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Environmental Statement – Volume 1 – Chapter 11 Marine Ornithology

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11. MARINE ORNITHOLOGY

11.1. SCOPE OF ASSESSMENT

11.1.1. INTRODUCTION

11.1.1.1. This chapter considers information regarding the potential effects on Marine ornithological features associated with construction, operation (including repair and maintenance) and decommissioning of the Proposed Development.

11.1.1.2. The potential effects of decommissioning are, in the worst case, considered to be equivalent to the effects associated with construction and are assessed on this basis, though they may potentially be less than those associated with construction depending on the decommissioning activities undertaken, for instance where the Marine Cable is left in situ.

11.1.1.3. Marine ornithological receptors present seaward of the mean low water springs (‘MLWS’) are covered in this chapter. Terrestrial and intertidal ornithological receptors present landward of the MLWS are considered separately in Chapter 16 (Onshore Ecology) of the ES Volume 1 (document reference 6.1.16).

11.1.1.4. This chapter should be read in conjunction with Chapter 8 (Intertidal and Benthic Habitats) of the ES Volume 1 (document reference 6.1.8) and Chapter 9 (Fish and Shellfish) of the ES Volume 1 (document reference 6.1.9) which contain relevant information on prey species, in addition to Chapter 16 (Onshore Ecology), Chapter 13 (Shipping, Navigation and Other Marine Users) of the ES Volume 1 (document reference 6.1.13), and Chapter 6 (Physical Processes) of the ES Volume 1 (document reference 6.1.6), which provide further information regarding potential effects.

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

11.1.1.6. Where effects arise as a result of the combination of the impacts of the Proposed Development and the effects of other projects in the UK Marine Area and/or other Member States, these are also identified and assessed in Section 11.7.

11.1.2. STUDY AREA

11.1.2.1. The Entire Marine Cable Corridor extends from Eastney, UK, to Pourville located on the Normandy coast of 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 (see Figure 3.1 of the ES Volume 2 (document reference 6.2.3.1)).

11.1.2.2. Assessment is also presented on the potential effects from sheet piling works that are associated with onshore Horizontal Directional Drilling ('HDD') construction activities at HDD1 (onshore Landfall works), HDD2 (allotments) and HDD3 (Langstone Harbour crossing) locations. The location of onshore HDD works is presented as a table in Chapter 3 (Description of the Proposed Development) in the ES Volume 1 (document reference 6.1.3) and are shown in Figure 3.9 of the ES Volume 2 (document reference 6.2.3.9).

Landfall

11.1.2.3. The Marine Cables will make Landfall using HDD methods which will travel underneath the intertidal areas at Eastney between an exit/entry point in the Marine environment beyond 1 km (between Kilometre Point ('KP') 1 and KP 1.6) and the Transition Joint Bays ('TJB') located in the car park behind Fraser Range (Figure 3.3 of the ES Volume 2 (document reference 6.2.3.3)). It is not determined yet whether the HDD direction will be onshore to Marine, Marine to onshore, or drilling from both ends. For the purposes of this assessment, the area of study at Landfall at Eastney is seaward of MLWS to the HDD Marine exit/entry points.

11.1.2.4. HDD is also proposed to be undertaken at Langstone Harbour to enable the cables to cross underneath Langstone Harbour from Portsea Island to the mainland (see sheet 2 of Figure 3.9 – section 7 of this map). No HDD works will occur within the Marine environment of Langstone Harbour as the drilling will be underneath the seabed of the harbour area, and the entry/exit points of the drill will be located above the mean high-water springs ('MHWS') mark. It has been agreed with the Marine Management Organisation ('MMO') that this is an exempt activity that does not require a Marine Licence, subject to the conditions of Article 35 of Marine Licensing (Exempted Activities) Order 2011 (as amended). The Consultation Report provides further detail on this and other consultations (document reference 5.1).

11.1.2.5. For consideration of intertidal birds, a description of the baseline methodology (including definition of the study area) and assessment of potential effects is presented in Chapter 16 (Onshore Ecology) and Appendix 16.13 (Wintering Bird Report) of the ES Volume 3 (document reference 6.3.16.13).

Marine Cable Corridor

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

11.1.2.7. For Marine birds, given their usually highly mobile nature, a study area of 100 km from the Marine Cable Corridor has been assumed, as birds occurring anywhere in this region could reasonably be expected to at least occasionally occur in the Marine Cable Corridor. Species originating from outside this study area are also considered where a clear ecological link could be established with the Proposed Development

(Figures 11.1 and 11.2 of the ES Volume 2 (document references 6.2.11.1 and 6.2.11.2).

11.2. LEGISLATION, POLICY AND GUIDANCE

11.2.1.1. This assessment has taken into account the current legislation, policy and guidance relevant to Marine ornithology. These are listed below.

11.2.2. LEGISLATION

International Legislation

- European Commission ('EC') Directive 2009/147/EC (codified version of 79/409/EC) on the Conservation of Wild Birds (the 'Birds Directive');
- EC Directive 92/43/EEC on the conservation of natural habitats and of wild fauna and flora (known as the 'Habitats Directive');
- Ramsar Convention on Wetlands of International Importance (1971).

National Legislation

- The Conservation of Habitats and Species Regulations (2017) (known as the 'Habitats Regulations') which transpose the Habitats Directive into national law. This legislation covers waters within the 12-nautical mile ('nmi') limit (known as Territorial Waters);
- The Conservation of Offshore Marine Habitats and Species Regulations (2017) (known as the 'Offshore Regulations') which transpose the Habitats Directive into UK law for all offshore activities. This legislation covers UK waters beyond the 12 nmi limit;
- Wildlife and Countryside Act (1981);
- Marine and Coastal Access Act (2009); and
- Natural Environment and Rural Communities Act (2006) ('NERC').

11.2.3. PLANNING POLICY

National Policy

- EN-1 Overarching National Policy Statement for Energy (2011).

  Para. 5.3.3 states: '*Where the development is subject to EIA the applicant should ensure that the ES clearly sets out any effects on internationally, nationally and locally designated sites of ecological or geological conservation importance, on protected species and on habitats and other species identified as being of principal importance for the conservation of biodiversity. The applicant should provide environmental information proportionate to the infrastructure where EIA is not required to help the IPC consider thoroughly the potential effects of a proposed project*.'

- UK Marine Policy Statement ('MPS') (2011).

  The UK MPS is the framework for preparing Marine Plans and taking decisions affecting the Marine environment (in the absence of an adopted Marine Plan). This policy aims to contribute to the achievement of sustainable development and ensure that development aims to avoid harm to Marine ecology and biodiversity through consideration of issues such as impacts of noise, ecological resources and water quality. The South Marine Plan, which covers the spatial extent of the Proposed Development, was adopted in July 2018, and is the primary Marine policy document.

Regional Policy

11.2.3.1. South Inshore and South Offshore Marine Plan (2018) including:

- Objective 10 includes policies to avoid, minimise or mitigate adverse impacts on Marine protected areas;
- Objective 12 includes policies to avoid, minimise or mitigate significant adverse impacts on natural habitat and species; and
- Policy S-DIST – 1 requires proposals to avoid, minimise or mitigate significant cumulative adverse disturbance or displacement impacts on highly mobile species.

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

Local Policy

- The Hampshire Local Biodiversity Action Plan ('LBAP').

11.2.4. GUIDANCE

- Chartered Institute of Ecology and Environmental Management ('CIEEM') (2019) Guidelines for Ecological Impact Assessment in the UK and Ireland: Terrestrial, Freshwater, Coastal and Marine;
- Planning Inspectorate ('PINS') (2019) - Advice Note Seventeen: Cumulative Effects Assessment;
- PINS (2017) - Advice Note Ten: Habitat Regulations Assessment relevant to Nationally Significant Infrastructure Projects;
- Institute of Environmental Management and Assessment ('IEMA') (2017) Delivering Proportionate Environmental Impact Assessment ('EIA'): A Collaborative Strategy for Enhancing UK Environmental Impact Assessment Practice; and
- OSPAR (2009) Assessment of the Environmental Impacts of Cables.

11.3. SCOPING OPINION AND CONSULTATION

11.3.1. SCOPING OPINION

11.3.1.1. As detailed within Chapter 5 (Consultation) of the ES Volume 1 (document reference 6.1.5), a Scoping Opinion was received by the Applicant from PINS on 7 December 2018. The Scoping Opinion comments from PINS and other key consultees in relation to Marine ornithology and how they were addressed are set out in Table 1 of Appendix 11.1 (Marine Ornithology Consultation Responses) of the ES Volume 3 (document reference 6.3.11.1). Key items that were raised included:

- PINS considered that impacts resulting from the exposure to surface hydrocarbons or chemicals should be assessed where significant effects are likely. As such, assessment of the potential effects arising from accidental spills was included in the Preliminary Environmental Information Report ('PEIR') and has been carried through to this chapter of the ES;
- PINS agreed that barrier effects and collision risk to Marine ornithology could be scoped out of further assessment given the nature of the Proposed Development. These potential effects were therefore scoped out from assessment in the PEIR and are not considered in this chapter of the ES;
- PINS requested that the study area applied for Marine ornithology be clearly presented and justified. The study area is outlined in detail in Section 11.1.2 and is presented in Figure 11.1 and Figure 11.2 of the ES Volume 2 (document references 6.2.11.1 and 6.2.11.2);
- PINS requested that the ES and/or information to inform the HRA should correctly identify LSE on all qualifying features of European sites under consideration. A HRA Report has been submitted as part of the Application, in which LSEs on European sites and their qualifying features have been considered;
- Natural England ('NE') requested that Habitats and Species of Principal Importance in addition to those species included in the LBAP be considered in the assessment. Where relevant, species listed under Section 41 of the NERC Act (2006) and the Hampshire LBAP have been considered in the PEIR and in this chapter of the ES;
- NE supported the consideration of effects arising from disturbance and displacement, and indirectly because of prey disturbance and/or habitat loss. These effects have therefore been assessed within the PEIR and this chapter of the ES;
- NE recommended the use of their Designated Sites View websites in order to identify relevant European sites and features, and that impacts upon European sites should be considered in a separate section of the ES. The Designated Sites

View website has been used to inform a standalone HRA Report which has been submitted as part of the Application;

- NE advised that direct and indirect effects on relevant Sites of Special Scientific Interest ('SSSIs') should be assessed within the ES. Those notified features of SSSIs with potential connectivity to the Proposed Development have been assessed where relevant in the PEIR and in this chapter of the ES; and
- NE highlighted that the ES should include an impact assessment of effects which may arise from the Proposed Development in combination with other projects or activities. As such, a cumulative effects assessment ('CEA') was included in the PEIR and had been updated in this chapter of the ES.

11.3.2. CONSULTATION PRIOR TO PUBLICATION OF THE PEIR

11.3.2.1. Consultation was also undertaken prior to the publication of the PEIR. The items discussed and outcomes are summarised in Table 2 in Appendix 11.1 (Marine Ornithology Consultation Responses). Key items that were raised included:

- In relation to HDD methods in Langstone Harbour, whilst consideration of potential impacts from HDD works on designated sites and features would be required, NE confirmed that survey work in the Marine environment would not be required. As such, a desk-based approach to assessment of potential effects has been undertaken in the PEIR and in this chapter of the ES.

11.3.3. PEIR CONSULTATION

11.3.3.1. Consultation on the PEIR was undertaken between February and April 2019. All of the comments received from the consultation relevant to the assessment are presented in Table 3 in Appendix 11.1 (Marine Ornithology Consultation Responses) however the key items that were raised included:

- NE advised that potential impacts on designated features of the Solent and Dorset Coast proposed Special Protection Area ('pSPA'), Chichester and Langstone Harbours Special Protection Area ('SPA')/Ramsar site, Portsmouth Harbour SPA/Ramsar site and Solent and Southampton Water SPA/Ramsar site should be considered, with reference to NE's Conservation Advice Packages[1]. This advice has been considered in the standalone HRA Report which has been submitted as part of the Application;
- NE welcomed the application of CIEEM guidelines to inform the approach to assessment and were content with the approach outlined in the PEIR. As such, this approach has been carried through to this chapter of the ES;
- NE recommended the inclusion of data from the Seabird Mapping and Sensitivity Tool ('SeaMaST') in the baseline environment for Marine ornithology. This

[1] https://designatedsites.naturalengland.org.uk/

reference has therefore been incorporated into the baseline of this chapter of the ES; and

- NE assumed that the outcomes of the CEA presented in the PEIR would be updated in the final ES. This assumption is correct and an updated CEA has been included in this chapter of the ES.

11.3.4. POST-PEIR CONSULTATION

11.3.4.1. Further consultation with key stakeholders has been undertaken. This was to ensure all species and impacts are assessed. The key items that have been discussed are presented in Table 11.1 below. Further details are provided in the Consultation Report (document reference 5.1).

Table 11.1 - Summary of Post-PEIR Consultation

Consultee	Date (Method of Consultation)	Discussion
NE	13 February 2019 Teleconference	Discussion on the approach to HRA and pre-screening of sites for Annex I habitat, Marine bird, Annex II migratory fish and Marine mammal features.
NE, MMO and Joint Nature Conservation Committee ('JNCC')	7 May 2019 Teleconference	Discussion on the approach to dredge and disposal and the approach to plume dispersion modelling.
NE	27 June 2019 Teleconference	Discussion on the Applicant's responses to the feedback received from NE on the PEIR.
Environment Agency ('EA')	8 July 2019 Email	Agreement on the approach to dredge and disposal and the approach to plume dispersion modelling.
NE	10 July 2019 Email	Advice on Zone of Influence ('ZOI') for the EIA and HRA for Marine ornithology.
MMO	18 July 2019 Teleconference	Discussion on the Applicant's responses to the feedback received from MMO on the PEIR.
MMO	24 July 2019 Email	Further recommendation to include MarineSpace *et al.* (2013b) methodology for identifying potential spawning habitat for herring.
JNCC	24 July 2019 Email	Consultation feedback received on the draft Deemed Marine Licence ('dML')
NE	25 July 2019 Teleconference	Review and discussions on the dML.

Consultee	Date (Method of Consultation)	Discussion
EA	31 July 2019 Email	Review and discussions on the dML.
MMO	1 August 2019 Teleconference	Review and discussions on the dML.
JNCC	13 August 2019 Email	Review and discussions on the dML.
EA	20 August 2019 Email	Review and agreement on the Applicant’s responses to EA feedback on the PEIR.
PINS	23 August 2019 Letter/Email	Feedback on draft HRA
MMO	19 September and 02 October 2019 Email	MMO are content with approach to cumulative assessment and requested one new coastal project to be added to long list.
NE	20 September 2019 Email	Feedback on draft HRA. Natural England has reviewed the environmental baseline data presented and cross-referenced it with a previous review of the PEIR. Natural England are content with the data sources used to inform this environmental baseline.
EA	26 September 2019 Email	Review and feedback on the WFD assessment and draft HRA report.
JNCC	28 September 2019 Email	Feedback on draft HRA
States of Alderney	01 October 2019 Email	Feedback on draft HRA
NE	09 October 2019 Email	NE are content with the plume dispersion modelling approach taken for disposal activities and the resultant outputs with respect to predicted sedimentation and SSC levels, spatial extent and duration.
MMO	11 October 2019 Email	MMO provided feedback that the rationale for the additional 10% non-burial protection contingency during operation looks satisfactory however further clarity to be provided post submission.

Consultee	Date (Method of Consultation)	Discussion
MMO/Cefas	22 October 2019	Review and feedback on the disposal site characterisation report.

11.3.4.2. Consultation on the standalone HRA Report was undertaken with statutory and non-statutory consultees including NE, EA, JNCC and States of Alderney.

11.3.4.3. All comments received from these consultations on the HRA for Marine ornithology specifically are provided in Appendix 4 of the HRA Report (Document Ref: 6.8.3.4).

11.3.4.4. The key items with relevance to EIA for Marine ornithology and pertinent to this chapter of the ES included;

- PINS advised that the Applicant is strongly advised to seek agreement with relevant consultation bodies, including NE, on the approach to baseline data appropriate for use in the HRA.
- NE were content with the application of a 10 km ZOI to the Marine Cable Corridor for the purposes of screening other plans/projects for cumulative assessment (based on the understanding that disturbance/displacement can occur up to *c.*6 km from source). This approach was applied in the PEIR and has been carried through to this chapter of the ES.
- NE were content with the data sources used to inform the environmental baseline used for the HRA.
- NE agreed with the UK SPAs and Ramsar sites screened in for the HRA.
- NE agreed with the approach to HRA in combination assessment and were content with the list of projects identified for assessment.
- EA were content with the approach and conclusions made in the HRA.
- States of Alderney are content with the level of detail within the HRA. Further data on gannets was provided and it was advised that fulmar and shearwaters should be considered in the assessment.

11.3.5. ELEMENTS SCOPED OUT OF THE ASSESSMENT

11.3.5.1. In line with advice received from PINS and NE, barrier effects and collision risk to Marine ornithological features have been scoped out of further assessment in this chapter of the ES.

11.3.6. IMPACTS SCOPED INTO THE ASSESSMENT

11.3.6.1. The following impacts were scoped into the assessment;

- Disturbance and displacement from plant and support vessels working within the Marine Cable Corridor and at the Landfall, as well as onshore HDD works where sheet piling may take place;

- Indirect effects because of seabed disturbance and/or loss on prey availability; and
- Exposure to surface hydrocarbons or chemicals due to accidental spills.

11.3.6.2. Tables 11.11 and 11.12 of this chapter provide further information relating to these potential impacts during construction, operation (including repair and maintenance) and decommissioning of the Proposed Development.

