. and Hiscock K. (eds) Marine Life Information Network: Biology and Sensitivity Key Information Reviews, [online]. Plymouth: Marine Biological Association of the United Kingdom. Available from: http://www.marlin.ac.uk/habitat/detail/177 [Accessed on: 28/11/2018].

Wyn, G, Brazier, D P and McMath, A J (2000) CCW handbook for marine intertidal Phase 1 survey and mapping. CCW Marine Sciences Report: 00/06/01. [Accessed on: 28/11/2018].