Havant BOROUGH COUNCIL

Coastal Partners

Environmental Statement

CHAPTER 8 – Marine Ecology

Langstone FCERM Scheme

November 2025

Langstone FCERM Scheme Environmental Statement

Chapter 8

Marine Ecology

Contents

8. Marine Ecology 8-1
8.1 Introduction 8-1
8.2 Key Legislation, Policy and Guidance Considerations 8-1
8.2.1 Conservation of Habitats and Species Regulations 2017 (as amended) 8-1
8.2.2 The Ramsar Convention on Wetlands of International Importance Especially as Waterfowl Habitat 1971 8-2
8.2.3 The Convention for the Protection of the Marine Environment of the North-East Atlantic (the 'OSPAR Convention') 8-2
8.2.4 Marine and Coastal Access Act 2009 8-2
8.2.5 Wildlife and Countryside Act 1981 (as amended) 8-2
8.2.6 Natural Environment and Rural Communities (NERC) Act 2006 (as amended) 8-3
8.2.7 Salmon and Freshwater Fisheries Act 1975 8-3
8.2.8 Eels (England and Wales) Regulations 2009 8-3
8.2.9 Bass Order 1999 8-3
8.2.10 Environment Act 2021 8-3
8.3 Methodology and Approach to EIA 8-4
8.3.1 Establishing the baseline 8-4
8.3.2 Determination of important marine receptors 8-5
8.3.3 Assessment criteria and assignment of significance 8-7
8.4 Baseline Conditions 8-9
8.4.1 Chichester and Langstone Harbours 8-9
8.4.2 Benthic Ecology 8-11
8.4.3 Fish and Shellfish 8-24
8.4.4 Marine Mammals 8-42
8.4.5 Habitats of Conservation Importance (HOCI), Species of Conservation Importance (SOCI) and Invasive Non-native Species (INNS) 8-44
8.4.6 Summary of Important Marine Ecological Receptors 8-45
8.5 Identification of Effect Pathways 8-46
8.6 Potential Impacts During Construction 8-50
8.6.1 Temporary loss and/or disturbance of intertidal sediment habitats and saltmarsh vegetation 8-50
8.6.2 Noise and vibration impacts on marine mammals, fish and benthic ecology 8-54
8.7 Potential Impacts During Operation 8-60
8.7.1 Temporary loss and/or disturbance of intertidal habitats during maintenance works 8-60
8.7.2 Permanent loss of intertidal habitat under the footprint of new defence structures and due to coastal squeeze 8-61
8.8 Cumulative Effects 8-62
8.9 Conclusions 8-70
8.10 References 8-72

Figures

Figure 8.1: Marine habitats in Chichester and Langstone Harbours 8-10
Figure 8.2: Intertidal habitats present within the Langstone FCERM scheme area 8-12
Figure 8.3: Saltmarsh extent and zonation in the Langstone FCERM scheme area 2016-2019 8-21
Figure 8.4: Saltmarsh extent and zonation in the Langstone FCERM scheme area in 2005.....8-22
Figure 8.5: Seagrass beds within Langstone and Chichester Harbours 8-23
Figure 8.6: Locations of the Cefas Solent Bass Survey tows 8-27
Figure 8.7: Sites included in the September 2022 Solent sea bass survey showing square root transforms of the catch rate of each age class 0–4 8-28
Figure 8.8: Sea bass recorded 2013 – 2022.....8-29
Figure 8.9: Total number of fish caught in the 2021 Southampton Water TraC survey 8-31
Figure 8.10: Total number of fish caught in the 2023 Southampton Water TraC survey 8-32
Figure 8.11: Location of LHB fish monitoring points within Langstone Harbour.....8-33
Figure 8.12: Total numbers of fish caught in Langstone Harbour in spring 2023 (left) and autumn 2023 (right). 8-34
Figure 8.13: Langstone Harbour small fish survey results for June 2012 – 2023 8-35
Figure 8.14: Langstone Harbour small fish survey results for September 2012 – 2023 8-35
Figure 8.15: Locations of shellfish beds surveyed as part of the Solent Native Oyster Survey in 2022 8-40
Figure 8.16: Langstone Harbour shellfish bed average CPUE for native oysters 8-41
Figure 8.17: Intertidal habitat types within the foreshore working area in Frontages 3, 4 and 5. 8-52
Figure 8.18: Airborne noise levels >85dB(A) from (a) Vibro piling (yellow) and (b) percussive piling (purple). 8-55
Figure 8.19: Southern Water outfalls in the Langstone area covered by the 10-year maintenance marine licence MLA/2019/00027.....8-69

Tables

Table 8.1: Importance criteria for marine EcIA 8-6
Table 8.2: Magnitude of impact.....8-7
Table 8.3: Matrix to determine sensitivity and value 8-8
Table 8.4: Significance of potential effects 8-9
Table 8.5: Intertidal Phase 1 broadscale habitats present within the study area 8-11
Table 8.6: Intertidal Phase 2 biotopes present within the study area 8-11
Table 8.7: List of fish species caught during the Langstone Harbour small fish surveys in 2017 and 2023 8-24
Table 8.8: Fish species that use the study area for spawning and nursery grounds.....8-25
Table 8.9: Main spawning periods for fish species in the study area 8-26
Table 8.10: List of species caught during Cefas Solent sea bass surveys.....8-29
Table 8.11: Seasonal movements of migratory fish species present in the Solent area.....8-36
Table 8.12: Important marine ecological receptors within the study area 8-45
Table 8.13: Summary of EIA Scoping for marine ecology potential impact pathways. 8-47
Table 8.14: Summary of sheet pile types and lengths to be used within the proposed Scheme. 8-56
Table 8.15: Sensitivity of shellfish receptors to underwater noise 8-59
Table 8.16: Areas of permanent intertidal sediment habitat loss by Frontage. 8-61
Table 8.17: Assessment of potential cumulative effects on marine ecological receptors. 8-64
Table 8.18: Overview of potential Impacts, necessary mitigation and residual impacts.....8-70

8. Marine Ecology

8.1 Introduction

This section describes the baseline conditions and provides an impact assessment of the proposed scheme with respect to marine flora and fauna. The impact assessment also details necessary mitigation and residual impacts to demonstrate the environmental acceptability of the scheme.

The study area for the marine ecological impact assessment comprises the intertidal area of Chichester and Langstone Harbours adjacent to the proposed scheme, on the north side of the Hayling Road bridge, as shown in **Figure 8.2** below. This area was chosen on the basis that it includes the habitat adjacent to the proposed Scheme and receptors that have the potential to be affected by the Scheme, including those that are afforded international, national and regional / local protection.

8.2 Key Legislation, Policy and Guidance Considerations

The marine ecology impact assessment has been undertaken within the context of relevant legislation and government policies and these are summarised below.

8.2.1 Conservation of Habitats and Species Regulations 2017 (as amended)

The Conservation of Habitats and Species Regulations 2017 (as amended), often referred to as the 'Habitats Regulations', transposed the requirements of Council Directive 92/43/EEC on the Conservation of Natural Habitats and of Wild Fauna and Flora (the Habitats Directive) and Council Directive 2009/147/EC on the conservation of wild birds (the 'Birds Directive') into law within England and Wales. These regulations provide for the designation and protection of a network of internationally important sites designated for their ecological status, including:

- Special Areas of Conservation (SACs) and Sites of Community Importance (SCIs) - promote the protection of flora, fauna and habitats.
- Special Protection Areas (SPAs) - protect rare, vulnerable and migratory birds.

These sites are collectively referred to as 'European sites', or more recently following Brexit as the 'National Site Network', and provide protection for qualifying habitats and species, as well as supporting habitats for SPA bird populations.

Regulation 63 of the Habitats Regulations defines the procedure for the assessment of the implications of plans or projects on European sites. Under this Regulation, if a proposed development is unconnected with site management and is likely to significantly affect the designated site, the competent authority must undertake an 'appropriate assessment' (Regulation 63(1)). Refer to **Appendix B** of this ES for the Habitats Regulations Assessment (HRA) undertaken for the proposed Scheme.

The Habitats Regulations also convey special protection to a number of species which are listed in Schedule 2 of the Regulations and are referred to as European Protected Species (EPS). Those relevant to the proposed Scheme include dolphins, porpoises and whales (all species). Regulation 41 makes it an offence to deliberately capture, injure or kill, or deliberately disturb an EPS.

In addition, Schedule 4 of the Regulations lists animals which may not be captured or killed in certain ways and includes the following species of relevance to the proposed Scheme:

- Harbour seal (*Phoca vitulina*)
- Grey seal (*Halichoerus grypus*)
- Atlantic salmon (*Salmo salar*) (only in fresh water)

8.2.2 The Ramsar Convention on Wetlands of International Importance Especially as Waterfowl Habitat 1971

The Convention on Wetlands, known as the Ramsar Convention, is an intergovernmental environmental treaty established in 1971 by UNESCO. UK Government policy (ODPM Circular 06/2005) states that internationally important wetlands designated under the Ramsar Convention 1971 (Ramsar sites) are afforded the same protection as SPAs and SACs for the purpose of considering development proposals that may affect them.

8.2.3 The Convention for the Protection of the Marine Environment of the North-East Atlantic (the 'OSPAR Convention')

The OSPAR Convention opened for signature in 1992 and is a Treaty to protect the marine environment of the north-east Atlantic. It sets out that Contracting Parties shall take the necessary measures to protect and conserve the ecosystems and the biological diversity of the maritime area, and to restore, where practicable, marine areas which have been adversely affected. Contained within the OSPAR Convention are a series of Annexes which deal with prevention and elimination of pollution, assessment of the quality of the marine environment and the protection and conservation of ecosystems and biological diversity.

The OSPAR convention includes a list of threatened and/or declining species, which includes European eel (*Anguilla anguilla*) and native oyster (*Ostrea edulis*) of relevance to the proposed Scheme.

8.2.4 Marine and Coastal Access Act 2009

The Marine and Coastal Access Act (2009) created a new type of Marine Protected Area (MPA) called a Marine Conservation Zone (MCZ). MCZs protect nationally important marine wildlife, habitats, geology and geomorphology. However, there are no MCZs within the study area. The nearest designated MCZs are Bembridge MCZ and Selsey Bill and the Hounds MCZ. Both of these sites are located approximately 15km away from the proposed Scheme.

The Marine and Coastal Access Act (2009) also created the Marine Management Organisation (MMO) and the requirement for a marine licence to undertake works below Mean High Water Springs (MHWS). Further information on this is described in **Chapter 6 (Legislative Framework)**.

8.2.5 Wildlife and Countryside Act 1981 (as amended)

The Wildlife and Countryside Act 1981 (as amended) is the primary piece of legislation for wildlife protection in the UK. It established a network of nationally designated Sites of Special Scientific Interest (SSSIs) and makes it an offence to carry out or permit to be carried out any operation listed within the notification without the consent of the Statutory Nature Conservation

Organisation (Natural England). The Wildlife and Countryside Act also places obligations on Government and other public bodies with regard to the conserving and enhancing of the features of SSSIs in the exercise of their functions.

The Wildlife and Countryside Act also provides protection to EPSs and other species, including dolphins, porpoises, whales and seahorses. It also includes provisions for the control of invasive non-native species (INNS) listed in Schedule 9 of the Act.

8.2.6 Natural Environment and Rural Communities (NERC) Act 2006 (as amended)

Section 40 of the Natural Environment and Rural Communities (NERC) Act 2006 requires that 'every public authority must, in exercising its functions, have regard, so far as is consistent with the proper exercise of those functions, to the purpose of conserving biodiversity'. In addition, Section 41 of the Act refers to a list of habitats and species which are of principal importance for the conservation of biodiversity in England and which were first identified as priority habitats and species in the UK Biodiversity Action Plan (UK BAP). Habitats of Principal Importance (HPI) and Species of Principal Importance (SPI) relevant to the proposed Scheme include saltmarsh, mudflats, native oyster, plaice, sole, cod, tope shark, undulate ray, European eel, sea trout, Atlantic salmon and sea lamprey.

8.2.7 Salmon and Freshwater Fisheries Act 1975

This Act was passed to protect migratory fish and their habitat / migration routes. Atlantic salmon, sea trout, eels, lampreys, smelt and shad are all afforded protection under this Act.

8.2.8 Eels (England and Wales) Regulations 2009

These Regulations require the establishment of measures for the recovery of the stock of European Eel (*Anguilla Anguilla*), with a target of ensuring that at least 40% of the potential production of adult eels return to the sea to spawn on an annual basis. The Regulations also give the Environment Agency powers to implement measures to reduce fishing pressures, improve access and habitat quality and reduce the impact of entrainment on eels.

8.2.9 Bass Order 1999

The Bass (Specified Areas) (Prohibition of Fishing) (Variation) Order 1999 provides protection for bass (*Dicentrarchus labrax*). Chichester and Langstone Harbours are designed bass nursery areas under the Bass Order 1999, and as such fishing for bass, or any other fish using sand eels as bait by any fishing boat in any part of the harbours, is prohibited between 30th April and 1st November.

8.2.10 Environment Act 2021

The Environment Act includes provisions to strengthen and improve the duty on public bodies to conserve and enhance biodiversity, including mandating a net gain in biodiversity through the planning system. The Act also requires the preparation and publication of Local Nature Recovery Strategies (LNRS) and introduces a new framework for setting long-term, legally binding targets for environmental improvement.

8.3 Methodology and Approach to EIA

Section 1.3 of this ES provides detailed information on the methodology and approach used to inform this EIA, but in principal, the Guidelines for Ecological Impact Assessment in the UK and Ireland: Terrestrial, Freshwater, Coastal and Marine (CIEEM, 2018) have been used for the basis for the marine ecology impact assessment.

In accordance with these guidelines the key elements of the Ecological Impact Assessment (EcIA) process are as follows:

- **Establishing the baseline** - Collecting information and describing the marine ecological communities in the absence of the proposed project, to inform the assessment of impacts.
- **Identifying important ecological features** - Identifying important ecological features (habitats, species and ecosystems) that may be affected, with reference to a geographical context in which they are considered important.
- **Impact assessment** - An assessment of whether important ecological features will be subject to impacts from all relevant phases of the proposed scheme (e.g. construction and operation), and the characterisation of these impacts and their effects. The significance of the residual ecological effects of the project (those remaining after mitigation), including cumulative effects is then determined.
- **Mitigation, compensation and enhancement** - Incorporation of measures to avoid, reduce and compensate potential negative ecological impacts and their effects, and the provision of ecological enhancements. Review of mitigation and assessment of residual effects.
- **Implications for decision making** - Consideration of the legal and policy framework throughout the process.

8.3.1 Establishing the baseline

A desk-based study was undertaken to describe the nature of the existing marine environment of the Langstone FCERM scheme area. This included review of information available on the habitats and species present within the study area using the following sources:

- The Environmental Scoping Report prepared for the Langstone FCERM scheme in November 2020 (Coastal Partners, 2020);
- The Scoping Opinions from Havant Borough Council (HBC) and the Marine Management Organisation (MMO) and the associated consultee responses;
- Natural England condition assessments and monitoring data for the SSSIs, SAC, SPA and Ramsar sites, available on the Designated Sites System;
- Natural England conservation advice for the SAC and SPA/Ramsar site, including MAGIC map and information available on the Designated Sites System; and
- Hampshire Biodiversity Information Centre (HBIC) and National Biodiversity Network (NBN) records.
- Environment Agency Saltmarsh Extent and Zonation dataset.
- Chichester Harbour Conservancy / University of Portsmouth 2005 Skyveg survey.

- APEM 2016 Intertidal sediment survey of Langstone Harbour SSSI.
- Hampshire and Isle of Wight Wildlife Trust Seagrass Inventory 2011.
- Sussex IFCA 2013 Seagrass Survey.
- Solent Seal Surveys reports.
- CEFAS, Environment Agency, IFCA and Harbour Authority fish and shellfish survey reports.
- Published journal articles.

In addition, to enable an assessment of the potential impact of the proposed scheme on marine benthic communities within the Langstone scheme area, a site-specific Phase 1 and Phase 2 intertidal habitat survey was undertaken by AECOM. The methodology is summarised below, and the full marine survey report can be found in **Appendix L2**.

Intertidal habitat survey

AECOM conducted a Phase 1 biotope survey and Phase 2 quantitative sampling of the intertidal habitats present along the Langstone scheme frontage. Surveys were conducted over low spring tides on 24th and 25th August 2021 following the procedural guidelines outlined in the Marine Monitoring Handbook (Davies et al., 2001) and habitats were assigned according to the European Nature Information System (EUNIS) classification system (EEA, 2012).

The survey area encompassed the intertidal habitat that extends either side of Langstone village in Langstone and Chichester Harbours (as shown in **Figure 8.2**). The survey included a Phase I walkover comprising a visual assessment of the habitats and species present, including a total of 11 transects across the intertidal area. Additional transects were added at specific points of interest. Photographs were taken and target notes recorded, including where any marine ecological features of interest were observed. The presence of any marine algae was also recorded, and notes were taken of any conspicuous fauna, as well as any evidence of, or potential for, the presence of protected and/or notable marine species. As a means of investigating indicators of nutrient enrichment, the percentage of several opportunistic algae species was estimated using the methods detailed in guidance by WFD UK TAG (2014) and broadscale habitat and biotope distributions were mapped.

Following the Phase 1 survey, Phase 2 quantitative sediment core sampling was undertaken for analysis of infauna, Particle Size Analysis (PSA) and determination of Total Organic Carbon (TOC). In total, 16 sampling stations were located across the intertidal zone between Mean High Water Springs (MHWS) and Mean Low Water Springs (MLWS) (see **Figure 8.2**). At each Phase 2 sampling station, single 0.01 m^2 sediment cores to a depth of approximately 15 cm were taken. A sub-sample was removed for PSA and TOC analysis whilst the remaining sample was transferred to a suitably sized container and preserved using a 4% formalin solution for subsequent faunal analysis by a third-party laboratory where the sample was sieved through a 0.5 mm mesh. Where it was not possible to take a core sample, such as very high on the shore, close to existing flood defences, because of the presence of very coarse sediments, data were collected using images and target notes.

8.3.2 Determination of important marine receptors

In order to determine the potential significance of an ecological impact, it is first necessary to identify whether an ecological receptor within the zone of influence is sufficiently ‘important’ for a significant impact upon it to be material in decision making. The value of species and

populations within the application site has been determined using a combination of information on their distribution, rarity and conservation status. Habitats have been evaluated against existing selection criteria, for example, those listed under international or national legislation.

In accordance with the CIEEM guidelines, a geographic scale has been used to determine the importance of ecological receptors within the zone of influence; this is outlined in **Table 8.1**.

Those ecological features classified below local/borough importance are not considered sufficiently valuable for a significant impact upon them to be material in decision making. Only those ecological receptors equivalent to, or greater than, local/borough value have therefore been included as 'important' ecological receptors within this assessment. The results of the marine ecological valuation process for the Langstone scheme area are presented in **Section 8.4.6**.

Table 8.1: Importance criteria for marine EcIA

Level of importance	Definition
International (Very high)	• An internationally designated site or candidate site (SPA, pSPA, SAC, cSAC, pSAC, Ramsar site etc.) or an area which the country agency has determined meets the published selection criteria for such designation, irrespective of whether or not it has yet been notified. • Internationally significant and viable areas of a Habitat type listed in Annex 1 of the Habitats Directive. • Globally threatened species (i.e. Critically endangered or endangered on IUCN Red list) or species listed on Annex 1 of the Berne Convention. • Regularly occurring populations of internationally important species that are rare or threatened in the UK or of uncertain conservation status. • A regularly occurring, nationally significant population/number of any internationally important species.
National (High)	• A nationally designated site (SSSI, NNR, MNR, MCZ) or a discrete area, which the country conservation agency has determined meets the published selection criteria for national designation (e.g. SSSI selection guidelines) irrespective of whether or not it has yet been notified. • Regularly occurring, globally threatened species (i.e. Vulnerable or lower on IUCN Red list) or species listed on Annex 1 of the Berne Convention. • Previously UKBAP habitats and species; Section 41 species of the Natural Environment and Rural Communities (NERC) Act.
Regional/County (Moderate)	• Viable areas of key habitat identified in the Regional/County BAP or smaller areas of such habitat which are essential to maintain the viability of a larger whole. • Viable areas of key habitat identified as being of Regional value in the appropriate Natural Area profile. • Water Framework Directive biological element. • Any regularly occurring significant population that is listed in a Local Red Data Book. • Significant populations of a regionally/county important species.

Level of importance	Definition
Local/Borough (Low)	• Areas of habitat identified in a sub-County (Local/Borough) BAP or in the relevant Natural Area profile. • District sites that the designating authority has determined meet the published ecological selection criteria for designation, including Local Nature Reserves selected on Local/Borough ecological criteria. • Sites/features that are scarce within the Local area/Borough or which appreciably enrich the Local area/Borough habitat resource. • Species are abundant, common or widely distributed. • Habitat/species possess low biodiversity, social/community value and / or economic value.
Negligible	• There is no site designation for areas of habitat. • The area does not offer key habitat for a population. • Species present are common and widespread. • Habitat/species are not considered particularly important for their biodiversity, social/community or economic value.

8.3.3 Assessment criteria and assignment of significance

The sensitivities of different marine habitats and species have been classified by the Marine Life Information Network (MarLIN) using the Marine Evidence based Sensitivity Assessment (MarESA) scale (MarLIN, 2022a). The assessments define sensitivity as high, moderate, low or not sensitive, taking into account the level of tolerance to change (termed intolerance or resistance), and the rate of recoverability (or resilience) once an impact (pressure) has abated or been removed (MarLIN, 2022b). Specific benchmarks are defined for the different impacts for which sensitivity has been assessed (e.g. smothering, abrasion, physical change to another sediment type etc.). For the purposes of this chapter of the ES, the MarLIN MarESA classification has been used to define the sensitivity of each of the important marine ecological receptors to the relevant impacts of the proposed scheme.

Potential marine ecological impacts arising as a result of the proposed development are described in **Section 8.5 and Section 8.7** for all features of ecological importance with reference to characteristics such as the likelihood, extent, magnitude, duration, frequency, timing and reversibility. The definitions of magnitude used within this chapter of the ES are defined in **Table 8.2** below.

Table 8.2: Magnitude of impact

Magnitude of Impact	Definition
High	• Effect causes extensive changes to a significant proportion of a habitat, community or trophic level nationally, or where relevant, within a statutory designated site, resulting in loss of function of the habitat. • Effects are likely beyond the marine ecology study area. • Effects cause a change to a significant proportion of a species population resulting in a decline in the abundance of the population nationally, or where relevant, within a statutory designated site, that will not be reversed through natural recruitment for 10+ years.

Medium	• Effect causes a change to part of the habitat, community or trophic level but does not result in long term effects on the function of the habitat. • Effect causes a substantial change in the abundance of a species, affecting a portion of a population that may last for more than 2 years but does not result in long term impacts to the population itself.
Low	• Effect causes a change to a small area of habitat, community or trophic level resulting in no loss of function of the habitat. • Effect causes a change to a small number of individuals of a local population for a short period of time (<2 years) but does not affect the viability of the population.
Negligible	• Effects on a trophic level, habitat, community, or population are undetectable or within the range of natural variation.

The interaction of the magnitude of an impact with the value (which mirrors the importance categories in **Table 8.1**) and sensitivity of the receptor (as defined by the MarESA) determines the significance of effects. The value and sensitivity of a receptor must therefore first be combined. The matrix used to combine these categories is shown in **Table 8.3**. In order to ensure that the worst-case scenario is assessed, where the sensitivity of a habitat or species varies due to different effects from a single impact/activity, the highest level of sensitivity will be applied within the matrix.

Table 8.3: Matrix to determine sensitivity and value

		Value			
		Inter-national	**National**	**Regional**	**Local**
Sensitivity	**High**	High	High	Medium	Low
	Medium	High	Medium	Low	Low
	Low	Medium	Low	Low	Negligible
	Negligible	Low	Low	Negligible	Negligible

The value-sensitivity category has then been applied to the matrix in **Table 8.4** to be used for the assessment of significance. For the purposes of the marine ecological assessment, an effect that is of major or moderate significance is considered to be significant in EIA terms whether adverse or beneficial. Any effect that is assessed as minor or negligible is not significant.