11.4. ASSESSMENT METHODOLOGY

11.4.1.1. The assessment methodology used for Marine ornithology follows that recommended by CIEEM for Marine and coastal developments (CIEEM, 2019). These guidelines set out the process for assessment through the following stages:

- Describing the ornithological baseline within the study area;
- Identifying Important Ornithological Features ('IOFs'): these are the species of highest ornithological importance present in the study area;
- Determining the nature conservation importance of the IOFs present within the study area that may be affected by the Proposed Development;
- Identifying and characterising the potential impacts on these IOFs, based on the nature of the construction, operation, maintenance and decommissioning activities associated with the Proposed Development;
- Determining the magnitude of the impacts including consideration of the sensitivity of the ornithological feature and the duration and reversibility of the effect;
- Determining the significance of the impacts based on the interaction between the effect magnitude/duration, the likelihood of the effect occurring and the nature conservation importance of the IOF. In addition, the sensitivity of the feature affected is also considered for potential ornithological impacts;
- Identifying the counter effect of any embedded mitigation measures to be undertaken, plus any further mitigation measures 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).

11.4.2. EVALUATING FEATURES

11.4.2.1. The assessment process involves identifying IOFs. These ornithological features and their importance are determined by the criteria defined in Table 11.2. These criteria are intended as a guide and are not definitive.

Table 11.2 - Approach to Valuing Ornithological Features

Level of Importance	Example of IOF
International	A species listed as a qualifying feature of an internationally designated site (e.g. SPA or Ramsar)
	Species populations present with sufficient conservation importance to meet criteria for SPA selection
National	A species listed as a notified feature of a nationally designated site (e.g. SSSI).
	Species populations present with sufficient conservation importance to meet criteria for SSSI selection.
Regional	A species occurring within SPAs, Ramsar sites and SSSIs, but not crucial to the integrity of the site.
	Species populations present falling short of SSSI selection criteria but with sufficient conservation importance to likely meet criteria for selection as a local site.
Local	All species described above but which are present very infrequently or in very low numbers.
	Other species of conservation concern, including species included on the UK Bird of Conservation Concern ('BoCC') Red and Amber Lists (Eaton *et al*., 2015).
Negligible	All other species that are widespread and common and which are not present in locally important (or greater) numbers and which are of low conservation concern (e.g. UK BoCC Green List species; Eaton *et al*., 2015).

11.4.2.2. The assessment of ornithological features identified in the baseline considers the importance of the Proposed Development for the species under consideration. To illustrate the rationale of this approach, whilst roseate tern (*Sterna dougallii*) may be a species of international conservation importance using the criteria in Table 11.2, by virtue of being an Annex I species, the importance of a development site to this species is considered limited if only a single sighting of one bird over-flying the Proposed Development has been identified in the baseline.

11.4.2.3. As such, while the importance of the species is considered, in order to assess the nature conservation importance of the Proposed Development the number of individuals of that species using it, and the nature and level of this use, is also taken into account. An assessment is then made of the importance of the Proposed Development to the species in question.

11.4.3. CHARACTERISING POTENTIAL EFFECTS

11.4.3.1. Effects on IOFs are judged in terms of magnitude and duration (Regini, 2000).

11.4.3.2. Magnitude refers to the scale of an impact and is determined on a quantitative basis where possible. This may relate to the area of habitat lost to the development footprint in the case of a habitat feature or predicted loss of individuals in the case of a population of a species of bird. Magnitude is assessed within six levels, as detailed in Table 11.3 (including effects referred to as 'beneficial').

Table 11.3 - Criteria used to Determine the Magnitude of Impacts

Impact Magnitude	Description
Very Highly Adverse	Total or almost complete loss of an ornithological feature resulting in a permanent adverse effect on the integrity of this feature. The conservation status of the ornithological feature would be affected.
Highly Adverse	Result in large-scale, permanent changes in an ornithological feature, and likely to change its ecological integrity. These impacts are therefore likely to result in overall changes in the conservation status of the feature.
Moderately Adverse	Include moderate-scale long-term changes in an ornithological feature, or larger-scale temporary changes, but the integrity of the feature is not likely to be affected. This may mean that there are temporary changes in the conservation status, but these are reversible and unlikely to be permanent.
Minor Adverse	Include impacts that are small in magnitude, have small-scale temporary changes, and where integrity is not affected. These impacts are unlikely to result in overall changes in the conservation status of an ornithological feature.
Negligible	No perceptible change in the ornithological feature.
Beneficial	The changes in the ornithological feature are beneficial to its integrity or nature conservation status.

11.4.3.3. Duration is defined as the time for which the impact is expected to last before recovery, i.e. a return to baseline conditions. This is summarised in Table 11.4 below.

Table 11.4 - Criteria Used for Describing Duration

Duration	Description
Permanent	Effects continuing indefinitely beyond the span of one human generation (taken as approximately 25 years), except where there is likely to be substantial improvement after this period (e.g. the restoration of ground after removal of a development. Such exceptions are termed "very long-term effects")
Temporary	Long-term (15 - 25 years or longer - see above) Medium-term (5 – 15 years) Short-term (up to 5 years)

11.4.3.4. Knowledge of how rapidly the population or performance of a species is likely to recover following loss or disturbance (e.g. by individuals being recruited from other populations elsewhere) is used to assess duration, where such information is available.

11.4.3.5. In addition to magnitude and duration, birds are assessed with consideration to their behavioural sensitivity and ability to recover from temporary adverse conditions. Behavioural sensitivity is determined subjectively based on the species' ecology and behaviour, using the broad criteria set out in Table 11.5. The judgement takes account of information available on the responses of birds to various stimuli (e.g. predators, noise and disturbance by humans).

11.4.3.6. Behavioural sensitivity can differ between similar species and between different populations of the same species. Thus, the behavioural responses of birds are likely to vary with both the nature and context of the stimulus and the experience of the individual bird. Sensitivity also depends on the activity of the bird, for example, a species is likely to be less tolerant of disturbance whilst breeding than at other times. In addition, individual birds of the same species will differ in their tolerance depending on the level of human disturbance that they regularly experience in a particular area, and have become habituated to (e.g. individuals that forage in proximity to an area with high human population and activity levels are likely to have a greater tolerance than those that occupy remote locations with little or no human presence).

Table 11.5 - Behavioural Sensitivity of Birds

Duration	Description
High	Species or populations occupying habitats remote from human activities, or that exhibit strong and long-lasting (guide: > 20 minutes) reactions to disturbance events.

Duration	Description
Moderate	Species or populations that appear to be warily tolerant of human activities or exhibit short-term reactions (guide: 5-20 minutes) to disturbance events.
Low	Species or populations occupying areas subject to frequent human activity and exhibiting mild and brief reaction (including flushing behaviour) to disturbance events.

11.4.4. DETERMINING SIGNIFICANCE

11.4.4.1. Having followed the process of attributing an importance to an ornithological feature, determining its sensitivity, and characterising potential effects, the significance of the effect is then determined. The CIEEM guidelines (2019) use only two categories to classify effects: “significant” or “not significant”. The significance of an effect is determined by considering the importance of the ornithological feature and the magnitude of the effect and applying professional judgement as to whether the integrity of the feature will be affected. This concept can be applied to both designated sites (for example, an SPA) and to defined populations (for example, a breeding herring gull (*Larus argentatus*) population).

11.4.4.2. The term integrity is used here in accordance with the definition adopted by the Office of the Deputy Prime Minister (‘ODPM’) Circular 06/2005 on Biodiversity and Geological Conservation whereby designated site integrity refers to “…*coherence of ecological structure and function…that enables it to sustain the habitat, complex of habitats and/or levels of populations of species for which it was classified*”. Integrity therefore, refers to the maintenance of the conservation status of a population of a species at a specific location or geographical scale.

11.4.4.3. Effects are more likely to be considered significant where they affect ornithological features of higher conservation importance or where the magnitude of the effect is high. Effects not considered to be significant would be those where the integrity of the feature is not threatened, effects on features of lower conservation importance, or where the magnitude of the impact is low.

11.4.4.4. In this assessment, an effect that threatens the integrity of an IOF is considered to be significant. Effects that do not threaten the integrity of a feature are considered as not significant. Alongside the criteria described above, professional judgement is applied in determining the significance of a potential effect.

11.4.4.5. Embedded mitigation and, where appropriate, additional mitigation measures are 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.

11.4.4.6. The significance of residual effects on receptors after the effects of mitigation have been considered can then be determined, along with any monitoring requirements.

11.4.4.7. Note that a matrix system has not been used in determining significance. CIEEM (2019) avoid and discourage the use of this approach. This guidance seeks to determine whether an effect is either significant or not significant by looking at the integrity of the wider population. The CIEEM guidance does not advocate the allocation of degrees of significance, but instead concentrates upon the effect that any impact may have upon the integrity of an affected population.

11.4.4.8. Therefore, if an impact is of a scale that is unlikely to exert an effect upon the population integrity, it is considered to be not significant. The assessment includes potential impacts on each ornithological feature determined as ‘important’ from all phases of the Proposed Development (e.g. construction, operation, repair/maintenance and decommissioning) and considers direct, indirect, secondary and cumulative impacts and whether the impacts and their effects are short, medium, long-term, permanent, temporary, reversible, irreversible, beneficial and/or adverse.

11.4.5. ASSUMPTIONS AND LIMITATIONS

11.4.5.1. Assessment has been undertaken based on the information provided within Chapter 3 (Description of the Proposed Development) and using the worst-case parameters presented in Appendix 3.2 (Marine Worst-Case Deign Parameters) of the ES Volume 3 (document reference 6.3.3.2). How these parameters are relevant for worst case scenarios for Marine ornithology is presented in Section 11.6.6.

11.4.5.2. As consulted on in the PEIR, it is considered that given the nature of the Proposed Development and construction works, that a proportionate assessment is undertaken following CIEEM (2019)[2], and as such, no project-specific surveys were undertaken. Instead, and in line with consultation advice received from NE on the PEIR and on the draft HRA, current information on aspects of seabird and inshore waterfowl presence and ecology (such as foraging ranges and behaviour) was collated in a desk-based review to determine the likely key species requiring assessment.

11.5. BASELINE ENVIRONMENT

11.5.1.1. This section presents the baseline results for the Landfall and Marine Cable Corridor in relation to the Proposed Development.

Desk-Based Review

11.5.1.2. A variety of data sources were examined in order to characterise the baseline for Marine ornithology and inform the assessment. Those considered most relevant to the Proposed Development are listed in Table 11.6 below. Given the nature of the Proposed Development and construction works, this desk-based review was

[2] CIEEM (2019) state that the level of the Ecological Impact Assessment (‘EcIA’) required should be “*proportionate to the scale of the development and the complexity of its potential impacts*”.

considered to be sufficient for undertaking a proportionate and robust assessment and was consulted on during both Scoping and PEIR consultation exercises.

Table 11.6 - Data sources

Organisation	Data Type	Details
South Coast Regional Environmental Characterisation ('REC')	James *et al.*, (2010) drew on a range of published information to characterise the seabird community present in the South Coast REC. The South Coast REC encompasses the Proposed Development.	Data sources included at-sea aerial surveys in the central Channel carried out in winter (October–March) 2007/2008 and summer (May–August) 2008 (Wildfowl and Wetlands Trust ('WWT'), 2009).
Rampion Offshore Wind Farm ('OWF')	ES Section 11 – Marine Ornithology (RSK, 2012). Rampion OWF is located 13 km off the coast of Sussex, to the east of the Proposed Development.	Baseline boat-based surveys were undertaken over an area of 1,076 km^2 around the OWF, whilst aerial surveys were also undertaken over a similar geographic area, covering some 1,100 km^2. Boat-based surveys were undertaken on a monthly basis between March 2010–February 2012, with aerial surveys undertaken on a monthly basis between August 2010 and August 2011.
Navitus Bay Wind Park	ES Chapter 12 – Offshore Ornithology (Navitus Bay Wind Park, 2014). Baseline Offshore Ornithological Assessment for the Navitus Bay Wind Park project (APEM, 2013).	Baseline boat-based surveys were undertaken over 24 months (December 2009–November 2011) with additional boat-based surveys in spring and autumn of 2011 for migrants. Aerial surveys were undertaken between November 2009–February 2010, and January–March 2011.

Organisation	Data Type	Details
	The proposed Navitus Bay Wind Park was located 14 km off the coast of Dorset (south-west of the Isle of Wight) west of the Proposed Development.	
L'Agence Française pour la Biodiversité ('AFB')	The SAMM (Aerial Monitoring of Marine Megafauna) Campaign (Pettex *et al*., 2014; Pettex *et al*., 2017).	All French Territorial Waters were surveyed using a visual aerial survey method during two survey campaigns: winter 2011/12 and summer 2012. The raw data were modelled to create density surface maps.
JNCC	Seabird 2000 Census (Mitchell *et al*., 2004).	Seabird 2000 was the third complete census of the entire breeding seabird population of Britain and Ireland. An update to this is census is currently ongoing with the results not yet publicly available.
	European Seabirds at Sea ('ESAS') Database (Stone *et al*., 1995).	Major atlas presents a comprehensive assessment of seabirds in north-west European waters and comes from a collaboration between several countries. Data were collected from 1979 to 1994 and have been used to describe the seasonal distribution and abundance of over 50 species of seabird.
	JNCC Coastal Directories Project: Region 8 Sussex: Rye Bay to Chichester Harbour (Barne *et al*.,	The JNCC's Coastal Directories project, collated extensive baseline environmental and human use

Organisation	Data Type	Details
	1998) and Region 9: Southern England: Hayling Island to Lyme Regis (Barne *et al*., 1996).	information, including fisheries, for the coastal and nearshore Marine zone of the whole of the UK.
	JNCC Reports No. 431, No. 461, No. 500 and No. 548 (Kober *et al*., 2010; Kober *et al*., 2012; Wilson *et al*., 2014; Parsons *et al*., 2015).	JNCC species abundance and distributional analyses to inform the identification of possible Marine SPAs in the UK.
NE	Technical Information Notes ('TINs'): Species Information for Marine Special Protection Area Consultations (NE, TIN 128, 135, 136, 138 and 139).	Information and guidance notes on scientific and technical issues, including practical advice.
	Designated Sites View website.	Site and species-based conservation advice and advice on operations.
	Data obtained from the SeaMaST and associated reports and publications (e.g. WWT, 2013; Bradbury *et al*., 2014).	This dataset provides evidence on the use of sea areas by all seabirds and inshore waterbirds in English Territorial Waters, including their sensitivity to offshore wind development. The analysis of displacement risks is considered relevant to the Proposed Development.
British Trust for Ornithology ('BTO')	Wetland Bird Survey ('WeBS') peak count data for the Portsmouth region (Frost *et al*., 2019).	WeBS is the principal scheme for monitoring wintering waterbird populations in the UK.

Organisation	Data Type	Details
Wakefield *et al*., (2013); Warwick-Evans *et al*., (2016)	Tracking data from gannets breeding on Les Etacs, Alderney	Tracking data has been gathered over a number of years at this colony (Les Etacs: 2011-2015) and are summarised in peer-reviewed papers.

11.5.1.3. The Marine bird communities characterised for Rampion OWF and Navitus Bay Wind Park, in addition to those characterised for the South Coast REC, are considered to be broadly representative of the bird community present within the Proposed Development.

11.5.2. DESIGNATED SITES

11.5.2.1. SPAs are sites of international nature conservation importance designated under the EC Birds Directive, which afford statutory protection for both bird species and their habitats. SPAs are usually comprised of one or more constituent SSSIs. In addition, Ramsar sites are Wetlands of International Importance, whose boundaries are often the same as those of SPAs.

11.5.2.2. Seven international statutory sites designated for Marine ornithological features were identified as having potential connectivity to the Proposed Development (Figure 11.1; also see the HRA Report for further details). Connectivity was established using mean-maximum foraging range values published in Thaxter *et al*., (2012), along with more recent tracking data where available (e.g. Warwick-Evans *et al*., 2016). Table 11.7 provides an overview of these sites and their Marine ornithological features for the purposes of identifying IOFs. It should be noted that only those qualifying features present seaward of MLWS are listed in Table 11.7 (see Sections 11.1.1 and 11.1.2). Terrestrial and intertidal ornithological features are outlined in Chapter 16 (Onshore Ecology).

11.5.2.3. A detailed description of all relevant SPAs and proposed SPAs and the species contributing to their designation are provided in the HRA Report, which includes relevant sites outside the UK.

Table 11.7 - SPAs/pSPAs and Ramsars designated for Marine ornithology with connectivity to the Proposed Development

Designated Site	Distance from Marine Cable Corridor (minimum) (km)	Qualifying Features*	Population (number of breeding pairs) *
Solent and Dorset Coast pSPA	0**	Little tern (*Sternula albifrons*)	63
		Sandwich tern (*Thalasseus sandvicensis*)	441
		Common tern (*Sterna hirundo*)	492
Chichester and Langstone Harbours SPA/Ramsar	0.1	Red-breasted merganser (*Mergus serrator*)	206 individuals***
		Little tern	49
		Common tern	126

Designated Site	Distance from Marine Cable Corridor (minimum) (km)	Qualifying Features*	Population (number of breeding pairs) *
		Sandwich tern	93
Portsmouth Harbour SPA/Ramsar	4.9	Red-breasted merganser	100 individuals†
Solent and Southampton Water SPA/Ramsar	6.6	Little tern	49
		Sandwich tern	231
		Common tern	267
		Roseate tern (*Sterna dougallii*)‡	2
		Mediterranean gull (*Larus melanocephalus*)	2
Pagham Harbour SPA/Ramsar	9.5	Common tern	149
Littoral Seino-Marin SPA	30.6	Fulmar (*Fulmarus glacialis*)	356§
		Kittiwake (*Rissa tridactyla*)	997§
		Herring gull	5,503§
		Great black-backed gull (*Larus marinus*)	33§
Alderney West Coast and Burhou Islands Ramsar	142.1	Gannet (*Morus bassanus*)	5,950
		Storm petrel (*Hydrobates pelagicus*)	100
		Lesser black-backed gull (*Larus fuscus*)	273

*Only those designated features present seaward of MLWS are shown. Terrestrial and intertidal species are outlined in Chapter 16 (Onshore Ecology). Potential connectivity was established using mean-maximum foraging range values from Thaxter *et al*., (2012) and more recent tracking data where available.
**The Proposed Development passes through the Solent and Dorset Coast pSPA.
***Five-year mean peak (1982/83-1986/87) at classification.
†Five-year mean peak (1986/87 to 1990/91) at classification.
‡ Roseate tern no longer breeds in this SPA (Holling *et al*., 2018).
§ Maximum numbers according to http://inpn.mnhn.fr/site/natura2000/FR2310045

11.5.2.4. In addition, seven SSSIs notified for breeding seabirds and inshore wintering waterfowl were also identified as having potential connectivity to the Proposed

Development during scoping (Figure 11.2). These sites, together with their notified features, are outlined in Table 11.8.

Table 11.8 - SSSIs Designated for Marine Ornithology with Connectivity to the Proposed Development

SSSI	Distance from Marine Cable Corridor (minimum) (km)	Species
Langstone Harbour	0.1	Little tern
		Sandwich tern
		Common tern
		Red-breasted merganser
Chichester Harbour	4.4	Little tern
		Sandwich tern
		Common tern
North Solent	18.7	Sandwich tern
		Common tern
		Black-headed gull (*Chroicocephalus ridibundus*)
Newtown Harbour	24.1	Sandwich tern
		Common tern
		Black-headed gull
Hurst Castle to Lymington River Estuary	29.2	Sandwich tern
		Common tern
		Black-headed gull
Brighton to Newhaven Cliffs	35.8	Fulmar
		Kittiwake
		Herring gull
Seaford to Beachy Head	40.7	Fulmar

11.5.3. MARINE ORNITHOLOGY BASELINE

11.5.3.1. Overall abundance of seabirds and inshore wintering waterfowl within the Channel is relatively low in comparison to other areas within UK waters (Wakefield *et al*., 2017), with numbers not reaching the necessary thresholds to qualify for Marine SPA designation under the Birds Directive (Kober *et al*., 2010, 2012). However, species diversity is high and the Channel is an important area during migration with an estimated 1 to 1.3 million seabirds flying through the Strait of Dover during spring and autumn (Steinen *et al*., 2007). Furthermore, whilst there is little suitable habitat for cliff-nesting seabirds in the study area surrounding the Marine Cable Corridor, there are a number of nationally and internationally important tern and gull colonies present on the sand and shingle beaches, saltmarshes and offshore islets of the southern English coastline. A number of nationally important estuarine and coastal wintering sites are also present for inshore wintering waterfowl.

11.5.3.2. The following sections utilise the data sources identified in Table 11.6 to characterise the baseline environment for key species. This information has been used to inform the evaluation of IOFs presented in Section 11.6.7.

Seaducks

11.5.3.3. Seaduck species including common scoter (*Melanitta nigra*; Schedule 1; BoCC Red List; NERC Species of Principal Importance) and eider (*Somateria mollissima*; BoCC Amber List) are known to be present in the South Coast REC (James *et al*., 2010). These species feed on shellfish on the seabed, and are thus dependent on benthic habitats for food. Both common scoter and eider show a strong preference for sandy substrates and shallow waters, so estuary mouths and large bays with sandbanks and shallows are preferred by large flocks (NE, 2012; WWT, 2013).

11.5.3.4. Whilst common eider is present along the UK coastline year-round, common scoter migrate south-west through the Channel in autumn after moulting in the Baltic and eastern North Sea, returning northward in the spring (Wernham *et al*., 2002).

11.5.3.5. Barne *et al*, (1998) state that common scoters are most abundant off Rye Harbour during the winter.

11.5.3.6. James *et al*., (2010) state that only a small number of seaduck observations were recorded during aerial surveys undertaken in 2007 and 2008, although these species may have been underestimated during surveys.

11.5.3.7. Surveys undertaken more recently for the Rampion OWF recorded a peak of 73 common scoters during boat-based surveys, and 210 using aerial surveys (RSK 2012).

11.5.3.8. An estimated 1,564 common scoters were considered to pass through the Navitus Bay Wind Park during spring and autumn, based on the outputs of a migration modelling tool (Navitus Bay Wind Park, 2014), with a significant easterly movement in April (NE, 2012).

Divers, Grebes and Mergansers

11.5.3.9. Divers, grebes and mergansers were reported to be present in the South Coast REC during winter 2007-2008 (James *et al*., 2010) and may therefore occur in the Marine Cable Corridor.

11.5.3.10. Great northern diver (*Gavia immer*; BoCC Amber List), black-throated diver (*Gavia arctica*; BoCC Amber List) and red-throated diver (*Gavia stellata*) all occur in inshore waters of the Channel during the winter, albeit in relatively low abundance. These species are all listed on Annex I of the Birds Directive and Schedule 1 of the Wildlife and Countryside Act (1981). Within the South Coast REC, the majority of diver records were off the east of Brighton (James *et al*., 2010). Relatively low numbers were recorded, with 171 noted in winter and two birds recorded during summer 2008.

11.5.3.11. Low numbers of diver species were also recorded during baseline surveys undertaken for proposed OWFs. A peak of 91 red-throated divers was recorded during boat-based surveys undertaken for the Rampion OWF in 2010-12, with seven recorded during aerial surveys. At Navitus Bay Wind Park, a single black-throated diver was recorded during a boat-based survey in December 2009.

11.5.3.12. Grebe species (including great crested grebe (*Podiceps cristatus*), black-necked grebe (*Podiceps nigricollis*; Schedule 1; BoCC Amber List), red-necked grebe (*Podiceps grisegena*; BoCC Red List) and Slavonian grebe (*Podiceps auritus*; Annex I; Schedule 1; BoCC Red List)) and red-breasted merganser species are also present in inshore waters of the Channel during the non-breeding season.

11.5.3.13. In particular, there is an over-wintering population of Slavonian grebe which utilises the Sussex coast, with nationally important numbers wintering in Pagham Harbour (20-25 individuals; Barne *et al*., 1998), and there are known black-necked grebe wintering sites in Langstone Harbour and Poole Harbour (Barne *et al*., 1996; RSPB, 2009). Nationally important numbers of red-breasted merganser are known to winter at Chichester, Langstone and Portsmouth Harbours. Frost *et al*., (2019) state that a five year mean peak of 109 red-breasted merganser (2012/13-2017/18) has also been present at Portsmouth Harbour, with numbers peaking in December.

11.5.3.14. Neither RSK (2012) nor Navitus Bay Wind Park (2014) report grebe species as having been recorded during baseline surveys. Two red-breasted mergansers were recorded during baseline surveys at Navitus Bay Wind Park; one in April 2011 and one in November 2011, with none reported at Rampion OWF.

Fulmar, Shearwaters and Petrels

11.5.3.15. These fully Marine birds spend the majority of their existence at sea feeding on fish and crustacea (pelagic zooplankton), in addition to scavenging fishery discards.

11.5.3.16. Three species were recorded in aerial surveys of the South Coast REC (James *et al*., 2010): fulmar (BoCC Amber List), Manx shearwater (*Puffinus*; BoCC Amber List) and storm petrel (Annex I; BoCC Amber List). However, baseline surveys undertaken for Navitus Bay Wind Park and Rampion OWF also reported low numbers of Balearic shearwater (*Puffinus mauretanicus*; Annex I; BoCC Red List; NERC Species of Principal Importance) passing through the region during migration (e.g. a peak of four birds during autumn at Navitus Bay; Navitus Bay Wind Park, 2014).

11.5.3.17. Fulmar have been observed across the South Coast REC year-round, with a high concentration observed to the east of Portsmouth (James *et al*., 2010). Numerous fulmar nesting sites are present along the coastline in the region, with nationally important numbers breeding between Brighton and Beachy Head (WWT, 2009). Both Manx shearwater and storm petrel breed at colonies further north, passing through the Channel during migration.

Gannet

11.5.3.18. Gannet (BoCC Amber List) are present in the Channel year-round. Baseline surveys undertaken for Navitus Bay Wind Park found that gannet were one of those most frequently recorded species during baseline surveys, with the highest numbers recorded during the breeding season (Navitus Bay Wind Park, 2014), consistent with other surveys (e.g. James *et al*., 2010; RSK, 2012). Pettex *et al*., (2014, 2017) also identified large numbers of gannets in the Eastern Channel during winter, particularly in the Strait of Dover. However, numbers in the Channel are relatively low during the breeding season in comparison to other regions within UK waters (WWT, 2013).

11.5.3.19. Most gannets recorded during baseline surveys undertaken for OWFs in the region recorded gannets in flight. This is to be expected as gannets are a wide-ranging aerial foraging species spending much of their time on the wing.

11.5.3.20. Multi-colony tracking data show that breeding adult gannets present in the vicinity of the Marine Cable Corridor are most likely to originate from the colony at Les Etacs, Alderney, which is included within the Alderney West Coast and Burhou Islands Ramsar site (Wakefield *et al*., 2013; Warwick-Evans *et al*., 2016).

Shags and Cormorants

11.5.3.21. Cormorants (*Phalacrocorax carbo*) are a fairly common coastal resident within Dorset, Hampshire and the Isle of Wight, whilst shags (*Phalacrocorax aristotelis*; BoCC Red List) are a fairly common coastal resident in Dorset, but scarce elsewhere in the region (APEM, 2013).

11.5.3.22. Low densities of both cormorants (0.01-0.09 birds/km) and shags (0.01-0.49 birds/km^2) were recorded by Stone *et al*., (1995) in coastal areas to the west of the Isle of Wight around Poole Harbour and around the Solent throughout much of the year. Langstone and Poole Harbours are both important wintering sites for cormorant (Barne *et al*., 1996) and Frost *et al*., (2019) report a five-year mean peak of 66 cormorants in Portsmouth Harbour, with the highest numbers recorded in October.

11.5.3.23. Rampion OWF recorded a peak of seven cormorants across its baseline survey campaign (RSK, 2012), whilst Navitus Bay Wind Park recorded a single cormorant during a boat-based survey in November 2011, and no shags (Navitus Bay Wind Park, 2014).

11.5.3.24. Cormorants are known to breed at two locations within the South Coast REC (James *et al*., 2010): at the Needles on the western tip of the Isle of Wight, and at Studland Cliffs along the Purbeck Coast (Barne *et al*., 1996; Lake *et al*., 2011). Small numbers of shag also breed along the Purbeck Coast (Lake *et al*., 2011) but are otherwise largely absent from the region.

Skuas

11.5.3.25. Four species of skua are known to pass through the Channel during spring and autumn migration: great skua (*Stercorarius skua*; BoCC Amber List), Arctic skua

(*Stercorarius parasiticus*; BoCC Red List), poMarine skua (*Stercorarius pomarinus*) and long-tailed skua (*Stercorarius longicaudus*). These species feed on fish and offal, and often kleptoparasitise prey catches of other seabird species.

11.5.3.26. James *et al*., (2010) report that limited numbers of skuas were recorded during aerial survey campaigns in 2007-2008 within the South Coast REC. Thus, the area was not considered to represent a significant resource for these species.

11.5.3.27. Indeed, aerial surveys conducted across the Channel as part of the SAMM campaigns showed that the encounter rate for great skua was highest closer to the French coastline as well the south-western tip of the UK off the Cornish coast (Pettex *et al*., 2014, 2017).

11.5.3.28. Boat-based surveys undertaken for Rampion OWF in 2010-2012 recorded 148 great skuas, 53 poMarine skuas and 10 Arctic skuas passing through the survey area. An estimated 1,114 Arctic skuas and 713 great skuas were considered to pass through the Navitus Bay Wind Park during spring and autumn, based on the outputs of a migration modelling tool (Navitus Bay Wind Park, 2014).

Terns

11.5.3.29. Sandwich tern (BoCC Amber List), Arctic tern (BoCC Amber List), common tern (BoCC Amber List), roseate tern (Schedule 1; BoCC Red List; NERC Species of Principal Importance; Hampshire LBAP) and little tern (Schedule 1; BoCC Amber List; Hampshire LBAP) are all migratory species listed on Annex I of the Bird Directive which arrive in the UK between from April to August to breed on sand and shingle beaches, saltmarshes and offshore islets within the South Coast REC (James *et al*., 2010). Internationally important breeding colonies are present at Chichester, Langstone, Pagham and Newtown Harbours, and at North Solent, Hurst Point to Pitts Deep and Lymington to Pylewell (Mitchell *et al*., 2004).

11.5.3.30. Many of these species feed on small fish, crustacea, worms and molluscs present in estuaries and other shallow, inshore waters. They are active flyers and as such their use of any one feeding patch or prey concentration may be limited, particularly since they tend to carry only single prey items back to their nest site (Perrow *et al*., 2006). These species may therefore be present within the Marine Cable Corridor.

11.5.3.31. James *et al*., (2010) report a total of 358 tern observations from aerial surveys undertaken in summer 2008. Tern records peaked in May during baseline boat-based surveys undertaken for Rampion OWF (RSK, 2012), with Sandwich terns (n=40), Arctic terns (n=180) and common terns (n=172) all recorded to species level, and a further 2,287 terns recorded as ‘Arctic/common’. No roseate terns were recorded which may reflect relatively low breeding numbers in comparison to the other tern species. Furthermore, little tern was not recorded which may reflect their inshore feeding distribution (with a mean-max foraging range of 11 km; Thaxter *et al*., 2012).

Gulls

11.5.3.32. Herring gull (BoCC Red List; NERC Species of Principal Importance), great black-backed gull (*Larus marinus*; BoCC Amber List), lesser black-backed gull, kittiwake (BoCC Red List), Mediterranean gull (Annex I; Schedule 1; BoCC Amber List; Hampshire LBAP), common gull (*Larus canus*; BoCC Amber List) and black-headed gull (BoCC Amber List) area all present in the vicinity of the Marine Cable Corridor (James *et al*., 2010). Small numbers of little gull (*Hydrocoloeus minutus*) and yellow-legged gull (*Larus michahellis*) have also been recorded during baseline surveys for Rampion OWF and Navitus Bay Wind Park (RSK, 2012; Navitus Bay Wind Park, 2014). Within Portsmouth Harbour, Frost *et al*., (2019) report five-year mean peaks for black-headed gull (2,816), Mediterranean gull (six), common gull (207), lesser-black-backed gull (four), herring gull (170) and great black-backed gull (24).

11.5.3.33. Gulls were the most abundant and widely distributed seabird group present within the South Coast REC during aerial surveys undertaken in 2007-2008, with 14,835 individuals recorded during winter and 6,294 recorded during the summer (James *et al*., 2010). More recent boat-based surveys undertaken for Rampion OWF recorded a total of 34,551 gulls across all surveys. Of those gulls identified to species level, herring gull was the most abundant (RSK, 2012).

11.5.3.34. Mediterranean gulls breed in internationally important numbers at Newtown Harbour, North Solent and between Hurst and Lymington, with nationally important numbers of black-headed gulls also present at these colonies. There are no major cliff sites with important seabird colonies in the vicinity of the Marine Cable Corridor (Stroud *et al*., 1990), with the nearest colony located at the cliffs between Brighton and Newhaven. Nationally important numbers of kittiwake and herring gull breed at this colony.

11.5.3.35. Many gull species are present in the Channel year-round. For species such as little gull and kittiwake, numbers increase during the winter as birds breeding at more northerly colonies move southwards (WWT, 2013; Pettex *et al*., 2017). Given their wide distribution and opportunistic feeding habits, it is likely that a range of gull species will utilise the Marine Cable Corridor throughout the year.

Auks

11.5.3.36. Three species of auk have been recorded in the South Coast REC: guillemot (BoCC Amber List), razorbill (BoCC Amber List) and puffin (BoCC Red List) (James *et al*., 2010). The south coast of England has relatively few cliff-based colonies of auks due to a lack of suitable habitat. However, small numbers of guillemots, razorbills and puffins breed along the Purbeck Cliffs (Barne *et al*., 1996; Lake *et al*., 2011).

11.5.3.37. James *et al*., (2010) notes that the South Coast REC represents a more significant resource during the winter months, evident in the relatively high number of auks observed at this time of year (RSK, 2012; Navitus Bay Wind Park, 2014; Pettex *et al*., 2017).

11.5.3.38. Of the three-auk species present in the region, guillemot are most abundant. Numbers of guillemots peaked in late spring during baseline surveys for Navitus Bay Wind Park and Rampion OWF as birds moved through the area on passage to more northerly breeding colonies (Navitus Bay Wind Park, 2014).

11.5.3.39. Auk species, particularly guillemot, are therefore likely to be present in the Marine Cable Corridor year-round, but most abundant during the non-breeding season.

11.5.4. FUTURE BASELINE

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

11.5.4.2. In the absence of the Proposed Development, numbers of Marine birds occurring within the study area over the operational period of the project, would likely reflect changes in populations resulting from climatic factors (such as temperature change and subsequent impacts on species' ranges), or anthropogenic activities such as changes in fishing activities indirectly affecting Marine bird communities. Furthermore, baseline conditions within the study area may also change in relation to other projects/plans which may be implemented during this timeframe. Baseline conditions are therefore not static and are likely to exhibit some degree of change over time, with or without the Proposed Development in place.

11.5.4.3. Therefore, potential impacts have been assessed in the context of the envelope of change that might occur over the operational period of the Proposed Development. Consideration of other projects/plans is undertaken through CEA in Section 11.7 and in doing so, their ability to modify the existing baseline is also considered.

11.6. IMPACT ASSESSMENT

11.6.1. EMBEDDED MITIGATION

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

11.6.1.2. Navigational protocols including the use of appropriate markings and lights will be in place to avoid vessel collisions. These will be secured through adherence to COLREGs (The International Regulations for Preventing Collisions at Sea 1972) requirements for vessels and Aids to Navigation which are further detailed in Chapter 13 (Shipping, Navigation and Other Marine Users).

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

11.6.2. POTENTIAL IMPACTS

11.6.2.1. Table 11.9 summarises the potential impacts scoped in for Marine ornithology during construction, operation (including repair and maintenance) and decommissioning of the Proposed Development. This assessment considers the methods described within Chapter 3 (Description of the Proposed Development).