Table 8.4: Significance of potential effects

		Value and Sensitivity			
		High	**Medium**	**Low**	**Negligible**
Magnitude	**High**	Major	Major	Moderate	Minor
	Medium	Major	Moderate	Minor	Minor
	Low	Moderate	Minor	Minor	Negligible
	Negligible	Minor	Minor	Negligible	Negligible

8.4 Baseline Conditions

As described in **Chapter 7 (Designated Sites & Features)**, the Langstone FCERM scheme is located within the Solent Maritime SAC, Chichester and Langstone Harbours SPA and Ramsar site and the Langstone Harbour and Chichester Harbour SSSIs.

8.4.1 Chichester and Langstone Harbours

Chichester and Langstone Harbours are two large, bar-built estuaries that, together with Portsmouth Harbour, form one of the most sheltered intertidal areas on the south coast of England. Urban development surrounds the west of Langstone Harbour, whereas farmland surrounds the majority of Chichester Harbour (Natural England, 2018; 2023a).

As shown in **Figure 8.1** below, both Chichester and Langstone Harbours contain extensive areas of intertidal mudflats and sandflats, supporting areas of seagrass (*Zostera* spp.) beds, subtidal sandbanks, saltmarsh, shallow coastal waters, coastal lagoons, coastal grazing marsh and vegetated shingle ridges and islands (Natural England, 2018; 2023a). These habitats support internationally and nationally important numbers of breeding and over-wintering bird species, as described in **Chapter 10 (Ornithology)**.

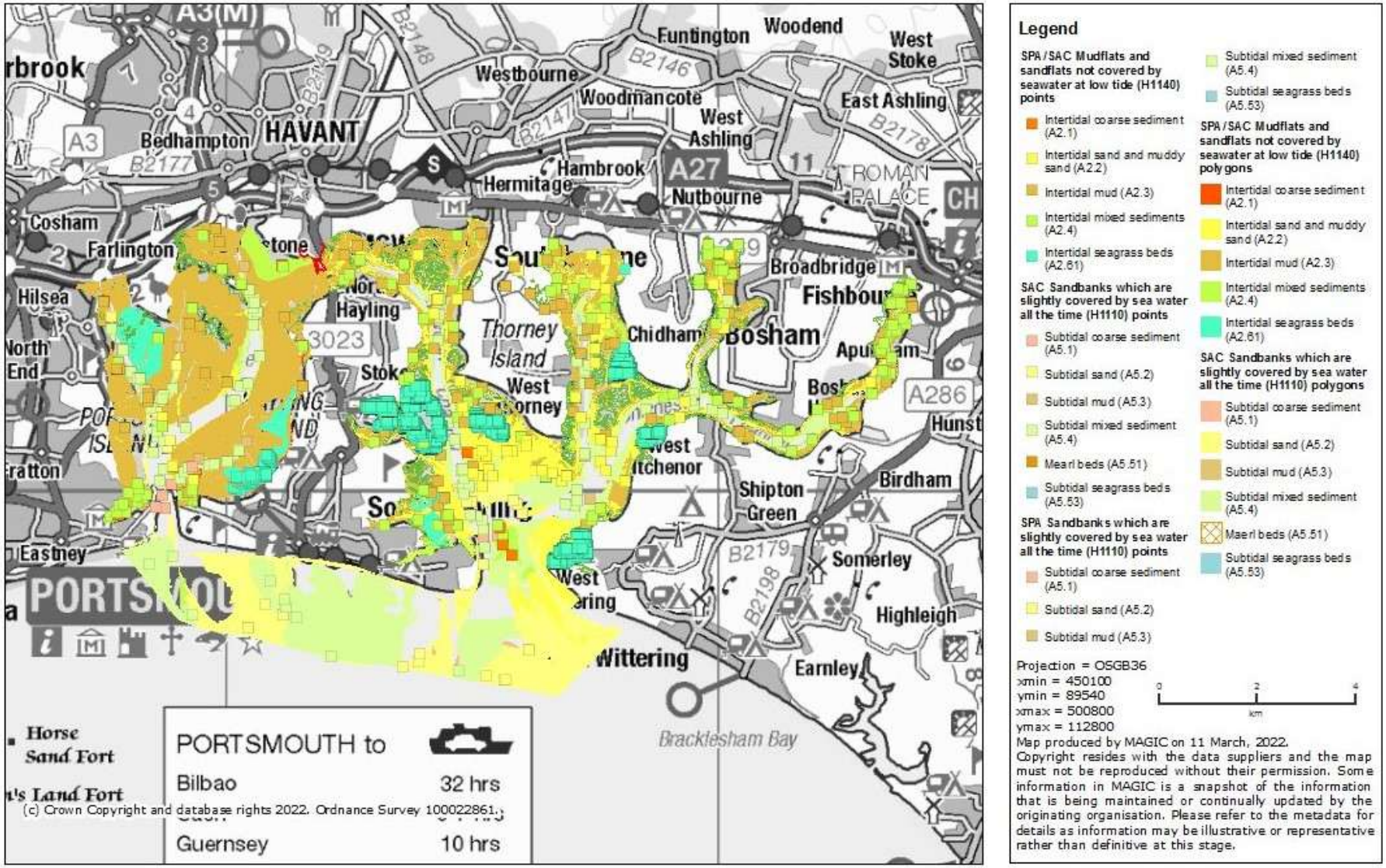


Figure 8.1: Marine habitats in Chichester and Langstone Harbours (source: MAGIC mapping).

8.4.2 Benthic Ecology

There are nine Phase 1 broadscale intertidal habitat types present within the study area, with some variation in the dominant habitats found on the Langstone Harbour side compared to the Chichester Harbour side of the Hayling Road bridge (AECOM, 2022). These broadscale habitat types are listed in **Table 8.5** and shown in **Figure 8.2**. During the Phase 2 survey, four intertidal biotopes were identified within the study area, as listed in **Table 8.6** and shown in **Figure 8.2**.

Table 8.5: Intertidal Phase 1 broadscale habitats present within the study area

EUNIS code	Broadscale habitat description
A1.3	Low energy littoral rock
A2.1	Littoral coarse sediment
A2.2 / A2.3	Littoral sand and muddy sand / Littoral mud
A2.3	Littoral mud
A2.4	Littoral mixed sediment
A2.1 / B2	Littoral coarse sediment / Coastal shingle
A2.5 (Tidal Creek)	Coastal saltmarsh and saline reedbeds
A2.5 (Intermittent) / A2.3	Coastal saltmarsh and saline reedbeds / Littoral mud
A2.5 (Sparse) / A2.3	Coastal saltmarsh and saline reedbeds / Littoral mud

Table 8.6: Intertidal Phase 2 biotopes present within the study area

EUNIS code	Biotope description
A2.243	*Hediste diversicolor, Macoma balthica* and *Eteone longa* in littoral muddy sand
A2.312	*Hediste diversicolor* and *Macoma balthica* in littoral sandy mud
A2.322	*Hediste diversicolor* in littoral mud
A2.411	*Hediste diversicolor* in littoral gravelly muddy sand and gravelly sandy mud

These habitats and biotopes are described in more detail in the following sections.

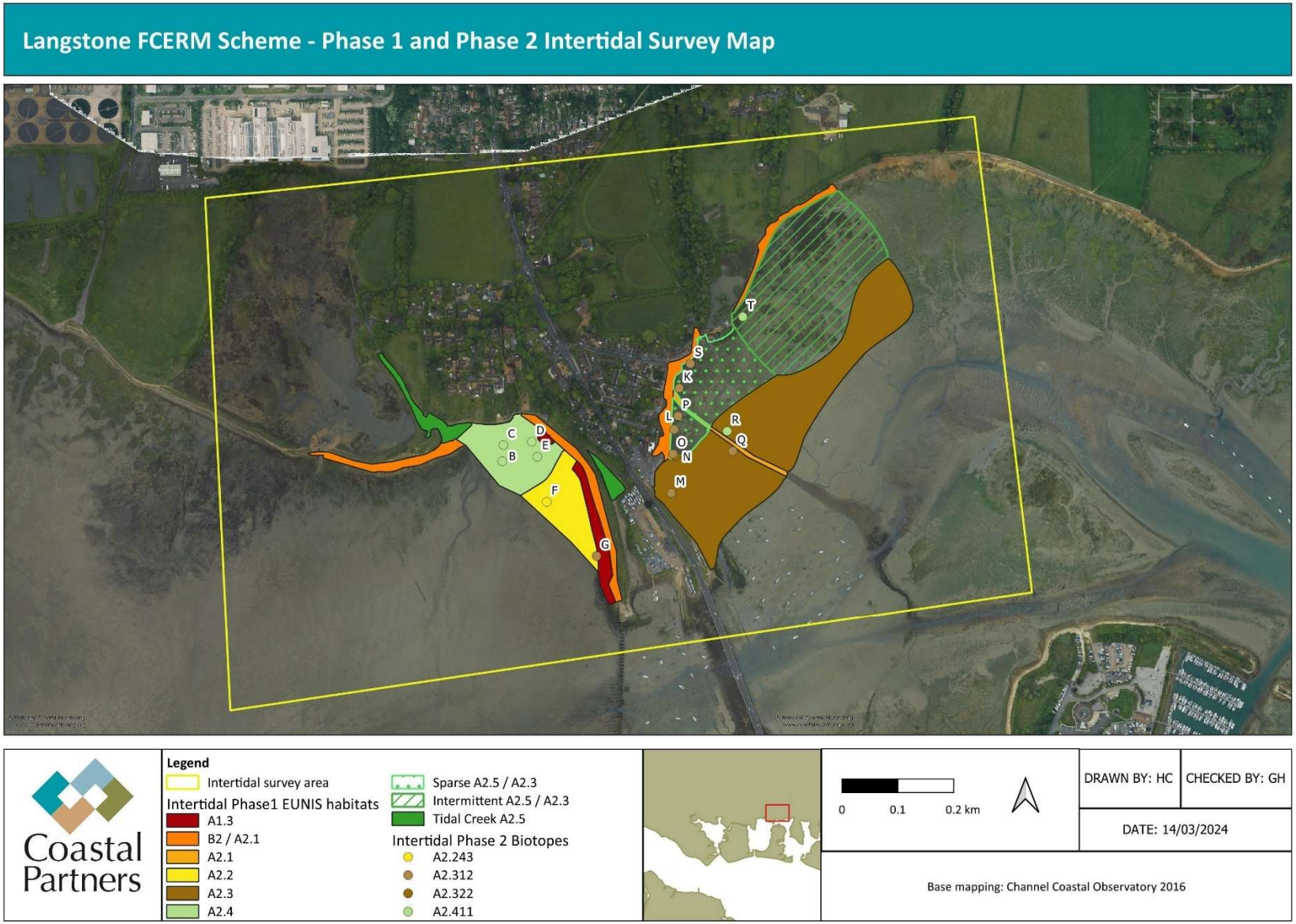


Figure 8.2: Intertidal habitats present within the Langstone FCERM scheme area (source: AECOM, 2022).

Upper shore: Littoral Coarse Sediment (A2.1) and Coastal Shingle (B2)

The upper shore and littoral fringe in both harbours is dominated by the habitat types A2.1 'littoral coarse sediment' transitioning into B2 'coastal shingle' above Mean High Water Springs (MHWS). There is limited vegetation on the A2.1 littoral coarse sediment habitat but at the eastern extent of the study area (to the east of The Old Mill, outside of the proposed scheme area) the B2 coastal shingle habitat includes coastal vegetation species typically found at the fringe of saltmarsh and shingle habitat such as sea lavender (*Limonium vulgare*), lax-flowered sea lavender (*Limonium humile*), and occasional patches of glasswort (*Salicornia* sp.).

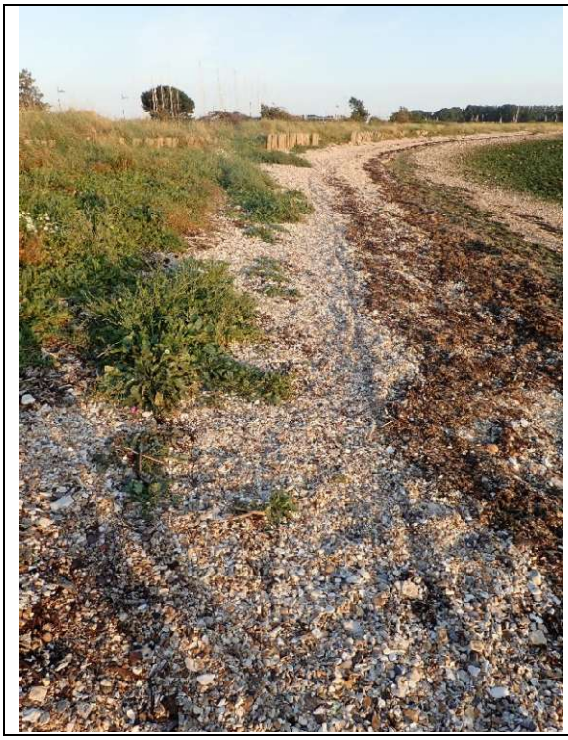
Within the proposed scheme area, the 'littoral coarse sediment' (A2.1) / 'coastal shingle' (B2) habitat, consisting of gravel with some evidence of green algae, extends from The Old Mill, past the Royal Oak public house, continuing to the slipway outside of the Ship Inn public house, and this area is used as a vehicular access route by several of the frontline properties. Due to the coarse nature of this habitat (shingle / gravel) and its compaction through use as an access route, it was not possible to undertake Phase 2 core sampling within this area. However, numerous photographs and notes were taken to characterise the habitat present. The habitat has little vegetation, although some patches of fringing saltmarsh habitat do occur on the lower limits of this habitat, as shown in **Plate 8.1** below.

Plate 8.1: Littoral coarse sediment (A2.1) habitat at: (a & b) Frontages 4 and 5 of the Langstone FCERM scheme showing the vehicular access route at the top of the shore and fringing saltmarsh habitat below this; (c) Frontage 3 of the Langstone FCERM scheme; and (d) the historic causeway, the 'Wadeway'.

From this area, a historic causeway, known as the 'Wadeway' (built in the 14th Century) (Satchell, 2014), extends from the upper shore area to the very low shore, where it becomes covered by

the main channel in Chichester Harbour. This causeway consists of a raised bed of A2.1 littoral coarse sediment with the presence of the blue mussel (*Mytilus edulis*), the Pacific oyster (*Magallana gigas*), and barnacles (*Semibalanus* sp.). These species were scattered (as one or two individuals) within the lower intertidal on and surrounding the causeway.

On the Langstone Harbour side of the study area, shingle and gravel representing 'littoral coarse sediment' (A2.1) transitioning into 'coastal shingle' (B2) is present on the upper shore along the western side of the Langstone Spit, as shown in **Plate 8.2** below. This sediment is covered in patches of dead and decaying brown algae on the strand line. On the upper fringe of this habitat, large areas of coastal vegetation are present including an abundance of sea beet (*Beta vulgaris*) – this habitat is described in more detail in **Chapter 9 (Terrestrial Ecology)**. Further west along the shore, outside of the proposed scheme area, similar 'littoral coarse sediment' (A2.1) and 'coastal shingle' (B2) is present on the Langbrook Spit at the mouth of the Langbrook Stream and continues along the beach in front of the Southmoor site.



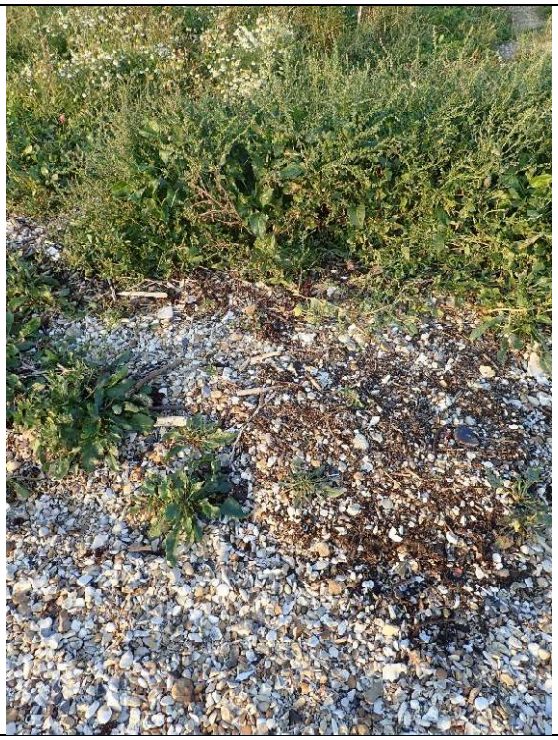


Plate 8.2: Littoral coarse sediment (A2.1) / Coastal shingle (B2) habitat and strandline transitioning to coastal vegetated shingle habitat along the western side of Langstone Spit.

Mid-lower shore: Littoral sand and muddy sand (A2.2), Littoral mud (A2.3), Littoral mixed sediments (A2.4) and Littoral rock (A1.3)

On the Chichester Harbour side of the study area, below the littoral fringe gravel and shingle, the intertidal habitat is a fragmented mosaic of saltmarsh patches within extensive mudflats (**Plate** 8.3). The spire shell, or mud snail, *Peringia ulvae*, and the oligochaete *Tubificoides benedii* are the dominant species within the mudflats, having the highest contribution to overall abundance. Typical estuarine species such as the rag worm *Hediste diversicolor*, the oligochaetes *Baltidrilus costatus* and *Tubificoides pseudogaster*, the polychaetes *Capitella* sp. and *Streblospio shrubsolii* and the bivalve *Macoma balthica* are also present (AECOM, 2022).

The majority of Phase 2 sampling locations within the Chichester Harbour side of the study area (i.e. in front of Langstone Village, Frontages 3 – 5) were classified as the biotope '*Hediste*

diversicolor and *Macoma balthica* in littoral sandy mud' (A2.312). This biotope is commonly found in sheltered marine inlets, sheltered bays and estuaries. One sampling location (Station N near the Ship Inn quay wall, Frontage 3) was classified as the biotope '*Hediste diversicolor* in littoral mud' (A2.322) as it had a higher content of sand. Station N also had a high diversity and was characterised by the taxa Nematoda and the oligochaete *Baltidrilus costatus*. This is in contrast to other sampling stations on the Chichester Harbour side of the study area which had a higher abundance of *Capitella* sp. (AECOM, 2022).

Two Phase 2 sampling locations within the Chichester Harbour side of the study area were classified as the biotope '*Hediste diversicolor* in littoral gravelly muddy sand and gravelly sandy mud' (A2.411). These locations had a high content of gravel on the surface of the sediment, which is likely explained by their proximity to 'littoral coarse sediment' (A2.1) on the upper shore (Station T east of the Old Mill) and on the historic Wadeway causeway (Station R).

The mudflats on the Chichester Harbour side are generally covered in a dense layer of the opportunistic green algae *Ulva* spp., with all but the first centimetre of the underlying sediment highly anoxic. As well as high levels of growth of opportunistic green algae, nutrient enrichment was also evident in the measures of high TOC, which was positively correlated with the high proportion of fine particles in the sediment. Where gravel and mixed sediments were present, TOC was generally lower.

Plate 8.3: Extensive Littoral mud (A2.3) habitat on the Chichester Harbour side of the study area (left) with high cover of opportuinstic green macroalgae (right).

On the Langstone Harbour side of the study area, with the exception of upper to mid-shore littoral rock along the Langstone Spit, benthic habitats are dominated by sediment biotopes of different proportions of mud, sand and gravel. The area comprises the broadscale habitats 'A2.2 littoral sand and muddy sand', 'A2.3 littoral mud' and 'A2.4 littoral mixed sediments' with increasing amounts of gravel in the north of the bay (**Plate 8.4**). In many of the samples collected on the Langstone Harbour side of the study area, the same species were dominant, but different biotopes were recorded due to the presence of more mixed and sandy sediments. Worm casts

are visible across the A2.3 littoral mud habitat, and the green algae *Ulva* sp. and red algae *Ceramium* sp. are present sporadically.

Phase 2 locations sampled in the northern extent of the bay on the Langstone Harbour side of the study area were classified as the biotope '*Hediste diversicolor* in littoral gravelly muddy sand and gravelly sandy mud' (A2.411), which is generally found on mid and lower shores where there is variable salinity (likely due to the influence of the nearby Langbrook Stream in this situation). These sampling locations had a high content of gravel generally located on the surface of the sediment, below which the sediment consisted of mud and sand. The diversity at these stations was relatively high, the characterising species (other than *Peringia ulvae* and *Tubificoides benedii*) being the oligochaete *Baltidrilus costatus,* the isopod *Cyathura carinata,* and the polychaete *Hediste diversicolor* (AECOM, 2022).

In the southern extent of the bay on the Langstone Harbour side of the study area the sediments are sandier, and the Phase 2 sample (Station F) was classified as the biotope '*Hediste diversicolor*, *Macoma balthica* and *Eteone longa* in littoral muddy sand' (A2.243). This biotope is found in fine to very fine muddy sand on the mid shore in estuaries and in moderately exposed and sheltered bays and marine inlets. On the lower shore to the west of Langstone Spit, where the habitat transitions from intertidal rock to intertidal sand / muddy sand, the biotope '*Hediste diversicolor* and *Macoma balthica* in littoral sandy mud' (A2.312) was recorded (at Station G). Both Stations F and G had a very high content of sand and were characterised by the oligochaete *Tubificoides benedii* and spire shell *Peringia ulvae,* the latter species being recorded in the highest abundance at these stations. Diversity at these stations was low, although slightly higher at station G where the content of mud was higher (AECOM, 2022).

The biotopes '*Hediste diversicolor* and *Macoma balthica* in littoral sandy mud' (A2.312), '*Hediste diversicolor* in littoral mud' (A2.322) and '*Hediste diversicolor*, *Macoma balthica* and *Eteone longa* in littoral muddy sand' (A2.243) all belong to the habitat type 'intertidal mudflats', which is a Habitat of Principal Importance under Section 41 of the NERC Act 2006 (formerly known as UK Biodiversity Action Plan (BAP) priority habitats) because of their high nature conservation importance. The biotope '*Hediste diversicolor* in littoral gravelly muddy sand and gravelly sandy mud' (A2.411) may occur as part of the Habitat of Principal Importance 'sheltered muddy gravels'. Furthermore, these biotopes and the broadscale habitats they represent, including 'littoral sand and muddy sand' (A2.2), 'littoral mud' (A2.3) and 'littoral mixed sediments' (A2.4) are all components of the EU Habitats Directive Annex I habitats 'Estuaries' and 'Mudflats and sandflats not covered by seawater at low tide', which are qualifying features of the Solent Maritime SAC. These intertidal sediment habitats are therefore considered to be of international importance.

The broadscale habitat 'A1.3 Low energy intertidal rock' comprising boulders and cobbles is present along the upper to mid-shore adjacent to Langstone Spit and the disused trestle railway bridge (**Plate 8.4** (d)). The boulders are covered in bladder wrack (*Fucus vesiculosus*), serrated wrack (*Fucus serratus*) and spiral wrack (*Fucus spiralis*) as well as knotted wrack (*Ascophyllum nodosum*). Green algae such as *Chaetomorpha* sp. and *Ulva* sp. are also present. The sediment between the boulders is characterised as A2.4 Littoral mixed sediments (AECOM, 2022).

Plate 8.4: Intertidal habitats on the Langstone Harbour side of the sutdy area – (a) Littoral sand and muddy sand (A2.2) and Littoral mud (A2.3) habitat with worm casts on the mid – lower shore west of Langstone Spit; (b & c) Littoral mixed sediments (A2.4) with increasing amounts of gravel in the north of the bay and north-west of Langstone Spit and (d) Low energy intertidal rock (A1.3) habitat with boulders and *Fucus* species on the upper to mid shore adjacent to the west of Langstone Spit and the railway line.

The percentage cover of opportunistic algae was high across the study area ranging from 25% at the southern end of Langstone Spit to 95% at the eastern extent of the study area in front of Wade Court Farm. The only locations within the study area that did not have high cover of opportunistic macroalgae during the intertidal survey were on the historic Wadeway causeway and within the tidal creek between the sailing club and Langstone Spit. On the Chichester Harbour side of the study area, the dense algal mats were dominated by *Ulva lactuca*, whereas on the Langstone Harbour side of the study area *Chaetomorpha* sp. dominated the algal mats (**Plate 8.5**).

(a)

(b)

Plate 8.5: (a) Dense mats of *Ulva* sp. on the Chichester Harbour side of the study area and (b) *Chaetomorpha* sp. on the Langstone Harbour side of the study area.

The ecological status of macrobenthic infaunal invertebrate assemblages (determined using the Water Framework Directive (WFD) Infaunal Quality Index (IQI) metric) at all stations sampled in the study area was 'Moderate', with the exception of a single 'Good' station in Langstone Harbour that was characterised by fewer opportunistic species than found at other stations (AECOM, 2022). Communities classified as 'Moderate' are generally characterised by the presence of first-order opportunistic and tolerant taxa which are indicators of pollution, with a general absence of sensitive taxa to high levels of organic enrichment and pollution (Phillips *et al.*, 2014). Those assigned as having a 'Good' IQI status represent habitats which are only slightly disturbed. The stations classified as 'Moderate', characterised by higher abundances of *Tubificoides benedii, Baltidrilus costatus, Cyathura carinata,* and *Capitella* sp., are likely the result of higher levels of nutrient and organic enrichment in these areas (AECOM, 2022).

Across all stations, the sediment was determined to be highly anoxic, with the redox layer occurring at 0.5-2 cm (below which the sediment was anoxic) indicating high levels of hydrogen sulphides (AECOM, 2022).

Saltmarsh (A2.5)

Saltmarsh habitat is present within both the Chichester and Langstone Harbour sides of the study area. On the Chichester Harbour side, pioneer saltmarsh is present as a mosaic within an extensive area of intertidal mudflat habitat, with large amounts of fragmentation between saltmarsh communities (**Plate 8.6**). The saltmarsh patches are dominated by *Spartina anglica* in monoculture stands. The density of saltmarsh is highest at the eastern extent of the study area and becomes more sparse and fragmented westwards towards Langstone Village.

Plate 8.6: Fragmented pioneer saltmarsh habitat, primarily comprising *Spartina anglica*, within extensive intertidal mudflat habitat on the Chihcester Harbour side of the study area

There are two tidal creeks on the Langstone Harbour side of the study area, between the Langstone Spit and the sailing club (Frontage 2) (**Plate 8.7 (a) – (c)**) and at the mouth of the Langbrook Stream (**Plate 8.7 (d)**Error! Reference source not found.). These areas support higher quality, more diverse saltmarsh with low-mid marsh and pioneer zone communities present as well as *Spartina* swards. Species present within the saltmarsh habitat within the tidal creeks on the Langstone Harbour side of the study area include golden samphire (*Limbarda crithmoides*), perennial glasswort (*Sarcocornia perennis*), sea lavender (*Limonium vulgare*), lax-flowered sea lavender (*Limonium humile*), sea purslane (*Atriplex portulacoides*), cordgrass (*Spartina* sp.) and glasswort (*Salicornia* sp.).

The Solent Maritime SAC is designated for the Annex I habitats 'Spartina swards (*Spartinion maritimae*)' (1320), 'Atlantic salt meadows (*Glauco-Puccinellietalia maritimae*)' (1330) and Salicornia and other annuals colonizing mud and sand (1310). These saltmarsh habitats within the SAC are therefore considered to be of international importance. Saltmarsh is also a Habitat of Principal Importance listed under Section 41 of the NERC Act 2006.

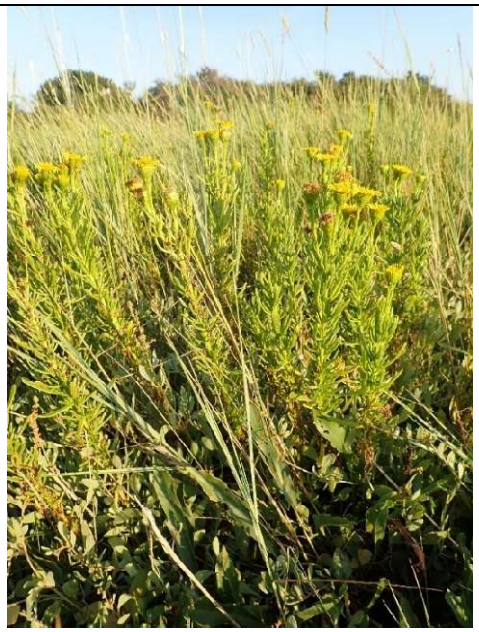
There has been a significant loss and degradation of saltmarsh habitat within both Langstone and Chichester Harbours, and in Chichester Harbour it has been estimated that if the current rate of loss continues, the harbour could lose all its remaining saltmarsh habitat by the middle of the next century (Bardsley *et al*., 2021). The decline in saltmarsh extent within the study area is evidenced by comparison of two datasets from 2016-2019 (as shown in **Figure 8.3**) and 2005 (as shown in **Figure 8.4**).

Seagrass (Zostera) beds (A2.6111)

There are no seagrass (*Zostera*) beds adjacent to the proposed Scheme frontage. The nearest seagrass beds are located over 3 km away from the proposed Scheme in Chichester Harbour at Gutner Point on Hayling Island, and over 2 km away in Langstone Harbour at South Binness Island and Sinah Lake (**Figure 8.5**).

(a)

(b)



(c)

(d)

Plate 8.7: (a) Saltmarsh A2.5 habitat within the tidal creek between the Sailing Club and Langstone Spit within Frontage 2 of the scheme, with (b) sea lavendar and sea purslane and (c) golden samphire present. (d) Saltmarsh habitat within the tidal creek at the mouth of the Langbrook Stream within Frontage 1B of the scheme.

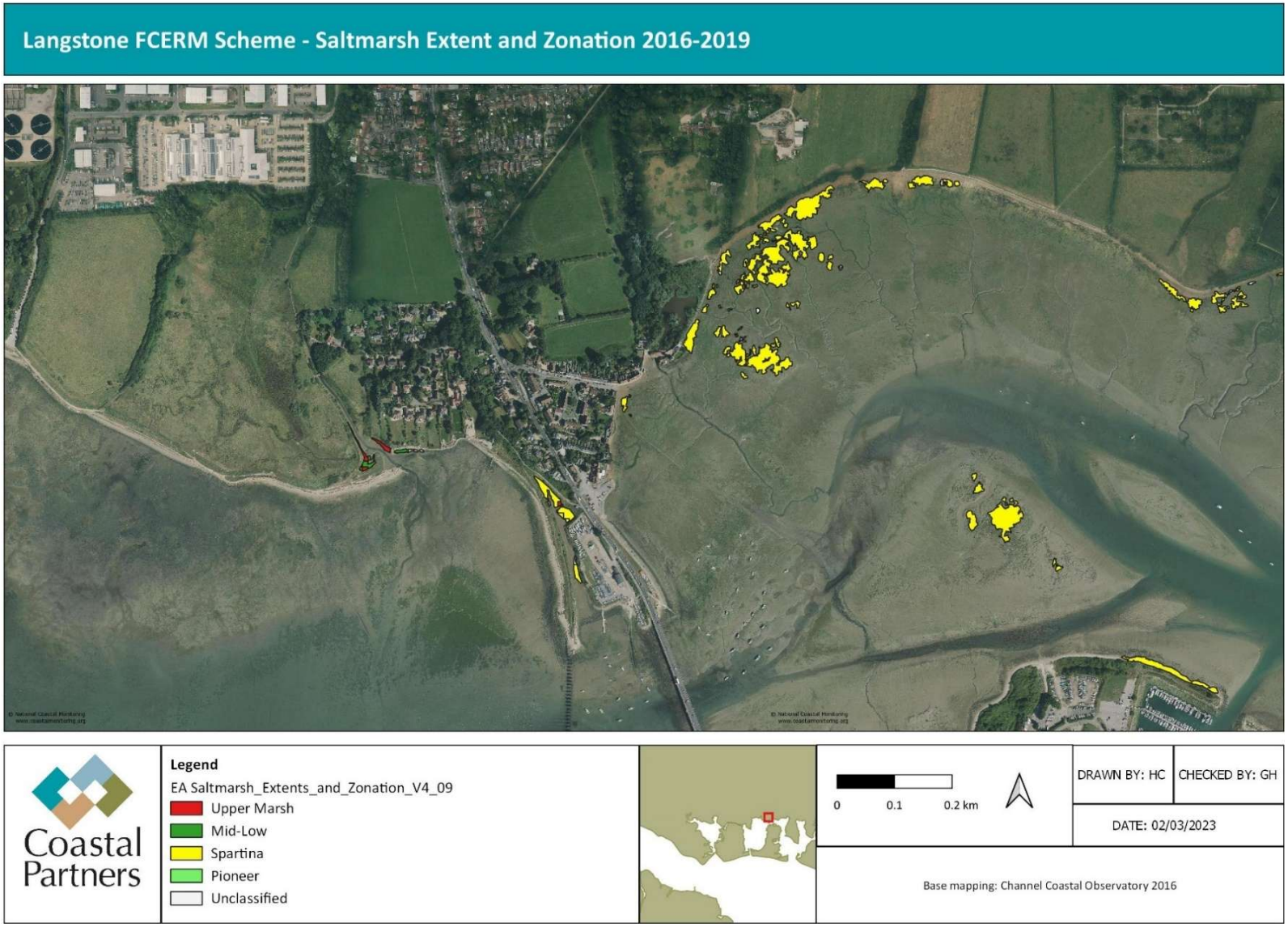


Figure 8.3: Saltmarsh extent and zonation in the Langstone FCERM scheme area 2016-2019 (source: Environment Agency, 2023b).

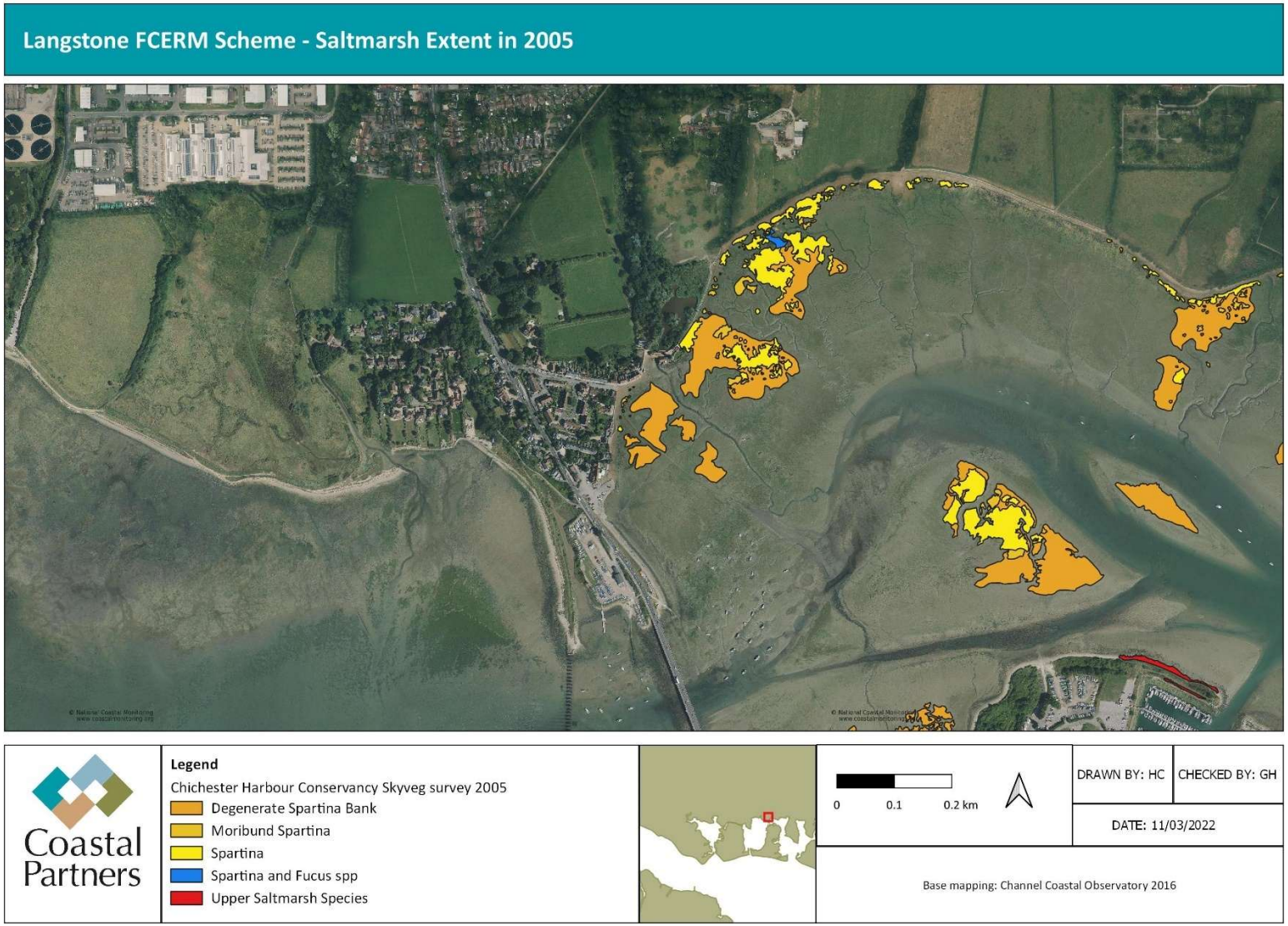


Figure 8.4: Saltmarsh extent and zonation in the Langstone FCERM scheme area in 2005 (source: Chichester Harbour Conservancy Skyveg survey 2005).

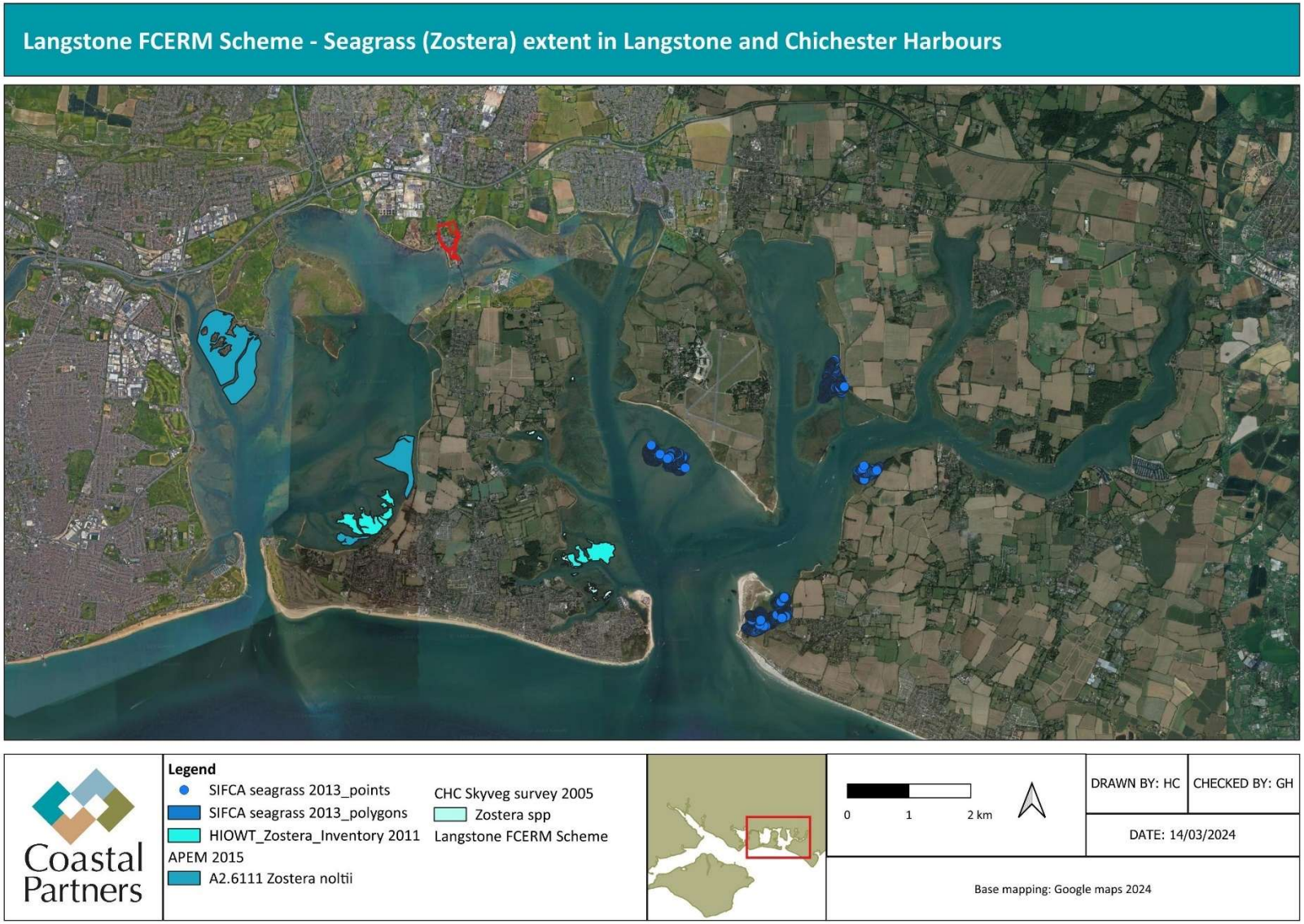


Figure 8.5: Seagrass beds within Langstone and Chichester Harbours (sources: APEM, 2016; SxIFCA, 2013; HIWWT, 2011 and Chichester Harbour Conservancy Skyveg survey 2005). N.B. There is a large intertidal seagrass bed present at Gutner Point in Chichester Harbour which is not shown in this figure due to third party data availability but is shown on the MAGIC map data in Figure 8.1.

8.4.3 Fish and Shellfish

Langstone and Chichester Harbours support a variety of marine and migratory freshwater fish and shellfish. This section of the ES considers fish and shellfish ecology – commercial fisheries were scoped out for the Core scheme as confirmed in the HBC and MMO Scoping Opinions (see **Appendix A1-A3**) and recreational fishing is considered within **Chapter 15 (Amenity, Recreation and Socio-Economics)**.

Marine fish

Marine fish are those species that spend all of their lives within the marine environment and can be divided into two distinct categories: demersal and pelagic species. Demersal fish are found on or near to the bottom of the sea where they forage, shelter and breed. Pelagic fish species are those species which live higher in the water column.

There are a range of marine fish species of commercial and non-commercial importance within the study area. Bass (*Dicentrarchus labrax*) are known to be present in the eastern Solent, and juvenile bass have been recorded in both Langstone Harbour and Chichester Harbour in Cefas Solent bass surveys (Woods & Brown, 2021). Bass at age 0 have been recorded at the northernmost part of Langstone Harbour in the vicinity of the proposed scheme area and bass at age 1–4 are more widespread across the Solent harbours. Records of bass at all ages have been very low in Chichester Harbour since 2015 (Woods & Brown, 2021).

Lesser sandeels (*Ammodytes tobianus*) are also present in the study area (LHB, 2017, 2023; SIFCA, 2017a; SxIFCA, 2018). Sandeels are an important species in the marine ecosystem as they are a prey species for several other fish, birds and marine mammals. Other fish species caught in the most recent (2023 and 2017) Langstone Harbour small fish surveys are listed in **Table 8.7**. Several elasmobranch species are present within the Solent, including tope shark (*Galeorhinus galeus*), thornback ray (*Raja clavata*) and undulate ray (*Raja undulata*) (Ellis *et al*., 2012).

Table 8.7: List of fish species caught during the Langstone Harbour small fish surveys in 2017 and 2023 (from LHB, 2017 & 2023).

Common Name	Latin Name	2017	2023
Ballan Wrasse	*Labrus bergylta*		✓
Bass	*Dicentrarchus labrax*	✓	✓
Brill	*Scophthalmus rhombus*		✓
Black Goby	*Gobius niger*	✓	✓
Common Goby	*Pomatoschistus microps*	✓	✓
Corkwing Wrasse	*Symphodus melops*	✓	✓
Dab	*Limanda limanda*		✓
Dover Sole	*Solea solea*	✓	✓
Fifteen Spine Stickleback	*Spinachia spinachia*		✓
Flounder	*Platichthys flesus*	✓	✓
Garfish	*Belone belone*	✓	
Goby sp.	N/A	✓	✓

Common Name	Latin Name	2017	2023
Greater Pipefish	*Sygnathus acus*	✓	✓
Greater sandeel	*Hyperoplus lanceolatus*		✓
Grey Mullet	*Liza / Chelon sp.*	✓	✓
Herring	*Clupea harengus*	✓	✓
Lesser sandeel	*Ammodytes tobianus*	✓	✓
Lesser weever	*Echiichthys vipera*		✓
Long Spined Sea Scorpion	*Taurulus bubalis*	✓	
Painted Goby	*Pomatoschistus pictus*	✓	
Plaice	*Pleuronectes platessa*		✓
Sand Goby	*Pomatoschistus minutus*	✓	✓
Sand Smelt	*Atherina presbyta*	✓	✓
Short Spined Sea Scorpion	*Myoxocephalus scorpius*	✓	
Snake Pipefish	*Entelurus aequoreus*	✓	
Sprat	*Sprattus sprattus*	✓	
Transparent Goby	*Aphia minuta*	✓	✓
Two-spotted Goby	*Gobiusculus flavescens*		✓

The Solent is known to be an important spawning and nursery area for several fish species. Evidence based maps for spawning and nursery grounds for selected fish species in the UK have been produced by Coull *et al.* (1998) and later revised by Ellis *et al.* (2012). These maps, together with a wider literature review and the EIA Scoping exercise that was undertaken for the proposed scheme, indicate that the fish species listed in **Table 8.8** have spawning and/or nursery grounds within the study area.

Table 8.8: Fish species that use the study area for spawning and nursery grounds

Species	Nursery	Spawning
Bass (*Dicentrarchus labrax*)	✓	✓
Tope Shark (*Galeorhinus galeus*)	✓	
Plaice (*Pleuronectes platessa*)	✓	✓
Sole (*Solea solea*)	✓	✓
Thornback Ray (*Raja clavata*)	✓	
Undulate Ray (*Raja undulata*)	✓	
Lemon Sole (*Microstomus kitt*)	✓	✓
Cod (*Gadus morhua*)		✓
Sandeel (*Ammodytes tobianus*)		✓
Sprat (*Sprattus sprattus*)		✓

Plaice, sole, cod, tope shark and undulate ray are all listed as Species of Principal Importance under Section 41 of the NERC Act 2006 and, as such, are considered to be of national importance.

The boundaries for spawning and nursery areas associated with **Table 8.8** should be seen as indicative only since species move around their preferred areas. However, some species are known to use the vicinity of the proposed scheme for nursery grounds including bass, plaice, sole, tope, thornback ray, undulate ray and lemon sole. Bass, lemon sole, sandeel, plaice, cod and sprat are all known to have spawning grounds within the area. **Table 8.9** below gives an indication of the peak spawning periods for the main species.

Table 8.9: Main spawning periods for fish species in the study area (after Coull *et al*., 1998, and Ellis *et al*., 2012).

Species	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Sole				*								
Lemon Sole												
Sandeel												
Plaice	*	*										
Cod		*	*									
Sprat					*	*						
Bass												
* denotes peak spawning period												

In particular, the inshore waters of the Solent are important spawning grounds for bass, and it is thought to be one of the most important bass nursery areas in the English Channel. To protect juvenile bass, Langstone and Chichester (and Portsmouth) Harbours are designated bass nurseries under the Bass Order 1999 and as such fishing for bass, or any other fish using sand eels as bait by any fishing boat in any part of the harbours, is prohibited between 30th April and 1st November (SIFCA, 2023; SxIFCA, 2023a). As a result of further declining stocks, seabass have been placed under additional special protection measures since 2015 (SIFCA, 2023; MMO, 2023).

There are several surveys that take place to monitor the various fish populations in the Solent area. The most relevant to the proposed scheme and study area are identified and summarised below.