Table 11.9 - Potential Impacts on Marine Ornithology

Potential Impact	Reason
Disturbance and displacement from construction plant and support vessels	Disturbance impacts can manifest through the displacement of birds from using suitable or preferred habitat. During works (construction, repair/maintenance or decommissioning) on the Marine Cables associated infrastructure, noise and visual disturbance has the potential to arise because of the presence of vessels and construction activity.
Reduced prey availability as a consequence of seabed disturbance and/or loss	Potential impacts of construction, operation or decommissioning on habitats, benthic organisms, fish and shellfish species and foraging success. The physical presence of cable components during operation, in addition to ongoing repair/maintenance activities may affect the availability of prey species and foraging success.
Exposure to surface hydrocarbons or chemicals due to accidental spills	In the event of an unplanned release of hydrocarbon fuel from vessels, seabirds and inshore wintering waterfowl on the water may become contaminated with hydrocarbons.

11.6.3. CONSTRUCTION

11.6.3.1. Disturbance impacts can manifest through the displacement of birds from suitable or preferred habitat. During the construction phase, both noise and visual disturbance have the potential to cause displacement as a result of the presence of vessels / plant and cable installation activities.

11.6.3.2. Different species show differing sensitivities to disturbance. Assessment of disturbance and hence displacement sensitivity has been based upon: species abundance within the Marine Cable Corridor, their estimated sensitivities to vessel presence (Garthe & Hüppop, 2004; Bradbury *et al*., 2014), whether their distribution over the wider area is localised or widespread, their reliance on specific habitat types and any published information on habituation to disturbing stimuli.

11.6.3.3. The loss and disturbance of seabed habitats (resulting from the trial of cable installation tools, and laying and installation of Marine Cables and associated infrastructure and activities), may lead to potential impacts on fish, shellfish and benthos, as well as changes to physical processes such as the local tidal flows and an increase of suspended sediment in the water column. These changes may reduce prey availability directly, or indirectly as increased turbidity reduces foraging Marine bird's ability to see prey in the water column. Potential effects of installation on fish, shellfish and benthic species are presented in Chapter 8 (Intertidal and Benthic Habitats) and Chapter 9 (Fish and Shellfish). The conclusions of the assessments of impacts on these features have been used to assess the potential effects upon the foraging behaviour of Marine ornithological features.

11.6.3.4. With the presence of construction vessels (and associated installation plant), there may be potential for accidental spillage, ranging from small spillages of lubricant oil, to the potential grounding or collision of vessels, resulting in the release of the entire fuel load. Oil spills have the potential to significantly affect Marine birds through direct oiling, over both short- and long-term timescales (e.g. Moreno *et al*., 2013). However, routine embedded mitigation measures of standard best practice in terms of waste management, pollution prevention measures and strict navigational protocols will make the likelihood of these events occurring highly unlikely.

11.6.4. OPERATION (INCLUDING REPAIR AND MAINTENANCE)

11.6.4.1. If cables need to be repaired or maintained, the activities required to undertake the works will be undertaken in line with Chapter 3 (Description of the Proposed Development) and are considered similar to the effects (although much reduced in scale and shorter in duration) that may arise during construction.

11.6.4.2. Noise and visual disturbance during operation may be initiated by vessel presence and other repair and maintenance activities to the cable components. Marine bird density, distribution and behavioural data have been used to inform potential disturbance and displacement effects across the Marine Cable Corridor in different seasons.

11.6.4.3. During operation, the availability of prey species may be affected by the physical presence of cable components and associated infrastructure such as non-burial cable protection, in addition to ongoing repair and maintenance activities. Potential effects of operation and maintenance on fish, shellfish and benthic species are presented in Chapter 8 (Intertidal and Benthic Habitats) and Chapter 9 (Fish and Shellfish). Again, the conclusions of the assessments of impacts on these features have been used to assess the potential (indirect) effects upon the foraging behaviour of Marine ornithological features.

11.6.4.4. As for construction, routine measures of standard best practice in terms of waste management, pollution prevention measures and strict navigational protocols will make the likelihood of accidental spills occurring highly unlikely.

11.6.5. DECOMMISSIONING

11.6.5.1. After the operational life of the Proposed Development, the inert and inactive Marine Cables may be left in place. This is common practice for subsea cables currently, as the environmental effect and financial cost of removing the cable often outweigh the benefits of removal. There is considered no potential for impact on Marine birds from leaving the inert Marine Cables in place.

11.6.5.2. However, the Crown Estate currently supports removal of cables where practicable (BEIS, 2019). If any Marine Cables are retrieved, decommissioning will be undertaken in line with industry best practice, and any effects of the works are considered to be similar (although likely lower) to those predicted for construction activities. As such, predicted effects from decommissioning the Proposed Development are not assessed individually in the following paragraphs for each feature and impact.

11.6.6. WORST CASE DESIGN ENVELOPE

11.6.6.1. Table 11.10 gives the worst-case design parameters considered for Marine ornithology during construction, operation (including repair and maintenance) and decommissioning of the Proposed Development. Further details regarding the proposed activities and anticipated programme are presented in Chapter 3 (Description of Proposed Development) and Appendix 3.2 (Marine Worst-Case Design Parameters) and Appendix 3.8 (Programme Onshore and Marine).

Table 11.10 - Worst Case Parameters

Potential Impact	Worst Case Parameters used in the Assessment
Construction	
Disturbance and displacement from construction plant and support vessels	**Vessel movements** As described in Chapter 3 (Description of the Proposed Development), an indicative number of 825 vessel movements (i.e. return trips) over a 30-month period, on a 24/7 basis. This is based on seabed preparation (63 movements), cable burial (126 movements) and HDD installation (636 movements) occurring simultaneously. Construction vessels (such as the larger cable lay vessels and barges that have difficulty in manoeuvring) will have a rolling safe passing distance of up to 700 m from the Marine Cable Corridor. **Landfall works** It is not determined yet whether the HDD direction will be onshore to Marine, Marine to onshore, or drilling from both ends. The Marine to onshore scenario for the Landfall HDD is the worst-case scenario for Marine birds. Marine HDD works at Eastney (KP 1.0-1.6; Figure 3.3) will require the use of a non-percussive excavator mounted vibro-hammer ('EMV') to install up to four trestles to support the drill casings, and a pipe driving machine to install the casings themselves. Pipe driving machines also use vibration in order to push in/install casing pipes with an auger inside which removes the sediment. Installation will take 10 x 12-hour shifts at each of the four ducts (this also includes vessel repositioning, setting up the trestles and driving them into the seabed and then setting up the casings on the trestles, welding the casings together and then driving them into the seabed). Typical sound pressure levels ('SPLs') from both EMV and pipe driving are low at *c.*90 dB at 5 m distance and reduces by 6 dB each time the distance is doubled (Watson & Hillhouse, 2019).

Potential Impact	Worst Case Parameters used in the Assessment
	There are also scheduled long breaks (9-10 weeks) between the vibro-hammering/pipe driving at each duct whilst the drilling and relocating of plant is underway. Temporary sheet piled anchor walls (5 m wide) will be installed at three onshore HDD entry points around Langstone Harbour (Landfall HDD1 in the onshore to offshore scenario; allotments HDD2; Langstone Harbour Crossing HDD3). Sheets will be installed using an EMV and it is predicted to take approximately two hours to install at each location. Typical sound pressure levels are < 90 dB at 5 m distance and reduce by 6 dB with doubling distance (Watson & Hillhouse, 2019).
Indirect effects as a consequence of seabed disturbance and/or loss on prey availability	**Disturbance of seabed** Seabed preparation, HDD and cable installation works will take place over 30 months. Trials of cable installation tools may be required prior to cable installation. However, it is considered that any potential effects from tool trials will be significantly reduced in scale and duration such that they would not be measurable against the potential effects from construction activities and have potential to overlap with areas impacted by other seabed preparation / construction activities. A maximum of four (two bundled pairs) Marine Cables will run from the Landfall at Eastney Beach to the UK/France EEZ Boundary Line. Maximum length for each cable is approximately 109 km, with each cable bundle installed in a separate trench (maximum of two trenches typically separated by 50 m). Maximum area for Marine Cable Corridor within UK Marine Area (i.e. Proposed Development) approximately 57 km^2 (as Marine Cable Corridor is 500 m wide for 8.6 km and 520 m wide for 100.4 km). The subtidal area (i.e. seaward MLWS) of seabed disturbed across Marine Cable Corridor is approximately 3.6 km^2. This is based on: • a pre-lay grapnel run ('PLGR') along 2 x 108 km of Marine Cable Corridor to a footprint width of 1 m (0.22 km^2),

Potential Impact	Worst Case Parameters used in the Assessment
	• 15.6 km of an 80-m swathe footprint for boulder clearance (1.25 km^2), • an assumed worst case of sandwave clearance along 4.2 km of the Marine Cable Corridor to a footprint width of 160 m (0.67 km^2), • an assumed worst case of 108 km of the Marine Cable Corridor disturbed through 2 x 6.5 m width of displacement plough trenching (1.41 km^2), • a maximum of two vessels would be grounded at low tides between KP 1.0 and KP 4.7 for up to 4 weeks (0.008 km^2); • anchor spreads (0.042 km^2); • HDD entry pit (if required for offshore to onshore scenario) excavation works will likely occur in areas that will have already been subject to some level of disturbance between KP 1.0 and 1.6. However, the worst case assumes a single pit approximately 60 m x 15 m (0.0009 km^2) rather than four discrete pits. • HDD temporary mattering prior to cable pull (0.0009 km^2) which will likely occur over the area of the pit. • A jack up vessel will be used for the HDD works at up to four locations. Typical jack-up barge will possess four legs, each leg approximately 1.4 m diameter (totalling 6.16 m^2). Temporary casing support frame comprising four trestles spaced 12 m apart at each location. Each trestle has a footprint of 3 m^2 (totalling 12 m^2). Combined maximum footprint of 0.00002 km^2. **Temporary increases in suspended sediment** Nearshore (between KP 0 and KP 21; Figure 3.1) – worst case activities which will lead to increased SSC are considered to be excavation at the Marine HDD pits (KP 1.0-1.6), and cable installation (due to the potential for the liberation and dispersal of fines identified between KP 5 and 15, and in other isolated locations).

Potential Impact	Worst Case Parameters used in the Assessment
	The finest sediments will be transported up to 10 km from the release point, however it is predicted that SSC at these distances will be low (< 5 mg/l) and therefore not discernible above natural variation, which ranges from approximately <5 to 75 mg/l in coastal areas, with annual averages of between 5–15 mg/l observed within surface waters. It is predicted that a peak SSC of up to 200 mg/l may be observed locally (i.e. within 2 km of the cable trench/HDD pit) and these concentrations could potentially persist for several hours following completion of construction activities. Sediment plumes are also likely to be transported up to 5 km from the cable trench/HDD pit at which point concentrations of 5 to 10 mg/l are predicted; SSC is expected to return to background levels within a few days following completion of these activities. Further offshore (KP 21 – KP 109; Figure 3.1) – the worst case assumes the disposal of approximately 1.7 million m^3 of dredged material from HDD excavation works and cable trenching in the designated disposal site between KP 21 and KP 109. Peak SSCs of 1000 mg/l are precited within 1 km from the release point but coarser sediment is expected to deposit quickly (almost immediately) with significant reductions of SSC within hours of disposal at each location. Beyond 1 km from release, the passive plume is likely to generate SSC in the region of approximately 20 mg/l, transported in the direction of the prevailing flow out to a worst-case distance of 25 km. SSC is predicted to reduce to background levels (<1 – 6 mg/l) within the timeframe of a few days following completion of these activities.
Exposure to surface hydrocarbons or chemicals due to accidental spills	The release of an entire hydrocarbon fuel load through vessel collision and/or potential grounding is considered as the worst case.
Operation (including repair/maintenance)	

Potential Impact	Worst Case Parameters used in the Assessment
Disturbance and displacement from construction plant and support vessels	A small number of vessel movements associated with maintenance are likely to be required to identify if the cables become de-buried over time, and to undertake appropriate remedial action which may include reburial or installation of non-burial protection. During operation, it is assumed that an indicative worst-case failure rate of the Marine Cables would require one repair every 10-12 years. It is predicted that the duration and spatial extent of operation activities including cable reburial, repair and replacement will be less than, and certainly no greater than the construction phase of development.
Indirect effects as a consequence of seabed disturbance and/or loss on prey availability	**Seabed loss** Total area of original habitat loss is 0.7 km^2 due to non-burial protection. This is based on worst case non-burial protection for rock placement (0.33 km^2) during construction and maximum footprint for Atlantic crossing protection (0.038 km^2) and HDD permanent rockfill (0.0009 km^2). This maximum footprint also allows an additional 10% rock placement non-burial contingency (0.33 km^2) for if further non-burial protection is required during maintenance/repair activities during a 15-year period post construction. **Temporary increases in SSC** During operation, it is assumed that an indicative worst-case failure rate of the Marine Cables would require one repair every 10-12 years. It is anticipated that any SSC increases during any repair and maintenance works would be much smaller in extent and shorter in duration that during construction but in any case, no greater.
Exposure to surface hydrocarbons or chemicals due to accidental spills	The release of an entire hydrocarbon fuel load through vessel collision and/or potential grounding is considered as the worst case.

Potential Impact	Worst Case Parameters used in the Assessment
Decommissioning	
All impacts	As outlined previously (see Section 11.6.5 and Chapter 3 (Description of the Proposed Development)), there is uncertainty regarding likely decommissioning activities. For the purposes of the EIA, impacts are assumed to be equal to or less than those resulting from construction activities.

11.6.7. EVALUATION OF ORNITHOLOGICAL FEATURES

11.6.7.1. On the basis of the baseline described in Section 11.5, a number of IOFs have been identified. All such features are listed in Table 11.11.

Table 11.11 - Summary of IOFs

Level of Importance	IOF	Rationale
International	Sandwich tern, common tern, little tern, Mediterranean gull, red-breasted merganser	Qualifying features of an internationally designated site (e.g. SPA or Ramsar) with connectivity to the Proposed Development.
National	Roseate tern, gannet, storm petrel, great black-backed gull, fulmar, kittiwake, herring gull, lesser-black-backed gull	Qualifying features of a designated site (e.g. SPA or Ramsar) with connectivity to the Proposed Development, but not present in the study area in numbers crucial to the integrity of the site.
	Black-headed gull	Species listed as notified features of a nationally designated site (e.g. SSSI) with connectivity to the Proposed Development.
	Slavonian grebe	Species populations present with sufficient conservation importance to meet criteria for SSSI selection.
Regional	Common scoter, black-necked grebe	Species that are not a qualifying feature of any designated site within the study area, but that are afforded special protection (Schedule 1 and Annex I species) and are present in numbers that can be considered to be of importance in a regional context.
	Guillemot, razorbill, puffin	Qualifying features of a designated site (e.g. SPA or Ramsar) within the study area but with no connectivity to the Proposed Development, or species that are not a qualifying feature of any designated site within the study area, but that are of medium/high conservation

Level of Importance	IOF	Rationale
		concern (e.g. i.e. LBAP species and/or species on the BoCC Red/Amber List) and are present in numbers that can be considered to be of importance in a regional context.
Local	Great northern diver, black-throated diver, red-throated diver, Balearic shearwater, Arctic tern	Species that are afforded special protection (Schedule 1 and Annex I species) but are not a qualifying feature of any designated site within the study area and were only recorded infrequently.
	Eider, red-necked grebe, great skua, Arctic skua, common gull, great black-backed gull, Manx shearwater, shag	Species that are considered to be of medium/high conservation concern (i.e. LBAP species and/or species on the BoCC Red/Amber List) that are not a qualifying feature of any designated site within the study area and are not present in regionally important numbers.
Negligible	Great crested grebe, poMarine skua, long-tailed skua, little gull, yellow-legged gull, cormorant	Species of low conservation concern (i.e. species on the UK BoCC Green Lists that are not LBAP species nor afforded any special protection) and that are not a designated feature of any designated site within the study area.

11.6.7.2. CIEEM guidelines (CIEEM, 2019) state the emphasis in EcIA should be on “significant effects rather than all ecological effects”. Therefore, IOFs of local importance or lower (see Table 11.11) are not considered further in this assessment. Significant effects on these species are not predicted given their infrequent occurrence in the study area and/or low conservation status.

11.6.7.3. IOFs considered to be of regional importance or above (see Table 11.11) have been discussed individually in the following subsections.

Common Scoter

11.6.7.4. Common scoter, considered to be of regional importance within this assessment, migrate south-west through the Channel in autumn after moulting in the Baltic and eastern North Sea, returning northward in the spring (Wernham *et al*., 2002). This species is not present within Langstone Harbour, and is highly unlikely to be present near the Marine HDD location (KP 1.0-1.6) given baseline levels of disturbance. Indeed, Barne *et al.*, (1998) state that common scoters are most abundant off Rye Harbour during the winter, approximately 84.4 km to the east of the Proposed Development.

11.6.7.5. Common scoters are consistently scored as being of high sensitivity to disturbance from vessel traffic (Garthe & Hüppop, 2004; Bradbury *et al*., 2014). However, given the large distances over which this species migrates, and given the distance between the Marine Cable Corridor and the possible aggregation of birds occurring off Rye Harbour it is unlikely that significant numbers of common scoters utilise the Marine Cable Corridor for foraging and roosting. Routine embedded mitigation measures of standard best practice in terms of waste management, pollution prevention measures and strict navigational protocols will make the likelihood of accidental spills occurring highly unlikely. As such, no potential impact on common scoter is predicted from any development phase of the Proposed Development.

Red-Breasted Merganser

11.6.7.6. Red-breasted merganser, considered to be of international importance within this assessment, feed and roost on the water in both Chichester and Langstone Harbours between October and March (NE, 2018), in relatively proximity to the Proposed Development. They dive and swim to forage on fish and aquatic invertebrates in the water column (NE 2018). In Chichester Harbour, they favour deep-water areas such as Thorney Deeps, south of Pilsey Island, and north Hayling/Sweare Deep. In Langstone Harbour, they favour the deeper waters to the east of Farlington Marshes and towards Langstone Bridge (NE, 2018).