Cefas Solent Bass Survey

Cefas bass surveys have been carried out in the Solent since 1983. The purpose of the survey is to develop a time-series of the abundance and pre-recruit indices of juvenile bass in and near the nursery grounds within the Solent area. Information on other fish caught is also recorded, which has provided useful information on the populations of a variety of species in the study area. It is a valuable long-term dataset. Since 1983 a total of 86 species have been found at the 35 stations throughout the Solent. **Figure 8.6** shows the locations of the sampling stations (identified as 'tows'), which includes sampling locations within Chichester and Langstone Harbours.

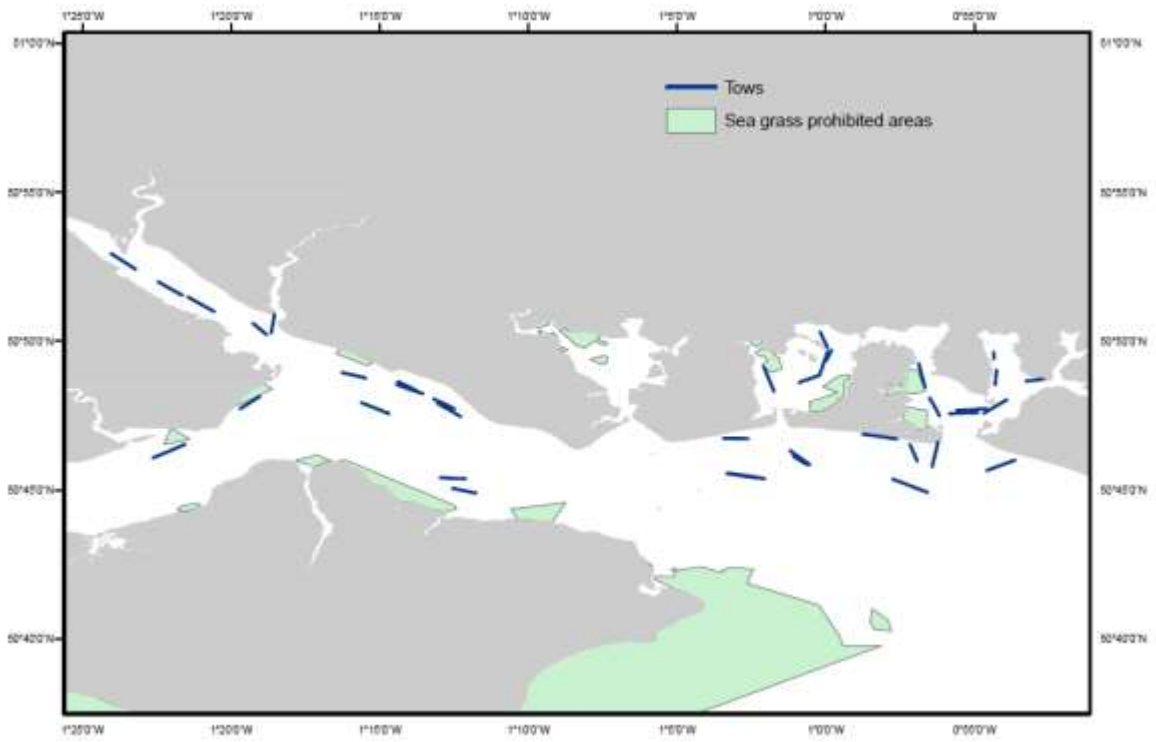


Figure 8.6: Locations of the Cefas Solent Bass Survey tows

The most recent survey report available at the time of writing is the 2022 survey report, which indicates that a total of 802 bass were caught, 740 within the harbours and 62 outside (Woods & Brown, 2022b). Bass at age 0 were found at the northernmost part of Langstone Harbour and bass at age 1–4 were more widespread across the survey area, as shown in **Figure 8.7**. It has been noted that catches of bass at all ages have been very low in Chichester Harbour over the last eight years compared to those pre-2015 (Woods & Brown, 2022b). **Figure 8.8** illustrates the Solent sea bass data over the last 10 years from 2013 – 2022.

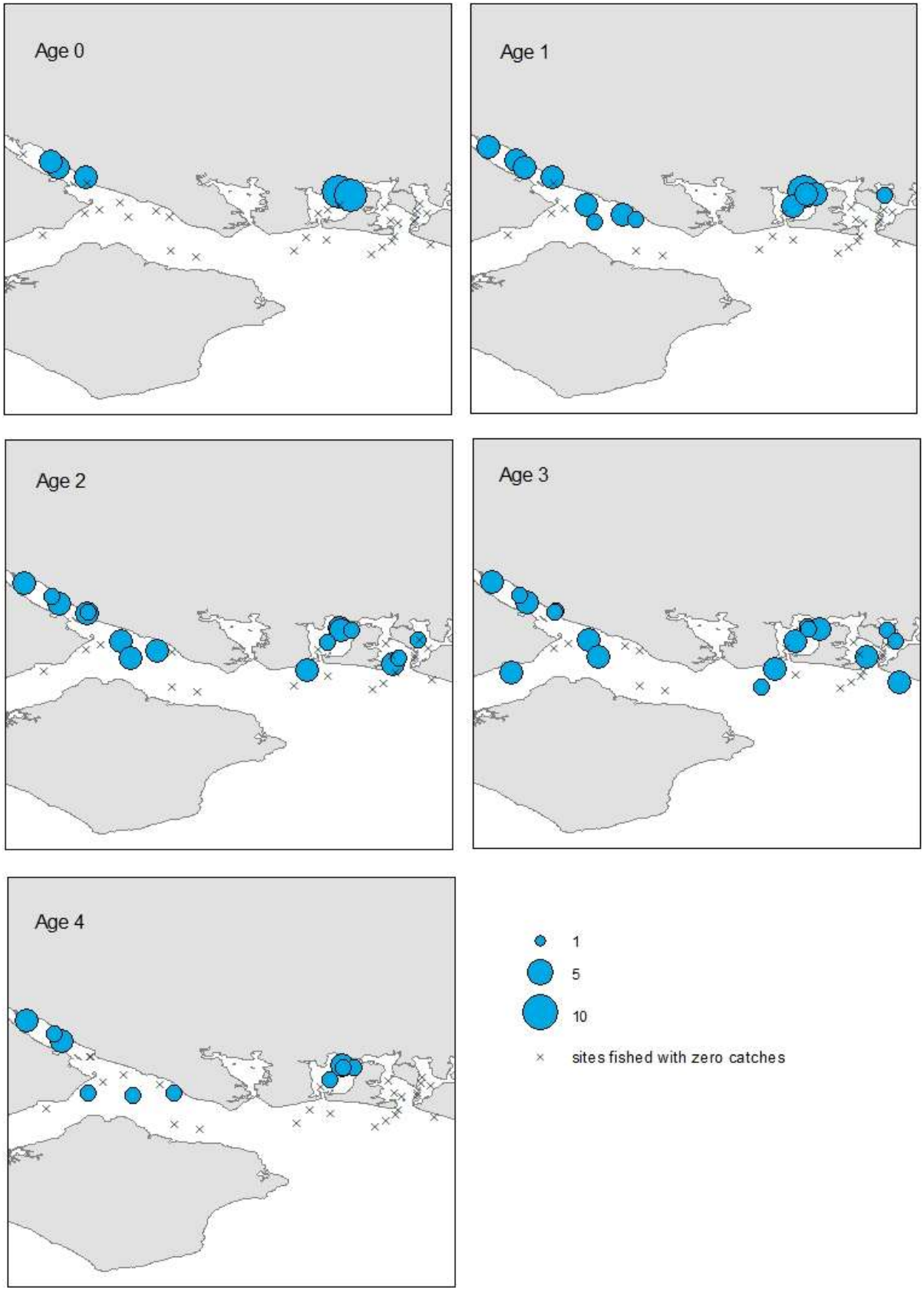


Figure 8.7: Sites included in the September 2022 Solent sea bass survey showing square root transforms of the catch rate of each age class 0–4. Source: Woods & Brown, 2022b.

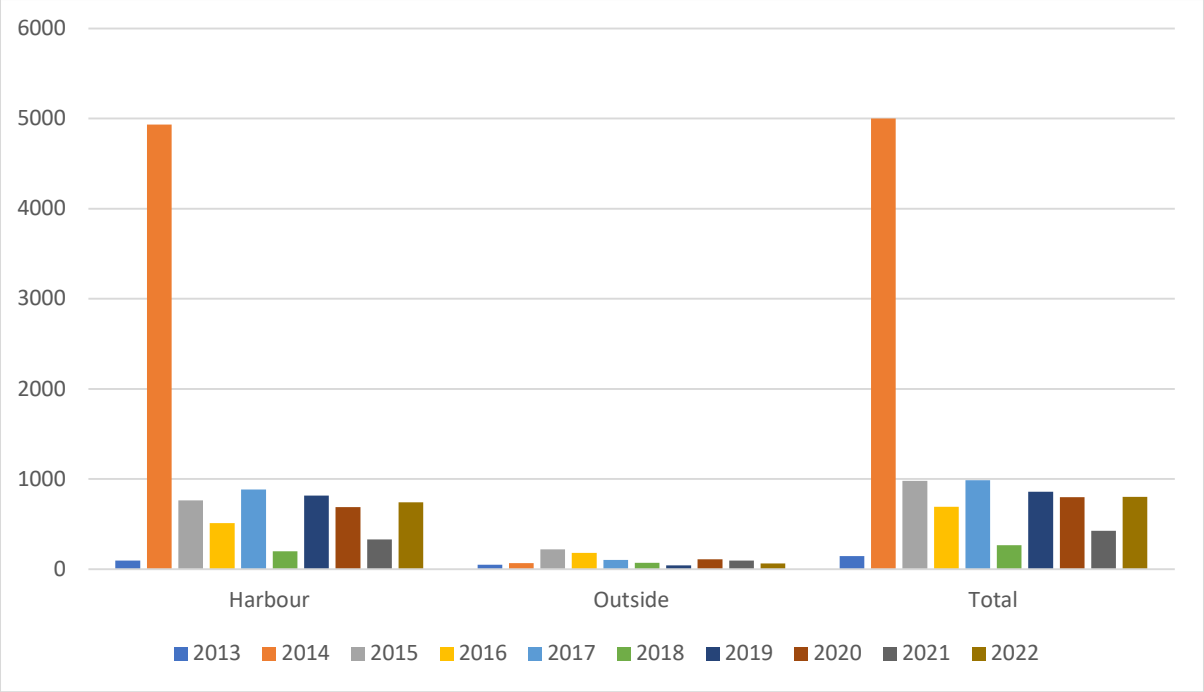


Figure 8.8: Sea bass recorded 2013 – 2022. This information has been collated from available Cefas Solent Sea Bass Survey reports (Brown, 2017; 2020a; 2020b and Woods & Brown, 2021; 2022a&b).

Other fish caught as part of this survey indicate a representative sample of fish present in the Solent harbours and these are listed in **Table 8.10**. Species highlighted in bold are particularly important for either spawning or nursery areas within the Solent.

Table 8.10: List of species caught during Cefas Solent sea bass surveys

Common Name	Latin Name
Baillon's wrasse	*Symphodus bailloni*
Ballan wrasse	*Labrus bergylta*
Barrel jellyfish	*Rhizostoma octopus*
Bass	***Dicentrarchus labrax***
Black seabream	*Spondyliosoma cantharus*
Clingfishes	*Gobiesocidae*
Common cuttlefish	*Sepia officinalis*
Common dragonet	*Callionymus lyra*
Common stingray	*Dasyatis pastinaca*
Corkwing wrasse	*Symphodus melops*
Deep-snouted pipefish	*Sygnathus typhle*
European eel	*Anguilla anguilla*
European common squid	*Loligo (alloteuthis) subulata*
Five-bearded rockling	*Ciliata mustela*
Flounder	*Platichthys flesus*
Gilt-head seabream	*Sparus auratus*

Common Name	Latin Name
Gobies	*Pomatoschistus spp*
Golden grey mullet	*Liza aurata*
Great pipefish	*Syngnathus acus*
Grey triggerfish	*Balistes capriscus*
Here bearded rockling	*Gaidropsarus*
Herring	*Clupea harengus*
Horse mackerel	*Trachurus trachurus*
Lesser spotted dogfish	*Scyliorhus canicula*
Mackerel (European)	*Scomber scombrus*
Nilsson's pipefish	*Syngnathus rostellatus*
Plaice	***Pleuronectus platessa***
Pollack	*Pollachius pollachius*
Red mullet	*Mullus surmuletus*
Rock goby	*Gobius paganellus*
Sandeel	***Ammodytes tobianus***
Sand goby	*Pomatochistus minutus*
Sand-smelts	*Atherina presbyter*
Sea scorpion	*Tauraulus bubalis*
Shore rockling	*Gaidropsarus mediterraneus*
Snake pipefish	*Entelurus aequoreus*
Sole	***Solea solea***
Spotted ray	*Raja montagui*
Sprat	***Sprattus sprattus***
Squid	*Loligo vulgaris*
Starry smooth hound	*Mustelus asterias*
Stickleback	*Spinachia spinachia*
Streaked gurnard	*Trigloporus lastoviza*
Thick-lipped mullet	*Chenon labrosus*
Thornback ray (roker)	***Raja clavata***
Three bearded rockling	*Gaidropsarus vulgaris*
Transparent goby	*Aphia minuta*
Tub gurnard	*Trigla (chelidonichthys) lucerna*
Two-spot goby	*Gobiusculus flavescens*
Undulate ray	***Raja undulata***
Whiting	*Merlangius merlangus*
Whiting-pout (bib)	*Trisopterus luscus*

Environment Agency Water Framework Directive fisheries monitoring data

The Environment Agency has monitored estuarine and coastal fish populations as part of its transitional (estuarine) and coastal water body monitoring for the Water Framework Directive (WFD) since 2007. The closest estuarine fish monitoring site is in Southampton Water, which is 23 km to the west of Langstone Village. However, this sampling location is considered to represent the fish species found generally in the coastal waters of the Solent.

The results of the Southampton Water Transitional and Coastal (TraC) Fish Monitoring Programme are consistent with the species recorded in the Cefas bass surveys described above. At the time of writing the most recent surveys covering the Southampton Water TraC water body are from 2021 and 2023. In 2021, 21 species of fish were caught, with sand smelt the most abundant species (Environment Agency, 2021). Sea bass, common goby and sand goby were the next most abundant species recorded. In 2023, 24 species of fish were caught, with sea bass the most abundant species recorded (Environment Agency, 2023a). **Figure 8.9 and Figure 8.10** show the abundance of each species caught in the 2021 and 2023 surveys.

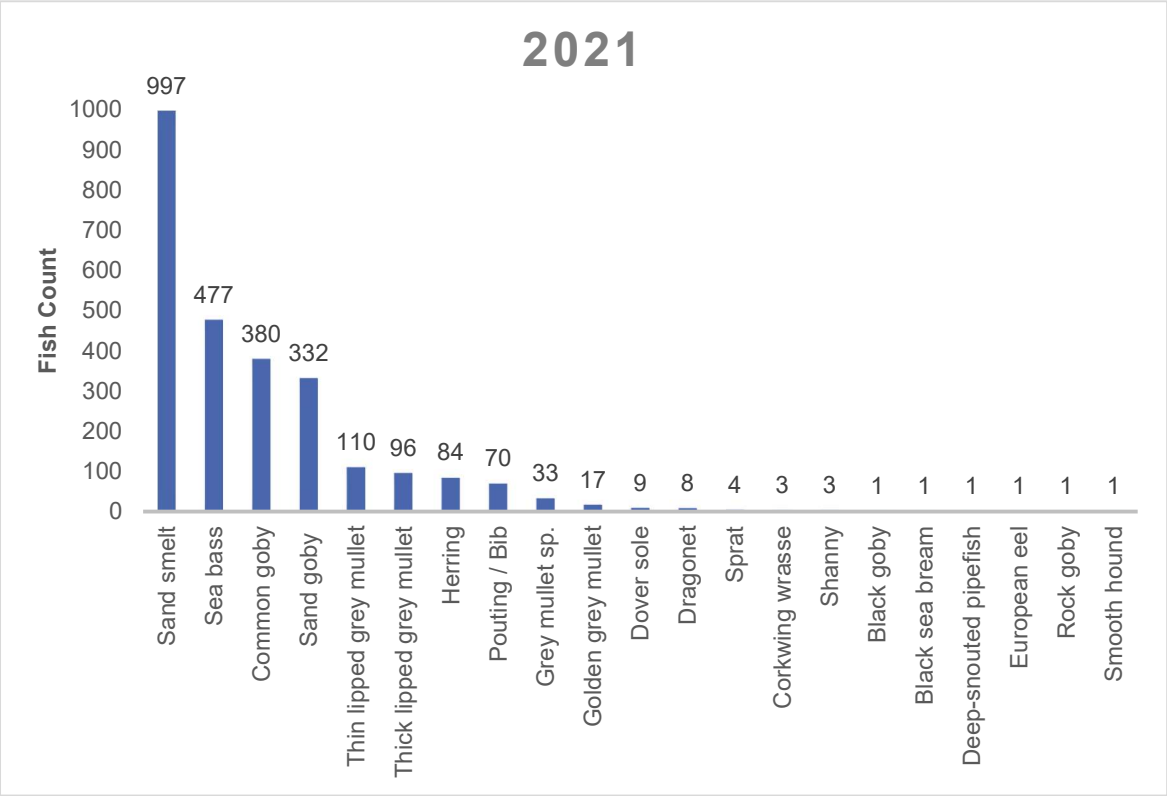


Figure 8.9: Total number of fish caught in the 2021 Southampton Water TraC survey (from Environment Agency, 2021. Where the bar appears absent, this is where only very few or single individuals were caught – labels indicate actual counts

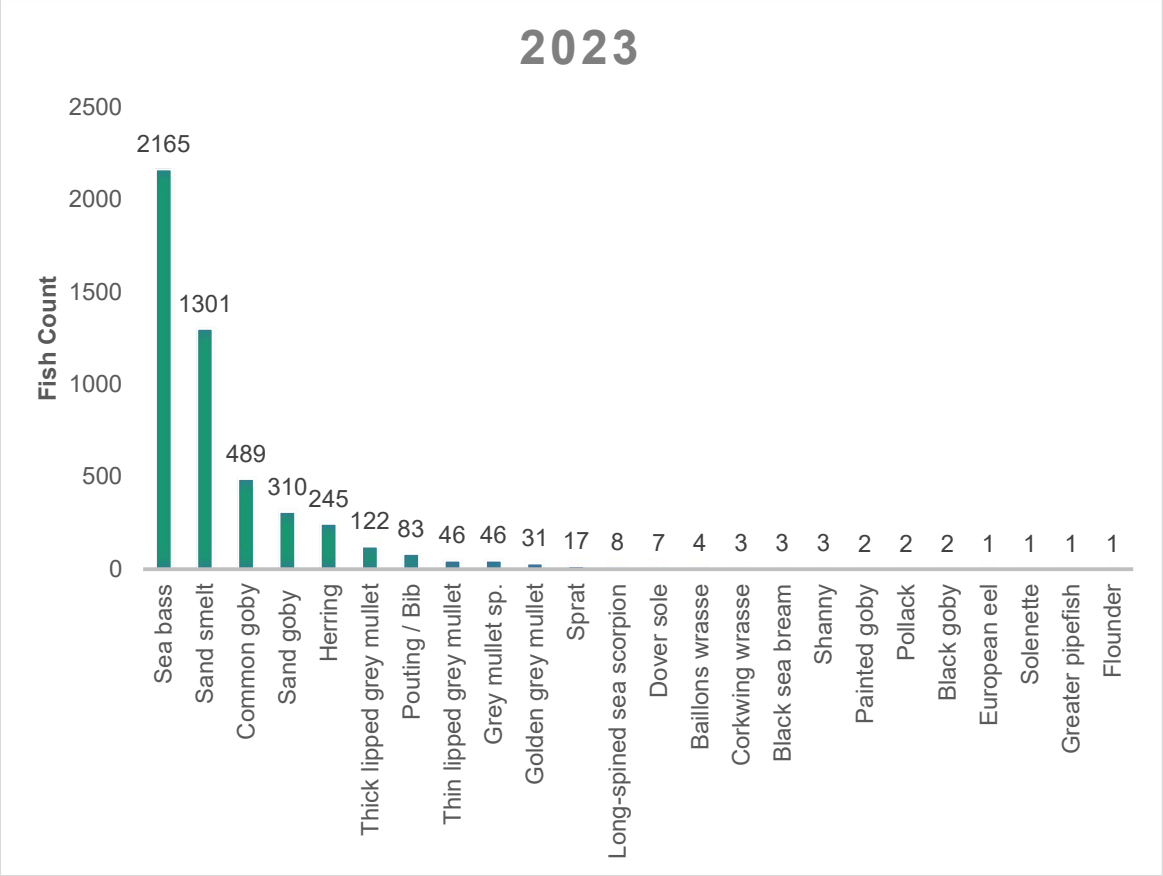


Figure 8.10: Total number of fish caught in the 2023 Southampton Water TraC survey (from Environment Agency, 2023a). Where the bar appears absent, this is where only very few or single individuals were caught – labels indicate actual counts.

Langstone Harbour Board fish surveys

Another valuable data set is the Langstone Harbour Board (LHB) Small Fish Survey. This survey data adds to the background information on fish species present and their abundance in the vicinity of the proposed scheme. The location of the monitoring points surveyed by the LHB is illustrated in **Figure 8.11**. Survey site 1 at Bedhampton Wharf is located closest to the proposed Langstone FCERM scheme.

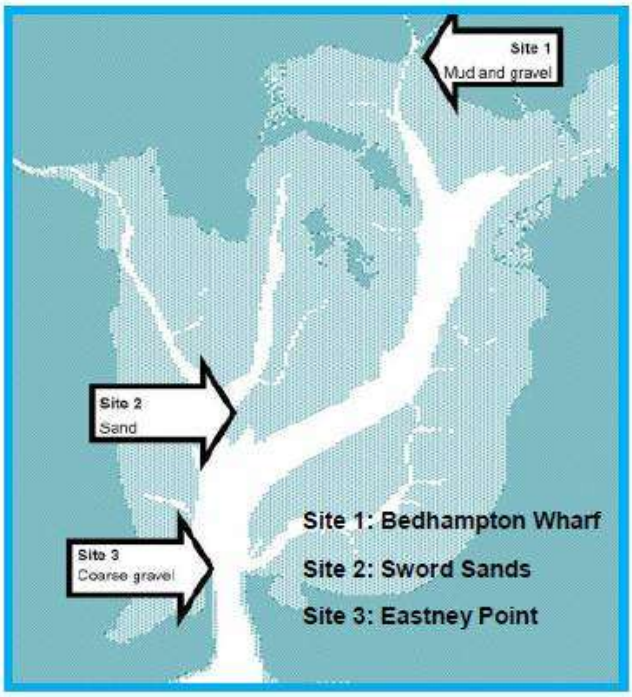


Figure 8.11: Location of LHB fish monitoring points within Langstone Harbour

Monitoring data from the LHB Small Fish Survey for the years 2012 to 2017 and 2023, the most recent survey (LHB, 2023), is provided in **Figure 8.12** to **Figure 8.14**. The results shown are for fish species that represent an important stock commercially and/or are an important seabird feeding resource. The 2023 survey was the first full survey year since 2017 for a number of reasons, namely Covid-19, which made conducting operations more difficult for a number of years.

In 2023, a total of 22 fish species were recorded across the entire survey season. In the spring surveys, common goby, lesser sandeel and bass were the most abundant species. Of particular significance in the spring season was the identification of Dab (*Limanda limanda*) for the first time in the Langstone fish survey, and the discovery of 24 flounder, at Bedhampton Wharf, surpassing the highest count recorded in 2012 (LHB, 2023). Subsequent years witnessed a decline, with no more than two individuals in any given survey season. In the autumn 2023 surveys, bass, sand smelt, herring and grey mullet were the most abundant species, but catch numbers in general were comparatively low at Bedhampton Wharf and Sword Sands compared to the spring surveys (LHB, 2023).