11.6.7.7. Red-breasted merganser spend their entire time on the water, roosting at night with other diving seaducks, either in the mid-channel in Portsmouth Harbour or other shallow nearshore waters in the Solent. Red-breasted merganser also raft in Portsmouth Harbour for shelter during times of stormy weather (NE, 2018).

Potential Disturbance/Displacement Effects

Construction (and Decommissioning)

11.6.7.8. Red-breasted merganser are of moderate sensitivity to disturbance and therefore displacement (Bradbury *et al*., 2014; Gittings & O'Donoghue, 2016).

11.6.7.9. Within Langstone Harbour, red-breasted mergansers are known to both feed and roost in internationally important numbers. It is considered that onshore HDD works within the harbour have the highest potential of all construction activities to cause disturbance and displacement to this species. Of the three onshore HDD locations, HDD3 at Kendall's Wharf is the closest location to favoured red-breasted merganser roosting areas east of Farlington Marshes and towards Langstone Bridge (*c.*1 km; Figure 3.9 - Section 7 on map). Sheet piling at this location may therefore disturb and displace birds through unpredictable noise events.

11.6.7.10. However, as detailed in Chapter 16 (Onshore Ecology), a winter working restriction is proposed for terrestrial and intertidal features of Chichester and Langstone Harbours SPA (Appendix 16.14 (Winter Working Restriction for Features of Chichester & Langstone Harbours SPA) of the ES Volume 3 (document reference 6.3.16.14)). This restriction would prevent sheet piling at HDD2 and HDD3 from being undertaken between the months of October to March, inclusive. Given that red-breasted mergansers are present in Chichester and Langstone Harbours during the non-breeding season, it is considered that this restriction will also minimise potential impacts on this IOF arising from onshore HDD activities.

11.6.7.11. Should overwintering red-breasted merganser be present within Langstone Harbour outside of this restriction, onshore HDD works will be above MHWS in an already industrialised setting. Installation will be very short in duration (Table 11.10) and noise levels from the EMV at HDD3 will be < 50 dB at Farlington Marshes, given that SPLs reduce by 6 dB each time the distance is doubled (Table 11.10). Noise and visual disturbance associated with construction activities at HDD3 are therefore unlikely to be noticeable above baseline levels of disturbance within Langstone Harbour (Cutts & Allen, 1999; Cutts *et al*., 2009). Given that HDD1 and HDD2 are located further away from red-breasted merganser roosting areas, it is considered that there is **no potential for impact** from onshore HDD works at these locations, both of which are located above MHWS in an urban environment.

11.6.7.12. Outside of Langstone Harbour, red-breasted mergansers may be present in shallow, nearshore waters throughout the Solent. There is therefore potential for foraging and roosting birds to be disturbed and therefore displaced by both unpredictable noise events and visual disturbance associated with construction activities at the Marine HDD location off Eastney, and elsewhere within the Marine Cable Corridor.

11.6.7.13. The installation of ducts and trestles at the Marine HDD location will be short (Table 11.10). Noise generated by the EMVs/pile pushers will be non-percussive, and airborne SPLs are unlikely to be noticeable above the baseline in this urban setting. Red-breasted mergansers dive from the sea surface to forage in water depths of <10 m (Robbins, 2017). Whilst they may be exposed to underwater noise resulting from the vibro-hammer and pipe driving machine during this time, it is highly unlikely noise levels will be discernible above background underwater noise levels (median noise levels around the UK range from 81.5 to 95.5 dB re 1 μPa; Merchant *et al*., 2016). A single jack-up vessel, together with a multiact, a safety vessel, a crew transfer vessel and up to four workboats may be present at the Marine HDD location for up to 44 weeks, with a total of 636 vessel movements predicted over this period (Chapter 3 (Description of Proposed Development)). This is unlikely to be noticeable above baseline levels of disturbance from the existing high levels of traffic within the area (*c.* 200 vessel movements/day in the winter and 400 vessel movements/day in the summer; see Chapter 13 (Shipping, Navigation, and Other Marine Users)).

11.6.7.14. Throughout the rest of the Marine Cable Corridor, it is anticipated that there may be up to *c*.825 vessel movements over the course of the construction stage (Table 11.10). However, it is anticipated that vessels will be present intermittently over the 30-month construction period. Construction vessels such as the larger cable lay vessels and barges that have difficulty in manoeuvring will have a rolling safe passing distance of up to 700 m from the Marine Cable Corridor. Whilst there may be a number of vessels present during each stage of installation, it is likely that each vessel will only be present in any one area of the rolling safe passing distance for very short durations (hours to days). The potential grounding of cable lay barges at low tide between KP 1.0 and KP 4.7 will occur over a short duration of up to approx. 4 weeks. Furthermore, vessel traffic levels in the Channel and Solent are already high (see Chapter 13 (Shipping, Navigation and Other Marine Users)). As such, red-breasted mergansers that use the Marine Cable Corridor to forage and roost are expected to be habituated to such levels of disturbance.

11.6.7.15. Therefore, potential disturbance/displacement effects are short-term, of minor adverse magnitude and **not significant** during construction (and decommissioning).

Operation (including Repair and Maintenance)

11.6.7.16. Given that an indicative worst-case failure rate of the Marine Cables would require one repair every 10-12 years, it is considered that potential disturbance/displacement effects on red-breasted mergansers would be less than predicted during construction.

11.6.7.17. Therefore, potential disturbance/displacement effects are short-term, of negligible adverse magnitude and **not significant** during operation.

Potential Indirect Effects as a Consequence of Seabed Disturbance on Prey Availability

Construction (and Decommissioning)

11.6.7.18. No direct loss of habitat used for roosting or loafing is predicted.

11.6.7.19. Red-breasted mergansers are effectively top predators of benthos, fish and shellfish populations and are of moderate sensitivity to habitat disturbance (Bradbury *et al*., 2014). If seabed habitats (and therefore the prey species) are disturbed, the area may be temporarily devoid of potential food sources, resulting in effective habitat loss. Furthermore, red-breasted mergansers are visual foragers and are likely to be affected by an increase in turbidity which can make it harder to see prey. Activities associated with construction have the potential to release sediment during cable burial and associated works.

11.6.7.20. Within Langstone Harbour, where red-breasted merganser numbers are likely to be highest, HDD will be used. The entry/exit points of the drill for these onshore HDD locations will above MHWS, thus there is no pathway for the works to result in an increase in suspended sediment or resultant smothering. Therefore, the works are not predicted to affect red-breasted merganser prey species or foraging success in Langstone Harbour.

11.6.7.21. Outside of Langstone Harbour, out to KP 21, the excavation at the Marine HDD pits (KP 1.0-1.6), and cable installation (due to the potential for the liberation and dispersal of fines identified between KP 5 and 15, and in other isolated locations) will transport the finest sediments up to 10 km from the release point. However, it is highly likely that SSC at these distances will be low (< 5 mg/l), not discernible above natural variation which ranges from approximately <5 to 75 mg/l in coastal areas and will return to background levels within a few days of completion of works. The resultant effects of sediment disposition are also expected not to be negligible. Effects on prey species and foraging success at the Landfall are therefore **not significant** (also see Chapter 9 (Fish and Shellfish)) since both habitat disturbance and increases in SSC will be temporary, short and small in extent (Table 11.10; Chapter 6 (Physical Processes)).

11.6.7.22. Elsewhere beyond KP 21 of the Marine Cable Corridor, the area of disturbed habitat due to route preparation is anticipated to be a maximum of 3.6 km^2 along the entire Marine Cable Corridor (*c.*6%). The worst case for SSC increases and resulting deposition of sediment is due to the disposal of *c.*1.7 million m^2 of dredged material. Peak SSC of 1000 mg/l within 1 km of sediment release is predicted from disposal events however the coarse sediment will deposit quickly. Beyond 1 km from release, the passive plume is likely to generate SSC in the region of approximately 20 mg/l, transported in the direction of the prevailing flow out to a worst-case distance of 25 km. However, red-breasted mergansers are most abundant within Langstone Harbour or shallow waters of the Solent, rather than the outer Solent and Channel and therefore, unlikely to be affected. Furthermore, peaks in SSC are localised and temporary (reducing significantly in a few hours) before returning to background levels within a few days, while greatest depths of sediment deposition is also localised around the point of sediment release. Therefore, effects on prey species and foraging success are therefore **not significant** since both habitat disturbance and increases in SSC will be temporary, short and small in extent.

11.6.7.23. Chapter 9 (Fish and Shellfish) highlights that most fish and shellfish are able to tolerate a degree of suspended sediment owing to frequent exposure to storm induced fluctuations in sediment concentrations. Indeed, background levels of suspended sediment in the study area, and the Solent are already highly turbid (Guillou, *et al*., 2017).

11.6.7.24. As such, the potential for effects of reduced prey availability and foraging success resulting from seabed disturbance and increased turbidity (and resulting sediment disposition) is short-term, of minor adverse magnitude and **not significant** during construction (and decommissioning).

Operation (including Repair and Maintenance)

11.6.7.25. Within Langstone Harbour, it is considered that there is no pathway for impact due to the onshore nature of the cable crossing using HDD methods.

11.6.7.26. Outside of Langstone Harbour, the permanent loss of fish and shellfish habitat as a result of cable non-burial protection is not predicted to significantly affect prey availability since these measures will be limited in spatial extent (0.7 km^2; Table 11.10; Chapter 9 (Fish and Shellfish)).

11.6.7.27. Given that an indicative worst-case failure rate of the Marine Cables would require one repair every 10-12 years, it is considered that potential increases in SSC and resultant sediment deposition would be less than predicted during construction and therefore **not significant**.

11.6.7.28. Therefore, the potential for effects from reduced prey availability and reduced foraging success resulting from a small area of seabed loss and/or temporary increases in turbidity (and resulting deposit sediment) is considered to be short-term, of negligible adverse magnitude and **not significant** during operation.

Exposure to Surface Hydrocarbons or Chemicals due to Accidental Spills

11.6.7.29. Routine embedded mitigation measures of standard best practice in terms of waste management, pollution prevention measures and strict navigational protocols will make the likelihood of accidental spills occurring highly unlikely across all development phases. As such, **no potential for impact** is predicted from accidental spills during any development phase of the Proposed Development.

Slavonian Grebe and Black-necked Grebe

11.6.7.30. Slavonian grebes, considered to be of national importance within this assessment, are amongst the most Marine of the grebe species outside the breeding season. Little is known of the precise migration behaviour and routes of Slavonian grebes. However, the main arrival of wintering birds from their northerly breeding sites into English waters takes place between September and November. Numbers peak between December and mid-February and then decline as birds return northwards back to their breeding grounds (Wernham *et al*., 2002).

11.6.7.31. Slavonian grebe pursuit dive from the sea surface up to depths of 20 m, in addition to dabbling for food items. They primarily catch fish and crustaceans during the winter. Nationally important numbers winter in Pagham Harbour (20-25 individuals; Barne *et al*., 1998), approximately 9.5 km from the Proposed Development.

11.6.7.32. The black-necked grebe is a scarce wintering bird in the UK, and is thus considered to be of conservation concern, of regional importance within this assessment (Schedule 1; BoCC Amber List). Wintering birds inhabit coastal waters and larger inland waters. Black-necked grebe pursuit dive and dabble from the sea surface to catch fish and crustaceans during the winter.

11.6.7.33. Black-necked grebe are known to winter in Langstone and Poole Harbours (Barne *et al*., 1996; Frost *et al*., 2019). Within Langstone Harbour, a five year mean peak of 14 birds has been recorded, with a five year mean peak of 18 birds recorded at Poole Harbour (2012/13-2017/18; Frost *et al*., 2019). Numbers peaked in December and January, respectively.

Potential Disturbance/Displacement Effects

Construction (and Decommissioning)

11.6.7.34. Both Slavonian and black-necked grebes are consistently scored as being of moderate sensitivity to disturbance and therefore displacement (Garthe & Hüppop, 2004; Bradbury *et al*., 2014).

11.6.7.35. Within Langstone Harbour, vibro-hammering associated with onshore HDD works at HDD1, HDD2 and HDD3 may disturb black-necked grebe which are known to be present in Langstone Harbour during the winter.

11.6.7.36. However, as detailed in Chapter 16 (Onshore Ecology), a winter working restriction is proposed for terrestrial and intertidal features of Chichester and Langstone Harbours SPA (Appendix 16.14 (Winter Working Restriction for Features of Chichester and Langstone Harbours SPA)). This restriction would prevent sheet piling at HDD2 and HDD3 from being undertaken between the months of October to March, inclusive. Given that black-necked grebe is present in Chichester and Langstone Harbours during the non-breeding season, it is considered that this restriction will also minimise potential impacts on this IOF arising from onshore HDD activities.

11.6.7.37. However, should overwintering black-necked grebe be present outside of this seasonal restriction, vibro-hammering activities will be very short in duration and noise levels from the vibro-hammer are unlikely to be noticeable above baseline levels of disturbance within Langstone Harbour (Table 11.10; Cutts & Allen, 1999; Cutts *et al*., 2009). Whilst considered unlikely, should black-necked grebe be temporarily disturbed from their wintering sites within Langstone Harbour, other equivalent foraging and roosting sites are present elsewhere within the Solent including Poole Harbour which will be unaffected by the Proposed Development.

11.6.7.38. Slavonian grebes are not known to utilise Langstone Harbour and as such, will be unaffected by vibro-hammering associated with onshore HDD works.

11.6.7.39. Outside of Langstone Harbour, both Slavonian and black-necked grebes are known to winter in varying numbers within harbours throughout the Solent, and both species may therefore be present in shallow, nearshore waters outside of these sheltered areas. There is therefore potential for foraging and roosting birds to be disturbed and therefore displaced by both unpredictable noise events and visual disturbance associated with construction activities at the Marine HDD location off Eastney, and elsewhere within the Marine Cable Corridor.

11.6.7.40. Vibro-hammering at the Marine HDD location will be short in duration (Table 11.10). Noise generated by the vibro-hammers will be non-percussive and airborne SPLs are unlikely to be noticeable above the baseline in this urban setting. Grebe species dive from the sea surface to forage in water depths of up to 5 m (RPS, 2011; Robbins, 2017). Whilst they may be exposed to underwater noise resulting from the vibro-hammer and pipe driving machine during this time, it is highly unlikely noise levels will be discernible above background underwater noise levels (median noise levels around the UK range from 81.5 to 95.5 dB re 1 μPa; Merchant *et al.*, 2016). A single jack-up vessel, together with a multiact, a safety vessel, a crew transfer vessel and up to four workboats may be present at the Marine HDD location for up to 44 weeks, with a total of 636 vessel movements predicted over this period (Chapter 3 (Description of Proposed Development)). This is unlikely to be noticeable above baseline levels of disturbance from the existing high levels of traffic within the area (*c.*200 vessel movements/day in the winter and 400 vessel movements/day in the summer; see Chapter 13 (Shipping, Navigation, and Other Marine Users)).

11.6.7.41. Throughout the rest of the Marine Cable Corridor, it is anticipated that there may be up to *c.*825 vessel movements over the course of the construction stage (Table 11.10). However, it is anticipated that vessels will be present intermittently over the 30-month construction period. Construction vessels such as the larger cable lay vessels and barges that have difficulty in manoeuvring will have a rolling safe passing distance of up to 700 m. Whilst there may be many vessels present during each stage of installation, it is likely that each vessel will only be present in any one area of the rolling safe passing distance for very short durations (hours to days). The potential grounding of cable lay barges at low tide between KP 1.0 and KP 4.7 will occur over a short duration of up to approx.4 weeks. Furthermore, vessel traffic levels in the Channel and Solent are already high (see Chapter 13 (Shipping, Navigation and Other Marine Users)). As such, Slavonian and black-necked grebes that use the Marine Cable Corridor to forage and roost are expected to be habituated to such levels of disturbance.

11.6.7.42. Given the large distances over which these species migrate, it is likely that any grebes present near construction activities will move to equivalent foraging and roosting habitat during the relatively short timeframe during which these temporary works will occur. Therefore, potential disturbance/displacement effects are short-term, of minor adverse magnitude and **not significant** during construction (and decommissioning)

Operation (including Repair and Maintenance)

11.6.7.43. Given that an indicative worst-case failure rate of the Marine Cables would require one repair every 10-12 years, it is considered that potential disturbance/displacement effects on Slavonian and black-necked grebes would be less than predicted during construction.

11.6.7.44. Therefore, potential disturbance/displacement effects are short-term, of negligible adverse magnitude and **not significant** during operation.

Potential Indirect Effects as a Consequence of Seabed Disturbance on Prey Availability

Construction (and Decommissioning)

11.6.7.45. No direct loss of habitat used for roosting or loafing is predicted.

11.6.7.46. However, Slavonian and black-necked grebes are effectively top predators of fish and shellfish populations and are considered to be of moderate sensitivity to habitat disturbance (Bradbury *et al*., 2014). If seabed habitats (and therefore the prey species) are disturbed, the area may be temporarily devoid of potential food sources, resulting in effective habitat loss. Furthermore, both species of grebe are visual foragers and are likely to be affected by an increase in turbidity which can make it harder to see prey. Activities associated with construction have the potential to release sediment during seabed preparation, cable burial, HDD pit excavation and other associated works which can increase turbidity.

11.6.7.47. Within Langstone Harbour where only black-necked grebes may be present, HDD will be used. The entry/exit points of the drill are expected to be onshore, thus there is no pathway for the works to result in an increase in suspended sediment or resultant smothering. Therefore, the works are not predicted to affect black-necked grebe prey species or foraging success in Langstone Harbour.