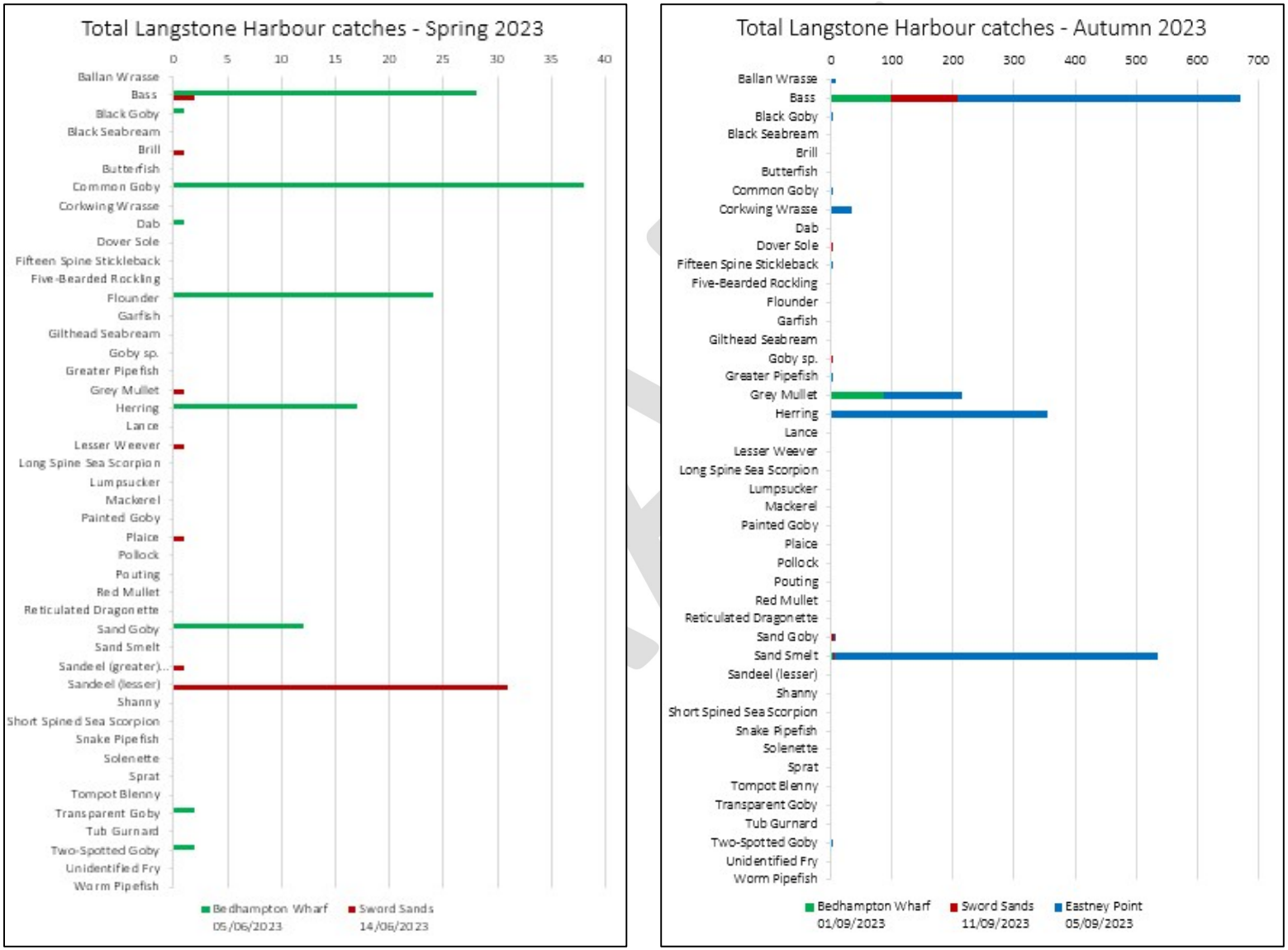


Figure 8.12: Total numbers of fish caught in Langstone Harbour in spring 2023 (left) and autumn 2023 (right).

In June 2017, a total of 19 species of fish were caught (LHB, 2017). The most abundant fish caught was the grey mullet (*Liza* sp.) with 174 individuals recorded. Bass numbers in June 2017 were consistent with catches in previous years (except for 2015 when especially high numbers were recorded). Herring were, however, caught in the lowest numbers in the history of the survey with just 13 individuals recorded. For the first time, no sand smelt were recorded in June and for the second consecutive year no sandeel were captured during June. Sand gobies were however recorded in their highest numbers since the survey began. Mean lengths during June were comparable to those seen in previous years, although bass were on average smaller than in previous years, most likely as a result of a greater proportion of year 1 individuals being captured (LHB, 2017). In September 2017, a total of 15 fish species were recorded, with all species having been previously recorded during the survey. The most abundant species was the sand goby with 721 individuals captured.

Figure 8.13 and **Figure 8.14** below show fish numbers across all survey seasons for species of commercial and ecological importance.

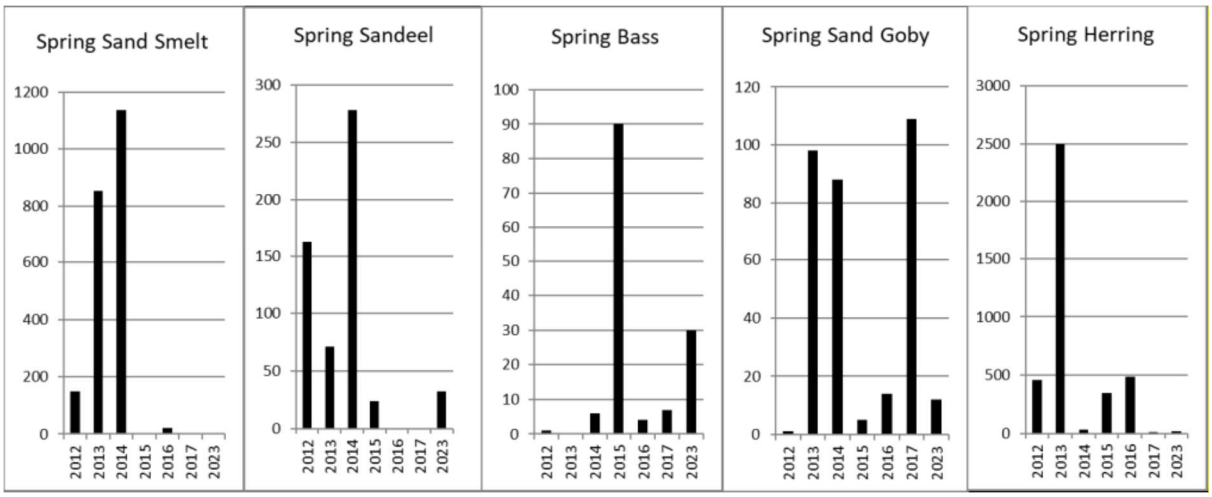


Figure 8.13: Langstone Harbour small fish survey results for June 2012 – 2023 (extracted from LHB, 2023).

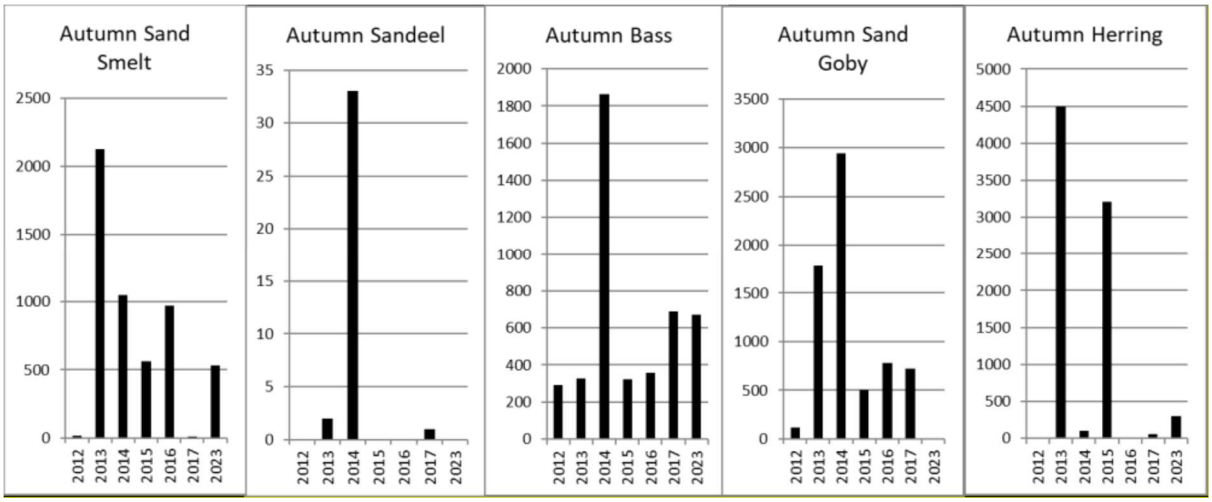


Figure 8.14: Langstone Harbour small fish survey results for September 2012 – 2023 (extracted from LHB, 2023).

Sussex IFCA small fish surveys

The Sussex IFCA conducted small fish surveys in Rye Harbour, Chichester Harbour and Medmerry managed realignment site in 2018. In Chichester Harbour, three sites were sampled twice in June and October/November and one site was sampled once in November. A total abundance of 896 fish were sampled in Chichester Harbour, comprised of 20 different species. The most abundant species were sand smelt, sea bass and juvenile gobies, which together made up 79% of the species caught in Chichester Harbour (SxIFCA, 2018).

Migratory fish

In addition to marine fish, the Solent is also an important area for migratory fish species including Atlantic salmon (*Salmo salar*), sea trout (*Salmo trutta*), sea lamprey (*Petromyzon marinus*) and European eel (*Anguilla anguilla*) on their way to and from spawning grounds in rivers and streams (Environment Agency, 2015; 2017; 2021; 2023a; SIFCA, 2017a).

As such, there is potential for migratory fish, many of which are of conservation concern e.g. European eel and sea trout, to pass through the harbours and the Langdale Brook (and potentially Lymbrook Stream) within the study area, which may form a migration route for these species (refer to the PEA in **Appendix L1**).

Table 8.11 below shows the seasonal movements of these migratory species during the year, summarising what is known of their migration patterns.

Table 8.11: Seasonal movements of migratory fish species present in the Solent area. U = upstream movement; D = downstream movement.

Species		Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Sea trout	U												
Sea trout smolt	D												
Salmon	U												
Salmon smolt	D												
Sea lamprey	U												
Sea lamprey juv.	D												
Eel	D												
Elvers	U												

As described for marine fish, the Environment Agency monitors estuarine and coastal fish populations as part of its TraC water body monitoring for the WFD. The National Fish Populations Database (NFPD) holds information collected from fisheries monitoring work on TraC water bodies, including rivers used by migratory fish. No TraC fish surveys are carried out on the Hermitage Stream or the Lavant Streams that flow into Langstone Harbour closest to the proposed scheme. However, TraC fish surveys are carried out on the River Ems that flows into Chichester Harbour, approximately 3km to the east of the proposed scheme, and this therefore represents the closest available dataset on migratory fish within the study area.

The most recent TraC fish survey data available in the NFPD for the River Ems at the time of writing is from a survey undertaken in August 2021, when 38 sea trout and 8 European eel were recorded at the Mill Meadows Farm monitoring site and 11 sea trout and 15 European eel were recorded at the Deep Springs monitoring site (Environment Agency, 2021). On the previous survey in May 2015, 27 sea trout and seven European eel were recorded at the Westbourne monitoring site, and 46 sea trout, 15 European eel and one Atlantic salmon were recorded at the Brook Meadow monitoring site (Environment Agency, 2021).

Sea trout

As described above, NFPD data indicates that sea trout are known to be present in the River Ems (Environment Agency, 2021) and therefore migrate through Chichester Harbour between March and October each year (Environment Agency *et al.,* 2014). Sea trout smolts travel downstream from the River Ems through the estuary and out to sea between mid-March and mid-May. During June to October, adult sea trout enter the mouth of Chichester Harbour and head north towards the River Ems. There are limited movements between November and February.

Sea trout attempt to enter most of the south coast's rivers and, as such, can and do run into virtually every river and stream that flows into the Solent or wider English Channel, with the proviso that they have sufficient water, good water quality and some habitat capable of supporting brown trout. The entrance to virtually every water course will be explored by sea trout and many highly unlikely streams support small runs of migratory trout (Environment Agency *et al.,* 2014). Therefore, it is also likely that sea trout use or attempt to use the Hermitage Stream, the Lavant Stream, the Langbrook Stream and/or the Lymbrook Stream, which are within and adjacent to the study area, and sea trout are therefore also likely to migrate through Langstone Harbour.

Sea trout are protected under the Salmon and Freshwater Fisheries Act 1975. Sea trout are also Species of Principal Importance under Section 41 of the NERC Act 2006 and, as such, are considered to be of national importance.

Atlantic salmon

Salmon smolts move downstream through the estuary and out to sea from mid-March to June and adult salmon move up the estuary to their natal river between March and September. Therefore, the only time of the year when there is no movement of Atlantic salmon is October to mid-March.

Atlantic salmon are protected under the Salmon and Freshwater Fisheries Act 1975. Atlantic salmon are also Species of Principal Importance under Section 41 of the NERC Act 2006 and, as such, are considered to be of national importance. Atlantic salmon are listed under Annex II of the Habitats Directive but the small population that migrates up the River Ems is not an internationally significant population and there are no SACs designated for Atlantic salmon within the study area.

European eel

As described above, migratory eels have been recorded in the River Ems in the NFPD dataset (Environment Agency, 2021) and therefore migrate through Chichester Harbour (Environment

Agency, 2015). Juvenile eels (elvers) generally enter coastal waters and migrate up rivers into freshwater from March through to September. Adult silver eels migrate seawards on their spawning migrations from September through to November.

European eels are a Species of Principal Importance under Section 41 of the NERC Act 2006. They are also listed as critically endangered on the IUCN red list and are included on the OSPAR Commission list of threatened and/or declining species. As such, they are considered to be of international importance.

Sea lamprey

Sea lamprey have not been recorded in the River Ems in the NFPD dataset (Environment Agency, 2021) and none were recorded in previous WFD surveys on the Western Streams catchment (Environment Agency, 2015). However, sea lamprey are present in the Solent (Environment Agency, 2015; 2017; 2021; SIFCA, 2017) and therefore could be present in Langstone and/or Chichester Harbours.

Sea lamprey migrate up rivers to spawn in freshwater during May and June and, after hatching, young larvae (ammocoetes) settle downstream in suitable habitats and remain in these nursery areas for up to eight years. After transforming into pre-adults, they migrate to the sea during the late autumn.

Sea lamprey are a Species of Principal Importance under Section 41 of the NERC Act 2006 and, as such, are considered to be of national importance.

Seahorses

Two species of seahorse are found along the south coast of England, the long-snouted seahorse (*Hippocampus guttulatus*) and the short-snouted seahorse (*Hippocampus hippocampus*). Both seahorse species are protected under Schedule 5 of the Wildlife and Countryside Act (1981), and it is an offence to intentionally or recklessly harm or disturb a seahorse or to damage, destroy or disturb their place of shelter.

There are 12 National Biodiversity Network (NBN) Atlas records[1] of short-snouted seahorse in the eastern Solent. One record from 2006 notes the presence of a short-snouted seahorse in Sinah Lake, Langstone Harbour just off Hayling Island (4km from the proposed scheme) and two Sussex IFCA records from 2018 note their presence in the Chichester Channel, Chichester Harbour between Thorney Island and Ella Nore (7km from the proposed scheme). The other East Solent records are from near the Nab Tower, outside Bembridge Harbour and off Selsey Bill (NBN Atlas, 2023).

There has also been a report of two juvenile *Hippocampus* species within the HMNB Portsmouth dockyard in Portsmouth Harbour (Defence Infrastructure Organisation, *pers. comms.*) and a short snouted seahorse was noted during scientific beam trawl surveys at Tipner in the northeast of Portsmouth Harbour (Mike Field, *pers. comms.*). The trawl in which the short snouted seahorse was captured had been deployed in the main channel at Tipner, in 6-12 m of water depth over habitats dominated by slipper limpets (*Crepidula fornicata*).

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[1] Records provided by Marine Biological Association, Isle of Wight Local Records Centre and Seasearch, accessed through NBN Atlas website.

Seahorses are most commonly found in shallow, sheltered subtidal waters, in estuaries or inshore, especially amongst seagrass and seaweed, clinging by the tail or swimming upright (Neish, 2007; Sabatini *et al*., 2021). The short-snouted seahorse can also be found in rocky areas (Sabatini *et al*., 2021). In winter they have been found in water depths up to 77 metres. It is thought that they migrate to deeper, more sheltered waters in winter to escape the disturbance caused by storms (Garrick-Maidment, 1998).

There are extensive intertidal seagrass beds in Langstone and Chichester Harbours (as described in **Section 8.4.2**), however, there are no seagrass beds adjacent to the proposed scheme. The nearest intertidal seagrass beds are located over 3 km away from the proposed Scheme in Chichester Harbour at Gutner Point on Hayling Island, and over 2 km away in Langstone Harbour at South Binness Island and Sinah Lake. There are no subtidal seagrass beds within Chichester and Langstone Harbours. The lack of preferred habitat means that the proposed scheme area is not considered optimal habitat for seahorses. This is supported by the NBN Atlas records for *Hippocampus* spp. in Langstone and Chichester Harbour, which are located at least 4km away from the proposed scheme.

Shellfish

The proposed Langstone FCERM scheme is located within the Chichester Harbour (Emsworth Channel) and Langstone Harbour designated Shellfish Waters. Potential impacts to Shellfish Waters are considered in the Water Framework Directive Assessment in **Appendix D**. Therefore, Shellfish Waters are not considered further in this chapter of the ES.

Through literature review, the intertidal survey undertaken for the proposed scheme and the EIA Scoping exercise, the following shellfish species have been identified as being present in the vicinity of the proposed scheme and are included in this chapter of the ES.

Native oyster (Ostrea edulis)

The Solent was historically the largest native oyster fishery in Europe, supporting up to 450 vessels and 15 million oysters were caught in one year alone in 1978 (Blue Marine Foundation, 2021). However, the population of oysters has declined in recent years for a variety of reasons including recruitment failures, poor water quality, over-fishing, the spread of the disease *Bonamia ostrea*, competition from the slipper limpet (*Crepidula fornicata*) and increases in the predatory winkle (*Ocenebra erinacea*). In 2013, the Solent oyster fishery collapsed and since then oyster populations across the Solent have continued to remain very low (SIFCA, 2022a).

The Southern IFCA undertakes annual surveys of the native oyster populations in the Solent (SIFCA, 2022a). **Figure 8.15** shows the areas sampled during the 2022 stock assessment surveys. The shellfish bed surveyed closest to the proposed scheme is at The Deeps in Langstone Harbour. The Langstone Harbour stock assessment results for the 2022 survey indicate that 12 oysters were caught over 14 tows with an average catch per unit effort (CPUE) of 1.1kg/m/hr. This was the lowest CPUE of all the Solent shellfish beds surveyed in 2022 and is well below the 5kg/m/hr baseline threshold set for triggering consideration of management intervention for a Bivalve Management Area (BMA). Of the oysters caught in the Langstone Harbour shellfish bed, 83% were >70mm (the minimum conservation reference size for native oyster) (SIFCA, 2022a).

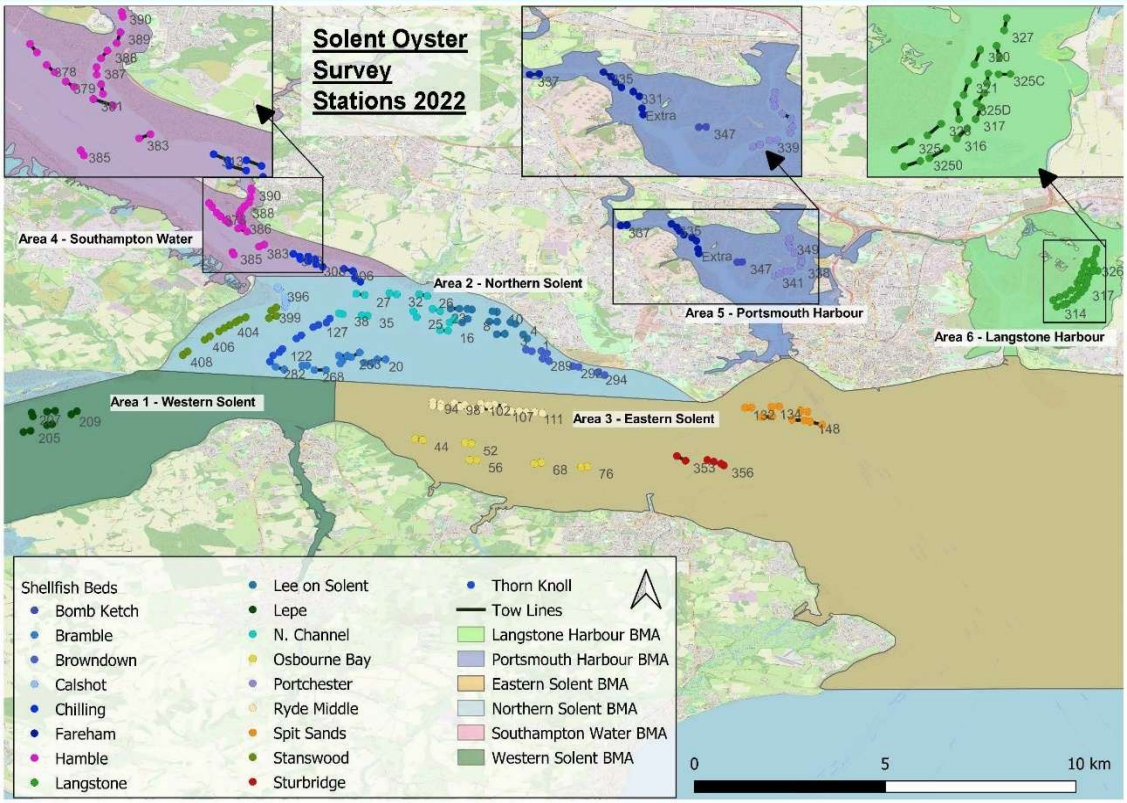

Figure 8.15: Locations of shellfish beds surveyed as part of the Solent Native Oyster Survey in 2022 (from SIFCA, 2022a).

The SIFCA stock assessment results for the last five surveys (from 2017 to 2022) for the Langstone Harbour shellfish bed are shown in **Figure 8.16** (N.B. No data was collected in 2020 due to COVID-19 pandemic restrictions). This data indicates that Langstone Harbour experienced its highest CPUE in 2019 at 3.6 kg/m/hr, with subsequent declines in 2021 and 2022 (SIFCA, 2019a; 2021a; 2022a).

Native oysters are also present within the subtidal channels in Chichester Harbour, but stock levels there have also been too low in recent years to allow any fishing activity (Williams *et al*., 2018; SxIFCA, 2023b).

Native oyster is a Species of Principal Importance under Section 41 of the NERC Act 2006 and is also on the OSPAR list of threatened and declining species and habitats. As such it is considered to be of national importance. The native oyster beds in the Solent are also partially within the Solent European Marine Site network of protected areas.

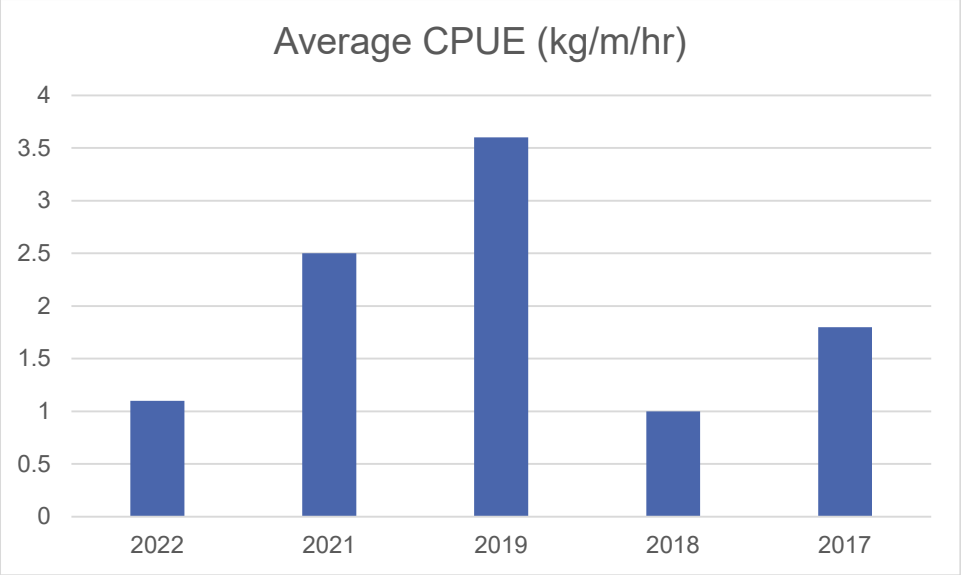

Figure 8.16: Langstone Harbour shellfish bed average CPUE for native oysters (data extracted from SIFCA, 2022a; 2021a; 2019a; 2018; 2017b)

Blue mussel (Mytilus edulis)

Mussels are usually found on the rocky shores of open coasts attached to the rock surface and in crevices, and on rocks and piers in sheltered harbours and estuaries, often occurring as dense masses. They generally occur from the high intertidal to the shallow subtidal attached by fibrous byssus threads to suitable substrata (Tyler-Walters, 2008).

During the intertidal survey undertaken for the proposed scheme (AECOM, 2022), blue mussels (*Mytilus edulis*) were identified in a localised area around the littoral coarse sediment habitat of the Wadeway. The mussels were scattered, present as one or two individuals, within the lower intertidal on and surrounding the causeway (AECOM, 2022).

Blue mussel beds are a Habitat of Principal Importance listed under Section 41 of the NERC Act 2006 and are therefore considered of national importance. However, the distribution of this species at Langstone Village is limited in size and number and is associated only with the Wadeway and the littoral coarse sediment habitat and change in the seabed on this causeway. Therefore, it does not meet the criteria to qualify as a 'bed' at this location.

Scallops

The Southern IFCA undertook a baseline survey for the Solent scallop fishery in 2021 (SIFCA, 2021b). The survey aimed to provide an initial understanding on the distribution of the king scallop (*Pecten maximus*) and collect information on the population structure of the scallops found within the Solent. The main scallop fishery area in the Solent (and therefore the main focus of the baseline survey) is around the north-east of the Isle of Wight and towards the entrance of Portsmouth Harbour (SIFCA, 2021b). However, analysis of other dredge survey data, namely the Solent native oyster survey, indicates a wider distribution of scallops including low numbers of scallop from within Langstone Harbour (SIFCA, 2021b).

Whelks, clams and cockles

Significant populations of common whelk (*Buccinum undatum*) are present within the Solent and are found on both hard and soft subtidal sediments. American hard-shell clams (*Mercenaria mercenaria*), the Native clam (*Ruditapes decussatus*), Manila clams (*Ruditapes philippinarum*) and common cockles (*Cerastoderma edule*) are also present within the study area (SIFCA, 2022b; Williams and Davies, 2018).

The Southern IFCA undertakes annual Solent bivalve surveys to support the monitoring and management of the Solent Dredge Permit Fishery. This survey focuses on the two main bivalve species harvested commercially in the Solent - the Manila clam and the common cockle - but results are also presented for the American hard-shelled clam (SIFCA, 2022b; 2019b). Manila clam, common cockle and American hard-shelled clam are recorded within Langstone Harbour and CPUE has remained fairly consistent over the last five years (SFICA, 2022b; 2019b).

Manila clam, the common cockle and American hard-shell clams are all common and widely distributed, are not protected species and are not listed under Section 41 of the NERC Act 2006 and therefore are considered to be of low ecological importance.

Crabs and Lobsters

Crabs and lobsters are a commercially important species present in the eastern Solent (Royal HaskoningDHV, 2012). However, the main area for crabs and lobsters is located to the east of the Isle of Wight, over 15 km from the location of the proposed scheme. No crabs or lobsters were recorded within the proposed scheme study area during the marine ecology surveys (AECOM, 2022). Furthermore, suitable subtidal rocky habitat and boulders / mixed coarse sediment are not present within the scheme area and, therefore, these species are unlikely to be present in the study area.

8.4.4 Marine Mammals

Marine mammals occurring in UK waters comprise cetaceans (whales, dolphins and porpoises) and pinnipeds (true seals and eared seals). All cetacean species are European Protected Species listed in Annex IV of the European Habitats Directive 2010. Additionally, the harbour porpoise and the bottlenose dolphin are protected under Annex II of the Habitats Directive. Grey seal and harbour seal are listed on Annex V of the Habitats Directive.

Marine mammal species diversity and abundance within the Solent is relatively low compared to the other areas around the UK, with few species recorded and low numbers of sightings and frequency of sightings (Hammond *et al.,* 2013; Hammond *et al*., 2017; Jones *et al*., 2016; SCOS, 2016). Reviewing the distribution of marine mammals throughout the Eastern Solent, including Langstone and Chichester Harbours, identifies six marine mammal species that potentially occur within the project area of influence. These include:

- Odontocetes (toothed whales): Harbour porpoise (*Phocoena phocoena*); bottlenose dolphin (*Tursiops truncatus*), common dolphin (*Delphinus delphis*) and long finned pilot whale (*Globicephala melas)*; and
- Pinnipeds: Grey seal (*Halichoerus grypus*) and harbour seal (*Phoca vitulina*).

The most common cetacean species in the region are the bottlenose dolphin and harbour porpoise. A long-staying bottlenose dolphin has been sighted in Portsmouth Harbour. In addition to the cetacean species potentially occurring in the Eastern Solent and harbours, other occasional visitors to the deeper water of the Solent and the English Channel (more than 50m water depth) may include Killer whale (*Orcinus orca)*, Fin whale (*Balaenoptera physalus)*, Sei whale (*Balaenoptera borealis*) and Humpback whale (*Magaptera novaeanglia)*. However, these species are not considered to be regular visitors to the south coast (Evans, 2006) and it would be highly unlikely to find them close to the proposed works due to the restricted water depth.

There is a small but growing population of harbour seal and occasional grey seals resident in the Solent, with highest numbers in Chichester and Langstone Harbours (Arnott, 2021; 2022; Castles *et al*., 2021; Chesworth *et al*., 2010). Current (2022) seal populations are estimated at 45-74 harbour seals and 14-20 grey seals (Arnott, 2022), compared to populations of 23-25 harbour seals and two grey seals in 2010 (Chesworth *et al*., 2010). Recent counts for Langstone Harbour indicated a maximum of nine harbour seals and no grey seals in 2022 (Arnott, 2022) and nine harbour seals and three grey seals were recorded in 2021 (Arnott, 2021). Recent counts for Chichester Harbour indicated a maximum of 55 harbour seals and 18 grey seals in 2022 (Arnott, 2022) and 50 harbour seals and 20 grey seals in 2021 (Arnott, 2021). These counts are both higher than the 43 harbour seals and 19 grey seals recorded in Chichester Harbour in 2019 (Castles *et al*., 2021). Between 2015 and 2019, 8-11 harbour seal pups were recorded each year and pups were only observed in Chichester Harbour (Castles *et al*., 2021). In 2021, seven harbour seal pups were recorded in Chichester Harbour (Arnott, 2021). In 2022, 12 harbour seal pups were recorded in Chichester Harbour and two harbour seal pups were recorded in Langstone Harbour (Arnott, 2022).

The seals predominately forage in the Eastern Solent, between Southampton and Selsey Bill. Regular foraging is observed in Portsmouth, Langstone, Chichester and Bembridge Harbours and is often concentrated around the main channels, where seals may be attracted by fish moving in to and out of the harbours with the tides (Chesworth *et al*., 2010; John Arnott, *pers. comms*.). The data from the Solent seal tagging project (Chesworth *et al*., 2010) indicates that the Solent seals often display individual foraging preferences and behaviour and are faithful to their preferred foraging sites. Preferred foraging locations can also change with the seasons. Some seals travel more between the harbours (Portsmouth, Langstone and Chichester) using the northern connecting channels, rather than going through the harbour entrances adjacent to the open coast areas of Southsea and South Hayling (Chesworth *et al*., 2010).

There are only two significant haul-out sites for seals in the Solent, one in Langstone Harbour at Mallard Sands and one in Chichester Harbour at Oar Rithe. Both haul-out sites are used on a more or less daily basis, but Chichester Harbour is used by more seals (Chesworth *et al*., 2010; Arnott, 2022). Both haul out sites are over 4 km from the proposed scheme boundary, however the 2010 Solent Seal Tagging Project recorded seals using all of the harbour area for foraging (Chesworth *et al* 2010).

Harbour and grey seals have distinct differences in breeding behaviour. Harbour seals pup in the summer months, typically June to August, and the pups are born well-developed and can swim and dive within a few hours of birth and return to haul outs regularly to feed on their mothers' milk (Chesworth *et al*., 2010). Locally, they moult in August/September when they

can be more vulnerable and will often need safe haul out areas for longer than normal to remain warmer than they might be in the water. Haul-out sites are therefore at their busiest after pupping and at the beginning of moulting periods in mid to late summer. Grey seals give birth in September to December and the pups are born above high water and have a white coat that is not waterproof, so they remain high up on the shore for approximately 3 weeks until they moult this natal coat and develop an adult one, when they will take to the water (Chesworth *et al*., 2010).

8.4.5 Habitats of Conservation Importance (HOCI), Species of Conservation Importance (SOCI) and Invasive Non-native Species (INNS)

Habitats of Conservation Importance (HOCI)

A number of HOCI are present within the study area. The biotopes '*Hediste diversicolor* and *Limecola balthica* in littoral sandy mud' (A2.312), '*Hediste diversicolor* in littoral mud' (A2.322), and '*Hediste diversicolor*, *Limecola balthica* and *Eteone longa* in littoral muddy sand' (A2.243) are components of the habitat type 'intertidal mudflats', which is a Habitat of Principal Importance under Section 41 of the NERC Act 2006 and occurs widely within the intertidal study area. The biotope '*Hediste diversicolor* in littoral gravelly muddy sand and gravelly sandy mud' (A2.411), which is present on the Wadeway causeway and on the upper shore to the east of the Old Mill, may occur as part of the Habitat of Principal Importance 'sheltered muddy gravels'. Furthermore, these biotopes and the broadscale habitats they represent, including 'littoral sand and muddy sand' (A2.2), 'littoral mud' (A2.3) and 'littoral mixed sediments' (A2.4) are all components of the EU Habitats Directive Annex I habitats 'Estuaries' and 'Mudflats and sandflats not covered by seawater at low tide', which are qualifying features of the Solent Maritime SAC.

There are areas of saltmarsh present within the study area, which is a Habitat of Principal Importance under Section 41 of the NERC Act 2006 and a qualifying feature of the Solent Maritime SAC, which is designated for the following Annex I saltmarsh habitats: *Salicornia* and other annuals colonising mud and sand, *Spartina* swards (*Spartinion maritimae*) and Atlantic salt meadows (*Glauco-Puccinellietalia maritimae*).

Blue mussels were found scattered along the historic Wadeway causeway on the Chichester Harbour side of the study area. However, these did not occur in sufficient numbers or densities to represent blue mussel beds (which are a Habitat of Principle Importance). In addition, seagrass beds (*Zostera* spp.), which qualify as a Habitat of Principal Importance, are not present within the study area, but are present in the wider harbours.

Species of Conservation Importance (SOCI)

No SOCI have been identified within the intertidal habitats within the study area (AECOM, 2022). The marine mammals present within the study area (primarily harbour and grey seals) are listed under the Conservation of Habitats and Species Regulations 2017 and are therefore SOCI. Harbour seals are also listed as Species of Principal Importance under Section 41 of the NERC Act 2006.

Plaice, sole, cod, lesser sandeel, tope shark, undulate ray and sea lamprey are all listed as Species of Principal Importance under Section 41 of the NERC Act 2006 and are therefore SOCI. Sea trout and Atlantic salmon are protected under the Salmon and Freshwater

Fisheries Act 1975 and are also Species of Principal Importance under Section 41 of the NERC Act 2006. European eels are a Species of Principal Importance under Section 41 of the NERC Act 2006 and are listed as critically endangered on the IUCN red list and included on the OSPAR Commission list of threatened and/or declining species.

Seahorses have not been recorded within the scheme area, but short-snouted seahorses have been recorded within Chichester and Langstone Harbours. Short-snouted seahorses are a Species of Principal Importance under Section 41 of the NERC Act and are therefore a SOCI.

Native oysters have not been recorded within the scheme area but are present within the subtidal channels in Chichester and Langstone Harbours. Native oyster is a Species of Principal Importance under Section 41 of the NERC Act 2006 and is also on the OSPAR list of threatened and declining species and habitats.

Invasive Non-Native Species (INNS)

The Solent is noted as a key entry point and hotspot for INNS in the UK, due to its high volumes of international shipping and recreational boating which are both major vectors of INNS (Taylor *et al*., 2022; Minchin *et al*., 2013).

Within the study area, the INNS Pacific oyster (*Magallana gigas*) was found sporadically along the historic Wadeway causeway during the intertidal survey undertaken for the proposed scheme (AECOM, 2022).

During the condition assessment survey for the Langstone Harbour SSSI the presence of *Austrominius modestus* (Australasian barnacle) was noted and the American slipper limpet (*Crepidula fornicata*) was recorded nearby (Thomas *et al.,* 2016).

During INNS surveys undertaken in the Solent by Natural England and The Marine Biological Association in 2018 and 2019, the north coast of Hayling Island (which is located directly across the channel from the proposed scheme) was noted as having the highest count of INNS of all the respective marina and shore sites surveyed (Taylor *et al*., 2022). The following notable INNS were recorded either on the shores or in the marina on the north coast of Hayling Island: the bryozoans *Tricellaria inopinata* (shores) and *Bugula neritina* (shores and marina), the ascidian carpet sea squirt *Didemnum vexillum* (shores), the serpulid tube worms *Hydroides ezoensis* and *H. dianthus* (shores and marina) and the ascidians *Botrylloides violaceus* and *B. diegensis* (shores and marina).

8.4.6 Summary of Important Marine Ecological Receptors

The important marine ecological receptors that have been scoped into the assessment following the criteria outlined in **Section 8.3.2** are summarised in **Table 8.12** below, together with the importance level of each feature.

Table 8.12: Important marine ecological receptors within the study area

Level of Importance	Receptor	Reasoning
Very High (International)	Saltmarsh Intertidal mudflats (including intertidal seagrass beds)	Listed under Annex 1 of the EC Habitats Directive and SAC and Ramsar site qualifying habitats. Supporting habitats for internationally important SPA and Ramsar bird populations. Notified as features of the

Level of Importance	Receptor	Reasoning
		SSSI as well as being Habitats of Principal Importance in England under the NERC Act 2006.
	European eel	Listed as critically endangered on the IUCN red list. European eel is also included on the OSPAR list of threatened and/or declining species and it is a Species of Principal Importance under the NERC Act 2006.
	Common seal Grey seal	Listed on Annex V of the Habitats Directive and in Schedule 4 of the Conservation of Habitats and Species Regulations 2017 (as amended).
High (National)	Spawning and nursery grounds for marine fish	Plaice, sole, cod, tope shark and undulate ray are all listed as Species of Principal Importance under Section 41 of the NERC Act 2006. Chichester and Langstone Harbours are designated bass nursery areas under the Bass Order 1999.
	Migratory fish: sea trout, Atlantic salmon and sea lamprey	Species of Principal Importance under Section 41 of the NERC Act 2006. Sea trout and Atlantic salmon are also protected under the Salmon and Freshwater Fisheries Act 1975.
	Native oyster	Species of Principal Importance under the NERC Act 2006. Native oyster is also on the OSPAR list of threatened and declining species.
	Short-snouted seahorse	Species of Principal Importance in England under the NERC Act 2006. Protected under the Wildlife and Countryside Act 1981.
Low (Local/Borough)	Scallops, whelks, clams and cockles	Locally important shellfish resource

8.5 Identification of Effect Pathways

The scope of the marine ecology impact assessment has been informed by the EIA Scoping Report produced for the scheme (Coastal Partners, 2020) and the associated Scoping Opinions received from Havant Borough Council (HBC) and the Marine Management Organisation (MMO) in February 2021 and May 2021 respectively (see **Appendix A1-A3**). **Table 8.13** below provides a summary of the potential impact pathways scoped in and out of the assessment with respect to marine ecology receptors.

Table 8.13: Summary of EIA Scoping for marine ecology potential impact pathways.

Potential Impact Pathway	Scoping Decision	Notes
Effects from contaminants (construction)	Scoped Out	The potential for contamination during construction has been scoped out, based on the findings of the Ground Investigation and the incorporation of several mitigation measures which will be included in the Construction Environmental Management Plan (CEMP) for the works. These mitigation measures include: • All materials used in the Scheme will be suitable for use in the marine environment. • A contaminated land method statement and materials management plan will be produced for approval by HBC prior to the commencement of construction works. • Works on the foreshore will be undertaken over the low tide period to minimise resuspension of any contaminants into the water column. • A silt curtain will be in place during construction works on the foreshore, which will contain any suspended sediments within the works area and prevent any significant impacts on water quality in the harbours. • Machinery used during construction will be required to adhere to standard best practice measures including pollution control strategies and spillage response. The new outfalls proposed as part of the Scheme will be draining the same surface water catchment area as the existing situation and will therefore not result in any new sources or pathways for the introduction of contaminants. This impact pathway has therefore been scoped out for construction and operation, as agreed by the HBC and MMO Scoping Opinions.
Indirect changes in benthic habitat extent and quality due to changes in coastal processes (operation)	Scoped Out	No changes in coastal processes are anticipated as no new cross-shore structures are proposed as part of the Scheme. The new defences will follow the existing alignment, albeit slightly seawards where encasement or sheet piles are required to ensure the stability of existing/new structures as part of the design. As such, there will be no discernible changes to coastal processes and this impact pathway has been scoped out, as agreed by the HBC and MMO Scoping Opinions.
Changes to suspended sediment concentrations and dissolved oxygen levels (construction)	Scoped Out	The Scheme does not involve any dredging or beach recharge works. The potential to increase suspended sediment concentrations and change dissolved oxygen levels within the harbours during excavation of the foreshore for construction of the new sea walls has been scoped out as: • A silt curtain will be used during works on the foreshore, which will contain any suspended sediments within the works area; and • Works on the foreshore will be undertaken over the low tide period to minimise resuspension of sediments into the water column.

Potential Impact Pathway	Scoping Decision	Notes
		Consequently, indirect effects on marine ecology receptors have also been scoped out, as agreed by the HBC and MMO Scoping Opinions.
Temporary loss and/or disturbance of intertidal sediment habitats and saltmarsh vegetation due to machine access and excavation of the foreshore (construction and operation – maintenance)	**Scoped In**	In Frontages 3, 4 and 5, temporary access for machinery and excavation works will be required within the foreshore area for the construction of the new defences, which may damage the intertidal habitats present. This impact pathway has therefore been scoped in for further assessment, as confirmed by the HBC and MMO Scoping Opinions.
Noise and vibration during construction – marine mammals and fish	**Scoped In**	There is potential for noise and vibration disturbance to marine mammals and fish, particularly as a result of piling during the construction of the new defences. This impact pathway has therefore been scoped in for further assessment, as confirmed by the HBC and MMO Scoping Opinions.
Underwater noise and vibration during construction – benthic ecology	**Scoped In**	Piling during construction has the potential to produce noise and vibration above background conditions. The understanding of elevated underwater noise and vibration levels on invertebrates is relatively underdeveloped (Hawkins et al., 2015). However, there is some evidence that some benthic species respond to sediment vibration. For example, at high levels hermit crabs (*Paganus bernhardus*) can leave their shell and then return (Roberts et al., 2016). Other behavioural effects have been recorded in decapod crustaceans including changes in foraging habitat (Tidau and Briffa, 2016). Changes in population and mortality is considered unlikely from the proposed Scheme, but the MMO recommended that this impact pathway be scoped in for further assessment once the full details of the proposed works are known.
Visual disturbance – marine mammals (construction)	Scoped Out	The majority of construction works for the proposed Scheme will be undertaken onshore and construction within the intertidal area will only be undertaken at low water. In addition, marine mammal populations are low (especially for cetaceans) within the vicinity of the Scheme and with the proposed works covering a very small proportion of the potential foraging area available to seals within the harbours. The works are over 4 km from the haul out sites used by seals and are therefore unlikely to be affected. This impact pathway has therefore been scoped out, as agreed by the HBC and MMO Scoping Opinions.
Permanent loss of intertidal habitat under the footprint of new defence structures and	**Scoped In**	The new defences in Frontages 3, 4 and 5 will result in the permanent loss of a narrow ribbon of intertidal habitat under the footprint of the new structures. Loss of intertidal habitat will also occur due to coastal squeeze over the lifetime of the Scheme from the implementation of the

Potential Impact Pathway	Scoping Decision	Notes
due to coastal squeeze (operation)		'Hold the Line' policy at Langstone Village. This impact pathway has therefore been scoped in for further assessment, as confirmed by the HBC and MMO Scoping Opinions.
Indirect effects of intertidal habitat loss on marine mammals and fish (construction and operation)	Scoped Out	The majority of construction works for the proposed Scheme will be undertaken onshore and the footprint of the Scheme on the intertidal area only covers a highly localised area that constitutes a very small fraction of the known ranges of local fish and marine mammals. Indirect effects of habitat loss on fish and mammals have therefore been scoped out of further assessment, as agreed by the HBC and MMO Scoping Opinions.
Introduction and/or spread of invasive non-native species (INNS) (construction and operation)	Scoped Out	The detailed design and selection of materials for the proposed Scheme has taken into consideration potential effects on the spread of INNS as well as measures to improve biodiversity where possible, such as using a mixture of material types. A biosecurity plan will be prepared within the CEMP for the proposed works. This impact pathway has been scoped out, as agreed by the HBC and MMO Scoping Opinions.

In summary, the potential impacts on important marine ecological features during the construction of the proposed scheme that have been scoped in for further assessment are:

- Temporary loss and/or disturbance of intertidal habitats during the construction of the new coastal defences; and
- Underwater noise and vibration impacts on benthic invertebrates, fish species and marine mammals during construction works.

The potential impacts on important marine ecological features during the operational phase of the proposed scheme that have been scoped in for further assessment are:

- Temporary loss and/or disturbance of intertidal habitats during maintenance works; and
- Permanent loss of intertidal habitat under the footprint of new defence structures and due to coastal squeeze.

These potential impacts are characterised and assessed in more detail in **Section 8.6** for the construction phase and **Section 8.7** for the operational phase of the proposed scheme.

8.6 Potential Impacts During Construction

The effects of the construction of the Langstone FCERM Scheme on the important marine ecological features within the study area has been assessed. A description of each effect, together with its significance for the relevant important marine ecological features, is provided below.

Where necessary, measures have been identified and incorporated into the proposed scheme design and/or construction methodology in order to avoid and mitigate negative effects on important marine ecological features. These measures are presented in text boxes in the following sub-sections to make them easy to identify and extract for collation into the CEMP to be produced for the works. An Ecological Clerk of Works will oversee the construction works to ensure that the CEMP is followed, mitigation measures are implemented and that impacts do not exceed those predicted and described within this assessment.

8.6.1 Temporary loss and/or disturbance of intertidal sediment habitats and saltmarsh vegetation

Direct disturbance of the intertidal habitats within the Scheme works area will occur during the construction works as a result of activities such as heavy plant movements on the foreshore, excavation of sediments for foundation preparation, breaking out of the existing defences, piling and installation of the new defence structures. This impact will occur on the Chichester Harbour side of the proposed Scheme area, in Frontages 3, 4 and 5 (Ship Inn to No.21 High Street) where marine works are proposed. There will be no disturbance impacts on intertidal habitats in Langstone Harbour during the construction of Frontages 1A and 2, or in Chichester Harbour during the construction of the landward sections of Frontage 5, as these works are either set back from the foreshore or can all be completed from the landward side of the works area.