11.6.7.48. Outside of Langstone Harbour out to KP 21, the excavation at the Marine HDD pits (KP 1.0-1.6), and cable installation (due to the potential for the liberation and dispersal of fines identified between KP 5 and 15, and in other isolated locations) will transport the finest sediments up to 10 km from the release point. However, it is highly likely that SSC at these distances will be low (< 5 mg/l) and therefore not discernible above natural variation, which ranges from approximately <5 to 75 mg/l in coastal areas and will return to background levels within a few days of completion of works. The resultant effects of sediment disposition are also expected to be negligible due to relatively small volumes of sediment being liberated into the column, with finer sediments being redistributed under forcing tidal flows. Effects on both grebe prey species availability and foraging success at the Landfall are therefore **not significant** (also see Chapter 9 (Fish and Shellfish)) since both habitat disturbance and increases in SSC will be temporary, short in duration and small in extent (Table 11.10; Chapter 6 (Physical Processes)).

11.6.7.49. Elsewhere beyond KP 21 of the Marine Cable Corridor, the area of disturbed habitat for route preparation is anticipated to be a maximum of 3.6 km^2 along the entire Marine Cable Corridor (*c.*6%). The worst case for SSC increases and resulting deposition of sediment is due to the disposal of *c.*1.7 million m^2 of dredged material. Peak SSC of 1000 mg/l within 1 km of sediment release is predicted from disposal events however the coarse sediment will deposit quickly. Beyond 1 km from release, the passive plume is likely to generate SSC in the region of approximately 20 mg/l, transported in the direction of the prevailing flow out to a worst-case distance of 25 km. Therefore, peaks in SSC are localised and temporary (reducing significantly in a few hours) before returning to background levels within a few days, while greatest depths of sediment deposition is also predicted to be localised within a few hundred metres of the point of sediment release.

11.6.7.50. Chapter 9 (Fish and Shellfish) highlights that most fish and shellfish are able to tolerate a degree of suspended sediment owing to frequent exposure to storm induced fluctuations in sediment concentrations. Indeed, background levels of suspended sediment in the study area, and the Solent are already highly turbid (Guillou, *et al*., 2017).

11.6.7.51. Overall, as Slavonian and black-necked grebe numbers are likely to be low in deeper waters and the potential for effects of reduced prey availability and reduced foraging success on Slavonian and black-necked grebes resulting from seabed disturbance and increased turbidity (and resulting sediment deposition) is short-term, of minor adverse magnitude and **not significant** during construction (and decommissioning).

Operation (including Repair and Maintenance)

11.6.7.52. Within Langstone Harbour, it is considered that there is no pathway for impact due to the onshore nature of the cable crossing using HDD methods (see Chapter 16 (Onshore Ecology)).

11.6.7.53. Outside of Langstone Harbour, the permanent loss of fish and shellfish habitat because of cable non-burial protection is not predicted to significantly affect prey availability since these measures will be limited in spatial extent (0.7 km^2; Table 11.10; Chapter 9 (Fish and Shellfish)).

11.6.7.54. Given that an indicative worst-case failure rate of the Marine Cables would require one repair every 10-12 years, it is considered that potential increases in SSC would be less than predicted during construction and therefore **not significant**.

11.6.7.55. Therefore, the potential effects on Slavonian and black-necked grebes from reduced prey availability and foraging success resulting from a small area of seabed loss and temporary increases in turbidity is short-term, of negligible adverse magnitude and **not significant** during operation.

Exposure to Surface Hydrocarbons or Chemicals due to Accidental Spills

11.6.7.56. Routine embedded mitigation measures of standard best practice in terms of waste management, pollution prevention measures and strict navigational protocols will make the likelihood of accidental spills occurring highly unlikely across all development phases. As such, the potential for impacts to occur is predicted to be negligible from accidental spills during any development phase of the Proposed Development.

Fulmar

11.6.7.57. Fulmars, considered to be of national importance within this assessment, mainly nest on ledges on steep cliffs or crags, but can use spaces on exposed building sides, low banks or even the ground (Snow & Perrins, 1998). The closest breeding colony is located on the cliffs between Brighton and Newhaven, *c*.36 km from the Proposed Development, with nationally important numbers also present on the cliffs between Seaford and Beachy Head, *c*.41 km from the Proposed Development. Fulmars disperse offshore after the breeding season, although they remain widespread in UK waters, with many attending colonies year-round. Young birds disperse most widely, throughout North Atlantic and European Arctic waters (Wernham *et al*., 2002).

11.6.7.58. They are opportunistic feeders and use their strong sense of smell to locate foraging opportunities. They can quickly form large flocks over concentrations of food, feeding on planktonic crustaceans, squid and small fish. They also scavenge discards from fishing vessels (e.g. Phillips *et al*., 1999). Fulmars have a large foraging range, with birds departing colonies for up to five days out to a maximum of 580 km (mean-max = 400 ± 245.8 km; Thaxter *et al*., 2012).

Construction, Operation (including Repair and Maintenance) and Decommissioning)

11.6.7.59. Routine embedded mitigation measures of standard best practice in terms of waste management, pollution prevention measures and strict navigational protocols will make the likelihood of accidental spills occurring highly unlikely. Given their wide-ranging foraging behaviour, low sensitivity to disturbance (Garthe & Hüppop, 2004; Bradbury *et al*., 2014) and plasticity in diet (Phillips *et al*., 1999), **no potential for impact** on fulmar is predicted from any development phase of the Proposed Development.

Storm Petrel

11.6.7.60. Storm petrels, considered to be of national importance within this assessment, nest colonially on remote offshore islands, using burrows and crevices under rocks on boulder beaches and scree and stone walls and ruined stone buildings (Snow & Perrins, 1998). As such, the closest colony is in the Channel Islands on Alderney, *c*. 142 km from the Proposed Development. They range widely to forage during the breeding season, over 65 km (Thaxter *et al*., 2012), feeding on small fish and zooplankton gleaned from the sea surface. Inshore they are known to feed on intertidal crustaceans (Snow & Perrins, 1998).

11.6.7.61. Storm petrels are highly pelagic, wintering off the coasts of western and southern Africa, and returning to land only to breed. Birds breeding at more northerly colonies therefore pass through the Channel during migration (Wernham *et al*., 2002).

Construction, Operation (including Repair and Maintenance) and Decommissioning)

11.6.7.62. Routine embedded mitigation measures of standard best practice in terms of waste management, pollution prevention measures and strict navigational protocols will make the likelihood of accidental spills occurring highly unlikely. Given the distance from the Proposed Development to the closest storm petrel breeding colony, their large foraging range, dispersed distribution during the winter, and low sensitivity to vessel traffic (Garthe & Hüppop, 2004; Bradbury *et al*., 2014), **no potential for impact** on storm petrel is predicted from any phase of the Proposed Development.

Gannet

11.6.7.63. Gannets, considered to be of national importance within this assessment, can return to breeding colonies from their wintering grounds as early as January with levels of attendance generally increasing until April, when the first eggs are laid. The closest breeding colony is in the Channel Islands, *c*. 142 km from the Proposed Development, where some 8,700 breeding pairs are located on Les Etacs and Ortac, Alderney (Copping *et al*., 2018). Tracking work by Warwick-Evans *et al*., (2016) demonstrated that these breeding birds forage over a wide area (mean-maximum = 135 ± 7 km in 2015), with the potential to forage within the Marine Cable Corridor.

11.6.7.64. Gannets feed by plunge-diving into the sea from heights of between 10-40 m either singly or in groups. They also sometimes swim with their heads immersed and dive for food from the sea surface. They prey on mid-sized schooling fish and squid, as well as fishery discards (Snow & Perrins, 1998). Gannets are wide-ranging throughout the year, with large numbers passing through the Channel during the non-breeding season, to winter as far as west Africa (Wernham *et al*., 2002).

Construction, Operation (including Repair and Maintenance) and Decommissioning)

11.6.7.65. Routine embedded mitigation measures of standard best practice in terms of waste management, pollution prevention measures and strict navigational protocols will make the likelihood of accidental spills occurring highly unlikely. Given the distance to the nearest gannet breeding colony, together with their extremely wide-ranging foraging behaviour, reliance on highly mobile schooling fish and squid as prey throughout the year, and low sensitivity to disturbance from vessel traffic (Garthe & Hüppop, 2004; Bradbury *et al*., 2014), **no potential for impact** on gannet is predicted from any phase of the Proposed Development.

Little Tern, Sandwich Tern and Common Tern

11.6.7.66. Little terns, considered to be of international importance within this assessment, arrive in the UK from April to breed, and generally stay until the end of September. They nest in simple shallow ‘scrapes’ on bare sand and shingle (NE, 2012a). In Langstone and Chichester Harbours, the closest breeding colony to the Proposed Development, little terns nest on Bakers Island, Pilsey Island, the north Stakes Islands, the Oyster beds islets and on manmade rafts (NE, 2018).

11.6.7.67. Little terns forage alone in shallow water often within 1 km of their breeding colony (out to a maximum of 7-11 km; Thaxter *et al*., 2012; Parsons *et al*., 2015) for small fish, crustaceans, and insects. Little terns take food from near the surface of the water by plunge diving, often following hovering, or by ‘contact dipping’, where only the bill enters the water and the bird remains in flight throughout (NE, 2018).

11.6.7.68. From March onwards, Sandwich terns, considered to be of international importance within this assessment, return to UK waters to breed. They nest colonially in high densities on the ground, on shingle spits, ridges and islets (NE, 2012b). In Chichester and Langstone Harbours, the closest breeding colony to the Proposed Development, they breed on the South Stakes islands, the Oyster beds islets and the Royal Society for the Protection of Birds (‘RSPB’) islands of Hayling Island. From July, onwards they start to gather in large flocks to depart in September (NE, 2012b).

11.6.7.69. Sandwich terns forage alone or in small flocks out to a maximum of 54 km from the colony (mean-max = 49.0 ± 7.1 km; Thaxter *et al*., 2012). Foraging behaviour is seen throughout Chichester and Langstone Harbours, with a stronger tendency to feed at the harbour mouths (NE, 2012; Wilson *et al*., 2014). At high tide in Langstone Harbour, they form groups to forage south of South Binness Island (NE, 2018). Prey species are more varied than that of the other terns, including sandeels, herring and sprats, as well as crustaceans and small squid. Individuals take prey from near the surface of the water by plunge-diving to a depth of 2 m (NE, 2012).

11.6.7.70. Common terns, considered to be of international importance within this assessment, arrive in the UK from April onwards to breed, and generally stay until the end of September. They nest in simple shallow 'scrapes' on sand, shingle or within low vegetation (NE, 2012c). In Langstone and Chichester Harbours, the closest breeding colony to the Proposed Development, common terns nest on the Stake Islands, the Oyster beds islets, the RSPB Islands and on floating manmade rafts (NE, 2018).

11.6.7.71. Common terns forage alone or in small flocks out to a maximum of 30 km from the colony (mean-max = 15.2 ± 11.2 km; Thaxter *et al*., 2012). Prey species include small fish and crustaceans, terrestrial insects and occasionally squid. They take food from near the surface of the water by plunge diving to a depth of 1-2 m, often following hovering. Prey might also be gathered by 'contact dipping': where only the bill enters the water and the bird remains in flight throughout (NE, 2012).

Potential Disturbance/Displacement Effects

Construction (and Decommissioning)

11.6.7.72. Little terns at sea are scored as being of moderate sensitivity to disturbance and therefore displacement, whilst Sandwich and common terns at sea are considered to be of low sensitivity (Garthe & Hüppop, 2004; Bradbury *et al*., 2014).

11.6.7.73. Potential disturbance to nesting terns at their onshore breeding colonies is considered in Chapter 16 (Onshore Ecology) and Appendix 16.13 (Wintering Bird Report).

11.6.7.74. Within Langstone and Chichester Harbours, breeding colonies of all three-tern species of tern are present. Given that little terns in particular are known to forage in relatively close proximity to their breeding colonies, onshore HDD works within the Langstone Harbour have potential to displace this species during foraging given its moderate sensitivity to disturbance at sea. Of the three onshore HDD locations, HDD3 at Kendall's Wharf is the closest location to a little tern breeding colony (Figure 3.9 - Section 7 on map), located at a minimum distance of *c*.2 km from the Baker's Island colony. Sheet piling at HDD3 may therefore disturb and displace foraging birds through unpredictable noise events.

11.6.7.75. However, these works will be above MHWS in an already industrialised setting. Vibro-hammering will be very short in duration (Table 11.10) and noise levels from the EMV at HDD3 will be *c*.40 dB at Baker's Island, given that SPLs reduce by 6 dB each time the distance is doubled (Table 11.10). Noise and visual disturbance associated with construction activities at HDD3 are therefore unlikely to be noticeable above baseline levels of disturbance within Langstone Harbour (Cutts & Allen, 1999; Cutts *et al*., 2009). Whilst considered unlikely, should little terns be temporarily disturbed from foraging in proximity to the onshore HDD works within Langstone Harbour, other equivalent foraging sites are present elsewhere in Chichester and Langstone Harbours which will be unaffected by the Proposed Development.

11.6.7.76. Given that HDD1 and HDD2 are located further away from little tern breeding colonies, it is considered that there is **no potential for impact** from onshore HDD works at these locations, both of which are located above MHWS in an urban environment.

11.6.7.77. The closest common and Sandwich tern breeding colonies to the onshore HDD works are located *c*.4 km east at Hayling Island, with feeding aggregations present to the south of South Binness Island at high tide, *c*.2.5 km from the closest onshore HDD location (Kendall's Wharf, HDD3; Figure 3.9 - Section 7 on map). Given these distances, together with their wider foraging ranges and low sensitivity to disturbance at sea, **no potential for impact** on either species is predicted from onshore HDD works.

11.6.7.78. Outside of Langstone Harbour, all three-tern species may be present in shallow, nearshore waters at the mouth of Langstone Harbour. There is therefore potential for foraging birds to be disturbed and therefore displaced by both unpredictable noise events and visual disturbance associated with construction activities at the Marine HDD location off Eastney.

11.6.7.79. Vibro-hammering (EMVs and pipe pushing equipment) at the Marine HDD location will be short (Table 11.10). Noise generated by the vibro-hammers will be non-percussive and airborne SPLs are unlikely to be noticeable above the baseline in this urban setting. Since tern species plunge dive to a maximum of 1 m whilst feeding (RPS, 2011), it is considered that exposure to any underwater noise resulting from the vibro-hammer and pipe driving machine will be minimal and not discernible above background underwater noise levels (median noise levels around the UK range from 81.5 to 95.5 dB re 1 μPa; Merchant *et al*., 2016). A single jack-up vessel, together with a multicat, a safety vessel, a crew transfer vessel and up to four workboats may be present at the Marine HDD location for up to 44 weeks, with a total of 636 vessel movements predicted over this period (Chapter 3 (Description of Proposed Development)). The potential grounding of cable lay barges at low tide between KP 1.0 and KP 4.7 will occur over a short duration of up to 4 weeks. This is unlikely to be noticeable above baseline levels of disturbance from the existing high levels of traffic within the area (*c.* 200 vessel movements/day in the winter and 400 vessel movements/day in the summer; see Chapter 13 (Shipping, Navigation, and Other Marine Users)).

11.6.7.80. Whilst the foraging range of little terns is restricted to nearshore waters up to *c.*10 km (Thaxter *et al*., 2012; Parsons *et al*., 2015), common and Sandwich terns are known to forage more widely (Thaxter *et al*., 2012; Wilson *et al*., 2014) and may therefore be disturbed by construction activities throughout the wider the Marine Cable

Corridor. This is reflected in the proposed Marine extension to these designated breeding colonies (Solent and Dorset Coast pSPA), through which the Proposed Development passes.

11.6.7.81. It is anticipated that there may be up to *c*.825 vessel movements over the course of the construction stage throughout the Marine Cable Corridor, including at the Marine HDD location (Table 11.10). However, it is anticipated that vessels will be present intermittently over the 30-month construction period. Construction vessels such as the larger cable lay vessels and barges that have difficulty in manoeuvring will have a rolling safe passing distance of up to 700 m. Whilst there may be many vessels present during each stage of installation, it is likely that each vessel will only be present in any one area of the rolling safe passing distance for very short durations (hours to days). Furthermore, vessel traffic levels in the Channel and Solent are already high (see Chapter 13 (Shipping, Navigation and Other Marine Users)). As such, common and Sandwich terns that use the Marine Cable Corridor to forage are expected to be habituated to such levels of disturbance, particularly given their low sensitivity to disturbance at sea.

11.6.7.82. Overall, potential disturbance/displacement effects on little tern are likely to be short-term, of minor adverse magnitude and **not significant** during construction (and decommissioning).

11.6.7.83. For Sandwich and common terns, potential disturbance/displacement effects are considered to be short-term, of negligible magnitude and **not significant** during construction (and decommissioning).

Operation (including Repair and Maintenance)

11.6.7.84. During operation, it is assumed that an indicative worst-case failure rate of the Marine Cables would require one repair every 10-12 years. If required, it is likely that repairs would be undertaken by a single vessel, over a short timeframe (weeks to months). Thus, the potential for disturbance/displacement effects on all three-tern species during operation and maintenance would be less than during construction.

11.6.7.85. Therefore, potential disturbance/displacement effects on little, common and Sandwich terns are short-term, of negligible adverse magnitude and **not significant** during operation.

Potential Indirect Effects as a Consequence of Seabed Disturbance on Prey Availability

Construction (and Decommissioning)

11.6.7.86. No direct loss of habitat used for breeding or loafing is predicted.

11.6.7.87. However, terns are effectively top predators of benthos, fish and shellfish populations and are considered likely to be of moderate sensitivity to habitat disturbance (Garthe & Hüppop, 2004; Bradbury *et al*., 2014). If seabed habitats (and therefore the prey species) are disturbed (including being subject to significant sediment deposition), the area may be temporarily devoid of potential food source for the birds which will result in effective habitat loss. Furthermore, terns are visual foragers and are likely to be affected by an increase in turbidity which can make it harder to see prey from the sea surface. Activities associated with construction have the potential to release sediment during cable burial and associated works.

11.6.7.88. Within Langstone Harbour where foraging tern's numbers may be high, particularly at high tide, HDD will be used. The entry/exit points of the drill are expected to be onshore, thus there is no pathway for the works to result in an increase in suspended sediment or resultant smothering in the Marine environment. Therefore, the works are not predicted to affect tern prey species or foraging success in Langstone Harbour.

11.6.7.89. Outside of Langstone Harbour out to KP 21, excavation at the Marine HDD pits (KP 1.0-1.6), and cable installation (due to the potential for the liberation and dispersal of fines identified between KP 5 and 15, and in other isolated locations) will transport the finest sediments up to 10 km from the release point. However, it is highly likely that SSC at these distances will be low (< 5 mg/l) and therefore not discernible above natural variation, which ranges from approximately <5 to 75 mg/l in coastal areas and will return to background levels within a few days of completion of works. The resultant effects of sediment disposition are also expected to be negligible due to relatively small volumes of sediment being liberated into the column, with finer sediments being redistributed under forcing tidal flows. Effects on prey species and foraging success at the Landfall are therefore **not significant** (also see Chapter 9 (Fish and Shellfish)) since both habitat disturbance and increases in SSC will be temporary, short in duration and small in extent (Table 11.10; Chapter 6 (Physical Processes)).

11.6.7.90. Elsewhere beyond KP 21 of the Marine Cable Corridor, where foraging tern densities are likely to be lower (Wilson *et al*., 2014; Parsons *et al*., 2015), the area of disturbed habitat for route preparation is anticipated to be a maximum of 3.6 km^2 along the entire Marine Cable Corridor (*c.*6%). The worst case for SSC increases and resulting deposition of sediment is due to the disposal of *c.*1.7 million m^2 of dredged material. Peak SSC of 1000 mg/l within 1 km of sediment release is predicted from disposal events however the coarse sediment will deposit quickly. Beyond 1 km from release, the passive plume is likely to generate SSC in the region of approximately 20 mg/l, transported in the direction of the prevailing flow out to a worst-case distance of 25 km. Therefore, peaks in SSC are localised and temporary (reducing significantly in a few hours) before returning to background levels within a few days, while greatest depths of sediment deposition are also predicted to be localised within a few hundred metres of the point of sediment release.

11.6.7.91. Most prey species are able to tolerate a degree of suspended sediment owing to frequent exposure to storm induced fluctuations in sediment concentrations, together with high background levels of suspended sediment already present in the study area and the Solent in particular (Guillou, *et al*., 2017).

11.6.7.92. As such, the potential for effects of reduced prey availability and foraging success resulting from seabed disturbance and increased turbidity (and resulting sediment deposition) during construction (and decommissioning) is considered to be short-term, of minor adverse magnitude and **not significant** for little terns given their smaller foraging range; and short-term, of negligible adverse magnitude and **not significant** for Sandwich and common terns.

Operation (including Repair and Maintenance)

11.6.7.93. Within Langstone Harbour, it is considered that there is no pathway for impact due to the onshore nature of the cable crossing using HDD methods (see Chapter 16 (Onshore Ecology)).

11.6.7.94. Outside of Langstone Harbour, the permanent loss of fish, shellfish and benthic habitat as a result of cable non-burial protection is not predicted to significantly affect prey availability since these measures will be limited in spatial extent (0.7 km^2; Table 11.10; Chapter 8 (Intertidal and Benthic Habitats); Chapter 9 (Fish and Shellfish)).

11.6.7.95. Given that an indicative worst-case failure rate of the Marine Cables would require one repair every 10-12 years, it is considered that potential increases in SSC would be less than predicted during construction and therefore **not significant**.

11.6.7.96. Therefore, the potential for impact from reduced prey availability resulting from a small area of seabed loss and temporary increases in turbidity (and resulting sediment deposition) is considered to be short-term, of negligible adverse magnitude and **not significant** for all three-tern species during operation.

Exposure to surface hydrocarbons or chemicals due to accidental spills

11.6.7.97. Routine embedded mitigation measures of standard best practice in terms of waste management, pollution prevention measures and strict navigational protocols will make the likelihood of accidental spills occurring highly unlikely across all development phases. As such, the potential for impacts to occur is predicted to negligible from accidental spills during any development phase of the Proposed Development.

Roseate Tern

11.6.7.98. Roseate terns, considered to be of national importance within this assessment, generally arrive in the UK from May to August to breed and prefer to nest on small shingle islands among or below vegetation (NE, 2012d). They tend to nest colonially with other species of tern, usually common (NE, 2012d).

11.6.7.99. Roseate terns feed in shallow coastal waters, out to a maximum of 30 km from the colony (mean-max = 16.6 ± 11.6 km; Thaxter *et al*., 2012). They prey mainly on small fish and crustacea, as well as worms and molluscs in shallow waters overlying the sediment (NE, 2012d).

Construction, Operation (including Repair and Maintenance) and Decommissioning)

11.6.7.100. Routine embedded mitigation measures of standard best practice in terms of waste management, pollution prevention measures and strict navigational protocols will make the likelihood of accidental spills occurring highly unlikely. Given that only a single individual has been recorded in Southampton Water during the last six years (last recorded in 2011; Frost *et al*., 2018) it is considered that roseate tern will only be present within the Marine Cable Corridor infrequently and therefore **no potential for impact** on roseate tern is predicted from any phase of the Proposed Development.

Kittiwake

11.6.7.101. Kittiwakes, considered to be of national importance within this assessment, return to UK colonies from March, with young birds mostly fledging from July (Wernham *et al*., 2012). The closest breeding colony is located on the cliffs between Brighton and Newhaven, *c*.36 km from the Proposed Development. They disperse widely after the breeding season, becoming highly nomadic, and often feeding and roosting several hundred kilometres from land. The majority remain within 500 km of colony, but some individuals, particularly immature birds, may wander as far as Greenland and North Africa to winter (Frederiksen *et al*., 2012).

11.6.7.102. Kittiwakes are surface-feeders, taking prey through dipping into the water and undertaking shallow plunge-dives, out to a maximum of 230 km from the breeding colony (NE, 2012e) with a mean-max = 60.0 ± 23.3 km (Thaxter *et al*., 2012). They generally feed on small shoaling fish, particularly sandeel, but also herring and sprat. During the breeding season kittiwakes can also forage on intertidal crustaceans and molluscs. They are also known to scavenge discards from fishing vessels (Snow & Perrins, 1998).

Construction, Operation (including Repair and Maintenance) and Decommissioning

11.6.7.103. Routine embedded mitigation measures of standard best practice in terms of waste management, pollution prevention measures and strict navigational protocols will make the likelihood of accidental spills occurring highly unlikely. Given their wide-ranging foraging behaviour, low sensitivity to vessel traffic (Garthe & Hüppop, 2004;

Bradbury *et al*., 2014), and reliance on highly mobile shoaling fish, **no potential for impact** on kittiwake is predicted from any phase of the Proposed Development.

Black-Headed Gull and Mediterranean Gull

11.6.7.104. The black-headed gull, considered to be of national importance within this assessment, is the most widely distributed seabird breeding in the UK, with similar numbers breeding inland as on the coast. Most of the breeding population are resident throughout the year, with numbers being greatly bolstered during the winter months by birds from northern and eastern Europe, especially in the east and southeast of England (Wernham *et al*., 2002).

11.6.7.105. Black-headed gulls forage in both terrestrial environments and in shallow coastal waters, particularly close to their breeding sites, out to a maximum of 40 km from the colony (mean-max = 25.5 ± 20.5 km; Thaxter *et al*., 2012). They are opportunistic foragers, feeding on invertebrates, small fish, seeds and carrion (Snow & Perrins, 1998).

11.6.7.106. Mediterranean gulls, considered to be of international importance within this assessment, generally arrive in the UK from May to August to breed, and prefer to nest colonially in short to medium swards of vegetation, and sometimes on vegetated shingle islands, particularly with black-headed gulls (NE, 2018).

11.6.7.107. Mediterranean gulls forage in shallow coastal waters, particularly close to their breeding sites, out to a maximum of 20 km from the colony (Thaxter *et al*., 2012). They prey on invertebrates and small fish (NE, 2018). They also feed in arable fields, and intertidal areas along the coastline (NE, 2018). Mediterranean gulls also feed on black-headed gull eggs and chicks, and have recently been recorded predating intensively on common tern eggs, and opportunistically on Sandwich tern eggs (NE, 2018).

11.6.7.108. Important breeding areas for both species include the North Solent, Newtown Harbour and Hurst Castle to Lymington River Estuary (Table 11.10; NE, 2018).

Potential Disturbance/Displacement Effects

Construction (and Decommissioning)

11.6.7.109. Gull species are consistently scored as being amongst the least sensitive species to disturbance at sea (Garthe & Hüppop, 2004; Bradbury *et al*., 2014).

11.6.7.110. Potential disturbance to nesting black-headed or Mediterranean gulls at their onshore breeding colonies is considered in Chapter 16 (Onshore Ecology) and Appendix 16.13 (Wintering Bird Report).

11.6.7.111. Given the proximity of the breeding colonies around the Solent to the Proposed Development, it is likely that these species utilise the shallow, coastal waters of the Marine Cable Corridor to forage.

11.6.7.112. Within Langstone and Chichester Harbours, both black-headed and Mediterranean gulls may utilise a range of habitats to forage year-round, including those in close proximity to all three onshore HDD locations. However, given that vibro-hammering at the onshore HDD locations will be completed over a very short timeframe (two hours to install at each location, and one hour to remove), together with the varied diet and relatively large foraging ranges of both gull species, any disturbance is **not significant.**

11.6.7.113. Outside of Langstone Harbour, both species of gull may again be present near the Marine HDD location and indeed throughout the wider Marine Cable Corridor throughout the year. The presence of construction vessels and associated plant at the Marine HDD location may displace black-headed and Mediterranean gulls from favoured foraging habitat through both visual disturbance and unpredictable noise events.

11.6.7.114. However, as for the onshore HDD works, vibro-hammering at the Marine HDD location will be short (Table 11.10). Noise generated by the vibro-hammers will be non-percussive and airborne SPLs are unlikely to be noticeable above the baseline in this urban setting. Since both gull species feed at the sea surface by dip-feeding or through shallow plunge-dives (RPS, 2011), it is considered that exposure to any underwater noise resulting from the vibro-hammer and pipe driving machine will be minimal and not discernible above background underwater noise levels (median noise levels around the UK range from 81.5 to 95.5 dB re 1 µPa; Merchant *et al*., 2016). A single jack-up vessel, together with a multicat, a safety vessel, a crew transfer vessel and up to four workboats may be present at the Marine HDD location for up to 44 weeks, with a total of 636 vessel movements predicted over this period (Chapter 3 (Description of Proposed Development)). The potential grounding of cable lay barges at low tide between KP 1.0 and KP 4.7 will occur over a short duration of up to 4 weeks. This is unlikely to be noticeable above baseline levels of disturbance from the existing high levels of traffic within the area (*c.* 200 vessel movements/day in the winter and 400 vessel movements/day in the summer; see Chapter 13 (Shipping, Navigation, and Other Marine Users) to which both gull species are most likely already habituated to give their low sensitivity to disturbance at sea.

11.6.7.115. Whilst it is anticipated that there may be up to *c*.825 vessel movements in total within the Marine Cable Corridor over the course of the construction stage (including those at the Marine HDD location; Table 11.10), it is anticipated that vessels will be present intermittently over the 30-month construction period. Construction vessels such as the larger cable lay vessels and barges that have difficulty in manoeuvring will have a rolling safe passing distance of up to 700 m. Whilst there may be a number of vessels present during each stage of installation, it is likely that each vessel will only be present in any one area of the rolling safe passing distance for very short durations (hours to days). Furthermore, vessel traffic levels in the Channel and Solent are already high (see Chapter 13 (Shipping, Navigation and Other Marine Users)) and neither Mediterranean gulls nor black-headed gulls are noted as being sensitive to vessel traffic (Bradbury *et al*., 2014).

11.6.7.116. Given that both black-headed and Mediterranean gulls forage in a variety of habitats where anthropogenic activities occur (NE, 2016; NE, 2018), potential disturbance/displacement effects are likely to be short-term, of negligible magnitude and **not significant** for both species during construction (and decommissioning).

Operation (including Repair and Maintenance)

11.6.7.117. During operation, it is assumed that an indicative worst-case failure rate of the Marine Cables would require one repair every 10-12 years. If required, it is likely that repairs would be undertaken by a single vessel, over a short timeframe (weeks to months). Thus, the potential for disturbance/displacement effects during operation and maintenance will be less than during construction.

11.6.7.118. Therefore, potential disturbance/displacement effects on Mediterranean and black-headed gulls are short-term, of negligible adverse magnitude and **not significant** during operation.

Potential Indirect Effects as a Consequence of Seabed Disturbance on Prey Availability

11.6.7.119. No direct loss of habitat used for breeding, roosting or loafing is predicted.

11.6.7.120. Whilst black-headed and Mediterranean gulls are considered to have low habitat specialisation, and hence low sensitivity to habitat disturbance (Garthe & Hüppop, 2004; Bradbury *et al*., 2014), both species are effectively top predators of fish and invertebrate populations. If seabed habitats (and therefore the prey species) are disturbed or buried by sediment deposition, the area may be temporarily devoid of any potential food sources, resulting in effective habitat loss. Furthermore, Mediterranean and black-headed gulls are visual foragers and are likely to be affected by an increase in turbidity which can make it harder to see prey from the sea surface. Activities associated with construction have the potential to release sediment during cable burial and associated works.

Construction (and Decommissioning)

11.6.7.121. Within Langstone Harbour, HDD will be used. The entry/exit points of the drill are expected to be onshore, thus there is no pathway for the works to result in an increase in suspended sediment or resultant smothering. Therefore, the works are not predicted to affect either gull species which may forage in Langstone Harbour.

11.6.7.122. Outside of Langstone Harbour out to KP 21, excavation at the Marine HDD pits (KP 1.0-1.6), and cable installation (due to the potential for the liberation and dispersal of fines identified between KP 5 and 15, and in other isolated locations) will transport the finest sediments up to 10 km from the release point. However, it is highly likely that SSC at these distances will be low (< 5 mg/l) and therefore not discernible above natural variation, which ranges from approximately <5 to 75 mg/l in coastal areas. The possible effects from sediment deposition is negligible due to the relatively small volumes of sediment being liberated into the water column, with finer sediments being redistributed under forcing tidal flows. Effects on prey species and foraging success at the Landfall are therefore **not significant** since both habitat disturbance and increases in SSC will be temporary, short and small in extent (Table 11.10; Chapter 6 (Physical Processes)).

11.6.7.123. Elsewhere beyond KP 21 of the Marine Cable Corridor, the area of disturbed habitat for route preparation is anticipated to be a maximum of 3.6 km^2 along the entire Marine Cable Corridor (*c.*6%). The worst case for SSC increases and resulting deposition of sediment is due to the disposal of *c.*1.7 million m^2 of dredged material. Peak SSC of 1000 mg/l within 1 km of sediment release is predicted from disposal events however the coarse sediment will deposit quickly. Beyond 1 km from release, the passive plume is likely to generate SSC in the region of approximately 20 mg/l, transported in the direction of the prevailing flow out to a worst-case distance of 25 km. Therefore, peaks in SSC are localised and temporary (reducing significantly in a few hours) before returning to background levels within a few days, while greatest depths of sediment deposition are also predicted to be localised within a few hundred metres of the point of sediment release.

11.6.7.124. Most prey species can tolerate a degree of suspended sediment owing to frequent exposure to storm induced fluctuations in sediment concentrations, together with high background levels of suspended sediment in the study area and the Solent in particular already (Guillou, *et al*., 2017).

11.6.7.125. Given the plasticity shown by both gull species in their foraging behaviour, it is likely that alternative feeding habitat is available elsewhere in the vicinity of the Marine Cable Corridor. The potential for impact from reduced prey availability resulting from increased turbidity during construction is therefore considered to be short-term, of negligible adverse magnitude and **not significant**.

Operation (including Repair and Maintenance)

11.6.7.126. Within Langstone Harbour, it is considered that there is no pathway for impact due to the onshore nature of the cable crossing.

11.6.7.127. Outside of Langstone Harbour, the permanent loss of fish, shellfish and benthic habitat as a result of cable non-burial protection is not predicted to significantly affect prey availability since these measures will be limited in spatial extent (0.7 km^2; Table 11.10; Chapter 8 (Intertidal and Benthic Habitats); Chapter 9 (Fish and Shellfish)).

11.6.7.128. Given that an indicative worst-case failure rate of the Marine Cables would require one repair every 10-12 years, it is considered that potential increases in SSC would be less than predicted during construction and therefore **not significant**.

11.6.7.129. Therefore, given the wide range of prey items taken by black-headed and Mediterranean gulls, the potential for impact from reduced prey availability resulting from a small area of seabed loss and temporary increases turbidity is short-term, of negligible adverse magnitude and **not significant** during operation.

Exposure to Surface Hydrocarbons or Chemicals due to Accidental Spills

11.6.7.130. Routine embedded mitigation measures of standard best practice in terms of waste management, pollution prevention measures and strict navigational protocols will make the likelihood of accidental spills occurring highly unlikely across all development phases. As such, **no potential for impact** is predicted from accidental spills during any development phase of the Proposed Development.

Lesser Black-backed Gull and Herring Gull

11.6.7.131. Lesser black-backed gulls, considered to be of national importance within this assessment, begin to return to breeding colonies in February, with most individuals having left by July, remaining largely resident in the UK year-round (Snow & Perrins, 1998). The closest coastal colony hosting significant numbers of lesser black-backed gulls is located in the Channel Islands on Alderney, *c*. 142 km from the Proposed Development. However, there are an increasing number of roof-nesting lesser-black-backed gulls in Dorset and Hampshire (Nager & O'Hanlon, 2016). In winter, numbers in the UK increase as there is an influx of birds from other locations in Europe (Wernham *et al*., 2002).