The impact of the disturbance of intertidal habitat from the proposed scheme will be temporary and confined to the immediate area of the construction works. The intertidal working area will

be clearly marked out at commencement of the works through the establishment of a silt curtain laid out along the working extent at a distance of 20 metres from the existing sea wall.

Temporary disturbance to the foreshore will be experienced from the first access to lay the silt curtain until the new sea walls are completed and any haul routes and the silt curtain are removed.

During construction works, the number of foreshore access points will be limited to the Ship Inn car park slipway, the High Street and via the allotment adjacent to No.21 High Street. Once on the foreshore, plant will need to track along the foreshore to reach sections of the sea wall construction with material deliveries and to undertake excavation, piling, concrete construction and foreshore reinstatement activities, as well as for installation of handrailing and cladding as part of the final finishes. The haul route will be across the existing foreshore (which is already used as a vehicular access route by the frontline properties in the village), using a temporary surface to prevent plant from sinking into the gravels and mud. The temporary surface will likely involve a layer of geotextile matting followed by a solid surface such as sheet piles laid down flat and/or a layer (c.0.3m) of compacted aggregate to act as a roadway for plant.

The temporary covering of the intertidal sediment habitat by haul route materials may disturb the shingle and coarse sediment surface and prevent surface access to invertebrates within the intertidal sediment. It is expected that the haul route will lead to a temporary loss of intertidal habitat and invertebrates during the period of construction for that section of wall (up to one year for each section) but that once the haul route is removed, natural recolonisation will occur as the foreshore structure will remain largely intact.

The very upper part of the foreshore within the 20m working area will be excavated to permit the construction of the new sea wall apron, which will then be buried to reinstate the foreshore to the current level. The area will therefore be returned to normal foreshore conditions at the end of the construction season. Within the upper shore excavated area, sediment (predominantly gravels and shingle) will be removed and stored nearby to assist reinstatement after the apron and new wall structure is in place. This will temporarily remove some habitat for intertidal invertebrates and when reinstated across the excavated area, this section will undergo some natural remobilisation to restore to previous biological condition.

The total area of foreshore between the existing sea wall and the seaward extent of the 20 metre site boundary / working area within Frontages 3, 4 and 5 is 0.57 ha and this represents the worst case (maximum) area of potential temporary intertidal habitat disturbance. The majority of this area (0.40 ha) is comprised of coastal shingle (B2) and littoral coarse sediment (A2.1) habitat types within the upper shore / existing vehicular access route area (as shown in **Figure 8.17** below). The remainder of this area (0.17 ha), more seaward, includes fragments of *Spartina anglica* saltmarsh communities within intertidal mudflat (A2.3) habitat.

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Coastal Partners

Scheme red line boundary

Intertidal habitats within the temporary construction working area

A2.1: Littoral coarse sediment

B2: Coastal shingle; A2.1: Littoral coarse sediment

Sparse A2.5: Coastal saltmarsh; A2.3: littoral mud

LOCATION: Langstone FCERM Scheme

TITLE: Intertidal habitats within the temporary construction working area

N

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Figure 8.17: Intertidal habitat types within the foreshore working area in Frontages 3, 4 and 5.

The intertidal habitat within the scheme works area and the species it supports are of national and international importance as indicated by their protection as part of the SAC, SPA, Ramsar

and SSSI designated sites. Therefore, a significant effect on this habitat would be considered an impact of major adverse significance.

However, the impact of the direct disturbance of the intertidal sediment habitat from the proposed Scheme works will be temporary and short-term (lasting less than one year for each frontage) and will be confined to the immediate area of the construction works.

Intertidal coarse sediment / shingle and intertidal mud habitats have low sensitivity to abrasion / disturbance of their surface and penetration below the subsurface (MarLIN, 2024a&b). The resilience of intertidal sediment communities to temporary disturbance is considered to be 'high' as the species present are likely to recover within two years, even after severe depletion of the resident populations or community, unless the substratum or other key habitat factors are altered. Species that live on or close to the surface such as the laver spire shell (*Peringia ulvae*) and the common cockle (*Cerastoderma edule*) are more likely to be sensitive to this impact than species that burrow deeply into the sediments such as oligochaetes. However, given the current use of this foreshore area as a frequent vehicular access route for the frontline properties, the presence and abundance of surface / near-surface infauna species is likely to be lower within the proposed works area than in other unimpacted areas within the harbours.

Saltmarsh habitat has a slightly higher sensitivity to abrasion / disturbance (but still classified as 'low') as it can take up to five years to recover following disturbance (MarLIN, 2024c). *Spartina anglica* is also considered an irreplaceable habitat under the recent Biodiversity Net Gain (BNG) Regulations.

Given the small area of the intertidal sediment habitats that will be affected and the short duration of the impact, the temporary disturbance of intertidal sediment habitats during the proposed works is considered to be of low magnitude. The longer recovery period for saltmarsh means that any impacts on areas of this habitat would be of medium magnitude. Both the intertidal sediment and saltmarsh habitats are of very high (international) importance (as SAC, SPA and Ramsar features, sub-features or supporting habitats) but have low to medium sensitivity worst case to abrasion / disturbance. Therefore, overall, the temporary disturbance of intertidal habitats during the construction phase, without mitigation, is considered to be of **minor adverse significance for intertidal sediment and moderate adverse to major significance for saltmarsh.**

The following mitigation measures / construction methodology requirements will be included within the CEMP for the works to minimise disturbance impacts on the intertidal habitats as far as possible.

Mitigation
• Works will be undertaken from the landward side wherever possible to minimise disturbance of the foreshore. • Where foreshore working is required, this will be restricted to a maximum of 20 metres seawards of the existing defences. The seaward limit of the intertidal works area will be marked by the silt curtain to limit the extent of foreshore disturbance. • The silt curtain and temporary working area boundary will be set out to ensure that areas of *Spartina* swards are protected and excluded from the haul route / working areas to ensure this habitat is not damaged during the works.

Mitigation
• Where access is required on the foreshore, removable temporary haul routes will be installed (e.g., geotextile with sheet piles laid flat or aggregate on top) to minimise disturbance to the intertidal habitat. This will be carefully removed as soon as access is no longer required. Methods will be finalised once a contractor has been appointed and will be confirmed within the CEMP. These will lead to a reduced or negligible impact on foreshore stability and accelerated recovery upon reinstatement. • The area excavated for construction of the buried apron of the new sea walls will be reinstated to existing foreshore levels using material retained from the excavation and stockpiled adjacent to the working area within the silt curtain, which will be replaced back over the new apron once it has been constructed. The foreshore material will be placed back over the new sea wall apron in the reverse order to that in which it was excavated to ensure that the sediment layers are returned in the order they were prior to the works. Methods will be finalised once a contractor has been appointed and confirmed within the CEMP.

With the mitigation measures outlined above, the magnitude of the impact on saltmarsh habitat will be significantly reduced / avoided (to low / negligible magnitude) as this habitat will be excluded from the temporary working area. As such, the residual impact on both the saltmarsh and intertidal sediment habitats from temporary disturbance during the construction works is expected to be of **minor adverse significance**. The mitigation measures described above have been included within the draft CEMP for the works and the Langstone FCERM Scheme would be added to Coastal Partners' post-construction monitoring programme to assess the habitat re-establishment.

8.6.2 Noise and vibration impacts on marine mammals, fish and benthic ecology

Emission of noise can affect marine wildlife in diverse ways, from masking other sounds used for foraging or communication, disturbance and active avoidance behaviour and even to injury or death (Thompson et al., 2013; Thomsen et al., 2012).

During the construction of the proposed Scheme, there is the potential for both airborne and underwater noise to be generated by mobile plant on the foreshore haul routes, excavators and through the installation of sheet piles. No vessels will be used in the construction of the proposed Scheme (all deliveries will be via road) and as such, there will be no impacts / sources of underwater noise from boat engines.

Airborne noise

Airborne noise emissions from the variety of noise sources expected during construction of the proposed Scheme have been investigated through a site-specific baseline noise survey and impact assessment, as described in **Chapter 14 (Noise and Vibration)** and **Appendix O**. This indicates that the largest potential for impacts upon important marine receptors from airborne noise during the construction works will be generated by breaking out of existing structures, use of a wacker plate to compact materials and piling activities. The key marine ecological receptor within the study area that is susceptible to airborne noise is seals when they are using the haul out sites within Langstone and Chichester Harbours. The construction works for the proposed Scheme could raise issues for the safety and suitability of the haul out

sites during key periods for harbour seals, i.e. their pupping season (June to July) and moulting period (August to September). Grey seals are also more vulnerable during their pupping season (September to December), and grey seal pups moult within approximately 3 weeks of birth.

Airborne noise is considered of minor significance to seals if it is less than 85dB re 20uPa RMS (East Span Project, 2004). Seals generally have hearing that is around 20 to 30 dB less sensitive than humans in the frequency ranges you would expect from piling works (Richardson et al., 1995). A Temporary Threshold Shift (TTS) is expected to be induced in seals from airborne noise from a sound of 132dB re 20uPa^2 or more (Southall et al., 2019).

The airborne noise modelling undertaken for the proposed Scheme indicates that the sound power level of vibro-piling is expected to be around 118 dBA and percussive piling around 133 dBA, at or near the source. The source levels are therefore already at or below levels likely to induce TTS. Seals will be exposed to safe levels of 85 dB re 20uPa in air from <10m from the source if vibro-piling is used and from <40m from source if percussive piling is employed, as shown in **Figure 8.18**.

Figure 8.18: Airborne noise levels >85dB(A) from (a) Vibro piling (yellow) and (b) percussive piling (purple).

As described in **Section 8.4.4**, the haul out sites used by seals in Chichester and Langstone Harbours are over 4 km from the proposed Scheme and are therefore well outside the 40-metre range of the 85dB noise contour for percussive piling. As a result, there will be a **negligible impact** upon seals in Chichester and Langstone Harbours arising from airborne noise emissions during piling and other construction activities for the Langstone FCERM Scheme works.

Underwater noise

The largest potential for impacts upon important marine receptors is from underwater noise and vibration, in particular marine piling activities as this generates an impulsive sound wave that has greater potential to cause physical injury. Activities which may create underwater sound have the potential to affect the behaviour of marine wildlife, and migratory species in particular, depending on their sensitivity to sound and the level of sound created. Sound travels much faster in water (approximately 1,500 m/s) than in air (340 m/s). Since water is a relatively incompressible, dense medium, the pressures associated with underwater sound tend to be much higher than in air.

Sound levels produced by piling can vary in relation to numerous factors including the pile type and diameter/size, hammer size, substrate type and piling installation method (Popper et al., 2014). **Table 8.14** below summarises the types and lengths of sheet piles proposed within the Scheme design. It is expected that the marine piles for the proposed Scheme will be able to be installed using a Movax vibrating piling hammer attached to a 35-tonne excavator working from the foreshore. However, other piling techniques may be required, for example where ground conditions mean that vibro piling is not possible or where it is necessary to minimise vibration levels on nearby heritage assets such as the Listed Buildings and/or residential properties.

Table 8.14: Summary of sheet pile types and lengths to be used within the proposed Scheme.

Frontage / Location	Marine or Terrestrial Piling?	Pile Type	Pile Length (metres)	Anticipated Duration of Piling Works
Frontage 1A	N/A – no piling in this frontage			
Frontage 2 – northern section	Terrestrial	PU12	3.0	15 days
Frontage 2 – central section	Terrestrial	PU12	5.5	
Frontage 2 – southern section	Terrestrial	PU12	3.5	
Frontage 3 – A3023 wall	Terrestrial	L8 trench sheets	2.0	4 days
Frontage 3 – Ship Inn flood wall	Marine	PU28	6.38	5 days
Frontage 3 – Ship Inn Annex wall	Marine	PU28	3.8	2 days
Frontage 4 – Watchtower to Winklemarket	Marine	PU12	2.5	20 days
Frontage 5 – High Street	Marine	PU12	2.05	3 days
Frontage 5 – Royal Oak sea wall	Marine	PU12	1.2 to 1.8	10 days
Frontage 5 – Allotment flood wall	Terrestrial	L8 trench sheets	2.1	2 days
Frontage 5 – No.21 vehicle flood gate	Terrestrial	L8 trench sheets	1.65	1 day
Frontage 5 – Footpath flood wall	Terrestrial	L8 trench sheets	0.82	7 days

Marine mammals

The key marine mammal receptor within the study area that is susceptible to underwater noise is seals. As discussed in **Section 8.4.4**, cetaceans are highly unlikely to be present close to the proposed works due to the restricted water depth.

Emission of noise can affect seals in diverse ways, from masking other sounds used for foraging or communication, through disturbance and active avoidance behaviour and even to injury or death (Thompson et al., 2013). Possible effects on marine mammals can be divided into behavioural disturbance (including displacement), masking, hearing damage (either as temporary threshold shift (TTS) where a temporary reduction in hearing sensitivity may occur, or permanent threshold shift (PTS) where unrecoverable hearing damage may occur) or other injuries such as tissue damage and, in extreme cases, death if the animal very close to pile-driving activities.

The subtidal channels in Langstone and Chichester Harbours, including the connecting channel between Hayling Island and Langstone (adjacent to the proposed Scheme), are important foraging and transiting areas for seals (Chesworth et al., 2010) and, as such, without mitigation, the generation of impulsive underwater noise during marine piling activities could have a **moderate to major adverse** effect on seals.

Mitigation
• Installation of piles will be undertaken using vibro piling techniques as standard. Percussive piling will only be used when necessary to achieve the required design depth. If percussive piling is required, a soft start procedure will be implemented for a minimum of 20 minutes. Should piling cease for a period greater than 10 minutes, then the soft start procedure will be repeated. • To avoid the transmission of impulsive noise into the water column, piling on the foreshore will only be undertaken in the dry (when the surface of the substrate is above the current tide level).

With the implementation of the mitigation measures outlined above, the impact of underwater noise on seals during the construction works will be of **negligible significance** as the pathway of transmission from the source (piling) to the receptor (seals) will be removed as piling will not take place within the water body.

Fish

Marine piling for the proposed Scheme has the potential to impact marine fish using the important spawning and nursery areas in the harbours adjacent to the scheme and/or migratory fish passing through the harbours on their way to and from spawning grounds in nearby rivers and streams. Possible effects on fish include behavioural disturbance (including displacement), auditory injury (temporary or permanent) and, in extreme cases, physical traumatic injury and fatality if the fish is very close to the pile driving activity. Marine piling also has the potential to generate underwater noise that could create a barrier across the narrow channel between Chichester and Langstone Harbours, between Hayling Island and the mainland at Langstone. If it extends across the whole channel at important times of the year,

this could block the movement of migratory fish and their young that may pass through this channel on their way to and from spawning and nursery habitat in e.g., the Langbrook and Lymbrook Streams.

The hearing sensitivity of fish depends upon whether they have and employ a swim bladder as a functional part of their hearing mechanism. Species for which the swim bladder is an integral part of hearing are most at risk of permanent hearing damage if the swim bladder is ruptured through excessive impulsive sound pressure but those where no swim bladder exists or where it exists but does not play a main part in hearing are less prone to permanent hearing damage from impulsive sounds.

There is limited evidence relating to the impacts of underwater noise on seahorse species. However, the Natural England Advice on Operations for short-snouted seahorse indicates that this species has a high sensitivity to underwater noise (Natural England, 2023b). Anderson et al. (2011) reported both behavioural and physiological reactions of seahorses when exposed to audio pollution, with them illustrating a decrease in both weight and overall condition of noise-stressed seahorses; unfortunately, although the authors documented an increasing number of distress behaviours such as change in colour among animals exposed to noise, it is unclear whether there was a corresponding decrease in foraging behaviour. It is important to highlight that this and other studies on the effects of noise pollution on seahorses have been conducted on captive specimens without the ability to move away and reduce or avoid exposure.

If marine piling was to occur within the water column at Langstone, it could have an impact of medium magnitude (affecting the abundance / behaviour of marine and/or migratory fish and/or seahorses in the harbours for ~2 years during the construction works). The sensitivity and value of the receptor is high (as they include species of international and national importance) and therefore the impact on fish would potentially be of **major adverse significance**.

However, piling for the proposed Scheme will not be directly coupled to the water as it will be undertaken in the dry (when the surface of the substrate is above the current tide level). Sheet piles for the new defence structures in Frontages 3, 4 and 5 will be driven close to the toe of the existing wall on the seaward side. Construction will be carried out over the low tide period; therefore, piling will not take place directly within the water body.

Whilst there may be a vibration transmission path through the ground and seabed, the sound radiated into the water will not be expected to be of a significant level. It is therefore considered that the noise propagated will not be transmitted into the water body at sufficient levels to cause disturbance to fish or shellfish species present in the area.

Mitigation
• To avoid the transmission of impulsive noise into the water column, piling on the foreshore will only be undertaken in the dry (when the surface of the substrate is above the current tide level), with methods to be agreed and included as part of the CEMP once a contractor has been appointed. • Installation of piles will be undertaken using vibro piling techniques as standard. Percussive piling will only be used when necessary to achieve the required design depth. If percussive piling is required, a soft start procedure will be implemented for a

Mitigation
minimum of 20 minutes to encourage any fish present to move away from the area. Should piling cease for a period greater than 10 minutes, then the soft start procedure will be repeated once piling is recommenced.

With the implementation of the mitigation measures outlined above, the impact of underwater noise on fish during the construction works will be of **negligible significance** as the pathway of transmission from the source (piling) to the receptor (fish) will be removed as piling will not take place within the water body.

Shellfish

The sensitivity of relevant shellfish receptors to underwater noise is shown in **Table 8.15** for those species for which sensitivity information is available. Shellfish such as oyster and mussels are fixed in one place once settled and are unable to move away from negative influences in their environment. However, the available evidence indicates that molluscs and crabs are not sensitive to underwater noise changes and lobsters have low sensitivity to this pressure.

Table 8.15: Sensitivity of shellfish receptors to underwater noise (from Marlin, 2024d).

Species	Sensitivity to underwater noise changes
Blue mussel	Not sensitive
Native oyster	Negligible
Common cockle	Not sensitive
Great scallop	Not sensitive
Common shore crab	Not sensitive
Edible crab	No information available
European spiny lobster	Low

With the implementation of the mitigation measures outlined above (for seals and fish), the impact of underwater noise on shellfish receptors during the construction works will be of **negligible significance** as the pathway of transmission from the source (piling) to the receptor (shellfish) will be removed as piling will not take place within the water body.

Benthic Ecology

The understanding of the impacts of elevated underwater noise levels on invertebrates is relatively underdeveloped (Hawkins et al., 2015). However, there is some evidence that some benthic species respond to sediment vibration. For example, at high levels hermit crabs (*Paganus bernhardus*) can leave their shell and then return (Roberts et al., 2016). Other behavioural effects have been recorded in decapod crustaceans including changes in foraging habitat (Tidau and Briffa, 2016).

The MarESA sensitivity assessments for the marine habitats and species present within the study area state that impacts from underwater noise are 'not relevant'. Although limited, the available literature on the impact of noise and vibration on benthic species suggests that some

marine invertebrates may be able to detect underwater noise which can potentially affect rates of food uptake, growth and reproductive rates (Hawkins and Popper, 2016; Aguilar de Soto *et al*., 2013; Spiga *et al*., 2012). Sediment vibrations were shown to adversely impact benthic crustacea and molluscs by eliciting changes in behaviour and physiology and even cause physical damage (Wale et al., 2013; Edmonds et al., 2016; Roberts and Elliot, 2017). Far less is understood about the impacts upon polychaetes that characterise the sediment communities within the study area.

The mitigation measures included above to protect marine mammal and fish receptors will also offer protection to the intertidal and subtidal invertebrate species present within Chichester and Langstone Harbours. Undertaking piling works in the dry will minimise the distance over which noise impacts will travel containing effects within the local area. In addition, during the low tide period, behaviour affecting ecosystem aspects such as predator-prey relations within the intertidal communities are far less likely to be disrupted.

Despite the lack of evidence relating to the impacts of noise upon invertebrate communities, overall, the indirect disturbance from increased noise during the construction phase would be localised, temporary with a short duration and the magnitude of effect negligible as piling will not take place within the water body. The value of the intertidal and subtidal habitats and communities have been assessed to be very high (as they include features and sub-features of international importance). The sensitivity of the benthic habitats and communities to the effects of noise are considered low, worst case. Therefore, overall, any effects will be of **minor adverse significance**.

8.7 Potential Impacts During Operation

The scoped in effects of the operational phase of the proposed Scheme on marine ecological receptors within the study area has been assessed. An outline of the nature of the impacts and a description of the significance of each effect upon marine ecological receptors is provided below.

8.7.1 Temporary loss and/or disturbance of intertidal habitats during maintenance works

It is expected that once the proposed scheme is operational, no maintenance (other than annual inspection and clearing of the drainage infrastructure) will be required for 10 years (AECOM, 2024). After that time, maintenance activities that will require access via the foreshore are likely to be limited to repairs to the concrete sea wall / cladding, maintenance of the flood gates, and maintenance of the outfalls and tidal flaps. The effect of direct disturbance and abrasion on the intertidal habitat during maintenance works will mirror that described for the construction works in **Section 8.6.1**, but will likely be of a smaller magnitude and duration than the initial capital construction works. Similar mitigation measures will be included in the methods and CEMP for any maintenance activities required during the operational phase.

Mitigation
• Works will be undertaken from the landward side wherever possible to minimise disturbance of the foreshore. • Where foreshore working is required, this will be restricted to a maximum of 20 metres seawards of the existing defences.

Mitigation
• The temporary working area boundary will be set out to ensure that areas of *Spartina* swards are protected and excluded from the haul route / working areas to ensure this habitat is not damaged during the works. • Where access is required on the foreshore, removable temporary haul routes will be installed (e.g., geotextile with sheet piles laid flat or aggregate on top) to minimise disturbance to the intertidal habitat.

As such, it is expected that there will be an impact of **minor adverse significance** from temporary disturbance of the intertidal habitat during maintenance activities in the operational phase of the proposed Scheme.

8.7.2 Permanent loss of intertidal habitat under the footprint of new defence structures and due to coastal squeeze

Small areas of permanent intertidal habitat loss will occur within the Scheme area as a result of the new coastal defence structures. In Frontages 3, 4 and 5, the new defences will result in the permanent loss of a narrow ribbon of intertidal sediment habitat under the footprint of the new structures. Along the whole of this area (Frontages 3, 4 and 5), this equates to 172m^2 of foreshore that will be lost under the footprint of the new structures, with a frontage-by-frontage breakdown provided in **Table 8.16** below. The area of permanent habitat loss that will arise from the proposed Scheme has been minimised as far as technically feasible, as described in **Chapter 4 (Alternatives)** and the **Detailed Design Report (AECOM, 2024)**. The proposed design for the new sea walls in Frontages 3, 4 and 5, with a buried apron, has significantly reduced the area of permanent habitat loss compared to the earlier outline design.

Table 8.16: Areas of permanent intertidal sediment habitat loss by Frontage.

Frontage / Location	Area of permanent intertidal sediment loss (m^2)
Frontage 3 – Ship Inn new sea wall	6.5
Frontage 4 – Watchtower to Winklemarket new quay wall	111.5
Frontage 5 – High Street concrete apron and pier supports for the new flood gates	10
Frontage 5 – Royal Oak new sea wall	44
Total	**172**

The area of permanent intertidal sediment habitat loss in Frontages 3, 4 and 5 is comprised of coastal shingle (B2) and littoral coarse sediment (A2.1) habitat types within the upper shore / existing vehicular access route area. This area of habitat is so compacted from its current use as a vehicular access route for the frontline properties that it was not possible to collect core samples within this area during the intertidal survey (AECOM, 2022). However, coastal shingle / littoral coarse sediment habitats are generally characterised by the absence, rather than the presence, of infaunal populations and have a low biodiversity. The area of permanent habitat loss that will result from the proposed works represents a very small footprint of effect in an intertidal habitat that is found commonly throughout the Solent and is therefore considered to be of low to medium magnitude. However, given its international importance

(very high value) as a SAC sub-feature and SPA/Ramsar supporting habitat, and the high sensitivity of the habitat to permanent loss, the impact is considered to be of **moderate to major adverse significance**.