11.6.7.132. Herring gulls, considered to be of national importance within this assessment, breed between May and July, remaining largely resident in the UK year-round (Snow & Perrins, 1998). The closest coastal breeding colony is located on the cliffs between Brighton and Newhaven, *c*.36 km from the Proposed Development. As for lesser black-backed gulls, herring gulls also nest in urban areas in the vicinity of the Proposed Development (Nager & O'Hanlon, 2016). Ringing data suggests that birds disperse away from colonies after breeding but the majority of individuals tend not to make long distance migrations and some birds remain loyal to the area. During winter there is an influx of herring gulls from other locations in Europe (Wernham *et al*., 2002).

11.6.7.133. Both herring gulls and lesser black-backed gulls utilise terrestrial, intertidal and Marine habitats for foraging, taking a wide variety of prey species including invertebrates, small fish and carrion (including fishery discards). The maximum foraging distance recorded for herring gull during the breeding season is 92 km (61.1 ± 44 km; Thaxter *et al*., 2012), whilst lesser black-backed gulls forage more widely

Construction, Operation (including Repair and Maintenance) and Decommissioning)

11.6.7.134. Routine embedded mitigation measures of standard best practice in terms of waste management, pollution prevention measures and strict navigational protocols will make the likelihood of accidental spills occurring highly unlikely. Given their wide-ranging foraging behaviour, low sensitivity to vessel traffic (Garthe & Hüppop, 2004; Bradbury *et al*., 2014) and plasticity in foraging habitat, **no potential for impact** on lesser black-backed gulls or herring gulls is predicted from any phase of the Proposed Development.

Puffin, Razorbill and Guillemot

11.6.7.135. Puffins, considered to be of regional importance within this assessment, arrive at their coastal breeding colonies in March and April, departing by mid-August (Snow & Perrins, 1998). The south coast of England has relatively few cliff-based colonies of auks due to a lack of suitable habitat. However, small numbers of puffins breed along the Purbeck Cliffs (Barne *et al*., 1996; Lake *et al*., 2011). The closest coastal colony hosting significant numbers of puffins is in the Channel Islands on Alderney, *c*. 142 km from the Proposed Development. Over winter puffins inhabit open sea with few, if any, present in nearshore waters (Fayet *et al*., 2017).

11.6.7.136. Puffins predate upon small schooling fish such as sandeels up to a maximum of 200 km from the breeding colony (mean-max = 105.4 ± 46.0 km; Thaxter *et al*., 2012). The main foraging method used by puffins is pursuit-diving from the sea surface, diving up to 60 m to catch prey (Burger & Simpson, 1986).

11.6.7.137. Given the lack of suitable cliff sites along the south coast of England, only small numbers of razorbills and guillemots, both considered to be of regional importance, breed within foraging range of the Marine Cable Corridor along the Purbeck Cliffs (Barne *et al*., 1996; Lake *et al*., 2011). Adults and dependent young of both species disperse offshore from colonies in July-August. Over winter, guillemots are widely dispersed in the North Sea and north-east Atlantic, with large numbers passing through the Channel during migration (e.g. Harris *et al*., 2015). Razorbills are also widely distributed in European seas, but with a somewhat more inshore distribution in UK waters compared to puffins and guillemots (Wernham *et al*., 2002).

11.6.7.138. As for puffins, both razorbills and guillemots predate upon small schooling fish such as sandeels, with razorbills foraging up to a maximum of 95 km from the breeding colony (mean-max = 48.5 ± 35.0 km; Thaxter *et al*., 2012) and guillemots foraging up to a maximum of 135 km from the breeding colony (mean-max = 84.2 ± 50.1 km; Thaxter *et al*., 2012). Prey are caught by pursuit-diving from the sea surface, (razorbill: up to 140 m; guillemot: up to 50 m).

Construction, Operation (including Repair and Maintenance) and Decommissioning

11.6.7.139. Routine embedded mitigation measures of standard best practice in terms of waste management, pollution prevention measures and strict navigational protocols will make the likelihood of accidental spills occurring highly unlikely. Whilst all three species of auk are scored at being of moderate sensitivity to vessel traffic (Garthe & Hüppop, 2004; Bradbury *et al*., 2014), **no potential for impact** is predicted from any phase of the Proposed Development, given their extremely large foraging range and winter distribution relative to the area of impact.

11.7. CUMULATIVE EFFECTS ASSESSMENT

11.7.1. INTER-PROJECT EFFECTS

11.7.1.1. Cumulative impacts on Marine ornithology may arise from the interaction of effects from the construction, operation and decommissioning of the Proposed Development, in addition to effects from other planned or consented projects in wider region.

11.7.1.2. It has generally been considered that the potential for cumulative effects will be greatest during the construction phase of the Proposed Development. Decommissioning is assumed to have similar (or lesser) impacts than construction. If cables need to be repaired or maintained, the activities required to undertake the works are considered similar to the effects that may arise during construction although much lower in magnitude due to the considerable reduced scale and shorter duration of works.

11.7.1.3. Monitoring of many Marine activities has shown that potential effects of disturbance/displacement are both site- and species-specific (Schwemmer *et al*., 2011; Dierschke *et al*., 2016). Disturbance/displacement has been shown to occur up to *c*.6 km from the source for sensitive species (except for red-throated diver; see Mendel *et al*., 2018). Potential significant indirect effects of prey disturbance and/or habitat loss are expected to be more localised as, beyond 1 km from disposal, the plume from disposal will reduce SSCs quickly and in the region of approximately 20 mg/l. Sediment deposition will be localised within the Marine Cable Corridor and in shallower waters the finest sediment plumes from construction activities are likely to transport up to 10 km at low SSCs below natural variation and deposition levels will be negligible. As such, a ZOI of 10 km has been adopted on a precautionary basis for the Marine ornithology cumulative assessment.

11.7.1.4. As detailed in Chapter 29 (Cumulative Effects) of the ES Volume 1 (document reference 6.1.29), the CEA is undertaken with regards to PINS Advice Note seventeen – CEA (PINS, 2019). The list of projects within the vicinity of the Proposed Development that have the potential to give rise to cumulative effects on Marine ornithology is presented in Appendix 11.2 (Marine Ornithology Cumulative Assessment Matrix) of the ES Volume 3 (document reference 6.3.11.2). The list of projects was refined for Marine ornithology as follows:

- Firstly, a spatial assessment was conducted. Any project identified in the long list of cumulative projects falling within the ZOI for Marine ornithology (10 km) was screened in for further consideration (Stage 1); and
- Secondly, a temporal, scale and nature-based assessment was conducted for those projects where a potential spatial overlap was identified (Stage 2).

11.7.1.5. A long list of projects within the vicinity of the Proposed Development that have potential to give rise to cumulative effects was considered and is presented in

Appendix 11.2 (Marine Ornithology Cumulative Assessment Matrix). This included major projects (offshore wind farms, interconnector cables, oil and gas), aggregate dredging projects, dredging and disposal projects, and coastal projects. This long list was agreed with the MMO (see Table 11.1). The locations of projects within this list in relation to the Proposed Development are shown in Figures 29.1 to 29.5 of the ES Volume 2 (document references 6.2.29.1 to 6.2.29.5).

11.7.1.6. Of the initial long list of 122 projects considered (presented in Appendix 11.2 (Marine Ornithology Cumulative Assessment Matrix)), 65 were considered to have spatial overlap with the Proposed Development under Stage 1 of the CEA. Of these, 38 were considered to have temporal overlap with the Proposed Development under Stage 2. These included the AQUIND Interconnector within the French EEZ and French Territorial Waters, 14 aggregate dredging projects, 18 dredge and disposal projects, and five coastal projects.

11.7.1.7. However, the scale and nature of these 38 shortlisted projects meant that any potential cumulative effects were predicted not to be significant (i.e. potential disturbance and effects on prey availability are predicted to be highly localised and temporary). Therefore, no projects were progressed to detailed CEA (i.e. progressed to Stage 3 and 4 as defined by PINS Advice Note Seventeen) for Marine ornithology.

11.7.2. INTRA-PROJECT EFFECTS

11.7.2.1. As detailed in Chapter 4 (EIA Methodology) of the ES Volume 1 (document reference 6.1.4), Chapter 29 (Cumulative Effects) presents consideration of potential intra-project effects on Marine ornithology receptors.

11.7.3. TRANSBOUNDARY EFFECTS

11.7.3.1. The possibility for transboundary effects exists where the impacts of the Proposed Development extend beyond the UK Marine Area, either in isolation or cumulatively. No significant effects on IOFs in UK waters have been identified because of the Proposed Development.

11.7.3.2. While there is potential for any sediment plume arising from construction and disposal activities to extend into French waters, and therefore potential for indirect effects on prey, transboundary effects from this 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.

11.7.3.3. In addition, the potential effects on designated sites in France and the Channel Islands where there is potential for connectivity to the Proposed Development has been assessed. Accordingly, potential effects on the integrity and conservation status of these sites have been considered as part of the HRA process (HRA Report; and appendices for further details). It has been concluded that there were no adverse effects on site integrity for the French and Channel Island sites considered.

11.8. PROPOSED MITIGATION

11.8.1.1. 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 such as those identified in 11.6.1 will be in place.

11.8.1.2. As detailed in Chapter 16 (Onshore Ecology), a winter working restriction is proposed for terrestrial and intertidal features of Chichester and Langstone Harbours SPA (Appendix 16.14 (Winter Working Restrictions for Features of Chichester and Langstone Harbours SPA)). This restriction would prevent sheet piling at HDD2 and HDD3 from being undertaken between the months of October to March, inclusive, and would minimise potential disturbance impacts on IOFs present below MLWS during these months.

11.8.1.3. Given that no significant effects were predicted for Marine ornithology, no further mitigation measures are proposed.

11.9. RESIDUAL EFFECTS

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

11.9.1.2. The assessment has therefore identified no significant residual effects resulting from the Proposed Development, either alone or cumulatively, for any IOF, with effects predicted to be short-term and of minor adverse magnitude at most.

11.9.1.3. With regards to possible impacts from exposure to surface hydrocarbons or chemicals due to accidental spills for all IOFs, the possible effects are negligible.

Table 11.12 - Summary of Effects for Marine Ornithology

IOF	Phase	Impact	Significance of Effect	Mitigation	Significance of Residual Effects
Common Scoter	Construction (and decommissioning); and Operation (including repair and maintenance)	Disturbance and displacement	No potential for impact	None	N/A
		Indirect effects on prey	No potential for impact	None	N/A
		Accidental spills	No potential for impact	None	N/A
Red-Breasted Merganser	Construction (and decommissioning)	Disturbance and displacement	Minor adverse, not significant	None	Not significant
	Operation (including repair and maintenance)	Disturbance and displacement	Negligible adverse, not significant	None	Not significant
	Construction (and decommissioning)	Indirect effects on prey	Minor adverse, not significant	None	Not significant
	Operation (including repair and maintenance)	Indirect effects on prey	Negligible adverse, not significant	None	Not significant
	Construction (and decommissioning); and Operation (including repair and maintenance)	Accidental spills	No potential for impact	None	N/A
Slavonian Grebe	Construction (and decommissioning)	Disturbance and displacement	Minor adverse, not significant	None	Not significant

IOF	Phase	Impact	Significance of Effect	Mitigation	Significance of Residual Effects
	Operation (including repair and maintenance)	Disturbance and displacement	Negligible adverse, not significant	None	Not significant
	Construction (and decommissioning)	Indirect effects on prey	Minor adverse, not significant	None	Not significant
	Operation (including repair and maintenance)	Indirect effects on prey	Negligible adverse, not significant	None	Not significant
	Construction (and decommissioning); and Operation (including repair and maintenance)	Accidental spills	No potential for impact	None	N/A
Black-Necked Grebe	Construction (and decommissioning)	Disturbance and displacement	Minor adverse, not significant	None	Not significant
	Operation (including repair and maintenance)	Disturbance and displacement	Negligible adverse, not significant	None	Not significant
	Construction (and decommissioning)	Indirect effects on prey	Minor adverse, not significant	None	Not significant
	Operation (including repair and maintenance)	Indirect effects on prey	Negligible adverse, not significant	None	Not significant
	Construction (and decommissioning); and Operation (including repair and maintenance)	Accidental spills	No potential for impact	None	N/A

IOF	Phase	Impact	Significance of Effect	Mitigation	Significance of Residual Effects
Fulmar	Construction (and decommissioning); and Operation (including repair and maintenance)	Disturbance and displacement	No potential for impact	None	N/A
		Indirect effects on prey	No potential for impact	None	N/A
		Accidental spills	No potential for impact	None	N/A
Storm Petrel	Construction (and decommissioning); and Operation (including repair and maintenance)	Disturbance and displacement	No potential for impact	None	N/A
		Indirect effects on prey	No potential for impact	None	N/A
		Accidental spills	No potential for impact	None	N/A
Gannet	Construction (and decommissioning); and Operation (including repair and maintenance)	Disturbance and displacement	No potential for impact	None	N/A
		Indirect effects on prey	No potential for impact	None	N/A
		Accidental spills	No potential for impact	None	N/A
Little Tern	Construction (and decommissioning)	Disturbance and displacement	Minor adverse, not significant	None	Not significant

IOF	Phase	Impact	Significance of Effect	Mitigation	Significance of Residual Effects
	Operation (including repair and maintenance)	Disturbance and displacement	Negligible adverse, not significant	None	Not significant
	Construction (and decommissioning	Indirect effects on prey	Minor adverse, not significant	None	Not significant
	Operation (including repair and maintenance)	Indirect effects on prey	Negligible adverse, not significant	None	Not significant
	Construction (and decommissioning); and Operation (including repair and maintenance)	Accidental spills	No potential for impact	None	N/A
Sandwich Tern	Construction (and decommissioning)	Disturbance and displacement	Negligible, not significant	None	Not significant
	Operation (including repair and maintenance)	Disturbance and displacement	Negligible adverse, not significant	None	Not significant
	Construction (and decommissioning	Indirect effects on prey	Negligible, not significant	None	Not significant
	Operation (including repair and maintenance)	Indirect effects on prey	Negligible adverse, not significant	None	Not significant
	Construction (and decommissioning); and Operation (including repair and maintenance)	Accidental spills	No potential for impact	None	N/A

IOF	Phase	Impact	Significance of Effect	Mitigation	Significance of Residual Effects
Common Tern	Construction (and decommissioning)	Disturbance and displacement	Negligible, not significant	None	Not significant
	Operation (including repair and maintenance)	Disturbance and displacement	Negligible adverse, not significant	None	Not significant
	Construction (and decommissioning)	Indirect effects on prey	Negligible, not significant	None	Not significant
	Operation (including repair and maintenance)	Indirect effects on prey	Negligible adverse, not significant	None	Not significant
	Construction (and decommissioning); and Operation (including repair and maintenance)	Accidental spills	No potential for impact	None	N/A
Roseate Tern	Construction (and decommissioning); and Operation (including repair and maintenance)	Disturbance and displacement	No potential for impact	None	N/A
		Indirect effects on prey	No potential for impact	None	N/A
		Accidental spills	No potential for impact	None	N/A
Kittiwake	Construction (and decommissioning); and Operation (including repair and maintenance)	Disturbance and displacement	No potential for impact	None	N/A
		Indirect effects on prey	No potential for impact	None	N/A

IOF	Phase	Impact	Significance of Effect	Mitigation	Significance of Residual Effects
		Accidental spills	No potential for impact	None	N/A
Black-headed Gull	Construction (and decommissioning)	Disturbance and displacement	Negligible, not significant	None	Not significant
	Operation (including repair and maintenance)	Disturbance and displacement	Negligible adverse, not significant	None	Not significant
	Construction (and decommissioning)	Indirect effects on prey	Negligible, not significant	None	Not significant
	Operation (including repair and maintenance)	Indirect effects on prey	Negligible adverse, not significant	None	Not significant
	Construction (and decommissioning); and Operation (including repair and maintenance)	Accidental spills	No potential for impact	None	N/A
Mediterranean Gull	Construction (and decommissioning)	Disturbance and displacement	Negligible, not significant	None	Not significant
	Operation (including repair and maintenance)	Disturbance and displacement	Negligible adverse, not significant	None	Not significant
	Construction (and decommissioning)	Indirect effects on prey	Negligible, not significant	None	Not significant
	Operation (including repair and maintenance)	Indirect effects on prey	Negligible adverse, not significant	None	Not significant

IOF	Phase	Impact	Significance of Effect	Mitigation	Significance of Residual Effects
	Construction (and decommissioning); and Operation (including repair and maintenance)	Accidental spills	No potential for impact	None	N/A
Lesser Black-Backed Gull	Construction (and decommissioning); and Operation (including repair and maintenance)	Disturbance and displacement	No potential for impact	None	N/A
		Indirect effects on prey	No potential for impact	None	N/A
		Accidental spills	No potential for impact	None	N/A
Herring Gull	Construction (and decommissioning); and Operation (including repair and maintenance)	Disturbance and displacement	No potential for impact	None	N/A
		Indirect effects on prey	No potential for impact	None	N/A
		Accidental spills	No potential for impact	None	N/A
Puffin	Construction (and decommissioning); and Operation (including repair and maintenance)	Disturbance and displacement	No potential for impact	None	N/A
		Indirect effects on prey	No potential for impact	None	N/A
		Accidental spills	No potential for impact	None	N/A

IOF	Phase	Impact	Significance of Effect	Mitigation	Significance of Residual Effects
Razorbill	Construction (and decommissioning); and Operation (including repair and maintenance)	Disturbance and displacement	No potential for impact	None	N/A
		Indirect effects on prey	No potential for impact	None	N/A
		Accidental spills	No potential for impact	None	N/A
Guillemot	Construction (and decommissioning); and Operation (including repair and maintenance)	Disturbance and displacement	No potential for impact	None	N/A
		Indirect effects on prey	No potential for impact	None	N/A
		Accidental spills	No potential for impact	None	N/A

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