Loss of intertidal habitat will also occur from the implementation of the Hold the Line policy along the proposed Scheme area due to sea level rise and coastal squeeze over the lifetime of the Scheme. This loss has already been assessed at the plan level in the Strategic Environmental Assessments (SEAs) for both the North Solent Shoreline Management Plan (SMP) (NFDC, 2010) and the Porchester to Emsworth Coastal Strategy (Environment Agency, 2012) and compensation via the Solent and South Downs (SSD) Habitat Compensation and Restoration Programme (HCRP) has been approved by the Secretary of State so is not considered further here.

Opportunities for intertidal habitat creation and/or improvement to offset the footprint losses have been considered as part of the detailed design work but are extremely limited within the proposed Scheme area given the very linear and narrow nature of the Scheme and the Conservation Areas / Listed Building heritage requirements and constraints on cladding and finishes. Given that there are no opportunities to offset within the Scheme area, the footprint intertidal habitat losses from the proposed Scheme will be added to the SSD HCRP. This is described further within the Information for HRA in **Appendix C**.

8.8 Cumulative Effects

The guidance and methodology described in **Chapter 16 (Cumulative Impacts)** has been used to assess potential cumulative effects from the proposed Scheme works on the important marine ecological receptors within the study area. The effects of the proposed Scheme that have the potential to affect marine ecological receptors in-combination with other plans and projects are:

a) Loss and/or disturbance of intertidal habitats (littoral sediment and saltmarsh) – temporary and permanent; and
b) Noise disturbance of marine mammals, fish and benthic invertebrates.

Given the nature of these impact pathways and the international and national importance of the marine ecological receptors, it is considered appropriate that the spatial extent of the cumulative effects assessment for this topic includes other plans and projects that could also affect these receptors via habitat or noise impact pathways within Chichester and Langstone Harbours (i.e., within the same water bodies, the same SSSI / SPA, and the same Estuary complex of the SAC designated site).

Table 16.1 lists the plans and projects scoped into the cumulative impacts assessment for the proposed Scheme. The following fully terrestrial projects have been scoped out of this marine ecology cumulative effects assessment as they have no potential for impacts on intertidal habitat and will not result in any underwater noise generation or any significant airborne noise that could affect marine mammals, fish or benthic invertebrates:

- Langstone Technology Park – Application for part demolition and reconfiguration of building 1000, car park layout and new industrial units and outline permission for demolition of existing buildings and erection of new employment space.

- Land Adjacent to Bosmere Medical Centre – Proposal for new headquarters building for Portsmouth Water.
- Land at Kingscroft Farm – Proposed development of up to 120 dwellings.
- Rook Farm – Proposed development of up to 300 dwellings.
- Land to the rear of 49 – 71 Fathoms Reach – proposed development of 51 dwellings.
- Land north of Oysters, Station Road – proposed development of 29 dwellings and associated highway works.
- Land south of Saltmarsh Lane – proposed development of up to 60 dwellings and associated landscape and highway works.
- Land south of the Mallards and west of Langstone Road – proposed development of 65 dwellings.
- Redevelopment of a brownfield site for the provision of 4No. apartment blocks comprising 90No. residential dwellings, parking, public open space, landscaping and other associated works, including demolition of existing buildings on site.

Table 8.17 below provides an assessment of potential cumulative effects on marine ecological receptors between the remaining plans and projects and the proposed Scheme.

Table 8.17: Assessment of potential cumulative effects on marine ecological receptors.

Plan or Project	Potential for cumulative effects from intertidal habitat loss?	Potential for cumulative noise disturbance effects on marine ecological receptors?
The North Solent Shoreline Management Plan	Yes. The proposed Scheme is delivering the SMP and PEMS policy of 'Hold the Line' (HTL) for this section of coastline. The effects of the SMP and Strategy policies on intertidal habitats was assessed within the relevant SEAs and HRAs, which both concluded a significant adverse effect on the Solent European Marine Sites due to permanent habitat loss due to coastal squeeze and are being compensated via the HCRP. The additional unforeseen footprint losses from the proposed Scheme, which are required to deliver the SMP and Strategy HTL policy, will also be added to the HCRP.	Any noise effects from the implementation of the SMP and Strategy policies is assessed at the individual scheme level. Relevant FCERM schemes that are being implemented to deliver the SMP and PEMS policies are considered below for the cumulative assessment (i.e. the South Hayling BMP, NPI FCERM Scheme and Farlington Marshes Coastal Defence and Regulated Tidal Exchange (RTE) scheme.
Portchester to Emsworth FCERM Strategy (PEMS)		
Hayling Island Coastal Management Strategy (HICMS)	Yes. The HICMS is still in development and has not yet been adopted by Havant Borough Council or approved by the Environment Agency. Nevertheless, the draft Strategy and its accompanying draft environmental assessments have identified that option development units where a sustain, maintain and/or improve policy is proposed will result in the loss of intertidal habitat due to coastal squeeze. However, these coastal squeeze losses have already been assessed and included in the HCRP for compensation as part of the North Solent SMP environmental assessments.	Any noise effects from the implementation of the HICMS policies will be assessed at the individual scheme level as they come forward.
Havant Borough Local Plan – The Core Strategy (2011) and The Allocations Plan (2014)	No. There are no policies or allocations within the Local Plan that will result in the loss of intertidal habitat.	Any noise effects from the implementation of the Core Strategy policies and allocations will be assessed at the individual scheme level as developments come forward. Land-based development schemes in the Local Plan are unlikely to have noise impacts on marine ecology receptors.
Havant Borough Regeneration Strategy	No. There are no policies within the Regeneration Strategy that will result in the loss of intertidal habitat.	Any noise effects from the implementation of the Regeneration Strategy will be assessed at the individual scheme level as developments come forward.

Plan or Project	Potential for cumulative effects from intertidal habitat loss?	Potential for cumulative noise disturbance effects on marine ecological receptors?
South Hayling Beach Management Plan (BMP)	No. The EIA and HRA for the BMP did not identify any loss of intertidal habitat as a result of the recycling and recharge works. Therefore, there is no potential for cumulative impacts from intertidal habitat loss with the proposed Scheme.	No. Beach recycling activities are undertaken above the water level and are therefore disconnected from the water body and have limited potential for underwater noise generation. Beach recharge activities involve the use of a dredging vessel to import material. However, beach recharge takes place very infrequently (less than once a year) and only involves one vessel for less than one week in each campaign and as such has a low to negligible impact on underwater noise. Therefore, no significant cumulative effect with the proposed Scheme is expected on marine ecological receptors.
North Portsea Island (NPI) FCERM Scheme	Yes. The NPI Scheme will result in the permanent loss of intertidal habitat, both as a result of coastal squeeze and from direct footprint losses. However, these losses have already been assessed within the SEA and HRA for the North Solent SMP and the Portsea Island Coastal Strategy (for coastal squeeze) and within the EIA and HRA for the NPI Scheme (for footprint losses) and the losses are being compensated via the HCRP.	No. Phases 1 to 4a of the NPI scheme have been completed and have therefore been considered as part of the baseline environment within this ES. Construction for Phase 4b is programmed to be completed in 2024 and therefore will not overlap temporally with the construction of the proposed Scheme. Phase 5 construction works are programmed to commence in 2025, which will overlap temporally with the construction of the proposed Scheme. However, the NPI5 works only include a very small amount of piling (approximately 1 day duration) for the new moat outfall, and the piling will be undertaken in the dry (when the surface of the substrate is above the current tide level) thereby avoiding any propagation of underwater noise. Therefore, together with the mitigation measures incorporated into the proposed Scheme works, there are unlikely to be any significant cumulative noise impacts on marine ecological receptors between this project and the proposed Scheme.
King Charles III England Coast Path: Portsmouth to South Hayling Stretch	No. The Portsmouth to South Hayling (PSH) stretch of the England Coast Path (ECP) runs from Old Portsmouth to South Hayling seafront, around Langstone Harbour. The proposal for the PSH stretch of the ECP has been published (with changes submitted in May 2021) but this stretch is still being determined by the Secretary of State. The length of	No. The proposed ECP route will not result in any underwater noise generation or any significant airborne noise disturbance that could affect marine mammals, fish or benthic invertebrates. As such, there is no potential for cumulative noise impacts on marine ecological receptors between this project and the proposed Scheme.

Plan or Project	Potential for cumulative effects from intertidal habitat loss?	Potential for cumulative noise disturbance effects on marine ecological receptors?
	this stretch that overlaps spatially with the proposed Scheme is PSH-2-S061. The Access and Sensitive Features Assessment (incorporating the HRA and SSSI impacts) for the PSH stretch of the ECP did not identify any loss or disturbance of intertidal habitat as a result of the proposed route. Therefore, there is no potential for cumulative impacts from intertidal habitat loss with the proposed Scheme.	
King Charles III England Coast Path: South Hayling to East Head Stretch	No. The South Hayling to East Head (SHE) stretch of the ECP runs from South Hayling seafront to West Wittering beach. The proposal for the SHE stretch of the ECP has been published but this stretch is still being determined by the Secretary of State. The length of this stretch that overlaps spatially with the proposed Scheme is SHE-2-S002 to SHE-2-S007. The HRA for the SHE stretch of the ECP identifies a very small (<5m^2) loss of intertidal habitat in Chichester Harbour due to the installation of a boardwalk (at Gutner Point) and a 20m fence (at Ella Nore). However, given the inconsequential size of this habitat loss, it is unlikely that there will be any significant cumulative effect with the proposed Scheme.	No. The proposed ECP route will not result in any underwater noise generation or any significant airborne noise disturbance that could affect marine mammals, fish or benthic invertebrates. As such, there is no potential for cumulative noise impacts on marine ecological receptors between this project and the proposed Scheme.
Northney Marina maintenance dredging. MMO case ref: MLA/2014/00288/1. Licence ref: L/2014/00368/2	No. This maintenance dredging licence is for dredging of subtidal sediments within the marina and will not result in any impacts on intertidal habitat.	No. This maintenance dredging licence is for the period from December 2014 to December 2024 and therefore will not overlap temporally with the proposed Scheme construction works. It is likely that this maintenance dredging licence will be renewed during 2024 as this is an ongoing marina operation. However, the works only involve the operation of one backhoe dredger and a disposal hopper, and as such has a low to negligible impact on underwater noise levels. Therefore, together with the mitigation measures incorporated into the proposed Scheme works, there are unlikely to be any significant cumulative noise impacts on marine ecological receptors between this project and the proposed Scheme.

Plan or Project	Potential for cumulative effects from intertidal habitat loss?	Potential for cumulative noise disturbance effects on marine ecological receptors?
Farlington Marshes Coastal Defence and Regulated Tidal Exchange (RTE) scheme (22/00006/EIASCO)	The Environment Agency is working in partnership with Portsmouth City Council (PCC) to investigate options for a sustainable solution to flood risk management at Farlington Marshes. As a result of engagement in 2019 with key stakeholders including PCC, Natural England, Coastal Partners and the Hampshire and Isle of Wight Wildlife Trust the proposed approach is currently Hold the Line with Regulated Tidal Exchange until 2060. An outline design was produced in 2022 and EIA Scoping was undertaken with PCC and the MMO. Information on the project website indicates that a planning application for the project will be submitted in early 2024. However, at the time of writing this ES (March 2024), there is insufficient information available on the timing or detailed design of the proposed works at Farlington Marshes to be able to undertake any meaningful assessment of potential cumulative effects with the proposed Langstone FCERM Scheme.	
Southern Water 10-year marine licence application for minor maintenance works on their coastal outfalls. (MMO case ref: MLA/2019/00027)	No. A marine licence was granted in 2021 by the MMO to Southern Water for a 10-year licence for minor maintenance work to their coastal outfalls. The application covers 605 coastal outfalls below Mean High Water Springs (MHWS) in the Southern Water region and the location data for the outfalls included within the application adjacent to the Ports Creek area are shown in **Figure 8.19** below. There are two outfalls covered by this licence within the proposed Scheme area and a further three within 1.5km of the proposed scheme. The Southern Water licence is for minor maintenance works including inspection, repair and replacement activities for outfalls and their associated infrastructure, such as beacons, support structures, flap valves and protection grilles. The MMO completed a HRA for the licence application, which indicates that the works may involve activities such as clearing build-up of sediment around the pipes and boreholes/trial pits, which could result in some intertidal habitat loss. However, the MMO concluded that given any loss is likely to be very small due to the nature of the works (to repair and maintain existing structures) and the fact that most habitat types represented are sediment such as mudflats, which can be back filled easily, that a de minimis approach could be taken. Therefore, given the inconsequential size of	No. This marine licence includes piling activities for repair / replacement of outfall structures, which has the potential to generate underwater noise that could affect marine mammals, fish and/or benthic invertebrates. However, the licence includes mitigation such as vibro-piling where suitable, using soft start procedures and timing restrictions on when piling can take place. Due to the small-scale and short term (<1 week) nature of the Southern Water maintenance activities, and with the underwater noise mitigation measures included in the Southern Water licence and those proposed within the Langstone FCERM Scheme, it is unlikely that there will be any significant cumulative effects on marine ecological receptors.

Plan or Project	Potential for cumulative effects from intertidal habitat loss?	Potential for cumulative noise disturbance effects on marine ecological receptors?
	any habitat loss from the Southern Water maintenance activities, it is unlikely that there will be any significant cumulative effects with the proposed Scheme.	
Partial Reinstatement and Repair of existing sea wall to a height of 1.4m and Creation of an inner bund with a maximum height of 2.25m to protect habitat for wintering bird populations. Northney Farm, St Peters Road, Hayling Island (APP/23/00507)	Yes. The proposed curlew mitigation at Northney Farm will result in the loss of intertidal habitat due to coastal squeeze from maintenance of the frontline sea wall. However, this application has not yet been approved and it is expected that it would need to identify and secure compensatory intertidal habitat in order to meet HRA requirements as it would have an adverse effect on the integrity of the SAC, SPA and Ramsar site alone and therefore is excluded from the in-combination / cumulative effects assessment.	No. The outline CEMP submitted with the Northney Farm curlew mitigation planning application indicates that no plant or equipment will access the foreshore during the sea wall works – the reconstruction will be carried out from behind the existing sea wall. There are also no piling works within the Northney Farm mitigation scheme. As such, there is no potential for cumulative noise impacts on marine ecological receptors between this project and the proposed Scheme.

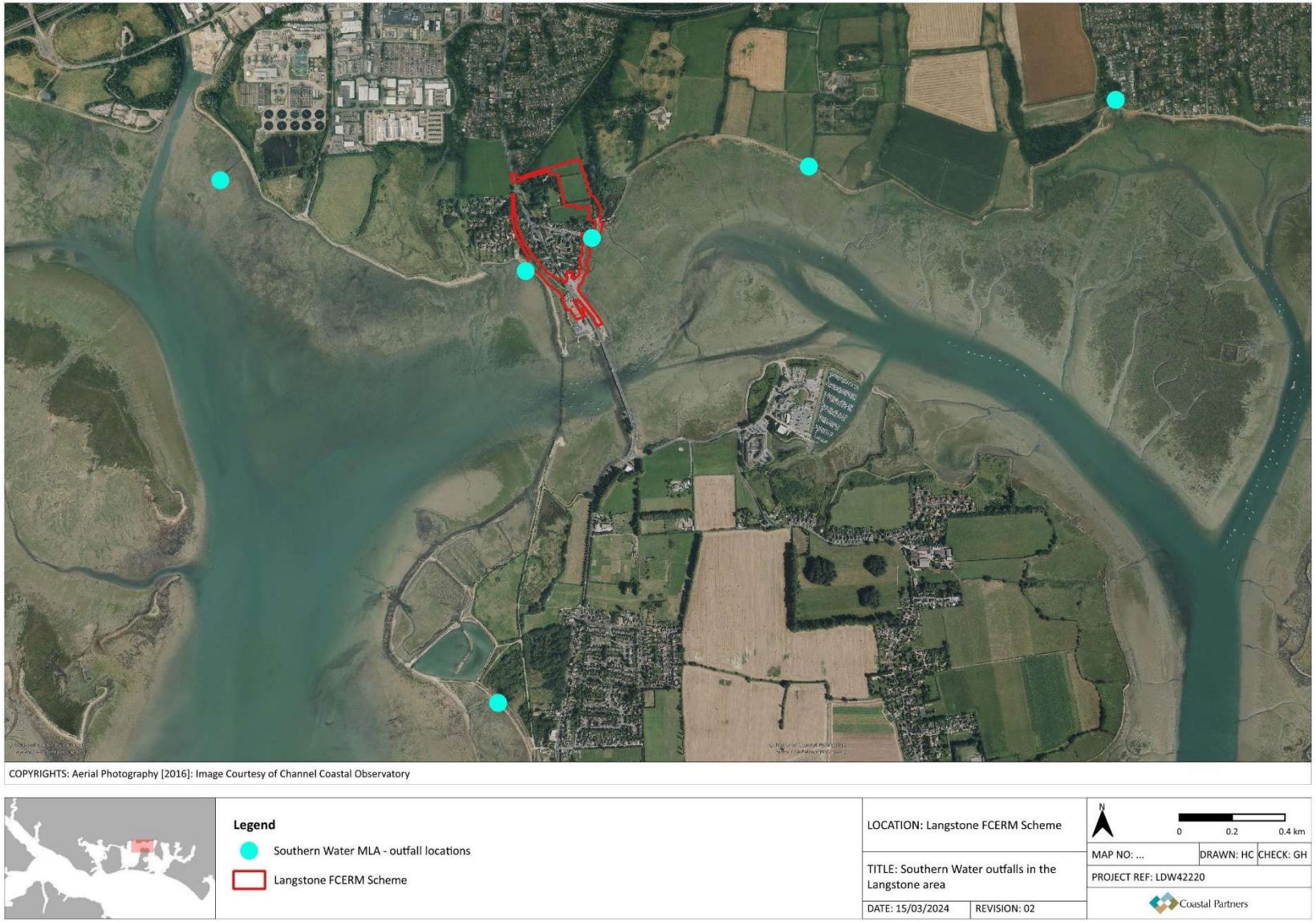

Figure 8.19: Southern Water outfalls in the Langstone area covered by the 10-year maintenance marine licence MLA/2019/00027.

The assessment above indicates that there are not likely to be significant cumulative effects on marine ecological receptors due to underwater noise between the proposed Schemes and other plans and projects. It does identify potential for cumulative effects from intertidal habitat loss between the proposed Scheme and other FCERM plans and projects. However, any losses of intertidal habitat have been added (or will be, when the relevant Strategy or Scheme is approved) to the SSD HCRP as the Government's agreed compensation mechanism for FCERM.

8.9 Conclusions

Table 8.18 below summarises the potential impacts on marine ecology that could result from delivery of the proposed Scheme. Where significant impacts have been identified, appropriate mitigation has been incorporated to remove or reduce this impact. Any residual impact resulting from the delivery of the scheme, after mitigation measures have been adopted, has been presented to demonstrate environmental acceptability.

Impacts from the proposed Scheme works will be largely limited due to the short term and temporary nature of the construction works. The mitigation measures that will be put in place, such as the silt curtain, restricted foreshore working area, temporary haul routes, piling methods and the majority of the marine works being undertaken over the low tide period, mean that the impacts can be considered to be minor for marine ecological receptors.

As such, the proposed works are considered environmentally acceptable, in terms of impacts on marine ecological receptors, following delivery of the mitigation measures in **Table 8.18**.

Table 8.18: Overview of potential Impacts, necessary mitigation and residual impacts

Potential Impact Pathway	Significance of impact	Mitigation and Residual Impacts
Temporary loss and/or disturbance of intertidal sediment habitats and saltmarsh vegetation during construction and maintenance works	A small area (maximum / worst case 0.57 ha) of intertidal habitat will be affected for the short duration of the construction and/or maintenance works. The impact is of low magnitude for intertidal sediment and medium magnitude for saltmarsh. The habitats are very high value but have low to medium sensitivity worst case to abrasion / disturbance. Therefore, overall, without mitigation, the impact is considered to be of **minor adverse significance for intertidal sediment** and **moderate to major adverse significance for saltmarsh.**	Works will be undertaken from the landward side wherever possible and where foreshore working is required, this will be restricted to a maximum of 20 metres seawards of the existing defences, marked by the silt curtain, to limit the extent of foreshore disturbance. The silt curtain and temporary working area boundary will be set out to ensure that areas of *Spartina* swards are protected and excluded from the haul route / working area to ensure this habitat is not damaged during the works. Where access is required on the foreshore, removable temporary haul routes will be installed to minimise disturbance to the intertidal habitat. The area excavated for construction of the new sea walls will be reinstated to existing foreshore levels, with foreshore material placed back in the reverse order to that in which it was excavated to ensure that the sediment

Potential Impact Pathway	Significance of impact	Mitigation and Residual Impacts
		layers are returned in the order they were prior to the works. With the mitigation measures outlined above, the residual impact on the saltmarsh and intertidal sediment habitats is expected to be of **minor adverse significance**.
Noise and vibration impacts on marine mammals, fish and benthic ecology	Piling is required in Frontages 2, 3, 4 and 5 of the proposed Scheme. Airborne noise: The haul out sites used by seals in Chichester and Langstone Harbours are over 4 km from the proposed Scheme and therefore a **negligible impact** is expected on seals from airborne noise emissions during construction activities. Underwater noise: The subtidal channels in Langstone and Chichester Harbours are important habitat for seals (which are a high value and sensitivity receptor). Therefore, without mitigation, the generation of impulsive underwater noise during marine piling activities could have a **moderate to major adverse** effect on seals. If marine piling was to occur within the water column at Langstone, it could have an impact of medium magnitude on fish, which have a high sensitivity and value, and therefore the impact on fish would potentially be of **major adverse significance**. The available evidence indicates that shellfish and benthic invertebrates are not sensitive / have low sensitivity to underwater noise and therefore this impact will be of **minor adverse significance** worst case to shellfish and benthic invertebrates.	To avoid the transmission of impulsive noise into the water column, piling on the foreshore will only be undertaken in the dry (when the surface of the substrate is above the current tide level). Installation of piles will be undertaken using vibro piling techniques as standard. Percussive piling will only be used when necessary to achieve the required design depth. If percussive piling is required, a soft start procedure will be implemented for a minimum of 20 minutes to encourage any marine ecological receptors present to move away from the area. Should piling cease for a period greater than 10 minutes, then the soft start procedure will be repeated once piling is recommenced. With the implementation of the mitigation measures outlined above, the impact of underwater noise on seals, fish, shellfish and benthic invertebrates during the construction works will be of **negligible significance** as the pathway of transmission from the source (piling) to the receptors will be removed as piling will not take place within the water body.
Permanent loss of intertidal habitat under the footprint of new defence structures and due to coastal squeeze	In Frontages 3, 4 and 5, there will be a permanent loss of 172m^2 of intertidal sediment habitat under the footprint of the new structures. This littoral coarse sediment habitat is within the existing vehicular access route used by frontline properties and is therefore already significantly impacted. The area of habitat loss is of low to medium	Opportunities for intertidal habitat creation and/or improvement to offset the footprint losses have been considered as part of the detailed design work but are extremely limited within the proposed Scheme area given the very linear and narrow nature of the Scheme and the heritage requirements and constraints on cladding and finishes. Given that there

Potential Impact Pathway	Significance of impact	Mitigation and Residual Impacts
	magnitude, but the habitat is of very high value and has a high sensitivity, so the impact is considered to be of **moderate to major adverse significance**.	are no opportunities to offset within the Scheme area, the footprint intertidal habitat losses from the proposed Scheme will be added to the SSD HCRP for compensatory habitat delivery. This will ensure that the habitat losses are offset and there will be a **negligible significance** impact on intertidal habitats overall.
Overall summary and confidence	The proposed Scheme works are considered environmentally acceptable, in terms of impacts on marine ecological receptors. Confidence in this assessment is high for benthic ecology as it has been informed by a site-specific Phase 1 and 2 baseline survey and the MarESA sensitivity assessment evidence database. Confidence in the assessment for fish and marine mammals is medium as, whilst no specific baseline surveys have been undertaken in relation to these receptors, appropriate desk-based evidence has been collated and reviewed, including sources that are widely accepted as industry standards and best practice.	

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